INVENTUM ENGINEERING, PC

Remedial Action Work Plan

Tonawanda Coke Corporation, Operable Unit 02

Site No. 915055

3875 River Road

Tonawanda, New York 14150

Prepared for

Honeywell International Inc.

July 3, 2026

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

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List of Acronyms and Abbreviations

AROD	Amended Record of Decision
AJD	Approved Jurisdictional Determination
AMSL	Above Mean Sea Level
bgs	Below Ground Surface
BMP	Best Management Practice
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
cm/s	Centimeters per second
CPP	Community Participation Plan
DOT	Department of Transportation
DOW	Division of Water
EDD	Electronic Data Deliverable
EDI	Earth Dimensions, Inc.
EQ	Equalization
EWP	Excavation Work Plan
FER	Final Engineering Report
ft bgs	Feet below ground surface
ft-amsl	Feet above mean sea level
FFS	Focused Feasibility Study
FRI	Focused Remedial Investigation
GHG	Green House Gasses
GSR	Green and Sustainable Remediation
HASP	Health and Safety Plan
HDPE	High-density polyethylene
HSA	Hollow-Stem Auger
mg/kg	Milligrams per kilogram
MW	Monitoring Well
NAPL	Non-aqueous Phase liquid
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	Operation Maintenance and Monitoring
OSC	Ontario Specialty Contracting
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyls
PEM	Palustrine Emergent
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization detector
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment

PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
RA	Remedial Action
RAMP	Remedial Action Monitoring Plan
RAWP	Remedial Action Work Plan
RAO	Remedial Action Objectives
RD	Remedial Design
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
RIR	Remedial Investigation Report
RITC	Riverview Innovation & Technology Campus, Inc.
RIWP	Remedial Investigation Work Plan
ROD	Record of Decision
SB	Soil Boring
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SGV	Standards and Guidance Values
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SRIWP	Supplemental Remedial Investigation Work Plan
SSF	State Superfund
SS	Surface Sample
SVOC	Semi-volatile organic compound
SVE	Soil Vapor Extraction
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
TCC	Tonawanda Coke Corporation
TCWG	Tonawanda Community Work Group
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TCLP	Toxicity Characteristic Leaching Procedure
ug/Kg	Micrograms per kilogram
ug/L	Micrograms per liter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
WOUS	Waters and Wetlands of the United States



Executive Summary

On behalf of Honeywell International Inc. (Honeywell) and the property owner Riverview Innovation & Technology Campus, Inc (RITC), Inventum Engineering, P.C. (Inventum) has prepared this Remedial Action Work Plan (RAWP) for the Tonawanda Coke Corporation (TCC), Operable Unit 02 Site (#915055, OU2). The RAWP has been prepared to detail the implementation of the selected remedial alternative in the Amended Record of Decision (AROD) prepared by the New York State Department of Environmental Conservation (NYSDEC, June 2024).

Honeywell entered Order on Consent and Settlement Agreement B9-85-2-779 ("2020 Order" February 14, 2020) to address the proposed change of use of the site from industrial to commercial. The previous ROD was executed while the site was operating as the TCC. TCC had a long history of environmental and safety violations and closed in October 2018. A predecessor of Honeywell owned the site until the 1970s. RITC had no ownership or operational history at the operating facility and is not party to the 2020 Order. The Site is listed as Operable Unit #2 of State Superfund (SSF) Site Number 915055. The approximate 7.7-acre Site 109 represents a portion of the former TCC facility, which was an operating coke making and by-products facility for more than 100-years.

The approved Focused Remedial Investigation (FRI, Parsons 2023) was conducted in accordance with the DER-10 Technical Guidance for Site Investigation and Remediation (May 2010) and a NYSDEC approved Remedial Investigation Work Plan (RIWP) for both Site 109 and Site 110 (OU1). The approved Focused Feasibility Study (FFS) was prepared (Parsons, 2024). The AROD was issued June 4, 2024.

Site Description

The Site, located in the western portion of 3875 River Road in the Town of Tonawanda, represents former TCC logistical areas; coal conveyance, water management, and trucking (tarp station and scale). The security building for the entire RITC properties is located on Site 109.

The Site occupies approximately 7.7 acres in the southwestern portion of the former TCC facility property. Two concrete-lined settling/separation ponds that are part of the stormwater management system for the entire 3875 River Road property are present on Site 109. The property (Figure 1-1) is in a historically heavy industrial area approximately 0.5 miles east of the Niagara River. The Site (Figure 1-2) is bordered to the:

- North by industrial operations (Vanocur). Further north by Swift River Associates (an aggregate supplier), abandoned railroad lines, a closed reclamation facility/salvage yard, and a solid waste (fly ash) landfill;
- South by the 3821 River Road Brownfield Clean-up Program (BCP) Site #C915003, which is the former Allied Chemical Special Chemical Division facility. Further south by a high voltage electrical line easement, a major oil storage facility, and commercial/industrial operations within a quarter mile, further south (>0.25-mile) by more commercial/industrial operations, and a small residential community. The nearest residences to the Site are located approximately 0.4-miles from the southern Site boundary; and
- West by River Road. Further southwest and west is another Operable Unit (OU3 aka Site 108) of the former TCC facility property (Site #915055, OU3), Niagara River World[1] (heavy industrial and

[1] Note: The property on which Niagara River World was located has been subdivided. The warehouse and paved areas remain as Niagara River World, the majority of the site, which is currently inactive, is now owned by Acquest Development (dba WW River Road LLC) of Williamsville, NY.

logistic operations), and beyond these industrial properties is an asphalt plant/terminal and the Niagara River.

Site Background

Prior to its closure in 2018, OU2 (Figure 1-3) had limited above ground development, the concrete settling ponds and stormwater infrastructure integral for the stormwater management at the adjacent RITC BCP Site (#C915353) has been in use since well before RITC acquired the property but appear to be one of the last structures built for the plant, likely in 1997 or 1998 (draft design drawings were dated June 1997, "For DEC Permit"). Historically a coal conveyor transported coal from the Niagara River (unloaded on Site 108 (#915055, OU3), across Site 109 for storage and use at the main TCC plant. The above ground conveyor and superstructure had been removed, but the foundations remain. Above and belowground utilities cross the site from River Road to the RITC BCP Site. One entry to a tunnel that continues below River Road onto Site 108 is located near the southwest boundary of Site 109. A small guard building was located in the northwest corner of the site (demolished in 2025), the existing security building is located near the northeast corner of the site, and a tarping frame and scale were located in the eastern part of the site (the scale was sold in the bankruptcy auction and the tarping frame was removed in 2024).

Geology

The geology beneath the Site is consistent with regional studies. Fill material overlies native silty clay and till deposits. The fill is composed primarily of coal, coke, and breeze and to a lesser extent reworked silt, sand, gravel, and miscellaneous fill debris (ex. wood and brick). The subsurface impacts of the TCC operation are contained within the fill. The silty clay underlying the fill is more than 40 feet thick and the data obtained to date indicates it is less permeable than the clay used in a typical landfill liner.

Nature and Extent

The Focused RI was completed between September 2020 and September 2023 and consisted of an investigation program of test pitting, soil borings, monitoring well installation, surficial soil sampling, surface water sampling, groundwater sampling, and "sediment[2]" sampling. Assessment of subsurface soil contamination was defined based on historical use to establish the RI scope of work and define the nature and extent of impact. The RI data has allowed definition of the nature and extent of contamination on Site 109 and allowed the New York State Department of Environmental Conservation (NYSDEC) to select the appropriate remedial alternative technologies to address those potential exposures (NYSDEC, 2024).

Additional test pits were advanced during pre-design investigations for this RAWP and indicate there is limited topsoil on the berms that meets commercial Soil Cleanup Objectives (SCOs), and the fill in the berms is typical of the balance of the site. These observations were confirmed when the Northwest most berm was removed to allow installation of a new overhead electrical power supply in 2025.

Qualitative Human Health Exposure Assessment

Parsons (2022) completed a qualitative human health exposure assessment (QHHEA) in accordance with NYSDEC DER-10 requirements. The QHHEA determined that there are no current completed pathways for exposure, and therefore no potential exposures to any offsite receptor, with the exception of contact to surface water from the settling ponds on the Site. All current and future potential exposures would be associated with contact with fill, shallow groundwater, and remaining process residuals. The onsite

[2] The term sediment as used herein is fill that is submerged below the flow in stormwater management facilities, there is no sediment as normally defined as loose sand, clay, silt, and other soil particles that settle at the bottom of a body of water, on Site 109.

potential exposures will be addressed through remedial actions selected by NYSDEC and Institutional Controls/Engineering Controls (IC/ECs), including a Site Management Plan and Environmental Easement.

Conclusions of the Remedial Investigation

The data from the RI established that:

- The potential exposure pathways at the Site have been or are being eliminated;
- The Site surface is covered with fill across a majority of the Site, (ranging in thickness of 0-feet to 16-feet) underlain by more than 40-feet of low permeability silty clay;
- There are no areas of the Site's current surface condition that meet the NYSDEC criteria for unrestricted use;
- The most significant area of impact are two areas of surface fill that contain concentrations of polycyclic aromatic hydrocarbons (PAHs) above 500 milligrams per kilogram (mg/Kg) and drainage ditch soils and sediment that exceed Protection of Ecological Resources SCOs, potentially due to historic spillage from the former elevated coal conveyor that was located over this area and/or due to erosion and transport of soils impacted with coal and coke from areas upgradient of Site 109 into the onsite drainage ditch. The drainage ditch was constructed to convey flow from the stormwater management systems to the culvert under River Road;
- The fill at the Site does not pose potential exposures to human health or the environment with respect to offsite receptors;
- The silty clay at the Site has not been affected by the TCC operations;
- The impacts to groundwater are limited both in concentrations and lateral and vertical extent of impact, with the most detections observed in the samples from the upgradient monitoring well;
- Impacts to shallow groundwater appear to be localized on the property; and
- Naturally occurring background metals are the only compounds detected consistently above Class GA Standards in groundwater samples.

Remedial Action Objectives (RAOs)

The generic RAOs address all media encountered and are applicable to the potential for exposure to the compounds identified by the RI. The generic RAOs for Public Health and Environmental Protection are applicable to the following media on the Site:

- Groundwater
- Soil
- Surface Water
- Sediment
- Soil Vapor

Focused Feasibility Study

The detailed Focused FS (Parsons, 2024) was completed following the procedures required by NYSDEC DER-10 and DER-31. The Focused FS identified and screened remedial technologies applicable to the nature and extent of contamination identified in the RI and those that would ultimately achieve the RAOs. Four remedial alternatives were assembled, and each provided an array of technologies to comprise a comprehensive remedial program for Site 109. The four assembled remedial alternatives were then screened to identify the single recommended alternative that is most appropriate for the Site. The NYSDEC,

NYSDOH and the public reviewed the recommendation and through their review and comments identified the Remedial Alternative No. 3 as defined in the AROD.

Selected Remedial Alternative

The Focused RI was designed to address significant threats to human health and the environment and eliminate potential exposure pathways. The RI was executed to characterize the areas known to have the potential to be impacted. The Focused FS recommended a remedial alternative to address the impacts and potential exposures that remain in fill, limited areas of the upper clay, groundwater, and soil vapor at Site 109.

The NYSDEC selected a remedial alternative that consists of:

- Institutional/Engineering Controls (IC's/ECs)
  - Placing an Environmental Easement;
  - Placing use restrictions on the Site:
    - Prohibiting the installation of drinking water wells without necessary Erie County Department of Health approvals and water quality treatment as determined by the NYSDOH to render it safe for intended use,
    - Prohibiting residential development; and
    - Require compliance with the Site Management Plan (SMP).
  - Establishing procedures for Site management, including requirements for future onsite excavation in a SMP and Excavation Work Plan(s) (EWP);
    - Cover inspection and maintenance;
    - Conducting groundwater monitoring in accordance with the SMP;
    - Establishing protocols for onsite excavation in an EWP;
    - Require soil vapor investigation prior to construction of new occupied structures; and
    - Annual reporting in Periodic Review Reports (PRRs).
- Source Controls
  - Ongoing Operation Management and Maintenance (OM&M) through completion of the remedial actions;
  - The existing concrete lined stormwater sedimentation ponds will be used until the new stormwater retention basin planned for the main TCC BCP Site is completed. The concrete lined basins will be cleaned and taken out of service;
  - Removal of contaminated materials from contact with water in the southern drainage ditch that exceed protection of ecological soil cleanup objectives (SCOs) and creating a clean corridor, effectively eliminating potential concerns related to erosion of cover within drainage ditch(es) (Note: Because the BCP Site remedial actions will eliminate flow to Outfall #002, the scope of this draft Site 109 RAWP achieves this objective by eliminating the southern ditch altogether); and
  - Cover placement for the site to include a combination of soil covers, asphalt or concrete paving, and buildings or structures to allow for the placement of the cover system and management of the surface water flow.
- Elimination of Exposure Pathways
  - Clearing, grubbing, and grading the Site to allow placement of the cover and if appropriate accommodate pending redevelopment;



- Excavation and offsite disposal of soil/sediment with concentrations of PAHs greater than 500 mg/Kg;
- Continuing the monitoring of the surface water discharge in accordance with the Stormwater Pollution Prevention and Protection (SWPPP) until the completed cover is established and no contact between precipitation and underlying fill is possible;
- Closure of existing underground utilities (north-south sewer, and settling pond manifold) that could act as preferential pathways;
- Regrading of fill, including the berm, on Site 109 to allow placement of a cover system where the upper one foot of exposed surface soil will not exceed the applicable SCOs. The measured concentrations in the cover materials will be at or lower than the commercial SCOs;
- Cover placement, a demarcation layer and no less than 12-inches of soil meeting the commercial or protection of ecological resources SCOs as appropriate (pavement or buildings slabs may be used in place of the soil cover);
- During site development, soil vapor intrusion evaluations shall be conducted in areas where building footprints are planned for construction; and
- Maintenance of the cover systems, vegetated areas, and groundwater monitoring system.

Schedule

The schedule included with this RAWP depicts the sequence of ongoing and proposed activities through completion of the Final Engineering Report (FER).

Engineering Certification

I, John P. Black, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31)

Respectfully Submitted,

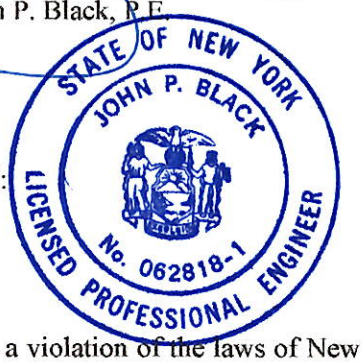
Inventum Engineering, P.C.

John P. Black, P.E.

Date: July 3, 2026

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1 Introduction

On behalf of Honeywell International Inc. (Honeywell), Inventum Engineering, P.C. (Inventum) has prepared this Remedial Action Work Plan (RAWP) for the TCC State Superfund Site (SSF) Number 915055, Operable Unit 2, Site 109 (Figure 1-1) located on the westernmost 7.7 acres of 3875 River Road in Tonawanda, Erie County, New York (Figure 1-2[3]). The property is Owned by Riverview Innovation & Technology Campus, Inc. (RITC) who has reviewed and approved the RAWP and who allow access for implementation of the Remedial Actions.

Site 109 is listed as Operable Unit 2 (OU2) of NYSDEC Site Number 915055. Site 109 represents a portion of the former Tonawanda Coke Corporation (TCC) facility, which was an operating coke making and by-products facility for more than 100-years. TCC filed for bankruptcy protection in 2018 and all manufacturing on the property was permanently suspended in October 2018. On September 23, 2019, the sale of the property to RITC was approved by the U.S. Bankruptcy Court and the purchase was completed October 10, 2019. RITC has maintained Site 109 since the purchase was approved in 2019 and Operation Maintenance and Monitoring (OM&M) of the setting ponds and stormwater discharge was transferred from the USEPA to RITC in June 2020.

Semet Solvay, a predecessor of Allied Signal/Honeywell owned and operated the coke making facilities, including logistical facilities on Site 109 prior to the sale to TCC. RITC is the current owner but had no ownership or operational history at the facility until after it was purchased through the U.S. Bankruptcy Court. All work conducted for the Site 109 - 110 Focused Remedial Investigation (FRI) and Site 109 Focused Feasibility Study (FFS) were completed for Honeywell, in accordance with the Order on Consent and Settlement Agreement B9-85-2-77D (2020 Order) between Honeywell and the New York State Department of Environmental Conservation (NYSDEC), and NYSDEC and New York State Department of Health (NYSDOH) approved work plans. Surface water management on Site 109 is conducted on behalf of RITC in accordance with the NYSDEC approved Stormwater Pollution Protection Plan (SWPPP) for the RITC BCP Site Number C915353, the primary source of stormwater to the ponds.

This RAWP was prepared to define the tasks required to complete the remedial actions in accordance with the AROD, State Superfund, DER-10 Technical Guidance for Site Investigation and Remediation (May 2010), and DER-31 Green Remediation. The Focused Remedial Investigation Report (FRI Report, Parsons, 2023) for Site 109 was approved by NYSDEC. The FFS for Site 109 was submitted in February 2024 and approved with the release of the NYSDEC Amended Record of Decision (AROD). The AROD was released by the NYSDEC June 2024, and Honeywell agreed to complete the selected remedial actions on July 16, 2024.

1.1 Remedial Action Work Plan Objectives

The objectives of the RAWP are to provide the scope and actions required to complete the remedial alternative selected in the NYSDEC AROD. The overall goals for the Site are to create a remediated property that is protective of human health and the environment and that can be safely redeveloped for commercial or industrial purposes. The remedial action will be implemented to achieve commercial soil cleanup objectives (SCOs) based on the reasonably anticipated commercial and industrial use of the Site.

[3] Note: For purposes of the RAWP there are Figures included in the text, and Construction Sheets (Appendix A) that provide the details and specification to be used in the field and will be used to implement the remedial actions and to create the "As-built Drawings" for the Final Engineering Report (FER).

1.2 RAWP Organization

This RAWP Report has been organized in accordance with DER-10, into the following sections:

Section 1 - Introduction
Section 2 - Design Investigations
Section 3 - Remedial Action Objectives
Section 4 – Remedial Action
Section 5 - Schedule
Section 6 – Post-construction Plans
Section 7 - Site Figures
Section 8 - Bibliography
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Figures[4]
Appendices

1.3 Contacts

Key contact information for NYSDEC, New York State Department of Health (NYSDOH), and Inventum is provided below for reference:

NYSDEC

Benjamin McPherson
Division of Environmental Remediation
700 Delaware Ave
Buffalo, NY 14209
benjamin.mcpherson@dec.ny.gov

Teresa Mucha, Esq.
Office of General Counsel
700 Delaware Ave
Buffalo, NY 14209
teresa.mucha@dec.ny.gov

NYSDOH

Angela Martin
Bureau of Environmental Exposure Investigation
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
beei@health.ny.gov

Inventum Engineering, P.C.

John. P. Black, P.E.
President/Partner
441C Carlisle Drive
Herndon, VA 20170
john.black@inventumeng.com

A website has been established for the projects at the RITC properties and can be accessed through: www.RiverviewTechCampus.com. The website contains numerous documents and photographs that may help the reader envision the locations referenced throughout this work plan.

[4] Note: Figures refer to the drawings in the text. Sheets refer to the Construction Sheets in Appendix A.

Copies of approved documents are sent in print and on compact disk to the Buffalo and Erie County Public Libraries, both the Central (Main) and Kenmore Branches:

- Buffalo and Erie County Public Library
  Central Library
  One Lafayette Square
  Buffalo, New York 14203
- Buffalo and Erie County Public Library
  Kenmore Branch
  160 Delaware Road
  Kenmore, New York 14217

Approved documents for the Site can also be accessed in the NYSDEC DECinfo Locator;
https://extapps.dec.ny.gov/data/DecDocs/915055/

1.4 Site Description and History

The Site (Figures 1-2 and 1-3) was a former logistical area and an entrance to the TCC. Site 109 was crossed by a coal conveyor used for delivery of coal from Site 108 (NYSDEC 915055, Operable Unit [OU]3), a surface water drainage system, two settling ponds and associated piping, security, and trucking facilities (tarping station and scale). The tunnel (aka the "River Road Tunnel"), through which the coal conveyor, tar pipelines and the primary electrical supply historically passed through, terminates on the southwest area of Site 109 (Figure 1-3).

The TCC had a long history of environmental and safety violations and closed in October 2018. The closure of the facility eliminated the primary source of those environmental violations. The shutdown and USEPA emergency response actions did not address residuals in the settling ponds or fill at Site 109. The remediation of conditions left on the Site 109 portion of the property abandoned by TCC to meet NYSDEC commercial criteria are the subject of this RAWP.

1.5 Site Location and Description

The property is located at 3875 River Road in the Town of Tonawanda, Erie County, New York (Figure 1-2). The Site occupies an area of approximately 7.7-acres of the approximately 120-acre RITC properties and the surface consists broadly of the concrete settling ponds, a small, abandoned guard shack, a security building/guard house, and paved access roads, the remainder of the OU is primarily covered by grass and other types of vegetation. The trees on Site 109 were removed in 2024.

The property (Figure 1-2) is in a heavily industrial area approximately 0.5 mile east of the Niagara River. The Site is bordered to the:

- North by industrial operations (Vanocur), including one-half of the current BCP access road. Further north by Swift River Associates (an aggregate supplier), abandoned railroad lines, a closed reclamation facility/salvage yard (now the Town of Tonawanda composting facility), and a solid waste (fly ash) landfill;
- South by the former Allied Chemical Special Chemical Division facility currently owned by 3821 River Road, Inc. and is the 3821 River Road BCP Site (BCP Site #C915003). Further south by a high voltage electrical line easement, a major oil storage facility, and commercial/industrial operations within a quarter mile, further south (>0.25-mile) by more commercial/industrial operations, and a small residential community. The nearest residences to the Site are located approximately 0.4-miles from the southern Site boundary;
- East by the RITC BCP Site #C915353; and

- West by River Road. Further southwest and west is another portion of the former TCC facility property (Site 108, #915055, OU3), Niagara River World[5] (heavy industrial and logistic operations), beyond these industrial properties is an asphalt plant and terminal and the Niagara River.

1.6 Site Background

Prior to the 2018 closure, the Site had been supporting the main coke plant operations as a utility corridor and the point of discharge of stormwater from the adjacent TCC coke making and by-products facility. The facility was owned and operated from circa 1917 through 1947 by Semet Solvay Company, a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet Solvay Company was merged into Allied Chemical Corporation[6], which owned and operated the facility until 1978, when it sold the facility to TCC. TCC owned and operated the facility continuously from 1978 through October 2018. TCC filed for bankruptcy protection in 2018 and all manufacturing on the adjacent BCP Site was permanently discontinued, although stormwater management for the BCP Site on Site 109 continues. It is unknown if the coal conveyor or tar conveyance piping were being used at the time of the bankruptcy, but both were removed in 2022. Between October 2018 and March 2020, the U.S. Environmental Protection Agency (USEPA) conducted emergency response activities to treat surface water, but no action was taken to remediate the sediment in the settling ponds or in fill on Site 109. The USEPA continued to manage stormwater on Site 109 through May 2020, after which time responsibility for stormwater management was transferred to RITC, as the property owner.

On September 23, 2019, the sale of the property to RITC was approved by the U.S. Bankruptcy Court. The purchase of the property was completed October 10, 2019. Management of the property was transitioned from the USEPA to RITC between September 2019 and June[7] 2020, Honeywell continues environmental management of the property under Order to the NYSDEC.

At the time of the RITC acquisition of the Site, the facility buildings, equipment, and other infrastructure on the east end of Site 109 were in various states of deteriorating conditions. The relatively new (circa 1997/1998) settling ponds were structurally in good condition although the ponds were nearly full of accumulated sediment significantly reducing the desired retention time. Since the acquisition, RITC implemented NYSDEC approved BCP Interim Remedial Measures (IRMs) to clean out the settling ponds, aerate and recirculate the water, video inspect the sewers leading to Site 109, and monitor the surface water discharge in accordance with the 2020 SWPPP.

1.7 Topography

Site 109 is an approximately rectangular area (Figure 1-3) of about 1,000-feet by 250-feet with an undulating surface in some areas. Overall, Site 109 slopes from the east to the west, from approximate elevation 600-feet above mean sea level (AMSL) at the boundary with the BCP Site to elevation 576-feet AMSL at River Road.

There were two large berms oriented approximately north-south along the western border of Site 109, with steep slopes extending downward to River Road and to the rest of Site 109. These berms created locally high topography. The berm in the northwest corner of Site 109 was removed in 2025 to allow installation of a new electrical power supply. There is another large berm near the east end of Site 109, adjacent to the

[5] Note: The property on which Niagara River World was located has been subdivided. The warehouse and paved areas directly west of Site 109 remain as Niagara River World (4000 River Road), the majority of the former Roblin Steel site (4002 River Road), which is currently inactive, is now owned by Acquest of Williamsville, New York, through River Road LLC.

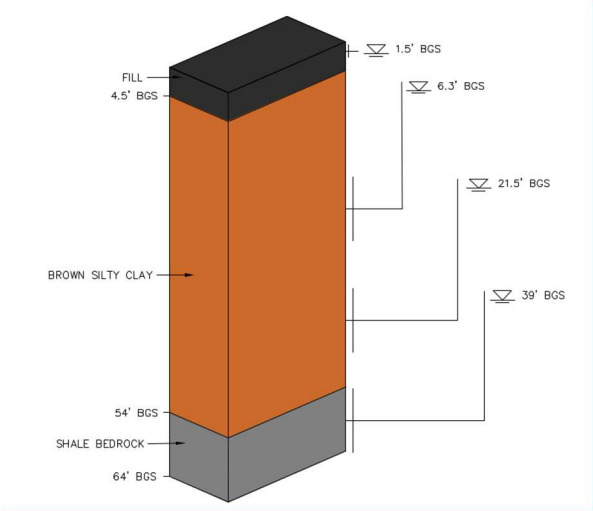
[6] Note: Honeywell was acquired by Allied Chemical Corporation in 1999 but the corporation retained the Honeywell name.

[7] The USEPA managed surface water on the property until the NYSDEC approved RITC's current SWPPP in May 2020.

stormwater settling ponds and a smaller mound immediately south of the pond access road. Generally, except for the berms, the Site elevation fairly uniformly increases from River Road (approximate elevation 576-ft-msl) moving east across Site 109 to the paved area at approximate elevation 600 ft-msl.

1.8 Geology

This description of the geology beneath the Site and the larger regional geology is based on the test pit and drilling programs conducted as part of the FRI (Parsons, 2021), regional studies conducted by others, boring/monitoring well log data from adjacent properties (#C915353 and C915003), historical knowledge, and local experience. The geology of the Site is remarkably uniform as detailed in the boring logs (Appendix B of the RI Report) and as shown in a generalized schematic typical of the east end of Site 109 (from the RI Report for the contiguous BCP Site #C915353) conditions below.



The schematic is to scale showing the relative thickness of silty clay between the fill and the underlying bedrock based on borings on the contiguous BCP Site (#C915353). The depths to groundwater shown on the right side of the schematic are typical of the eastern portion of Site 109. The conditions on the west side of Site 109 can be inferred from the boring logs (e.g., MW-PBCP-06D) on the adjacent BCP Site (#C915003) that indicate the rock elevation is consistent with the BCP Site but as the ground surface is lower, the silty clay thickness is approximately 20-feet along River Road.

Fill material overlies the native silty clay and till deposits across the Site and is composed primarily of coal, coke, breeze and to a lesser extent silt, sand, gravel (reworked alluvium and glaciofluvial deposits) and miscellaneous debris (ex. Wood and brick). An area near the northwestern corner of Site 109 was reportedly the location used to place fill from a demolished building although a test pit advanced through the area for this RAWP encountered demolition debris, the test pit did not encounter any unusual materials that would be considered potential source materials. The fill was the near surface material encountered in every test pit and boring. Fill thicknesses (0-feet to 16-feet [through the mounds]) across the Site were mapped and the mapping was based on ground surface elevations and depths to top of clay observed within the test pits. The fill in the berm in the northwestern corner of Site 109 was investigated in November 2024 and contained 6- to 12-inches of topsoil over general construction debris and fill representative of the Site. During removal of the northwest berm the findings of the PDI test pit excavation was confirmed.

A glacial lacustrine silty clay deposit consisting primarily of silt, sand, and clay appears to be the most widespread natural overburdened deposit in the area of Site 109. Glacial till consisting of a poorly sorted, non-stratified mixture of sand, silt, clay, gravel, and rock fragments lies below the lacustrine deposit. The silty clay is expected to range in thickness from 45-feet in the western part of Site 109 to 20-feet along River Road. Permeabilities for clay samples from the adjacent BCP Site ranged from 3.3 x 10^{-8} centimeters per second (cm/s) to 2.1 x 10^{-8} cm/s. For reference this is a lower permeability than required for clay used in landfill bottom layer liner systems.

Site 109 is located within the Erie-Niagara drainage basin of the Erie-Ontario Lowlands Physiographic Province of New York, which is characterized by a thick sequence of rock formations consisting predominantly of sandstones, shales, dolostones, and limestones.

1.9 Surface Water Hydrology

RITC discharges storm water to the Niagara River under a SWPPP approved by the NYSDEC. Surface water is discharged through three outfalls[8]:

- Outfall #001 – Discharge point for stormwater runoff from the former production area on the BCP Site after treatment in two concrete-lined settling/skimming ponds/lagoons. Only stormwater runoff has been discharged through this outfall since the acquisition of the BCP Site by RITC.
- Outfall #002 (on the BCP Site) – Discharge of runoff from the coal and coke yards and the southern drainage area of the BCP Site. Flow discharges to a culvert on Site 109 then to a surface drainage ditch. The flow from Outfall #002 combines with the discharge from Outfall #001 at the discharge from the settling ponds.
- Outfall #004 – (Southwest corner of Site 109) – Represents the combined flow from Outfalls #001, #002, Site 109, and a portion of 3821 River Road Site (Site # C915003). Outfall #004 discharges to a drainage ditch on the east side of River Road where the flow combines with flows from the western portion of Site 109 and other industrial properties south of Site 109 including the western portion of the 3821 River Road BCP Site, the National Grid Right of Way, and the Energy Transfer Terminal, as well as portions of River Road runoff. The combined flow is conveyed through a box culvert under River Road, into a drainage ditch on Site 108, and finally to the Niagara River.

1.9.1 Existing Stormwater Management Features

RITC assumed responsibility for stormwater management after the approval of the SWPPP. RITC has implemented a series of NYSDEC approved IRMs to improve the water quality discharged from the stormwater system.

1.9.1.1 Aeration and Filtration

The surface water in the settling basins at the time of transfer from the USEPA was anerobic. The addition of a pump and spray nozzle provided (1) aeration of the recirculated water, and (2) increased the overall retention time by moving a portion of the water being treated from the downstream settling pond to the upstream pond.

Monthly testing suggested a correlation between discharge quality and total suspended solids (TSS). A series of bag filters were added prior to the discharge. Water from the settling pond is pumped through the bag filters rather than being allowed to flow over the discharge weir.

[8] Outfall 003 was not in use at the time of the bankruptcy and there has been no flow from this outfall since 2008 (TCC 2016).

1.9.1.2 Pond Cleaning

RITC took each pond out of service separately to allow dewatering and excavation of the sediment in the ponds. The pond capacity and retention time was increased by more than 50 percent. The sediments were solidified and disposed offsite as solid waste at the Modern Landfill.

1.9.1.3 Elimination of Upstream Sources

Multiple IRMs have been implemented to remove the sources of surface water impact from the former TCC production areas and equipment, stormwater sewers, and surface fill.

1.9.1.4 Ongoing Management

Ontario Specialty Contracting (OSC) conducts daily inspections of the controls, and Inventum conducts detailed monthly inspections and sampling. Inventum on behalf of RITC conducts a monthly, quarterly, and semi-annual sampling program in accordance with the approved SWPPP. SWPPP Site Management Reports (SMRs) are submitted monthly to the NYSDEC.

1.9.1.5 Proposed Remedial Design

The existing settling ponds on Site 109 are a primary treatment system for stormwater from the BCP Site #C915353. These ponds will remain in operation until an alternative stormwater management system is constructed for the BCP Site. Following construction of stormwater controls on the BCP Site, the concrete lined basins on Site 109 will be emptied, decontaminated, and demolished.

1.10 Wetlands and Waterways

Inventum reviewed the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps for the potential presence of Waters and Wetlands of the United States (WOUS) and the NYSDEC Environmental Resource Mapper for the potential presence of NYS Freshwater Wetlands on the Site. A Site-wide Wetland and waterways assessment was completed by Earth Dimensions, Inc. (EDI) of Elma, New York for the RI (Appendix B). The wetland investigation area encompassed the BCP Site, Site 109, and Site 110.

The wetland delineation identified four palustrine emergent (PEM) wetlands on Sites 109 and 110, totaling 0.908 acres (Earth Dimensions, Inc. 2021). The wetland delineation identified the wetlands as being non-federally jurisdictional under the Navigable Waters Protection Rule due to apparent lack of connectivity to an intermittent or perennial stream. In a letter dated February 1, 2022, the NYSDEC determined that none of the wetlands identified are state regulated. In a letter dated January 3, 2023, the USACoE issued a letter confirming that these areas are not waters of the U.S. and are not regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899.

1.11 Groundwater

The groundwater in the fill layer at the Site can be characterized as a discontinuous, unconfined, or perched water bearing unit. The observations made during the focused remedial investigation identified areas where the fill zone lacked water or contained limited saturated thickness. Groundwater occurs within the Site in three water bearing units as evidenced by regional groundwater studies (NYSDEC 2007), site investigations on this and adjacent properties, and historical knowledge and experience of the area.

For purposes of understanding the groundwater potential energy, a groundwater contour map (Figure 1-4) was developed for the shallow groundwater perched in the fill. The contour map is a gradient map, not a groundwater map, as it does not represent the areas of the ditches or those areas where the shallow

groundwater is absent. Groundwater within the clay and bedrock are not impacted based on investigations at the eastern boundary of Site 109.

2 Design Investigations

Two supporting investigations were completed during the development of this RAWP:

1. Topographic Mapping – Niagara Boundary July 2024
2. Groundwater Elevation Measurements – Site-wide including adjacent Sites 3821 River Road and Sites 109 and 110.

These activities provided data for the finalization of the remedial design and refined the location of potentially impacted sediment (Figure 2-2), locations of soil with concentrations of PAHs above 500 mg/kg (Figure 2-3), locations of underground utilities (Figure 2-4) and the berm locations and materials (Figure2-5).

2.1 Topographic Survey

A topographic survey of the BCP Site and portions of the surrounding properties was conducted to provide the base mapping for this RAWP. The topographic mapping included the RITC BCP Site, Sites 109 and 110 (OU2 and OU1 of Site 915055). The mapping of the surrounding sites was completed as required to allow proper design of drainage integration and grading at the perimeter of Site 109.

For the purposes of developing the topographic map, the properties were surveyed by Niagara Boundary, a surveyor licensed in the state of New York consistent with standard technical practices. Horizontal locations were referenced to the North American Datum of 1983 and the New York State Plane system (west zone) and be accurate to within ±0.1 foot. Vertical elevations of monitoring wells and utilities were measured from the ground surface and top of casing (TOC) was referenced to the North American Vertical Datum of 1988 and reported in feet above mean sea level. Vertical measurements are accurate to within ±0.01 foot. The topographic mapping includes a 1-foot contour interval and identification of all monitoring wells, remaining above and at grade utility features, and the remaining buildings.

2.2 Surface and Groundwater Level Measurements

Groundwater level measurements provide the design baseline for water management at Site 109. Groundwater level measurements[9] were collected from monitoring wells on Site 109, the BCP Site, and 3821 River Road.

The ground water elevation map (Figure 1-4) was developed using the aerial photography for the new topographic mapping as a comparison and to verify assumptions associated with the interpretation of the groundwater elevations across the property. The groundwater contours on Site 109 are reflective of the surface, suggesting little exposure during the remedial action is expected with the exception of work required to close the ditches, remove the settling ponds and pipes, and reconstruct the outlet at the River Road box culvert.

[9] For purposes of developing a synchronous groundwater surface(s), as possible, water level measurements were coordinated and measured across the BCP Site, Site 110, and Site 109 in a single day.

3 Remedial Goals and Remedial Action Objectives

The RAWP includes all phases of the remedial action from approvals; procurement; materials management; surface water management; cover placement; and monitoring system installation. Remedial Action Objectives (RAOs) that will be achieved by implementation of this RAWP include the following.

3.1 Remedial Action Objectives

Remedial Action Objectives are specific action goals by media and receptor. The RAOs that apply to the Site are listed below:

3.1.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.

3.1.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

3.1.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

4 Remedial Action

The Remedial Actions to be implemented following this RAWP were developed based on the NYSDEC selected remedy. The selected remedial alternative consists of excavation and offsite placement or disposal, containment, Institutional Controls, and Engineering Controls.

One important change to the selected remedial alternative is the elimination, rather than reconstruction of the south ditch. The watershed for the south ditch is primarily the RITC BCP Site. When the Feasibility Study was drafted, the remedial actions for the upgradient area had not been defined. The stormwater controls in the draft RAWP for that site redirects all surface water to a retention basin north of Site 109, eliminating flow to Outfall #002 and to the concrete-lined settling ponds. As a result, the south ditch would no longer receive water from the majority of the current watershed and therefore would no longer be necessary. The draft RAWP includes in place closure to eliminate any contact between the existing soil/sediment and surface water.

The remedial design will allow redevelopment in compliance with the General Industrial (GI) Zoning adopted for the Town of Tonawanda including this Site on April 9, 2024. The design and execution of the alternative includes:

- Institutional/Engineering Controls (IC/EC)
    - Place an Environmental Easement on the Site 109 portion of 3875 River Road after the final limits of the unrestricted SCO area is surveyed;
    - Place use restrictions on Site 109:
        - Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3);
        - Allow the use and development of the controlled property for commercial use or industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
        - Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Erie County DOH; and
        - Require compliance with the Site Management Plan (SMP).

- Source Controls (Sheet S-2[10], Appendix A)
    - Ongoing Operation, Maintenance & Monitoring (OM&M) through completion of the remedial actions;
    - Removal of remaining structures due to their locations over areas to be remediated. The security building and settling ponds will be demolished as their functions are replaced by actions on the RITC BCP Site (#C915353);
    - Securing the entrance to the River Road Tunnel to eliminate an open conduit for offsite migration of eroded materials during grading and to prevent trespassing during the remedial actions. The existing metal structure will be removed, and the opening will be blocked with a wood frame covered by plywood that prevents both surface water intrusion and trespassing;

[10] Note: Sheets are the construction drawings that will be used to implement this RAWP. The Sheets are presented in Appendix A.

- The existing concrete lined stormwater sedimentation ponds will be used until the new stormwater retention basin on the BCP Site is completed. The concrete lined basins will be cleaned and taken out of service. If the location of the stormwater ponds is regraded, the surface will meet the proposed final contours and receive a soil cover consistent with the remedial action;
- Although the AROD includes excavation of the ditch sediments with concentrations in excess of the protection of ecological resources SCOs in, elimination of flow to the ditch above the east berm allows closure of the soils in place (Sheet S-2). Excavation of sediment from the ditch that conveys flow from Energy Transfer (Figure 2-2) that contain concentrations above the protection of ecological resources SCOs will be completed. The soils excavated from the ditch conveying flow from Energy Transfer and the stilling pool will be blended with drier soils and placed in areas of Site 109 to receive a soil cover;
- Excavated soil with total PAH concentrations in excess of 500 mg/Kg (Figure 2-3, Sheet S-11) shall be disposed offsite. There was one historic sample (SS-09 @ 541 mg/kg from the surface to 0.16 foot [2 inches] below ground surface (BGS)) and one FRI sample (SB-02-2020 @ 940 mg/kg from the surface to 0.16 foot [2-inches] BGS) that contained greater than 500 mg/kg. The materials will be excavated and disposed offsite;
- The volumes of materials to be managed are provided in Table 3-1 and the locations are depicted on Sheet S-3.

- Elimination of Exposure Pathways/Cover Placement
  - The Remedial Action Monitoring Plan (RAMP, Appendix C) to define the testing required for management of onsite and import materials;
  - Identification and testing of the cover borrow and import materials (Table 4-1 and Sheets S-12 to S-15). The measured concentrations in the cover materials will be at or lower than the commercial SCOs and imported materials will comply with the import requirements of DER-10; Installation of Erosion and Sediment Controls (Sheets S-4 and S-5)
  - Removal of any remaining out-of-service below ground process or utility piping (sewer, power duct bank) that could act as migration pathways (Sheet S-6), including the monitoring wells installed for the FRI and previous investigations;
  - Identification and protection of in-service underground utilities (Figure 2-4, Sheet S-7);
  - Clearing, grubbing, and grading Site 109 to allow placement of the cover and if appropriate accommodate pending redevelopment.
  - The remediation will affect the existing utility network and several utilities will be replaced (Sheets S-7, S-8, S-9, and S-10).
  - Grading of the subgrade will be balanced and will be governed by stormwater management, the proposed redevelopment plan, and the relocation and placement of the ditch soil/sediment. The sediment impacted by the TCC, National Grid and Energy Transfer (Sheet S-11) will be excavated, staged, tested and managed on site in an area to receive a soil cover;
  - Outfall #004 will be regraded to eliminate contact between fill and surface water (Sheet S-12). Improvement to the entrance to Outfall #004 will include a rip rap lined stilling pool. The excavation base and sidewalls will be sampled to confirm the exposed soils in the base meet the Protection of Ecological Resources (PER) SCOs. The sidewalls will be sampled and covered if they do not meet the protection of ecological resources SCOs. Wetland



compatible vegetation will be planted to enhance the natural filtration of flow to and through the box culvert;
    - Continued monitoring of the surface water discharge in accordance with the SWPPP until the completed cover is established;
    - In coordination with the schedule of the remedial actions for the RITC BCP Site, removal of the existing pavement and disposal as C&D debris (Sheet S-13). The timing of the removal must be coordinated to avoid disruption of the remediation of the RITC BCP Site and Site 110;
    - Removal and stockpiling of topsoil that meets the commercial SCOs;
    - Backfilling the abandoned section of the south ditch using unclassified fill to the base of the soil cover (Sheet S-13). If the BCP Site has not been remediated, a temporary system (Sheet S-7) has been designed to continue conveying stormwater from Site 109, the BCP Site, Site 110, and that portion of 3821 River Road that drains to the ditch;
    - Regrading of fill on the Site (including the east and west berms [Figure 2-5, Sheet S-13]) to allow placement of cover system where the upper one foot of exposed surface soil will exceed the applicable soil SCOs.;
    - Placement of the demarcation layer over the prepared subgrade (Sheet S-13).
    - Cover placement or consolidation of materials solidified to improve their geotechnical characteristics in accordance with the Town of Tonawanda Code Part 2, 179-5: Ground Cover Drainage and Erosion[11] (Sheets S-4, S-13, S-14, and S-15); and
    - Revegetation of the entire Site that is not paved or covered with riprap (Sheet S-15).
- Long-term Care
    - Conduct groundwater monitoring in accordance with the SMP (Sheet S-16);
    - Establish procedures for Site management, including requirements for future onsite excavation in a Site Management Plan including an Excavation Work Plan;
    - During site development soil vapor intrusion evaluations shall be conducted in the location of all proposed buildings
    - Inspection and maintenance of the cover systems (Sheet S-15);
    - Conduct surface water monitoring (Sheet S-16) in accordance with the applicable approvals or permits;
    - Establishing protocols for onsite excavation during redevelopment and utility installation and maintenance in the EWP (Under separate cover); and
    - Annual reporting in PRRs.

[11] § 179-4. Location restrictions for excavations and stockpiles. No such excavation or stockpiles arising therefrom shall be made within 50 feet of the right-of way of any public road, street, highway, or public area or within 50 feet of any property line of adjoining land unless written consent of the adjoining property owner shall be first obtained, and a duplicate or original copy attached to the application.

§ 179-5. Ground cover; drainage and erosion. A. B. Surface texture or ground cover for each removal may consist of one or more of the following: (1) Completely seeded with grass to prevent erosion. (2) Any type of landscaping or site improvement which will prevent erosion, subject to approval by the Town Engineer. The surface of all excavated or disturbed areas shall have a positive slope to existing drainage facilities and the surface texture of all such areas shall be of such a nature as to prevent erosion of the surface after all excavation has been performed and completed. The proposed grading and slope and the necessary auxiliary appurtenances shall provide adequate drainage to existing Town facilities as shall be approved by the Town Engineer before removal operations are commenced.

4.1 Permitting and Approvals

The remedial action will require a series of approvals in close coordination between Honeywell, RITC, the NYSDEC, the County of Erie, and the Town of Tonawanda. The permits and approvals will largely be associated with:

- RAWP approval;
- Site plan approval;
- Demolition permit for security building and stormwater ponds;
- Storm water management associated with Outfalls #001 and #002, which will be eliminated, and Outfall #004 that will be relocated.

The approvals will largely center on the approval of the work plans required to implement the remedy including the required grading and erosion and sediment controls for the remedial actions.

Note: A "Generic EIS"– Long-form Environmental Assessment Form, Part 1, has been submitted to the Town of Tonawanda for the redevelopment of the former TCC properties including Site 109, but the Town officials indicated that the RAWP is independent of the EA and the RAWP will be reviewed and can be accepted by the Town without completion of the SEQR process that is associated solely with the redevelopment activities.

4.1.1 Permits

The required permits or permit conditions will be applied for or requested during the remedial design:

1. Demolition permits (Town of Tonawanda) – Security Building; and

2. Industrial Waste Discharge Permit No. 331 from the Town of Tonawanda will be updated as the sanitary sewer discharge pipe and monitoring point locations are modified.

An application to amend the IWD Permit with the Town of Tonawanda will be submitted to include the remedial action wash waters, testing and decontamination waters.

4.1.2 Authorizations and Approvals

There are a series of plans, approvals, and modifications to existing approvals needed during and associated with the RAWP, including:

1. Grading Plan/Site Control/Erosion & Sediment Control (Town of Tonawanda);
2. Construction Permits – Roads and Utility Extensions/Connections in the River Road Right of Way (NYSDOT);
3. Erosion and Sediment Control Plan (E&SCP) – Implementation of the Remedial Design will disturb the entire 7.7-acre surface of the BCP Site (Town of Tonawanda). The E&SCP provides the scope of the erosion and dust control measures that will be implemented during the remedy (Sheets S-4 and S-5, Appendix A).
4. Storm Water Pollution Prevention Plan (SWPPP) – The BCP Site SWPPP[12] may be modified as the sources of surface water flow will change as the various flow paths (ditches and overland) undergo remedial action;

12 Although the SWPPP is specific to the adjacent BCP Site, two of the outfalls and a primary treatment component of that plan are located on Site 109.

5. Community Air Monitoring Plan (CAMP) – The CAMP (Appendix D) has been modified to address the conditions and Site 109 features and actions for implementation of the remedial actions;
6. Site Grading – The grading plans (Appendix A) have been reviewed with (meeting at the Town engineering offices January 16, 2025) and submitted to the Town of Tonawanda to ensure the proposed grading is consistent with the zoning and vision for the River Road corridor;
7. Final Engineering Report– The Final Engineering report (FER) will include the As-built construction documents and the data collected during the remedial action; and
8. Site Management Plan (SMP) – The SMP will include the long-term operational procedures for the active components of OU1 (Site 110) and OU2[13] of the Site, the long-term monitoring program, and the Excavation Work Plan (EWP). The SMP will include the requirements to test for, and if appropriate, install soil vapor intrusion mitigation system(s). The EWP will define the procedures for future intrusive work on Site 109.

4.2 Procurement

Completion of the selected remedial action will require procurement of the following:

1. Erosion and Sediment Control Materials:
    a. Silt Fence;
    b. Temporary seed;
    c. Geotextile for construction entrances; and
    d. Gravel for construction entrances and check dams
2. Utilities
    a. Pipe and manholes to relocate POTW discharge and potable water supply;
    b. New outfall piping and inlets from the BCP Site to the storm sewer at River Road; and
    c. Temporary piping from Outfalls #001 and #002.
3. Monitoring Supplies, Well Abandonment and Installation
    a. NYS Licensed Well Driller to Abandon Existing Monitoring Wells;
    b. Laboratory (RAMP, Appendix C);
    c. NYS Licensed Driller to Install Permanent Monitoring Wells (Sheet S-16).
4. Stilling Pool at River Road Box Culvert Entrance:
    a. Excavation to the underlying silty clay to meet protection of ecological resources SCOs;
    b. Sampling of the base and sidewalls to determine if the protection of ecological resources SCOs are met;
    c. Geotextile for separation of existing soil and riprap;
    d. Riprap for pool and protection of River Road slope; and
    e. Seed mixture suitable for emergent slope along pool.
5. Cover Systems:
    a. Demarcation layer (4-ounce orange non-woven geotextile or approved substitute);
    b. Unclassified fill (from the BCP Site Borrow source);
    c. Topsoil;

[13] The different environmental setting of OU3 (Site 108) will require a separate SMP be prepared for Site 109 and 110 and Site 108 of the SSF Site.

d. Seed, fertilizer, and mulch;
e. Gravel for pavement subbase; and
f. Asphalt.

The procedures to be used to select and ensure the materials and suppliers comply with the requirements of this RAWP include:

- Providing the specifications for the specific materials from each source;
- Soliciting quotations of the materials required;
- Conducting required testing; and
- Completing and executing purchase orders specifying the materials as required.

The unclassified fill, topsoil, and subbase gravel will be tested (Table 4-1) in accordance with DER-10, Table 5.4(e)10 "Recommended Number of Soil Samples for Soil Imported To or Exported From a Site" and the RAMP (Appendix C) Relief from the number of PFAS samples is requested for the unclassified soil imported from the BCP portion of the property as no PFAS has been detected from that location to date.

Table 5.4(e)10
Recommended Number of Soil Samples for Soil Imported To or Exported From a Site

Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete samples from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
➢ 1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

(f) Compliance for soil exported from a site for reuse. For soil that is being exported from a site to locations other than permitted disposal facilities, the handling requirements are set forth in this subdivision and in paragraph 5.4(e)4.

1. Levels of contamination must not exceed the lower of the groundwater and residential use levels as shown in Appendix 5, absent a beneficial use determination issued by DEC. DER will coordinate with the Division of Solid & Hazardous Materials (DSHM), prior to the start of the remedial action, relative to whether the exported soil can be used beneficially in accordance with 6 NYCRR 360-1. The sampling and analysis requirements are set forth in paragraph 5.4(e)10.

2. The number of required samples are specified in Table 5.4(e)10 and paragraph (e)10 above, which may be modified by the DER project manager based on various factors, including the location of the site receiving the soil.

Rip rap will be selected that "contains less than 10% by weight material which would pass through a No. 80 sieve". Import requests and sieve analyses will be submitted. In accordance with the ASTM Recommended Best Management Practices for Green and Sustainable Remediation (Table 4-2), unclassified fill will be obtained from the BCP Site; and topsoil, gravel and riprap will be obtained from sources in western New York to avoid long-haul transportation of locally available materials.

4.3 Materials Management

The remedial action will require management of large quantities of on-site and off-site sourced materials. The following materials will be managed as follows:

1. Existing topsoil – In accordance with Green Remediation Initiatives and the ASTM BMPs, onsite topsoil that meets the commercial SCOs will be recovered and reused rather than wasting it under a cover. Up to 800 cubic yards of topsoil (Table 3-1, Sheet S-3) may be recovered from Site 109. The topsoil recovered from the Site will be stockpiled in piles of no more than 200 cubic yards to allow collection of the 5 discrete Volatile Organic Compound (VOC) samples required under DER-10, Table 5.4 (e)10. The piles from which the two composite samples are collected will be noted, and should any composite sample exceed the commercial SCOs, those piles will be placed below the cover systems on Site 109.
2. Existing fill – The existing fill will be managed in accordance with the concentrations of polycyclic aromatic hydrocarbons (PAHs), as follows:
    a. An estimated 30-cubic yards (51 tons) of fill with concentrations of PAHs above 500 milligrams per kilogram (Sheet S-3) shall be excavated and disposed offsite or, if required to eliminate free liquids, solidified with lime kiln dust and tested to confirm the elimination of free liquids and transported and disposed offsite.
    b. Fill with concentrations of PAHs below 500 mg/kg, including soil from the berms (Sheet S-3), will be used to create a relatively uniform subgrade for placement of the cover systems (Sheet S-14). Fill being relocated onsite will be observed and any tar, or tar-like materials will be removed and placed in a "grossly contaminated" material stockpile. After the grading is completed, the "grossly contaminated" materials will be sampled, solidified, and disposed offsite.
3. Crushed concrete (conveyor and scale foundations, building slabs, and settling ponds) – The concrete from each source will be crushed and stockpiled. The stockpiles will be used as fill on Site 109 in areas to receive a soil cover.
4. On-site silty clay – The RAWP does not anticipate excavation of silty clay. If sufficient silty clay is removed to justify sampling (greater than 50 cubic yards), the material will be sampled for use as unclassified fill in the soil cover. If less than 50 cubic yards are excavated or if the sampling detects concentrations above the commercial SCO's, the clay will be used as subgrade fill below the demarcation layer of the soil cover.
5. Offsite sourced:
    a. Granular materials (gravel and well-graded subgrade materials) – Granular materials will be tested in accordance with DER-10 Table 5.4 (e)10 if more than 10 percent passes a No. 80- sieve. Because PFAS is not expected in quarried stone, only the initial sample from each source of granular material with more than 10% passing a No. 80 sieve will be tested for PFAS. If less than 10 percent passes the No. 80 sieve, the grain-size analysis will be submitted with the import request;
    b. Riprap – Riprap will contain less than 10 percent passing the No. 80 sieve. The grain-size analysis will be submitted with the import request;
    c. Unclassified fill – While the borrow source for unclassified fill is on the same 3875 River Road property, it is on the BCP Site #C915353 and therefore the material will be treated as import. Depending on the timing of the settling ponds removal, between 7,000 and 8,000 cubic yards of unclassified fill will be borrowed from the BCP Site. The soil will be tested at the frequency required in DER-10, Table 5.4 (e)10 with the exception that only the first



two samples will include PFAS analysis. The testing will be conducted concurrently with the RAMP for the BCP Site on this property, and

d. Topsoil – There is not sufficient topsoil on Site 109 that is expected to meet commercial SCOs. Topsoil will be imported from local sources. Topsoil will be tested at the frequency required in DER-10, Table 5.4 (e)10. Import requests from each source will be submitted.

6. Industrial Debris (scrap, tires, abandoned pipe) – During excavation, industrial debris such as metal scrap, tires and abandoned pipe may be encountered. These materials will be segregated from the excavated materials and disposed or, if possible, recycled (Table 4-2). Note: inert materials such as brick will be used as fill with the excavated soils.
7. Asphalt – The access road on Site 109, not the adjacent asphalt on Vanocur property, and the paved area covering the east end of Site 109 will be removed to allow placement of a final cover. The asphalt will be disposed offsite as C&D.

The quantities of materials anticipated for completion of the selected remedial action are listed in Table 3-1. The proposed sampling and testing to be completed during the remedial action are presented in the Remedial Action Monitoring Plan and Table 4-1.

4.4 Mobilization

Mobilization for the project will follow the permitting and initial procurement. To the extent practicable, equipment already mobilized on the adjacent BCP Site will be used to reduce the fuel consumption required to transport heavy equipment to Site 109. The mobilization phase will extend over a significant portion of the remedial action but will include:

1. Calling Dig-NY;
2. Establishing the Erosion & Sediment Controls (Sheets S-4 and S-5, Appendix A);
3. Establishing the CAMP stations (Appendix D);
4. Preparing the equipment and materials laydown areas;
5. Abandoning the five monitoring wells on Site 109 (Figure 4 of FRI, Sheet S-6); and
6. Mobilizing earthmoving equipment (utilize equipment on the BCP Site to the extent practicable[14]).

The CAMP stations shall be deployed and monitored during all activities that disturb soil or fill on the Site.

4.5 Excavation of Fill with Concentrations of PAHs Above 500 Mg/Kg

The Focused Remedial Investigation (Figure 4-2, Parsons, 2022, Sheet S-3)) identified two sample locations where fill contained concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) above 500 milligrams per kilograms (mg/kg):

- SS-9 Location – 541 mg/kg surface soil sample (surface to 2-inches) collected adjacent to the material storage bin, and
- SB-02-2020 – 940 mg/kg surface soil sample (surface to 2 inches) collected adjacent to the ditch/coal conveyor alignment.

The anticipated COCs in these locations are SVOCs in shallow soils. The initial excavation shall be 40-feet by 20 feet as shown on Figure 4-2 and Sheet S-3. The initial excavation shall be 6-inches deep (three times

[14] In accordance with Green and Sustainable Best Management Practices (Table 4-2), OSC will minimize the number of trips associated with mobilizing equipment to and from the Site.

the depth of the samples). The soils shall be stockpiled on polyethylene sheeting on the asphalt pavement east of the settling ponds.

Confirmation soil samples will be collected after the initial excavation of surface soils; 0- to 6 inches around each of the two (2) shallow soil samples. A sample from each sidewall and the base of the excavation will be sampled for SVOCs (Table 4-1). Should any confirmation sample contain a total PAH concentration above 500 mg/kg, additional excavation will be advanced as follows:

- Sidewall samples – extend the excavation wall 10 feet further in the direction of the sample(s) that exceed 500 mg/kg, resample sidewall, repeat expansion and resampling, if sample exceeds 500 mg/kg and
- Base sample – extend the excavation an additional 6-inches, resample base, repeat excavation and resampling, if sample exceeds 500 mg/kg.

Assuming the excavation volume could reach 30 cubic yards, one composite sample will be collected for import parameters, Table 4-1 and Toxicity Characteristics Leaching Procedure (TCLP) for offsite disposal purposes. The following steps will be based on the data from the first composite sample:

Action	Volume	PAH Concentration	TCLP Result
Fill Below Cover	Any	<500 mg/kg	Not Haz
Offsite Disposal	Any	>500 mg/Kg	Not Haz

4.6 Topsoil Recovery

The topsoil placed over the berms (Figure 2-4) is the highest quality on Site 109. Three 3- to 6-inches of topsoil will be removed from the berms and will be stockpiled on the concrete pad east of the settling ponds but will be isolated from the soils removed from the SS-09 and SB-02-2020 areas. Up to 800 cubic yards may be recovered onsite. The recovery of onsite soil not only reduces the area that must be disturbed offsite (at an offsite borrow source), but it also reduces the GHGs generated by the excavation and transportation of offsite soils to the property.

Following stockpiling (Table 4-1), 6 discrete VOC samples and two samples of the remaining Table 5.4 (e)10 parameters (including PFAS) will be collected. All topsoil meeting the commercial SCOs shall be used in the cover, and the topsoil in any stockpile that does not meet the commercial SCOs will be placed in an area to be contained with a soil or other compliant cover (pavement or structure).

4.7 Sediment Removal

The majority of the southern ditch and 100 percent of the northern ditch on Site 109 will be taken out of service (Sheet S-13), eliminating any exposure to ecological resources. In-situ closure of the underlying sediment/soil is the most green and sustainable approach reducing onsite excavation and transportation of excavated materials.

The sequence of the action will be dependent on the timing of the RITC BCP Site (#C915353) remedial action. The two likely scenarios are outlined below:

4.7.1 Site 109 Remediation Before RITC BCP Site is Completed

The first scenario to be addressed is considering that the initiation of the RITC remedial action could be delayed until after the Site 109 remedial action is completed. In this scenario, the settling basins and Outfall

#002 would remain in service while Site 109 is closed. In this scenario, the following actions would be taken to address sediment in the south ditch on Site 109:

1. Install the permanent 36-inch diameter outfall along the proposed primary access road (Sheet S-7) to the box culvert under River Road;
2. Install manholes as required (Sheet S-7);
3. The River Road box culvert is a rectangular concrete structure that has managed all flow from the east side of River Road and is the headwater for the ditch on Site 108. Excavate an estimated 250 tons of sediment and underlying soil from the River Road box culvert entrance and the outlets of the cross 3821 River Road pipes[15] to the Outfall #004 pipe and stage on polyethylene sheeting (Sheet S-11). Removal of the sediment from the box culvert shall be limited to the sediment that can be removed without personnel entry into the box culvert;
4. Sample the sediment stockpile(s) for VOC's, SVOCs, Cyanide, PCBs, Metals, Pesticides/Herbicides, and PFAS (Table 4-1). Note: TCC Site knowledge is not applicable as National Grid and Energy Transfer also discharge to this section of ditch, so no relief from the frequency of PFAS sampling is applicable;
5. Manage the sediment in accordance with the sample results, solidify and place under cover unless potentially hazardous waste;
6. Construct a stilling pool at the Site 109 western boundary (Sheet S-12). Sample the base and the sidewalls (8 samples, four in base, one in each compass direction on sidewalls at the elevation of the center of the box culvert). The base and sidewall data will be compared to the Protection of Ecological Resources (PER) SCOs. If possible, excavate the bottom and sidewalls to soils that meet the PER SCOs. If the surrounding soils or soils at the base do not meet the PER SCOs, a layer of geo-composite clay liner shall be placed before the demarcation fabric. If the geo-composite clay liner is required, the geo-composite shall cover the soils to the elevation of the top of the box culvert;
7. Line the stilling pool with one layer of demarcation fabric, 12-inches of 3- to 6- inch riprap and seed the perimeter and riprap voids with 2 pounds of OBL Wetland Mix (Ernst Conservation Seed, ERNMX-131);
8. Discharge flow from settling ponds to 12-inch outfall (Sheet S-7);
9. Construct temporary conduit from Outfall #002 to new 12-inch outfall (Sheet S-7);
10. Divert the surface water flow from National Grid and Energy Transfer directly into the box culvert until the stilling pool rip rap is in place;
11. Reconstruct the ditch from National Grid and Energy Transfer and a new stilling pool to the Box culvert (Sheet S-12);
12. Line the ditch and stilling pool with one layer of demarcation fabric and 12-inch (minimum of 3- to 6-inch riprap; and
13. Revegetate area (~6,000 sf) with 2 pounds of OBL Wetland Mix (Ernst Conservation Seed, ERNMX-131).

4.7.2 Site 109 Remediation Coordinated with RITC BCP Site Remediation

The second scenario to be addressed is considering that the RITC remedial action on the BCP Site is coordinated with the Site 109 remedial action:

[15] The pipes that cross the 3821 River Road BCP site are stormwater pipes from the National Grid right of way conveying storm water from National Grod and Energy Transfer properties.

1. Complete the Retention Pond on the RITC BCP Site to the extent it can replace the function of the Site 109 Settling Ponds;
2. Install the permanent 36-inch diameter outfall along the proposed primary access road (Sheet S-7) to the box culvert under River Road;
3. Install manholes as required and a riprap outlet at the Site 109 western boundary;
4. Excavate an estimated 250 tons of sediment from the River Road box culvert and the outlets of the pipes that cross 3821 River Road from National Grid and Energy Transfer to the area below the Outfall #004 pipe and stage on polyethylene sheeting (Sheet S-11);
5. Sample the sediment stockpile(s) for VOC's, SVOCs, Cyanide, PCBs, Metals, Pesticides/Herbicides, and PFAS (Table 4-1). Note: TCC Site knowledge is not applicable as National Grid and Energy Transfer also discharge to this section of ditch, so no relief from the frequency of PFAS sampling is applicable;
6. Manage the sediment in accordance with the sample results, solidify and place under cover unless potentially hazardous waste;
7. Construct a stilling pool at the Site 109 western boundary (Sheet S-12). Sample the base and the sidewalls (8 samples, four in base, one in each compass direction on sidewalls at the elevation of the center of the box culvert). Compare the base and sidewall data to the PER SCOs. If possible, excavate the bottom and sidewalls to soils that meet the PER SCOs. If the surrounding soils or soils at the base do not meet the PER SCOs, a layer of geo-composite clay liner shall be placed before the demarcation fabric. If the geo-composite clay liner is required, the geo-composite shall cover the soils to the elevation of the top of the box culvert;
8. Reconstruct the ditch from National Grid and Energy Transfer and a new stilling pool to the Box culvert (Sheet S 12);
9. Line the ditch and stilling pool with one layer of demarcation fabric and 12-inch (minimum of 3- to 6-inch riprap) layer; and
10. Revegetate area (~6,000 sf) with 2 pounds of OBL Wetland Mix (Ernst Conservation Seed, ERNMX-131).

4.8 Consolidation

While the sediment in portions of the ditch exceeds the protection of ecological resources SCOs and two areas contain fill that exceeds 500 mg/Kg of PAHs, the materials are believed to have been largely impacted by coal and coke dust. The sediment in the south ditch will be closed in place. The soils from the vicinity of the two surface soil samples that exceeded 500 mg/Kg of PAHs will be sampled. The volume of the excavated materials from the two areas exceeding 500 mg/Kg PAHs, may range from 30- to 100 tons. These soils will be tested and if consistent with the rest of the fill on Site 109 and with less than 500 mg/Kg PAHs will be solidified to improve their geotechnical characteristics so they can be compacted and placed in an area that will be below the final soil cover. If the PAH concentration exceeds 500 mg/Kg, the soils will be transported offsite to a landfill permitted for solid waste disposal.

4.9 Asphalt Removal

Asphalt pavement portion of the current access road on Site #915055/OU2 and from the paved area around the former scale and former tarping frame (Sheets S-3 and S-13) will be removed and disposed offsite. The asphalt along the RITC/Vanocur property line will be cut with a concrete saw to separate the onsite and offsite pavement. The onsite asphalt will be lifted from the current surfaces and prepared by breaking into pieces that conform with the landfill requirements. After preparation, the asphalt will be transported offsite



for disposal as construction and demolition (C&D) debris. If the asphalt debris cannot be loaded directly, it will be staged within the limits of the former paved areas until transportation can be made available.

Typically, the landfill does not require sampling for this type of C&D, and therefore no disposal sampling is proposed. If disposal characterization is required, the waste profile samples required by the landfill will be collected.

4.10 Demolition

The small guard shack at the entrance to the Site along River Road was removed in 2025. The metal enclosure over the east end of the River Road Tunnel, the former conveyor, scale, and the tarping frame foundations will be demolished during the site preparation for the Site 109 remedial actions. Depending on the timing of the RITC BCP remedial actions, the security office and the walls of the settling ponds will also be demolished. The tunnel enclosure debris will be recycled. The small guard shack and the security building will be transported offsite as C&D. The concrete foundations, slabs and pond walls will be crushed and used as fill below areas to receive a soil cover on Site 109.

4.11 Grading

The Site will be graded to match the proposed sub-grade (Sheet S-13). The grading/subgrade preparation will follow the abandonment of the existing monitoring wells (Sheet S-6), installation of the erosion and sediment controls (Sheets S-4 and S-5), removal of the soils with concentrations of PAHs greater than 500 mg/kg, removal of the sediment between Outfall #004 and River Road, removal of the sediment in the south ditch, and will include:

1. Establishing the GPS base station and Site boundary markers by a licensed land surveyor;
2. CAMP (Appendix D) monitoring during all intrusive work;
3. Grubbing of the Site to remove stumps and major root systems. All grubbed materials will be properly disposed offsite;
4. Stripping of the top 3- to 5-inches of topsoil, where present, from the Site and stockpiling the highly organic materials on the former paved area at the east end of the Site;
5. Isolating the Site by removing or air gapping all out of service utilities at the boundary (Sheet S-6):
    a. 4-inch diameter drain from the paved area at the east end of the Site;
    b. If the BCP Site Retention Pond is in service, remove the 24-inch diameter North-South sewer line;
    c. Outfall #001 corrugated HDPE tubing, remove, decontaminate, and store for reuse. The future use has not been defined, but the material will have been decontaminated and was the outfall for water being discharged, not for influent;
    d. 2,300-volt electrical duct bank, air gap at Site boundaries after verifying it has been de-energized;
    e. Overhead power supply to pumps and Outfall #001 flow meter, remove;
    f. Overhead power supply to the Outfall #004 flow meter, relocate to the new outfall location;
    g. 40-inch diameter HDPE and RCP at Outfall #004 (remove as berm is relocated); and
    h. 12-inch HDPE culvert (remove as berm is relocated).
6. Proof rolling the existing grades between the berms, the south property line, and the north access road and utility right of way[16] (Appendix A);

[16] The construction of the access road is considered a cover system and is detailed in Section 4.12.2.

7. Excavation, placement, and compaction of the fill in the berms in accordance with the grading plan (Sheet S-13);
8. Inspection of all materials being graded from the berms. Any potentially grossly contaminated materials; fill with viscous tar, containers of any type, or fill containing any non-aqueous phase liquid will be properly stored for characterization and proper management;
9. Placement of the topsoil that does not meet commercial SCOs in the western end of the site in an area that is not expected to be redeveloped and that will receive a soil cover;
10. Proof-rolling the area from which the berms have been removed; and
11. Surveying of the subgrade surface to verify grades and to provide a basis for verifying cover thicknesses.

4.12 Primary Access Road and Utility Corridor

Adjacent to the north property boundary with Vanocur, a new access road will be constructed (Sheet S-13). The access road will consist of a prepared subgrade, geotextile fabric for stabilization and as a demarcation layer, subbase, base, stabilized base, and the wearing course. The pavement will be designed to carry heavy traffic for future development as detailed on Sheet S-5. The pavement section shown is the minimum recommended by the civil design professional engineer.

Adjacent to the new access road, a utility corridor will be constructed to accommodate the water, sewer, stormwater outfall and other site utilities from River Road to service 3875 redevelopment. The utility corridor will consist of contiguous utility trenches (no pre-existing fill will remain between trenches) to the dimensions shown on Sheet S-9. Materials meeting the commercial SCOs will be used to allow utility installation, repairs, and replacement by general contractor personnel.

The prepared subgrade and finished road and ground surface elevations will be surveyed by a licensed New York State surveyor. The location of all installed utilities will be documented by the surveyor and will be included in the as-built drawings in the FER.

4.12.1 Soil Cover

The soil cover will be placed over Site 109 outside the limits of the access road unless an approved development plan exists prior to completion of the remedial action. The soil cover will include a demarcation layer, 9-inches (nominal) of unclassified fill, no less than 3-inches of topsoil, to a measured thickness of no less than 12-inches. The surface of the soil cover will be vegetated in accordance with Sheet S-15.

Consistent with Green Remediation initiatives, the unclassified fill will be imported from the BCP Site Retention Pond excavation. The unclassified fill and topsoil will be tested in accordance with the RAMP (Table 4-1, Appendix C). The topsoil will be from the recovered topsoil on the Site and from offsite sources. Import forms will be submitted for each source of unclassified fill and topsoil.

Over the majority of Site 109, two types of cover will be placed on Site 109, the new primary access road and utility corridor, and a soil cover. Following grading, the construction of each type of cover includes:

- Proof roll entire graded surface with no less than 3 passes of a 20,000-pound (nominal) smooth-wheel compactor;
- Place demarcation layer; Note the access road demarcation layer will be a geogrid (Mirafi BWG11 or approved substitute) to provide support and load distribution for the permanent access road, the

cover demarcation layer shall be orange non-woven geotextile (IWT Cargo Guard Orange Demarcation Fabric);

- Soil Cover;
    - Survey the compacted subgrade surface of the unclassified fill as it is placed (Note: the demarcation layer may be placed over completed sections of subgrade fill before all proof rolling is completed);
    - Place and compact 9-inch (nominal) unclassified fill (Sheet S-14) layer, monitor to ensure demarcation layer is not compromised;
    - Survey the compacted surface of the unclassified fill as it is placed (Note: topsoil may be placed over completed sections of unclassified fill before all unclassified fill is placed);
    - Place and compact the topsoil layer (Sheet S-15) to bring the entire thickness of the soil cover to no less than 12-inches;
    - Survey the surface of the topsoil fill as-built to confirm soil cover is no less than 12-inches thick across the Site;
    - Seed, mulch and fertilize soil cover (Sheet S-15) as the topsoil is completed; and
    - Monitor Site until the seed germinates to ensure no erosion rills form before the surface is stabilized.
- Access Road;
    - Grade uniform road subgrade surface;
    - Compact subgrade to confirm solid base for access road;
    - Place geogrid (Sheet S-5) to provide separation of subbase and existing fill, to reinforce subbase load distribution, and to provide a demarcation between the road and the existing fill;
    - Place and compact granular subbase in two lifts (NYSDOT Type 2 stone);
    - Place and compact nominal 4.5 -inch asphalt base course (NYSDOT Type 3); and
    - Place and compact nominal 1.5-inch-thick top/wearing course asphalt (NYSDOT Type 7).

The reconstructed drainage ditch from the ends of the National Grid and Energy Transfer properties to the box culvert (Sheet S-12) will be lined with geotextile (IWT Cargo Guard Orange Demarcation Fabric or approved substitute) and 12-inches (minimum) of 3- to 6-inch riprap. The area of the riprap and surrounding disturbed soils shall be seeded with 2 pounds of OBL Wetland Mix. This is not intended to provide a vegetated cover, simply an attempt to stimulate growth of other wetland vegetation species before phragmites have an opportunity to dominate the vegetation along the stilling pool. The riprap will provide erosion protection and ultimately absent the use of herbicides, phragmites from upgradient areas will dominate the vegetation in the area around the pool.

The prepared subgrade, top of subgrade, unclassified fill and finished ground surface and pavement elevations will be surveyed by a licensed New York State surveyor. The location of all installed utilities and monitoring wells will be documented by the surveyor and will be included in the as-built drawings in the FER.

4.13 Surface Water Management

The surface water management systems that will be installed during the remedial action have been designed to comply with the Municipal Separate Stormwater Sewer Systems (MS4) as managed by the Town of Tonawanda and NYSDOT.

4.14 The specifications for installation of the stormwater management systems are included on Sheets S-8, S-9, and S-10.Monitoring Systems

The location, installation specifications and testing of the proposed monitoring locations are identified on Sheet S-17. Although only 4 monitoring wells were sampled during the RI, five wells exist on Site 109. The wells will be replaced with the intent of placing the screens at the same elevations and the existing monitoring wells. The proposed array is in recognition that there will be permanent groundwater monitoring on 3821 River Road, the RITC BCP Site and OU1 (Site 110) forming a comprehensive groundwater monitoring network. The details of the monitoring well installations are included on Sheet S-17 and in the RAMP (Appendix C).

The sampling and analysis plan will be included in the SMP.

4.15 Institutional Access Restrictions

Following completion of the remedial action, the NYSDEC approved/required institutional controls and environmental easement shall be placed on the controlled Site 109. The revised easement will be filed with Erie County at a time when the remedy is substantially complete and will appear any time a party conducts a title search or has a survey prepared for 3875 River Road. The easement will notify the party searching for the deed that the property at 3875 River Road contains the SSF and BCP Site and that the NYSDEC and NYSDOH have, among other rights, rights of entry and inspection to Site 109.

In addition, specific deed restrictions will be placed on 3875 River Road, including Site 109 to prohibit the installation of a well for the purposes of human consumption without necessary Erie County Department of Health approvals and water quality treatment as determined by the NYSDOH to render it safe for intended use; restrict to commercial and industrial uses in accordance with local zoning; and prohibiting excavation on Site 109 without complying with the SMP and EWP(s).



5 Schedule

The proposed baseline schedule for the implementation of the recommended remedial alternative is included as Figure 5-1. The recommended alternative largely removes external factors impacting the schedule by limiting the dependance on resources that are not controlled by the State of New York, the Town of Tonawanda, Honeywell or RITC. The schedule is largely driven by the review and approvals needed from the state and local representatives and the time required to manage the onsite materials and prepare and place the cover system. Highlights of the baseline schedule include:

- The RAWP.
- The remedial actions are completed in phases, the majority of which overlap, such as:
    - Topographic mapping
    - Permit Applications
    - Buried Utility Management
- From the initiation of action through the completion of the capital phases,the remedial actions are estimated to take 8-months (if completed late in the year, final seeding may take place the following spring).
- Institutional Controls
    - Environmental Easement Preparation
    - Use Restrictions
- OM&M will begin during the later phases of the remedial action primarily associated with the changeover from the existing TCC era Outfalls, the the final stormwater outfalls.
- At the completion of the remedial actions, an FER summarizing all of the work completed fom the time of the BCP Agreement to the completion of the remedial action will be prepared.
- The final OM&M programs will be defined in the SMP.
- The baseline schedule is an evergreen document that will be updated quarterly as the cleanup progresses.

6 Post-construction Plans

The following post-construction plans are anticipated at this time:

1. Final Engineering Report – The FER will be prepared following DER-10 Section 5.8, and shall include the As-built construction documents, CCRs for the IRMs (aeration, pond cleaning, filtration), and the data collected during the remedial action.
2. Interim Site Management Plan (ISMP) – An ISMP will be prepared to address conditions on OU#2 (Site 109) until OU#1 and OU#3 have been completed. The final SMP will include the long-term operational procedures for the active components of the Site, the long-term monitoring program, and the EWP. The SMP will include the requirements to test for, and if appropriate, install soil vapor intrusion mitigation systems under new buildings constructed on Site 109. The EWP will define the procedures for future intrusive work on Site 109.
3. Environmental Easement – NYSDEC format including the appropriate site-specific references.



7 Site Figures

Site figures have been developed using the 2024 aerial photographs and topographic mapping. The Figures and Construction Sheets (Appendix A) provide the entire scope of the remedial action.

8 Bibliography

The bibliography provides a list of documents used in conjunction with numerous BCP Site visits, discussions with USEPA and NYSDEC personnel, IRM data and observations, and expertise at coke making facilities to develop this remedial design workplan. Some of the documents listed below are not specific to Site 109 but were referenced to provide regional or other background information.

1. Earth Dimensions, 2021, Report Summarizing the Results of a Wetland Delineation Survey of Riverview Innovation and Technology Campus, Brownfield Cleanup Site, November 11.

2. Environmental Data Resources, 2019 Radius Map Report with GeoCheck. TCC Site. 3875 River Rd, Tonawanda, NY. August 2019.

3. Inventum Engineering, 2020a, Citizen Participation Plan, Riverview Innovation & Technology Campus, BCP Site No. C915353, March.

4. Inventum Engineering, 2020b, Storm Water Pollution Prevention Plan, Riverview Innovation & Technology Campus, BCP Site No. C915353, June.

5. Inventum Engineering, 2021b, Surface Water System Maintenance, IRM Work Plan, Concrete-lined Settling Ponds, July.

6. Inventum, Engineering, 2024, Draft Remedial Design Work Plan, Riverview Innovation & Technology Campus, BCP Site No. C915353, August

7. New York State Department of Environmental Conservation, 2007, Hydrogeologic and Geochemical Investigation of the Southwestern Portion of the Town of Tonawanda, Erie County, New York. April 2007.

8. New York State Department of Environmental Conservation, 2010, DER-10: Technical Guidance for Site Investigation and Remediation, June.

9. New York State Department of Environmental Conservation, 2010, DER-31 Green Remediation, September.

10. New York State Department of Environmental Conservation, 2010, CP-51: Soil Cleanup Guidance Policy, October.

11. New York State Department of Environmental Conservation, 2010, DER-33: Institutional Controls - A Guide to Drafting and Recording Institutional Controls, December.

12. New York State Department of Environmental Conservation, 2015, “Order on Consent, File No. 14-59, R9-20141203-96”, June 12.

13. New York State Department of Environmental Conservation, 2016, “Order on Consent, File No. 15-61, R9-20151215-132”, Not Signed.

14. New York State Department of Environmental Conservation, 2016, New York State Standards and Specifications for Erosion and Sediment Control, November.

15. New York State Department of Environmental Conservation, 2022, Freshwater Wetland Determination, February.

16. New York Statement Department of Environmental Conservation (NYSDEC), 2023, Final Permit, SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4), December 13.

17. New York Statement Department of Environmental Conservation (NYSDEC), 2024, Amended Record of Decision, Tonawanda Coke, Operable Unit 02, Tonawanda, Erie County, New York, Site Number 915055, June.

18. Parsons, 2022, "Draft, Remedial Investigation Report, Operable Units 1 (Site 110) and 2 (Site 109), Tonawanda Coke Site", 3875 River Road, Tonawanda, New York, April.

19. Parsons, 2024, Focused Feasibility Study, Operable Unit 2 (Site 109), Tonawanda Coke Site", October.

20. Snyder, Abby, 2013, Stipulation to Pursuant to Section 17-0303 of the Environmental Conservation Law and Section 176 of the Navigation Law, June.

21. Town of Tonawanda, n.d., Stormwater Management Plan, SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems, GP-0-15-003.

Tables

Table 3-1
Remedial Action Quantities
Tonawanda Coke Site #915055, OU2
Town of Tonawanda, New York

Action	Description	Material	Unit	Quantity
Fence Removal	Remove Fence along the Northern Border of Site 109	Chain-link Fence	LF	600
Fill Removal	Fill/soil containing concentrations of PAHs above 500 mg/Kg	Fill	CY	30
Berm Removal	Excavation and placement on Site 109	Fill	CY	14,750
Stilling Pool	Stilling Pool Lining	Geosynthetic Clay Lining (GCL) (If Required)	SF	5,000
		4-ounce Non-woven Fabric	SF	5,000
		Rip Rap	Ton	350
Removal of Pavement	Access Road (Portion on RITC Property)	C&D	Ton	800
	Pavement East of Berm - Scale and Tarp Frame Area	C&D	Ton	400
Concrete Foundations	Conveyor, Security Building, Tarping Shed, and Scale	Recycled Concrete	Ton	50
General Grading	Demarcation Layer	4-ounce Non-woven Fabric	SF	390,000
	Unclassified Fill (Imported from BCP Site)	Fill meeting commercial SCOs	Ton	15,045
	Topsoil Recovered Onsite	Topsoil meeting commercial SCOs	Ton	800
	Topsoil	Topsoil meeting commercial SCOs	Ton	3,960
Access Road Construction	Subbase	#2 Stone	Ton	1,500
	Base	BCBC	Ton	700
	Wearing Course	Asphalt	Ton	200
Revegetation	Seeding, Fertilizer and Mulch	Seeding	Acre	7
Note: Quantities shown are for the Remedial Action Activities, redevelopment materials are not included.				

6/1/2026

Table 4-1
Remedial Action Monitoring Plan Samples
Site #913055 (OU2)
Town of Tonawanda, New York

Location	Rationale	Sample Type	Sample Depth	Soil Sample Analysis										Water Sample Analysis								
				VOCs	SVOCs	Cyanide	PCBs	Metals	Mercury	Pesticides/Herbicides	PFAS/1,4-Dioxane	TCLP (SVOCs)	Total Organic Carbon	VOCs	SVOCs	Cyanide	PCBs	Metals	Ammonia	Mercury	Pesticides/Herbicides	PFAS/1,4-Dioxane
Surface Water - See SWPPP																						
Stormwater Reuse Onsite																						
Outfall #001	1 sample per week while being used for dust control and revegetation	Grab	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	6	6	6	N.A.	6	6	6	N.A.	N.A.
Excavation																						
SS-9 Excavation	Confirmation that fill with greater than 500 mg/kg PAHs has been removed	Shallow Fill	0-0.5 feet (sidewall and bottom)	0	5	0	0	0	0	0	0	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
SB-02-2020 Excavation	Confirmation that fill with greater than 500 mg/kg PAHs has been removed	Shallow Fill	0-0.5 feet (sidewall and bottom)	0	5	0	0	0	0	0	0	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposal Profile Sample	Initial sample for determination of disposal alternative	Composite	0.0-0.5 feet	1	1	1	1	1	1	1	1	1	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Asphalt	Disposal Profile	Grab	N.A.	As required by C&D Landfill										N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Sediment - Box Culvert Inlet/Stilling Pool Excavation	Materials Management Characterization	Grab	N.A.	6	6	6	6	6	6	6	6	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Sediment - Stilling Pool	Materials Management Characterization, PER SCO samples.	Grab	N.A.	14	11	11	11	11	11	11	11	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Soil Cover Systems																						
Unclassified Fill	Import Testing	Grab	N.A.	21	9	9	9	9	9	9	2	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Topsoil (Onsite Reuse)	Confirmation	Grab	N.A.	6	2	2	2	2	2	2	1	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Topsoil (Offsite Source)	Import Testing	Grab	N.A.	11	4	4	4	4	4	4	4	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Gravel/RipRap	Import Analysis	Grab	N.A.	Grain-size Analysis, >90% Retained on No. 80 Sieve										N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Long-term Monitoring																						
Monitoring Wells	Initial/Baseline Sampling	Low-flow	TBD	0	0	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5
	Totals			59	43	33	33	33	33	33	25	1	0	11	11	11	5	11	11	11	5	5

Table 4-2
Green and Sustainable Remediation
Best Management Practices
Site 109 #915055 OU2
3875 River Road
Town Of Tonawanda, New York

Category	Description	Monitoring Metric	Comment/Exclusion
Buildings	Reuse existing structures for treatment system, storage, sample management, etc.	Not applicable	Security building and Settling Ponds will be used until they must be removed to complete the remedial actions.
Buildings	Use graywater collection systems at on-site buildings for water during cleanup activities, to minimize freshwater use	Not applicable	
Materials	Steam-clean or use phosphate-free detergents or biodegradable cleaning products instead of organic solvents or acids to decontaminate sampling and other equipment	Document that no solvents or acids are used to clean equipment.	
Materials	Use materials with recycled content (for example, concrete and/or asphalt from recycled crushed concrete and/or asphalt; plastic made from recycled plastic; geotextile fabrics/tarps made with recycled contents)	Track testing and volume of crushed concrete used during site grading.	To the extent practicable, crushed concrete from foundations, slabs and the settling ponds will be used for fill onsite.
Power and Fuel	Use solar power pack system for low-power system demands (for example, security lighting)	Tried solar power for CAMP stations but the systems power demands exceeded what could be supplied with portable solar panels.	Tried solar power for CAMP stations but the systems power demands exceeded what could be supplied with portable solor panels. Not allowed for system telemetry that must operate 24/7.
Project Planning and Team Management	Choose equipment and product vendors with production and distribution centers near the site to minimize fuel consumption associated with delivery	Document sources of major materials; topsoil, gravel/crushed stone, and asphalt.	Topsoil, crushed stone and asphalt will be sourced locally.
Project Planning and Team Management	Choose suppliers that will take back scraps or unused materials (if available)		To the extent possible, unused materials will be returned.
Project Planning and Team Management	Designate collection points for compostable materials and routine recycling of single-use items such as metal, plastic, and glass containers; paper and cardboard; and other items that may be recycled locally	Onsite recycling bins will be provided.	
Project Planning and Team Management	Select local waste disposal and recycling facilities to minimize transportation impacts	Onsite management of materials will be documented.	To the extent practicable, all materials will be managed on the 3875 River Road property.
Project Planning and Team Management	Use a local laboratory to minimize transportation impacts		To the extent practicable, laboratories with local offices or that pick up samples will be used.
Project Planning and Team Management	Use local staff (including subcontractors) when possible to minimize transportation impacts		With the exception of Senior engineering staff, all project personnel are local.
Residual Solid and Liquid Waste	Recycle or reuse un-used, spent or uncontaminated equipment or infrastructure.	Document onsite cut and fill and reuse of crushed concrete.	The fill and onsite concrete will be used to the extent practicable.
Residual Solid and Liquid Waste	Reuse or recycle recovered product (such as resale of captured petroleum products, precipitated metals) and materials (for example, cardboard, plastics, asphalt, concrete)	Document recycling of metal and waste oil.	
Residual Solid and Liquid Waste	Salvage uncontaminated objects/infrastructure with potential to recycle, re-sell, donate, or re-use	Document recycling of metal and waste oil.	
Residual Solid and Liquid Waste	Segregate drilling or excavation waste based on location and composition to reduce the volume of drilling waste disposed off-site; collect needed analytical data to make on-site reuse decisions	To the extent practicable, all drill cuttings will be used as onsite fill.	
Residual Solid and Liquid Waste	Use filters (for example, baghouse or cartridge filters) that can be backwashed to avoid frequent disposal of filters	Not Applicable	

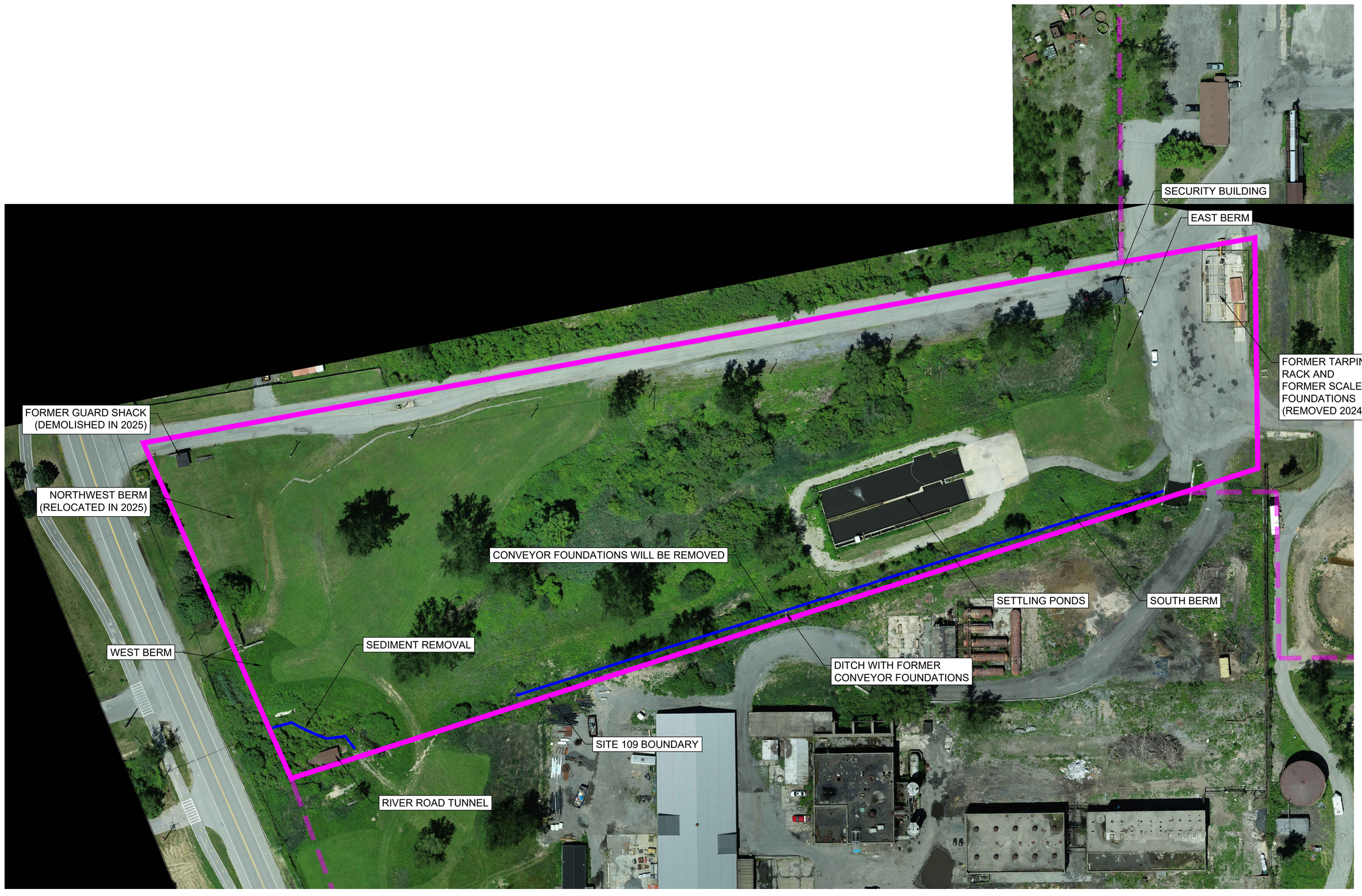
Table 4-2
Green and Sustainable Remediation
Best Management Practices
Site 109 #915055 OU2
3875 River Road
Town Of Tonawanda, New York

Category	Description	Monitoring Metric	Comment/Exclusion
Sampling and Analysis	Use dedicated materials (that is, re-use of sampling equipment and non-use of disposable materials/equipment) when performing multiple rounds of sampling	None, follow the RAMP.	To the extent practicable. Samples are shipped in reusable coolers, bowls for composite samples are reused. Sample spoons, cord and bailers cannot be reused or would require more detergent and energy to reuse than replace. Sample bottles, zip lock bags cannot be reused.
Site Preparation and Land Restoration	Cover filled excavations with biodegradable fabric to control erosion and serve as a substrate for ecosystems	Document the use of biodegradable fabrics.	Where possible, potentially along the sides of the reconstructed ditch from the National Grid and Energy Transfer pipes to the new drop inlet. Note: the demarcation layer fabrics cannot be biodegradable.
Site Preparation and Land Restoration	For landfill covers, use lower permeability soils than required by regulation when soils are available locally to reduce the amount of leachate generated	Document the volume of silty clay placed in the soil cover.	The RITC Retention basin is the borrow source for the unclassified fill. The unclassified fill is silty clay with low permeability.
Site Preparation and Land Restoration	For restoration use a suitable mix of trees, shrubs, grasses, and forbs to preserve or improve biodiversity and related ecosystem services	Document planting in the FER	Where possible, and where consistent with redevelopment plans, trees and shrubs will be planted.
Site Preparation and Land Restoration	If grass is required, use no- or low-mowing species to minimize mowing	Document that the seed mixture includes low-mowing species such as red and white clover.	The tested blend for the cover includes both red and white clover, but some grasses are needed to ensure dense vegetative coverage.
Site Preparation and Land Restoration	Reuse on-site or local clean materials (for example, shredded tires, crushed concrete) rather than importing borrow for fill	Track testing and volume of crushed concrete used during site grading.	To the extent practicable, crushed concrete from foundations, slabs and the settling ponds will be used for fill onsite.
Site Preparation and Land Restoration	Use crushed concrete as a construction aggregate for road base, pipe bedding, or landscaping	Track testing and volume of crushed concrete used during site grading.	To the extent practicable, crushed concrete from foundations, slabs and the settling ponds will be used for fill onsite.
Site Preparation and Land Restoration	Use excavated areas to serve as retention basins in final storm water control plans	The RITC Retention basin is the borrow source for the unclassified fill.	The RITC Retention basin is the borrow source for the unclassified fill.
Surface and Storm Water	For a landfarm, use a leachate collection and treatment system to fully preserve the quality of downgradient water bodies, soil, and groundwater	Not Applicable, no landfarming on Site 109	
Vehicles and Equipment	Implement an idle reduction plan		Will post a no idling policy.

Reference: ASTM BMP Table

List of Acronyms	Definition
BMP	best management practice
GAC	granular activated carbon
GSA	General Services Administration
POTW	publicly owned treatment works
RITC	Riverview Innovation & Technology Campus, Inc.

Figures



D

1" = 50'
50' 25' 0' 50'

REFERENCES:
1. SITE AERIAL IMAGES PROVIDED BY NIAGARA BOUNDARY AND MAPPING, JULY 2024
2. GENERAL AERIAL IMAGERY UTILIZED FROM GOOGLE MAPS

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2024 AERIAL LAYOUT
SITE 109, SITE #915055, OU2
3875 RIVER ROAD
TONAWANDA, NEW YORK

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FIGURE 1 - 1

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A

SITE 109 RAWP

FIGURE 1-2

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SITE LOCATION MAP
TONAWANDA COKE SITE
3875 RIVER ROAD
TONAWANDA, NEW YORK 14150
NYSDEC SITE NO.
915055-OU2

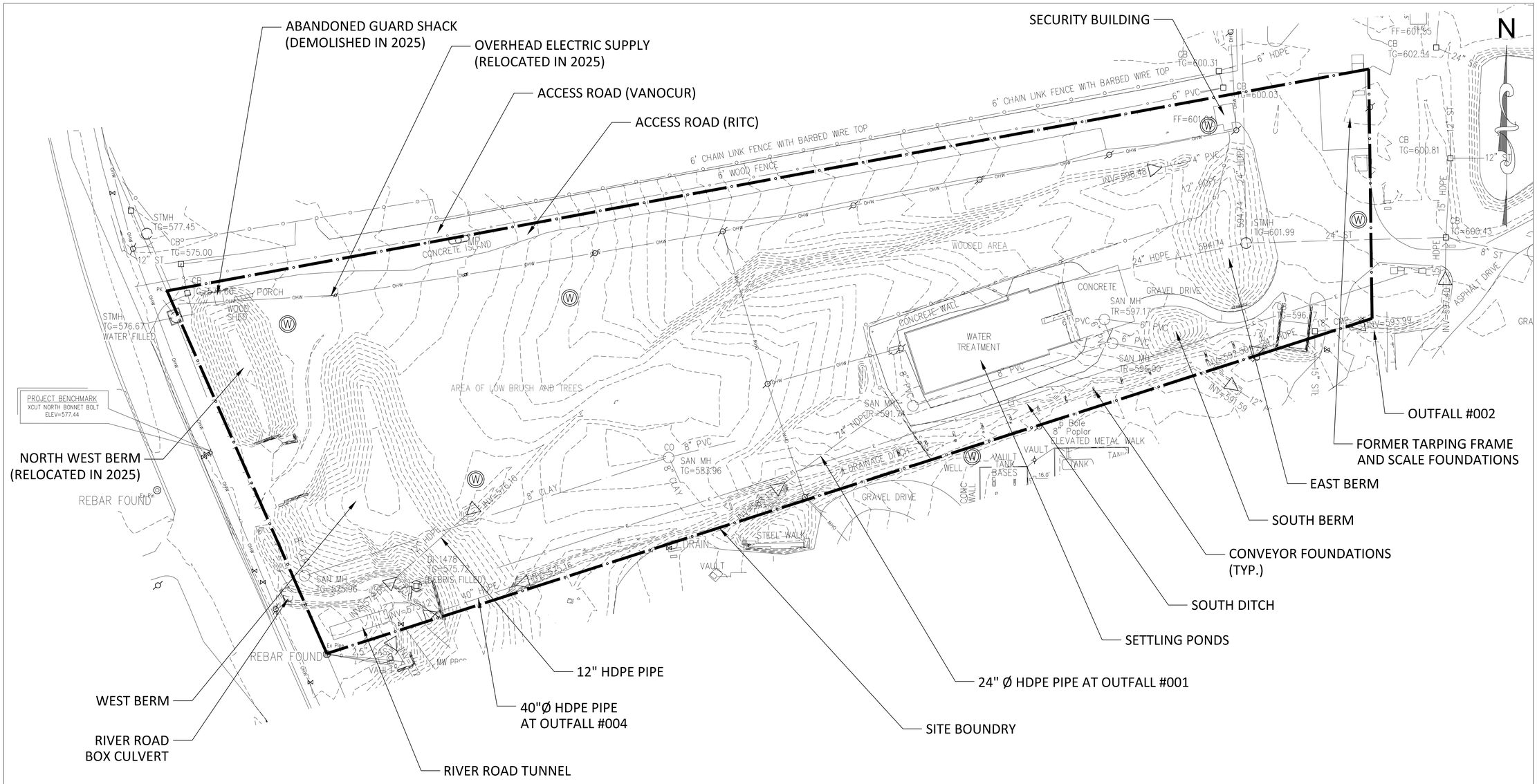
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LEGEND

BOUNDARY LINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
EXISTING TREE LINE
PROPERTY MARKER FOUND
EXISTING CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
EXISTING GAS MAIN
EXISTING UNDERGROUND ELECTRIC/CONDUIT
EDGE OF WATER

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

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SITE 109 LAYOUT

SITE 109 (OU2, NYSDEC #915055)

3875 RIVER ROAD

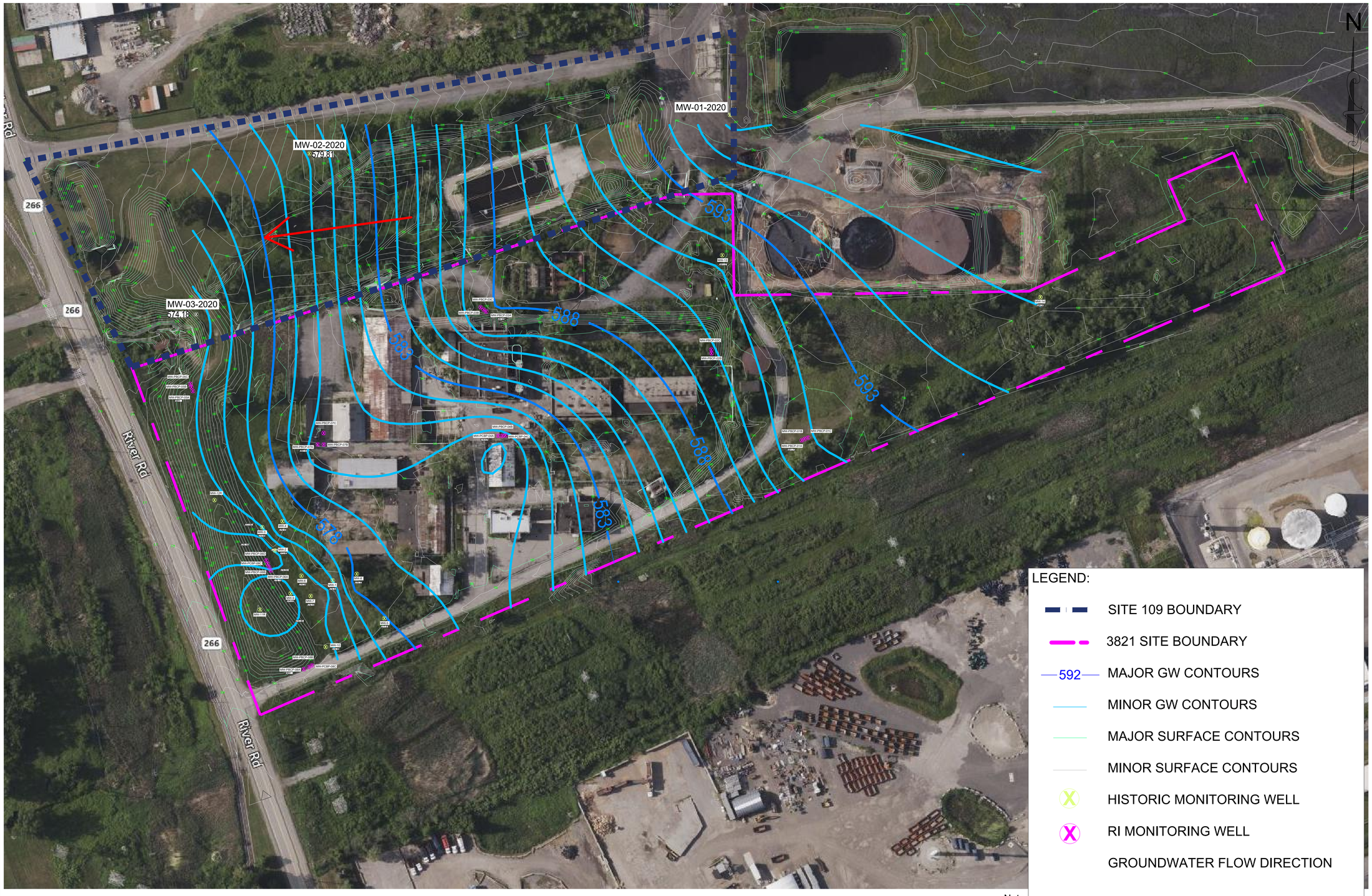
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FIGURE 1-3

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Notes:
1. Groundwater elevations are reported in feet above mean sea level (ft. AMSL).
2. Groundwater contours are displayed in 1.0-foot intervals.
3. Includes data from Site 109 Wells MW-02-2020 and MW-03-2020.

D

1" = 80'
80' 40' 0' 80'

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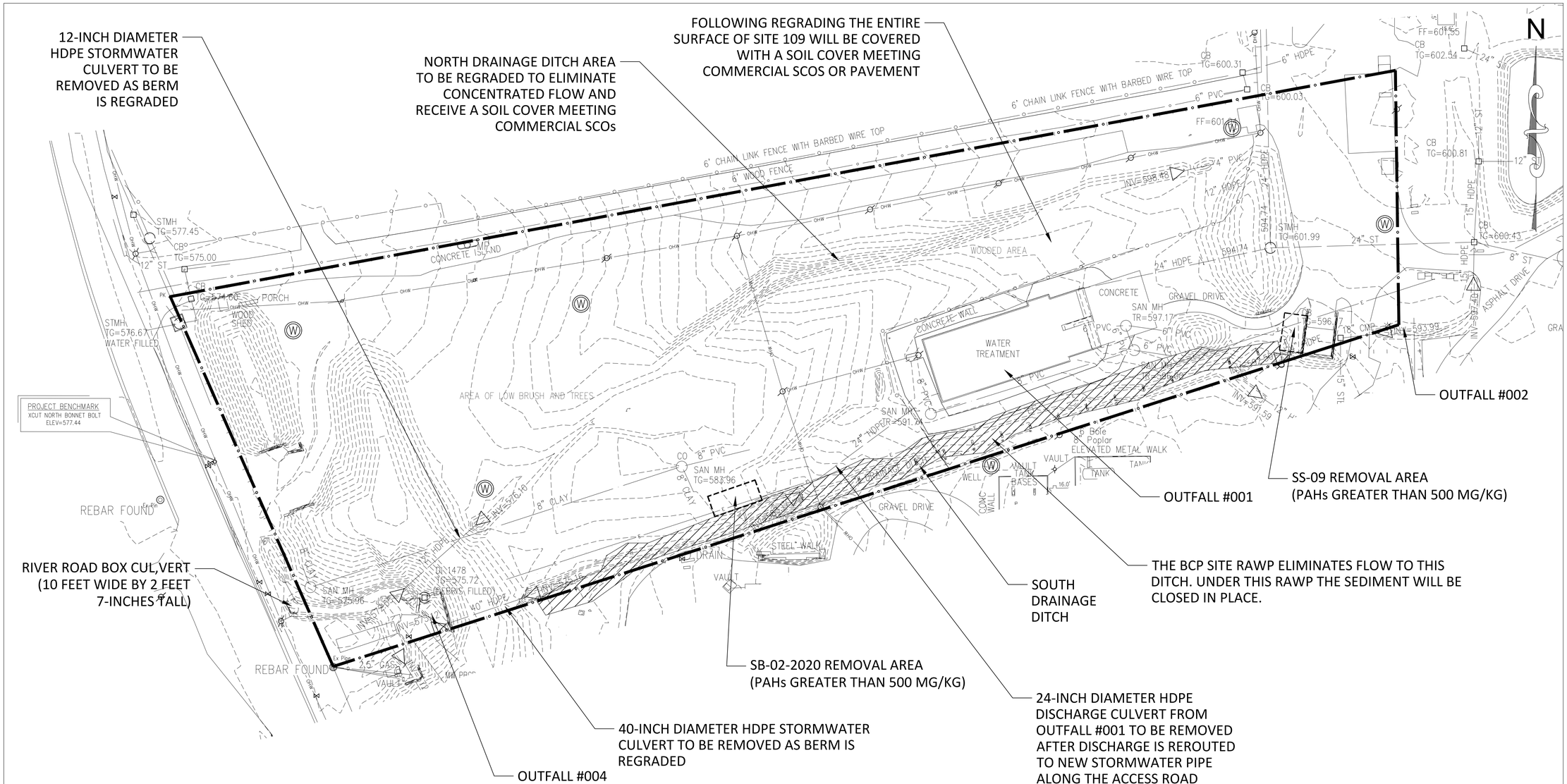
A ZONE GROUNDWATER CONTOURS OCTOBER 2023
SITE 109
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TONAWANDA, NY 14150
BCP SITE No. 915055

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FIGURE 1-4

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LEGEND

BOUNDARY LINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
EXISTING TREE LINE
PROPERTY MARKER FOUND
EXISTING CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
EXISTING GAS MAIN
EXISTING UNDERGROUND ELECTRIC/CONDUIT
EDGE OF WATER

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

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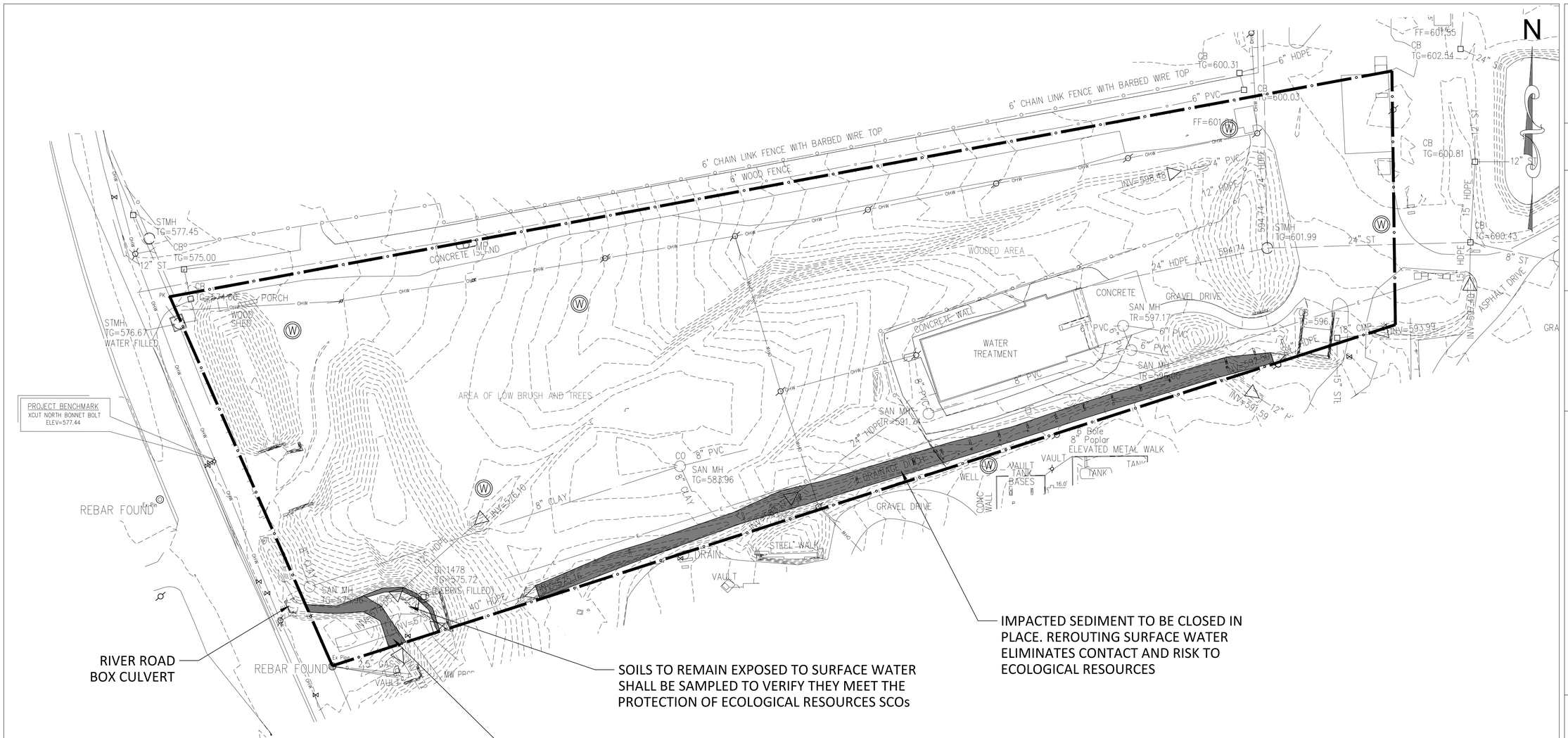
SITE-WIDE REMEDIAL ACTION
SELECTED REMEDIAL ALTERNATIVE

SITE 109 (OU2, NYSDEC #915055)
3875 RIVER ROAD
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FIGURE 2-1

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LEGEND

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EXISTING STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
EXISTING TREE LINE
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PLAN
LOCATIONS OF IMPACTED SEDIMENT

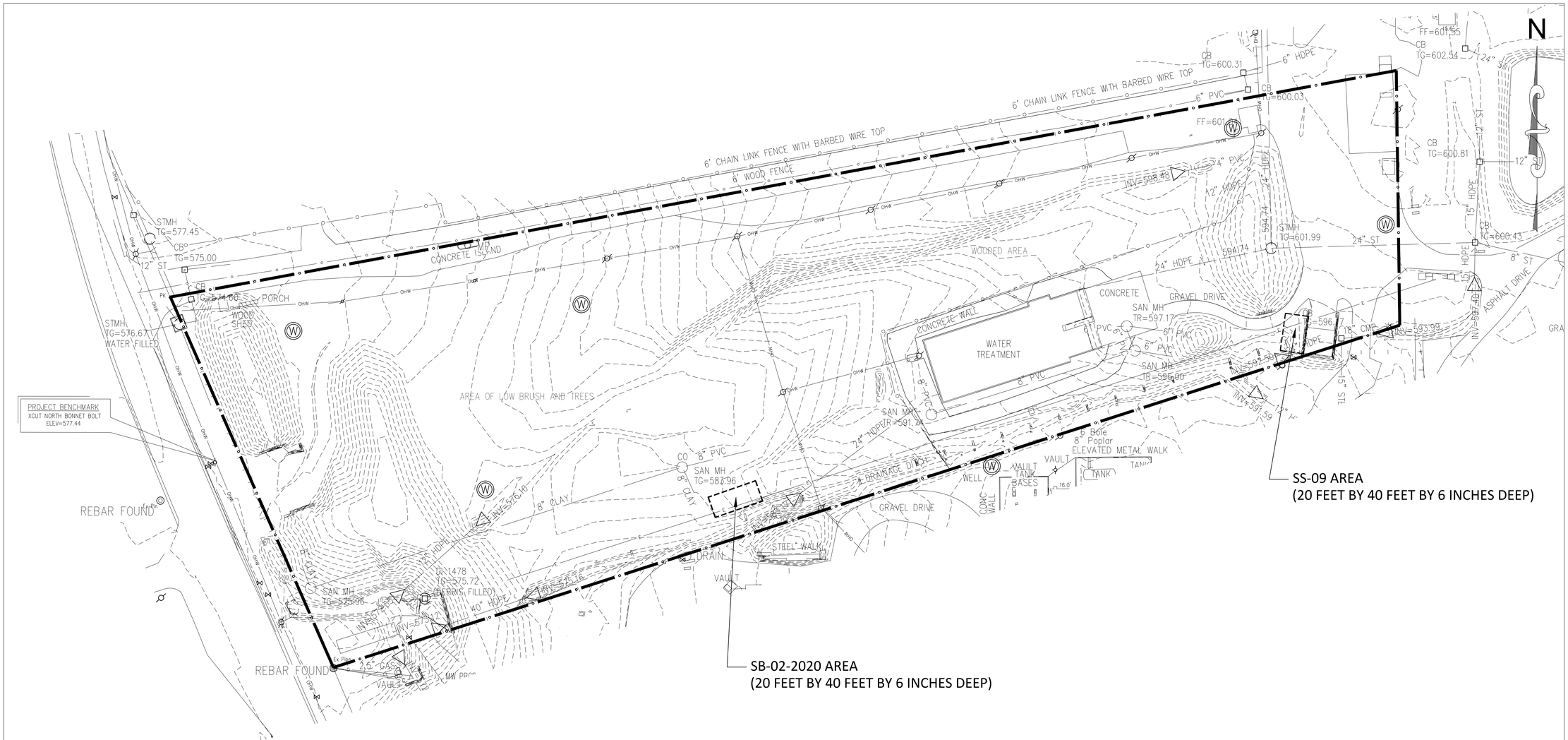
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FIGURE 2-2

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SITE 109 RAWP

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LEGEND

BOUNDARY LINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
EXISTING TREE LINE
PROPERTY MARKER FOUND
EXISTING CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
EXISTING GAS MAIN
EXISTING UNDERGROUND ELECTRIC/CONDUIT
EDGE OF WATER

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

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LOCATIONS OF SOIL WITH CONCENTRATIONS OF PAHs ABOVE 500 mg/kg

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3875 RIVER ROAD

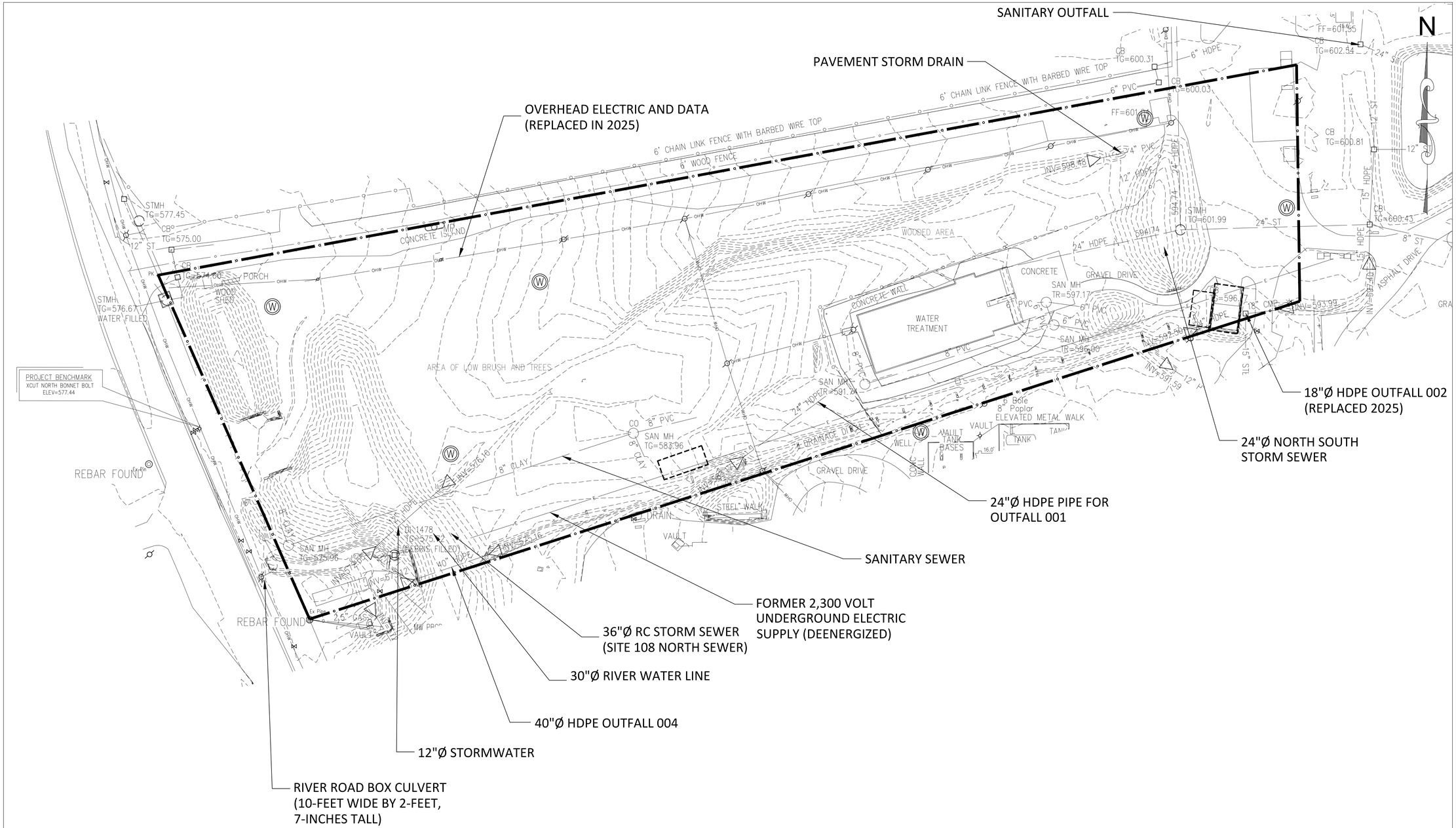
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FIGURE 2-3

DRAWING NUMBER

SITE 109 RAWP



LEGEND

	BOUNDARY LINE
W	EXISTING WATERMAIN, HYDRANT, AND VALVE
	EXISTING STORM SEWER, MANHOLE, AND INLET
	EXISTING SANITARY SEWER AND MANHOLE
	EXISTING TREE LINE
	PROPERTY MARKER FOUND
336	EXISTING CONTOUR W/ ELEVATION
336x5	EXISTING SPOT ELEVATION
G	EXISTING GAS MAIN
E	EXISTING UNDERGROUND ELECTRIC/CONDUIT
	EDGE OF WATER

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

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PLAN UTILITIES

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3875 RIVER ROAD

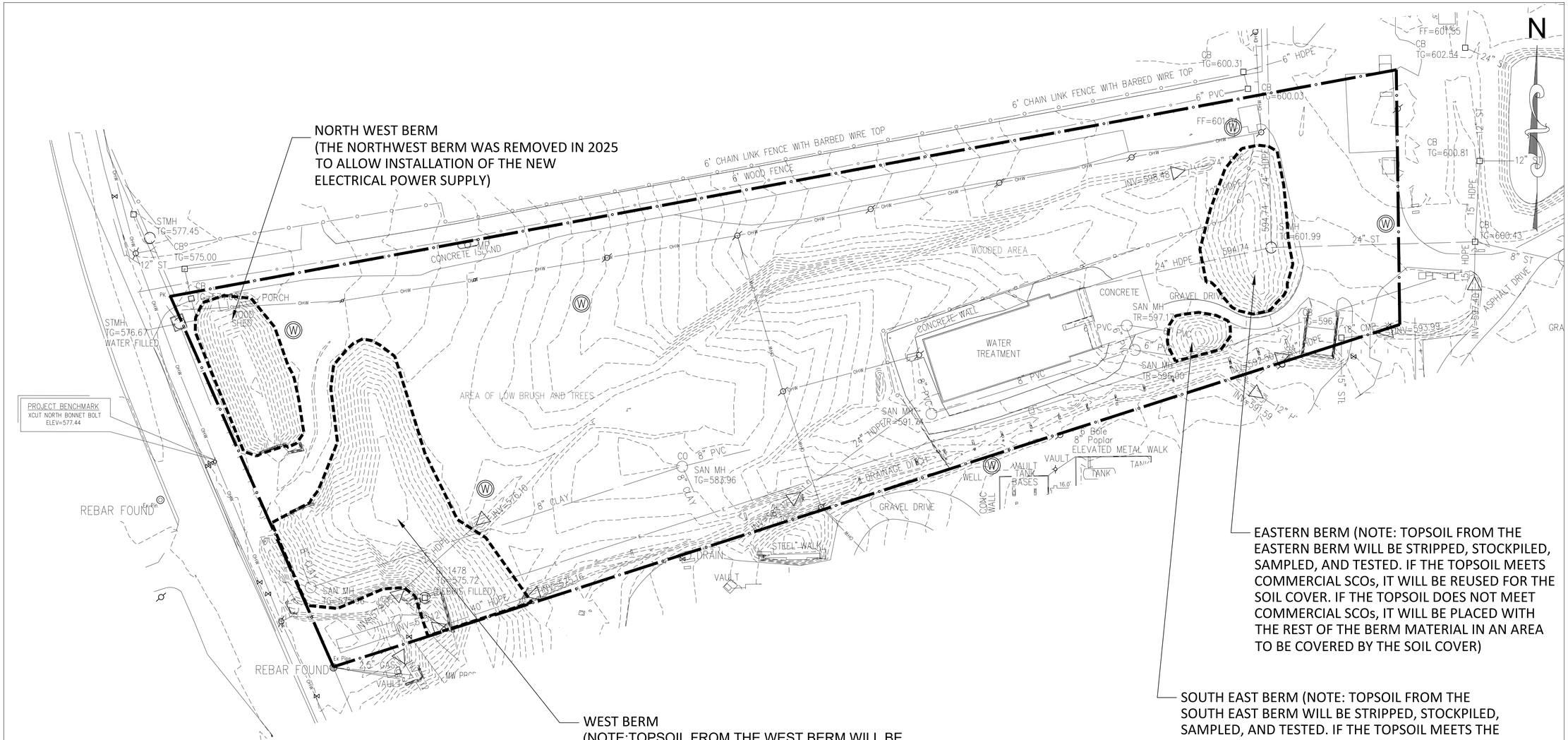
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FIGURE 2-4

DRAWING NUMBER
SITE 109 RAWP

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LEGEND

- BOUNDARY LINE
- EXISTING WATERMAIN, HYDRANT, AND VALVE
- EXISTING STORM SEWER, MANHOLE, AND INLET
- EXISTING SANITARY SEWER AND MANHOLE
- EXISTING TREE LINE
- PROPERTY MARKER FOUND
- EXISTING CONTOUR W/ ELEVATION
- EXISTING SPOT ELEVATION
- EXISTING GAS MAIN
- EXISTING UNDERGROUND ELECTRIC/CONDUIT
- EDGE OF WATER

GRAPHIC SCALE

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(IN FEET)
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PLAN
LOCATIONS OF BERMS TO BE GRADED

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FIGURE 2-5

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SITE 109 RAWP

Appendices

Appendix A – Construction Sheets

Title Sheet
Remedial Action Work Plan

Tonawanda Coke Site #915055-OU2
3875 River Road
Town of Tonawanda, New York

List of Sheets

S-1	-	TITLE SHEET
S-2	-	PLAN-SITE-WIDE REMEDIAL ACTION
S-3	-	PLAN-MATERIALS MANAGEMENT
S-4	-	PLAN-EROSION AND SEDIMENT CONTROLS
S-5	-	DETAILS-EROSION AND SEDIMENT CONTROLS
S-6	-	PLAN-UTILITIES
S-7	-	SITE AND UTILITY PLAN
S-8	-	PROFILE SHEET
S-9	-	DETAIL SHEET 02
S-10	-	DETAIL SHEET 03
S-11	-	PLAN-SEDIMENT REMOVAL
S-12	-	RECONSTRUCTION OUTFALL
S-13	-	CROSS SECTIONS
S-14	-	GRADING PLAN- SUBGRADE
S-15	-	GRADING PLAN- UNCLASSIFIED FILL
S-16	-	GRADING PLAN- FINISHED GRADE
S-17	-	MONITORING PLAN

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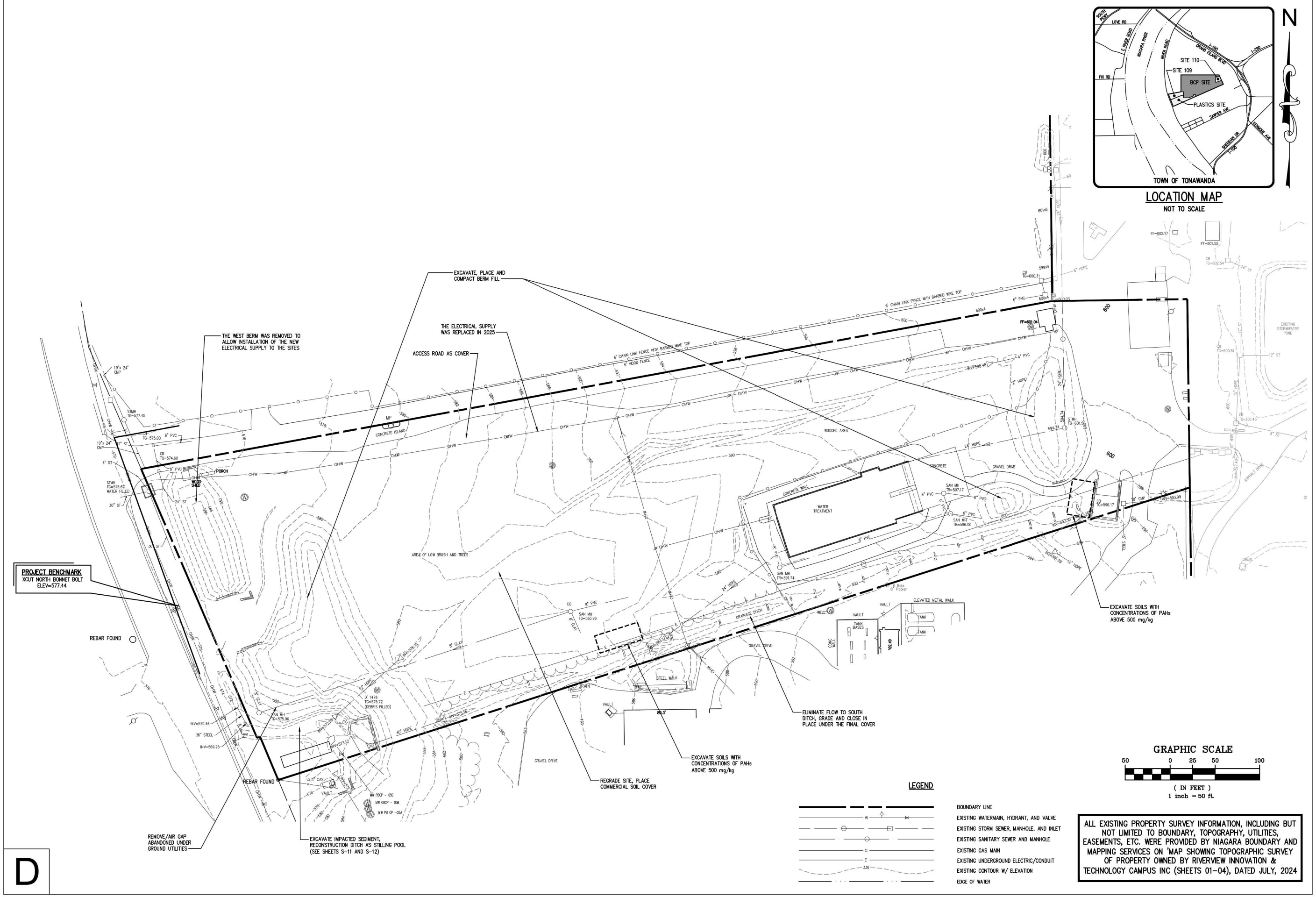
TITLE SHEET
REMEDIAL ACTION WORK PLAN

TONAWANDA COKE SITE
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S–1

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LOCATION MAP
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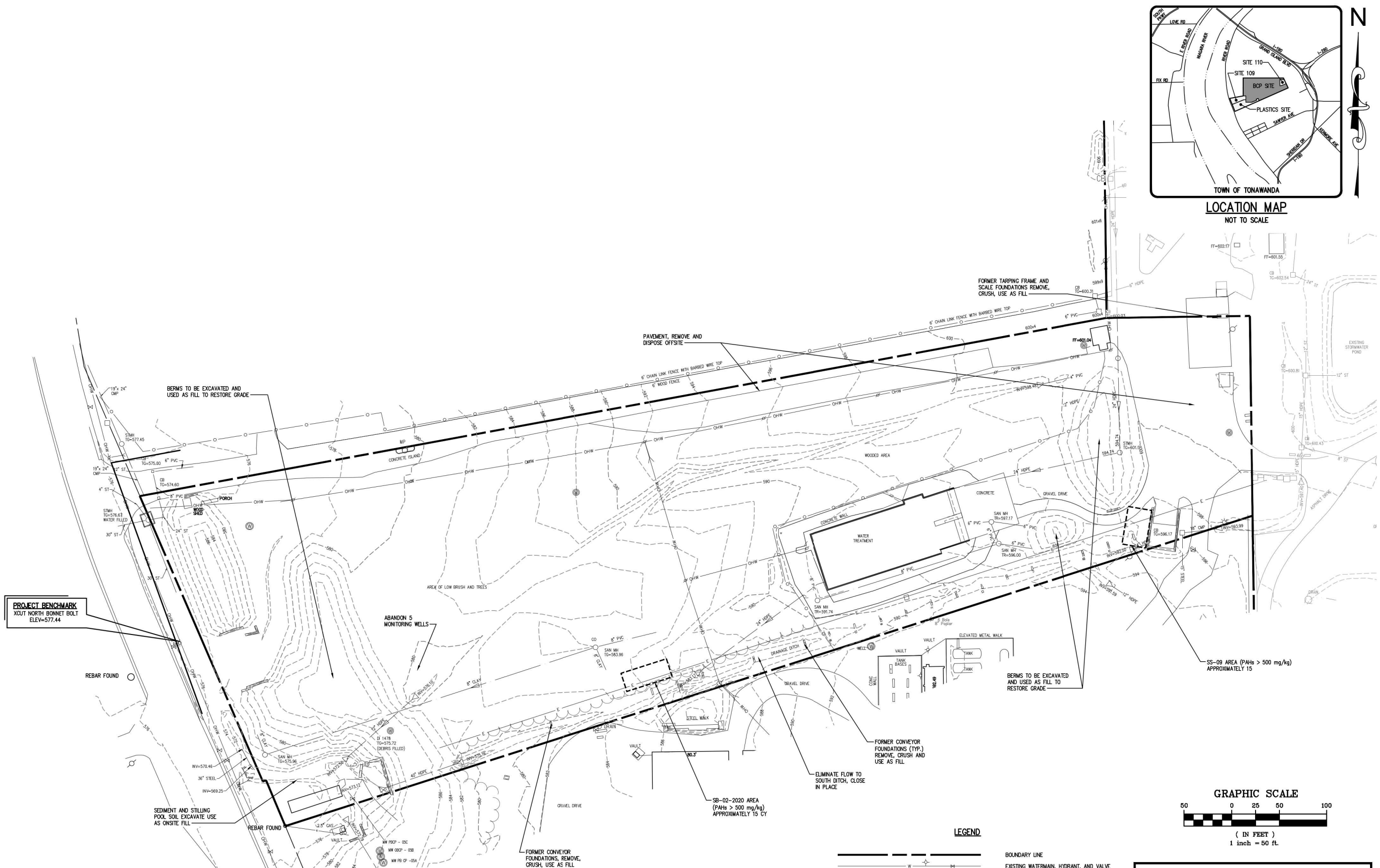
PLAN
SITE WIDE REMEDIAL ACTIONS

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FIGURE

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S–2



LOCATION MAP
NOT TO SCALE

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

LEGEND

- BOUNDARY LINE
- EXISTING WATERMAIN, HYDRANT, AND VALVE
- EXISTING STORM SEWER, MANHOLE, AND INLET
- EXISTING SANITARY SEWER AND MANHOLE
- EXISTING GAS MAIN
- EXISTING UNDERGROUND ELECTRIC/CONDUIT
- EXISTING CONTOUR W/ ELEVATION
- EDGE OF WATER

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NOTE: THE EXISTING TOPSOIL FROM THE BERMS SHALL BE STRIPPED, STOCKPILED AND SAMPLED FOR THE DER–10 IMPORT CRITERIA. IF THE COMMERCIAL SCOs ARE SATISFIED, THE TOPSOIL WILL BE USED IN THE SOIL COVER. IF THE COMMERCIAL SCOs ARE NOT MET, THE SOIL SHALL BE PLACES AS FILL BELOW THE SOIL COVER.

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PLAN
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FIGURE

DRAWING NUMBER
S–3

CONSTRUCTION EROSION CONTROL NOTES:

1. THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) CONSISTS OF THE STORMWATER MANAGEMENT REPORT, THE PROJECT PLANS, INCLUDING THE GRADING, CONSTRUCTION EROSION CONTROL PLAN AND DETAIL SHEET. THE SWPPP FOR THIS PROJECT IS INTENDED TO CONFORM WITH THE NYSDEC GENERAL PERMIT GP-0-20-001 AND THE REQUIREMENTS OF LOCAL AND NYSDEC AUTHORITIES REGARDING THE CONTROL OF STORMWATER QUANTITY AND QUALITY. A SWPPP MAY ALREADY BE IN PLACE FOR THIS PROJECT AS PART OF THE ONGOING REMEDIATION ACTIVITIES.
2. THE RESPONSIBLE PARTY SHALL IMPLEMENT THE REQUIRED SWPPP. THE OWNER'S CONTRACTOR, SUB-CONTRACTOR AND ALL OTHERS ASSOCIATED WITH THE IMPLEMENTATION OF THE PLAN SHALL BE FAMILIAR WITH THE PLAN AND THE CONDITIONS OF THE NYSDEC GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES.
3. ANY MODIFICATIONS OR DEVIATIONS FROM THE SWPPP, INCLUDING EROSION CONTROL MEASURES AND STORMWATER MANAGEMENT FACILITIES, SHALL BE DOCUMENTED IN THE INSPECTION REPORT AND CONSIDERED PART OF THE SWPPP FOR THE PROJECT.
4. THE RESPONSIBLE PARTY SHALL FILE THE NOTICE OF INTENT (NOI) FOR CONSTRUCTION ACTIVITY WITH NYSDEC PRIOR TO COMMENCING ANY CONSTRUCTION. A COPY OF THE NOI SHALL BE KEPT ON-SITE AND PROVIDED TO THE MUNICIPALITY.
5. THE RESPONSIBLE PARTY SHALL PROVIDE ON SITE INSPECTIONS BY A LICENSED PROFESSIONAL REGARDING EROSION CONTROL DURING CONSTRUCTION. INSPECTIONS ARE TO BE PROVIDED AT A MINIMUM OF TWICE A WEEK FOR DISTURBANCES OF 5 ACRES AND GREATER AND ONCE A WEEK FOR DISTURBANCES LESS THAN 5 ACRES. AN INSPECTION REPORT LOG AND THE SWPPP ARE TO BE KEPT ON-SITE BY THE RESPONSIBLE PARTY.
6. FOR SITES WHERE SOIL DISTURBANCE ACTIVITIES HAVE BEEN TEMPORARILY SUSPENDED (E.G. WINTER SHUTDOWN) AND TEMPORARY STABILIZATION MEASURES HAVE BEEN APPLIED TO ALL DISTURBED AREAS, THE RESPONSIBLE PARTY/OPERATOR MAY REDUCE THE SELF-INSPECTION FREQUENCY, BUT SHALL MAINTAIN A MINIMUM OF MONTHLY INSPECTIONS. (30 CALENDAR DAYS)
7. THE RESPONSIBLE PARTY'S CONTRACTOR/REPRESENTATIVE SHALL IDENTIFY AT LEAST ONE INDIVIDUAL TO BE TRAINED FROM THEIR COMPANY THAT WILL BE RESPONSIBLE FOR IMPLEMENTATION OF THE SWPPP. THE INDIVIDUAL MUST RECEIVE (4) HOURS OF NYSDEC TRAINING EVERY (3) YEARS. THE OWNER/OPERATOR SHALL ENSURE THAT AT LEAST ONE OF THE TRAINED INDIVIDUALS IS ON SITE ON A DAILY BASIS WHEN SOIL DISTURBANCE ACTIVITIES ARE BEING PERFORMED.
8. FOR DISTURBANCES OF 5 ACRES AND GREATER, IN AREAS WHERE SOIL DISTURBANCE ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED, THE APPLICATION OF SOIL STABILIZATION MEASURES MUST BE INITIATED BY THE END OF THE NEXT BUSINESS DAY AND COMPLETED WITHIN 7 DAYS. FROM THE DATE THE CURRENT SOIL DISTURBANCE ACTIVITY CEASED. IF THE SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY GROUNDCOVER, THE DISTURBED AREAS SHALL BE MULCHED WITH STRAW OR EQUIVALENT MATERIAL. ADDITIONAL TIME FRAMES FOR STABILIZATION ARE SUBJECT TO THE REQUIREMENTS OF A REGULATED TRADITIONAL LAND USE MS4.
9. FOR DISTURBANCES LESS THAN 5 ACRES, IN AREAS WHERE SOIL DISTURBANCE ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED, THE APPLICATION OF SOIL STABILIZATION MEASURES MUST BE INITIATED BY THE END OF THE NEXT BUSINESS DAY AND COMPLETED WITHIN 14 DAYS. FROM THE DATE THE CURRENT SOIL DISTURBANCE ACTIVITY CEASED. IF THE SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY GROUNDCOVER, THE DISTURBED AREAS SHALL BE MULCHED WITH STRAW OR EQUIVALENT MATERIAL. ADDITIONAL TIME FRAMES FOR STABILIZATION ARE SUBJECT TO THE REQUIREMENTS OF A REGULATED TRADITIONAL LAND USE MS4.
10. ALL GROUND DISTURBANCE ACTIVITIES AND UTILITY EXCAVATIONS SHALL COMPLY WITH THE EXCAVATION WORK PLAN.
11. THE RESPONSIBLE PARTY'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE ESTABLISHMENT, MAINTENANCE, CLEANING, REPAIR AND REPLACEMENT OF EROSION CONTROL MEASURES DURING SITE CONSTRUCTION.
12. ALL DISTURBED AREAS TO BE RECLAIMED PER THE DRAFT EXCAVATION INTERIM REMEDIAL MEASURE WORK PLAN REQUIREMENTS.
13. AREAS OR EMBANKMENTS REQUIRING AN EROSION CONTROL BLANKET SHALL UTILIZE ECS-1B (EASTCOAST) OR AN APPROVED EQUIVALENT.
14. TEMPORARY SEEDING OF DISTURBED AREAS SHALL BE PROVIDED AS FOLLOWS:

THE SURFACE TWO INCHES OF SOIL SHOULD BE LOOSENED BY DISKING, RAKING, OR BACK-BLADING WITH A BULLDOZER. IMMEDIATELY FERTILIZE WITH 300 LBS PER ACRE (OR 7 LBS. PER 1000 SQ. FT.) OF 10-10-10 FERTILIZER. IMMEDIATELY SEED WITH THE FOLLOWING MIX:

	LBS./ACRE	LBS./1000 SQ. FT.
ANNUAL RYEGRASS	40	1
PERENNIAL RYEGRASS	40	1
OATS	40	1
WHITE CLOVER (+ INOCULANT)	4	0.1

SEED SHOULD HAVE A GERMINATION RATE OF AT LEAST 85 PERCENT AND MINIMAL INERT MATERIAL.

CONSTRUCTION EROSION CONTROL NOTES CONTINUED:

15. DISTURBED AREAS WITH A SOIL COVER SYSTEM SHALL BE STABLIZED USING PERMANENT LAWN SEEDING MIX UPON COMPLETION OF GRADING AND CONSTRUCTION:

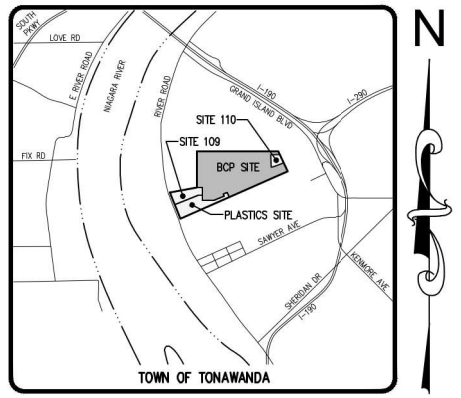
	LBS/ACRE
CREPING RED FESCUE	36
CHEWINGS FESCUE	36
PERENNIAL RYEGRASS	9
RED CLOVER	14
WHITE CLOVER	18

SEEDING RATE: 6.0 LBS PER 1,000 SQ FT.
MULCH: STRAW OR WOOD FIBER MULCH USED WITH HYDROSEEDING METHOD, AT TWO TONS PER ACRE WITH TACKIFIER
STARTING FERTILIZER: 5-10-10 AT 20 LBS PER 1,000 SQ. FT

16. SEED MIX AT INLET AREA AROUND RIVER ROAD CULVERT;
"OBL WETLAND MIX", ERNST CONSERVATION SEEDS, ERNMX-131;
SEEDING RATE: 15 LBS/AC OR ½ LB/1,000 SF
17. ALL SEEDED AREAS ARE TO BE MONITORED FOR GERMINATION AND EROSION. ERODED AREAS ARE TO BE BACKFILLED, FINE GRADED AND RE-SEEDED. AREAS THAT FAIL TO GERMINATE A MINIMUM OF 80% SHALL BE RE-SEEDED
18. ANY EXCAVATIONS THAT MUST BE DEWATERED SHALL BE HANDLED IN ACCORDANCE WITH THE DRAFT EXCAVATION INTERIM REMEDIAL MEASURE WORK PLAN.
19. THE RESPONSIBLE PARTY SHALL BE RESPONSIBLE FOR REMOVING EXISTING EROSION CONTROL MEASURES THAT ARE LOCATED WITHIN ESTABLISHED AREAS. MATERIALS ARE TO BE DISPOSED OF PROPERLY.
20. UPON COMPLETION OF CONSTRUCTION AND FINAL STABILIZATION THE RESPONSIBLE PARTY MAY FILE A NOTICE OF TERMINATION (NOT) WITH NYSDEC PER THE REQUIREMENTS OF THE GENERAL PERMIT GP-0-20-001.

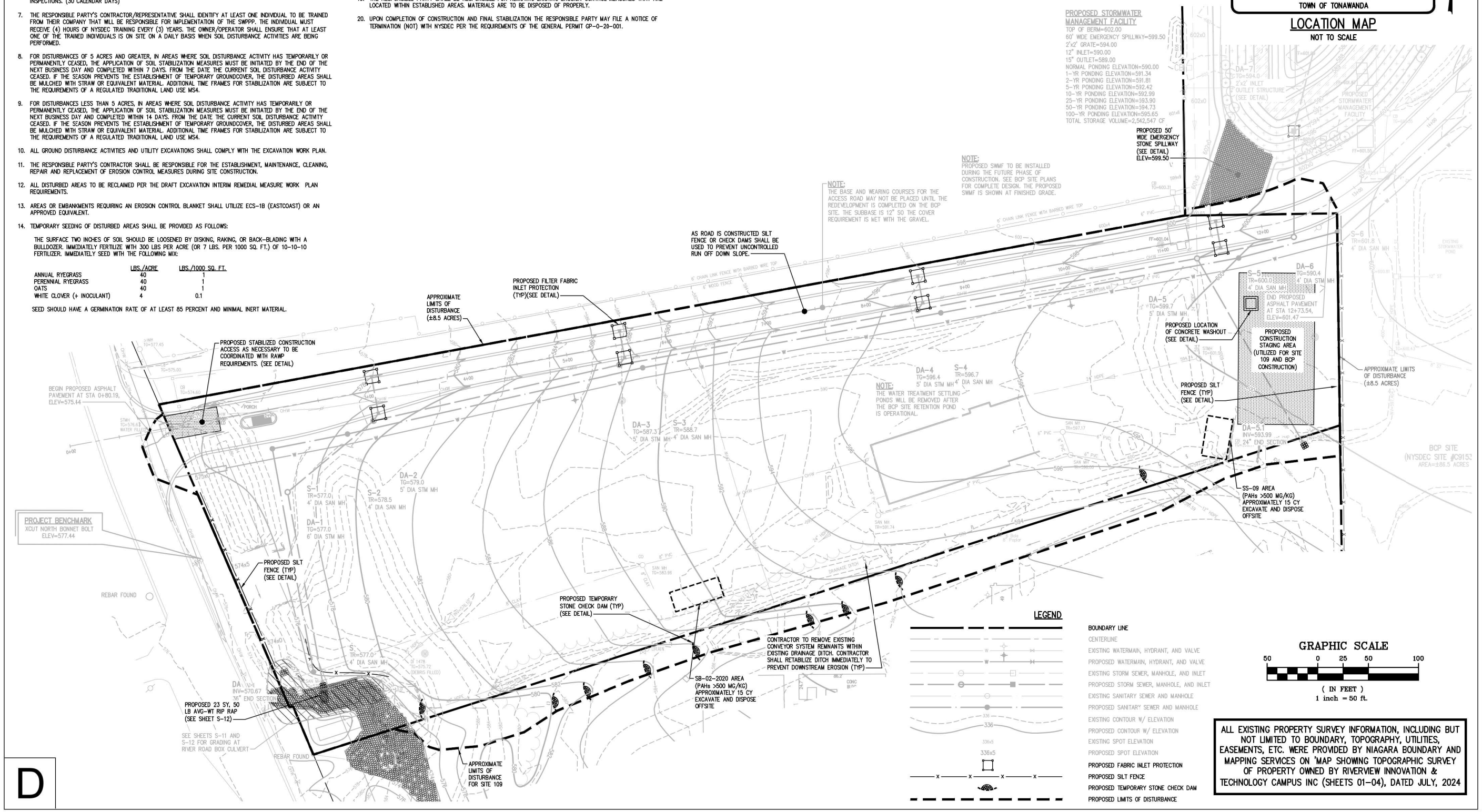
GROUNDCOVER SEEDING LEGEND

STORMWATER MANAGEMENT AQUATIC BENCH SEED MIX;
"OBL WETLAND MIX", ERNST CONSERVATION SEEDS, ERNMX-131;
SEEDING RATE: 15 LBS/AC OR ½ LB/1,000 SF.



LOCATION MAP

NOT TO SCALE



LEGEND

BOUNDARY LINE
CENTERLINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
PROPOSED WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
PROPOSED STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
PROPOSED SANITARY SEWER AND MANHOLE
EXISTING CONTOUR W/ ELEVATION
PROPOSED CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
PROPOSED SPOT ELEVATION
PROPOSED FABRIC INLET PROTECTION
PROPOSED SILT FENCE
PROPOSED TEMPORARY STONE CHECK DAM
PROPOSED LIMITS OF DISTURBANCE

GRAPHIC SCALE

50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

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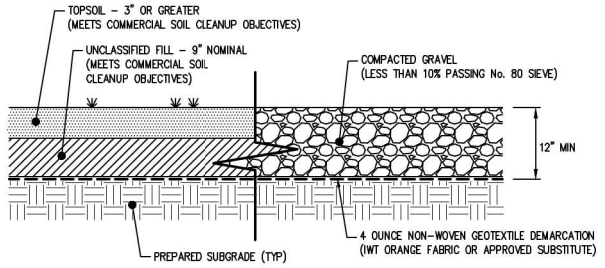
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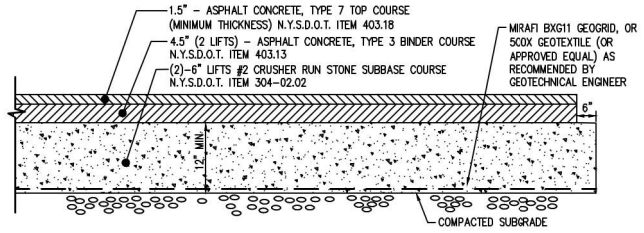
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CONSTRUCTION EROSION CONTROL PLAN

DRAWING NUMBER
S-4

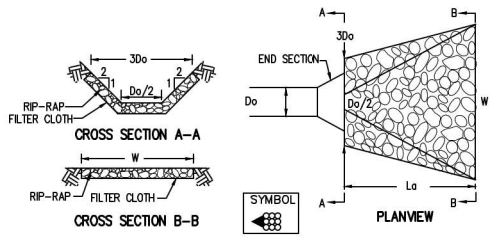


SOIL COVER SYSTEM DETAIL
N.T.S.



NOTE:
THICKNESS OF PAVEMENT SHALL BE BASED ON SERVICEABILITY, NO MINIMUM THICKNESS REQUIREMENT APPLIES TO PAVEMENT.

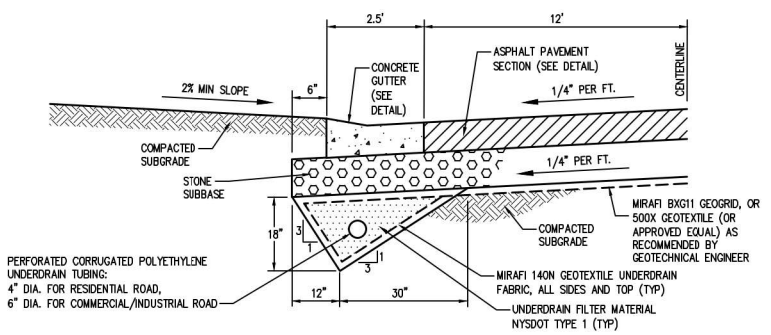
ASPHALT PAVEMENT SECTION
N.T.S.



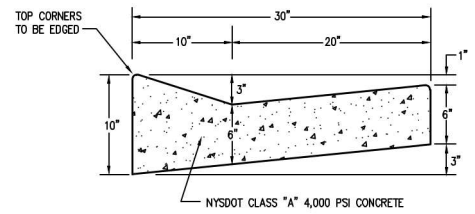
RIP–RAP OUTLET DIMENSIONS

DESIGNATION	DIA. OF PIPE Do	3Do	La	W
DA	36"	9.0'	16.0'	20.0'

RIP–RAP OUTLET PROTECTION DETAIL
N.T.S.

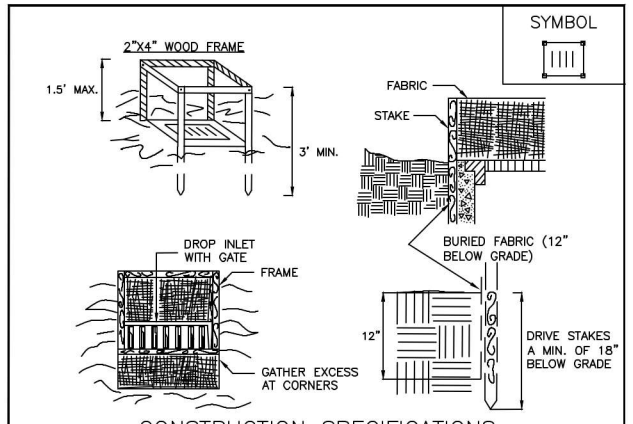


ROAD UNDERDRAIN DETAIL
N.T.S.



NOTES:
1. CONTRACTION JOINTS TO BE AT 10' INTERVALS AND SHALL BE FORMED OR SAW CUT TO A DEPTH OF ¼" BELOW THE SURFACE OF THE GUTTER.
2. EXPANSION JOITS TO BE AT 100' INTERVALS AND SHALL BE FORMED WITH ½" WIDE PREMOLDED BITUMINOUS JOINT FILLER. THE FILLER MATERIAL SHALL BE CUT TO CONFORM TO THE CROSS–SECTION OF THE GUTTER.
3. EXPANSION JOINTS AND FORMED CONTRACTION JOINTS ARE TO BE EDGED WITH CONCRETE FINISHING TOOLS.

CONCRETE GUTTER DETAIL
N.T.S.

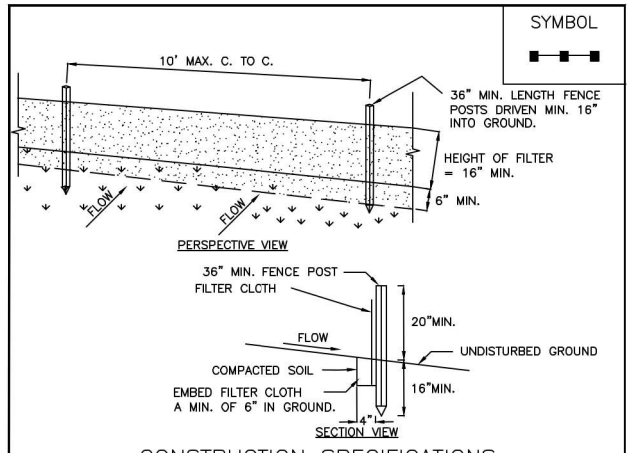


CONSTRUCTION SPECIFICATIONS

1. FABRIC SHALL HAVE AN EOS OF 40–85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUM DRAINAGE AREA 1 ACRE

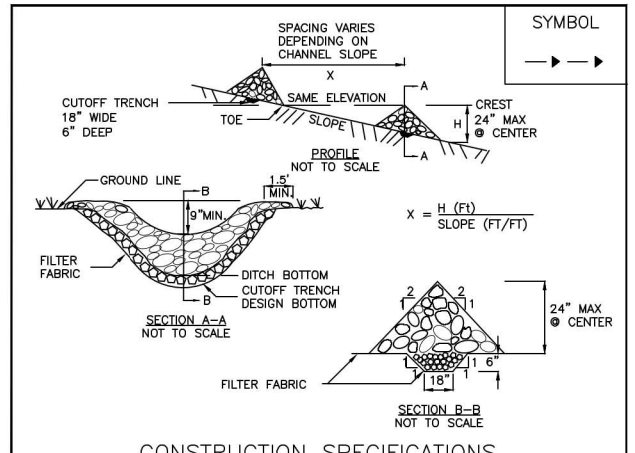
ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FABRIC DROP INLET PROTECTION



CONSTRUCTION SPECIFICATIONS

1. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO POST AS NECESSARY.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STANDARD SILT FENCE

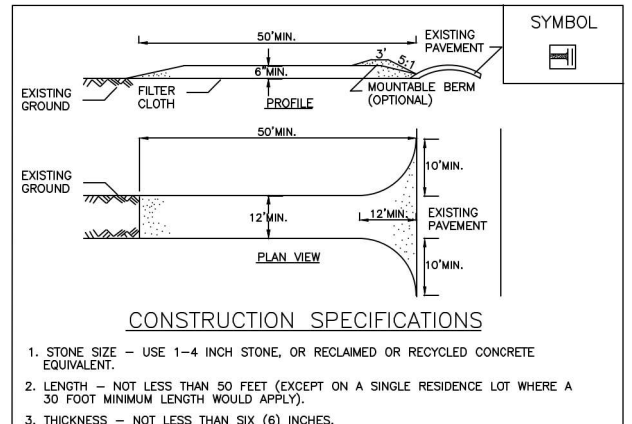


CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE CHECK DAM



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE – USE 1–4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY–FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CON–STRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ACCESS

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APPROVED	

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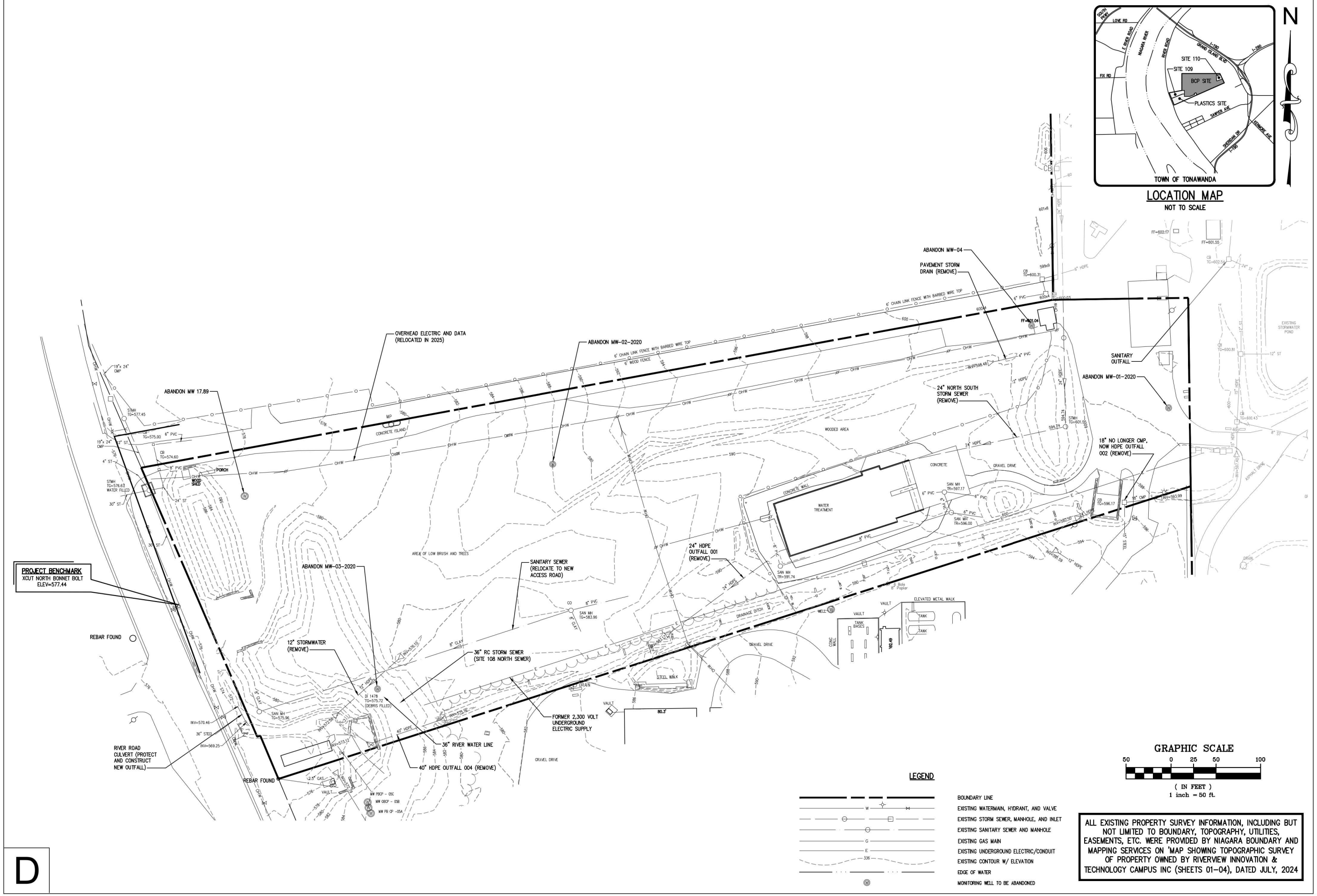
RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS

SITE 109 (OU2, NYSDEC #915055)
TONAWANDA, NY 14150
3975 RIVER ROAD
TOWN OF TONAWANDA, NEW YORK

INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
(703) 722-6049
www.InventumEng.com

DETAIL SHEET 01

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S–5



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STATE OF NEW YORK
PROFESSIONAL ENGINEER
LICENSED

PLAN
UTILITIES

SITE 109 (OU2, NYSDEC #915055)
3875 RIVER ROAD
TOWN OF TONAWANDA, NEW YORK

INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
(703) 722-6049
www.InventumEng.com

FIGURE

DRAWING NUMBER
S-6

SITE NOTES:

1. TOTAL PROJECT AREA: ±119.806 ACRES
   SITE 109: ±7.739 ACRES
2. EXISTING ZONING: GENERAL INDUSTRIAL (GI)
3. EXISTING USE: REMEDIATION SITE
4. PROPOSED USE: COMMERCIAL DEVELOPMENT
5. LOT DEVELOPMENT STANDARDS:

	REQUIRED	PROVIDED (LOT 109)
SETBACKS:		
FRONT	40 FEET	N/A
SIDE	25 FEET	N/A
REAR	25 FEET	N/A
MIN. LOT AREA:	40,000 S.F.	±337,000 S.F.
MIN. LOT WIDTH:	100 FEET	±200 FEET
MAX LOT COVERAGE	75%	TBD
MIN OPEN SPACE	25%	TBD
MAX BLDG HEIGHT	80 FEET	TBD

6. ALL IMPROVEMENTS SHALL BE IN ACCORDANCE WITH THE MOST RECENT STANDARDS AND SPECIFICATIONS OF THE TOWN OF TONAWANDA AND THE APPROPRIATE ERIE COUNTY AND NEW YORK STATE AGENCIES, UNLESS OTHERWISE NOTED.
7. ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01–04), DATED JULY, 2024.
8. REVIEW OF THE FEMA MAPS INDICATES THAT THIS PROPERTY IS NOT WITHIN A RECOGNIZED 100-YEAR FLOODPLAIN PER THE FLOOD INSURANCE RATE MAP, ERIE COUNTY, NEW YORK, PANEL 181 OF 807 MAP NUMBER 36029C0181J EFFECTIVE DATE JUNE 16, 2021.

UTILITY NOTES:

1. THE SETBACK LINES AND NOTES RELATING TO SETBACK SHOWN HEREON ARE INTENDED TO SHOW APPLICABLE ZONING REQUIREMENTS OF THE TOWN OF TONAWANDA AS OF THE DATE OF THIS MAP AND ARE NOT INTENDED TO IMPOSE ANY ADDITIONAL RESTRICTIONS OTHER THAN SAID ZONING REQUIREMENTS.
2. ALL IMPROVEMENTS SHALL BE IN ACCORDANCE WITH THE MOST RECENT STANDARDS AND SPECIFICATIONS OF THE TOWN OF TONAWANDA, THE APPROPRIATE AGENCIES (IE, ERIE COUNTY WATER AUTHORITY, THE ERIE COUNTY HEALTH DEPARTMENT, AND THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION) UNLESS OTHERWISE NOTED.
3. ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01–04), DATED JULY, 2024.
4. THE CONTRACTOR SHALL DETERMINE EXACT LOCATION AND ELEVATION OF UNDERGROUND UTILITIES BEFORE COMMENCING CONSTRUCTION. CONTRACTOR SHALL MAKE EXPLORATION EXCAVATIONS TO LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS AS REQUIRED TO MEET EXISTING CONDITIONS.
5. HIGHWAY DRAINAGE ALONG RIVER ROAD IS TO BE MAINTAINED.

UTILITY NOTES CONTINUED:

WATERMAIN:

6. WATERMAINS AND APPURTENANCES TO BE CONSTRUCTED TO THE MOST RECENT STANDARDS AND SPECIFICATIONS OF THE ERIE COUNTY WATER AUTHORITY. WATERMAIN EXCAVATION SHALL BE IN ACCORDANCE WITH THE EXCAVATION IRM WORK PLAN.
7. FOR WATERMAIN CONSTRUCTION, ALL MECHANICAL JOINT FITTINGS, TEES, BENDS, PLUGS, ETC. SHALL BE BACKED WITH 3,000 PSI CONCRETE THRUST BLOCKS
8. WATERMAINS SHALL BE PVC DR-14, AS NOTED ON THE PLANS.
9. WATERMAINS AND APPURTENANCES SHALL BE INSTALLED PER THE MOST RECENT AWWA C900 STANDARDS.
10. THE WATERMAIN SHALL BE PRESSURE/LEAKAGE TESTED IN ACCORDANCE WITH THE MINIMUM REQUIREMENTS OF THE AWWA C605 STANDARDS (LATEST REVISION) OR IN ACCORDANCE WITH MORE STRINGENT REQUIREMENTS IMPOSED BY THE ERIE COUNTY WATER AUTHORITY.
11. THE WATER MAIN SHALL BE DISINFECTED PER THE MOST RECENT AWWA C651 STANDARDS. FOLLOWING DISINFECTION, THE WATER MAIN SHALL BE FLUSHED UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM. THE SAMPLING POINT(S) MUST BE DECONTAMINATED BY FLAMING.

    FIRE HYDRANTS ARE NOT ACCEPTABLE SAMPLING POINTS.

    THE ERIE COUNTY DEPARTMENT OF HEALTH MUST RECEIVE AT LEAST 48-HOUR ADVANCE NOTIFICATION REQUESTING SAMPLING SERVICES. THE HEALTH DEPARTMENT WILL COLLECT SAMPLES FOR FREE CHLORINE RESIDUAL, TOTAL AND FECAL COLIFORM AND 24-HOUR BACTERIAL PLATE COUNT.

    ALL WATER MAIN FITTINGS NOT RECEIVING 24-HOUR CHLORINE DISINFECTION CONTACT TIME MUST BE SWAB DISINFECTED 30 MINUTES PRIOR TO INSTALLATION.

    THE WATER MAIN SHALL NOT BE PLACED INTO SERVICE UNTIL SO AUTHORIZED BY THE ERIE COUNTY DEPARTMENT OF HEALTH.
12. ALL WATERMAINS SHALL HAVE A MINIMUM OF FIVE FEET OF COVER FROM FINISHED GRADE IN LAWN AREAS AND A MINIMUM OF SIX FEET OF COVER FROM FINISHED GRADE IN PAVED AREAS. THE CONTRACTOR SHALL CHECK ALL CUT STAKES BEFORE TRENCHING TO INSURE THAT ALL INSTALLED WATERMAINS WILL HAVE THE REQUIRED COVER.
13. WHEN INSTALLING FIRE HYDRANTS, SHOULD GROUNDWATER BE ENCOUNTERED WITHIN SEVEN (7') FEET OF THE FINISH GRADE, FIRE HYDRANT WEEPHOLES (DRAINS) SHALL BE PLUGGED.
14. PRIOR TO INSTALLATION OF THE WATERMAIN, THE CONTRACTOR SHALL PROVIDE RESULTS OF A 10 POINT SOIL TEST EVALUATION PER ANSI-AWWA C105-A21.5-82 TO DETERMINE THE NEED FOR POLYETHYLENE ENCASEMENT. SOIL TESTS ARE TO BE PERFORMED BY AN APPROVED SOIL TESTING LABORATORY IN ACCORDANCE WITH ECWA STANDARDS.
15. MINIMUM SEPARATION BETWEEN WATERMAIN AND SEWER MAINS TO BE 18" VERTICALLY MEASURED FROM THE OUTSIDE OF THE PIPES AT THE POINT OF CROSSING. MINIMUM HORIZONTAL SEPARATION BETWEEN WATERMAINS AND STORM/SANITARY SEWER MAINS TO BE 10 FEET MEASURED FROM THE OUTSIDE OF THE PIPES. ONE FULL LENGTH OF WATERMAIN SHALL BE CENTERED UNDER OR OVER THE SEWER SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE. WHERE A WATERMAIN CROSSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT (COMPACTED SELECTED FILL) SHALL BE PROVIDED FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING ON AND BREAKING THE WATERMAINS.
16. WATER MAINS FROM THE CONNECTION OF RIVER ROAD THROUGHOUT THE SITE TO BE PRIVATELY OWNED AND MAINTAINED.

UTILITY NOTES CONTINUED:

SANITARY SEWER:

17. ALL SANITARY SEWERS ARE IN COMPLIANCE WITH THE SPECIFICATIONS AND SEWER POLICY OF THE TOWN OF TONAWANDA.
18. SANITARY SEWERS, LATERALS AND APPURTENANCES SHALL BE CONSTRUCTED ACCORDING TO THE SPECIFICATIONS OF THE TOWN OF TONAWANDA. SANITARY SEWER EXCAVATION SHALL BE IN ACCORDANCE WITH THE EXCAVATION IRM WORK PLAN.
19. SANITARY SEWER PIPE SHALL BE 8" PVC SDR-35 OR AS NOTED ON THE PLAN.
20. INFILTRATION AND EXFILTRATION SHALL BE LIMITED TO 100 GALLONS PER MILE PER INCH DIAMETER OF PIPE PER 24 HOURS FOR SANITARY SEWERS. IF AN AIR TEST IS USED, THE TEST AS A MINIMUM SHALL CONFORM TO THE PROCEDURE DESCRIBED IN ASTMF-1417, ENTITLED "STANDARD PRACTICE FOR INSTALLATION ACCEPTANCE OF PLASTIC NON-PRESSURE SEWER LINES USING LOW-PRESSURE AIR."
21. THE FOLLOWING TESTS SHALL BE PERFORMED ON PVC SANITARY SEWER PIPE:

    A) DEFLECTION TESTS SHALL BE PERFORMED ON ALL FLEXIBLE PIPE. THE TEST SHALL BE CONDUCTED AFTER THE FINAL BACK FILL HAS BEEN IN PLACE AT LEAST 30 DAYS.

    B) NO PIPE SHALL EXCEED A 5% DEFLECTION.

    C) IF THE DEFLECTION TEST IS TO BE RUN USING A RIGID BALL OR MANDREL, IT SHALL HAVE A DIAMETER EQUAL TO 95% OF THE INSIDE DIAMETER OF THE PIPE. THE TEST SHALL BE PERFORMED WITHOUT MECHANICAL PULLING DEVICES.
22. NEW SEWERS ARE TO BE PLUGGED WHEN CONNECTED TO EXISTING MANHOLES UNTIL THE NEW SEWERS ARE FLUSHED, TESTED, AND READY FOR SERVICE.

STORM SEWER:

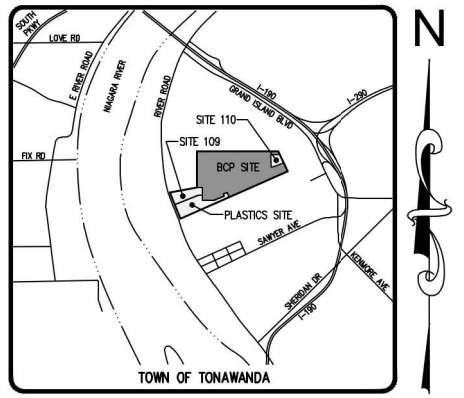
23. STORM SEWERS, LATERALS AND APPURTENANCES SHALL BE CONSTRUCTED ACCORDING TO THE SPECIFICATIONS OF THE TOWN OF TONAWANDA. STORM SEWER EXCAVATION SHALL BE IN ACCORDANCE WITH THE EXCAVATION IRM WORK PLAN.
24. STORM SEWER PIPE SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) SMOOTH INTERIOR, AS NOTED ON THE PLAN.

GUTTER INLET PIPE TABLE

FROM	TO	LENGTH	SIZE/MATERIAL	SLOPE
STA 2+56.25 (N) INV=574.86	STA 2+56.25 (S) INV=574.72	37'	12" – HDPE	0.36%
STA 2+56.25 (S) INV=574.82	DA-2 INV=574.78	9'	12" – HDPE	0.49%
STA 5+56.25 (N) INV=584.30	STA 5+56.25 (S) INV=584.17	27'	12" – HDPE	0.50%
STA 5+56.25 (S) INV=584.17	DA-3 INV=584.13	9'	12" – HDPE	0.50%
STA 8+56.25 (N) INV=593.16	STA 8+56.25 (S) INV=593.03	27'	12" – HDPE	0.50%
STA 8+56.25 (S) INV=593.03	DA-4 INV=592.99	9'	12" – HDPE	0.50%
STA 11+56.25 (N) INV=596.17	STA 11+56.25 (S) INV=596.04	27'	12" – HDPE	0.50%
STA 11+56.25 (S) INV=596.04	DA-5 INV=595.91	25'	12" – HDPE	0.50%

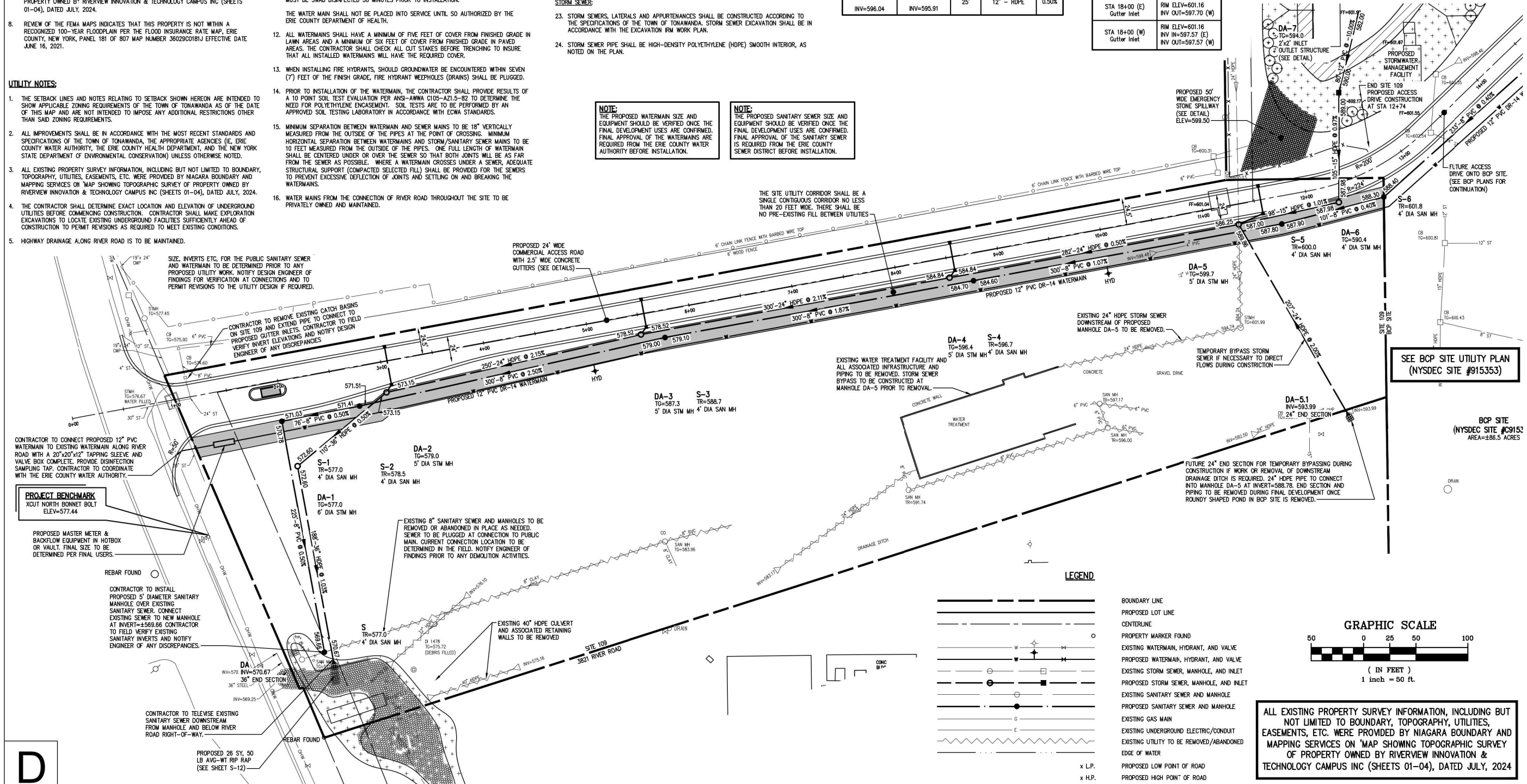
GUTTER INLET TABLE

STRUCTURE NAME	DETAILS
STA 2+56.25 (N) Gutter Inlet	RIM ELEV=577.86 INV OUT=574.86 (S)
STA 2+56.25 (S) Gutter Inlet	RIM ELEV=575.78 INV IN=574.72 (N) INV OUT=574.82 (SW)
STA 5+56.25 (N) Gutter Inlet	RIM ELEV=587.30 INV OUT=584.30 (S)
STA 5+56.25 (S) Gutter Inlet	RIM ELEV=587.30 INV IN=584.17 (N) INV OUT=584.17 (SW)
STA 8+56.25 (N) Gutter Inlet	RIM ELEV=596.16 INV OUT=593.16 (S)
STA 8+56.25 (S) Gutter Inlet	RIM ELEV=596.16 INV IN=593.03 (N) INV OUT=593.03 (SW)
STA 11+56.25 (N) Gutter Inlet	RIM ELEV=599.17 INV OUT=596.17 (S)
STA 11+56.25 (S) Gutter Inlet	RIM ELEV=599.17 INV IN=596.04 (N) INV OUT=596.04 (SW)
STA 18+00 (E) Gutter Inlet	RIM ELEV=601.16 INV OUT=597.70 (W)
STA 18+00 (W) Gutter Inlet	RIM ELEV=601.16 INV IN=597.57 (E) INV OUT=597.57 (W)



LOCATION MAP

NOT TO SCALE



LEGEND

- BOUNDARY LINE
- PROPOSED LOT LINE
- CENTERLINE
- PROPERTY MARKER FOUND
- EXISTING WATERMAIN, HYDRANT, AND VALVE
- PROPOSED WATERMAIN, HYDRANT, AND VALVE
- EXISTING STORM SEWER, MANHOLE, AND INLET
- PROPOSED STORM SEWER, MANHOLE, AND INLET
- EXISTING SANITARY SEWER AND MANHOLE
- PROPOSED SANITARY SEWER AND MANHOLE
- EXISTING GAS MAIN
- EXISTING UNDERGROUND ELECTRIC/CONDUIT
- EXISTING UTILITY TO BE REMOVED/ABANDONED
- EDGE OF WATER
- x L.P. PROPOSED LOW POINT OF ROAD
- x H.P. PROPOSED HIGH POINT OF ROAD

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01–04), DATED JULY, 2024

D

DRAWING BY: RB
CHECKED:
APPROVED:

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SITE 109 (OU2, NYSDEC #915055)
TONAWANDA, NY 14150
3875 RIVER ROAD
TOWN OF TONAWANDA, NEW YORK

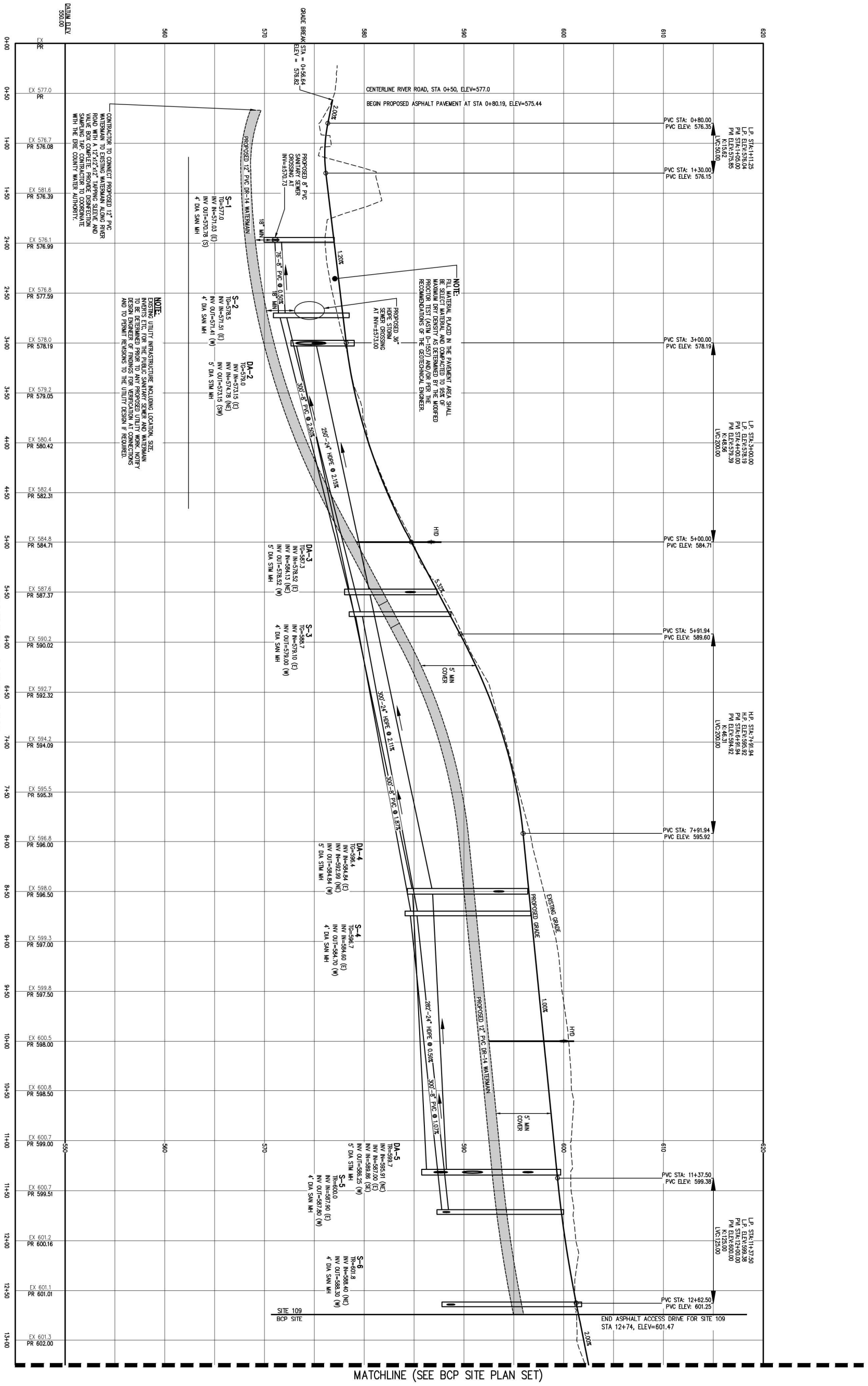
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SITE & UTILITY PLAN

DRAWING NUMBER
S-7

PROPOSED ACCESS ROAD

SCALE: HOR 1"=50'
VER 1"=5'



MATCHLINE (SEE BCP SITE PLAN SET)

S-8

PROFILE SHEET

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RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS

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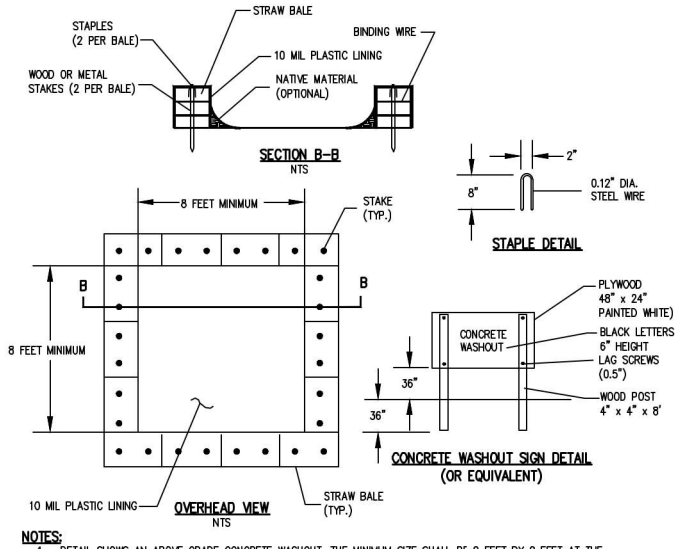
STATE OF NEW YORK JOHN P. BLACK No. 062818-1 LICENSED PROFESSIONAL ENGINEER

DRAWING BY	RB
CHECKED	
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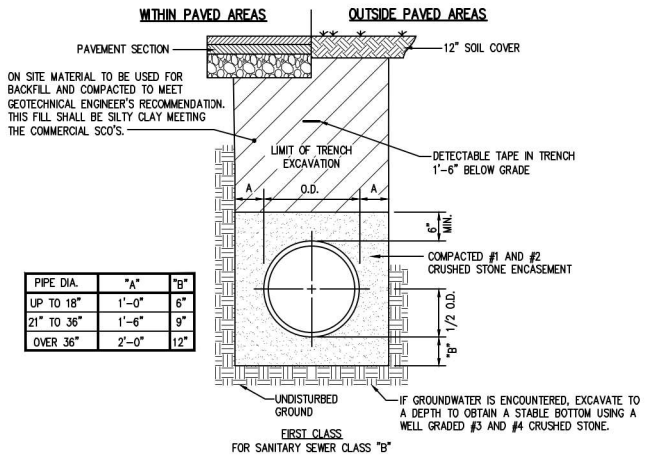
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NOTES:

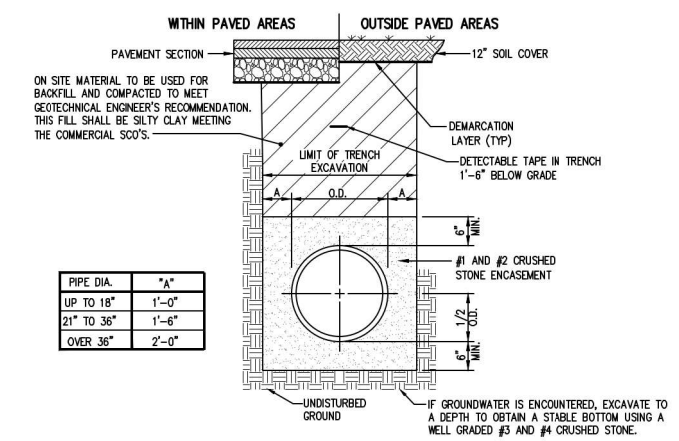
1. DETAIL SHOWS AN ABOVE GRADE CONCRETE WASHOUT. THE MINIMUM SIZE SHALL BE 8 FEET BY 8 FEET AT THE BOTTOM AND 2 FEET DEEP. IF EXCAVATED, THE SIDE SLOPES SHALL BE 2 HORIZONTAL TO 1 VERTICAL.
2. ACTUAL LAYOUT DETERMINED IN THE FIELD. LOCATE THE FACILITY A MINIMUM OF 100 FEET FROM DRAINAGE SWALES, STORM DRAIN INLETS, WETLANDS, STREAMS AND OTHER SURFACE WATERS.
3. WASHOUT STATION SHOULD BE CLEANED WHEN CONCRETE ACCUMULATES TO 75% OF THE STORAGE VOLUME. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF SITE.
4. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30' OF THE TEMPORARY CONCRETE WASHOUT FACILITY.
5. THE PLASTIC LINER SHALL BE REPLACED WHENEVER THE LINER IS TORN, PUNCTURED, OR THE WASHOUT IS EMPTIED.

CONCRETE WASHOUT DETAIL
N.T.S.



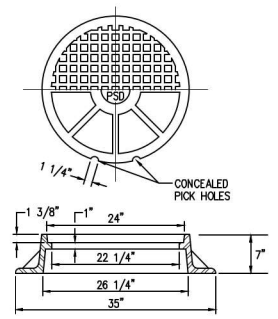
PIPE DIA.	"A"	"B"
UP TO 18"	1'-0"	8"
21" TO 36"	1'-6"	9"
OVER 36"	2'-0"	12"

SANITARY SEWER BEDDING DETAIL
N.T.S.

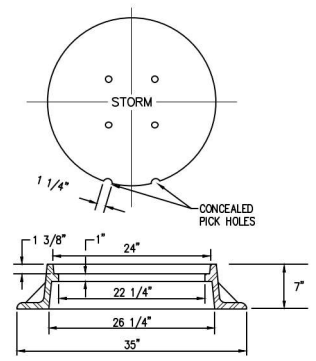


PIPE DIA.	"A"
UP TO 18"	1'-0"
21" TO 36"	1'-6"
OVER 36"	2'-0"

STORM SEWER BEDDING DETAIL
N.T.S.



SANITARY SEWER MANHOLE STANDARD FRAME AND COVER
N.T.S.



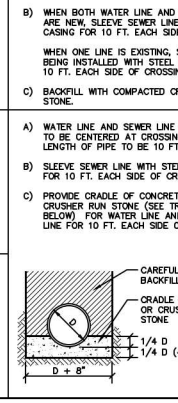
STORM SEWER STANDARD MANHOLE FRAME & COVER
N.T.S.

CONDITION	SCHEMATIC	REQUIREMENTS
I WATER LINE ABOVE SEWER LINE	WL MORE THAN 18" SL	A) WATER LINE AND SEWER LINE PIPE LENGTHS TO BE CENTERED AT CROSSING. EACH LENGTH OF PIPE TO BE 10 FT. MINIMUM. B) BACKFILL WITH COMPACTED CRUSHER RUN STONE.
II WATER LINE ABOVE SEWER LINE	WL 18" MIN. SL	A) WATER LINE AND SEWER LINE PIPE LENGTHS TO BE CENTERED AT CROSSING. EACH LENGTH OF PIPE TO BE 10 FT. MINIMUM. B) WHEN BOTH WATER LINE AND SEWER LINE ARE NEW, SLEEVE SEWER LINE WITH STEEL CASING FOR 10 FT. EACH SIDE OF CROSSING. WHEN ONE LINE IS EXISTING, SLEEVE PIPE BEING INSTALLED WITH STEEL CASING FOR 10 FT. EACH SIDE OF CROSSING. C) BACKFILL WITH COMPACTED CRUSHER RUN STONE.
III SEWER LINE ABOVE WATER LINE	SL 18" MIN. WL	A) WATER LINE AND SEWER LINE PIPE LENGTHS TO BE CENTERED AT CROSSING. EACH LENGTH OF PIPE TO BE 10 FT. MINIMUM. B) SLEEVE SEWER LINE WITH STEEL CASING FOR 10 FT. EACH SIDE OF CROSSING. C) PROVIDE CRADLE OF CONCRETE OR CRUSHER RUN STONE (SEE TRENCH DETAIL BELOW) FOR WATER LINE AND SEWER LINE FOR 10 FT. EACH SIDE OF CROSSING.

NOTES

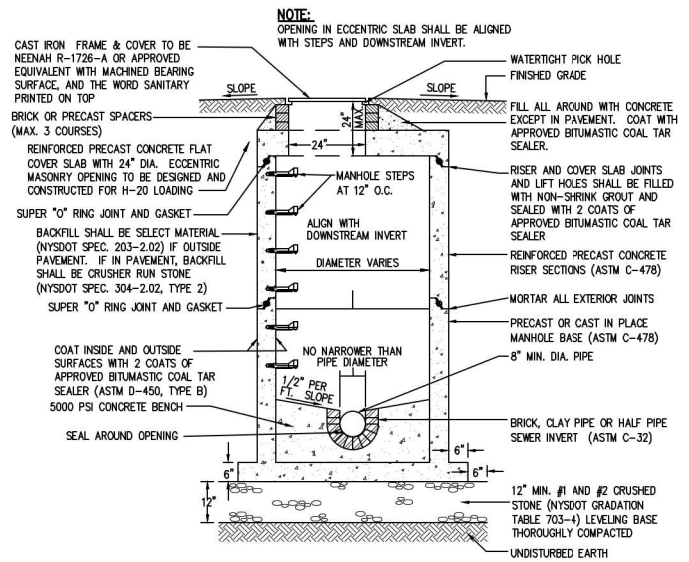
WL (WATER LINE)
SL (SEWER LINE)
D (OUTSIDE DIAMETER OF PIPE)

IN NO CASE SHALL PIPES BE CLOSER THAN 18" APART. DISTANCES ARE MEASURED BETWEEN OUTSIDES OF PIPE.

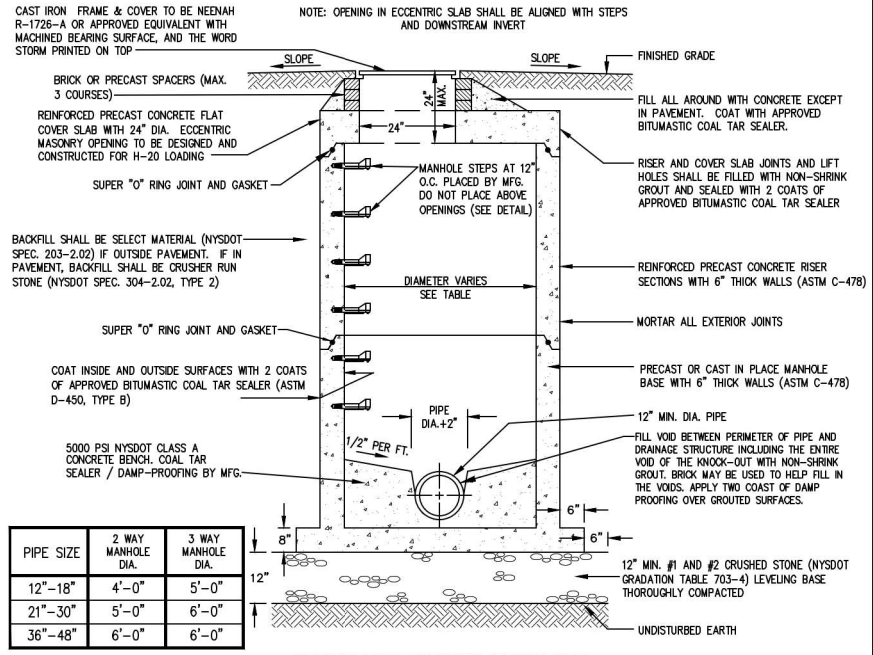


WATERMAIN/SEWER CROSSING DETAIL
N.T.S.

D

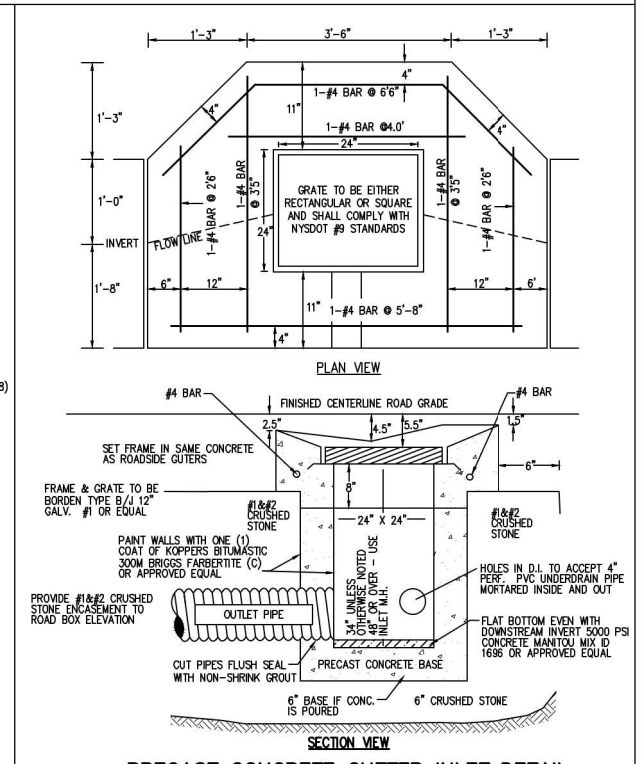


SANITARY MANHOLE DETAIL
N.T.S.



PIPE SIZE	2 WAY MANHOLE DIA.	3 WAY MANHOLE DIA.
12"-18"	4'-0"	5'-0"
21"-30"	5'-0"	6'-0"
36"-48"	6'-0"	6'-0"

STANDARD STORM MANHOLE
N.T.S.



PRECAST CONCRETE GUTTER INLET DETAIL
N.T.S.

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CHECKED:
APPROVED:

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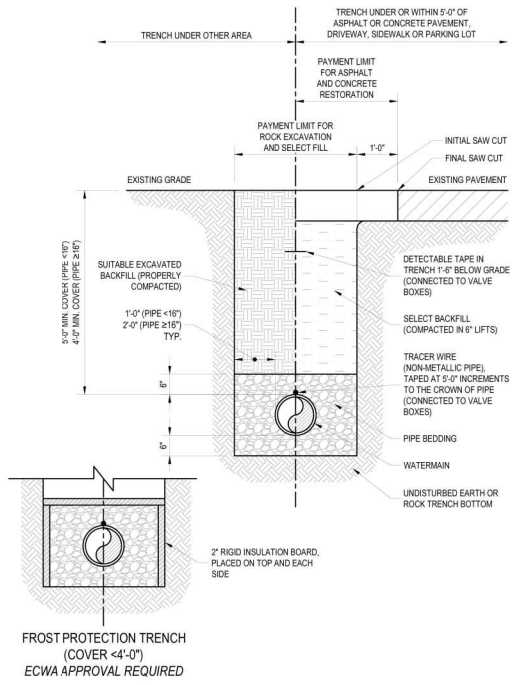
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SUITE C
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DETAIL SHEET 02

DRAWING NUMBER
S-9

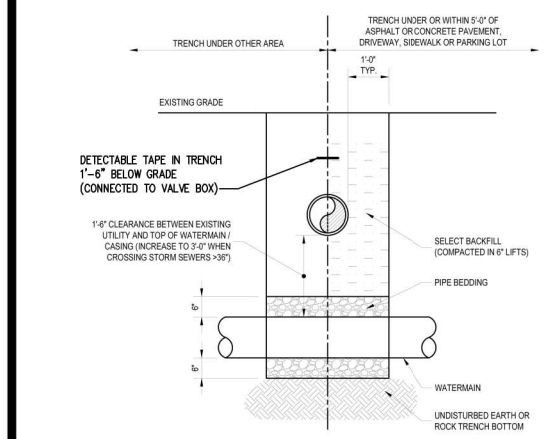


FROST PROTECTION TRENCH
(COVER <4'-0")
ECWA APPROVAL REQUIRED

TYPICAL TRENCH DETAIL

SCALE: NTS

Revision: 2024-01
Detail: SD-01



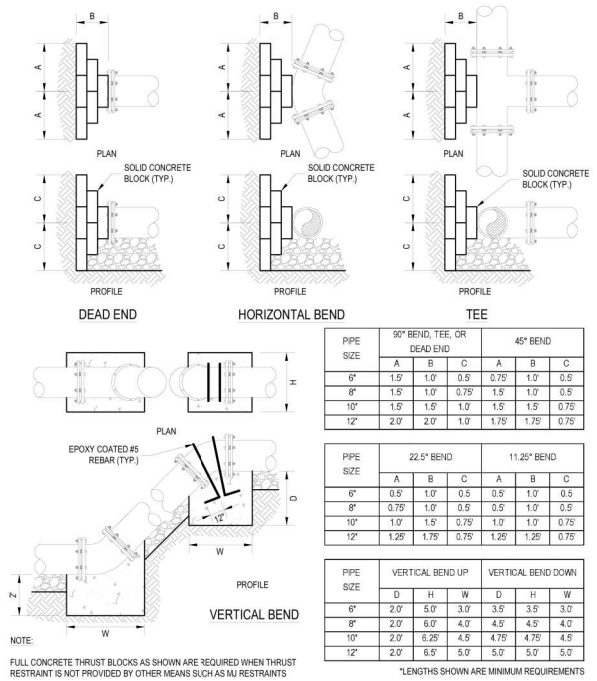
NOTES:

1. ALL EXISTING UTILITIES MUST BE SUPPORTED WITH APPROPRIATE CHAINS / STRAPS DURING CONSTRUCTION OF THE NEW WATERMAIN. CONTRACTOR IS REQUIRED TO COORDINATE WITH THE OWNER FOR THEIR PREFERRED SUPPORT REQUIREMENTS.
2. WHEN CROSSING A SEWER LINE WITH NEW WATERMAIN (AND WITHOUT A CASING PIPE), ONE FULL LENGTH (18'-0" MIN.) SHALL BE USED AT THE POINT OF CROSSING. THE WATERMAIN SHALL BE PLACED SO THAT BOTH JOINT ENDS ARE AS FAR AS POSSIBLE FROM THE EXISTING SEWER.
3. IF CASING PIPE IS USED, IT SHALL EXTEND 5'-0" BEYOND THE EXISTING PIPE OUTER EDGE IN EACH DIRECTION, AND NO WATERMAIN JOINTS OR FITTINGS SHALL BE LOCATED WITHIN 4'-0" FROM THE CASING PIPE EDGE.

PIPE CROSSING DETAIL

SCALE: NTS

Revision: 2024-01
Detail: SD-02



PIPE SIZE	90° BEND, TEE, OR DEAD END			45° BEND		
	A	B	C	A	B	C
6"	1.5'	1.0'	0.5'	0.75'	1.0'	0.5'
8"	1.5'	1.0'	0.75'	1.5'	1.0'	0.5'
10"	1.5'	1.5'	1.0'	1.5'	1.5'	0.75'
12"	2.0'	2.0'	1.0'	1.75'	1.75'	0.75'

PIPE SIZE	22.5° BEND			11.25° BEND		
	A	B	C	A	B	C
6"	0.5'	1.0'	0.5'	0.5'	1.0'	0.5'
8"	0.75'	1.0'	0.5'	0.5'	1.0'	0.5'
10"	1.0'	1.5'	0.75'	1.0'	1.0'	0.75'
12"	1.25'	1.75'	0.75'	1.25'	1.25'	0.75'

PIPE SIZE	VERTICAL BEND UP			VERTICAL BEND DOWN		
	D	H	W	D	H	W
6"	2.0'	5.0'	3.0'	3.5'	3.5'	3.0'
8"	2.0'	6.0'	4.0'	4.5'	4.5'	4.0'
10"	2.0'	6.25'	4.5'	4.75'	4.75'	4.5'
12"	2.0'	6.5'	5.0'	5.0'	5.0'	5.0'

NOTE:

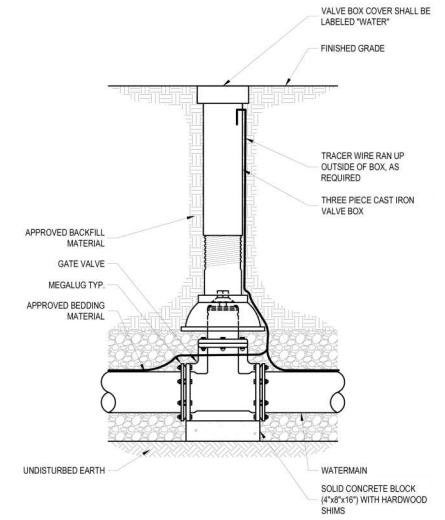
FULL CONCRETE THRUST BLOCKS AS SHOWN ARE REQUIRED WHEN THRUST RESTRAINT IS NOT PROVIDED BY OTHER MEANS SUCH AS MJ RESTRAINTS

*LENGTHS SHOWN ARE MINIMUM REQUIREMENTS

THRUST BLOCKS

SCALE: NTS

Revision: 2024-01
Detail: SD-10



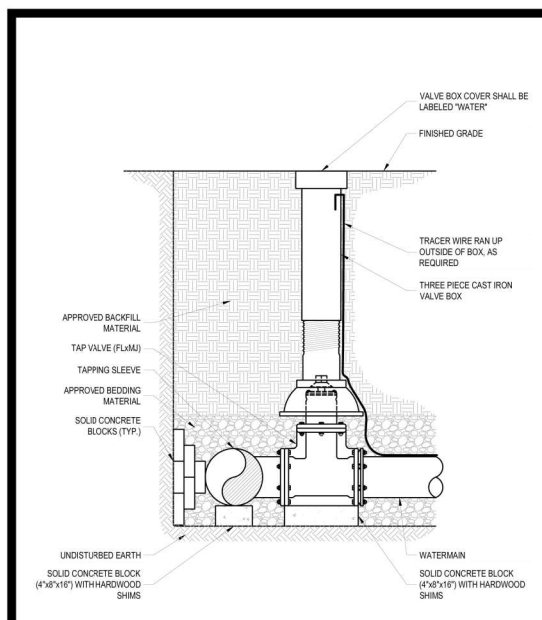
NOTES:

1. VALVE SHALL NOT SUPPORT VALVE BOX.
2. GATE VALVE SHALL BE INSTALLED LEVEL AND VERTICALLY PLUMB.
3. VALVE BOX SHALL BE PLUMB TO GRADE, WITH OPERATING NUT CENTERED IN BOX.

GATE VALVE SETTING

SCALE: NTS

Revision: 2024-01
Detail: SD-12



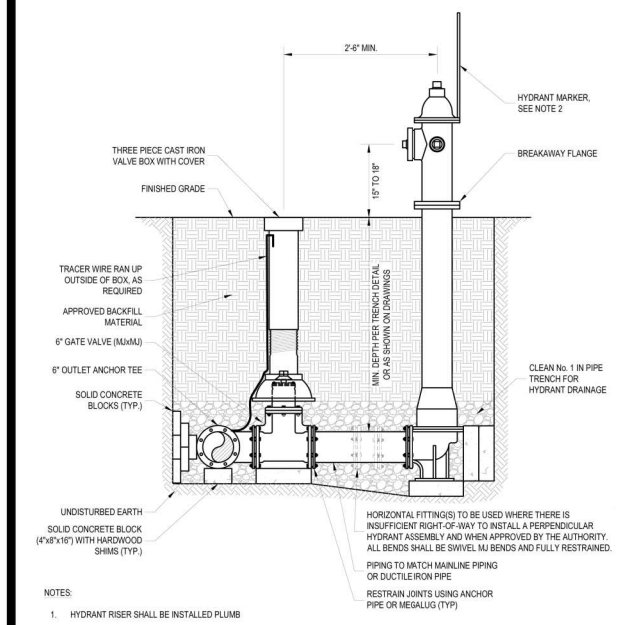
NOTES:

1. VALVE SHALL NOT SUPPORT VALVE BOX.
2. TAP VALVE SHALL BE INSTALLED LEVEL AND VERTICALLY PLUMB.
3. VALVE BOX SHALL BE PLUMB TO GRADE, WITH OPERATING NUT CENTERED IN BOX.

TAPPING SLEEVE AND VALVE

SCALE: NTS

Revision: 2024-01
Detail: SD-14



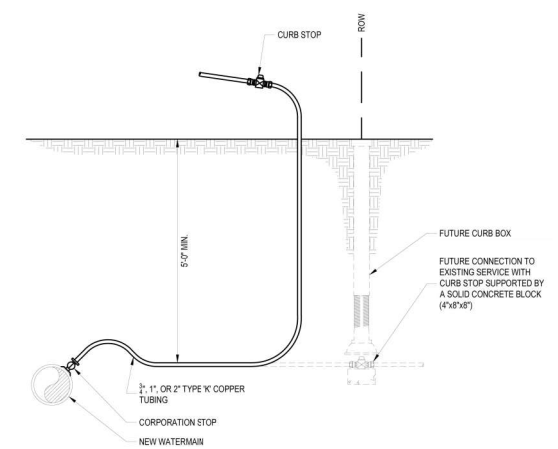
NOTES:

1. HYDRANT RISER SHALL BE INSTALLED PLUMB
2. FOR WATERMAIN REPLACEMENT PROJECTS, RELOCATE EXISTING MARKERS TO NEW HYDRANTS. MUNICIPALITY SHALL BE RESPONSIBLE TO PROVIDE ANY NEW HYDRANT MARKERS AS NEEDED. CONTRACTOR TO COORDINATE WITH ALL MUNICIPALITIES AND FIRE DISTRICTS.
3. HYDRANT FACE TO BE A MINIMUM OF 3'-0" FROM THE BACK FACE OF ALL CURBS OR A MINIMUM OF 5'-0" FROM ALL EDGE OF PAVEMENT.

HYDRANT ASSEMBLY INSTALLATION

SCALE: NTS

Revision: 2024-01
Detail: SD-16



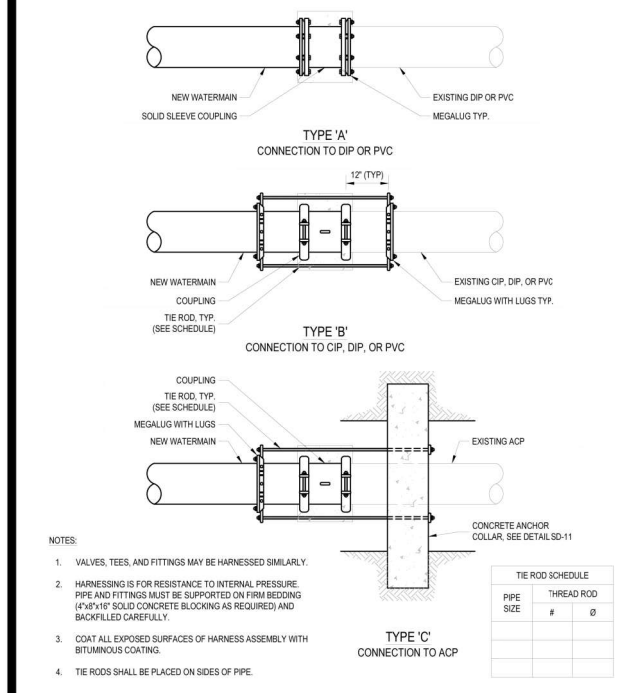
NOTES:

1. AFTER COMPLETION OF TESTING, THE SAMPLE POINT SHALL BE UTILIZED FOR A SERVICE CONNECTION. IF UNABLE TO UTILIZE FOR A SERVICE REPLACE THE CORPORATION STOP IN PIPE WITH A THREADED BRASS PLUG.

TEMPORARY BLOW-OFF / SAMPLING POINT

SCALE: NTS

Revision: 2024-01
Detail: SD-30



TIE ROD SCHEDULE		
PIPE SIZE	THREAD ROD	
	#	Ø

NOTES:

1. VALVES, TEES, AND FITTINGS MAY BE HARNESSED SIMILARLY.
2. HARNESSING IS FOR RESISTANCE TO INTERNAL PRESSURE. PIPE AND FITTINGS MUST BE SUPPORTED ON FIRM BEDDING (4"x8"x16" SOLID CONCRETE BLOCKING AS REQUIRED) AND BACKFILLED CAREFULLY.
3. COAT ALL EXPOSED SURFACES OF HARNESS ASSEMBLY WITH BITUMINOUS COATING.
4. TIE RODS SHALL BE PLACED ON SIDES OF PIPE.

TYPICAL CONNECTION TO EXISTING WATERMAIN

SCALE: NTS

Revision: 2024-01
Detail: SD-08

D

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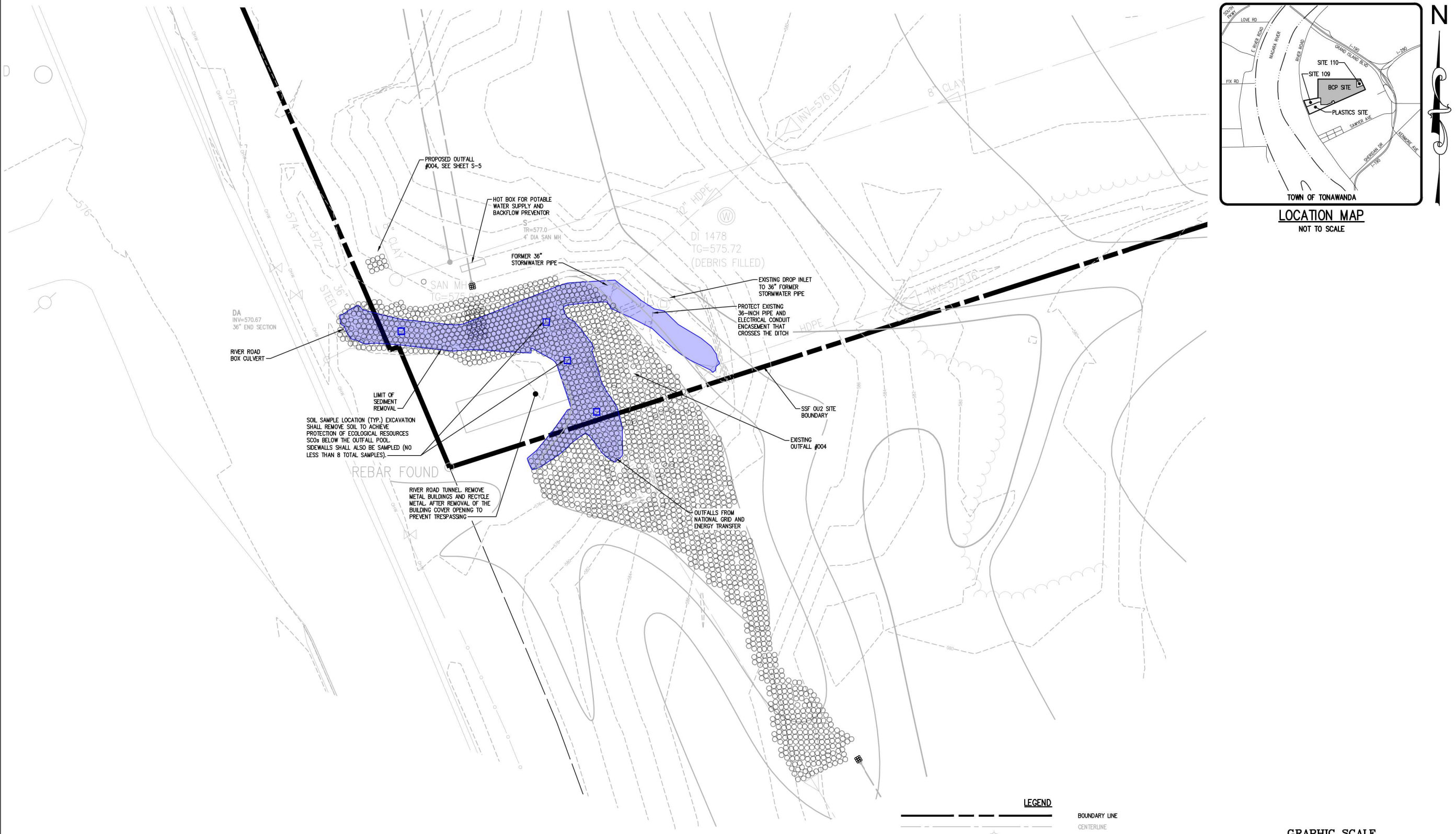
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DETAIL SHEET 03

DRAWING NUMBER
S–10



LOCATION MAP

NOT TO SCALE

NOTE: LIMIT OF SEDIMENT REMOVAL SHALL BE DETERMINED DURING EXCAVATION, BUT SHALL INCLUDE, AT A MINIMUM, THE TOP 6 INCHES OF SEDIMENT/SOIL LIKE MATERIALS BELOW THE TOP OF BANK FOR THE EXISTING DRAINAGE DITCHES.

LEGEND

BOUNDARY LINE
CENTERLINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
PROPOSED WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
PROPOSED STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
PROPOSED SANITARY SEWER AND MANHOLE
EXISTING CONTOUR W/ ELEVATION
PROPOSED CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
PROPOSED SPOT ELEVATION
PROPOSED FABRIC INLET PROTECTION
PROPOSED SILT FENCE
PROPOSED TEMPORARY STONE CHECK DAM
PROPOSED LIMITS OF DISTURBANCE

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)
1 inch = 20 ft.

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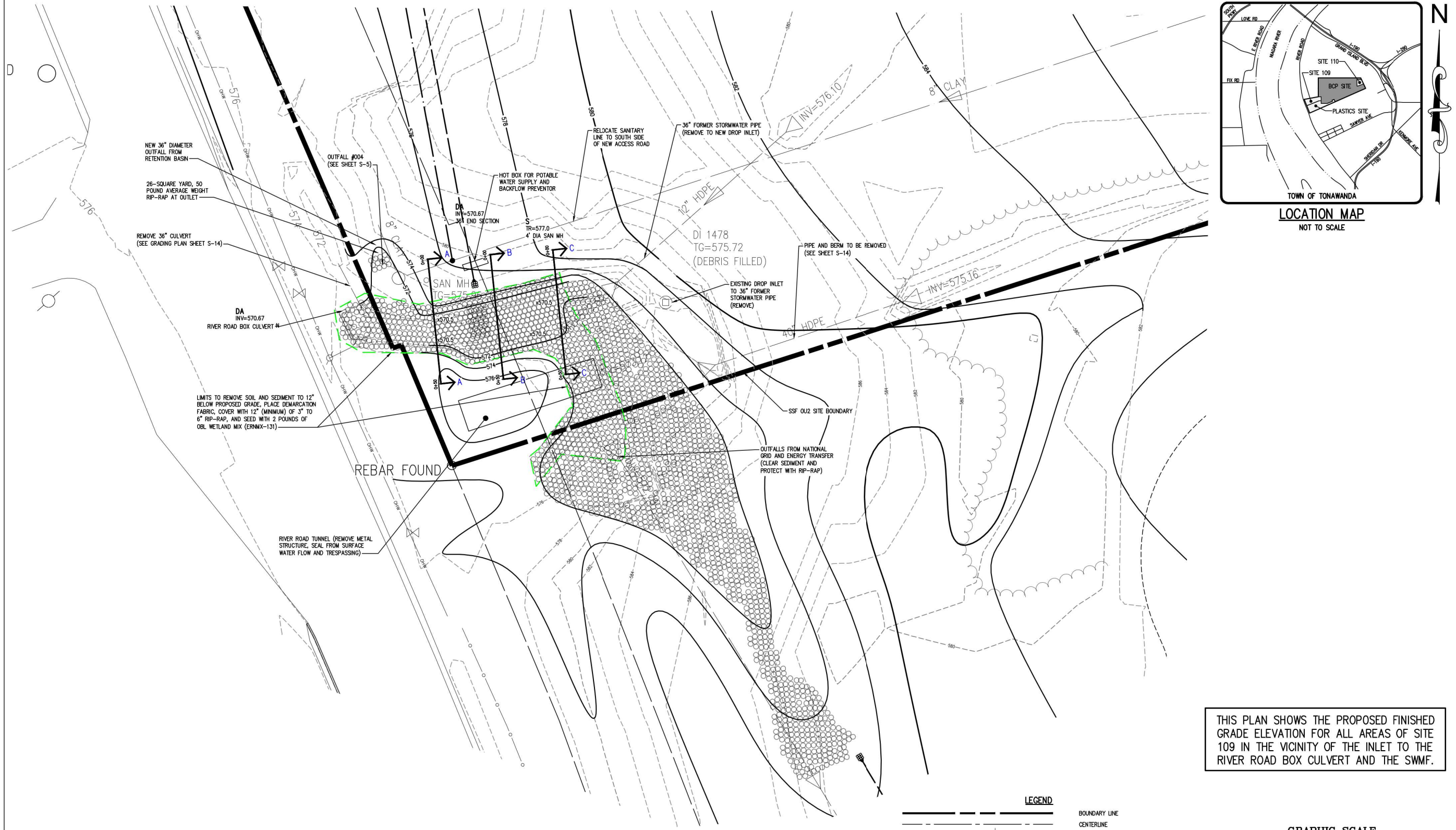
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SEDIMENT REMOVAL FIGURE

DRAWING NUMBER
S-11



LOCATION MAP
NOT TO SCALE

THIS PLAN SHOWS THE PROPOSED FINISHED GRADE ELEVATION FOR ALL AREAS OF SITE 109 IN THE VICINITY OF THE INLET TO THE RIVER ROAD BOX CULVERT AND THE SWMF.

LEGEND

- BOUNDARY LINE
- CENTERLINE
- EXISTING WATERMAIN, HYDRANT, AND VALVE
- PROPOSED WATERMAIN, HYDRANT, AND VALVE
- EXISTING STORM SEWER, MANHOLE, AND INLET
- PROPOSED STORM SEWER, MANHOLE, AND INLET
- EXISTING SANITARY SEWER AND MANHOLE
- PROPOSED SANITARY SEWER AND MANHOLE
- EXISTING CONTOUR W/ ELEVATION
- PROPOSED CONTOUR W/ ELEVATION
- EXISTING SPOT ELEVATION
- PROPOSED SPOT ELEVATION
- PROPOSED FABRIC INLET PROTECTION
- PROPOSED SILT FENCE
- PROPOSED TEMPORARY STONE CHECK DAM
- PROPOSED LIMITS OF DISTURBANCE

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

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NOTE: SEE SHEET S-13 FOR PROFILES OF CROSS SECTIONS A–A, B–B, & C–C

D

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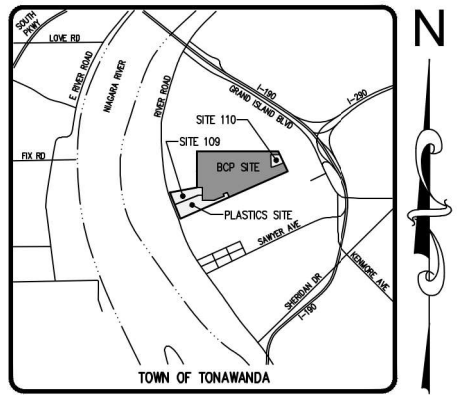
SITE 109 (OU2, NYSDEC #915055)
TONAWANDA, NY 14150
3875 RIVER ROAD
TOWN OF TONAWANDA, NEW YORK

INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
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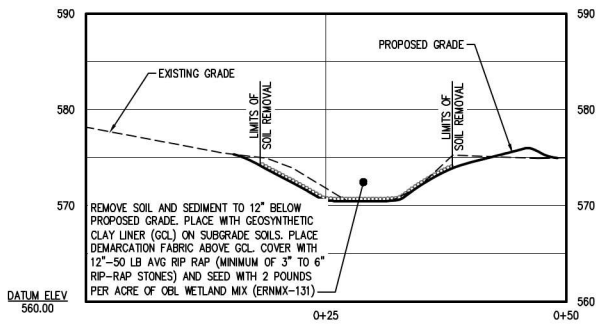
OUTFALL RECONSTRUCTION

DRAWING NUMBER
S-12

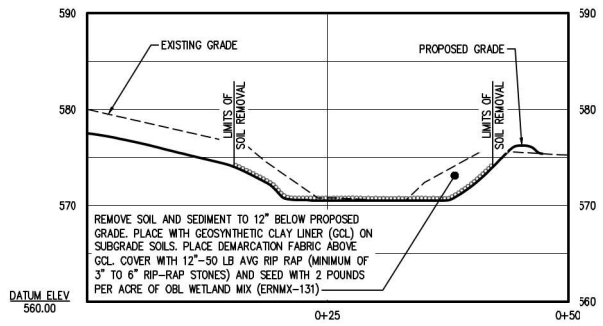
THIS PLAN SHOWS THE PROPOSED FINISHED GRADE ELEVATION FOR ALL AREAS OF SITE 109 AND THE SWMF.



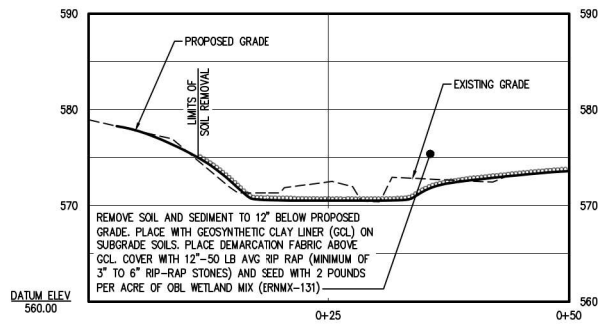
LOCATION MAP
NOT TO SCALE



PROPOSED CROSS SECTION A-A
SCALE: HOR 1"=10'
VER 1"=10'



PROPOSED CROSS SECTION B-B
SCALE: HOR 1"=10'
VER 1"=10'



PROPOSED CROSS SECTION C-C
SCALE: HOR 1"=10'
VER 1"=10'

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

SEE SHEET S-12 FOR OVERALL OUTFALL RECONSTRUCTION

D

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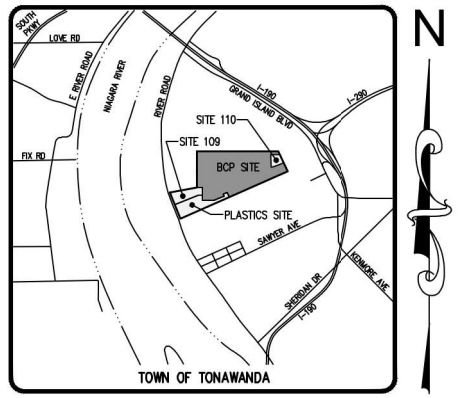
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CROSS SECTIONS OUTFALL

DRAWING NUMBER
S-13

THIS PLAN SHOWS THE PROPOSED GRADING AT THE SUB-GRADE ELEVATION WITHIN SITE 109 INCLUDING BOTTOM OF ROAD SUBBASE STONE AND BOTOM OF SOIL CAPPING SYSTEM (12" BELOW FINISHED GRADE). THE PROPOSED SWMF IS SHOWN AT FISNISHED GRADE.



LOCATION MAP

NOT TO SCALE

PROPOSED STORMWATER MANAGEMENT FACILITY
TOP OF BERM=602.00
60' WIDE EMERGENCY SPILLWAY=599.50
2'x2' GRATE=594.00
12" INLET=590.00
15" OUTLET=589.00
NORMAL PONDING ELEVATION=590.00
1-YR PONDING ELEVATION=591.34
2-YR PONDING ELEVATION=591.81
5-YR PONDING ELEVATION=592.42
10-YR PONDING ELEVATION=592.99
25-YR PONDING ELEVATION=593.90
50-YR PONDING ELEVATION=594.73
100-YR PONDING ELEVATION=595.65
TOTAL STORAGE VOLUME=2,542,547 CF

PROPOSED 50' WIDE EMERGENCY STONE SPILLWAY (SEE DETAIL) ELEV=599.50

NOTE:
PROPOSED SWMF TO BE INSTALLED DURING THE FUTURE PHASE OF CONSTRUCTION. SEE BCP SITE PLANS FOR COMPLETE DESIGN. THE PROPOSED SWMF IS SHOWN AT FINISHED GRADE.

PROPOSED STORMWATER MANAGEMENT FACILITY

6' CHAIN LINK FENCE WITH BARBED WIRE TOP
6' WOOD FENCE

APPROXIMATE LIMITS OF DISTURBANCE (±8.5 ACRES)

BEGIN PROPOSED ASPHALT PAVEMENT AT STA 0+80.19, ELEV=575.44

END PROPOSED ASPHALT PAVEMENT AT STA 12+73.54, ELEV=601.47

SEE BCP SITE GRADING PLAN (NYSDEC SITE #915353)

NOTE:
PROPOSED ROAD CONTOURS SHOWN REPRESENT BOTTOM OF STONE SUBBASE (-24" BELOW FINISHED GRADE)

NOTE:
PROPOSED CONTOURS SHOWN REPRESENT BOTTOM OF UNCLASSIFIED FILL LAYER (-12" BELOW FINISHED GRADE)

NOTE:
THE WATER TREATMENT SETTLING PONDS WILL BE REMOVED AFTER THE BCP SITE RETENTION POND IS OPERATIONAL.

CONCRETE
GRAVEL DRIVE
CONCRETE WALL
WATER TREATMENT

BCP SITE
(NYSDEC SITE #C915?
AREA=±86.5 ACRES

SS-09 AREA (PAHs >500 MG/KG) APPROXIMATELY 15 CY EXCAVATE AND DISPOSE OFFSITE

SB-02-2020 AREA (PAHs >500 MG/KG) APPROXIMATELY 15 CY EXCAVATE AND DISPOSE OFFSITE

PROJECT BENCHMARK
XCUT NORTH BONNET BOLT
ELEV=577.44

REBAR FOUND

SEE SHEETS S-11 AND S-12 FOR GRADING AT RIVER ROAD BOX CULVERT

APPROXIMATE LIMITS OF DISTURBANCE FOR SITE 109

LEGEND

	BOUNDARY LINE
	PROPOSED LOT LINE
	CENTERLINE
W	EXISTING WATERMAIN, HYDRANT, AND VALVE
W	PROPOSED WATERMAIN, HYDRANT, AND VALVE
	EXISTING STORM SEWER, MANHOLE, AND INLET
	PROPOSED STORM SEWER, MANHOLE, AND INLET
	EXISTING SANITARY SEWER AND MANHOLE
	PROPOSED SANITARY SEWER AND MANHOLE
	EXISTING TREE LINE
	PROPOSED TREE LINE
336	EXISTING CONTOUR W/ ELEVATION
336	PROPOSED CONTOUR W/ ELEVATION
	EXISTING SPOT ELEVATION
336x5	PROPOSED SPOT ELEVATION
F.G. = 336.0	PROPOSED FINISHED GRADE ELEVATION
F.F. = 336.0	PROPOSED FINISHED FLOOR ELEVATION

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01-04), DATED JULY, 2024

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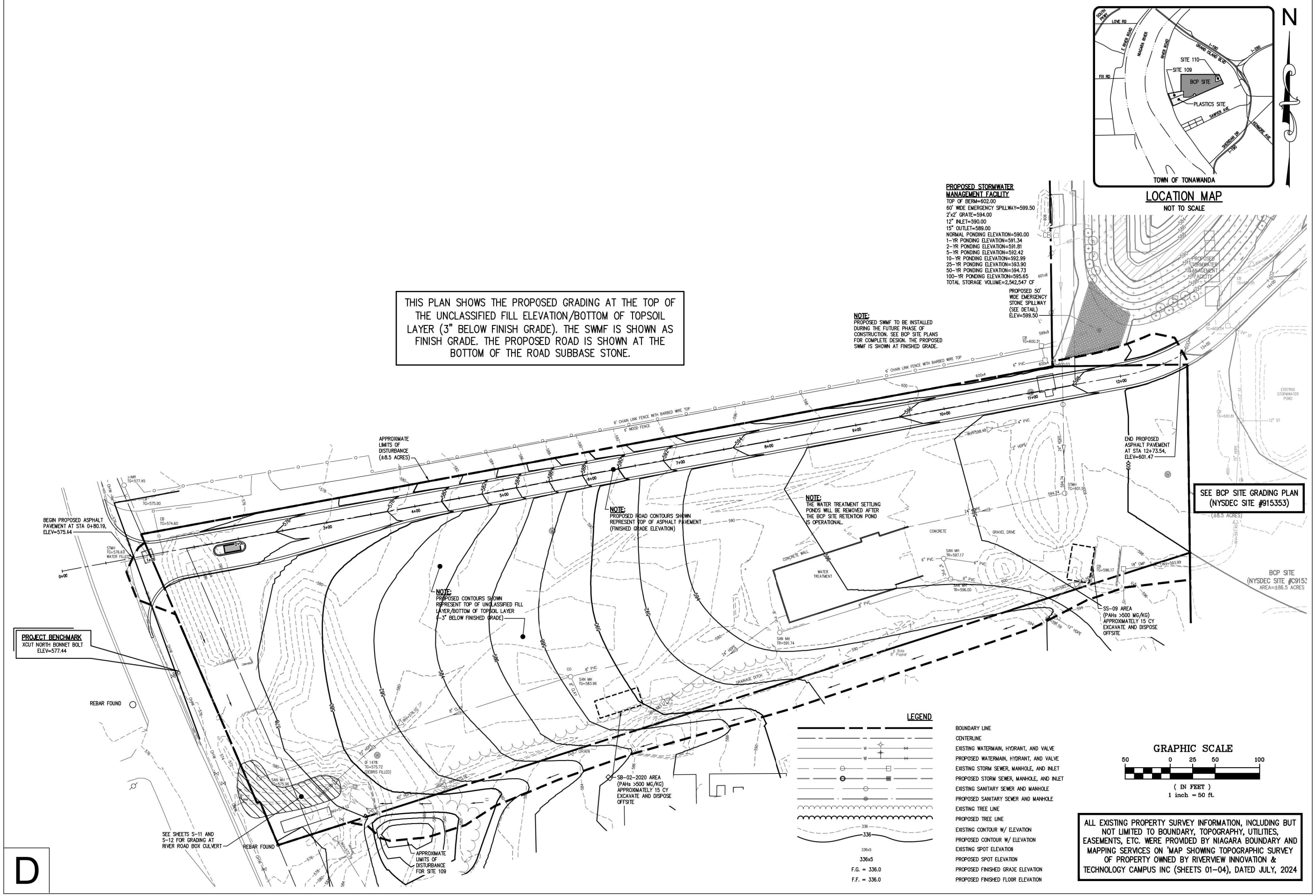
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SUITE C
HERNDON, VIRGINIA 20170
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SUB-GRADE PLAN

DRAWING NUMBER
S-14

THIS PLAN SHOWS THE PROPOSED GRADING AT THE TOP OF THE UNCLASSIFIED FILL ELEVATION/BOTTOM OF TOPSOIL LAYER (3" BELOW FINISH GRADE). THE SWMF IS SHOWN AS FINISH GRADE. THE PROPOSED ROAD IS SHOWN AT THE BOTTOM OF THE ROAD SUBBASE STONE.



LOCATION MAP
NOT TO SCALE

D

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441 CARLISLE DRIVE
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SUB-GRADE PLAN (UNCLASSIFIED FILL)

DRAWING NUMBER
S-15

SEQUENCE OF CONSTRUCTION STEPS:

TOTAL DISTURBED ACREAGE = ±8.5 ACRES

THE PROJECT SITE IS CURRENTLY UNDERGOING REMEDIATION ACTIVITIES. CONSTRUCTION SEQUENCE PROVIDED ON THESE PLANS ARE GENERIC AND SHOULD BE REVIEWED WITH THE REMEDIAL ACTION WORK PLAN (RAWP) AND ANY OTHER REMEDIATION REQUIREMENTS. THE CONTRACTOR SHALL IMPLEMENT EROSION MEASURES AS NECESSARY AND SHALL COORDINATE CONSTRUCTION SEQUENCE WITH ON SITE FIELD ENGINEERS.

STEP 1: (SITE PREPARATION)

- INSTALL AND MAINTAIN STABILIZED CONSTRUCTION ENTRANCE(S), CONSTRUCTION STAGING AREAS, AND CONSTRUCTION FENCING.
- CLEAR AND GRUB DESIGNATED AREAS AS REQUIRED FOR SILT FENCE INSTALLATION.
- COMPLETE CLEARING AND GRUBBING OPERATIONS.
- INSTALL CONCRETE TRUCK WASHOUT PRIOR TO CONCRETE POURING ACTIVITIES (SEE DETAIL)

STEP 2: (CONSTRUCTION ACTIVITY)

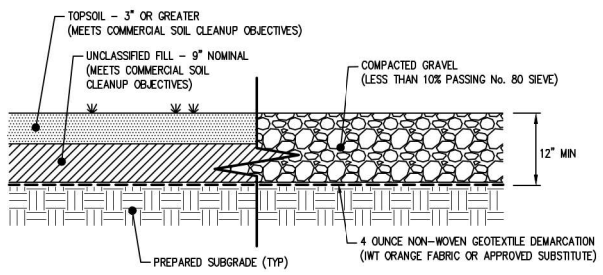
- COMMENCE MASS GRADING OPERATIONS, COMPLETE REQUIRED CUTS AND FILLS. UPON COMPLETION OF THE MASS GRADING OPERATIONS OR AS NECESSARY, INSTALL ADDITIONAL EROSION CONTROL MEASURES INCLUDING STONE CHECK DAMS, INTERCEPTOR SWALES, AND TEMPORARY SEDIMENT TRAPS. SWALES TO BE STABILIZED WITHIN 2 DAYS OF COMPLETION AND SEDIMENT TRAPS TO BE STABILIZED IMMEDIATELY. MEASURES ARE TO BE MAINTAINED BY THE CONTRACTOR UNTIL GROUND COVER HAS BEEN ESTABLISHED.
- CONTRACTOR MAY BEGIN TO INSTALL UTILITIES DURING GRADING OPERATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO STABILIZE THE SITE AND VERIFY GRADING ELEVATIONS PRIOR TO UTILITY CONSTRUCTION. ADDITIONAL EROSION CONTROL MEASURES, INCLUDING STONE CHECK DAMS, INTERCEPTOR SWALES AND TEMPORARY SEDIMENT TRAPS SHALL BE PROVIDED AS SHOWN IN THE PLANS, OR AS DIRECTED.
- THE PROPOSED STORM SEWERS FROM DA TO PROPOSED SWMF SHALL BE INSTALLED PRIOR TO REMOVAL OF THE EXISTING WATER TREATMENT FACILITY IN SITE 109 AND THE EXISTING 24" PIPE AT PROPOSED MANHOLE DA-5 TO BE TEMPORARILY DIRECTED DOWNSTREAM UNTIL THE PROPOSED SWMF IS BUILT.
- COMPLETE EARTHWORK, INCLUDING FINE GRADING OF STORMWATER MANAGEMENT AREA AND SLOPES. THE SOIL COVER SYSTEM IN DESIGNATED AREAS MAY BE INSTALLED AND STABILIZED WITH IDENTIFIED SEED MIXTURE.
- COMPLETE INSTALLATION OF UNDERGROUND UTILITIES AND PAVEMENT BOXOUTS.
- INSTALL ASPHALT ACCESS DRIVE.

STEP 3: (STABILIZATION & MONITORING)

- SEED AND MULCH ALL DISTURBED AREAS AS REQUIRED BY GP-0-20-001. SEED WITH A SEED MIX AS INDICATED IN CONSTRUCTION EROSION CONTROL NOTES, AND MULCH.
- FROM NOVEMBER 15TH TO APRIL 1ST, IF STRAW MULCH ALONE IS USED FOR TEMPORARY STABILIZATION, IT SHALL BE APPLIED AT DOUBLE THE STANDARD RATE OF 2 TONS PER ACRE, MAKING THE APPLICATION RATE 4 TONS PER ACRE.
- MONITOR STORMWATER MANAGEMENT FACILITY, SEDIMENT BASINS, AND SEDIMENT TRAPS DURING CONSTRUCTION OPERATIONS FOR SILT ACCUMULATION. CONTRACTOR TO CLEAN AS NECESSARY.
- MAINTAIN PERIMETER SILT FENCE AND INLET PROTECTION UNTIL THE ADJACENT SOILS HAVE ACHIEVED 80% STABILIZATION.
- SEE CONSTRUCTION EROSION CONTROL NOTES FOR REQUIRED SEED MIXES AND TEMPORARY/WINTER STABILIZATION METHODOLOGY.
- DUST SHALL BE CONTROLLED DURING CONSTRUCTION BY THE CONTRACTOR TO MINIMIZE EFFECT ON THE ADJACENT PROPERTIES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THE EXISTING ROADWAYS, PAVED AREAS, AND CHANNELS FREE OF MUD, DIRT, AND DEBRIS. THE CONTRACTOR WILL CLEAN THESE AREAS AS NECESSARY OR AS REQUIRED BY THE OWNER OR TOWN OF TONAWANDA.

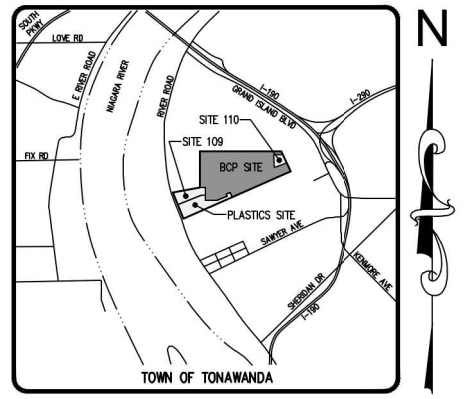
GRADING NOTES:

1. ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01-04), DATED JULY, 2024.
2. EXISTING UTILITIES WHETHER FUNCTIONAL OR ABANDONED WITHIN THE PROJECT AREA MAY NOT BE SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL CALL THE UFPO HOTLINE AT 1(800)962-7962 OR 811 FOR STAKE-OUT OF EXISTING UTILITIES
3. ALL EXCAVATIONS SHALL BE CONDUCTED IN ACCORDANCE WITH THE EXCAVATION REMEDIAL ACTION WORK PLAN (RAWP).
4. DUST SHALL BE CONTROLLED DURING CONSTRUCTION BY THE CONTRACTOR TO MINIMIZE EFFECT ON THE ADJACENT PROPERTIES.
5. THE OWNER AND THE CONTRACTOR SHALL HAVE COMPLETE KNOWLEDGE OF THE CURRENT BLASTING POLICY FOR THE TOWN OF TONAWANDA, AND THEY WILL CONFORM TO THIS POLICY AT ALL TIMES.
6. HIGHWAY DRAINAGE ALONG RIVER ROAD TO BE MAINTAINED AS DIRECTED BY COUNTY SUPERINTENDENT OF HIGHWAYS.
7. FILL MATERIAL PLACED IN THE PAVEMENT AND BUILDING AREA SHALL BE SELECT MATERIAL AND COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS MEASURED BY THE MODIFIED PROCTOR TEST (ASTM D1557) AND/OR THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER. ALL IMPORTED MATERIAL SHALL MEET THE COMMERCIAL SOIL CLEANUP OBJECTIVES AND BE TESTED IN ACCORDANCE WITH THE RAMP.
8. REVIEW OF THE FEMA MAPS INDICATES THAT THIS PROPERTY IS NOT WITHIN A RECOGNIZED 100-YEAR FLOODPLAIN PER THE FLOOD INSURANCE RATE MAP, ERIE COUNTY, NEW YORK, PANEL 181 OF 807 MAP NUMBER 36029C0181J EFFECTIVE DATE JUNE 16, 2021.



SOIL COVER SYSTEM DETAIL

N.T.S.



LOCATION MAP

NOT TO SCALE

THIS PLAN SHOWS THE PROPOSED FINISHED GRADE ELEVATION FOR ALL AREAS OF SITE 109 AND THE SWMF.

PROPOSED STORMWATER MANAGEMENT FACILITY
TOP OF BERM=602.00
60' WIDE EMERGENCY SPILLWAY=599.50
2'x2' GRATE=594.00
12" INLET=590.00
15" OUTLET=589.00
NORMAL PONDING ELEVATION=590.00
1-YR PONDING ELEVATION=591.34
2-YR PONDING ELEVATION=591.81
5-YR PONDING ELEVATION=592.42
10-YR PONDING ELEVATION=592.99
25-YR PONDING ELEVATION=593.90
50-YR PONDING ELEVATION=594.73
100-YR PONDING ELEVATION=595.65
TOTAL STORAGE VOLUME=2,542,547 CF

PROPOSED 50' WIDE EMERGENCY STONE SPILLWAY (SEE DETAIL) ELEV=599.50

NOTE:
PROPOSED SWMF TO BE INSTALLED DURING THE FUTURE PHASE OF CONSTRUCTION. SEE BCP SITE PLANS FOR COMPLETE DESIGN. THE PROPOSED SWMF IS SHOWN AT FINISHED GRADE.

NOTE:
THE BASE AND WEARING COURSES FOR THE ACCESS ROAD MAY NOT BE PLACED UNTIL THE REDEVELOPMENT IS COMPLETED ON THE BCP SITE. THE SUBBASE IS 12" SO THE COVER REQUIREMENT IS MET WITH THE GRAVEL.

NOTE:
THE WATER TREATMENT SETTLING PONDS WILL BE REMOVED AFTER THE BCP SITE RETENTION POND IS OPERATIONAL.

APPROXIMATE LIMITS OF DISTURBANCE (±8.5 ACRES)

BEGIN PROPOSED ASPHALT PAVEMENT AT STA 0+80.19, ELEV=575.14

PROJECT BENCHMARK
XCUT NORTH BONNET BOLT
ELEV=577.44

REBAR FOUND

SEE SHEETS S-11 AND S-12 FOR GRADING AT RIVER ROAD BOX CULVERT

SEE BCP SITE GRADING PLAN (NYSDEC SITE #915353)

SB-02-2020 AREA (PAHs >500 MG/KG) APPROXIMATELY 15 CY EXCAVATE AND DISPOSE OFFSITE

SS-09 AREA (PAHs >500 MG/KG) APPROXIMATELY 15 CY EXCAVATE AND DISPOSE OFFSITE

APPROXIMATE LIMITS OF DISTURBANCE FOR SITE 109

BCP SITE (NYSDEC SITE #C915353) AREA=±86.5 ACRES

DA-1 TG=577.0 6' DIA STM MH
DA-2 TG=579.0 5' DIA STM MH
DA-3 TG=587.3 5' DIA STM MH
DA-4 TG=596.4 5' DIA STM MH
DA-5 TG=599.7 5' DIA STM MH
DA-6 TG=590.4 4' DIA STM MH
DA-7 TG=594.0 2'x2' INLET OUTLET STRUCTURE (SEE DETAIL)
DA-5.1 INV=593.99 24" END SECTION
DA INV=570.67 36" END SECTION

S-1 TR=577.0 4' DIA SAN MH
S-2 TR=578.5 4' DIA SAN MH
S-3 TR=588.7 4' DIA SAN MH
S-4 TR=596.7 4' DIA SAN MH
S-5 TR=600.0 4' DIA SAN MH
S-6 TR=601.8 4' DIA SAN MH

END PROPOSED ASPHALT PAVEMENT AT STA 12+73.54, ELEV=601.47

LEGEND

	BOUNDARY LINE
	CENTERLINE
W W	EXISTING WATERMAIN, HYDRANT, AND VALVE
	PROPOSED WATERMAIN, HYDRANT, AND VALVE
	EXISTING STORM SEWER, MANHOLE, AND INLET
	PROPOSED STORM SEWER, MANHOLE, AND INLET
	EXISTING SANITARY SEWER AND MANHOLE
	PROPOSED SANITARY SEWER AND MANHOLE
	EXISTING TREE LINE
	PROPOSED TREE LINE
336	EXISTING CONTOUR W/ ELEVATION
336	PROPOSED CONTOUR W/ ELEVATION
336x5	EXISTING SPOT ELEVATION
336x5	PROPOSED SPOT ELEVATION
F.G. = 336.0	PROPOSED FINISHED GRADE ELEVATION
F.F. = 336.0	PROPOSED FINISHED FLOOR ELEVATION

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

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INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
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GRADING PLAN (FINISHED GRADE)

DRAWING NUMBER
S-16

MONITORING WELL SCHEDULE

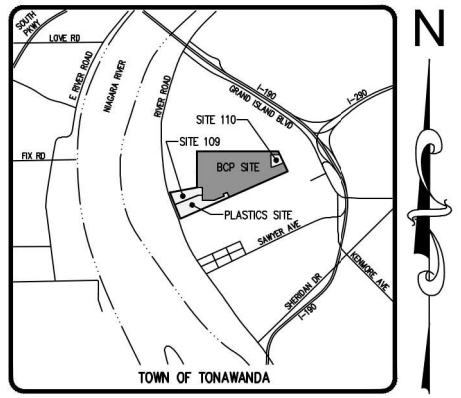
PROPOSED SMP MONITORING WELL	REPLACES	EXISTING MONITORING WELL DATA			PROPOSED SMP MONITORING WELL DATA			
		DEPTH (ft.)	SCREEN INTERVAL (FT.)		BORING DEPTH (FT.)	ELEVATION OF BASE OF BORING (FT.)	SCREEN ELEVATION/DEPTH INTERVAL (FT.)	
MW-109-1	MW-04	10	2	10	12	588	597/3	589/11
MW-109-2	MW-2-2020	10	5	10	11.19	576.81	580.5/5	577.81/10.19
MW-109-3	MW-17-89	5	3	5	6	570	572/4	570/6
MW-109-4	MW-03-2020	20	10	20	10	564	570/5	565/10
MW-109-5	MW-01-2020	9	4	9	11	590.3	596.3/4.2	591.3/9.2

Notes:

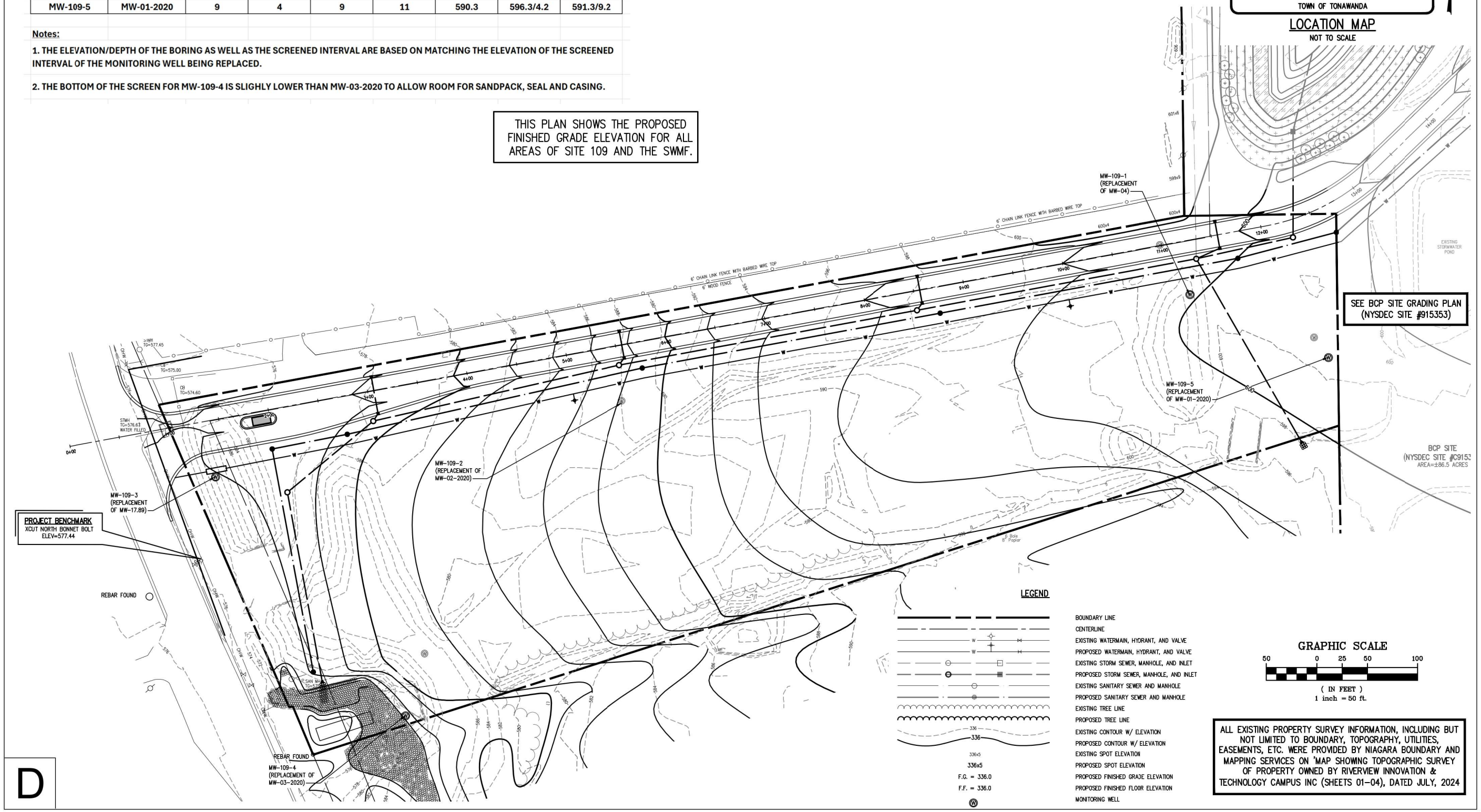
1. THE ELEVATION/DEPTH OF THE BORING AS WELL AS THE SCREENED INTERVAL ARE BASED ON MATCHING THE ELEVATION OF THE SCREENED INTERVAL OF THE MONITORING WELL BEING REPLACED.

2. THE BOTTOM OF THE SCREEN FOR MW-109-4 IS SLIGHLY LOWER THAN MW-03-2020 TO ALLOW ROOM FOR SANDPACK, SEAL AND CASING.

THIS PLAN SHOWS THE PROPOSED FINISHED GRADE ELEVATION FOR ALL AREAS OF SITE 109 AND THE SWMF.



LOCATION MAP
NOT TO SCALE



LEGEND

	BOUNDARY LINE
	CENTERLINE
W	EXISTING WATERMAIN, HYDRANT, AND VALVE
W	PROPOSED WATERMAIN, HYDRANT, AND VALVE
	EXISTING STORM SEWER, MANHOLE, AND INLET
	PROPOSED STORM SEWER, MANHOLE, AND INLET
	EXISTING SANITARY SEWER AND MANHOLE
	PROPOSED SANITARY SEWER AND MANHOLE
	EXISTING TREE LINE
	PROPOSED TREE LINE
336	EXISTING CONTOUR W/ ELEVATION
336	PROPOSED CONTOUR W/ ELEVATION
336x5	EXISTING SPOT ELEVATION
336x5	PROPOSED SPOT ELEVATION
F.G. = 336.0	PROPOSED FINISHED GRADE ELEVATION
F.F. = 336.0	PROPOSED FINISHED FLOOR ELEVATION
W	MONITORING WELL

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

ALL EXISTING PROPERTY SURVEY INFORMATION, INCLUDING BUT NOT LIMITED TO BOUNDARY, TOPOGRAPHY, UTILITIES, EASEMENTS, ETC. WERE PROVIDED BY NIAGARA BOUNDARY AND MAPPING SERVICES ON 'MAP SHOWING TOPOGRAPHIC SURVEY OF PROPERTY OWNED BY RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS INC (SHEETS 01–04), DATED JULY, 2024

D

DRAWING BY RB
CHECKED
APPROVED

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STATE OF NEW YORK — MARK A. [illegible] — LICENSED PROFESSIONAL ENGINEER

RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS

SITE 109 (OU2, NYSDEC #915055)
TONAWANDA, NY 14150
3875 RIVER ROAD
TOWN OF TONAWANDA, NEW YORK

INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
(703) 722-6049
www.InventumEng.com

MONITORING PLAN

DRAWING NUMBER
S–17

Appendix B – Wetland Jurisdictional Determinations

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Fish and Wildlife, Region 9
270 Michigan Avenue, Buffalo, NY 14203-2915
P: (716) 851-7010 I F: (716) 851-7005
www.dec.ny.gov

February 1, 2022

Todd Waldrop, P.E.
Inventum Engineering
481 Carlisle Drive, Suite 202
Herndon, Virginia, 20170

Dear Todd Waldrop:

Freshwater Wetland Determination
Riverview Innovation & Technology Campus
Town of Tonawanda, Erie County

This letter serves as notification that I completed an office review of the Riverview Innovation & Technology Campus property on at 3875 River Road, parcel #64.08-1-10, to determine whether wetlands present within and adjacent to the parcel meet New York State Department of Environmental Conservation (NYSDEC) criteria for state wetlands jurisdiction.

Based on our review, we determined that there is no state-regulated freshwater wetlands jurisdiction of Earth Dimensions, Inc. (EDI)'s "Wetland W1" through "Wetland W6," as depicted in Figure 6 of EDI's November 2021 Wetland Delineation Report. Specifically, our review of map resources on the Department's geographic information system (GIS) determined that NYSDEC Wetland BW-6 would not extend across roads or railroad tracks, definable map features, and therefore "Wetland 2", "Wetland W5", and "Wetland W6" cannot be considered for an extension of Wetland BW-6.

We also determined that "Wetland W1", "Wetland W3", and "Wetland W4" are over 500 feet from the originally mapped wetland, and cannot be considered for inclusion in NYSDEC Wetland BW-6.

In addition, the total contiguous area of "Wetland W1" through "Wetland W6" does not meet the 12.4-acre size threshold for state wetlands jurisdiction. Finally, we determined that "Wetland W1" through "Wetland W6" lack significant features (e.g., resident habitat for endangered or threatened species) and therefore would not qualify for state wetlands jurisdiction under the NYSDEC's "unusual local importance" designation.

Please note that NYSDEC Wetland BW-6 is mapped on the east and south sides of roads/railroad tracks on the 3875 River Road parcel (just east and south of "Wetland W2", "Wetland W5", and "Wetland W6"), and the associated 100-foot Adjacent Area does extend across the road onto the parcel of concern. Therefore, any regulated activity that takes place within the 100-foot Adjacent Area would require a NYSDEC Article 24 permit.

Based on NYSDEC's 2015 delineation of the National Grid parcel just south of the 3875 River Road parcel, the wetland boundary follows along the south parcel boundary. Therefore, any regulated activity that takes place within 100 feet of the southern property boundary will fall within the 100-foot Adjacent Area and would require a NYSDEC Article 24 permit.

Be advised that the U.S. Army Corps of Engineers may have wetland jurisdiction irrespective of the Department of Environmental Conservation. For more information, you may contact the Corps at:

United States Army Corps of Engineers Regulatory Branch
1776 Niagara Street
Buffalo, New York 14207
Telephone: (716) 879-4330

If you have any questions about this wetland determination, please feel free to contact me via email at Angela.Driscoll@dec.ny.gov, or call me at (716) 851-7006.

Sincerely,

Angela G. Driscoll
Wetlands & Waters Ecologist
Region 9 - Buffalo

AD:lm

Enclosure: A Brief Description of the Freshwater Wetlands Act

ec: Jody Celeste, Earth Dimensions, Inc.
Wetland BW-6 File

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, BUFFALO DISTRICT
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

January 6, 2023

Regulatory Branch

SUBJECT: Approved Jurisdictional Determination and Delineation Verification for Department of the Army Processing No. LRB-2021-01504

Inventum Engineering
Attn: Todd Waldrop
481 Carlisle Drive, Suite 202
Herndon, Virginia 20170
Email: todd.waldrop@inventumeng.com

Dear Mr. Waldrop:

I have reviewed your request for an approved jurisdictional determination (JD) for a 103-acres site made up of multiple parcels on the east side of River Road, in the Town of Tonawanda, Erie County, New York (Sheets 1 and 2 of 4: latitude: 42.98328 N, Longitude: -78.92505 W).

I have determined that the location and extent of all aquatic resources shown on the attached maps accurately represent the review area conditions.

Enclosed is an approved JD which verifies the limits of waters of the U.S. within the review area as depicted on Sheets 3 & 4 of 4. This approved JD will remain valid for a period of five (5) years from the date of this correspondence unless new information warrants revision of the approved JD before the expiration date. At the end of this period, a new aquatic resource delineation will be required to support any request for a new JD.

I have determined that the following aquatic resources are not waters of the U.S. as noted on the attached Approved Jurisdictional Determination Form 1 of 1: Wetlands 1, 2, 3, 4, 5, 6, Ponds 1 & 2, Ponds from Coke removal, and Ditches 1 and 2. Therefore, these aquatic resources are not regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899. Department of the Army authorization is not required if you propose work, installation of structures, or a discharge of dredged or fill material in these aquatic resources.

Based upon the information provided and as shown on the attached maps, the proposed activity is occurring entirely outside of the geographic limits of any waters of the U.S. Therefore, it has been determined that the Corps has no jurisdiction, and a Department of Army permit is not required.

Further, the delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for

Regulatory Branch

SUBJECT: Approved Jurisdictional Determination and Delineation Verification for Department of the Army Processing No. **LRB-2021-01504**

purposes of the Clean Water Act for the review area identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Request for Appeal (RFA) form. If you request to appeal the above JD, you must submit a completed RFA form within 60 days of the date on this letter to the Great Lakes/Ohio River Division Office at the following address:

Katherine McCafferty
Regulatory Appeals Officer
US Army Corps of Engineers
Great Lakes and Ohio River Division
550 Main Street, Room 10780
Cincinnati, Ohio 45202-3222
Phone: 513-684-2699 Fax: 513-684-2460
e-mail: katherine.a.mccafferty@usace.army.mil

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete; that it meets the criteria for appeal under 33 C.F.R. part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **March 8, 2023**.

It is not necessary to submit an RFA to the Division office if you do not object to the determination in this letter.

A copy of this letter has been sent to Earth Dimensions, Inc.

Questions pertaining to this matter should be directed to me at (716)879-4240, by writing to the following address: U.S. Army Corps of Engineers Regulatory Branch 1776 Niagara Street, Buffalo, New York 14207 or by e-mail at: Shaina.r.souder@usace.army.mil

Sincerely,

Shaina R. Souder
Biologist

Enclosures

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): January 6, 2023

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Buffalo District (LRB); Inventum Engineering - Riverview Innovation & Technology Campus; LRB-2021-01504; Form 1 of 1.

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: New York County: Erie City: Tonawanda

Center coordinates of site (lat/long in degree decimal format): Lat: 42.98328° N Long: -78.69843° W
Universal Transverse Mercator: Zone: 17
Name of nearest waterbody: Niagara River
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: **N/A**
Name of watershed or Hydrologic Unit Code (HUC): 0412010406

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION:
☒ Office (Desk) Determination Date: January 6, 2023
☒ Field Determination. Date: October 28, 2022

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.
There **ARE NO** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain:

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
There **ARE NO** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area.

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]
☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:
Non-wetland waters: linear feet: width (ft) and/or acres.

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).

Wetlands: acres.

c. Limits (boundaries) of jurisdiction based on: **Pick List**
Elevation of established OHWM (if known):

2. Non-regulated waters/wetlands (check if applicable):[3]

☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.

The review area is an approximately 103-acre irregular-shaped area made up of multiple parcels on the east side of River Road, in the Town of Tonawanda, Erie County, New York. The review area is a highly disturbed parcel that is contaminated with Coke and the current active project is removing much of the coke. There are remnant buildings and other human structures on the parcel too. The review area contains several aquatic resources including constructed ponds and ditches that are part of a drainage system to work with the products on-site, as follows:

Wetland 1	.751 acre	PEM
Wetland 2	.125 acre	PEM
Wetland 3	.32 acre	PEM
Wetland 4	.364 acre	PEM
Wetland 5	.078 acre	PEM
Wetland 6	.026 acre	PEM
Pond Areas (from recent Coke removal)	1.308 acre	POW
Pond 1	.432 acre	POW
Pond 2	.248 acre	POW
Ditch 1	1240 ft	R4
Ditch 2	866 ft	R4
Pond 3	.122 acre	POW

Explain: Wetlands 1, 2, 3, 4, 5, 6, are not, or could not be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or is used or could be used for industrial purposes by industries in interstate commerce. Further, the subject wetlands, ponds, and ditches do not meet adjacency criteria and has been determined to be an isolated, intrastate wetland with no interstate or foreign commerce nexus.

The review area also contains Ponds 1, 2, 3, and Pond Areas (from recent Coke removal), and Ditches 1 and 2. Ponds 1, 2, 3, and Ditches 1 and 2 are man-made storm water control features that are part of an active, approved Stormwater Pollution Prevention Plan and are actively managed within this area. The Pond areas in the west-central portion of the site are waters that resulted from recent coke removal (since the delineation completion in 2021) and are now functioning as a man-made pond complex consisting of three ponds. It has been determined that these waters are not considered to be waters of the U.S. as described in the U.S. Army Corps of Engineers Regulations preamble, dated November 13, 1986 (preamble water), and as supported by the narrative below in this document.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

[3] Supporting documentation is presented in Section III.F.

1. **TNW**
   Identify TNW:
   Summarize rationale supporting determination:

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent":

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):
This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.
A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**
   (i) General Area Conditions:
   Watershed size: **Pick List**
   Drainage area: **Pick List**
   Average annual rainfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW
   Project waters are **Pick List** river miles from TNW
   Project waters are **Pick List** river miles from RPW
   Project waters are **Pick List** aerial (straight) miles from TNW
   Project waters are **Pick List** aerial (straight) miles from RPW
   Project waters cross or serve as state boundaries. Explain:
   Identify flow route to TNW[5]:
   Tributary stream order, if known:

   (b) General Tributary Characteristics (check all that apply):
   Tributary is: ☐ Natural

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

☐ Artificial (man-made). Explain:
☐ Manipulated (man-altered). Explain:

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List**

Primary tributary substrate composition (check all that apply):

☐ Silts	☐ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain:		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain:
Presence of run/riffle/pool complexes. Explain:
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime:
Other information on duration and volume:
Surface flow is: **Pick List.** Characteristics:
Subsurface flow: **Pick List**. Explain findings:
☐ Dye (or other) test performed:
Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ multiple observed or predicted flow events	☐ sediment deposition
☐ abrupt change in plant community	☐ water staining
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain:

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.). Explain:
Identify specific pollutants, if known:

(iv) Biological Characteristics. Channel supports (check all that apply):
- ☐ Riparian corridor. Characteristics (type, average width):
- ☐ Wetland fringe. Characteristics:
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings:
  - ☐ Fish/spawn areas. Explain findings:
  - ☐ Other environmentally-sensitive species. Explain findings:
  - ☐ Aquatic/wildlife diversity. Explain findings:

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain:
Wetland quality. Explain:
Project wetlands cross or serve as state boundaries. Explain:

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain:
Surface flow is**: Pick List**
Characteristics:
Subsurface flow: **Pick List**. Explain findings:
- ☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:
- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain:
  - ☐ Ecological connection. Explain:
  - ☐ Separated by berm/barrier. Explain:

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:
Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain:
Identify specific pollutants, if known:

(iii) Biological Characteristics. Wetland supports (check all that apply):
- ☐ Riparian buffer. Characteristics (type, average width):
- ☐ Vegetation type/percent cover. Explain:
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings:

☐ Fish/spawn areas. Explain findings:
☐ Other environmentally-sensitive species. Explain findings:
☐ Aquatic/wildlife diversity. Explain findings:

3. **Characteristics of all wetlands adjacent to the tributary (if any)**
   All wetland(s) being considered in the cumulative analysis: **Pick List**
   Approximately ( ) acres in total are being considered in the cumulative analysis.
   For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

   Summarize overall biological, chemical and physical functions being performed:

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:

☐ TNWs: linear feet width (ft), Or, acres.
☐ Wetlands adjacent to TNWs: acres.

2. RPWs that flow directly or indirectly into TNWs.

☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally:

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters:

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters:

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW:

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain:
☐ Other factors. Explain:

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters:
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☒ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain:

☒ Other: (explain, if not covered above):

The review area is an approximately 103-acre irregular-shaped area made up of multiple parcels on the east side of River Road, in the Town of Tonawanda, Erie County, New York. The review area is a highly disturbed parcel that is contaminated with Coke and the current active project is removing much of the coke. There are remnant buildings and other human structures on the parcel too. The review area contains several aquatic resources including constructed ponds and ditches that are part of a drainage system to work with the products on-site: Wetlands 1, 2, 3, 4, 5, 6, Ponds 1, 2, 3, Ditches 1 and 2, and Ponded areas from recent Coke removal.

On October 28, 2022, a site visit was performed by U.S. Army Corps of Engineers staff with the wetland delineator, Mr. Scott Livingstone from Earth Dimensions, Inc. During the site visit Wetland's 1, 2, 3, 4, 5, and 6 were walked entirely around confirming that there were no observable surface water connections to any of these. Wetlands 1, 2, 5, and 6 are Palustrine Emergent wetlands that are depressional in nature resulting from the flat nature of the site and the historic high level of disturbance before being left fallow, which created early successional vegetation growth and including the establishment of invasive species, such as *Phragmites australis*. Wetlands 3 and 4 are Palustrine Emergent wetlands located on the western extent of the review area and are in a much more topographic location, located lower than the entrance road to the review area. An in-office resource review, including aerial imagery suggested that this area may flow to the west. However, during the October 28, 2022 site visit it was determined that Wetlands 3 and 4 were completely surrounded by dry land and in some areas consisting of old fill material; no surface or subsurface water connections were observed flowing to the ditch observed in aerials outside of the review area. The nearest RPW is the Niagara River which is located approximately 2000 linear feet to the west of the review area. on the west side of the review area, approximately 440 linear feet away from Wetland 1. Wetlands 1, 2, 3, 4, 5, and 6 is not within a floodplain of any streams or rivers and does not have any inundations by any other regulated waters. There is no possibility of water from the wetlands within the review area to exchange waters through a surface or subsurface water connection with the Niagara River.

A review of in-office resources was conducted. The U.S. Fish and Wildlife Wetland mapper does not show any wetlands or waters or streams within the review area; the nearest waters shown are wetlands south of the site and a stream just outside of the western extent of the review area along River Road. According to the USDA NRCS web soil survey, majority of

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

the review area is mapped as Ud-Urban Land, which has a hydric rating of 5. The locations of Wetlands 3 and 4 has soil types of CfB- Cayuga silt loam, 3-8% slopes and CfC – Cayuga silt loam, 8-15% slopes, both having a hydric rating of 0. The location of Wetland 1 is mapped with soil majorly labeled as Ud, but the southern extent is mapped as Od-Odessa silt loam, 0-3% slopes which has a hydric rating of 5. Even mapped as Urban Land, due to the high disturbance on this site, much of the soils have been disturbed and likely filled, changing their composition. Further to the east of this location a narrow strip of area on the southern portion of the review area is mapped as Oe-Odessa Lakemont complex, 0-3% slopes which has a hydric rating of 37 and La-Lakemont silt loam, 0-3% slopes which has a hydric rating of 95. The New York State Department of Environmental Conservation (NYSDEC) Environmental Resource Mapper (ERM) has a NYSDEC wetland (labeled BW-6) mapped outside of the review area on the east and southeast side of the review area; some of the adjacent area comes minimally into the eastern portion of the review area. The ERM does not show any streams flowing around or through the review area. The FEMA FIRM website indicated that there is a mapped floodplain around the Niagara River, but none within the review area. Aerial and Oblique imagery was reviewed prior to the site visit, which supports that the review area is a highly disturbed parcel (historically and currently), and the ponds and ditches were the only visible waters. Earth Dimensions, Inc. also provided a copy of the letter from the NYSDEC that states that "there is no [NYSDEC] state-regulated freshwater wetlands jurisdiction" of Wetlands 1, 2, and 6 as shown in the Earth Dimensions Inc November 2021 delineation report, and that "Wetlands 1, 3, and 4 [as shown in the Earth Dimensions Inc November 2021 delineation report] are over 500 feet from the originally mapped wetland and cannot be considered for inclusion into NYSDEC Wetland BW-6."The in-office resource review is consistent with and support the findings of the Wetlands and Waterbodies Delineation Report submitted by Earth Dimensions, Inc. and observations made during the Corps of Engineers site visit on October 28, 2022.

The review area also contains Ponds 1, 2, 3, and Pond Areas (from recent Coke removal), and Ditches 1 and 2. Ponds 1, 2, 3, and Ditches 1 and 2 that are man-made storm water control features that are part of an active, approved Stormwater Pollution Prevention Plan and are actively managed within this area. The Pond areas in the west-central portion of the site are waters that resulted from recent coke removal (since the delineation completion in 2021) and are now functioning as a man-made pond complex consisting of three ponds. These ponded areas from recent Coke removal were not mapped on the original delineation report submitted by Earth Dimensions, Inc, but were requested to be added during the October 28, 2022 Corps of Engineers' site visit because they were visible on aerial imagery and observably holding/sustaining water during the visit. It has been determined that these waters are not considered to be waters of the U.S. as described in the U.S. Army Corps of Engineers Regulations preamble, dated November 13, 1986 (preamble water), and as supported by the narrative below in this document.

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource:
☒ Wetlands: Total Wetlands within the Review Area – 1.664-acres

Wetland 1	.751 acre	PEM
Wetland 2	.125 acre	PEM
Wetland 3	.32 acre	PEM
Wetland 4	.364 acre	PEM
Wetland 5	.078 acre	PEM
Wetland 6	.026 acre	PEM

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☒ Other non-wetland waters: Pond totals within review area - 2.11-acres. Ditch length total within the review area – 2106 feet. List type of aquatic resource:

Pond Areas (from recent Coke removal)	1.308 acre	POW

Pond 1	.432 acre	POW
Pond 2	.248 acre	POW
Ditch 1	1240 ft	R4
Ditch 2	866 ft	R4
Pond 3	.122 acre	POW

☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted: Wetland and Waterbodies Delineation Report for Riverview Innovation & Techonology Campus, Town of Tonawanda, Erie County, New York; dated, November 11, 2021; prepared for Inventum Engineering; prepared by Earth Dimensions, Inc.

☒ Data sheets prepared/submitted by Earth Dimensions, Inc. on behalf of Inventum Engineering.

☒ Office concurs with delineation data sheets dated June 23, 2021 and April 5, 2021 on an approximately 103-acre parcel and summarized in the Wetland and Waterbodies delineation report dated November 11, 2021.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps:
☐ Corps navigable waters' study:
☒ U.S. Geological Survey Hydrologic Atlas: HA -730
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: https://ngmdb.usgs.gov/topoview/viewer/ - Scale: 24k; USGS; Buffalo NW - NY; 2019; accessed October 27, 2022.

☒ USDA Natural Resources Conservation Service Soil Survey. Citation: on-line Web Soil Survey - https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx – accessed October 27, 2022.

☒ National wetlands inventory map(s). : https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper - accessed October 27, 2022. No wetlands shown within the review area.

☒ State/Local wetland inventory map(s): New York State Department of Environmental Resource Mapper - https://gisservices.dec.ny.gov/gis/erm/; accessed October 27, 2022.

☒ FEMA/FIRM maps: https://msc.fema.gov/portal/ - accessed October 27, 2022

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs:

☒ Aerial (Name & Date): Connect Explorer - https://explorer.pictometry.com/login.php oblique imagery dated April 25, 2020. Google Earth aerial dated May 2022.

☒ Other (Name & Date): Photographs included in the delineation report, dated April 5, 2021 and June 23, 2021.

☐ Previous determination(s):
☐ Applicable/supporting case law:
☐ Applicable/supporting scientific literature:
☒ Other information (please specify): U.S. Army Corps of Engineers Site Visit on October 28, 2022. NYS Department of Environmental Conservation letter dated February 1, 2022.

B. ADDITIONAL COMMENTS TO SUPPORT JD:

The review area (approximately 103-acres in size) contains Wetlands 1, 2, 3, 4, 5, 6 which have been determined to be closed boundary wetlands with no inflow or outflow, as an isolated water completely surrounded by uplands. The review area also contains Ponds 1, 2, 3, and Pond Areas (from recent Coke removal), and Ditches 1 and 2. Ponds 1, 2, 3, and Ditches 1 and 2 are man-made storm water control features that are part of an active, approved Stormwater Pollution Prevention Plan and are actively managed within this area. The Pond areas in the west-central portion of the site are waters that resulted from recent coke removal (since the delineation completion in 2021) and are now functioning as a man-made pond complex consisting of three ponds. It has been determined that these waters are not considered to be waters of the U.S. as described in the U.S. Army Corps of Engineers Regulations preamble, dated November 13, 1986 (preamble water), and as supported by the narrative below in this document. The documentation on this form explains and supports this determination.

Received by USACE-LRBUFD-CR November 11, 2021

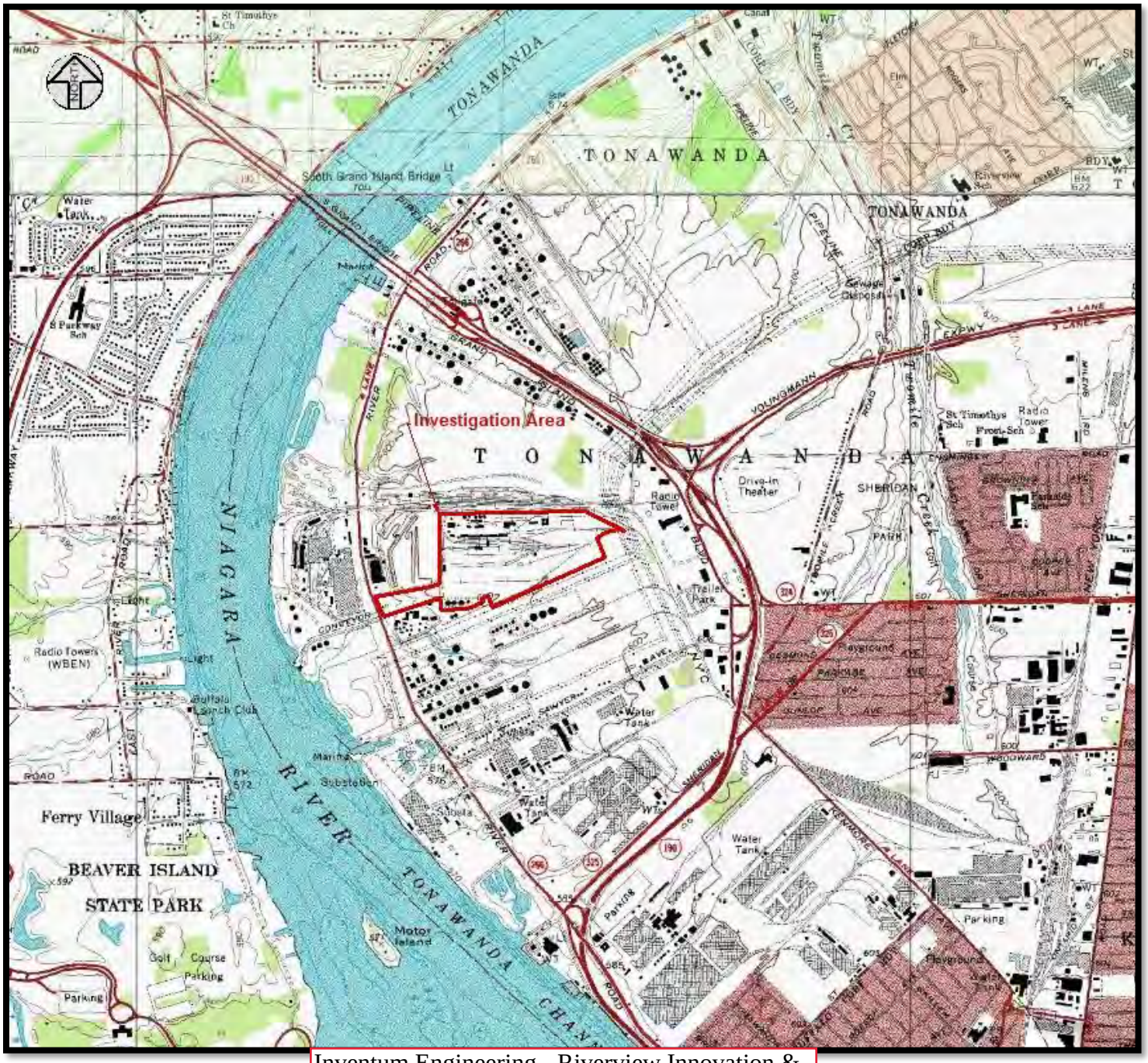


FIGURE 7: DRAINAGE MAP

Buffalo Northwest Quadrangle / U.S. Geological Survey

Riverview Innovation & Technology Campus Brownfield Cleanup Program Site
Town of Tonawanda, Erie County, New York

Received by USACE-LRBOR on November 11, 2021



Inventum Engineering - Riverview Innovation & Technology Campus
LRB-2021-01504
Erie County, New York
USGS Quad: NY - Buffalo NW
Sheet 2 of 4 - Review Area Location Map

FIGURE 8: SITE AERIAL PHOTOGRAPH

http://gis2.erie.gov/HTML5/ErieCountyNY/PublicLaunchPage.aspx (Visited 04/08/21)

Riverview Innovation & Technology Campus Brownfield Cleanup Program Site
Town of Tonawanda, Erie County, New York

Figure 6: Wetland Delineation Map
Riverview Tech Campus
Town of Tonawanda, Erie County, New York

EARTH DIMENSIONS, INC.
Wetland Delineations • Wetland Mitigation

Inventum Engineering - Riverview Innovation &
Technology Campus
LRB-2021-01504
Erie County, New York
USGS Quad: NY - Buffalo NW
Sheet 3 of 4 - Waters/Wetland Delineation Map

NORTH

NYSDEC WETLAND LINE
WETLAND W2: 0.125± acre
WETLAND W3: 0.078± acre
WETLAND W6: 0.026± acre
PONDED AREAS FROM REMOVAL OF COKE
0.571± acre
0.120± acre
0.617± acre
roadside ditch 866 lf
roadside ditch 1240 lf
CULVERT
Pond P3: 0.122± acre
Pond P1: 0.432± acre
Pond P2: 0.248± acre
WETLAND W4: 0.364± acre
WETLAND W5: 0.751± acre
Edge of Wetland
RIVER ROAD
D1 Photo 3
D2 Photo 4
D3 Photo 5
D4 Photo 6
D5 Photo 7
D6 Photo 9
D8 Photo 11
Photo 12
Photo 13
Photo 14
Photo 15
Photo 16
Photo 17
Photo 18
Photo 19
Photo 20
Photo 21
Photo 22
Photo 23
Photo 24
D9
D10
D11
D12
D13
D14
D15
D16

LEGEND

- Wetland Area
- Photo location (P1)
- Investigation Area
- Tree/Shrub Line
- Pond Area
- Wetland Flag (W1-1)
- Data Point Location (D1)
- Ditch or Stream

Scale: as shown
Map Date: July 6, 2021 JMC/EDI Revised: October 31, 2022 JMC/EDI
Base Map Provided By: GPS MAPPING
File Name: DD MAP.DWG
EDI Project Code: W2F89d

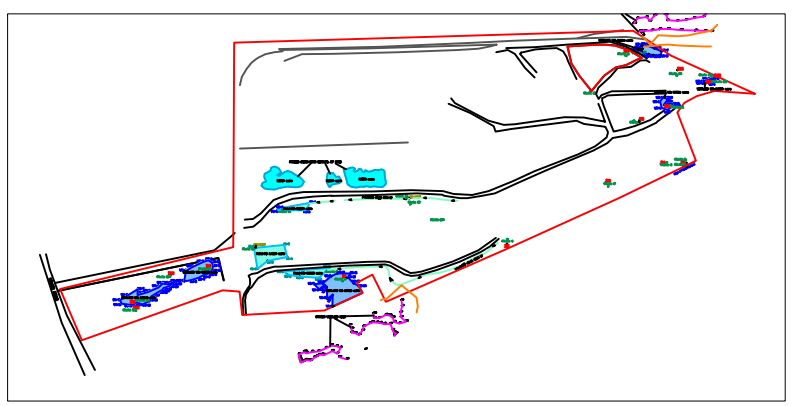




FIGURE 1: AERIAL PHOTO WITH WETLANDS
GoogleEarth.com (Visited 11/01/22)
Riverview Tech Campus, Town of Tonawanda, Erie County, New York

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Inventum Engineering - Riverview Innovation & Technology Campus	File Number: LRB-2021-01504	Date: January 6, 2023

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Shaina R. Souder U.S. Army Corps of Engineers 1776 Niagara Street Buffalo, New York 14207 (716)879-4240 Shaina.r.souder@usace.army.mil	Katherine McCafferty Regulatory Appeals Officer US Army Corps of Engineers Great Lakes and Ohio River Division 550 Main Street, Room 10780 Cincinnati, Ohio 45202-3222 Phone: 513-684-2699 Fax: 513-684-2460 e-mail: katherine.a.mccafferty@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
_____ Signature of appellant or agent.		

Appendix C - RAMP

INVENTUM ENGINEERING, PC

Remedial Action Monitoring Plan

Tonawanda Coke Corporation Site

Site No. 915055, OU 2

3875 River Road

Tonawanda, NY 14150

June 9, 2026

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

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Appendix A – Quality Assurance Project Plan (QAPP)

1 Introduction

The purpose of this Remedial Action Monitoring Plan (RAMP) is to serve as a guidance document during sampling activities during the Remedial Action Implementation for the Tonawanda Coke Corporation Site #915055, Operable Unit (OU) 2 at 3875 River Road, on behalf of Honeywell International, on property owned by Riverview Innovation & Technology Campus, Inc. The remedial actions are being completed in accordance with The Amended Record of Decision (AROD) dated June 2024, and pursuant to the Order on Consent and Administrative Settlement (Index No. B9-85-2-77D) entered into between Honeywell and the NYSDEC on February 24, 2020.

The environmental sample types and corresponding analytical parameters/methods are provided in Table 4-1 of the RAWP and Appendix A.

2 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support the investigation of the Site. DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing the definitive data category, as outlined in Guidance for the Data Quality Objectives Process, EPA QA/G-4 (September 1994). All samples will provide definitive data, which are generated using rigorous analytical methods, such as the reference methods approved by the United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC).

2.1 QA Objectives for Chemical Data Management

Sample analytical methodology for the media sampled and data deliverables will meet the requirements in the attached Quality Assurance Project Plan (Appendix A). Laboratories will be instructed that completed Sample Preparation and Analysis Summary forms are to be submitted with the analytical data packages. The laboratory will also be instructed that matrix interferences must be cleaned up, to the extent practicable.

3 Sampling Locations, Custody, Holding Times, and Analysis

Sample locations and procedures are discussed in the Remedial Action Work Plan, the following sections of this RAMP and the accompanying Tables and Figures of the RAWP and the Quality Assurance Project Plan (QAPP). Procedures for chain of custody, holding times and laboratory analyses shall be followed as per SW-846 and as per the laboratory's Quality Assurance Plan and the QAPP. All holding times begin with validated time of sample receipt (VTSR) at the laboratory. The laboratory must meet the method required detection limits which are referenced within the EPA Methods.

In addition, for the emerging contaminants, the laboratory must meet the detection limits for PFAS specified in the NYSDEC's January 2020 *Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Remedial Programs* and 0.28 micrograms per liter (µg/L) for 1,4-Dioxane.

4 Remedial Action Monitoring Scope of Work

The remedial action monitoring scope of work was designed to provide the data to confirm the Remedial Action Objectives (RAWP, Inventum 2026) have been achieved. All RAMP work will be conducted in accordance with the following supplemental documents:

- Quality Assurance Project Plan (QAPP) – Appendix A – defines the data quality objectives, sampling and analytical method requirements, QA/QC sample collection frequency, quality control requirements, data management, and data review, validation, and verification requirements to be followed during completion of the remedial action.
- Community Air Monitoring Plan (CAMP) – Appendix D of the RAWP – defines the appropriate air monitoring requirements and designated protocols to be followed to monitor the air quality emanating from work areas (personal air monitoring is covered by the HASP) during completion of the remedial action.
- Health and Safety Plan (HASP) – Appendix H of the RAWP – defines the appropriate health and safety requirements and designated protocols to be followed during completion of the remedial action.

Table 1 summarizes the sampling program for and includes information on proposed sample type, sample depth, and rationale for each remedial action requiring sampling.

4.1 Remedial Actions

The sampling and analysis for each component of the remedial action are listed below. The community air monitoring program is presented in the Community Air Monitoring Plan (CAMP), Appendix D of the RAWP.

4.1.1 Excavation of Fill with Concentrations of PAHs Above 500 Mg/Kg

The Focused Remedial Investigation (FRI, Parsons, 2022) identified two locations where fill contained concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) above 500 milligrams per kilograms (mg/kg):

- SS-9 Location – 541 mg/kg surface soil sample (surface to 2-inches) collected adjacent to the material storage bin, and
- SB-02-2020 – 940 mg/kg surface soil sample (surface to 2 inches) collected adjacent to the ditch/coal conveyor alignment.

The COCs in these locations is SVOCs (specifically PAHs) in shallow soils.

Confirmation soil samples (Table 4-1) will be collected after the near surface soils; 0- to 6 inches around each of the two (2) shallow soil samples are removed. The initial excavation shall be 40-feet by 20 feet as shown on Figure 4-2 and Sheet S-3 of the RAWP. The initial excavation shall be 6-inches deep (three times the depth of the samples). A sample from each sidewall and the base of the excavation will be sampled for SVOCs. Should any confirmation sample contain a total PAH concentration above 500 mg/kg, additional excavation will be advanced as follows:

- Sidewall samples – extend the excavation 10 feet, resample sidewall or
- Base sample – extend the excavation an additional 6-inches, resample base.

Assuming the excavation volume could reach 30 cubic yards, one composite sample will be collected for import parameters, Table 4-1, and Toxicity Characteristics Leaching Procedure (TCLP). The following steps will be based on the data from the first composite sample:



Action	Volume	PAH Concentration	TCLP Result
Fill Below Cover	Any	<500 mg/kg	Not Haz
Offsite Disposal	<100 Tons	>500 mg/Kg	Not Haz

4.1.2 Topsoil Recovery

At a minimum, topsoil will come from two sources; onsite and a single offsite source. There is not enough onsite topsoil that meets the commercial SCO's for the final cover. As a result, each topsoil source will restart the minimum requirements of Table 5.4(e)10:

Onsite Topsoil (Assuming 400 cubic yards):

- 6 VOC Discrete samples
- 2 SVOC Grab samples
- 2 PCB Grab samples
- 2 TAL Metals (inc. Mercury) Grab samples
- 2 Pesticide/Herbicide Grab Samples, and
- 1[1] PFAS/1,4 Dioxane Grab samples

In addition, 2 Cyanide Grab samples will be collected.

The onsite generated topsoil samples will be collected from the stockpile created after recovering the topsoil from the center of the site.

Assuming a single source for the remaining 3,600 cubic yards of topsoil is used, the following samples will be collected:

- 11 VOC Discrete samples
- 4 SVOC Grab samples
- 4 PCB Grab samples
- 4 TAL Metals (inc. Mercury) Grab samples
- 4 Pesticide/Herbicide Grab Samples, and
- 4 PFAS/1,4 Dioxane Grab samples

In addition, 4 Cyanide Grab samples will be collected.

The topsoil import samples will be collected before the topsoil is excavated and transported to Site 109, but may be collected in stages as the borrow source is developed, i.e., not all samples will be collected before import is initiated.

[1] While this would typically be 2 PFAS/1,4 Dioxane samples, there have been few detections of these compounds on the site. This RAMP is based on collecting one initial PFAS/1,4 Dioxane samples and if no detections, no additional import testing for those compounds will be collected.

4.1.3 Sediment

Approximately 200- to 250-tons of sediment will be excavated from the existing ditch below Outfall #004. The sediment will be stockpiled in no less than 2 piles on polyethylene to determine how the materials will be managed. Samples will be collected to determine if the soils can be used as fill on Site 109 and the sidewalls and base will be sampled (RAWP Sheet S-11):

- 48VOC Discrete samples
- 8 SVOC Grab samples
- 8 PCB Grab samples
- 8 TAL Metals (inc. Mercury) Grab samples
- 8 Pesticide/Herbicide Grab Samples, and
- 8 PFAS/1,4 Dioxane Grab samples

In addition, 2 Cyanide Grab samples will be collected.

4.1.4 Unclassified Fill

Approximately 14,000 tons of unclassified fill will primarily come from the retention pond excavation on the BCP Site on the same property, 3875 River Road. For purposes of the RAMP and the RAWP it is assumed that the entire surface of the site will be covered with unclassified soil to a depth of 9-inches. Based on the maximum extent of the cover, this will require collection of the following:

- 21 VOC Discrete samples
- 9 SVOC Grab samples
- 9 PCB Grab samples
- 9 TAL Metals (inc. Mercury) Grab samples
- 9 Pesticide/Herbicide Grab Samples, and
- 2[2] PFAS/1,4 Dioxane Grab samples

In addition, 9 Cyanide Grab samples will be collected.

The import samples will be collected before the unclassified fill is excavated and transported to Site 109, but may be collected in stages as the borrow source is developed, i.e., not all samples will be collected before import is initiated.

4.1.5 Asphalt Removal

Asphalt pavement portion of the current access road on Site #915055/OU2 and from the paved area around the former scale and tarping frame (Figure 2-2 of the RAWP). The asphalt will be lifted from the current surfaces and prepared by breaking into pieces that conform with the landfill requirements. After preparation, the asphalt will be transported offsite for disposal as construction and demolition (C&D) debris. Typically, no sampling is required for this type of C&D. If disposal characterization is required, the waste profile samples required by the landfill will be collected.

[2] While this would typically be 10 PFAS/1,4 Dioxane samples, there have been few detections of these compounds on the site. This RAMP is based on collecting two initial PFAS/1,4 Dioxane samples and if no detections, no additional import testing for those compounds will be collected.

4.2 Monitoring Well Installation

The groundwater monitoring program proposed in the RAWP the installation of five monitoring wells in the fill (Sheet S-17 of the RAWP) The monitoring wells will be screened at the depths shown in the schedule on the sheet to match the existing monitoring wells. The screen length will be as shown on the schedule. The monitoring well data will be added to the as-built figures in the Final Engineering Report and in the Site Management Plan (SMP).

Borings will be advanced at each proposed location using hollow-stem auger (HSA) tools to a depth of 2 feet below the proposed screen to verify the strata in which the well is constructed. All downhole equipment will be decontaminated before use on the property and between borings. Unconsolidated material samples from the base of the cover/demarcation layer will be continuously collected with a split-barrel sampler driven through the augers for observation, lithological characterization, and screening with a PID equipped with a 10.6eV lamp. Soil samples for laboratory analysis will not be collected unless observations of separate phase product or viscous tar are made or PID readings exceed 50 parts per million (ppm), although all PID readings will be evaluated.

The well construction will include a 2-foot-long solid well sump, screen, and a solid vertical riser protected with an above grade lockable casing.

All wells will be developed a minimum of two weeks prior to collection of water samples. The depth to water in the wells will be manually measured using an oil/water interface probe prior to development. Wells will be developed by removing three well volumes of water, purging the wells until dry, or purging and surging the wells. Water quality measurements for pH, temperature, conductivity, dissolved oxygen, oxidative-reductive potential (ORP), and turbidity will be recorded periodically during the development process.

4.2.1 Monitoring Well Construction

The monitoring wells will be installed to monitor groundwater elevations and groundwater quality in the fill layer. A solid casing well sump will be installed in grout within the silty clay. The wells will be screened within the fill above the clay.

Monitoring wells will be completed with a 2-inch diameter Schedule 40 polyvinyl chloride (PVC) well casing and 2 to 3-feet of 0.010-inch slotted screen depending on the depth of the boring (estimated at 5-feet on average). A sand filter pack will be placed from the bottom of the screened interval to a minimum of 1 foot above the top of the screen. The remaining annular space will be completed with a bentonite seal to within 6 inches of the ground surface, and across the demarcation layer. An at grade casing will be installed to protect MW-109-1, and above ground lockable casings will be installed over monitoring wells MW-109-2 and MW-109-3. The well cover and casings will be completed with a concrete collar to protect the casings.

4.2.2 Groundwater Sampling

Liquid level measurements will be collected from the monitoring wells no sooner than 2 weeks after development. The depth to water and overall total depth of the wells will be collected using an oil/water interface probe and recorded in the SMP field notebook. The total depth of the well will be verified to ensure it has not accumulated sediment.

A minimum of three well volumes will be purged from the monitoring wells using a bailer or peristaltic pump or the well be purged dry prior to collecting groundwater samples. Field measurements of pH, temperature, conductivity, turbidity, dissolved oxygen, and oxygen reduction potential (ORP) will be recorded at three intervals during the purging process for standard purge. Groundwater samples will be



collected with a bailer or with dedicated polyethylene tubing and a peristaltic pump. Each well will be sampled and the samples will be analyzed:

- 5 VOCs
- 5 SVOCs
- 5 TAL Metals
- 5 Low level mercury
- 5 Polychlorinated biphenyls
- 5 Ammonia
- 5 Pesticides/herbicides and
- 5 PFAS/,4-Dioxane

In addition, 5 cyanide samples will be collected.

4.3 Survey

Monitoring wells will be surveyed by a surveyor licensed in the state of New York consistent with standard technical practices. Horizontal locations will reference the North American Datum of 1983 and the New York State Plane system and be accurate to within ±0.1 foot. Vertical elevations from the ground surface and top of casing (TOC) will be referenced to the North American Vertical Datum of 1988 and reported in feet above mean sea level. Vertical measurements will be accurate to within ±0.01 foot.

Soil sample and test pit locations will be measured with onsite GPS equipment. The Topcon GPS equipment used at the site is accurate within 0.01 foot (0.08 inch) horizontally and 0.01 foot (0.09 inch) vertically at 300 meters from the base station.

All sample locations will be provided on the as-built Figures in the FER and the monitoring well location data will be provided in the SMP.

4.4 Community Air Monitoring Program

The air monitoring program during the remedial action will be conducted in accordance with the Community Air Monitoring Plan (CAMP) provided in Appendix F of the RAWP, including during all sampling and drilling. Should the action level of 150 mcg/m^3 above the upwind monitoring concentration be exceeded after corrective actions are taken, work must stop and NYSDEC and NYSDOH must be notified within 24-hours by either phone or email. The notification shall include a description of the control measures implemented to prevent further exceedances.

4.5 Field Modification Notifications

The NYSDEC PM, or their designated representative, will be notified via electronic mail and telephone if the following conditions occur:

- Field activities are delayed and/or rescheduled due to unsafe or unsuitable weather conditions and/or equipment malfunctions.
- Proposed monitoring well locations must be relocated more than 25-feet from the location shown in the RAWP due to surface or subsurface conditions preventing completion of the soil boring to the desired depth or unforeseen hazardous overhead conditions.



5 Sample Naming Nomenclature

All samples shall be labeled:

TYPE-LOCATION-DATE COLLECTED, for example:

CS-SS09- 01-06172025 – Would be the first confirmation sample from the SS09 excavation collected June 17, 2025.

Types:

CS	-	Confirmation Sample
GW	-	Ground Water
TCLP	-	Hazardous Waste Characterization Sample for TCLP Analysis
IM	-	Import Sample

Locations:

SS09	-	SS09 Area Excavation
SB02	-	Soil Boring SB-02-202 Area Excavation
BCP	-	Borrow Pit, 3875 River Road
TS109	-	Topsoil Recovered from Site 109
TS#	-	Topsoil from Offsite Source #

6 Storage of Data

All incoming laboratory data shall be stored on the Inventum Google Drive at the location specified below. All Summary Reports (preliminary and final) and Electronic Data Deliverables (EDD) shall share a common laboratory project number.

- Google Drive Path: *Inventum/Laboratory/RITC/Laboratory/Month*

7 Electronic Data Deliverables

EDD's shall be in a format that can be uploaded to both the NYSDEC and Honeywell EQiS data management systems.

8 Reference

Inventum Engineering, 2026, Remedial Action Work Plan, Tonawanda Coke Corporation, Operable Unit 02, Site No. 915055, 3875 River Road, Tonawanda, New York 14150, Prepared for Honeywell International Inc., Revised June 1.

Table

Table 4-1
Remedial Action Monitoring Plan Samples
Site #913055 (OU2)
Town of Tonawanda, New York

Location	Rationale	Sample Type	Sample Depth	Soil Sample Analysis										Water Sample Analysis								
				VOCs	SVOCs	Cyanide	PCBs	Metals	Mercury	Pesticides/Herbicides	PFAS/1,4-Dioxane	TCLP (SVOCs)	Total Organic Carbon	VOCs	SVOCs	Cyanide	PCBs	Metals	Ammonia	Mercury	Pesticides/Herbicides	PFAS/1,4-Dioxane
Surface Water - See SWPPP																						
Stormwater Reuse Onsite																						
Outfall #001	1 sample per week while being used for dust control and revegetation	Grab	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	6	6	6	N.A.	6	6	6	N.A.	N.A.
Excavation																						
SS-9 Excavation	Confirmation that fill with greater than 500 mg/kg PAHs has been removed	Shallow Fill	0-0.5 feet (sidewall and bottom)	0	5	0	0	0	0	0	0	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
SB-02-2020 Excavation	Confirmation that fill with greater than 500 mg/kg PAHs has been removed	Shallow Fill	0-0.5 feet (sidewall and bottom)	0	5	0	0	0	0	0	0	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Disposal Profile Sample	Initial sample for determination of disposal alternative	Composite	0.0-0.5 feet	1	1	1	1	1	1	1	1	1	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Asphalt	Disposal Profile	Grab	N.A.	As required by C&D Landfill										N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Sediment - Box Culvert Inlet/Stilling Pool Excavation	Materials Management Characterization	Grab	N.A.	6	6	6	6	6	6	6	6	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Sediment - Stilling Pool	Materials Management Characterization, PER SCO samples.	Grab	N.A.	14	11	11	11	11	11	11	11	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Soil Cover Systems																						
Unclassified Fill	Import Testing	Grab	N.A.	21	9	9	9	9	9	9	2	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Topsoil (Onsite Reuse)	Confirmation	Grab	N.A.	6	2	2	2	2	2	2	1	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Topsoil (Offsite Source)	Import Testing	Grab	N.A.	11	4	4	4	4	4	4	4	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Gravel/RipRap	Import Analysis	Grab	N.A.	Grain-size Analysis, >90% Retained on No. 80 Sieve										N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Long-term Monitoring																						
Monitoring Wells	Initial/Baseline Sampling	Low-flow	TBD	0	0	0	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5
	Totals			59	43	33	33	33	33	33	25	1	0	11	11	11	5	11	11	11	5	5

INVENTUM ENGINEERING, P.C.

Remedial Action Monitoring Plan
(Quality Assurance Project Plan)

Tonawanda Coke Superfund Site OU2

NYSDEC Site #915055/OU2

3875 River Road

Tonawanda, New York 14150

July 3, 2026

441 CARLISLE DRIVE
SUITE C
HERNDON, VA 20170
WWW.INVENTUMENG.COM

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1 Introduction

The purpose of this Remedial Action Monitoring Plan (RAMP)/Quality Assurance Project Plan (QAPP) is to serve as a guidance document during implementation of the Remedial Action Work Plan (RAWP) for Operable Unit 2 of the Tonawanda Coke State Superfund Site (Site 109) #915055/OU2 located at 3875 River Road in Tonawanda, Erie County, New York. The RAMP will be implemented in accordance with the executed Order between the New York Statement Department of Environmental Conservation (NYSDEC) and Honeywell International Inc.

This RAMP/QAPP is designed to provide the requirements for testing during the implementation of the RAWP and the Assurance/Quality Control (QA/QC) procedures required. Specific methods and QA/QC procedures for chemical testing of environmental samples obtained from the site are part of the RAWP.

An Inventum Engineering, P.C. (Inventum) Project Manager will be responsible for verifying that QA procedures are followed during the investigation and analysis. This will provide for the valid collection of representative samples. The Project Manager will be in direct contact with the analytical laboratory to ensure that holding times and other QA/QC requirements are met. The selected laboratory will be responsible for overseeing analytical QA/QC activities.

The estimated number of environmental samples and corresponding analytical parameters/methods are provided in Table 1 below. These sample quantities may vary depending on media availability and routine adjustments made during the field work.

Table 1 – Analytical Parameters and Methods

Parameter	EPA Method Reference	Groundwater and Surface Water	Soils
Metals	6010C	11	59
Mercury	7470A	11	43
Cyanide	9012B	11	43
Ammonia	350.1	11	0
Volatile Organic Compounds	8260C	11	59
Semi-Volatile Organic Compounds	8270D	11	43
Polychlorinated Biphenyls	8082A	5	33
Pesticides	8081B	5	33

Herbicides	8151A	5	33
1,4 Dioxane	8270SIM	5	25
Per- and Polyfluoroalkyl Substances	1633	5	25
Toxicity Characteristic Leaching Procedure (TCLP)	1311	0	1

The laboratory QA Manager will be responsible for performing project-specific audits and overseeing the quality control data generated.

2 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support the remediation of the Site. DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing the definitive data category, as outlined in Guidance for the Data Quality Objectives Process, EPA QA/G-4 (September 1994). All samples will provide definitive data, which are generated using rigorous analytical methods, such as the reference methods approved by the United States Environmental Protection Agency (USEPA). The purpose of this program is to support implementation of the selected remedy by establishing data quality objectives for environmental data collected during remedial activities, including excavation, material management, and site restoration.

Within the context of the purpose stated above, the project DQOs for data collected during the remedial activities are:

- To confirm that remaining soil and groundwater meet remedial action objectives and/or cleanup criteria.
- To verify that excavated areas meet cleanup criteria prior to backfilling.
- To confirm that imported backfill meets requirements for use as cover.
- To properly characterize materials for reuse or off-site disposal.

2.1 QA Objectives for Chemical Data Management

Sample analytical methodology for the media sampled and data deliverables will meet the requirements of the EPA Methods.. Laboratories will be instructed that completed Sample Preparation and Analysis Summary forms are to be submitted with the analytical data packages. The laboratory will also be instructed that matrix interferences must be cleaned up, to the extent practicable. Data Usability Summary Reports (DUSRs) will be generated. In order to achieve the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, and completeness will be measured during offsite chemical analysis.



2.1.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike duplicate (for organics) and matrix duplicates (for inorganics), which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative Percent Difference (RPD) is used to evaluate precision. RPD criteria must meet the method requirements identified in QAPP Section 6.1.

2.1.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. This data help to assess the potential concentration contribution from various outside sources. The laboratory objective for accuracy is to equal or exceeds the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the matrix spike/matrix spike duplicate and matrix spike blank samples. The spike and spike duplicate, which will give an indication of matrix effects that may be affecting target compounds is also a good gauge of method efficiency.

2.1.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represents the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter, which is most concerned with the proper design of the sampling program or sub-sampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives. The sampling procedures have been selected with the goal of obtaining representative samples for the media of concern.

2.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. A DQO for this program is to produce data with the greatest practicable degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Complete field documentation will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, completeness, comparability), because only when precision and accuracy are known can data sets be compared with confidence. In order for data sets may be comparable, it is imperative that contract-required methods and procedures be explicitly followed.

2.1.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is important that appropriate QA procedures be maintained to verify that valid data are obtained in order to meet project needs. For the data generated, a goal of 90% is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC, Inventum, and the 3821 River Road project personnel will determine whether the deviations might cause the data to be rejected.



3 Sampling Locations, Custody, Holding Times, and Analysis

Sample locations and procedures are discussed in the RAWP and the accompanying Tables and Figures of the Site's RAMP. Procedures for chain of custody, holding times and laboratory analyses shall be followed as per SW-846 and as per the laboratory's Quality Assurance Plan. All holding times begin with validated time of sample receipt (VTSR) at the laboratory. The laboratory must meet the method required detection limits which are referenced within the EPA Methods (QAPP Table 1).

In addition, for the emerging contaminants, the laboratory must meet the detection limits for PFAS specified in the NYSDEC's April 2023 *Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Remedial Programs* and 0.28 micrograms per liter (µg/L) for 1,4-Dioxane.

4 Calibration Procedures and Frequency

In order to obtain a high level of precision and accuracy during sample processing procedures laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following section describes the analytical support areas and laboratory instrument calibration procedures.

4.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered; these are detailed in the following paragraphs.

- Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished according to the methods referenced. All standards and standard solutions are to be formally documented (i.e., in a logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparers name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

- Balances - The analytical balances shall be calibrated and maintained in accordance with manufacturer specifications. Calibration is conducted with two Class AS" weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and they must be properly documented in permanently bound logbooks.

- Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised, and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (2 to 6°C for refrigerators) shall be clearly posted on each unit in service.

- Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses and ion-exchange treatment is recommended for inorganic tests.



Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

4.2 Laboratory Instruments

Calibration of instruments is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet established quantitation limits. Each instrument for organic and inorganic analyses shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to specified methods.

In addition to the requirements stated within the analytical methods, the contract laboratory will be required to analyze an additional low-level standard at or near the detection limits. In general, standards will be used that bracket the expected concentration of the samples. This will require the use of different concentration levels, which are used to demonstrate the instrument's linear range of calibration.

Calibration of an instrument must be performed prior to the analysis of any samples and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still calibrated. If the contract laboratory cannot meet the method required calibration requirements, corrective action shall be taken as discussed in QAPP Section 7. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

5 Internal Quality Control Checks

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. Two types of internal checks are performed and are described as batch QC and matrix-specific QC procedures. The type and frequency of specific QC samples performed by the contract laboratory will be according to the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples are presented within the referenced analytical methods.

QC results which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples including any project-specific QC will be analyzed are discussed below.

5.1 Batch QC

Method Blanks - A method blank is defined as laboratory-distilled or deionized water that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - A matrix spike blank (MSB) sample is an aliquot of water spiked (fortified) with all the elements being analyzed for calculation of precision and accuracy to verify that the analysis that is being performed is in control. An MSB will be performed for each matrix and organic parameter only.

5.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of a matrix is spiked with known concentrations of specific compounds as stipulated by the methodology. The matrix spike (MS) and matrix spike duplicate (MSD) are subjected to the entire analytical procedure in order to assess both accuracy and precision of the method for the matrix



by measuring the percent recovery and relative percent difference of the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are analyzed at a frequency of one each per 20 samples per matrix.

Matrix Duplicates - The matrix duplicate (MD) is two representative aliquots of the same sample which are prepared and analyzed identically. The collection of duplicate samples provides for the evaluation of precision both in the field and at the laboratory by comparing the analytical results of two samples taken from the same location. Obtaining duplicate samples from a soil matrix requires homogenization (except for volatile organic compounds) of the sample aliquot prior to filling sample containers, in order to best achieve representative samples. Every effort will be made to obtain replicate samples; however, due to interferences, lack of homogeneity, and the nature of the soil samples, the analytical results are not always reproducible.

Rinsate (Equipment) Blanks - A rinsate blank is a sample of laboratory demonstrated analyte free water passed through and over the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from ambient air and from sample instruments used to collect and transfer samples. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks for nonaqueous matrices should be performed at a rate of 10 percent of the total number of samples collected throughout the sampling event. Rinse blanks will not be performed on samples (i.e., groundwater) where dedicated disposable equipment is used.

Trip Blanks - Trip blanks are not required for nonaqueous matrices. Trip blanks are required for aqueous sampling events. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte free water. These samples then accompany the bottles that are prepared at the lab into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks must return to the lab with the same set of bottles they accompanied to the field. Trip blanks will be analyzed for volatile organic parameters. Trip blanks must be included at a rate of one per volatile sample shipment.

6 Calculation of Data Quality Indicators

6.1 Precision

Precision is evaluated using analyses of a field duplicate and/or a laboratory MS/MSD which not only exhibit sampling and analytical precision but indicate analytical precision through the reproducibility of the analytical results. RPD is used to evaluate precision by the following formula:

$$RPD = \frac{(X1 - X2) \times 100\%}{[(X1 + X2)/2]}$$

Where:

X1= Measured value of sample or matrix spike

X2= Measured value of duplicate or matrix spike duplicate

Precision will be determined through the use of MS/MSD (for organics) and matrix duplicates (for inorganics) analyses.

6.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. The closer the numerical value of the measurement comes to the true value or actual concentration, the more accurate the measurement is. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at known concentrations before analysis. Analytical accuracy may be assessed through the use of known and unknown QC samples and spiked samples. It is presented as percent recovery. Accuracy will be determined from matrix spike, matrix spike duplicate, and matrix spike blank samples, as well as from surrogate compounds added to organic fractions (i.e., volatiles, semi volatiles, PCB), and is calculated as follows:

$$\text{Accuracy (\%R)} = \frac{(Xs - Xu) \times 100\%}{K}$$

Where:

Xs- Measured value of the spike sample

Xu- Measured value of the unspiked sample

K - Known amount of spike in the sample

6.3 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\text{Completeness (\%C)} = \frac{(Xv - Xn) \times 100\%}{N}$$

Where:

Xv- Number of valid measurements

Xn- Number of invalid measurements

N - Number of valid measurements expected to be obtained

7 Corrective Actions

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem shall be filed in the project records, and the information summarized in the case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

7.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. The Inventum Project Manager shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.



7.2 Sample Holding Times

If any sample extraction and/or analyses exceed method holding time requirements, the Inventum Project Manager shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

7.3 Instrument Calibration

Sample analysis shall not be allowed until all initial calibrations meet the appropriate requirements. All laboratory instrumentation must be calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, recalibration must be performed and, if necessary, reanalysis of all samples affected back to the previous acceptable calibration check.

7.4 Reporting Limits

The laboratory must meet the method required detection limits listed in NYSDEC ASP, 10/95 criteria. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory must notify Inventum personnel for problem resolution. In order to achieve those detection limits, the laboratory must utilize all appropriate cleanup procedures in an attempt to retain the project required detection limits. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must document all initial analyses and secondary dilution results. Secondary dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a secondary dilution with no target analytes detected, the Project Manager will be immediately notified so that appropriate corrective actions can be initiated.

7.5 Method QC

All QC method-specified QC samples shall meet the method requirements referenced in the analytical methods. Failure of method-required QC will result in the review and possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed and/or re-extracted/redigested, then reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed and/or re-extracted/redigested, then reanalyzed. Inventum shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

7.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

8 Data Reduction, Validation, and usability

8.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either in a graphic or printed tabular format. Specific data generation procedures and calculations are found in each of the referenced. Analytical results must be reported consistently. Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or USEPA sources. Individuals experienced with a method's particular analysis and knowledgeable of requirements will perform data reduction.



8.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use. All analytical samples collected will receive a limited data review. The data validation will be limited to a review of holding times, completeness of all required deliverables, review of QC results (surrogates, spikes, duplicates) and a 10% check of all samples analyzed to ensure they were analyzed properly. The methods as well as the general guidelines presented in the following documents will be used during the data review USEPA Contract Laboratory Program (CLP) Organic Data Review, SOP Nos. HW-6, Revision #11 and USEPA Evaluation of Metals Data for the Contract Laboratory Program based on 3/90, SOW, Revision XI. These documents will be used with the following exceptions:

- Technical holding times will be in accordance with NYSDEC ASP, 10/95 edition.
- Organic calibration and QC criteria will be in accordance with NYSDEC ASP, 10/95 edition. Data will be qualified if it does not meet NYSDEC ASP, 10/95 criteria.

Where possible, discrepancies will be resolved by the project manager (i.e., no letters will be written to laboratories). A complete analytical data validation is not anticipated. However, if the initial limited data audit reveals significant deviations and problems with the analytical data, project personnel may recommend a complete variation of the data.

Category B deliverables will be provided for all samples collected to delineate the nature and extent of contamination. Inventum will submit all analytical data packages for third-party data validation review. A third-party Data Usability Summary Report (DUSR) will be prepared for each laboratory data package.

9 References

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy, Revision I, October 1989.
- National Enforcement Investigations Center of USEPA Office of Enforcement. NEIC Policies and Procedures. Washington: USEPA.



Appendix D – CAMP

Community Air Monitoring Plan

Tonawanda Coke Corporation

Superfund Site Operable Unit 2

NYSDEC Site #915055/OU2

3875 River Road

Tonawanda, NY 14150

April 11, 2025

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1 Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required.

- *The Tonawanda Coke Superfund Site, Operable Unit 2. (3875 River Road) Site will have a air monitoring program before and during the Remedial Actions (RAWP). If there are detections at the downwind station at or above the action levels, additional monitoring requirements will be considered*[1].
- *Two (2) air monitoring station units (1 Upwind and 2 Downwind) will be mobile and moved as the work area(s) change at the Site.*

Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

- *There are no sensitive receptors on the property. The closest residence is more than 0.25 miles away from the property boundary.*

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

2 Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

- *VOC and particulate monitoring will be incorporated into the RAWP activities.*

Continuous monitoring will be required for all ground intrusive activities during the demolition of contaminated or potentially contaminated structures, installing utility trenches, and during all

[1] The text in *italic font* are comments inserted by Inventum in addition to the standard CAMP Template.

earthmoving, including placement of the cover materials. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include confirmation soil sample collection, import sample collection, groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

- *During sampling (confirmation sampling) periodic monitoring will be implemented with hand-held instruments.*

3 VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

5. The NYSDEC and NYSDOH project managers for the Site will be notified within 24-hours by phone or email if there is an exceedance of the VOC action level of 25 ppm at the perimeter of the work

area as described within Section 3. The notification shall include a description of the control measures implemented to prevent further exceedances.

4 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for New York State (DEC and NYSDOH) and County Health personnel to review.

4. Should the action level of 150 mcg/m3 above the upwind monitoring concentration be exceeded after corrective actions are taken, work must stop and NYDEC and NYSDOH project managers for the Site must be notified within 24-hours by phone or email. The notification shall include a description of the control measures implemented to prevent further exceedances.

Appendix A-1
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;

(b) Measurement Ranges: 0.001 to 400 mg/m^3 (1 to 400,000 :ug/m^3);

(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m^3 for one second averaging; and +/- 1.5 g/m^3 for sixty second averaging;

(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);

(e) Resolution: 0.1% of reading or 1g/m^3, whichever is larger;

(f) Particle Size Range of Maximum Response: 0.1-10;

(g) Total Number of Data Points in Memory: 10,000;

(h) Logged Data: Each data point with average concentration, time/date and data point number

(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;

(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;

(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;

(l) Operating Temperature: -10 to 50° C (14 to 122° F);

(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m^3 (15 minutes average). While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m^3 above the upwind monitoring concentration be exceeded after corrective actions are taken, work must stop and DER and DOH must be notified within one hour. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential-- such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads and demolitions;

(b) Wetting equipment and excavation faces;

(c) Spraying water on buckets during excavation and dumping;

(d) Hauling materials in properly tarped or watertight containers;

(e) Restricting vehicle speeds to 10 mph;

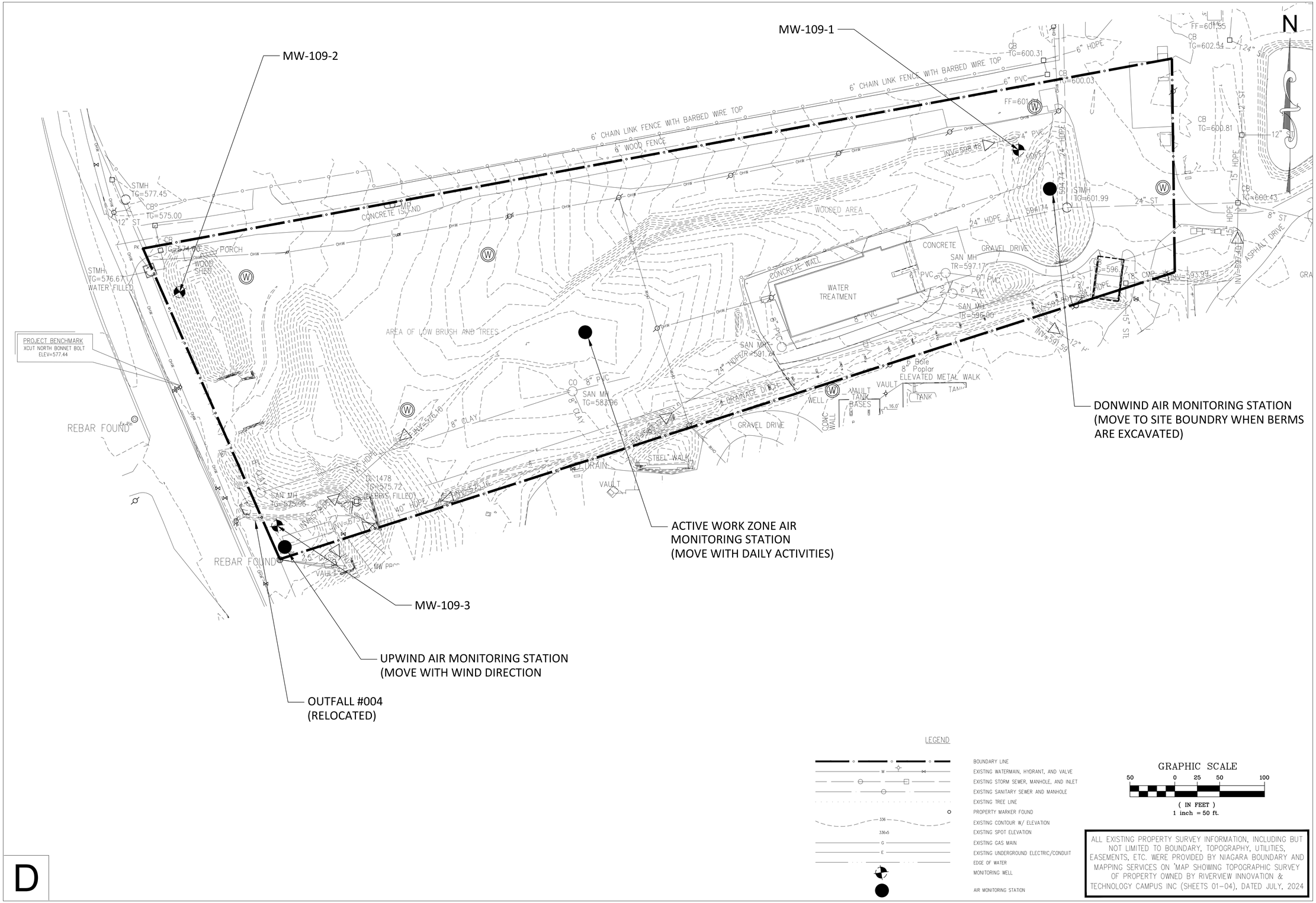
(f) Covering excavated areas and material after excavation activity ceases; and

(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m^3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.



LEGEND

BOUNDARY LINE
EXISTING WATERMAIN, HYDRANT, AND VALVE
EXISTING STORM SEWER, MANHOLE, AND INLET
EXISTING SANITARY SEWER AND MANHOLE
EXISTING TREE LINE
PROPERTY MARKER FOUND
EXISTING CONTOUR W/ ELEVATION
EXISTING SPOT ELEVATION
EXISTING GAS MAIN
EXISTING UNDERGROUND ELECTRIC/CONDUIT
EDGE OF WATER
MONITORING WELL

AIR MONITORING STATION

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

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MONITORING PLAN

SITE 109 (OU2, NYSDEC #915055)

3875 RIVER ROAD

TOWN OF TONAWANDA, NEW YORK

INVENTUM ENGINEERING
441 CARLISLE DRIVE
SUITE C
HERNDON, VIRGINIA 20170
(703) 722-6049
www.InventumEng.com

FIGURE

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Sheet S-16

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Appendix E – Stormwater Design Metrics

Engineer's Report for

Riverview Innovation & Technology Campus

Site 109 – OU2, NYSDEC Site #915055
BCP Site – NYSDEC Site #915353
3821 River Road - NYSDEC Site # C915003
Site 110 - OU1, NYSDEC Site 915055

Prepared for:

Inventum Engineering
441 Carlisle Drive
Herndon, Virginia 20170

Prepared by:

BME ASSOCIATES
ENGINEERS • SURVEYORS • LANDSCAPE ARCHITECTS

10 Lift Bridge Lane East
Fairport, NY 14450
(585) 377-7360

March 11, 2026

BME Project #2968

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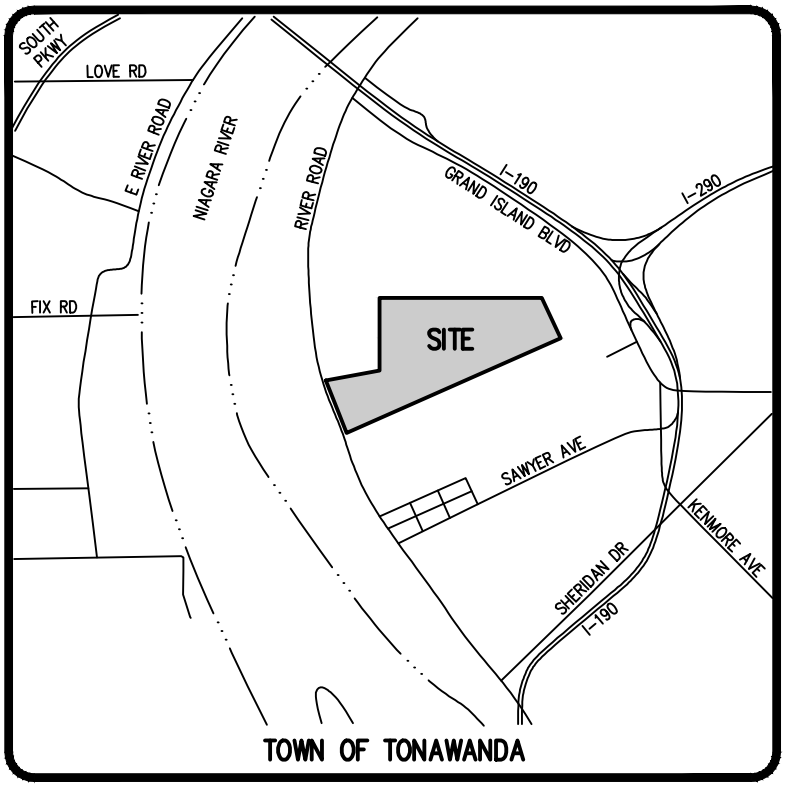


FIGURE 01 – LOCATION MAP

NOT TO SCALE

P:\2968\Drawings\Final\2968 Drainage Base.dwg



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

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BME ASSOCIATES
ENGINEERS • SURVEYORS • LANDSCAPE ARCHITECTS
10 LIFTBRIDGE LANE EAST
FAIRPORT, NEW YORK 14450
WWW.BMEPC.COM
585-377-7360

PROJECT: RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS
LOCATION: TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK STATE
CLIENT: INVENTIUM ENGINEERING
441 CARLISLE DRIVE
HERNDON, VIRGINIA 20170
DRAWING TITLE: AERIAL IMAGE EXHIBIT

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JGC	
SCALE	DATE ISSUED
AS NOTED	DECEMBER 2024

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2968
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FIGURE 02

1. Introduction

The Riverview Innovation and Technology Campus located along River Road in Tonawanda, New York 14150, is undergoing an environmental site remediation and restoration project with the intent to redevelop the properties for new industrial and/or commercial uses. Inventum Engineering contracted with BME Associates to assist in designing some site improvements to enable remediation activities and potential future development.

This report focuses primarily on the remediation sites located to the East of River Road (see Figure 02) including;

1. Site 109 – OU2, NYSDEC Site #915055
2. BCP Site – NYSDEC Site #915353
3. 3821 River Road - NYSDEC Site # C915003
4. Site 110 - OU1, NYSDEC Site 915055

The overall project will ultimately include additional remediation and site improvements located on the property West of River Road which receives runoff from the properties listed above but is not included in the discussions or analysis contained in this report.

5. Site 108 – OU3, NYSDEC Site # 915055

The project is currently served by two existing entrances located along River Road, one in Site 109 and 3821 River Road, which will remain in approximately the same locations for the post developed condition. The proposed road will be designed to accommodate a fire apparatus and full-sized tractor trailer movements.

The site is currently served by public water and sewer services which extend from the River Road right-of-way and east into the property. However, as part of the remediation and site improvements the existing services will be abandoned, removed as necessary, or reconnected to for the new water and sanitary sewer mains to serve the future development.

Stormwater drainage will be managed via installation of a new stormwater management facility, conveyance swales, and culverts. Runoff will be collected and released at controlled rates to the same location as under existing conditions, ultimately discharging into the Niagara River along the western limits of Site 108.

The following report provides the technical data to support the proposed overall development, with a focus on the stormwater management controls. The report also includes discussion on the water and sanitary sewer service, construction erosion control, environmental setting, and other site design components.

2. Water Supply System

The properties to the east of River Road will be supplied by a new private watermain service, which will be extended from the existing public watermains located within the right-of-way. The new watermain will connect to the public water system near the entrance of Site 109 and extend along the proposed loop road to serve the future development and fire hydrants. A new master meter and backflow devices will be provided in a hotbox or vault near the point of connection in Site 109. The approximate location of the new watermain is identified on the construction drawings for Site 109. The final size of the watermain,

meter, and backflow equipment will need to be verified based on the final uses, and the existing public water systems available pressure and flow rates.

Water usage for the entire development, including Site 108, is approximately 33,050 gallons per day and calculations have been included in Appendix 6.

3. Sanitary Sewer System

The properties to the east of River Road will be supplied by a new 8" private sanitary sewer main, which will be extended from the existing public sewer mains located on site near the River Road right-of-way. The new sanitary sewer will connect to the public sewer system near the entrance of Site 109 and extend along the proposed loop road to serve the future development. The initial phase of construction within Site 109 will include construction of the sanitary sewer main, which will be left with a stub near the eastern limits along the BCP Site for future extension through the development area.

Wastewater generated for the entire development, including Site 108, is consistent with the anticipated water usage and is approximately 33,050 gallons per day and calculations have been included in Appendix 6.

4. Stormwater Management Analysis

4.a. Overview

Stormwater runoff associated with the proposed redevelopment project will be treated during and after construction to meet New York State Department of Environment Conservation (NYSDEC) water quality and quantity requirements. This section of the report focuses on the existing and proposed stormwater conditions for the remediation properties located to the east of River Road identified in Section A.

The remediation activities will include construction of a large stormwater management facility which is intended to detain and treat stormwater runoff from the eastern portion of the future development areas before being released downstream toward River Road and ultimately through Site 108 to the Niagara River. Due to the properties previous use and required remediation activities, infiltration of surface water into the subsoils should be avoided, which limits the use of some of the green infrastructure measure typically used with development and redevelopment. However, the properties redevelopment is intended to result in a decrease in impervious surfaces at the project site over 25% from its pre-remediation and redevelopment activities to satisfy the water quality requirements.

The stormwater management plan for the project is designed in accordance with the current rules and regulations set in the NYSDEC Stormwater Management Design Manual (July 2024) and the current SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-25-001).

The post construction stormwater controls for the proposed development have been designed with 30% green space being provided within the developable areas, exclusive of the loop road, adjacent lawn areas, stormwater management facility (SWMF), substation area, and known building and access areas for the large building located on the BCP property. See Figure 08 in Appendix 4 for the assumed land cover areas under post developed conditions.

The final design and development of the properties located to the east of River Road will need to be reviewed for compliance against the assumptions within this report for the overall stormwater management outlined. Additional stormwater quantity or quality controls may be required based upon the final development configuration.

4.b. Methodology

The NYSDEC Stormwater Management Design Manual provides specifications and sizing criteria for stormwater management practices for stormwater discharges. The proposed stormwater management for this project has been designed to meet the five key criteria outlined in the Design Manual:

- Water quality volume (WQv) to meet pollutant removal goals;
- Runoff reduction volume (RRv) by application of runoff reduction practices to replicate pre-development flows;
- Channel protection volume (Cpv) to reduce channel erosion;
- Overbank flood protection (Qp) to prevent overbank flooding; and
- Extreme storm protection (Qf) to help control extreme floods.

The proposed site modifications are classified as a redevelopment project considering the disturbance of an existing developed site with existing impervious surface areas per the New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activities, General Permit Number GP-0-25-001 (General Permit), and the 2024 New York State Stormwater Management Design Manual (SWDM) "Chapter 9 – Redevelopment - Projects" guidelines. Given the anticipated site disturbance of over 1 acre of land area, the site development must address Water Quality Volume (WQv), Runoff Reduction (RRv) and Water Quantity criteria per the SWDM "Chapter 9 – Redevelopment - Projects" guidelines.

The quality criteria, WQv and RRv, will be satisfied by reduction of existing impervious surfaces on the property by more than 25%. The quantity criteria, Cpv, Qp, and Qf, will be satisfied by construction of a large stormwater management facility, which will collect post development runoff from a portion of the project site before releasing it at controlled rates to the downstream areas.

There are two existing storm sewers which convey stormwater runoff from the property to the south, and through 3821 River Road, to Analysis Point A. No modifications to the offsite drainage area are proposed, and the runoff entering the project area from the adjacent property will continue to be bypassed under the post development conditions utilizing the existing pipes or pipes with equivalent conveyance capacity if relocation of the pipes is necessary.

The existing and proposed drainage conditions at the project site were analyzed following the methods outlined in Soil Conservation Service Technical Release No. 20 & 55. Peak runoff rates for existing and post-development conditions were modeled for the 1, 2, 5, 10, 25, 50, and 100-year design storm events using the HydroCAD V10.20-5c software. Runoff rates were determined based on the hydrologic characteristics of the site (soil conditions, existing and proposed land cover, time of concentration for the contributing drainage areas) and the hydraulic characteristics of the proposed stormwater management facility (type of storage, size of facility and outlet structure features and sizing as applicable). Twenty-four (24) hour extreme storm event precipitation amounts were obtained from Northeast Regional Climate Center online web tool and have been included in Appendix 1 for reference. Appendix 2 contains the stormwater hydrographs and subarea information. These stormwater hydrograph reports show the subarea routings, subarea data, stormwater management facility and outlet structure sizing, estimated detention times, storage volumes, peak ponding elevations, and discharge rates.

4.c. Soils

The Natural Resources Conservation Service (NRCS) indicates the project sites contain soils primarily listed as Urban Land (Ud), which doesn't have a hydrologic soil classification. There are some small

areas of hydrologic soil D along the southern and eastern most site limits consisting of Cayuga silt loam (CfB & CfC), Lakemont silt loam (La), and Odessa silt loam (Od & Oe). A soils map has been included as Figure 03 in Appendix 1 for reference.

For purposes of the analysis contained within this report all the Urban Land soils have been evaluated as hydrologic soil class D. This is supported by test pits which confirm an underlying clay layer and relatively shallow groundwater elevation compared to surface grades and by field observations which indicate poor water infiltration in several locations from standing water for a period after a rain event occurs.

4.d. Existing Conditions

The analyzed watershed for the project area east of River Road, totals approximately 134.2 acres and under existing conditions consists of 2 analysis points and 4 drainage areas (see Figure 4 in Appendix 2). The analysis points are described below, followed by existing subarea information (Table 1), detailed subarea discussions, and information regarding the hydrologic modeling of the existing stormwater ponds/structures relevant to the stormwater quantity analysis.

Analysis Point A
Analysis Point A was selected at the inlet of the existing box culvert located along the River Road right-of-way limits on the eastern portion of Site 109. This analysis point receives runoff directly from most of the development area allowing for a comparison between pre and post condition peak flow rates. Once runoff flows past the analysis point and through the existing box culvert below River Road, it is conveyed through Site 108 and ultimately into the Niagara River. This subarea also receives runoff from the property south of the development properties which is bypassed through 3821 River Road in an existing 36" and 48" culverts and discharges immediately upstream of Analysis Point A.

Analysis Point B
Analysis Point B was selected as the entire southern property limits of 3821 River Road and the BCP Site. The entire property limits were selected for the analysis point because the post developed conditions will reduce the area and runoff flowing offsite generally long the entire length, and this allows for comparison between pre and post condition peak flow rate. Runoff flowing past the Analysis Point B Limits and on the adjacent property eventually reaches two existing culverts which convey it back through 3821 River Road and toward Analysis Point A.

Table 1: SCS Hydrologic Data, Existing Conditions

Subarea	Area	Curve Number (CN)	Time of Concentration (Tc)
Ex Subarea A-1	31.5 acres	89	18.2 min
Ex Subarea A-2	40.1 acres	96	24.5 min
Ex Subarea A-3	51.0 acres	93	88.9 min
Ex Subarea B-1	11.6 acres	85	8.0 min

Ex Subarea A-1 (31.5 acres)
This subarea consists of the western portion of the properties including a majority of Site 109 and 3821 River Road, and a small portion of the BCP Site. This subarea consists of impervious surfaces from previous industrial use, brush, and lawn areas. Runoff from this subarea begins as sheet flow in the western portion before concentrating and reaching the existing drainage swales in Site 109 or through the

existing storm sewer located with 3821 River Road. Runoff eventually is conveyed through this subarea west toward River Road and through an existing box culvert (Analysis Point A), before flowing through site 108 and reaching the Niagara River.

Ex Subarea A-2 (40.1 acres)
This subarea consists of the central portion of the BCP Site. This subarea consists of primarily impervious surfaces from the former industrial uses, with some small lawn areas along the drainage swales. Runoff from this subarea begins as sheet flow in the western portion before concentrating into the existing stormwater swales and flowing west to a small kidney shaped pond, west of Site 109. Runoff entering the small pond is discharged through an outlet pipe and into the existing drainage swale along the southern limits of Site 109, before reaching the box culvert below River Road (Analysis Point A). This pond functions as a settling basin for stormwater runoff before being discharged from it. See below for additional information regarding the hydrologic modeling of the kidney shaped pond.

Ex Subarea A-3 (51.0 acres)
This subarea consists of the northern part of the BCP Site, western portion of Site 110, and some offsite area to the north which flows into the property. The portion of this subarea within the project limits consists of primarily impervious surfaces from the former industrial uses, with some small lawn areas along the drainage swales, and brush areas in the eastern portion. The offsite area which drains into the project site is brush. Runoff from this subarea begins as sheet flow before concentrating into the existing stormwater swales or being collected in some of the existing storm sewers in this area. Runoff from this subarea is directed toward a collection pit where several storm sewers route to, before being discharged through a 24" culvert. See below for additional information regarding the hydrologic modeling of the collection sump. The outfall culvert conveys runoff south into Site 109, where it enters an existing water quality facility composed of multiple cells. This structure was previously used by the industrial use as a settling basin for stormwater runoff before being discharged downstream and doesn't provide any substantial stormwater storage volume or attenuation of flows before being discharged from it. Runoff leaving the facility is routed through a 24" pipe which discharges into the existing drainage swale along the southern limits of Site 109, before reaching the box culvert below River Road (Analysis Point A).

Ex Subarea B-1 (11.6 acres)
This subarea consists of the southern portions of 3821 River Road and the BCP Site, which drain directly off the property to the south. This subarea consists of impervious surfaces from the former industrial uses and brush areas. Runoff from this subarea begins as sheet flow and generally flows south offsite onto the adjacent property into a brush/wetland area located within an overhead utility corridor. To allow for comparison to post developed conditions the entire southern property limits were selected as Analysis Point B. Runoff flowing onto the adjoining property from Ex Subarea B, eventually flows west along the utility corridor and enters one of two existing culverts, which convey runoff through 3821 River Road and discharge near Analysis Point A.

Hydrologic Model Discussion for Existing Conditions
The existing conditions hydrologic model includes two existing pond nodes to model the existing kidney shaped pond (Ex Kidney Pond) in the western portion of Ex Subarea A-2, and the existing collection sump (Ex Collection Sump) in the northwest corner of Ex Subarea A-3.

The existing kidney pond serves as a settling basin for stormwater runoff in Ex Subarea A-2, which is generally conveyed to it via overland flow and existing drainage ditches. This facility doesn't provide any substantial storage volume between the normal ponding and adjacent surface grades within its immediate limits. However, the elevation at which this facility would overflow would require ponding through a large portion of the contributing drainage swales and relatively flat upper areas of the drainage before it would be able to overflow. In effect, this additional upstream storage, which appears as surface storage or water stored in the upper limits of the subgrade soils does provide a large amount of storage volume,

allowing the facility to attenuate existing flows and discharge all storm events through its existing 12" outlet pipe. To model this configuration the storage volume for the facility was entered into the HydroCAD pond node for this facility, but the top 1' of storage modeled the surface area was increased beyond the immediate pond area. Modeling it with this configuration allows the model to function consistently with observed field conditions and results in a lower peak discharge rate to Analysis Point A for a conservative estimate and more restrictive design criteria.

The existing collection sump located at the northwest corner of the site functions similarly to the existing kidney pond. This collection sump is the converging location for several drainage pipes within Subarea A-3, which all are discharged through an existing 24" outlet pipe which routes to the existing water quality treatment unit in Site 109. This sump provides minimal storage within it compared to the contributing drainage area, however the upstream swales and surface areas in this subarea provide additional storage volume which allows for the structure to attenuate existing flows. Similarly to the kidney pond, the top 1' of storage modeled for the collection sump structure was greatly increased, allowing the model to function consistently with observed field conditions, which results in a lower peak discharge rate to Analysis Point A for a conservative estimate and more restrictive design criteria. As noted above the existing water quality unit within Site 109 doesn't provide any attenuation of flows and therefore was excluded from the hydrologic modeling for the existing conditions.

4.e Proposed Conditions

The drainage subareas for the post-development conditions (see Figure 05 in Appendix 2) have been delineated per the proposed grading of the site development and assumed final land cover conditions (See Figure 08 in Appendix 2). The proposed subareas are based on assumptions provided in this report and will require verification per the final development plans. The analyzed drainage area includes approximately 134.2 acres, which matches the existing conditions, and is composed of 3 subareas. Drainage under the proposed conditions will continue to drain toward the analysis points to allow for a comparison to pre-development flow rates. Table 2 below provides a summary of the proposed subareas, which are described in further detail following the table.

Table 2: SCS Hydrologic Data, Proposed Conditions

Subarea	Area	Curve Number (CN)	Time of Concentration (Tc)
Pr Subarea A-1	32.8 acres	91	22.1 min
Pr Subarea A-2	93.5 acres	91	25.1 min
Pr Subarea B-1	7.9 acres	86	7.2 min

Pr Subarea A-1 (32.8 acres)
This subarea contains the western portion of the overall development area including a majority of Site 109, 3821 River Road, and a small portion the BCP Site. The post developed condition for this subarea is assumed to have 70% impervious area and 30% lawn area for all areas excluding the proposed road corridor (impervious and adjacent lawn area) and areas within the River Road right-of-way. Runoff from this subarea under post developed conditions will flow westward via the proposed road corridor or future storm sewers and reach Analysis Point A. No post construction stormwater quantity controls area proposed within the subarea at this time, however the final developed condition will need to be re-evaluated to confirm compliance with the stormwater quantity requirements.

Pr Subarea A-2 (93.5 acres)
This subarea will include the majority of the BCP Site. The post developed condition for this subarea based on the proposed development and future potential development areas assumed to have 70% impervious area and 30% lawn area. Runoff from this subarea will be collected via a proposed drainage swale along the east and northern limits of the property, the proposed road corridor, and other storm sewers installed during the final site development. Runoff from this subarea will be directed to a large stormwater management facility located along the western limits of the BCP site. The stormwater facility will be capable of detaining greater than the 100-year storm event and releasing the runoff downstream through a proposed storm sewer system through Site 109, toward Analysis Point A.

Pr Subarea B-1 (7.9 acres)
This subarea includes the southern area between the proposed road and southern property limits within 3821 River Road and the BCP Site, and the eastern substation in the southeast corner of the project area. Runoff from this area will continue to sheet flow over the southern property limits, Analysis Point B, to allow for comparison to predevelopment flow rates. This subarea is consistent with Existing Subarea B-1, and runoff will flow west after passing Analysis Point B, and eventually being conveyed back through 3821 River Road in culverts toward Analysis Point A. Reconfiguration of the bypass culverts within 3821 River Road may be necessary based on the final post development condition, however flows will continue to be conveyed from the property south through the site toward Analysis Point A.

4.f Proposed Stormwater Management Facility

The proposed remediation and redevelopment activities will include one new stormwater management facility (SWMF), which will be located along the western limits within the BCP Site and constructed as a Wet Pond (P-2), per the 2015 NYSDEC SWDM. As described previously this facility will receive runoff from a majority of the BCP site (PR Subarea A-2). Runoff entering the SWMF will be treated and attenuated before being released through an engineered outlet structure and a new storm sewer system within Site 109, to Analysis Point A near the River Road right-of-way limits.

The facility will detain and treat the post-development runoff and discharge it toward Analysis Point A. Sufficient storage volume is provided in the facilities to effectively detain the 1, 2, 5, 10, 25, 50 and 100-year storms and release them to Analysis Point A at controlled rates, to reduce the total peak runoff for the overall project. The outlet structure is designed to control the rate at which runoff is discharged from the site, ensuring that runoff rates will remain at or below those for the existing conditions. The outlet structure consists of a 15” outlet pipe, a 12” inverted pipe extending into the stormwater facility’s deep pool, and a 24” x 24” flat outlet grate. The 12” inverted pipe will discharge runoff from the bottom of the deep pool where it cooler in temperature. Details of the outlet structure are also provided on the design plans. The facility also includes a 60’ wide spillway which was set approximately 3’ above the 100-year ponding elevation and will allow the facility to release runoff in the case of an extreme rain event exceeding the storage volume of the facility. Table 3 below contains the ponding elevation and outflow data for each SWMF.

Table 3: - Stormwater Management Facility (SWMF) Summary

Design Storm Event	Post-Dev. Inflow (cfs)	Post Deve. Outflow (cfs)	Time to Peak Outflow (hrs)	Ponding Elevation (ft)	Storage Volume Used (cf)
1-yr	76.82	3.59	15.82	591.40	893,575
2-yr	98.24	4.43	16.28	591.87	973,560
5-yr	128.82	5.31	16.38	592.47	1,079,738
10-yr	158.32	5.74	16.75	593.03	1,184,563
25-yr	206.48	6.11	17.54	593.92	1,359,098
50-yr	249.40	6.43	18.18	594.73	1,525,507
100-yr	301.89	6.77	18.75	595.63	1,720,337
15” Outlet Pipe Elev Inv Elev.	589.00		Total Available Storage Volume @ Elev = 601.50 (cf)		2,542,547
12” Inverted Pipe Inv Elev.	590.00				
2’x2’ Grate Elev.	594.00				
Spillway Elev.	599.50				
Top of Berm Elev.	591.5 - 592.00				

4.g. Stormwater Quantity Results:

The calculations provided within the appendices show that the proposed project does not result in an increase to stormwater runoff rates at the Analysis Point A or B, for both the 10-year (Qp) and 100-year (Qf) events as required by the NYSDEC Stormwater Design Manual quantity criteria.

A summary of the existing vs. proposed runoff rates at the Analysis Point has been summarized with Table 4 below.

Table 4: Comparison of Existing and Proposed Peak Runoff Rates at Analysis Points

	Design Storm	Existing Peak Runoff Rate (cfs)	Proposed Peak Runoff Rate (cfs)
Analysis Point A	1	30.60	29.79
	2	40.12	38.69
	5	53.02	50.90
	10	**65.50**	**62.43**
	25	86.05	81.12
	50	104.00	97.59
	100	**125.58**	**117.60**
Analysis Point B	1	10.01	7.79
	2	14.16	10.79
	5	19.51	14.63
	10	**24.78**	**18.41**
	25	33.87	24.90
	50	41.78	30.48
	100	**51.58**	**37.40**

4.h. Channel Protection:

The 2015 NYSDEC Stormwater Design Manual Chapter 4 defines the CPv requirement as extended detention of the post-developed 1-Year, 24-hour storm event. This requirement is intended to protect stream channels from erosion. Since the project is considered a redevelopment, the Chapter 9 criteria for Channel Protection may be applied, which states,

"Channel protection for redevelopment activities is not required if there are no changes to hydrology that increase the discharge rater from the project site. This criterion as defined in Chapter 4 of this Manual, is not based on a pre versus post-development comparison. However, for redevelopment activities this requirement is relaxed. If the hydrology and hydrologic analysis for the project site shows that the post-construction 1-year 24 hour discharge rate and velocity are less than or equal to the pre-construction discharge rate, providing 24 hour detention of the 1-year storm to meet the channel protection criteria is not required".

The peak flow rates identified at Analysis Point A and B in the previous sections are both less under proposed conditions than existing, and therefore the channel protection criteria for the project are satisfied.

However, the SWMF will attenuate peak flow rates during the 1-year storm event and release the runoff over a period greater than 24 hours, and therefore the facility will be providing Channel Protection Volume for the project although not required. To show compliance with the standards in Chapter 4 if this project was considered all new development, the required Channel Protection Volume was calculated based upon the property limits within the proposed subareas (see Figure 06 in Appendix 3). The calculated volume is provided in the SWMF located within the BCP Site (Subarea A-2) between the maintained water elevation (590.00) and grate elevation (594.00).

The channel protection volume calculations are provided in Appendix 3 and summarized below.

CPv Required if entirely new development = 83,699 cf
CPv Provided in SWMF = 701,885 cf

4.i. Stormwater Quality:

The August 2015 NYSDEC Stormwater Management Design Manual outlines numerous practices that can be constructed to improve the water quality and reduce the runoff volume of stormwater runoff. Reduced Runoff Volume (RRv) is the reduction of the total Water Quality Volume (WQv) by application of green infrastructure techniques and standard management practices to replicate pre-development hydrology. The intent of the green infrastructure measures is to replicate the pre-construction infiltration, peak runoff flow and discharge volume, as well as minimization of concentrated flow by using runoff control techniques to provide treatment in a distributed manner before runoff reaches offsite discharge locations.

As discussed previously, the proposed site modifications are classified as a redevelopment project per the NYSDEC 2015 SWDM, Chapter 9, and therefore the project must satisfy the Water Quality criteria (RRv and WQv) identified there. This project proposed to utilize Option I in Chapter 9.2.1.B, which states,

"The plan proposed a reduction of existing impervious cover by a minimum of 25% of the total disturbed, impervious area. A reduction in site imperviousness will reduce the volume of stormwater runoff, thereby achieving, at least in part, stormwater criteria for water quality and quantity."

The previous industrial uses of the properties created a large amount of asphalt and compacted gravel areas throughout a majority of the site, totaling approximately 100.1 acres (to Analysis Point A & B). The proposed remediation and future development the property will are anticipated to reduce the existing impervious surfaces to approximately 77.65 acres (to Analysis Point A & B, based on the assumptions for the final land cover conditions, which is a 22.4% reduction from existing. It is anticipated the total future development will not reach 77.65 acres of impervious surfaces within the analyzed drainage areas and therefore satisfies the Chapter 9 quality criteria for WQv and RRV. Figure 07 and 08 in Appendix 4 identify the assumed land cover utilized for the existing and proposed conditions, which were determined based upon historical photos, current aerial drone imagery (Figure 02), and on-site observation.

The total impervious surfaces created will need to be verified with the final development plans and additional RRv practices may be required if the final development does not reduce the impervious area compared to existing by more than 25%

Although the WQv criteria is anticipated to be satisfied via reduction of the total impervious surfaces on site, the SWMF proposed for the project will provide additional WQv in the forebay and deep pool areas, totaling approximately 524,036 cf. The information regarding water quality is summarized below.

Stormwater Quality Summary

Existing Impervious (within drainage analyzed Drainage Areas) = 100.10 acres
Proposed Impervious (within drainage analyzed Drainage Areas) = 77.65 acres
Percent Impervious Reduction = 22.4%
WQv Required = N/A, criteria satisfied since reduction of impervious cover is anticipated to be >25%
RRv Required = N/A, criteria satisfied since reduction of impervious cover is anticipated to be >25%
WQv Provided in SWMF = 524,036 cf

Additional WQv or RRv practices may be necessary depending on the final development plans, which will need to be verified based upon these assumptions.

4.j. Stormwater Quantity and Quality Analysis and Results:

The calculations provided within the appendices show the proposed project results in a reduction of stormwater runoff rates at the Analysis Points for both the 10-year and 100-year events as required by the NYSDEC Stormwater Design Manual quantity criteria. The previous sections showed the project also satisfies all key criteria including Qp, Qf, CPv, WQv, and RRv. These values have been summarized in Table 5 below.

Table 5. Compliance with NYSDEC Sizing Requirements

New York Stormwater Sizing Criteria	**Compliance**
Overbank Flood Protection (Qp) *Control peak discharge from 10-year storm to 10-year pre-development rates*	Analysis Point A **62.43** cfs (Proposed) < **65.50** cfs (Existing) **OK** Analysis Point B **18.41** cfs (Proposed) < **24.78** cfs (Existing) **OK**
Extreme Storm Protection (Qf) *Control peak discharge from 100-year storm to 100-year pre-development rates*	Analysis Point A **117.60** cfs (Proposed) < **125.58** cfs (Existing) **OK** Analysis Point B **37.40** cfs (Proposed) < **51.58** cfs (Existing) **OK**
Channel Protection Volume (CPv)	Post 1-year discharge < Existing 1-year discharge, therefore CPv criteria is satisfied. **OK** CPv Provided in SWMF = 701,885 cf
Water Quality Volume (WQv)	N/A, criteria satisfied since reduction of impervious cover is anticipated to be >25% **OK**
Runoff Reduction Volume (RRv)	N/A, criteria satisfied since reduction of impervious cover is anticipated to be >25% **OK**

Based on the above information, the proposed stormwater management design for the project satisfies the key criteria of the Stormwater Management Design Manual guidelines and will require a five-day Notice of Intent review to acquire permit coverage from NYSDEC under General Permit GP-0-25-001.

The final design and development of the properties located to the east of River Road will need to be reviewed for compliance against the assumptions within this report for the overall stormwater management outlined. Additional stormwater quantity or quality controls may be required based upon the final development configuration.

5. Storm Sewers

The development will include installation of storm sewers through the property to collect and convey stormwater runoff to the proposed SWMF and analysis points. The storm sewers located from the SWMF's outlet structure, and through Site 109 along the access drive will be installed with the initial phases of redevelopment and have been sized the stormwater discharges from the SWMF and the assumed drainage areas which drain into the proposed road and will be collected by the new gutter inlets. Appendix 5 contains the stormwater calculations and assumed drainage areas (Figure 09). Rip rap calculations were also completed for the proposed end section near Site 109.

Sizing for the storm sewers along the proposed loop road, substation area, and +/-495,000 sf building (BCP Site and 3821 River Road) has been also included in Appendix 5. Additional storm sewers will be necessary with the future development areas, however they will need to be designed based upon the final use and configuration of the property.

6. Erosion and Sediment Control

The property is currently undergoing remediation activities and a SWPPP may already be in place for site disturbances. All work on site should be completed to minimize erosion to the downstream areas (Analysis Points A & B), and the contractors should implement any additional erosion control measures necessary based on field conditions to prevent erosion in accordance with the New York Standards and Specifications for Erosion and Sediment Control. A 5-acre waiver will be required for the project if not already obtained through an existing SWPPP.

The proposed stormwater management facility and an erosion control plan have been designed to control sediment runoff and provide water quality treatment during and after the site construction. As required by the NYSDEC, the project will include a Stormwater Pollution Prevention Plan (SWPPP), if not already in place, that will combine the design presented in this report and on the plans with the requirements of NYSDEC GP-0-25-001 to outline how the owner will address the construction and post construction stormwater condition. The construction erosion control plan has been designed per the New York Standards and Specifications for Erosion and Sediment Control. The SWMF will be used as a settling basin for stormwater runoff during construction. After development the SWMF permanent pools volumes should be verified, and any accumulated sediment should be removed. The erosion control practices proposed are shown on the design plans and detailed on the detail sheets. The details are per the New York State Standards and Specifications for Erosion and Sediment Control.

Additional erosion control measures will be implemented during construction to control silt and minimize disturbance to the existing swales and drainage conditions. Typical practices include the installation and maintenance of silt fence, stone check dams, rip rap outlet protection, and filter fabric inlet protection. The disturbed areas will be seeded and mulched as soon as possible to control erosion. Pipe outlet control rip-rap measures are also proposed with the storm sewer system. A stabilized construction entrance will also be installed near the right-of-way limits to access the site during construction.

The design plans include a general sequence of construction however due to the remediation activities which may be required on site, order of site operations is subject to change. The contractor should review the proposed improvement activities and sequence with the site engineers to ensure appropriate erosion control measures are in place for any areas actively being worked in or susceptible to erosion.

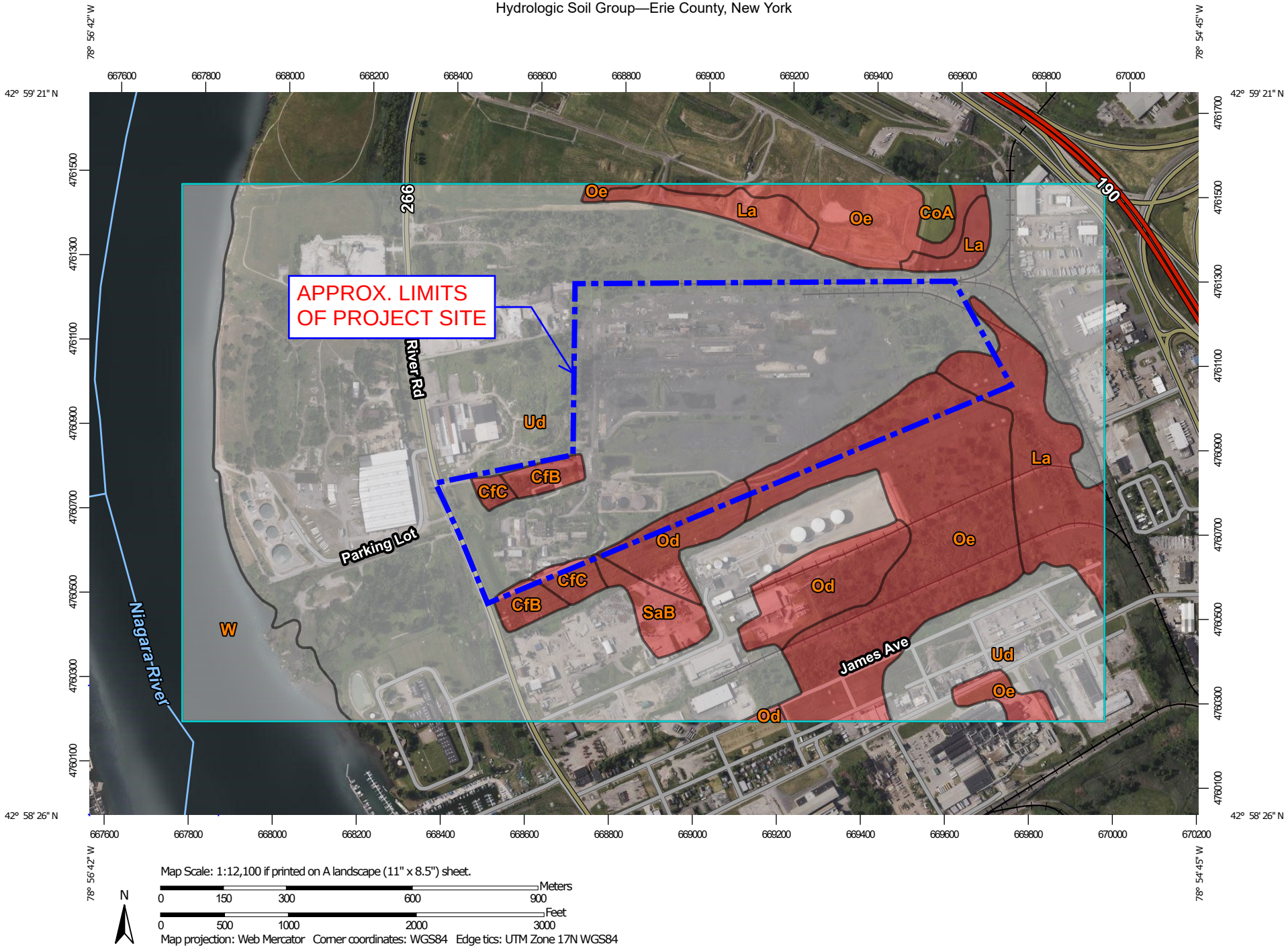
The final component of the erosion control plan will be maintenance. The contractor will be responsible for installing the erosion control features, as well as maintaining and replacing them as necessary throughout construction. An owner's representative will review the erosion control measures to determine their efficiency, need for replacement, or need for additional measures. The SWPPP for the project is to be kept on-site throughout the soil disturbing activities and until groundcover is established.

Appendix 1
Background Information

Figure 03 – Soil Map
Northeast Regional Climent Center Extreme Precipitation Events

Figure 03 - Soil Map

Hydrologic Soil Group—Erie County, New York



Map Scale: 1:12,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

Soil Survey Area: Erie County, New York
Survey Area Data: Version 24, Aug 25, 2024

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

Date(s) aerial images were photographed: May 9, 2022—Aug 15, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CfB	Cayuga silt loam, 3 to 8 percent slopes	D	6.3	0.9%
CfC	Cayuga silt loam, 8 to 15 percent slopes	D	4.4	0.6%
CoA	Churchville silt loam, 0 to 3 percent slopes	C/D	2.6	0.4%
La	Lakemont silt loam, 0 to 3 percent slopes	D	37.0	5.3%
Od	Odessa silt loam, 0 to 3 percent slopes	D	25.6	3.7%
Oe	Odessa-Lakemont complex, 0 to 3 percent slopes	D	84.2	12.1%
SaB	Schoharie silt loam, 3 to 8 percent slopes	D	6.7	1.0%
Ud	Urban land		480.5	69.2%
W	Water		46.8	6.7%
Totals for Area of Interest			**694.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

Smoothing	Yes
State	New York
Location	New York, United States
Latitude	42.983 degrees North
Longitude	78.928 degrees West
Elevation	180 feet
Date/Time	Thu Dec 19 2024 15:19:16 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.66	0.82	1.00	**1yr**	0.71	0.92	1.12	1.33	1.55	1.78	2.08	**1yr**	1.58	2.00	2.40	2.90	3.38	**1yr**
2yr	0.30	0.46	0.57	0.75	0.94	1.16	**2yr**	0.81	1.06	1.31	1.57	1.85	2.17	2.46	**2yr**	1.92	2.36	2.78	3.30	3.79	**2yr**
5yr	0.35	0.55	0.68	0.92	1.17	1.45	**5yr**	1.01	1.32	1.64	1.95	2.27	2.62	2.99	**5yr**	2.32	2.88	3.35	3.95	4.51	**5yr**
10yr	0.39	0.62	0.78	1.07	1.39	1.72	**10yr**	1.20	1.57	1.95	2.30	2.66	3.04	3.47	**10yr**	2.69	3.34	3.87	4.53	5.16	**10yr**
25yr	0.47	0.74	0.95	1.31	1.74	2.16	**25yr**	1.50	1.96	2.44	2.86	3.27	3.68	4.23	**25yr**	3.26	4.06	4.68	5.43	6.15	**25yr**
50yr	0.53	0.85	1.09	1.53	2.06	2.57	**50yr**	1.78	2.33	2.90	3.37	3.83	4.27	4.91	**50yr**	3.78	4.72	5.41	6.23	7.03	**50yr**
100yr	0.60	0.98	1.26	1.79	2.44	3.05	**100yr**	2.11	2.77	3.44	3.98	4.48	4.95	5.70	**100yr**	4.38	5.48	6.25	7.16	8.04	**100yr**
200yr	0.70	1.13	1.47	2.11	2.91	3.63	**200yr**	2.51	3.30	4.08	4.69	5.24	5.74	6.63	**200yr**	5.08	6.37	7.23	8.22	9.20	**200yr**
500yr	0.83	1.37	1.79	2.61	3.66	4.56	**500yr**	3.15	4.16	5.12	5.84	6.46	7.00	8.09	**500yr**	6.19	7.78	8.77	9.87	10.99	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.22	0.34	0.42	0.56	0.69	0.82	**1yr**	0.59	0.80	0.87	1.11	1.37	1.60	1.84	**1yr**	1.41	1.77	2.19	2.67	3.04	**1yr**
2yr	0.28	0.44	0.54	0.73	0.90	1.03	**2yr**	0.77	1.01	1.14	1.39	1.67	2.07	2.34	**2yr**	1.84	2.25	2.69	3.17	3.63	**2yr**
5yr	0.32	0.49	0.61	0.83	1.06	1.22	**5yr**	0.91	1.19	1.34	1.63	1.97	2.39	2.68	**5yr**	2.11	2.57	3.10	3.57	4.07	**5yr**
10yr	0.35	0.53	0.66	0.92	1.19	1.37	**10yr**	1.03	1.34	1.51	1.83	2.21	2.63	2.94	**10yr**	2.33	2.83	3.45	3.88	4.41	**10yr**
25yr	0.39	0.59	0.74	1.05	1.38	1.59	**25yr**	1.19	1.56	1.75	2.11	2.55	2.97	3.30	**25yr**	2.63	3.17	3.94	4.28	4.87	**25yr**
50yr	0.42	0.64	0.80	1.14	1.54	1.77	**50yr**	1.33	1.74	1.94	2.34	2.83	3.25	3.58	**50yr**	2.87	3.45	4.36	4.59	5.22	**50yr**
100yr	0.45	0.69	0.86	1.24	1.70	1.98	**100yr**	1.47	1.94	2.16	2.60	3.14	3.54	3.85	**100yr**	3.14	3.71	4.81	4.90	5.58	**100yr**
200yr	0.49	0.74	0.94	1.36	1.90	2.21	**200yr**	1.64	2.16	2.40	2.87	3.47	3.86	4.13	**200yr**	3.42	3.97	5.29	5.20	5.93	**200yr**
500yr	0.55	0.81	1.05	1.52	2.16	2.54	**500yr**	1.86	2.48	2.73	3.25	3.93	4.32	4.48	**500yr**	3.82	4.31	5.97	5.55	6.35	**500yr**

Upper Confidence Limits

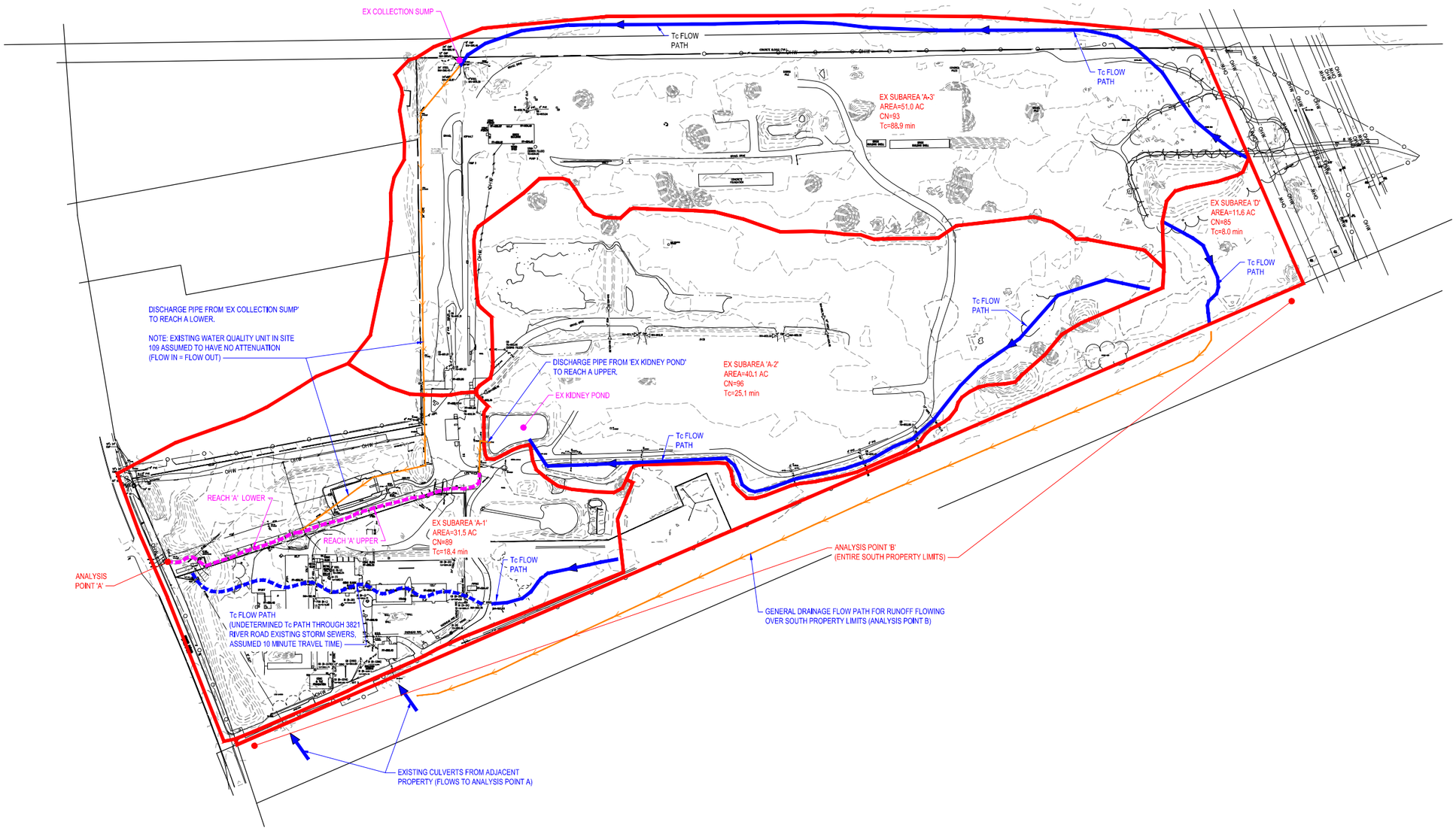
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.30	0.46	0.57	0.76	0.94	1.08	**1yr**	0.81	1.05	1.20	1.44	1.73	1.95	2.36	**1yr**	1.72	2.27	2.60	3.11	3.70	**1yr**
2yr	0.31	0.48	0.59	0.80	0.99	1.13	**2yr**	0.85	1.11	1.26	1.53	1.84	2.26	2.58	**2yr**	2.00	2.48	2.88	3.46	3.98	**2yr**
5yr	0.38	0.59	0.74	1.01	1.28	1.49	**5yr**	1.11	1.46	1.65	2.01	2.41	2.87	3.31	**5yr**	2.54	3.18	3.60	4.35	5.00	**5yr**
10yr	0.46	0.71	0.88	1.22	1.58	1.84	**10yr**	1.36	1.80	2.04	2.48	2.97	3.45	4.02	**10yr**	3.06	3.86	4.28	5.18	5.97	**10yr**
25yr	0.59	0.89	1.11	1.59	2.09	2.45	**25yr**	1.80	2.39	2.72	3.29	3.91	4.42	5.20	**25yr**	3.91	5.00	5.40	6.55	7.55	**25yr**
50yr	0.70	1.07	1.33	1.91	2.57	3.03	**50yr**	2.22	2.96	3.37	4.06	4.81	5.33	6.32	**50yr**	4.72	6.08	6.44	7.84	9.05	**50yr**
100yr	0.84	1.28	1.60	2.31	3.17	3.75	**100yr**	2.73	3.67	4.18	5.02	5.93	6.41	7.70	**100yr**	5.67	7.40	7.69	9.38	10.82	**100yr**
200yr	1.01	1.52	1.93	2.80	3.90	4.64	**200yr**	3.36	4.54	5.20	6.21	7.29	7.71	9.36	**200yr**	6.83	9.00	9.20	11.23	12.97	**200yr**
500yr	1.30	1.93	2.48	3.61	5.13	6.15	**500yr**	4.43	6.01	6.91	8.21	9.58	9.87	12.13	**500yr**	8.73	11.67	11.65	14.28	16.44	**500yr**

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Northeast Regional Climate Center

Appendix 2
Stormwater Quantity

Figure 04 – Existing Conditions Drainage Exhibits
Figure 05 – Proposed Conditions Drainage Exhibits
Stormwater Hydrographs

P:\2968\Drawings\Final\2968 Drainage Base.dwg



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)
1 inch = 200 ft.

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BME Associates

Drawing Alteration
The following is an excerpt from the New York State Education Law Article 145 Section 7209 and applies to this drawing:
"It is a violation of this law for any person, unless he is acting under the direction of a licensed professional engineer or land surveyor to alter any item in any way. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration."

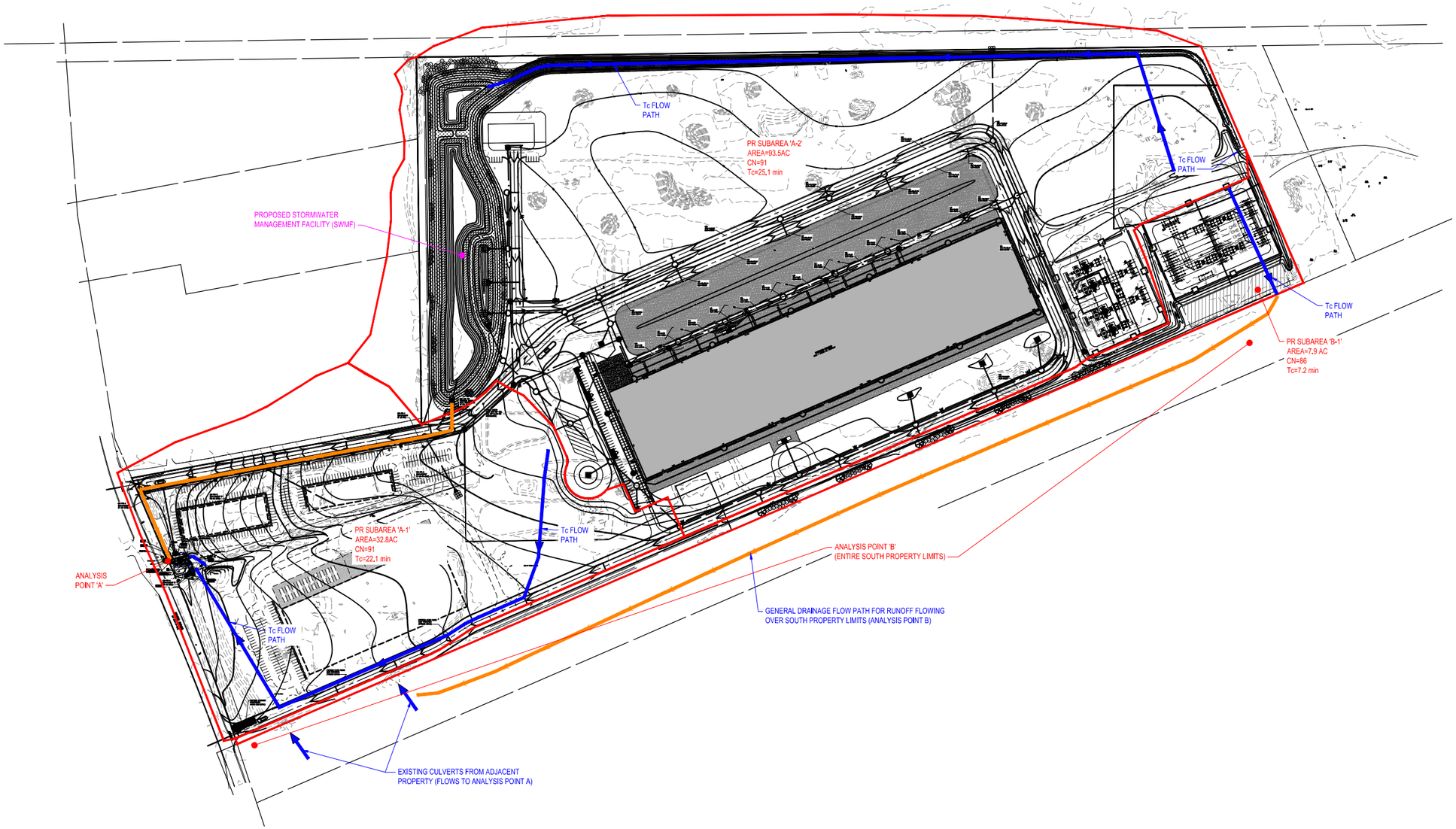
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6			
5			
4			
3			
2			
1			
	REVISIONS	DATE	BY

BME ASSOCIATES
ENGINEERS • SURVEYORS • LANDSCAPE ARCHITECTS
10 LIFTBRIDGE LANE EAST
FAIRPORT, NEW YORK 14450
WWW.BMEPC.COM
585-377-7360

PROJECT: RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS
LOCATION: TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK STATE
CLIENT: INVENTIUM ENGINEERING
441 CARLISLE DRIVE
HERNDON, VIRGINIA 20170
DRAWING TITLE: EXISTING DRAINAGE CONDITIONS

PROJECT MANAGER	
PGV	
PROJECT ENGINEER	
JGC	
DRAWN BY	
JGC	
SCALE	DATE ISSUED
AS NOTED	DECEMBER 2024
PROJECT NO.	
2968	
DRAWING NO.	
FIGURE 04	

P:\2968\Drawings\Final\2968 Drainage Base.dwg



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

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Drawing Alteration
The following is an excerpt from the New York State Education Law Article 145 Section 7209 and applies to this drawing:
"It is a violation of this law for any person, unless he is acting under the direction of a licensed professional engineer or land surveyor to alter any item in any way. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration."

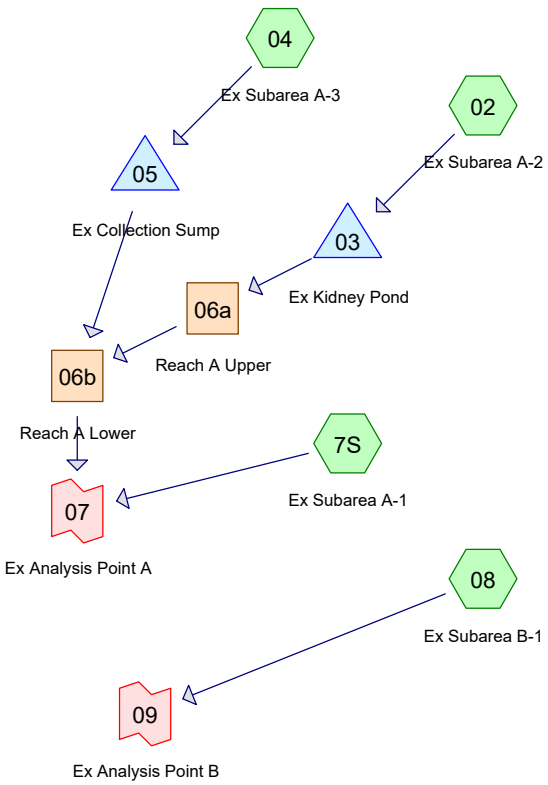
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1			
	REVISIONS	DATE	BY

BME ASSOCIATES
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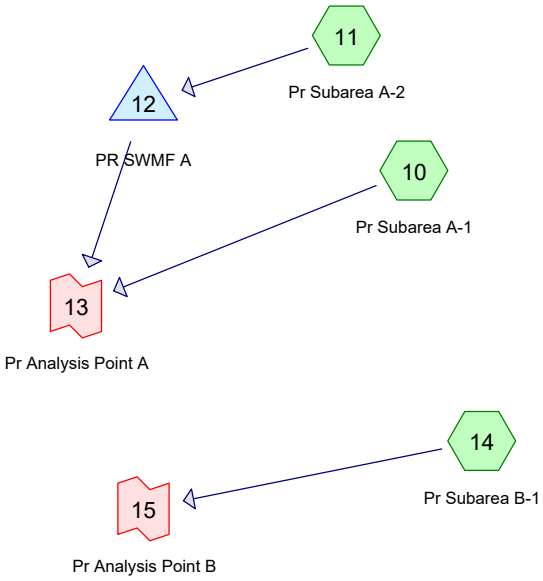
PROJECT: RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS
LOCATION: TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK STATE
CLIENT: INVENTIUM ENGINEERING
441 CARLISLE DRIVE
HERNDON, VIRGINIA 20170
DRAWING TITLE: PROPOSED DRAINAGE CONDITIONS

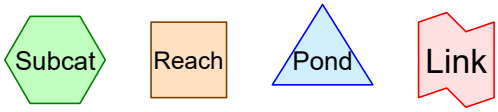
PROJECT MANAGER	
PGV	
PROJECT ENGINEER	
JGC	
DRAWN BY	
JGC	
SCALE	DATE ISSUED
AS NOTED	DECEMBER 2024
PROJECT NO.	
2968	
DRAWING NO.	
FIGURE 05	

EXISTING DRAINAGE



PROPOSED DRAINAGE





Routing Diagram for 2968 Drainage 2026-03-09
Prepared by BME Associates, Printed 3/11/2026
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2968 Drainage 2026-03-09

Prepared by BME Associates

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	project rain 24-hr S1	1-yr	Default	24.00	1	1.78	2
2	2-yr	project rain 24-hr S1	2-yr	Default	24.00	1	2.17	2
3	5-yr	project rain 24-hr S1	5-yr	Default	24.00	1	2.62	2
4	10-yr	project rain 24-hr S1	10-yr	Default	24.00	1	3.03	2
5	25-yr	project rain 24-hr S1	25-yr	Default	24.00	1	3.67	2
6	50-yr	project rain 24-hr S1	50-yr	Default	24.00	1	4.26	2
7	100-yr	project rain 24-hr S1	100-yr	Default	24.00	1	4.93	2

Summary for Subcatchment 02: Ex Subarea A-2

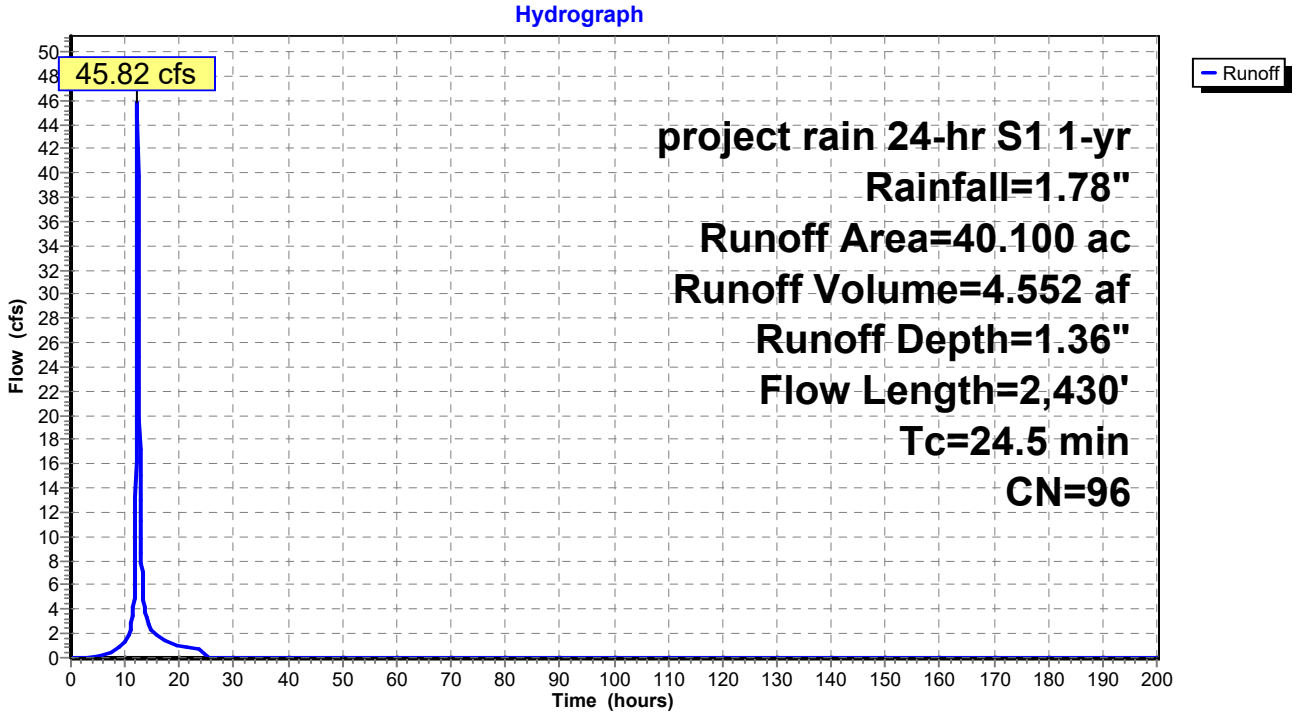
Runoff = 45.82 cfs @ 12.28 hrs, Volume= 4.552 af, Depth= 1.36"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 1.36" for 1-yr event
Inflow = 45.82 cfs @ 12.28 hrs, Volume= 4.552 af
Outflow = 7.18 cfs @ 13.09 hrs, Volume= 4.547 af, Atten= 84%, Lag= 48.4 min
Primary = 7.18 cfs @ 13.09 hrs, Volume= 4.547 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.11' @ 13.09 hrs Surf.Area= 2.146 ac Storage= 2.318 af

Plug-Flow detention time= 204.4 min calculated for 4.545 af (100% of inflow)
Center-of-Mass det. time= 205.9 min (1,015.4 - 809.5)

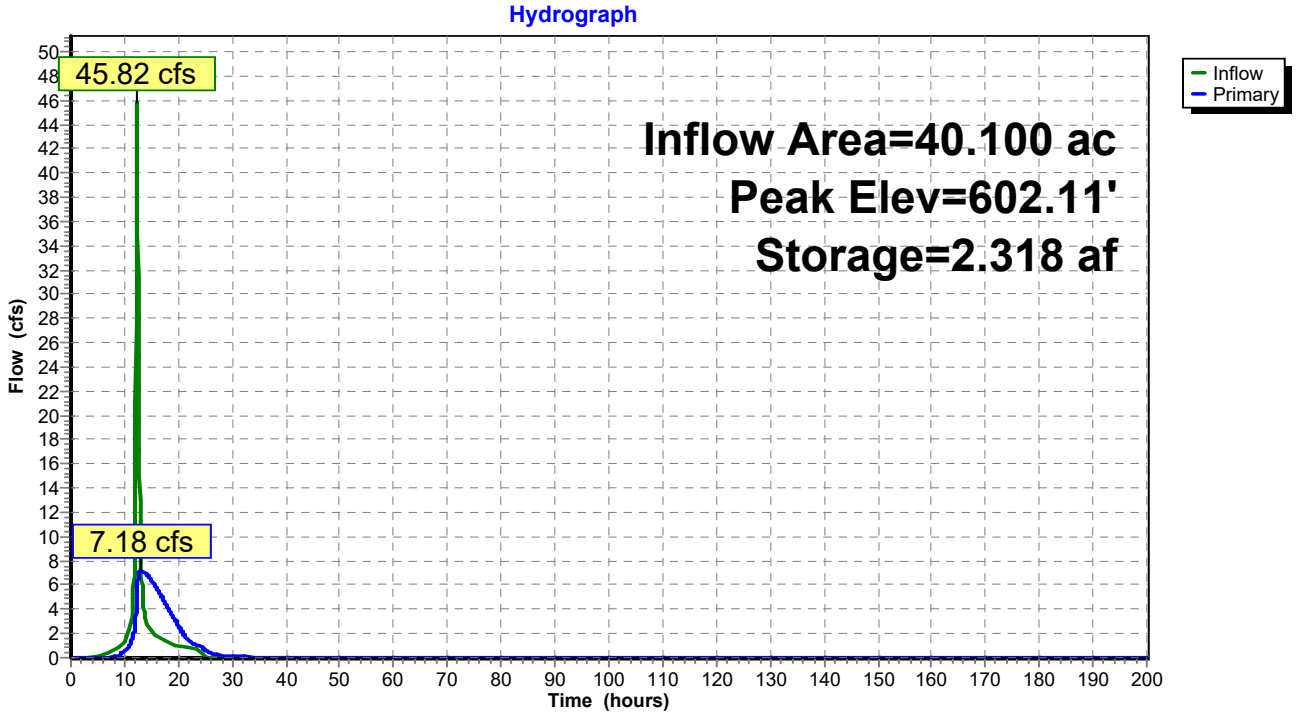
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.18 cfs @ 13.09 hrs HW=602.11' TW=598.27' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.18 cfs of 9.21 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.18 cfs @ 9.14 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

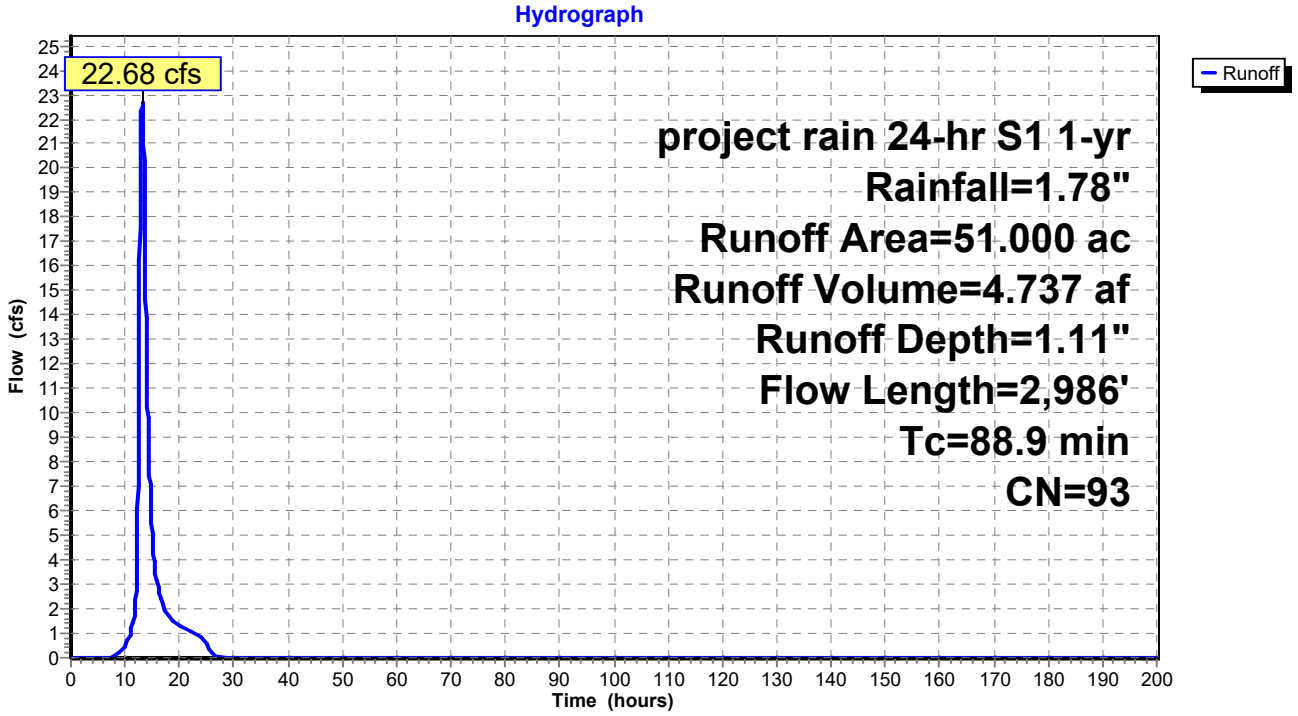
Runoff = 22.68 cfs @ 13.15 hrs, Volume= 4.737 af, Depth= 1.11"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 1.11" for 1-yr event
Inflow = 22.68 cfs @ 13.15 hrs, Volume= 4.737 af
Outflow = 8.94 cfs @ 14.29 hrs, Volume= 4.706 af, Atten= 61%, Lag= 68.9 min
Primary = 8.94 cfs @ 14.29 hrs, Volume= 4.706 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 598.57' @ 14.29 hrs Surf.Area= 1.000 ac Storage= 2.118 af

Plug-Flow detention time= 333.2 min calculated for 4.706 af (99% of inflow)
Center-of-Mass det. time= 329.0 min (1,220.2 - 891.2)

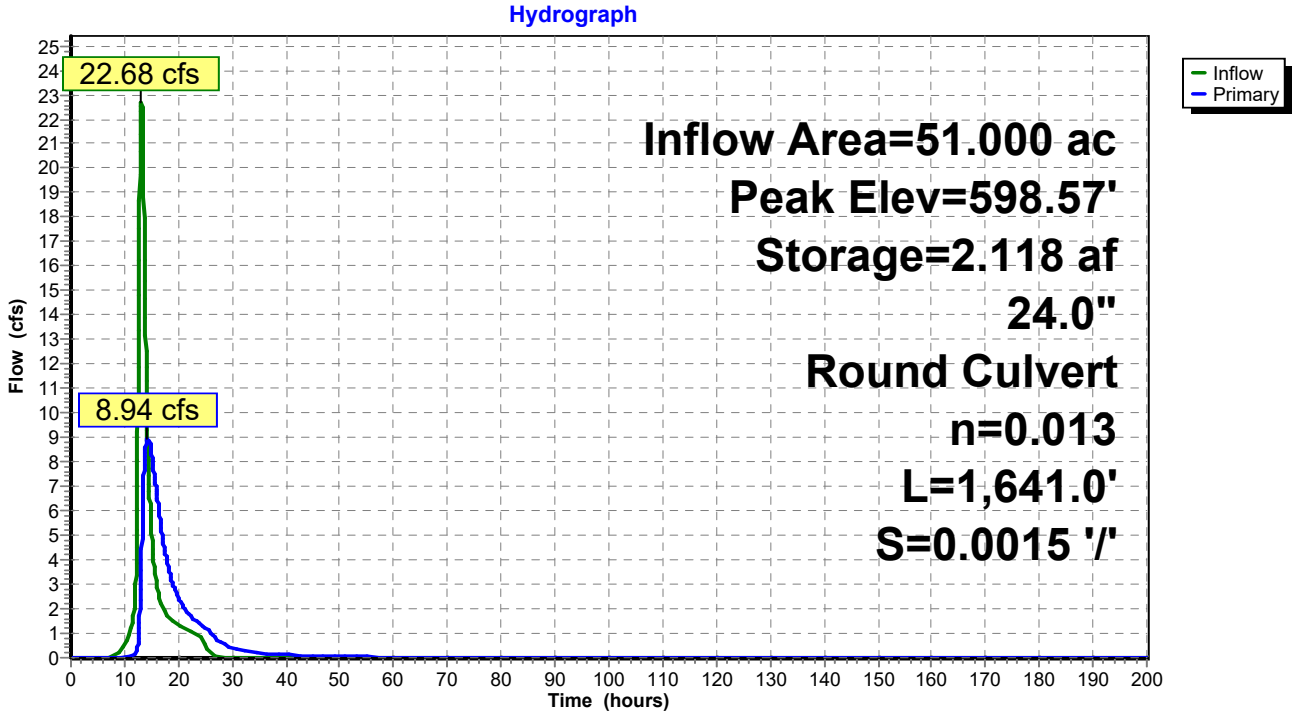
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.94 cfs @ 14.29 hrs HW=598.57' TW=584.05' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 8.94 cfs @ 3.34 fps)

Pond 05: Ex Collection Sump



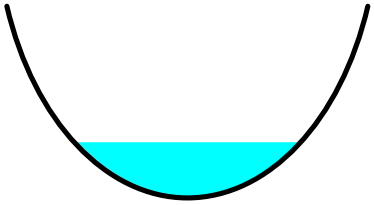
Summary for Reach 06a: Reach A Upper

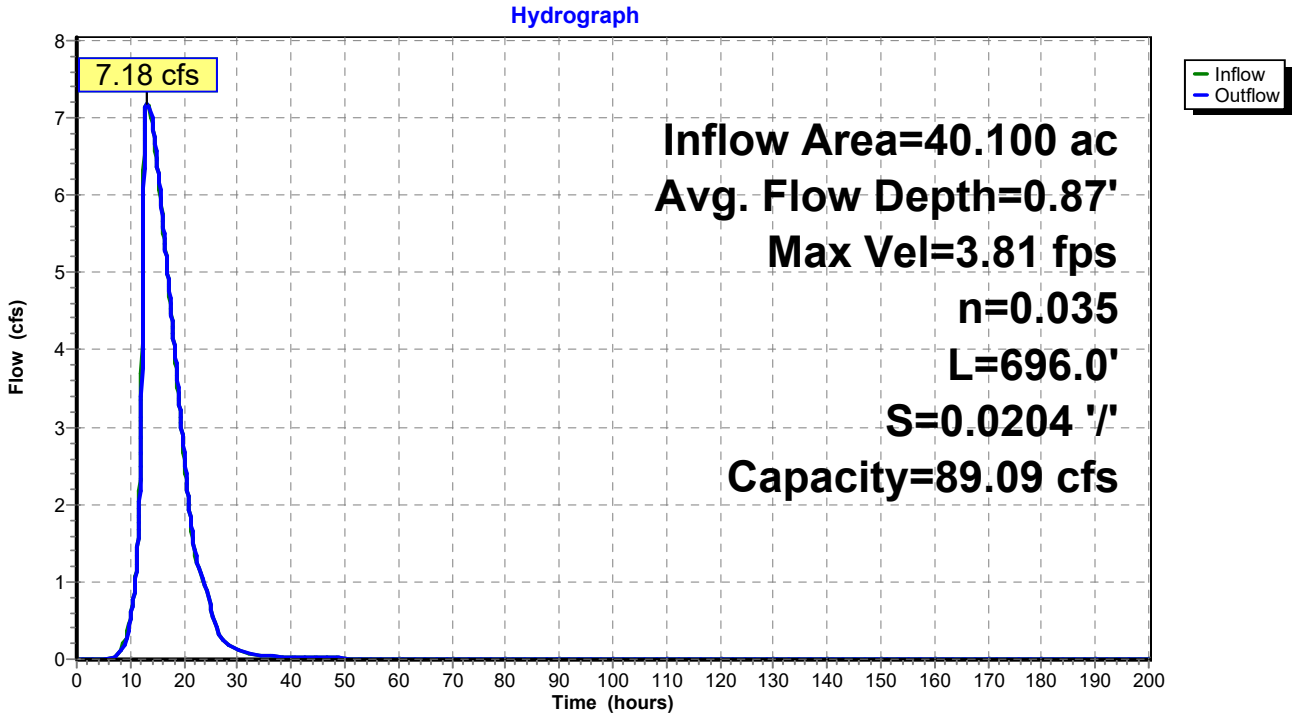
Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 1.36" for 1-yr event
Inflow = 7.18 cfs @ 13.09 hrs, Volume= 4.547 af
Outflow = 7.18 cfs @ 13.13 hrs, Volume= 4.547 af, Atten= 0%, Lag= 2.3 min
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 16.3 min

Peak Storage= 1,311 cf @ 13.13 hrs
Average Depth at Peak Storage= 0.87' , Surface Width= 3.24'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'





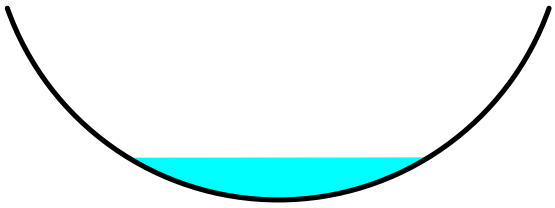
Summary for Reach 06b: Reach A Lower

Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 1.22" for 1-yr event
Inflow = 15.82 cfs @ 14.14 hrs, Volume= 9.253 af
Outflow = 15.82 cfs @ 14.16 hrs, Volume= 9.253 af, Atten= 0%, Lag= 1.2 min
Routed to Link 07 : Ex Analysis Point A

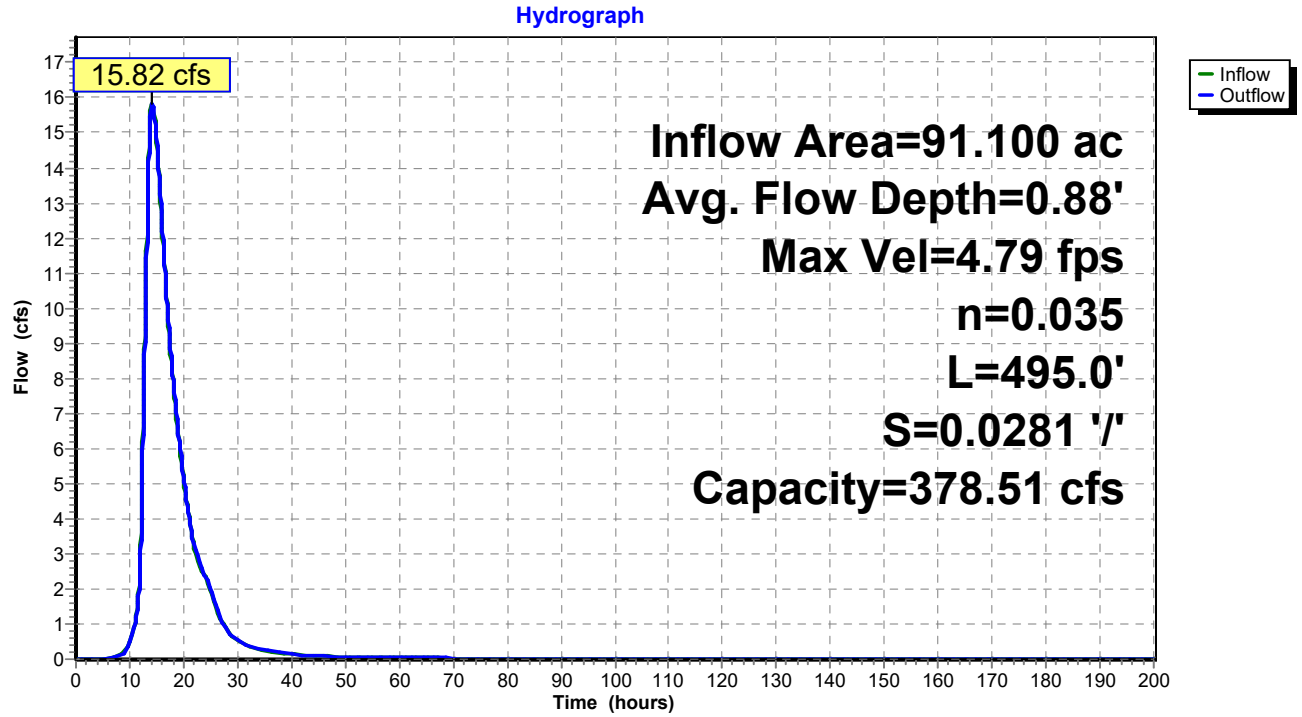
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.79 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 8.4 min

Peak Storage= 1,634 cf @ 14.16 hrs
Average Depth at Peak Storage= 0.88' , Surface Width= 5.63'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



Reach 06b: Reach A Lower

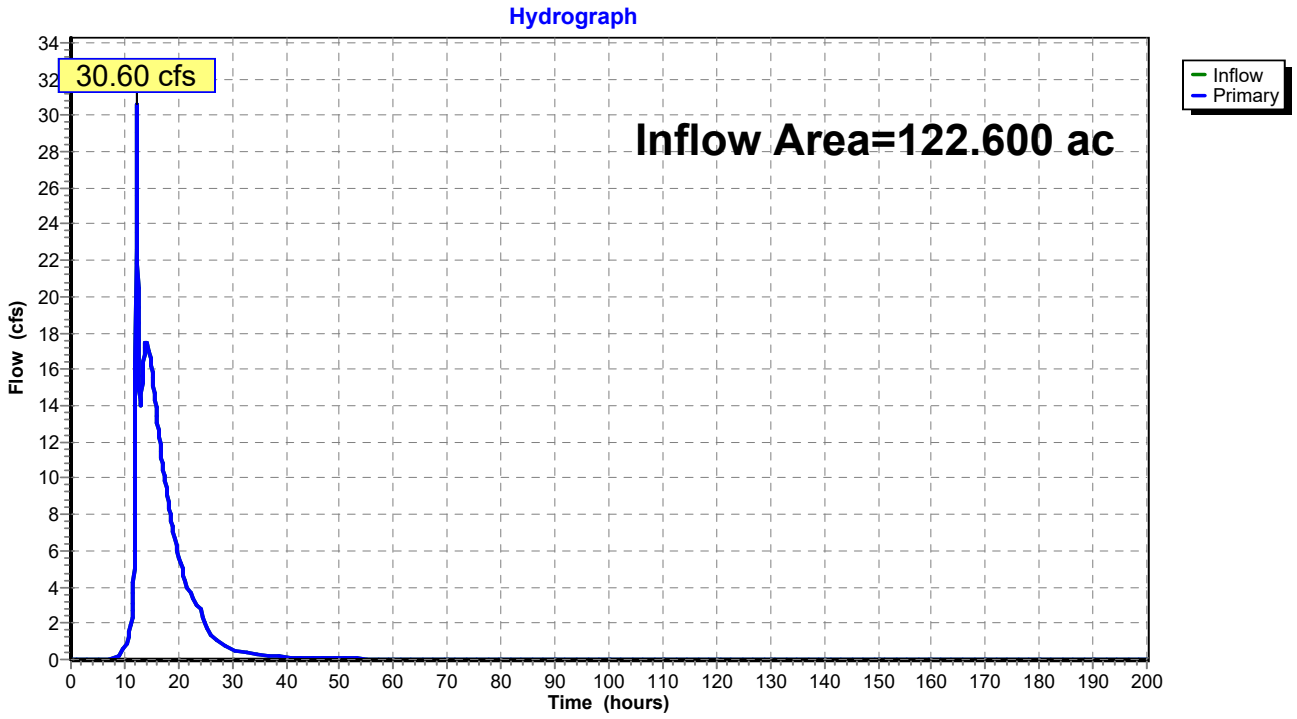


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 1.12" for 1-yr event
Inflow = 30.60 cfs @ 12.22 hrs, Volume= 11.480 af
Primary = 30.60 cfs @ 12.22 hrs, Volume= 11.480 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

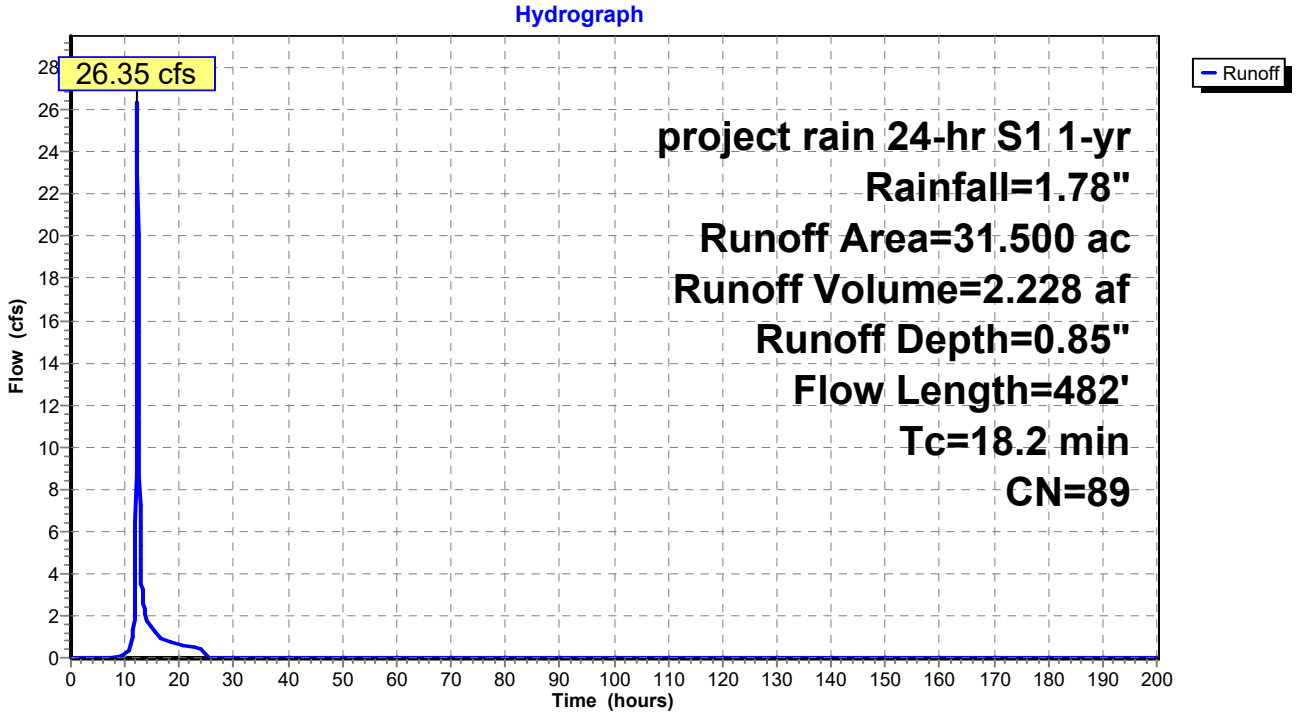
Runoff = 26.35 cfs @ 12.21 hrs, Volume= 2.228 af, Depth= 0.85"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

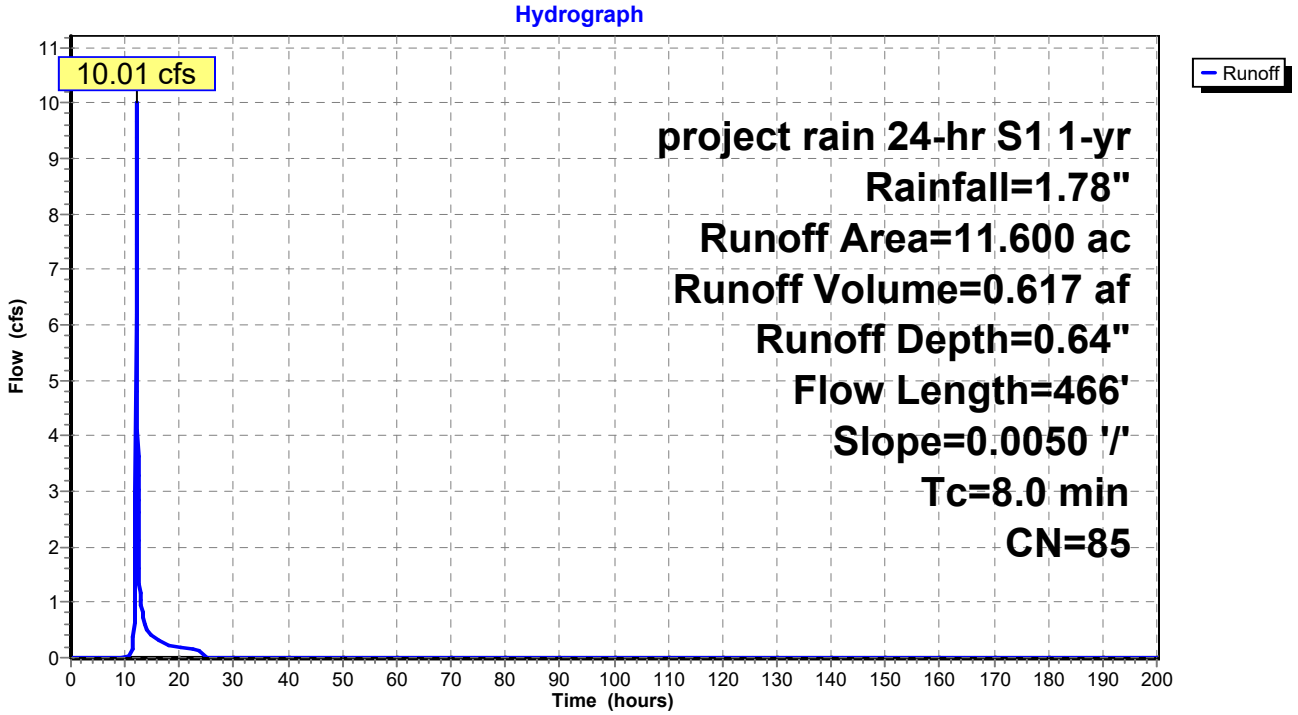
Runoff = 10.01 cfs @ 12.07 hrs, Volume= 0.617 af, Depth= 0.64"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

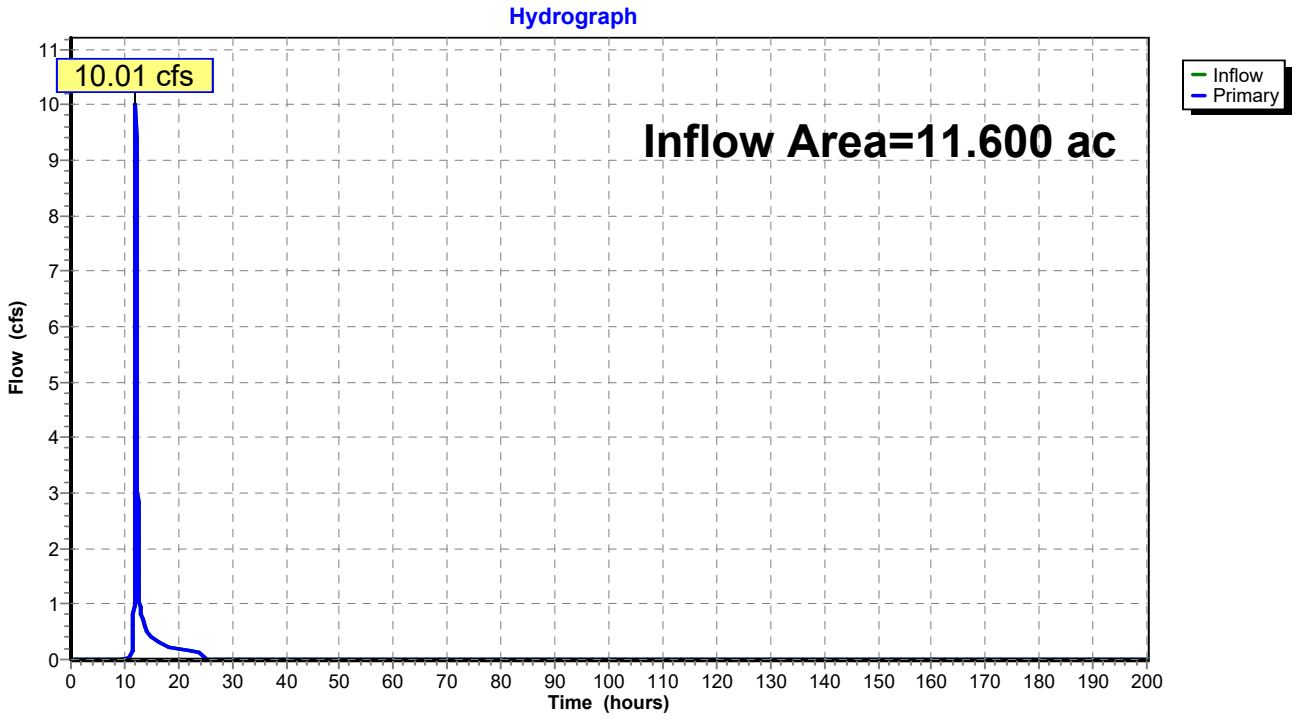


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 0.64" for 1-yr event
Inflow = 10.01 cfs @ 12.07 hrs, Volume= 0.617 af
Primary = 10.01 cfs @ 12.07 hrs, Volume= 0.617 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

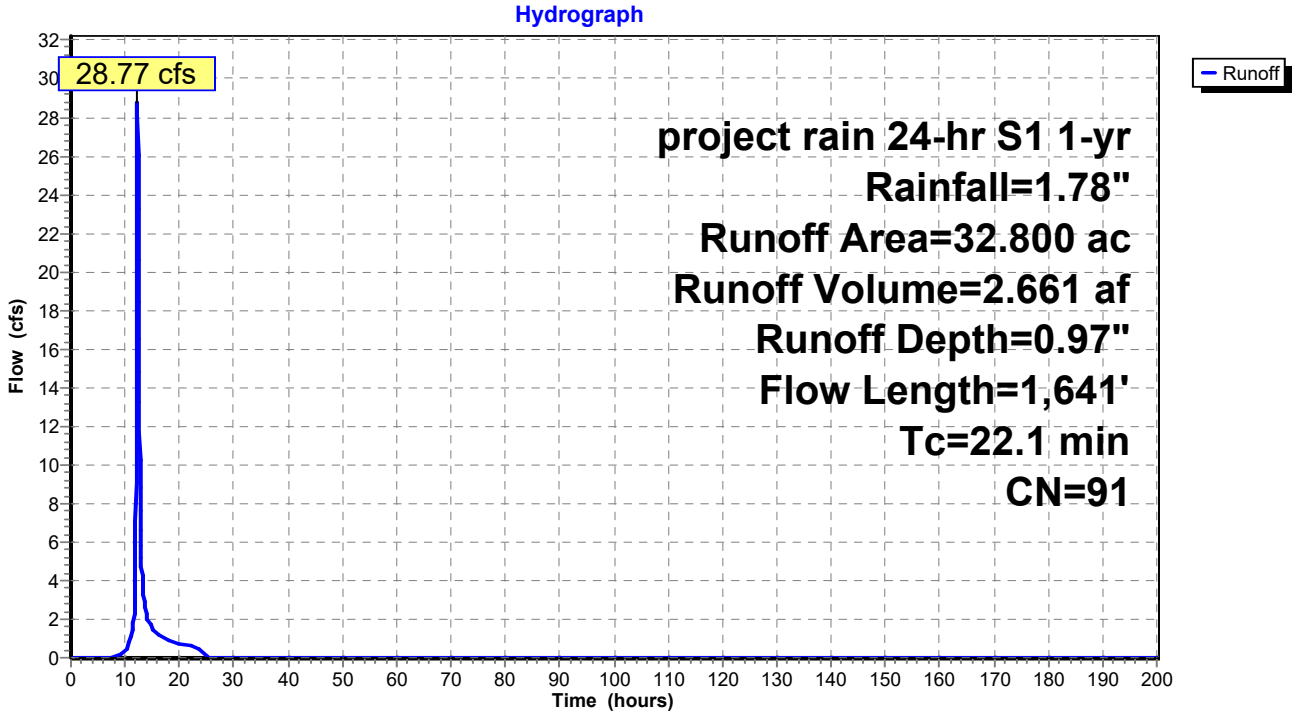
Runoff = 28.77 cfs @ 12.26 hrs, Volume= 2.661 af, Depth= 0.97"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

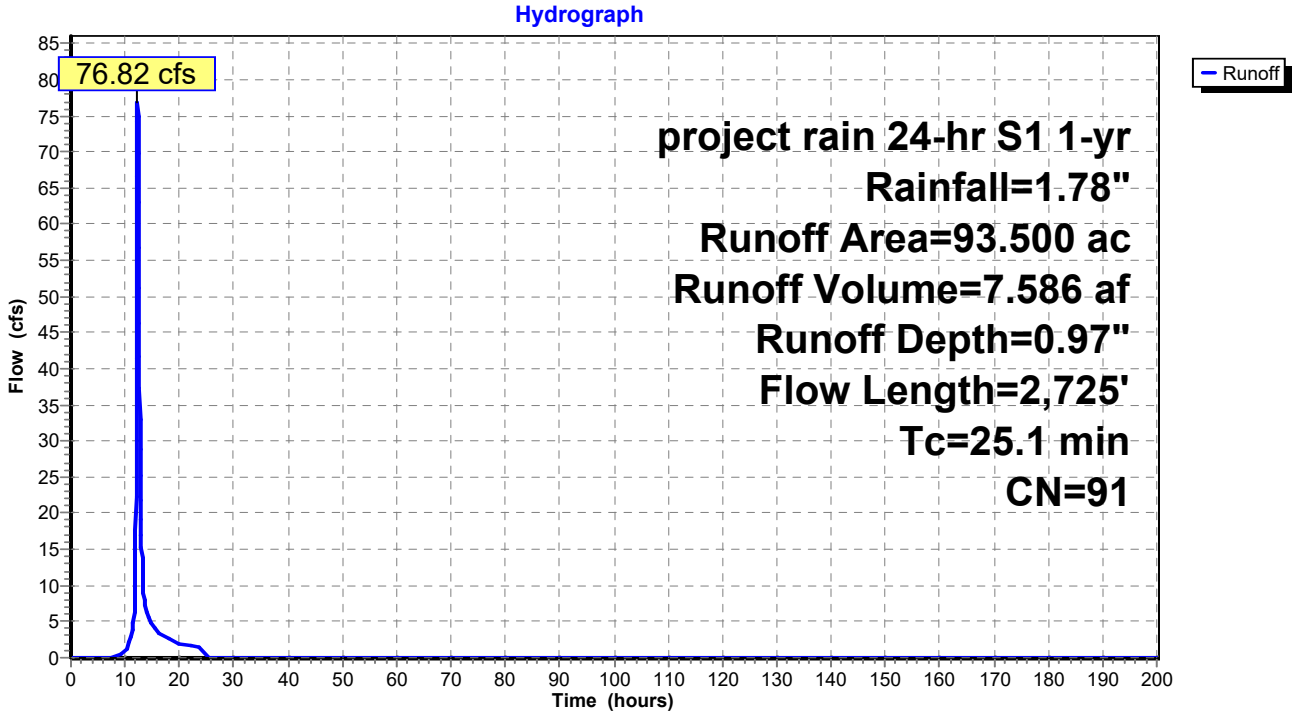
Runoff = 76.82 cfs @ 12.30 hrs, Volume= 7.586 af, Depth= 0.97"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 0.97" for 1-yr event
Inflow = 76.82 cfs @ 12.30 hrs, Volume= 7.586 af
Outflow = 3.59 cfs @ 15.82 hrs, Volume= 7.404 af, Atten= 95%, Lag= 211.1 min
Primary = 3.59 cfs @ 15.82 hrs, Volume= 7.404 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 591.40' @ 15.82 hrs Surf.Area= 315,019 sf Storage= 893,575 cf (220,994 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,150.3 min (1,993.8 - 843.5)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

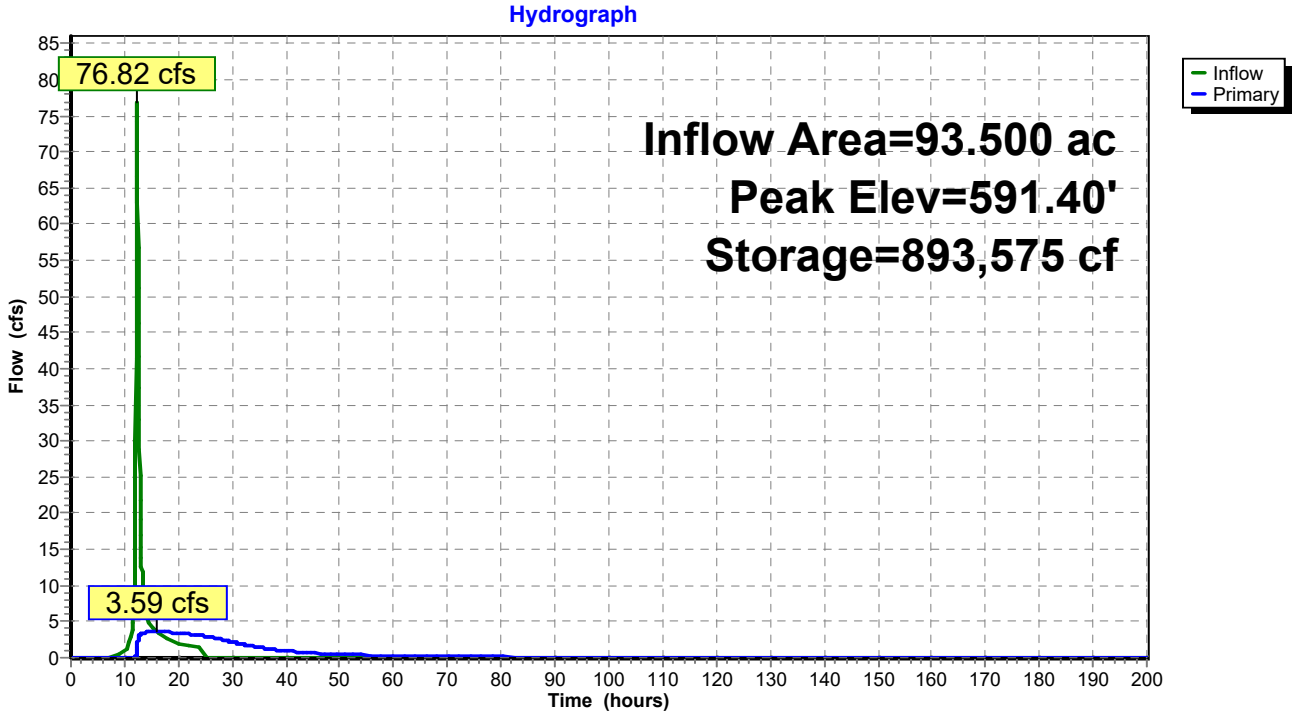
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.59 cfs @ 15.82 hrs HW=591.40' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.59 cfs of 4.99 cfs potential flow)
  - **2=Culvert** (Inlet Controls 3.59 cfs @ 4.58 fps)
  - **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

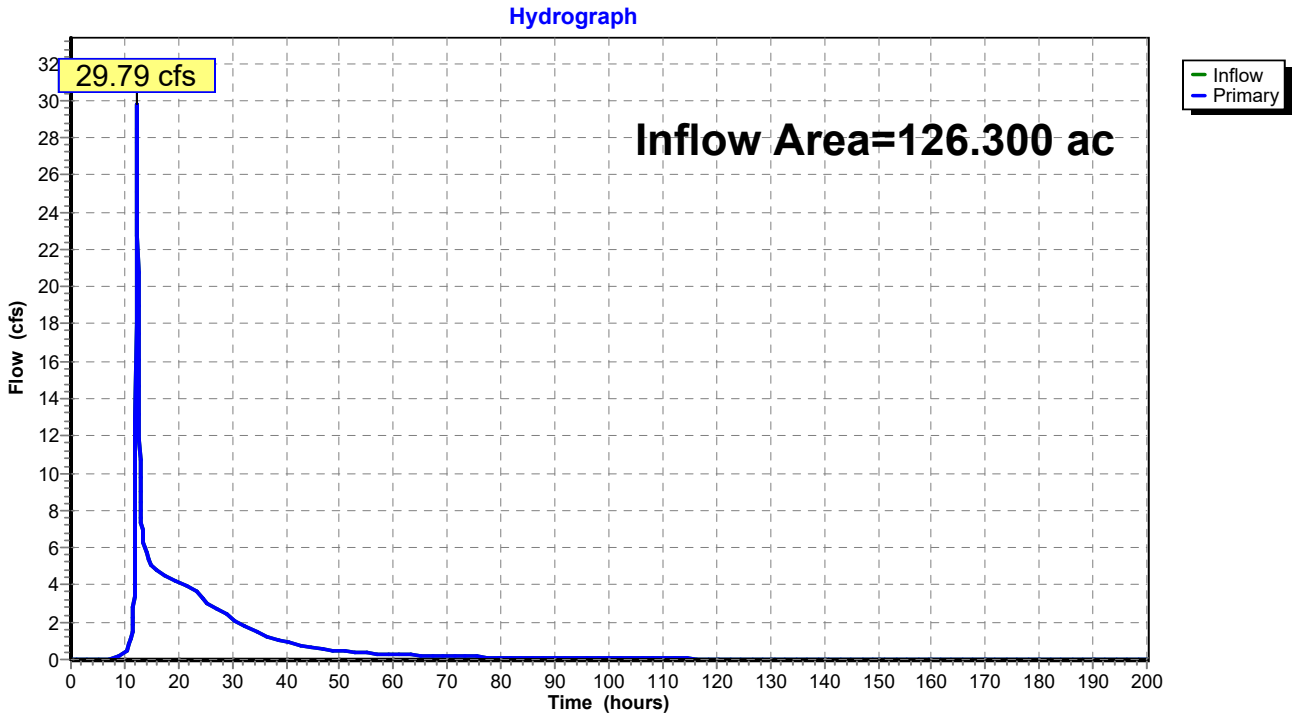


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 0.96" for 1-yr event
Inflow = 29.79 cfs @ 12.27 hrs, Volume= 10.066 af
Primary = 29.79 cfs @ 12.27 hrs, Volume= 10.066 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

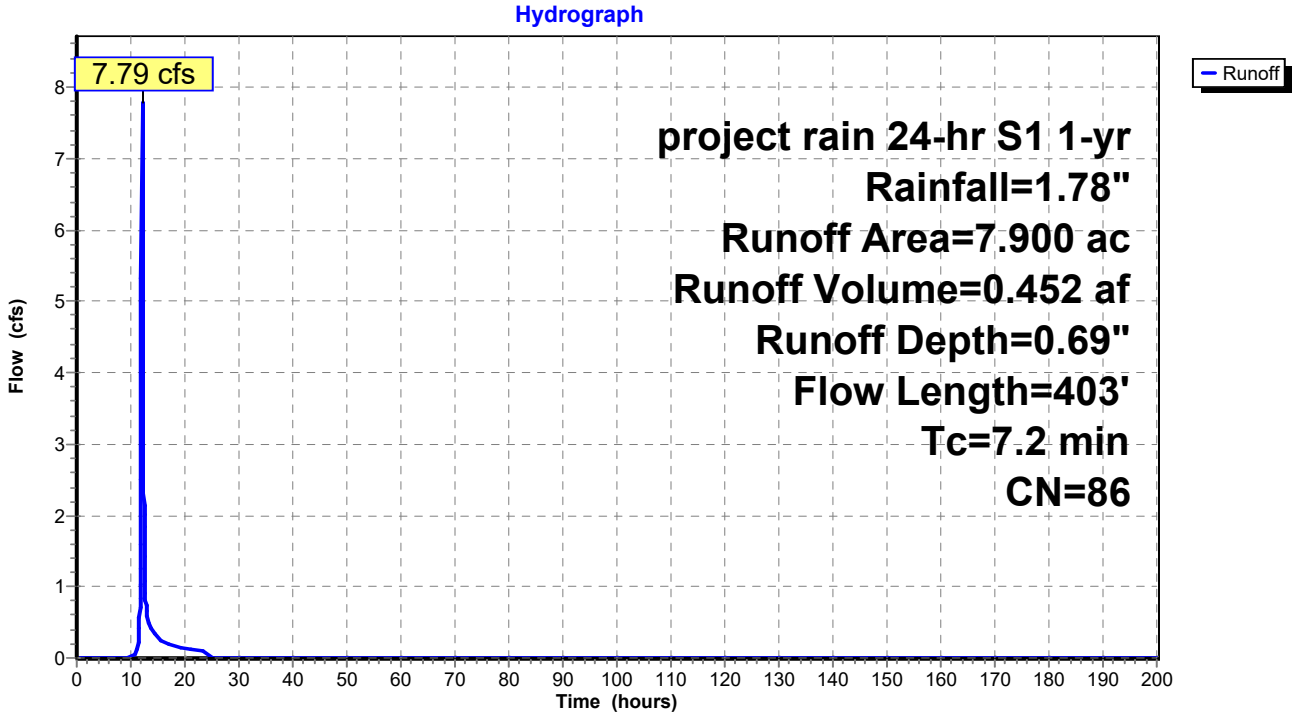
Runoff = 7.79 cfs @ 12.06 hrs, Volume= 0.452 af, Depth= 0.69"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 1-yr Rainfall=1.78"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

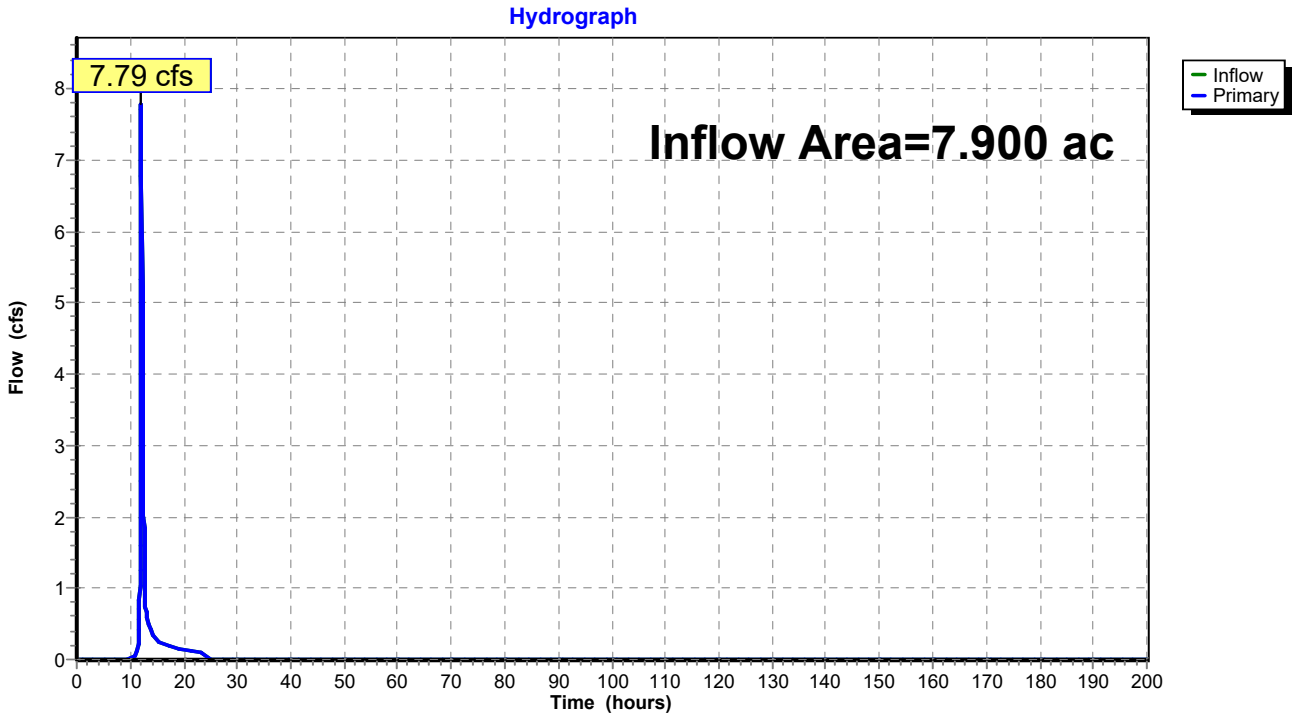


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 7.79 cfs @ 12.06 hrs, Volume= 0.452 af
Primary = 7.79 cfs @ 12.06 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

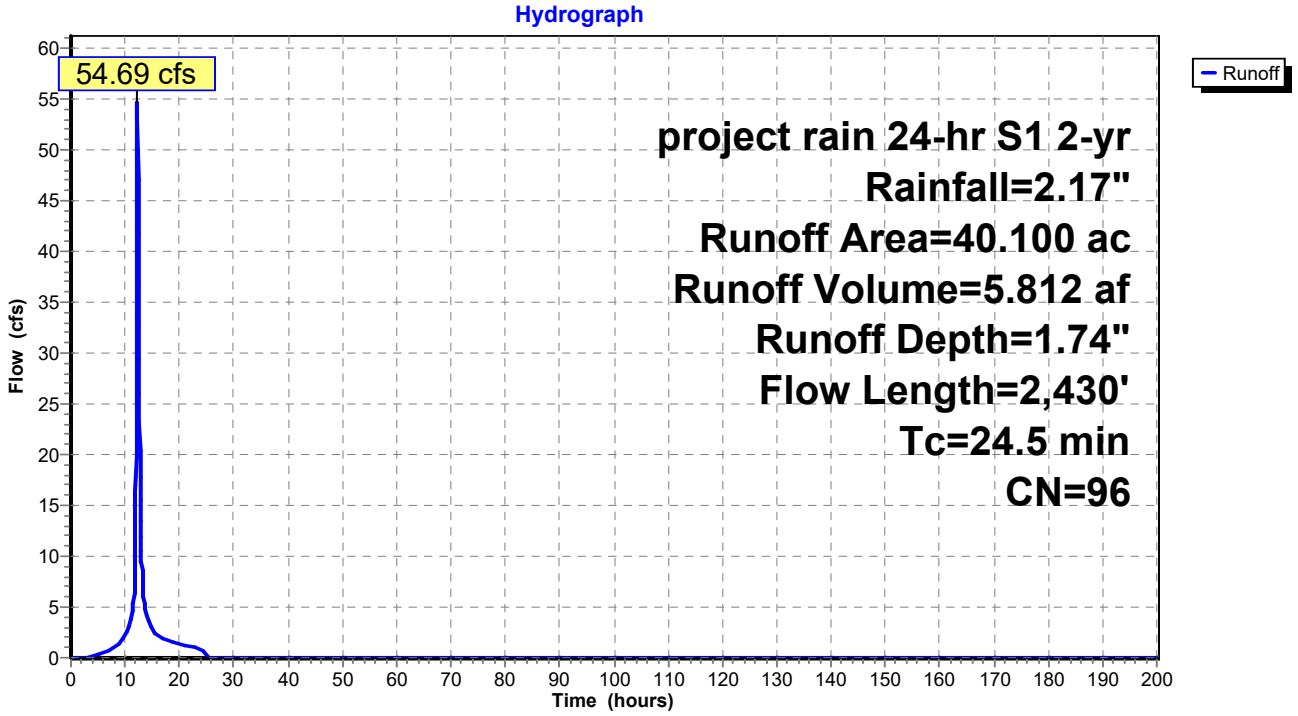
Runoff = 54.69 cfs @ 12.28 hrs, Volume= 5.812 af, Depth= 1.74"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 1.74" for 2-yr event
Inflow = 54.69 cfs @ 12.28 hrs, Volume= 5.812 af
Outflow = 7.35 cfs @ 13.21 hrs, Volume= 5.807 af, Atten= 87%, Lag= 55.7 min
Primary = 7.35 cfs @ 13.21 hrs, Volume= 5.807 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.28' @ 13.21 hrs Surf.Area= 4.631 ac Storage= 2.904 af

Plug-Flow detention time= 217.9 min calculated for 5.806 af (100% of inflow)
Center-of-Mass det. time= 219.5 min (1,024.8 - 805.3)

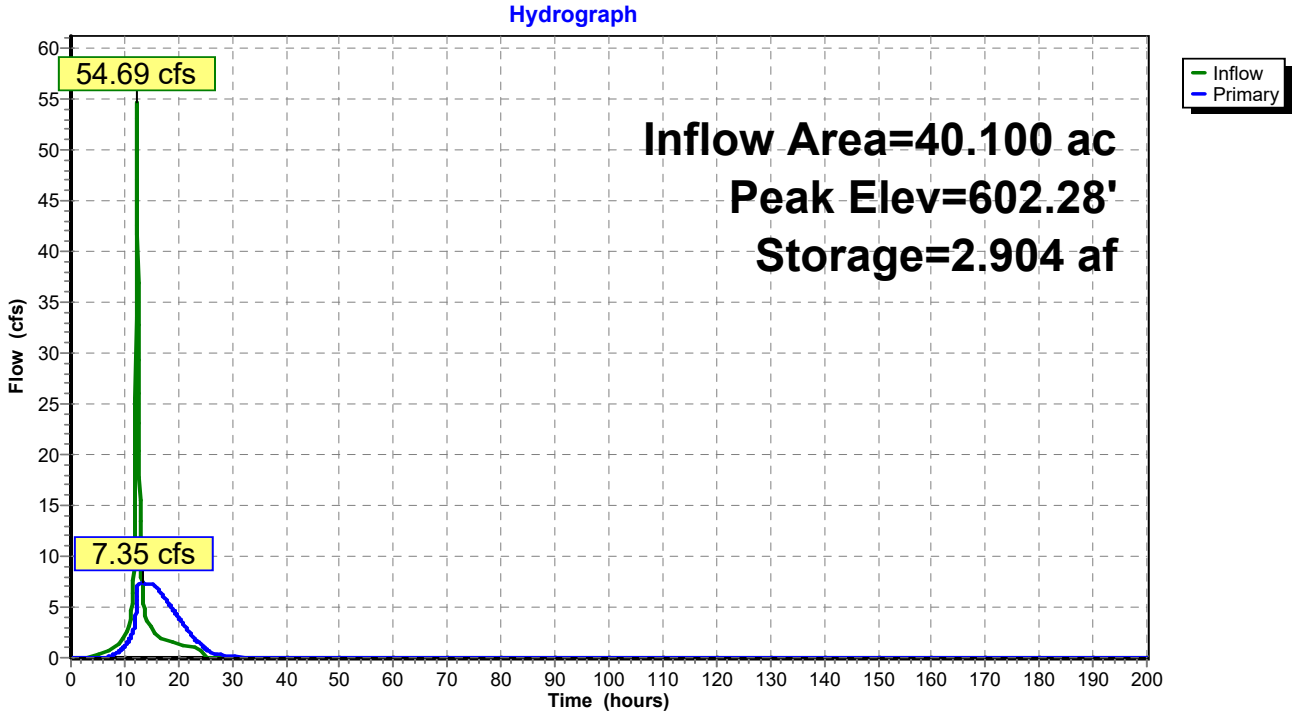
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.35 cfs @ 13.21 hrs HW=602.28' TW=598.28' (Dynamic Tailwater)
↑**1=Culvert** (Passes 7.35 cfs of 9.44 cfs potential flow)
↑**2=Orifice** (Orifice Controls 7.35 cfs @ 9.36 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

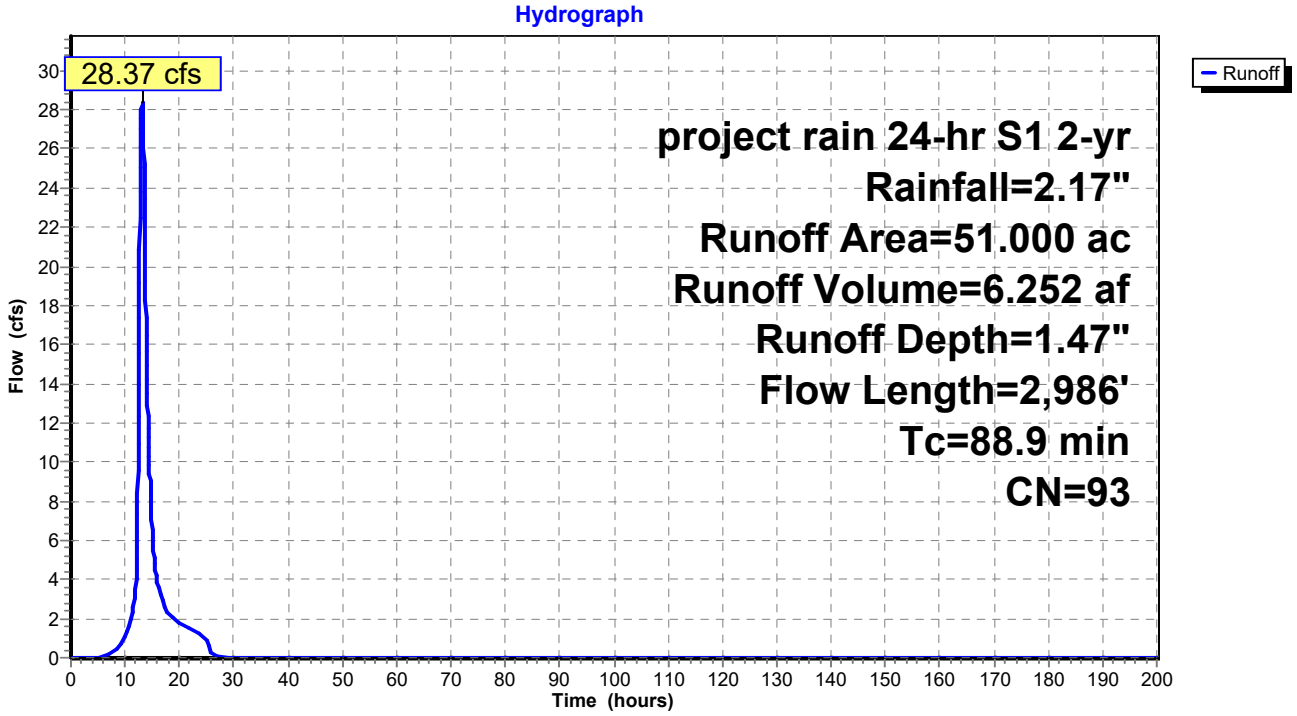
Runoff = 28.37 cfs @ 13.14 hrs, Volume= 6.252 af, Depth= 1.47"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 1.47" for 2-yr event
Inflow = 28.37 cfs @ 13.14 hrs, Volume= 6.252 af
Outflow = 10.10 cfs @ 15.48 hrs, Volume= 6.221 af, Atten= 64%, Lag= 140.7 min
Primary = 10.10 cfs @ 15.48 hrs, Volume= 6.221 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 599.23' @ 14.47 hrs Surf.Area= 1.000 ac Storage= 2.777 af

Plug-Flow detention time= 297.9 min calculated for 6.220 af (99% of inflow)
Center-of-Mass det. time= 297.1 min (1,184.4 - 887.3)

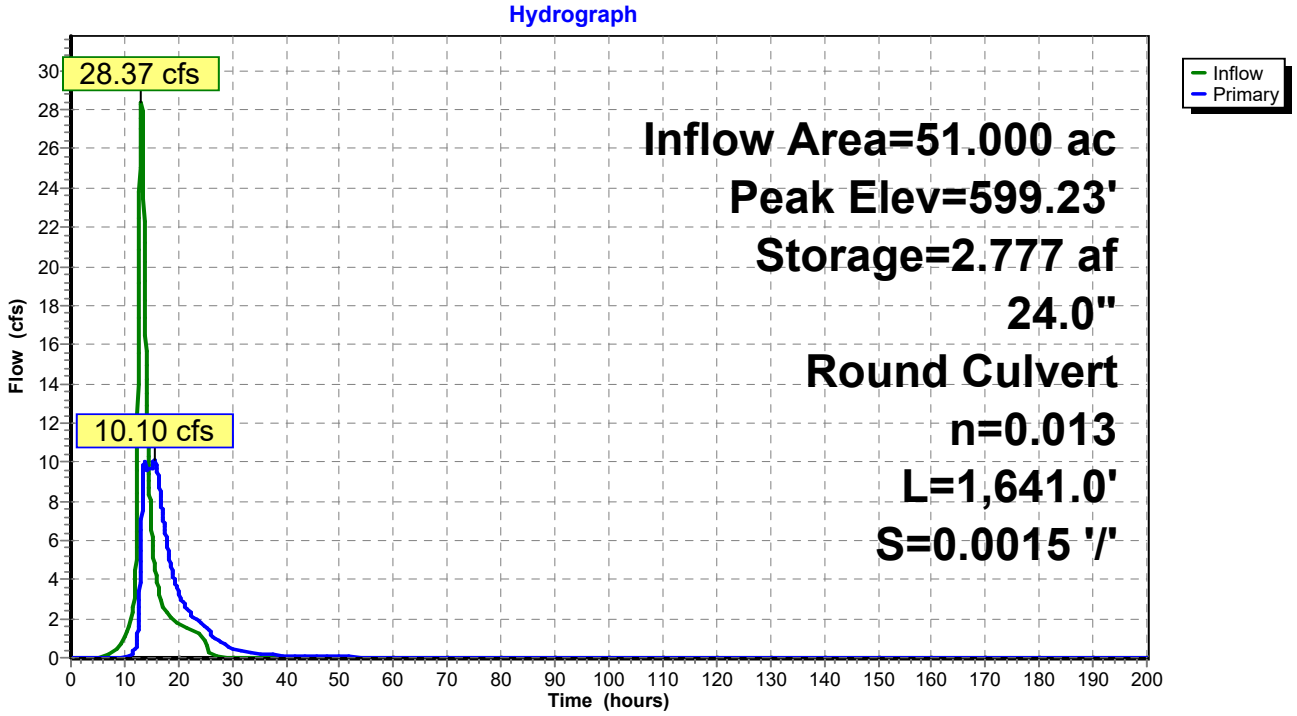
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.10 cfs @ 15.48 hrs HW=598.98' TW=584.09' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 10.10 cfs @ 3.28 fps)

Pond 05: Ex Collection Sump



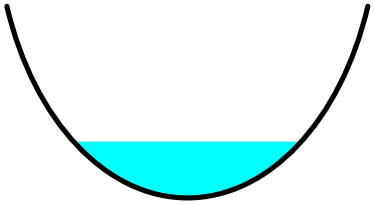
Summary for Reach 06a: Reach A Upper

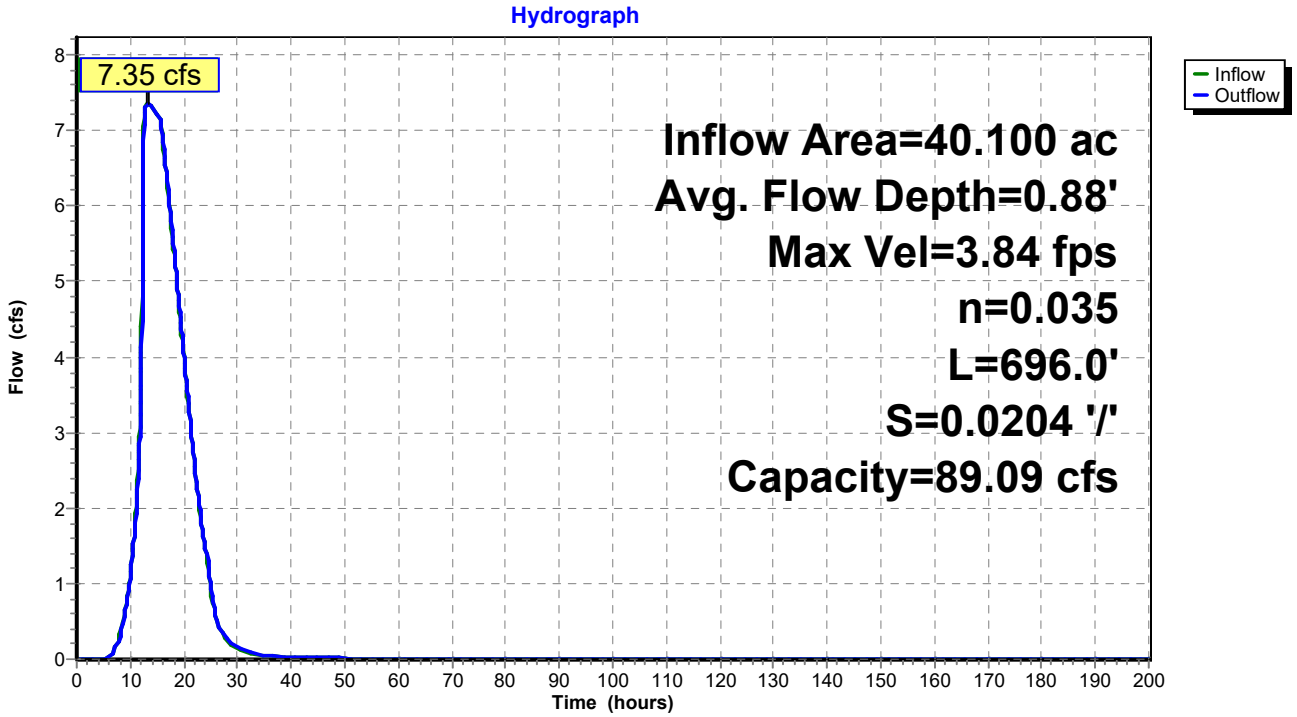
Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 1.74" for 2-yr event
Inflow = 7.35 cfs @ 13.21 hrs, Volume= 5.807 af
Outflow = 7.35 cfs @ 13.25 hrs, Volume= 5.807 af, Atten= 0%, Lag= 2.3 min
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.84 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 15.5 min

Peak Storage= 1,333 cf @ 13.25 hrs
Average Depth at Peak Storage= 0.88' , Surface Width= 3.25'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'





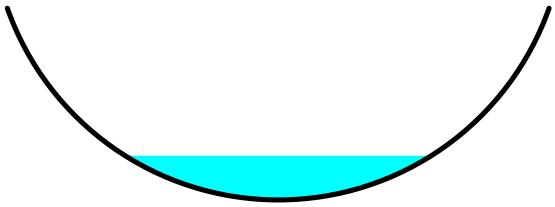
Summary for Reach 06b: Reach A Lower

Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 1.58" for 2-yr event
Inflow = 17.44 cfs @ 13.74 hrs, Volume= 12.028 af
Outflow = 17.44 cfs @ 13.76 hrs, Volume= 12.028 af, Atten= 0%, Lag= 1.2 min
Routed to Link 07 : Ex Analysis Point A

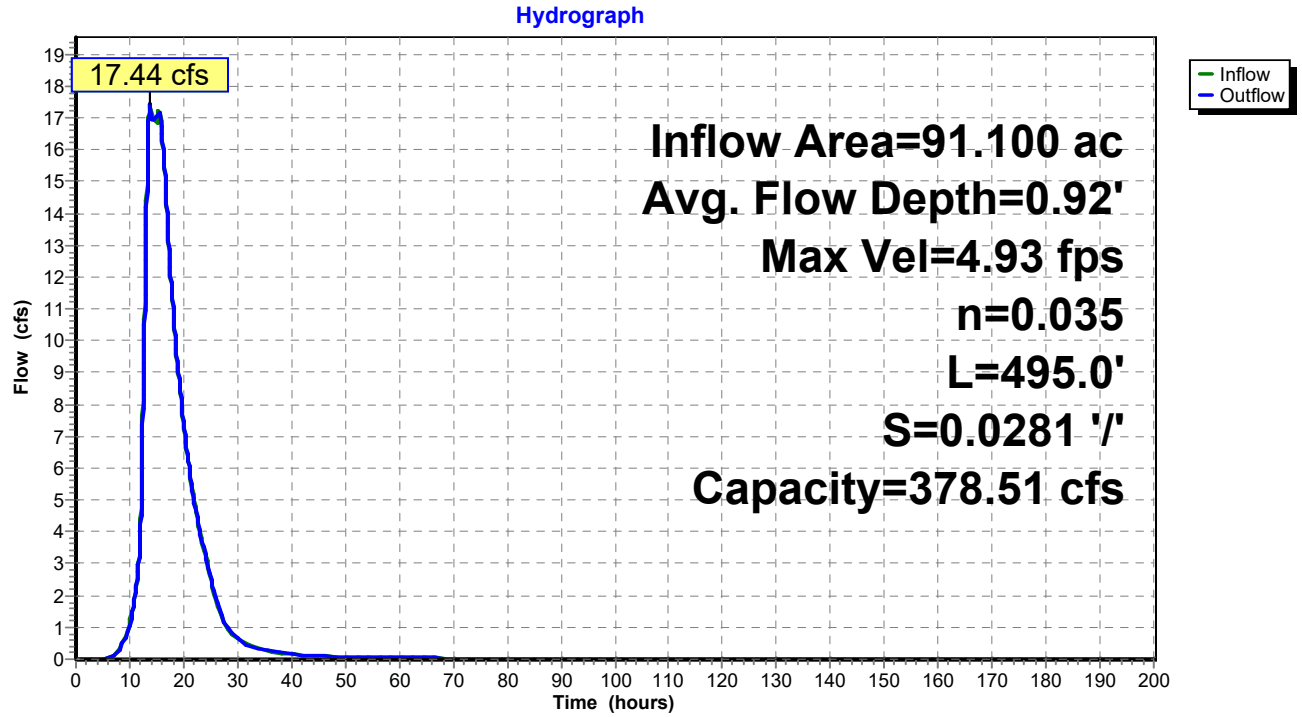
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.93 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 8.1 min

Peak Storage= 1,750 cf @ 13.76 hrs
Average Depth at Peak Storage= 0.92' , Surface Width= 5.76'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



Reach 06b: Reach A Lower

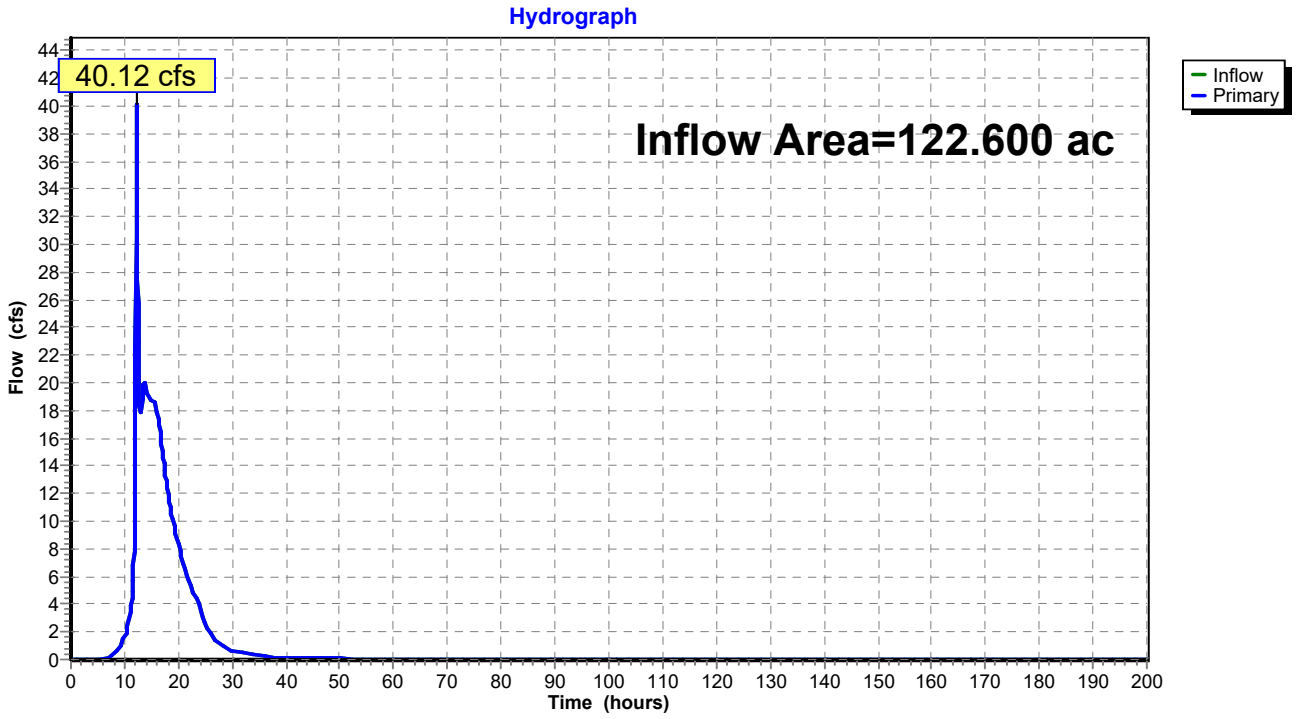


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 1.48" for 2-yr event
Inflow = 40.12 cfs @ 12.21 hrs, Volume= 15.101 af
Primary = 40.12 cfs @ 12.21 hrs, Volume= 15.101 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

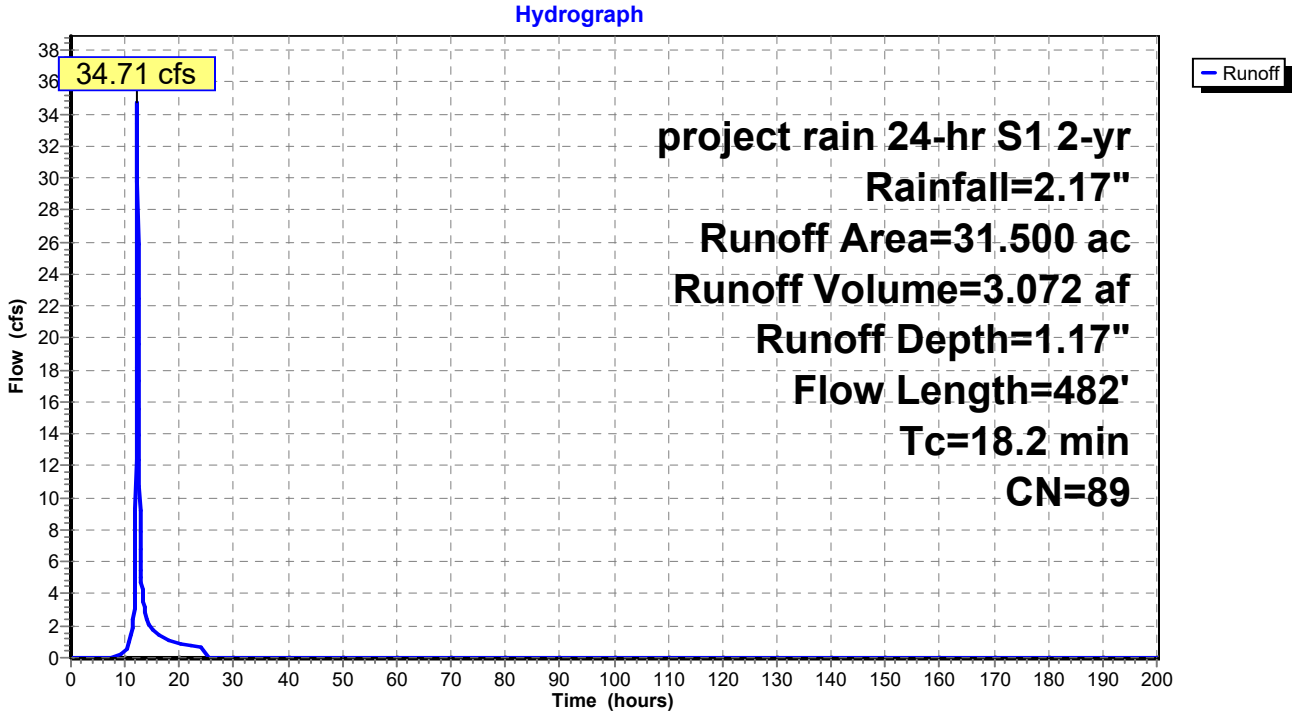
Runoff = 34.71 cfs @ 12.21 hrs, Volume= 3.072 af, Depth= 1.17"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

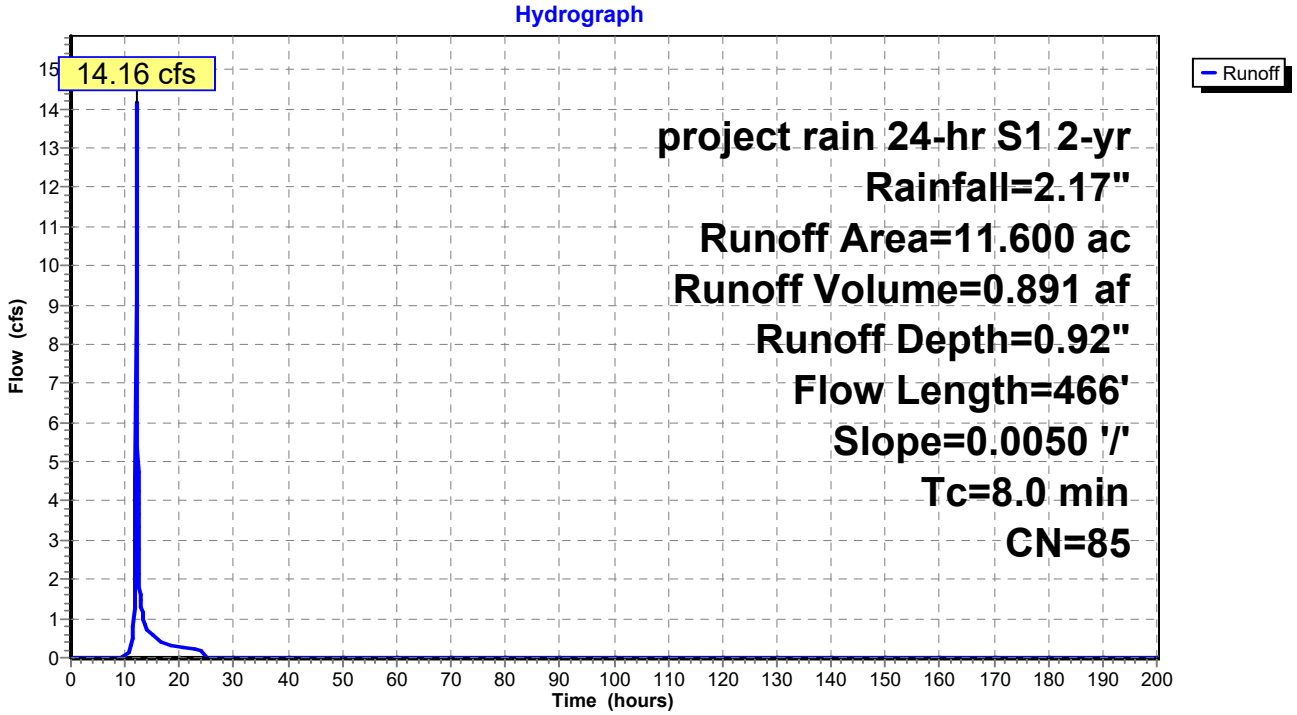
Runoff = 14.16 cfs @ 12.07 hrs, Volume= 0.891 af, Depth= 0.92"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

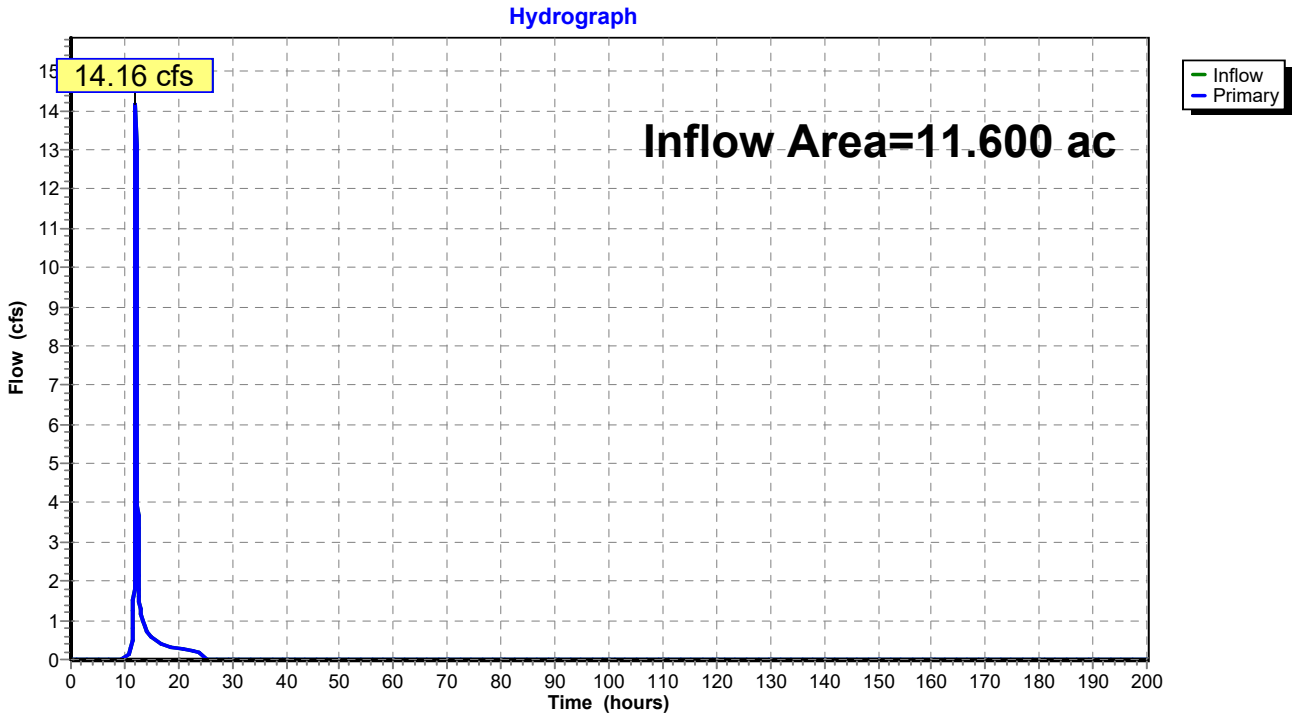


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 0.92" for 2-yr event
Inflow = 14.16 cfs @ 12.07 hrs, Volume= 0.891 af
Primary = 14.16 cfs @ 12.07 hrs, Volume= 0.891 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

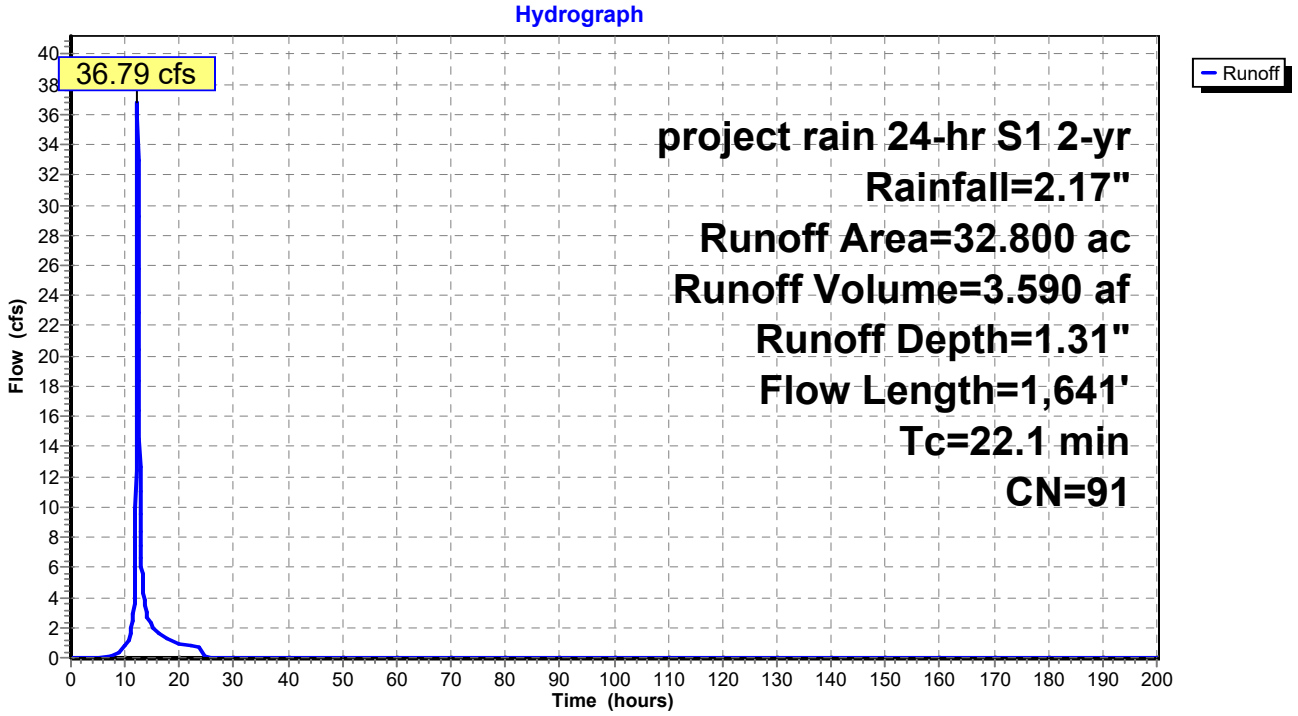
Runoff = 36.79 cfs @ 12.26 hrs, Volume= 3.590 af, Depth= 1.31"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

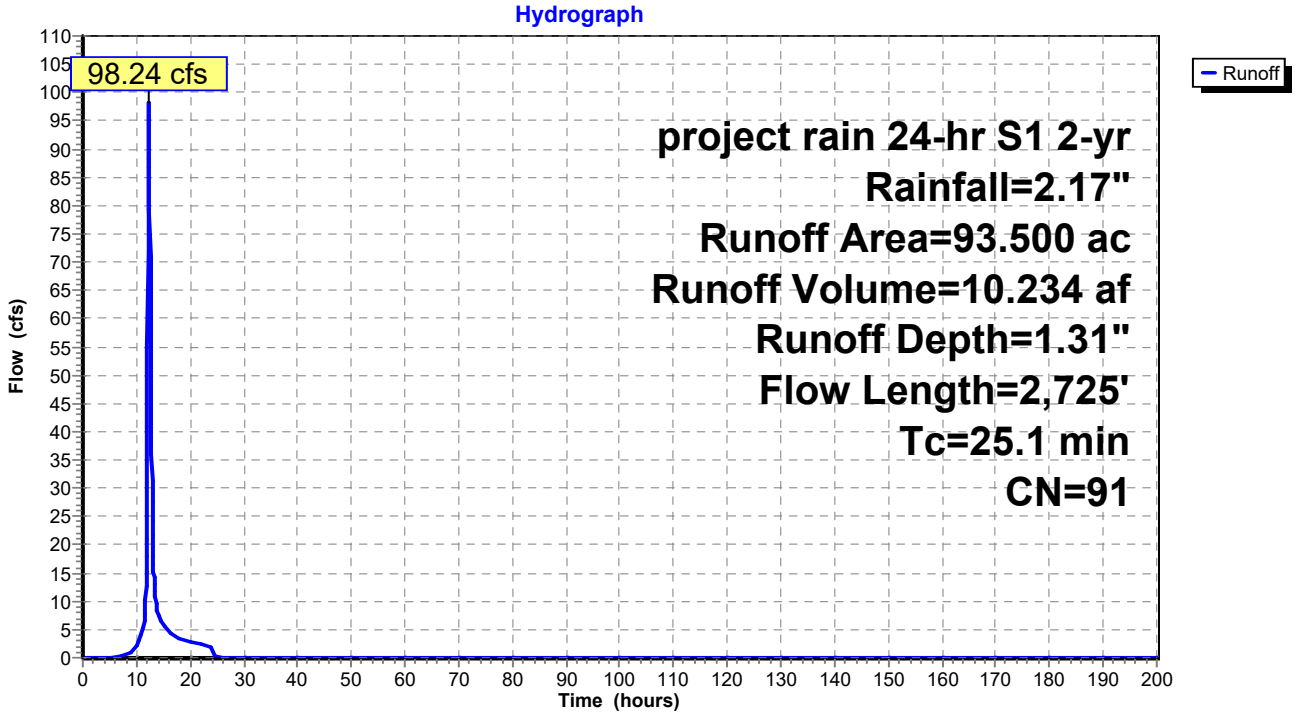
Runoff = 98.24 cfs @ 12.30 hrs, Volume= 10.234 af, Depth= 1.31"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 1.31" for 2-yr event
Inflow = 98.24 cfs @ 12.30 hrs, Volume= 10.234 af
Outflow = 4.43 cfs @ 16.28 hrs, Volume= 10.046 af, Atten= 95%, Lag= 239.0 min
Primary = 4.43 cfs @ 16.28 hrs, Volume= 10.046 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 591.87' @ 16.28 hrs Surf.Area= 321,495 sf Storage= 973,560 cf (300,979 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,147.5 min (1,987.2 - 839.7)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

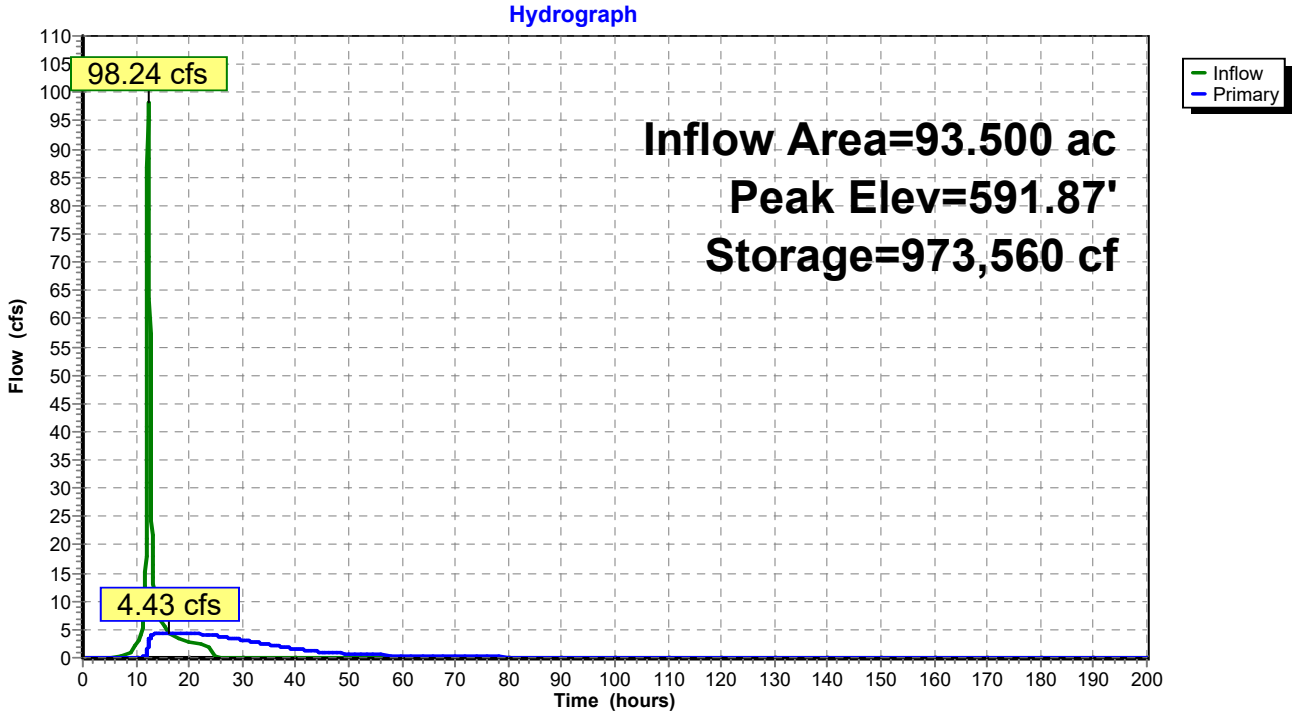
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.43 cfs @ 16.28 hrs HW=591.87' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 4.43 cfs of 5.22 cfs potential flow)
  - **2=Culvert** (Inlet Controls 4.43 cfs @ 5.64 fps)
  - **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

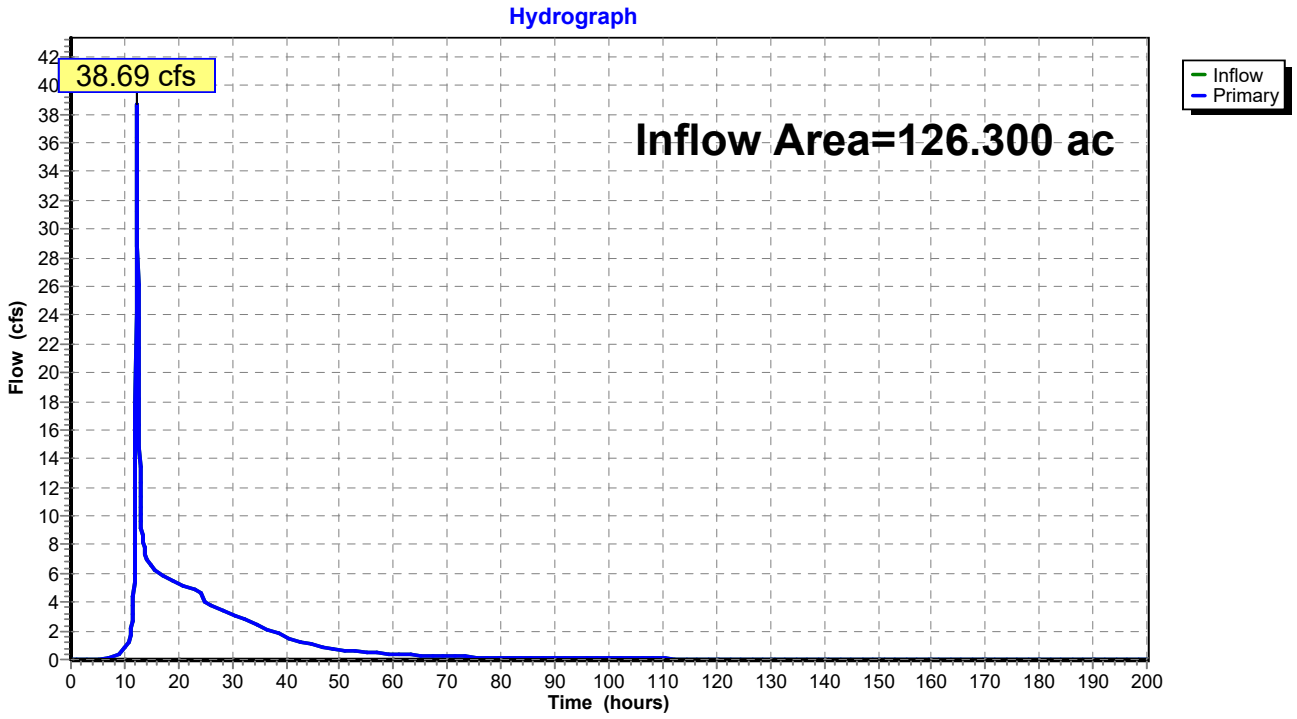


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 1.30" for 2-yr event
Inflow = 38.69 cfs @ 12.27 hrs, Volume= 13.636 af
Primary = 38.69 cfs @ 12.27 hrs, Volume= 13.636 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

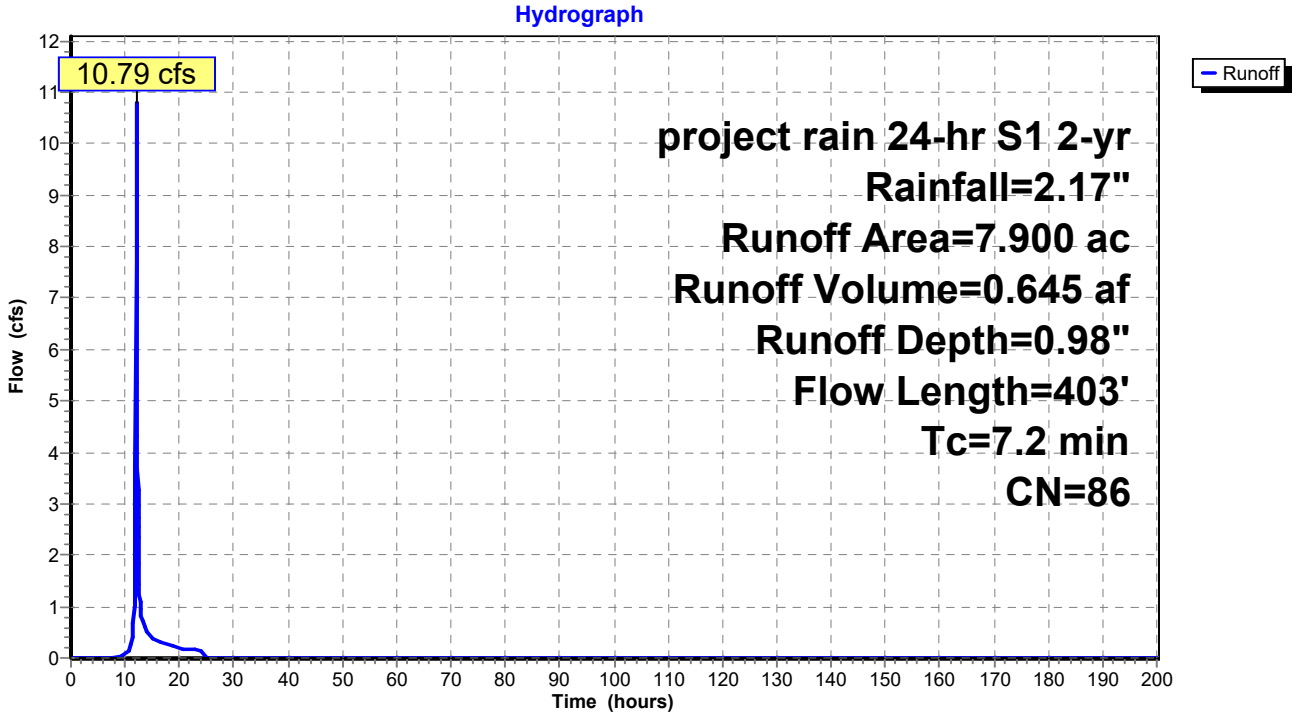
Runoff = 10.79 cfs @ 12.06 hrs, Volume= 0.645 af, Depth= 0.98"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 2-yr Rainfall=2.17"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

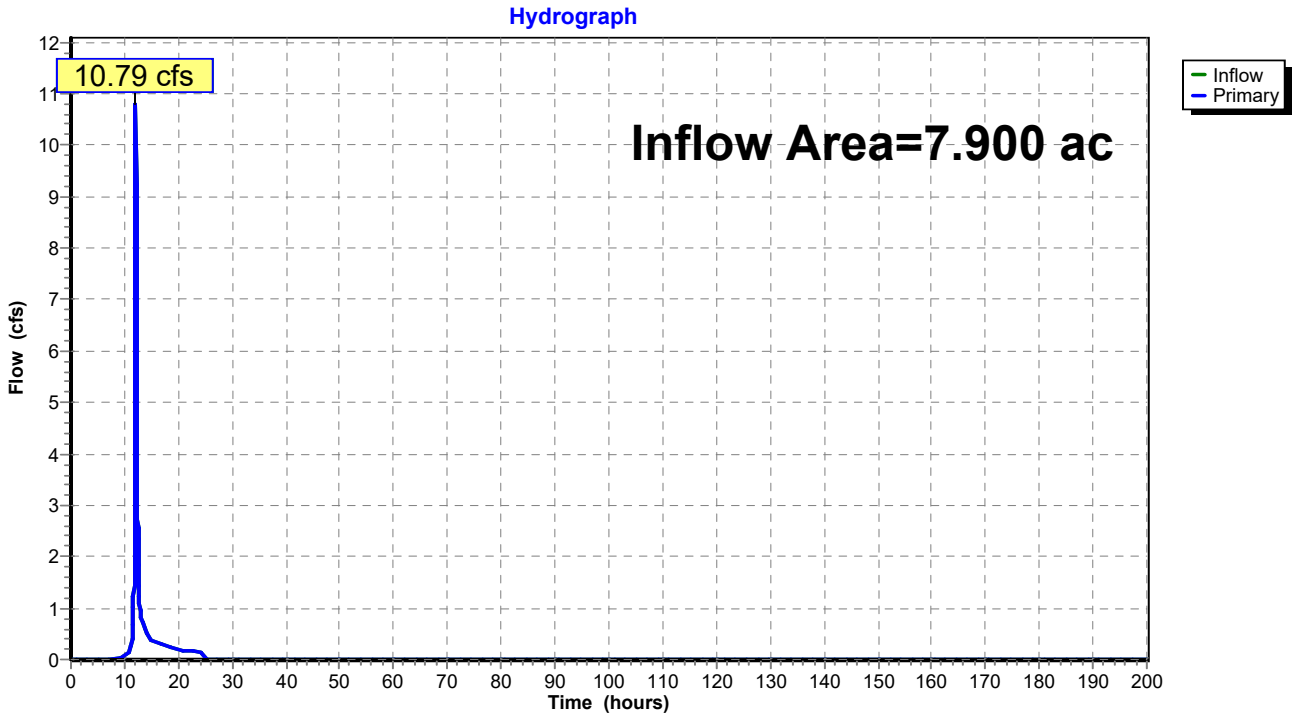


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 0.98" for 2-yr event
Inflow = 10.79 cfs @ 12.06 hrs, Volume= 0.645 af
Primary = 10.79 cfs @ 12.06 hrs, Volume= 0.645 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

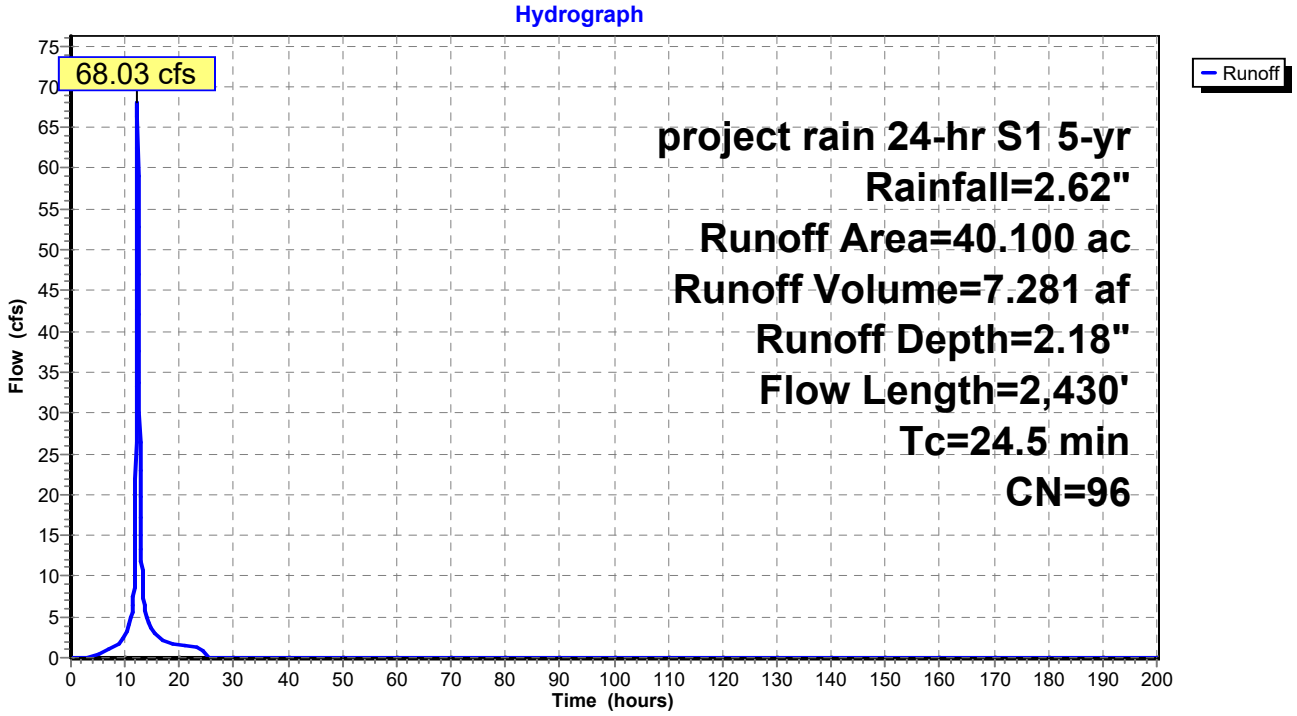
Runoff = 68.03 cfs @ 12.28 hrs, Volume= 7.281 af, Depth= 2.18"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 2.18" for 5-yr event
Inflow = 68.03 cfs @ 12.28 hrs, Volume= 7.281 af
Outflow = 7.51 cfs @ 13.35 hrs, Volume= 7.275 af, Atten= 89%, Lag= 64.1 min
Primary = 7.51 cfs @ 13.35 hrs, Volume= 7.275 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.44' @ 13.35 hrs Surf.Area= 6.937 ac Storage= 3.831 af

Plug-Flow detention time= 255.0 min calculated for 7.275 af (100% of inflow)
Center-of-Mass det. time= 254.5 min (1,052.5 - 798.0)

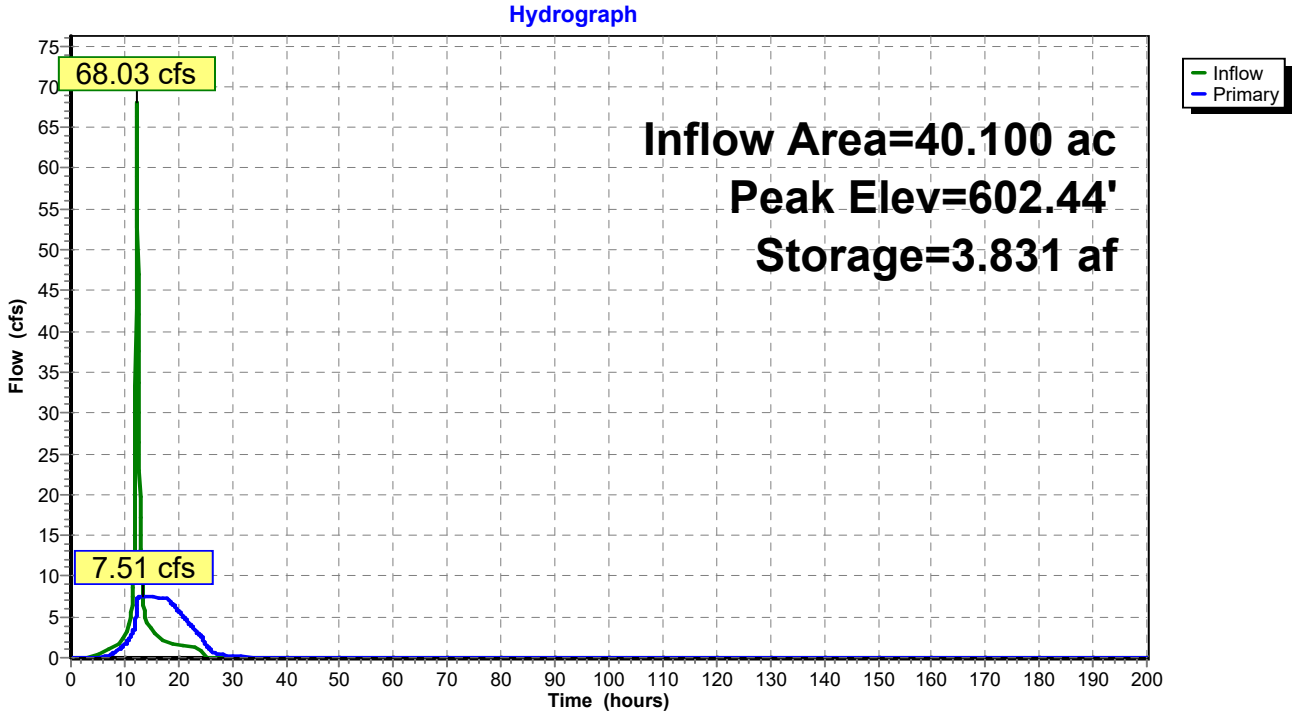
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.51 cfs @ 13.35 hrs HW=602.44' TW=598.29' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.51 cfs of 9.65 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.51 cfs @ 9.56 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

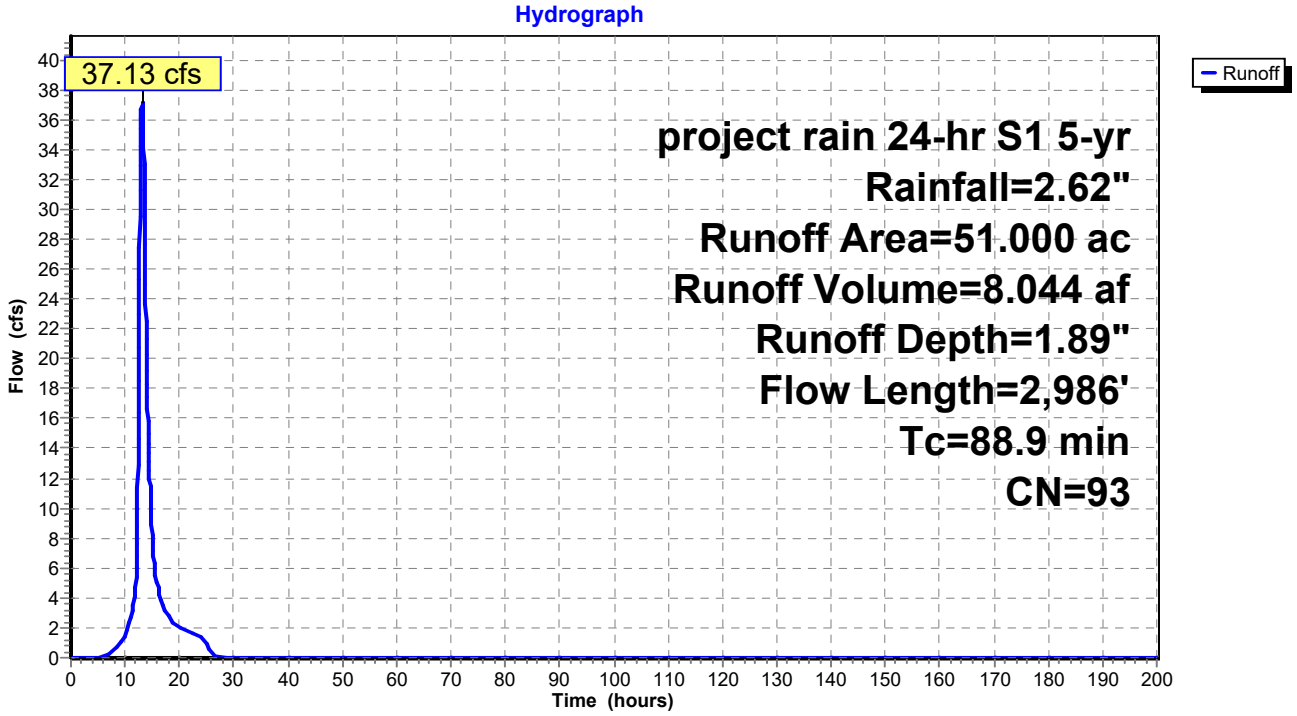
Runoff = 37.13 cfs @ 13.14 hrs, Volume= 8.044 af, Depth= 1.89"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 1.89" for 5-yr event
Inflow = 37.13 cfs @ 13.14 hrs, Volume= 8.044 af
Outflow = 11.11 cfs @ 14.59 hrs, Volume= 8.013 af, Atten= 70%, Lag= 87.0 min
Primary = 11.11 cfs @ 14.59 hrs, Volume= 8.013 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 600.25' @ 14.59 hrs Surf.Area= 1.000 ac Storage= 3.804 af

Plug-Flow detention time= 288.7 min calculated for 8.011 af (100% of inflow)
Center-of-Mass det. time= 288.6 min (1,166.8 - 878.2)

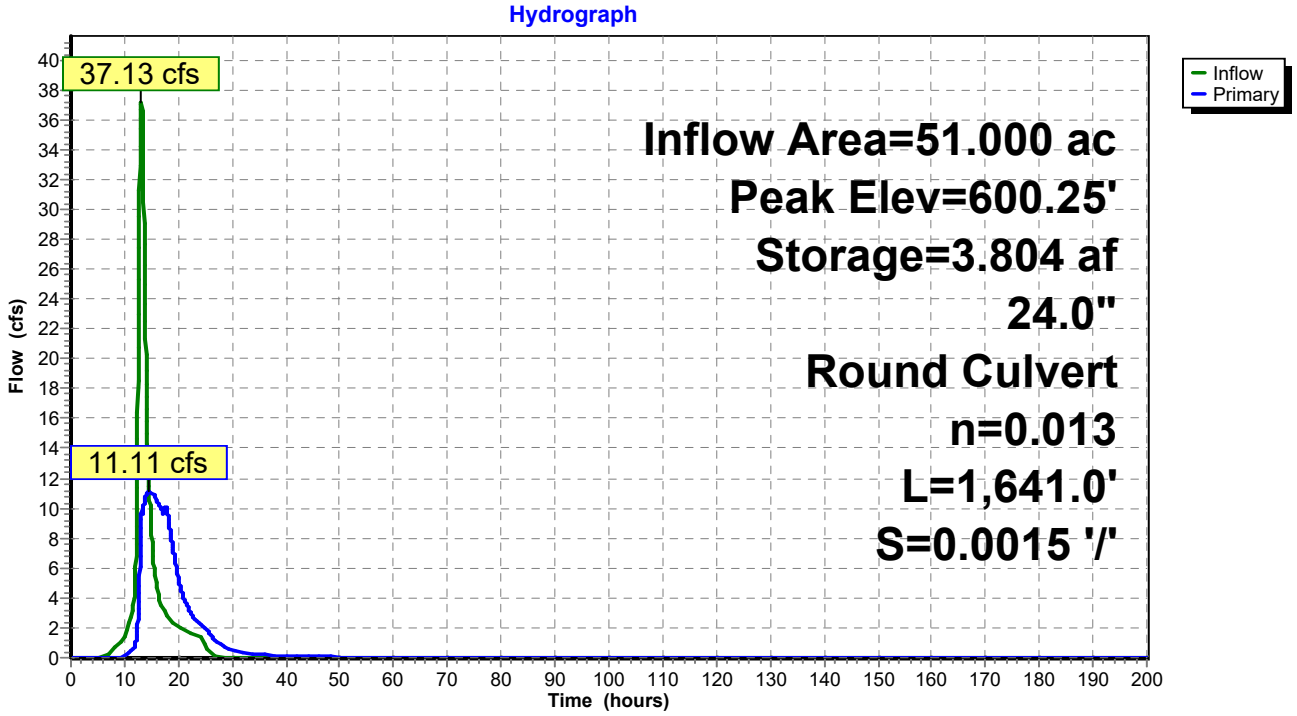
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.11 cfs @ 14.59 hrs HW=600.25' TW=584.12' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 11.11 cfs @ 3.54 fps)

Pond 05: Ex Collection Sump



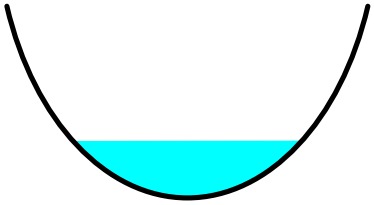
Summary for Reach 06a: Reach A Upper

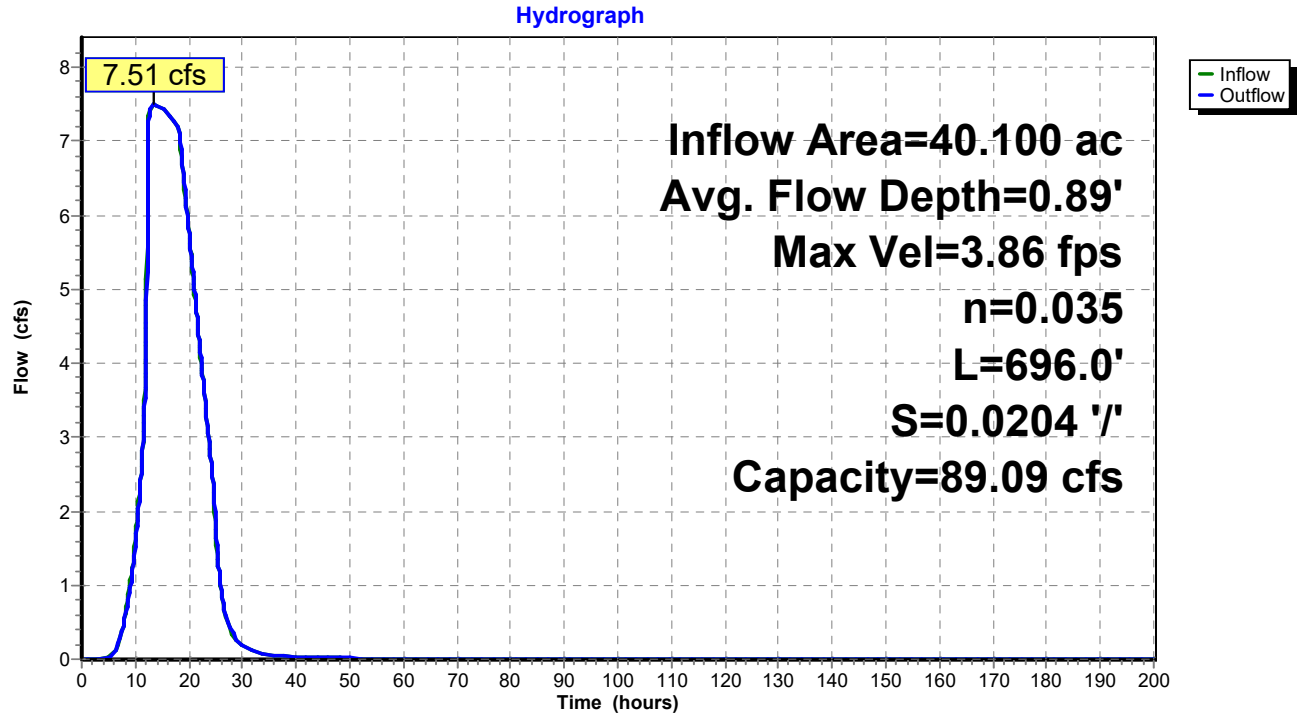
Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 2.18" for 5-yr event
Inflow = 7.51 cfs @ 13.35 hrs, Volume= 7.275 af
Outflow = 7.51 cfs @ 13.39 hrs, Volume= 7.275 af, Atten= 0%, Lag= 2.3 min
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.86 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 14.8 min

Peak Storage= 1,353 cf @ 13.39 hrs
Average Depth at Peak Storage= 0.89' , Surface Width= 3.27'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'





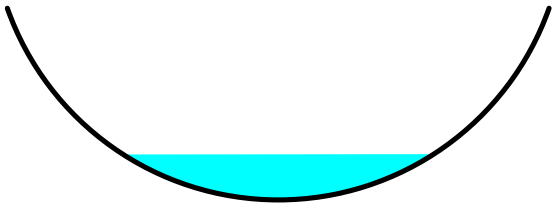
Summary for Reach 06b: Reach A Lower

Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 2.01" for 5-yr event
Inflow = 18.59 cfs @ 14.55 hrs, Volume= 15.288 af
Outflow = 18.59 cfs @ 14.57 hrs, Volume= 15.288 af, Atten= 0%, Lag= 1.2 min
Routed to Link 07 : Ex Analysis Point A

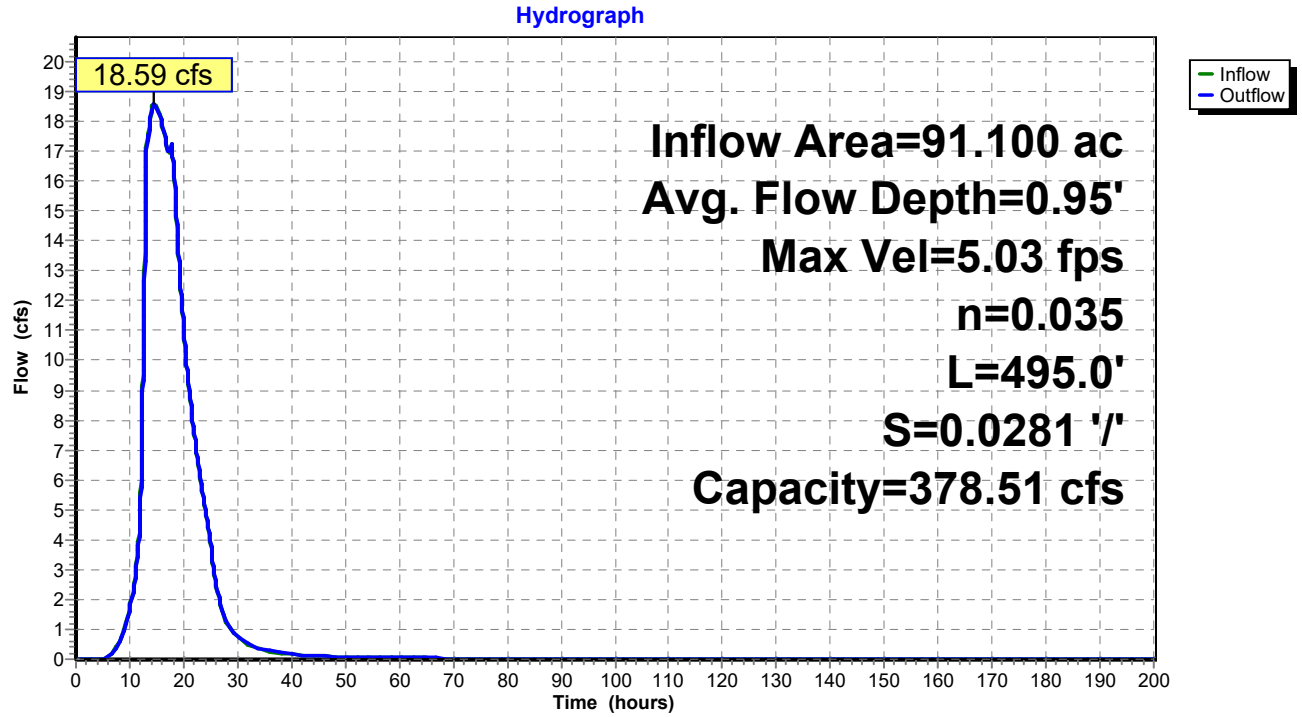
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.03 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 7.8 min

Peak Storage= 1,830 cf @ 14.57 hrs
Average Depth at Peak Storage= 0.95' , Surface Width= 5.84'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



Reach 06b: Reach A Lower

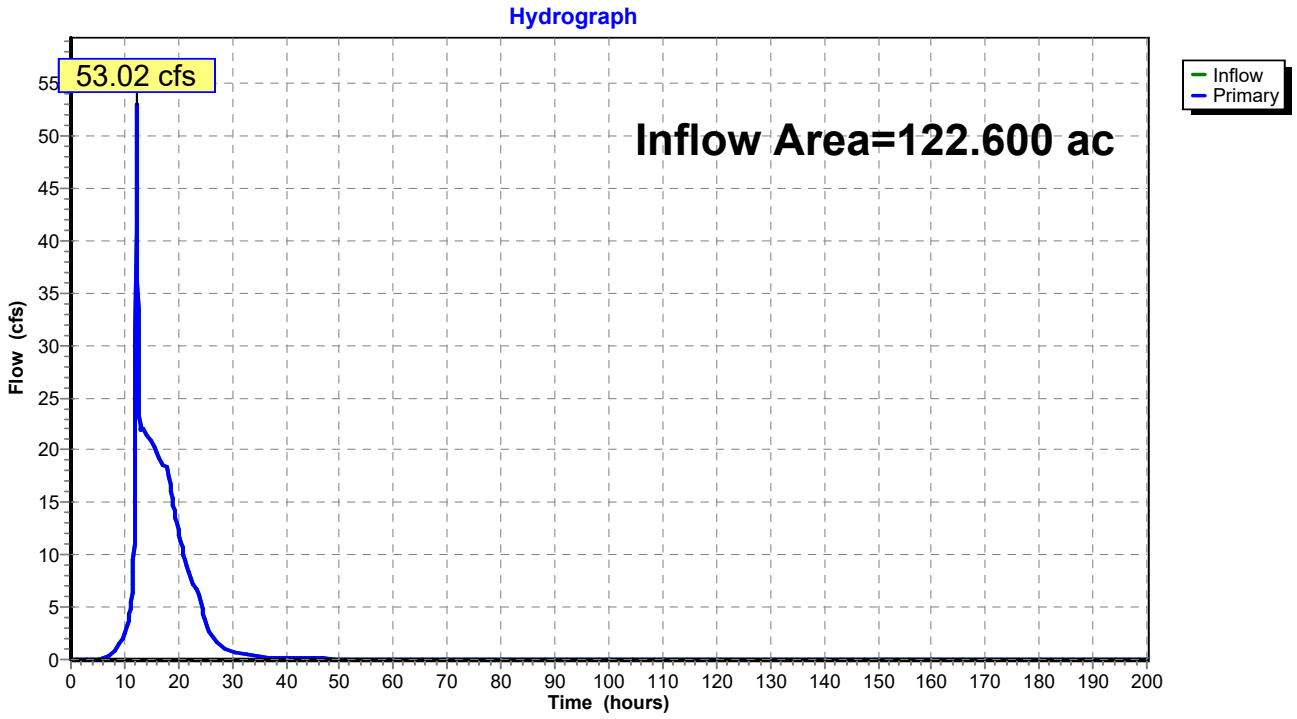


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 1.90" for 5-yr event
Inflow = 53.02 cfs @ 12.21 hrs, Volume= 19.383 af
Primary = 53.02 cfs @ 12.21 hrs, Volume= 19.383 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

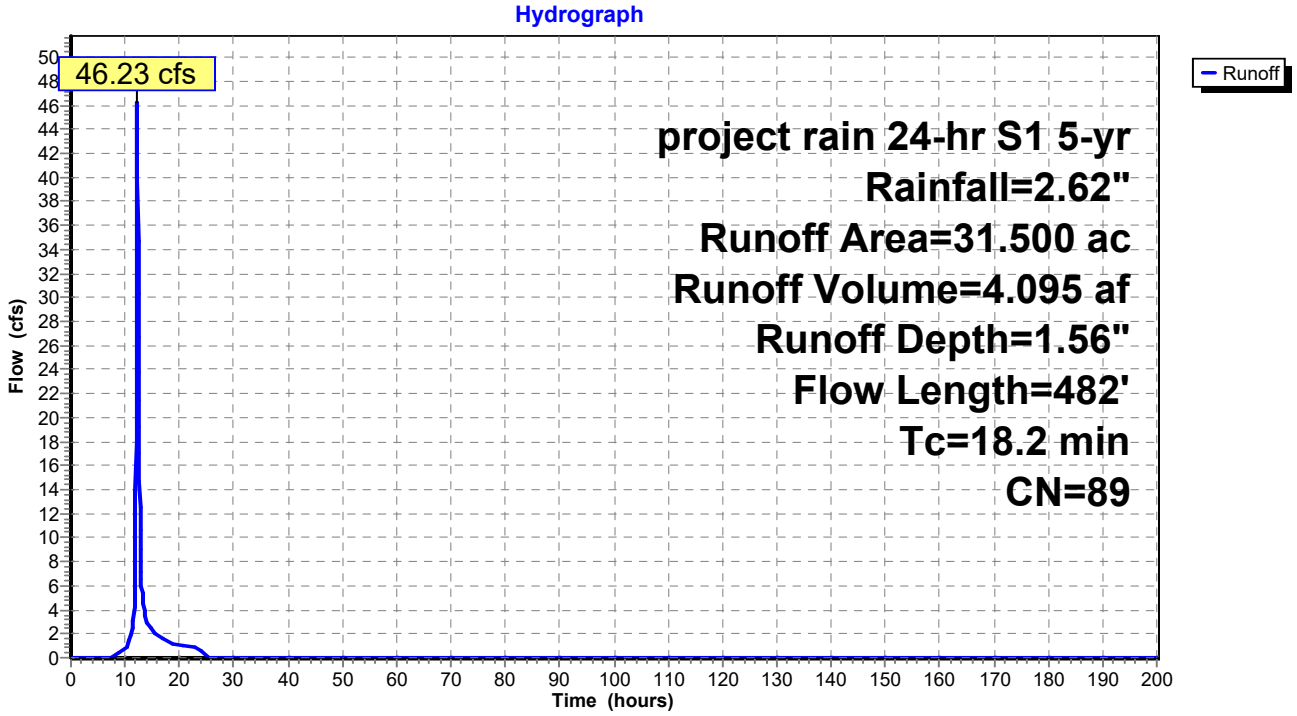
Runoff = 46.23 cfs @ 12.21 hrs, Volume= 4.095 af, Depth= 1.56"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

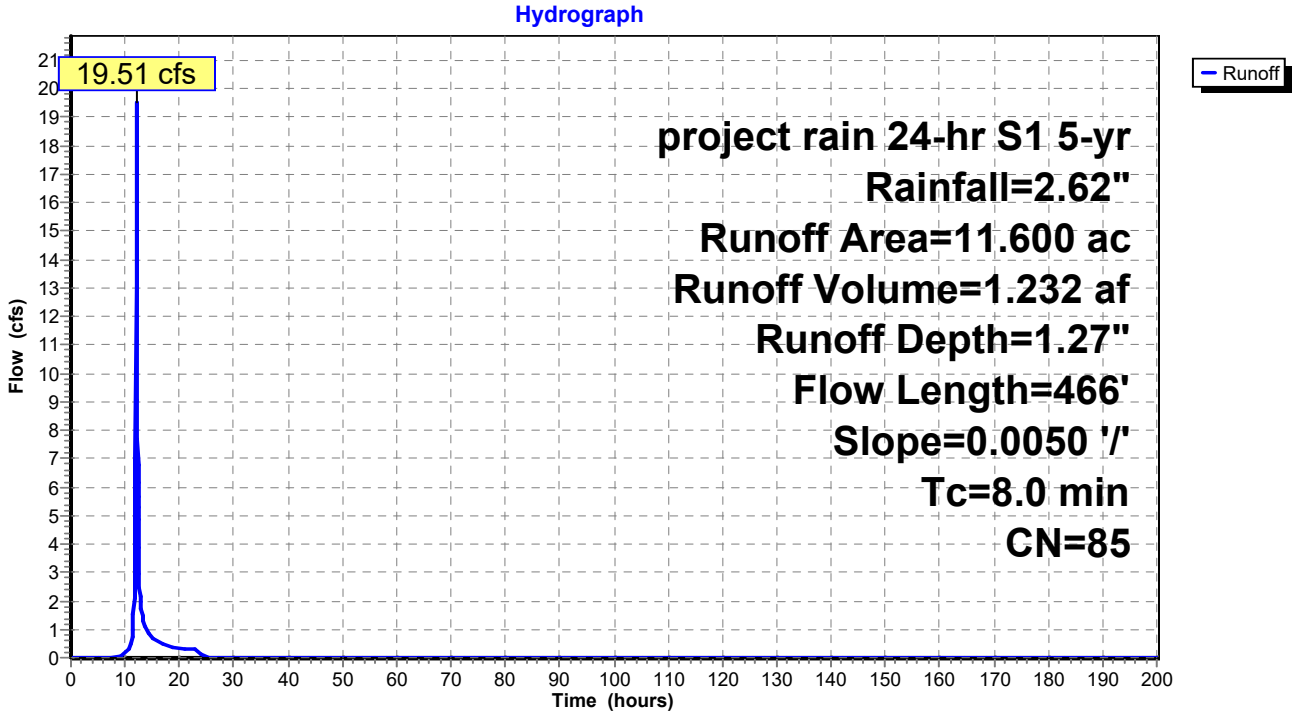
Runoff = 19.51 cfs @ 12.07 hrs, Volume= 1.232 af, Depth= 1.27"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

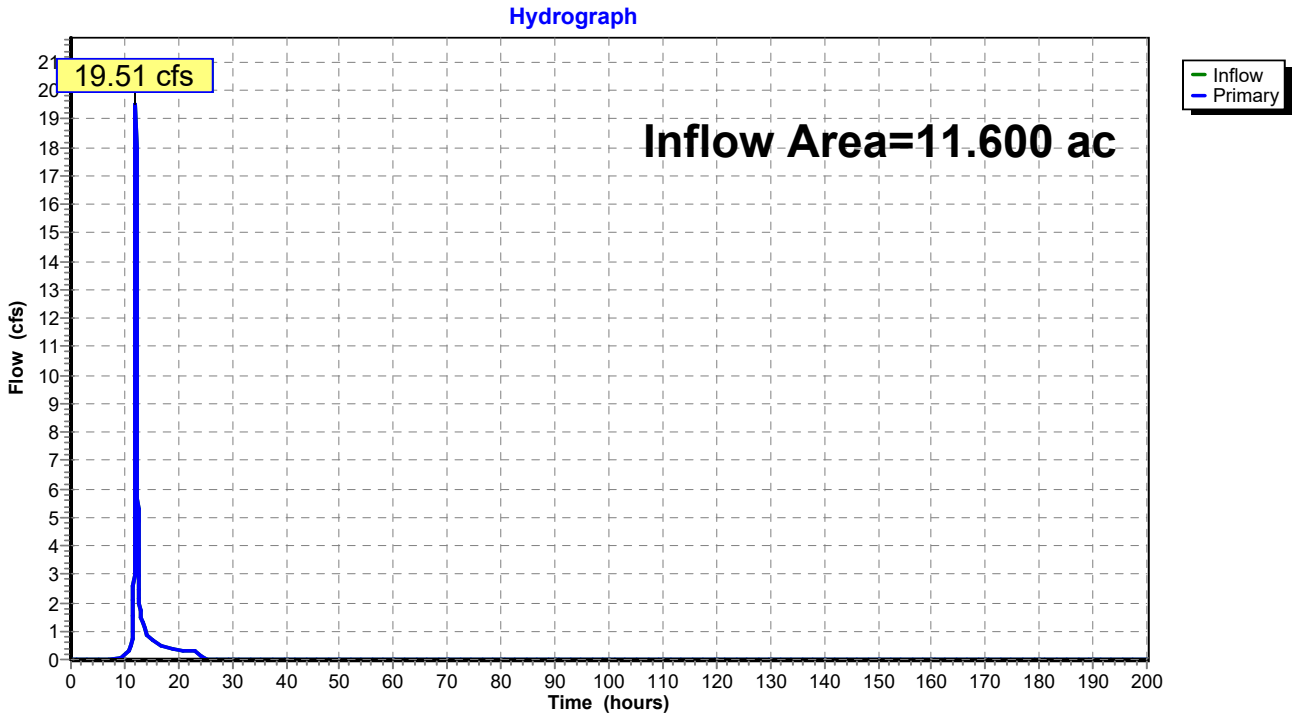


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 1.27" for 5-yr event
Inflow = 19.51 cfs @ 12.07 hrs, Volume= 1.232 af
Primary = 19.51 cfs @ 12.07 hrs, Volume= 1.232 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

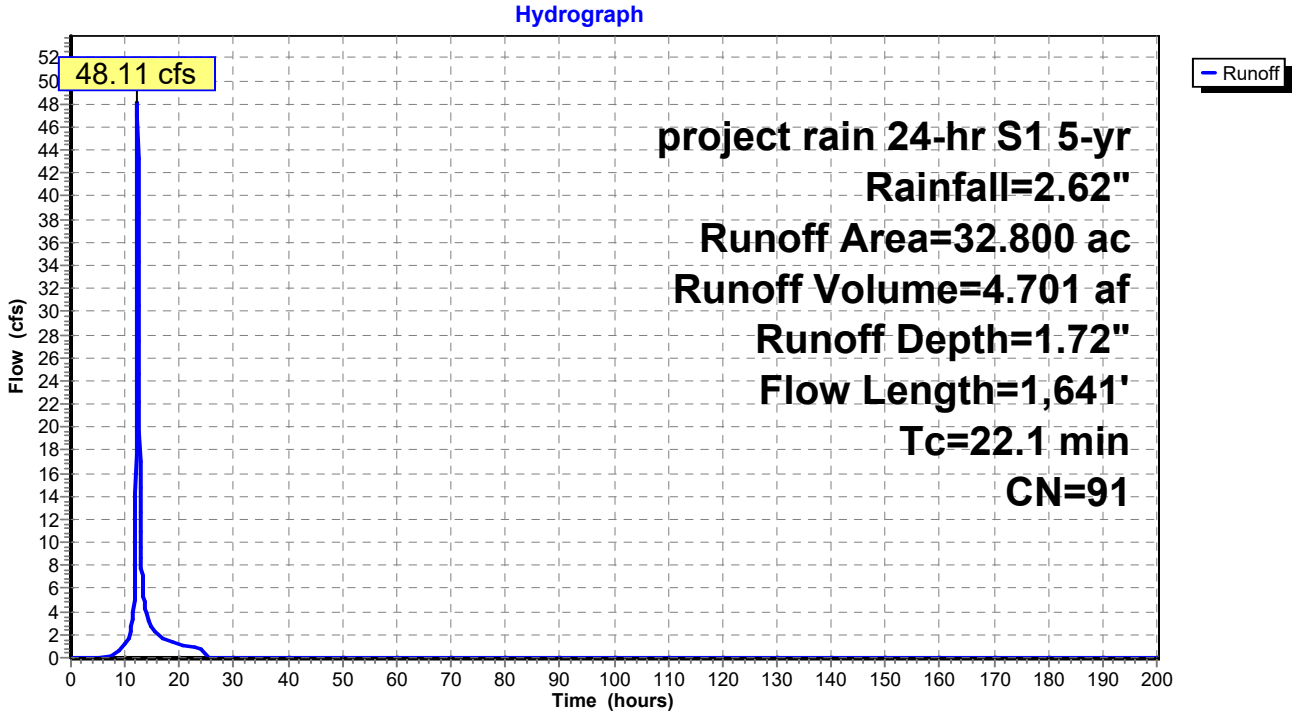
Runoff = 48.11 cfs @ 12.26 hrs, Volume= 4.701 af, Depth= 1.72"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

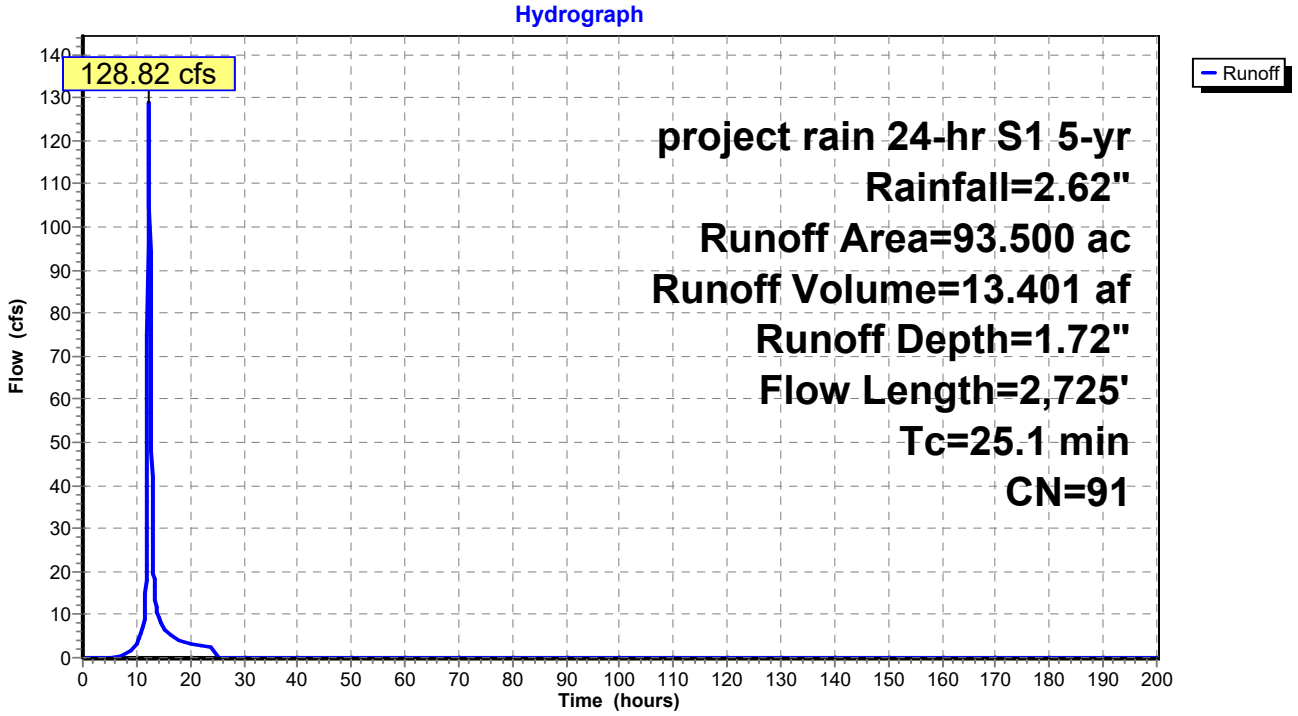
Runoff = 128.82 cfs @ 12.30 hrs, Volume= 13.401 af, Depth= 1.72"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 1.72" for 5-yr event
Inflow = 128.82 cfs @ 12.30 hrs, Volume= 13.401 af
Outflow = 5.31 cfs @ 16.38 hrs, Volume= 13.206 af, Atten= 96%, Lag= 245.2 min
Primary = 5.31 cfs @ 16.38 hrs, Volume= 13.206 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 592.47' @ 16.38 hrs Surf.Area= 329,777 sf Storage= 1,079,738 cf (407,157 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 1,188.2 min (2,017.9 - 829.7)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

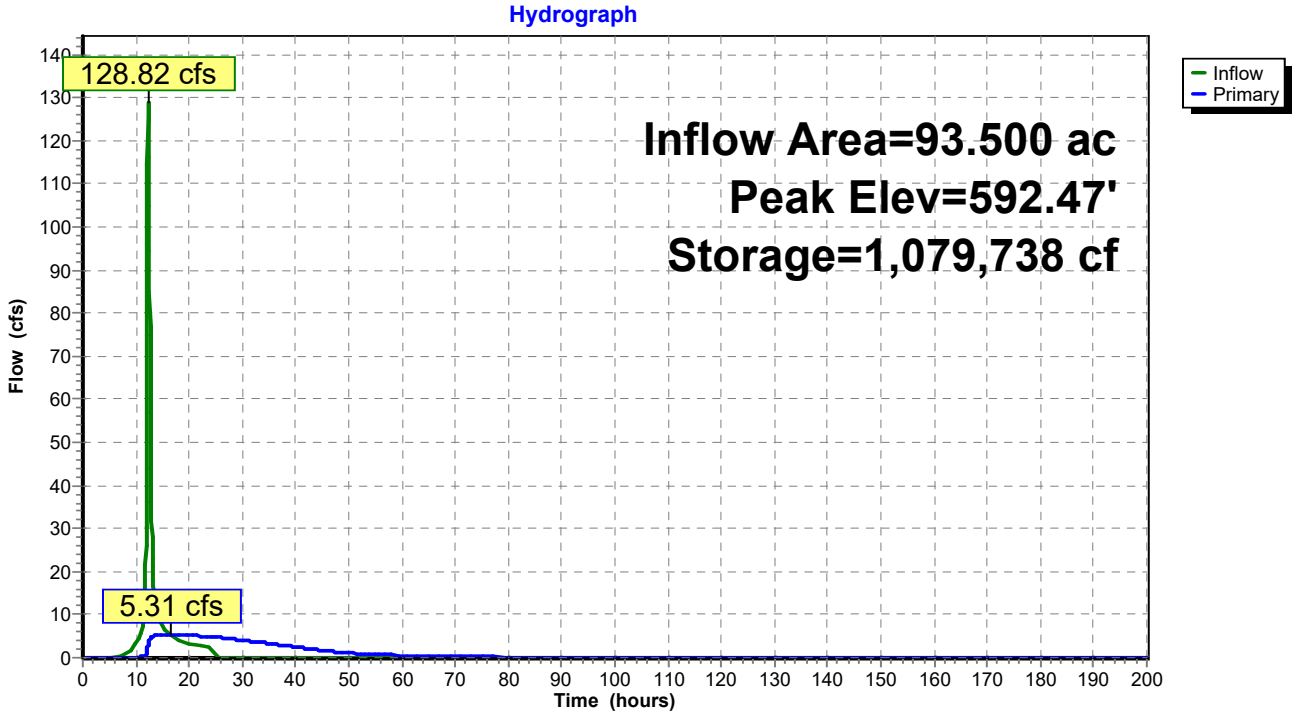
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.31 cfs @ 16.38 hrs HW=592.47' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 5.31 cfs of 5.49 cfs potential flow)
  - **2=Culvert** (Inlet Controls 5.31 cfs @ 6.76 fps)
  - **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

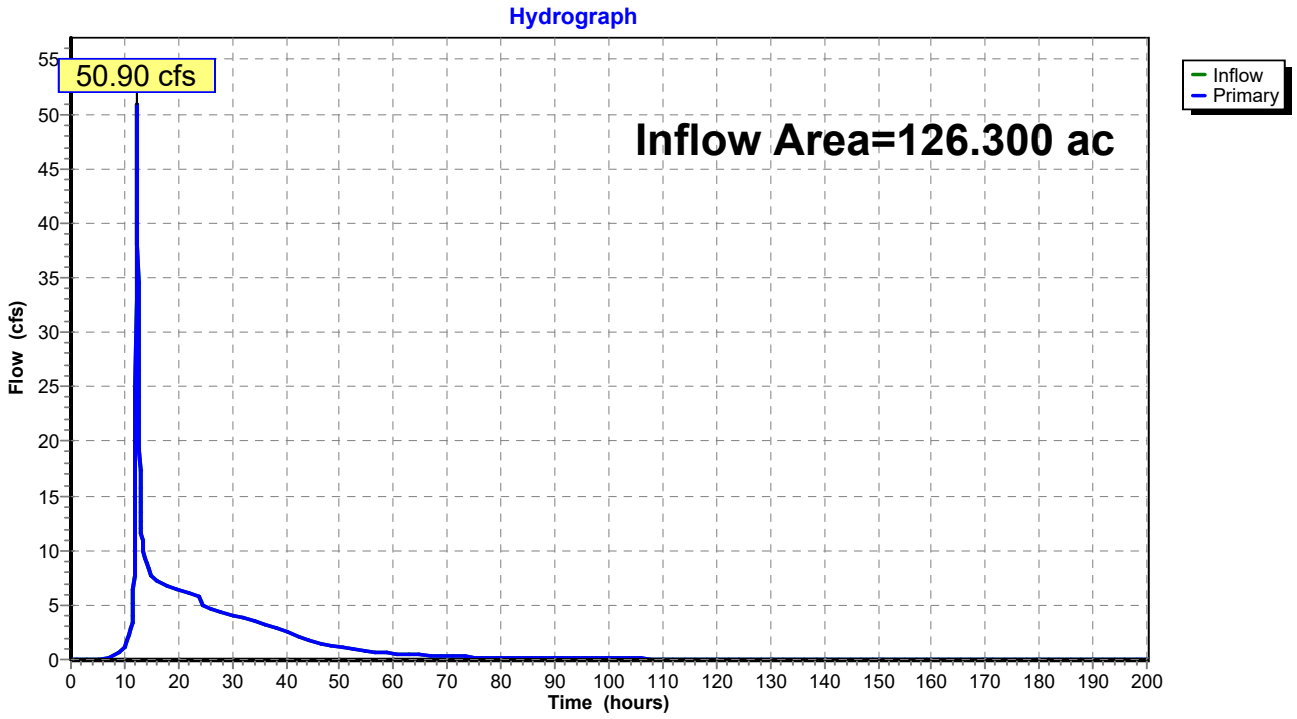


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 1.70" for 5-yr event
Inflow = 50.90 cfs @ 12.26 hrs, Volume= 17.907 af
Primary = 50.90 cfs @ 12.26 hrs, Volume= 17.907 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

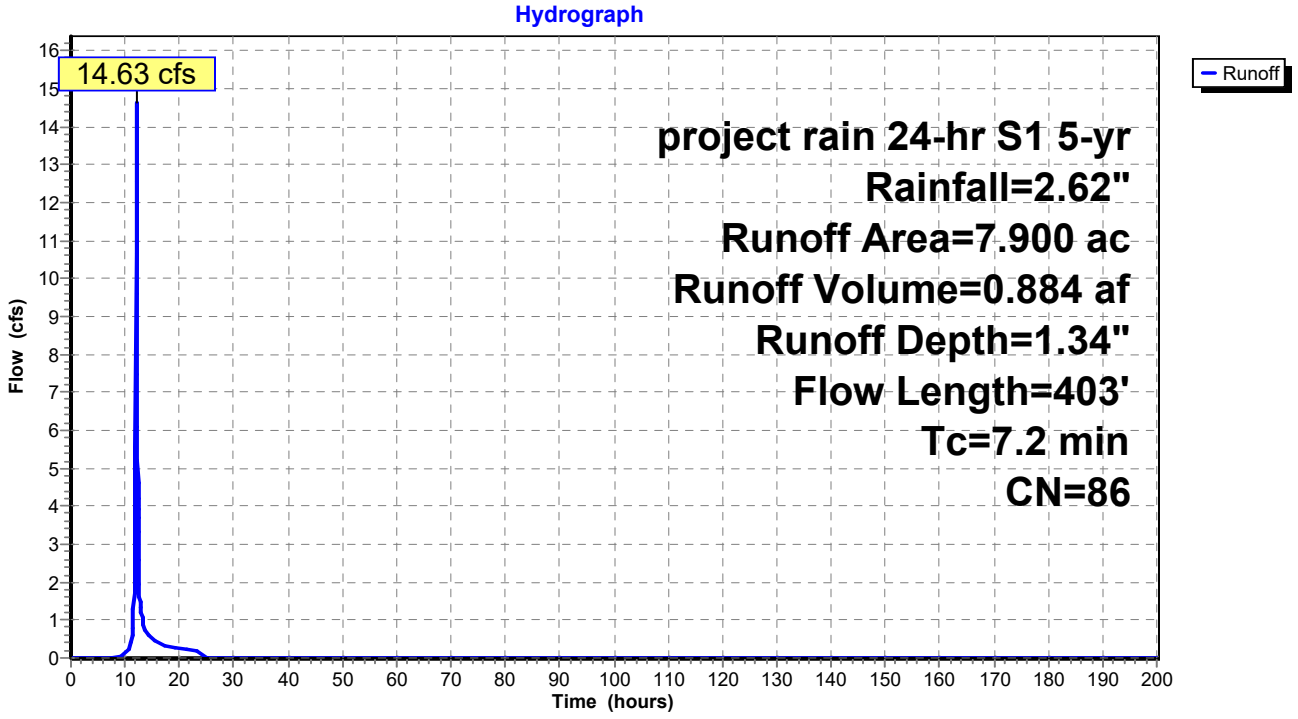
Runoff = 14.63 cfs @ 12.06 hrs, Volume= 0.884 af, Depth= 1.34"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 5-yr Rainfall=2.62"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

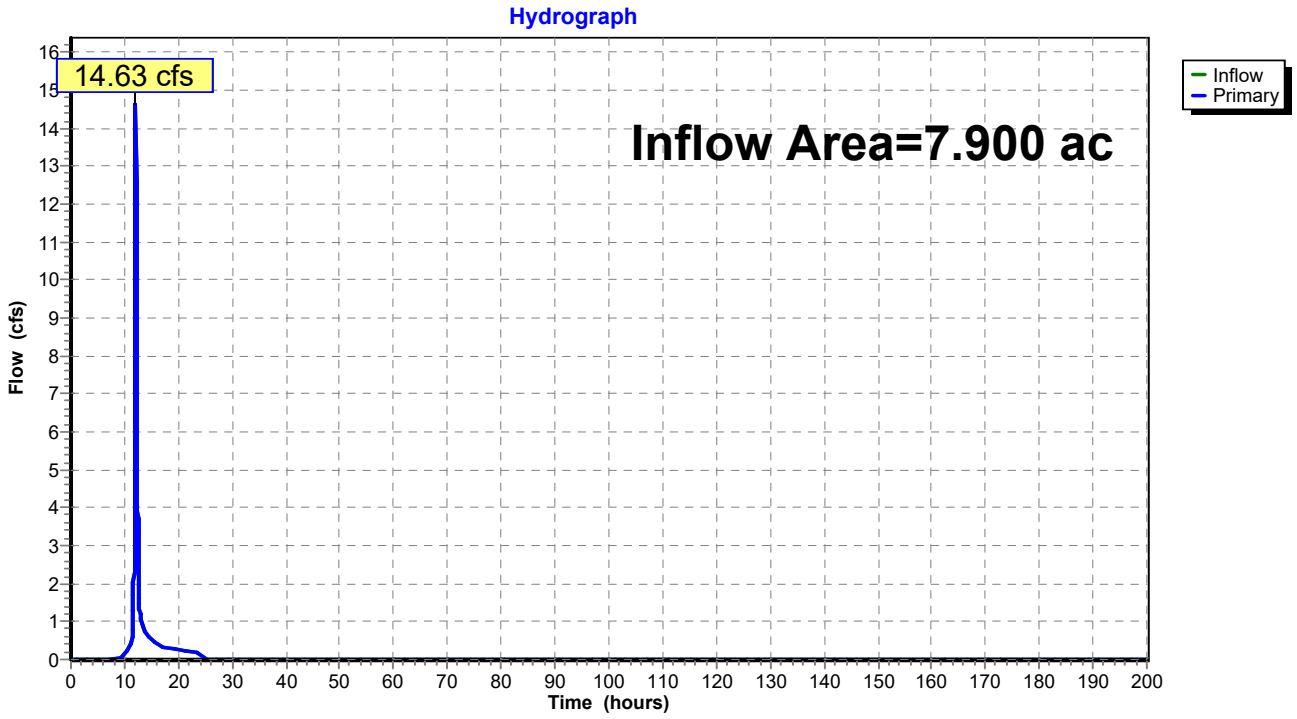


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 1.34" for 5-yr event
Inflow = 14.63 cfs @ 12.06 hrs, Volume= 0.884 af
Primary = 14.63 cfs @ 12.06 hrs, Volume= 0.884 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

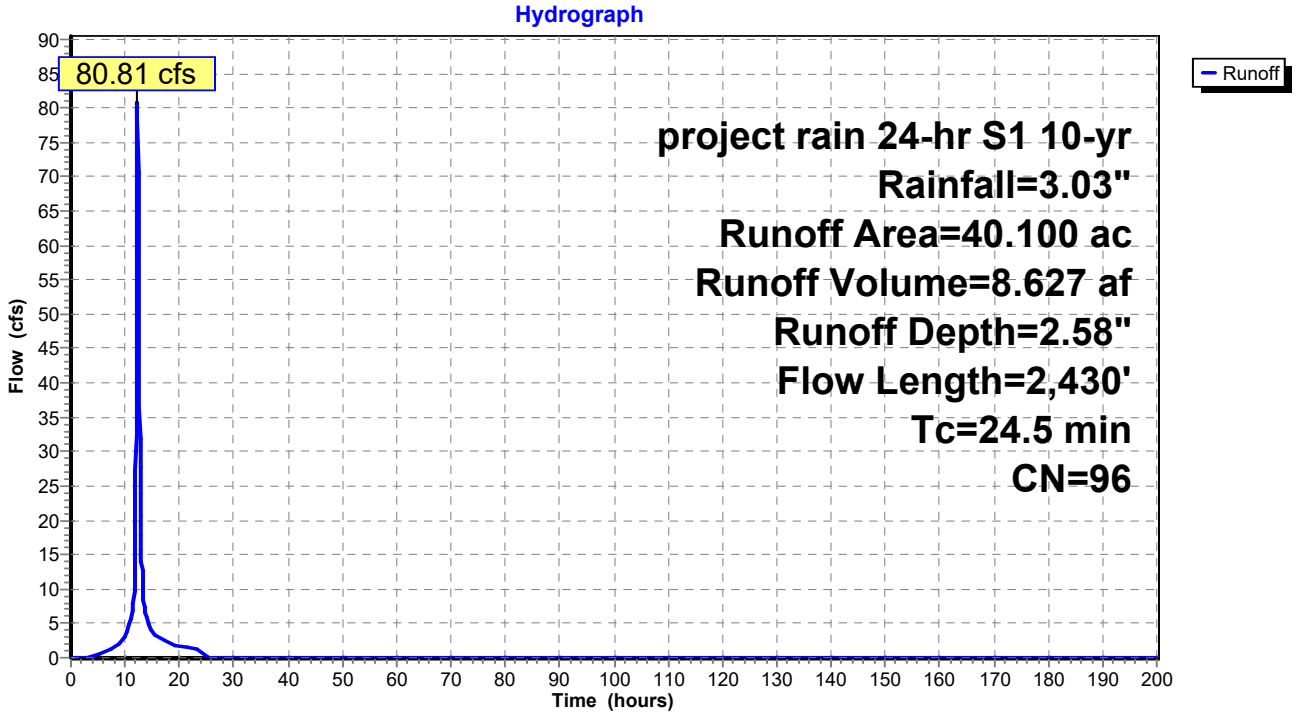
Runoff = 80.81 cfs @ 12.28 hrs, Volume= 8.627 af, Depth= 2.58"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 2.58" for 10-yr event
Inflow = 80.81 cfs @ 12.28 hrs, Volume= 8.627 af
Outflow = 7.62 cfs @ 13.48 hrs, Volume= 8.622 af, Atten= 91%, Lag= 72.1 min
Primary = 7.62 cfs @ 13.48 hrs, Volume= 8.622 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.56' @ 13.48 hrs Surf.Area= 8.606 ac Storage= 4.732 af

Plug-Flow detention time= 294.7 min calculated for 8.622 af (100% of inflow)
Center-of-Mass det. time= 294.2 min (1,086.9 - 792.7)

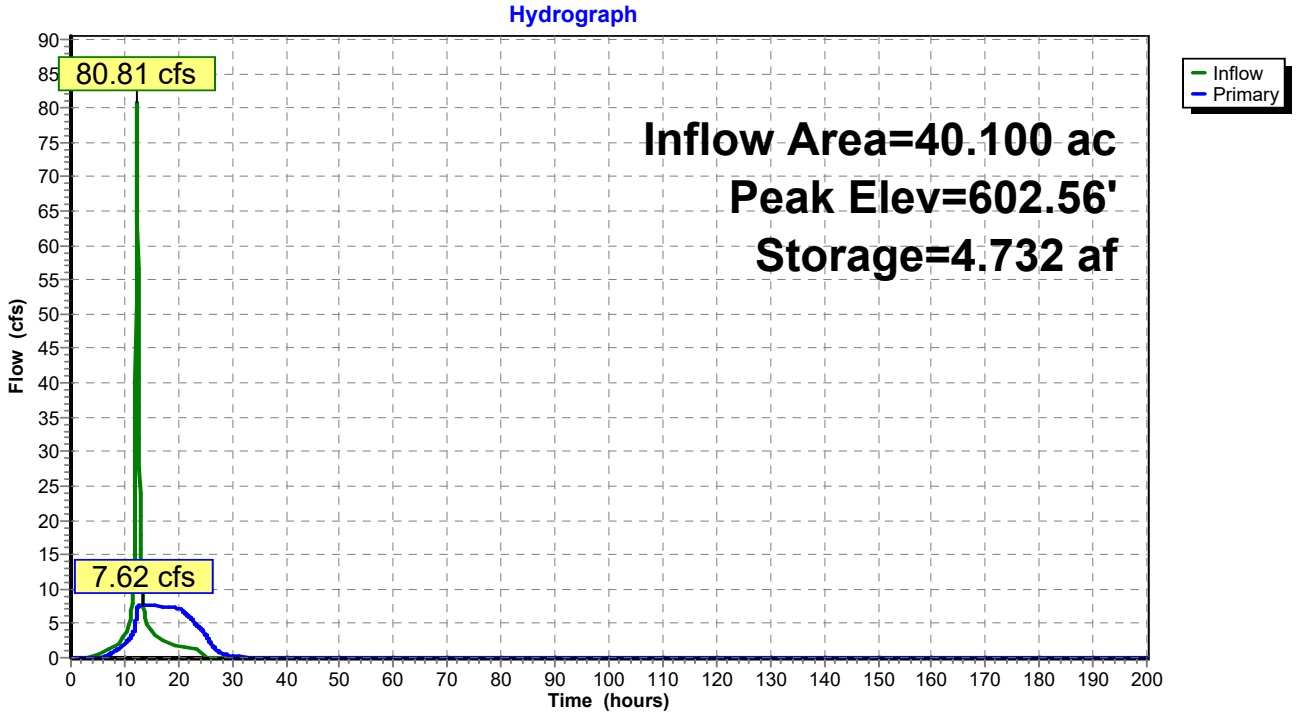
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.62 cfs @ 13.48 hrs HW=602.56' TW=598.30' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.62 cfs of 9.79 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.62 cfs @ 9.70 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

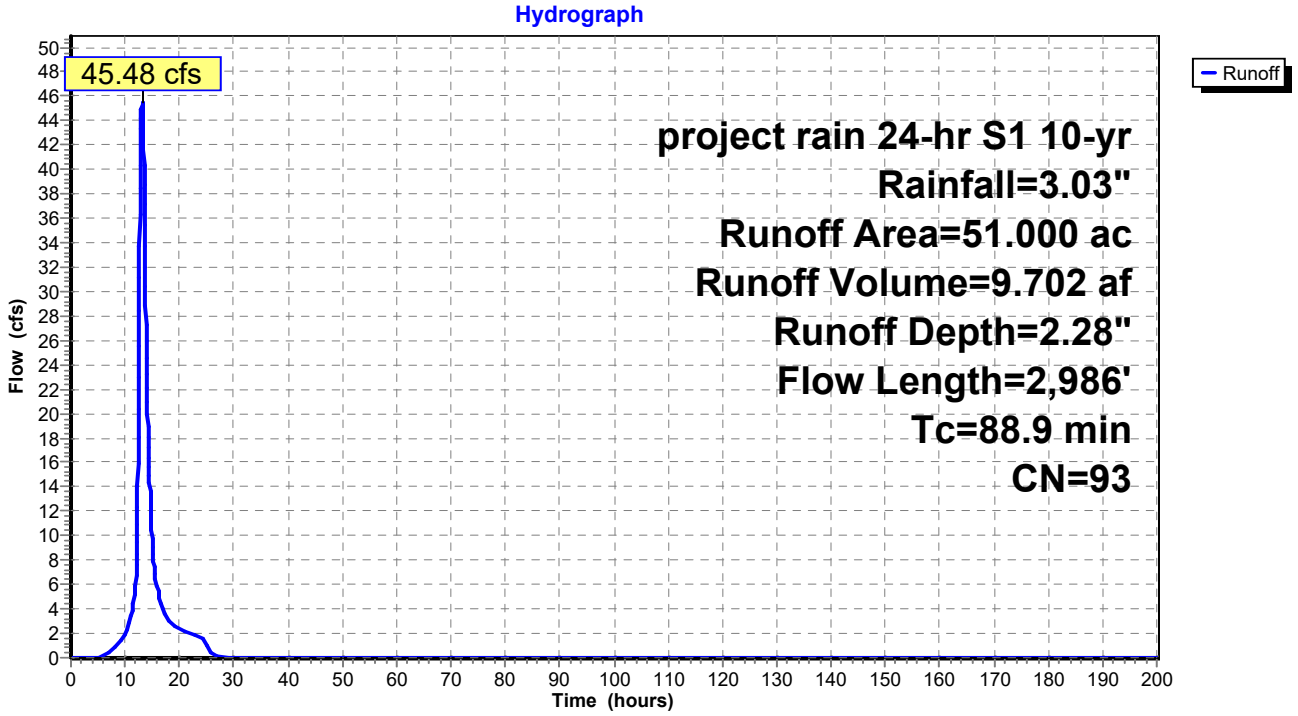
Runoff = 45.48 cfs @ 13.14 hrs, Volume= 9.702 af, Depth= 2.28"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 2.28" for 10-yr event
Inflow = 45.48 cfs @ 13.14 hrs, Volume= 9.702 af
Outflow = 12.34 cfs @ 14.67 hrs, Volume= 9.671 af, Atten= 73%, Lag= 92.1 min
Primary = 12.34 cfs @ 14.67 hrs, Volume= 9.671 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 601.25' @ 14.67 hrs Surf.Area= 1.000 ac Storage= 4.796 af

Plug-Flow detention time= 293.0 min calculated for 9.671 af (100% of inflow)
Center-of-Mass det. time= 290.8 min (1,162.4 - 871.6)

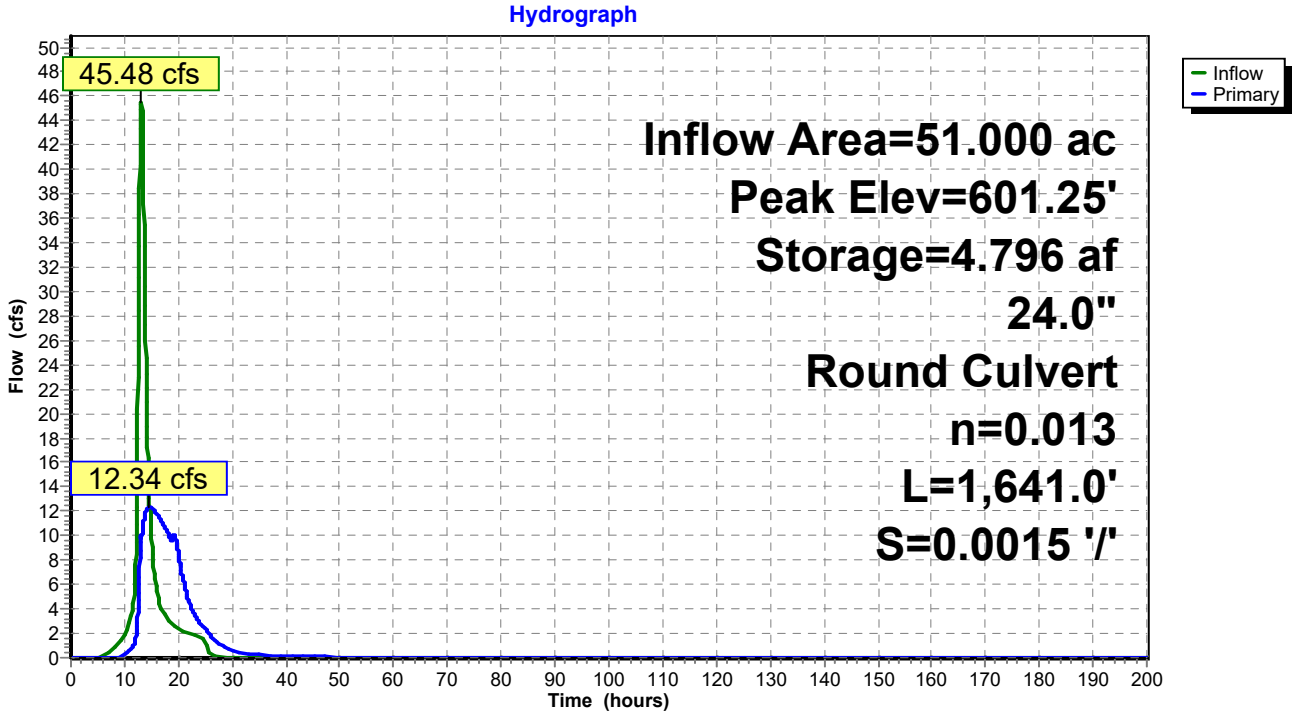
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.34 cfs @ 14.67 hrs HW=601.25' TW=584.15' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 12.34 cfs @ 3.93 fps)

Pond 05: Ex Collection Sump



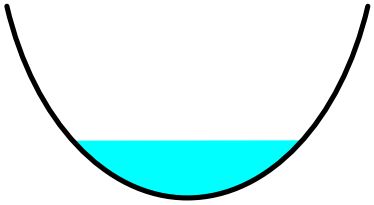
Summary for Reach 06a: Reach A Upper

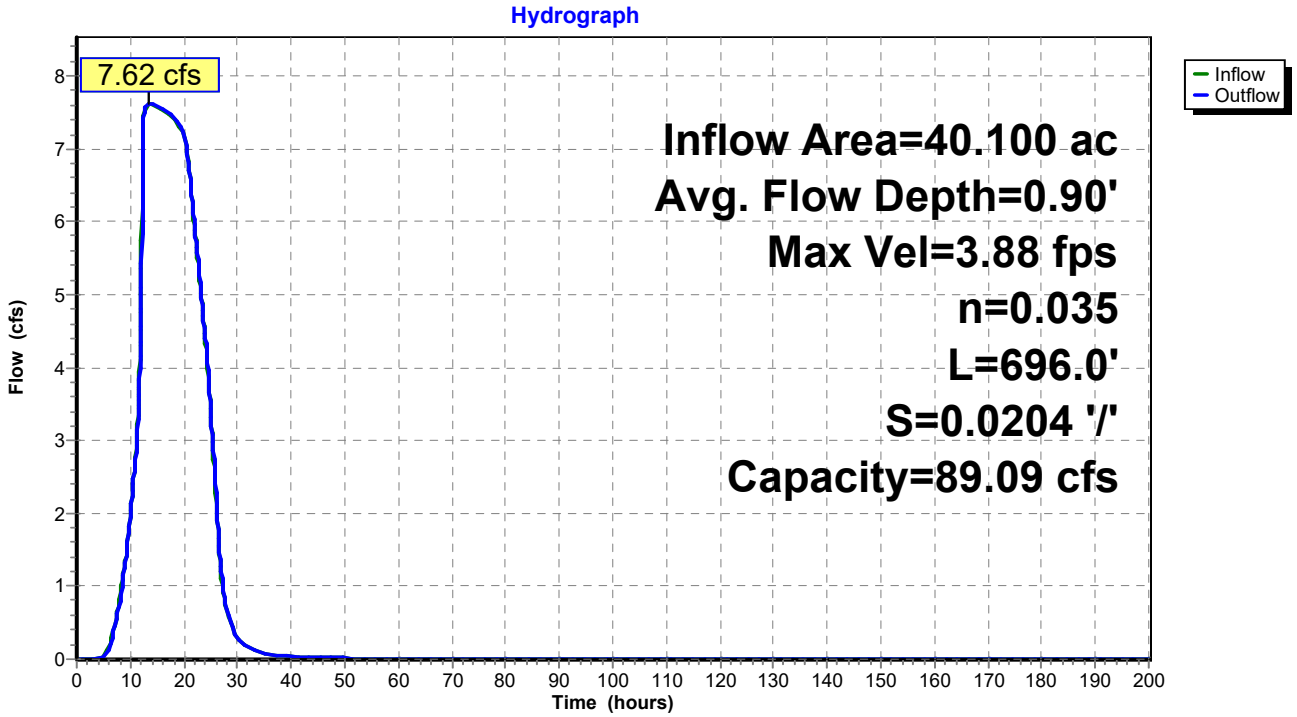
Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 2.58" for 10-yr event
Inflow = 7.62 cfs @ 13.48 hrs, Volume= 8.622 af
Outflow = 7.62 cfs @ 13.52 hrs, Volume= 8.622 af, Atten= 0%, Lag= 2.3 min
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.88 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,368 cf @ 13.52 hrs
Average Depth at Peak Storage= 0.90' , Surface Width= 3.28'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'





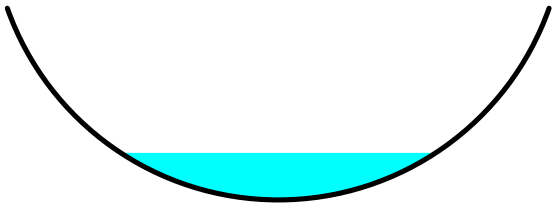
Summary for Reach 06b: Reach A Lower

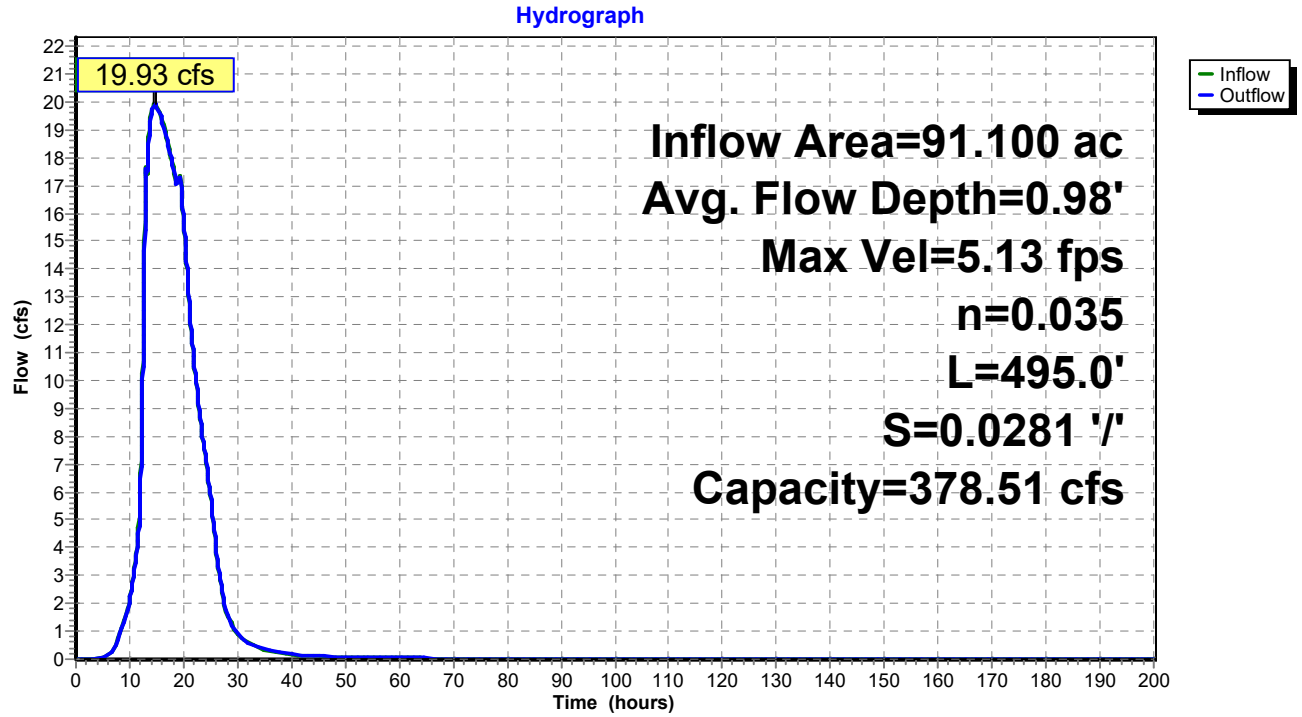
Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 2.41" for 10-yr event
Inflow = 19.93 cfs @ 14.64 hrs, Volume= 18.292 af
Outflow = 19.93 cfs @ 14.66 hrs, Volume= 18.292 af, Atten= 0%, Lag= 1.2 min
Routed to Link 07 : Ex Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.13 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 7.5 min

Peak Storage= 1,922 cf @ 14.66 hrs
Average Depth at Peak Storage= 0.98' , Surface Width= 5.94'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



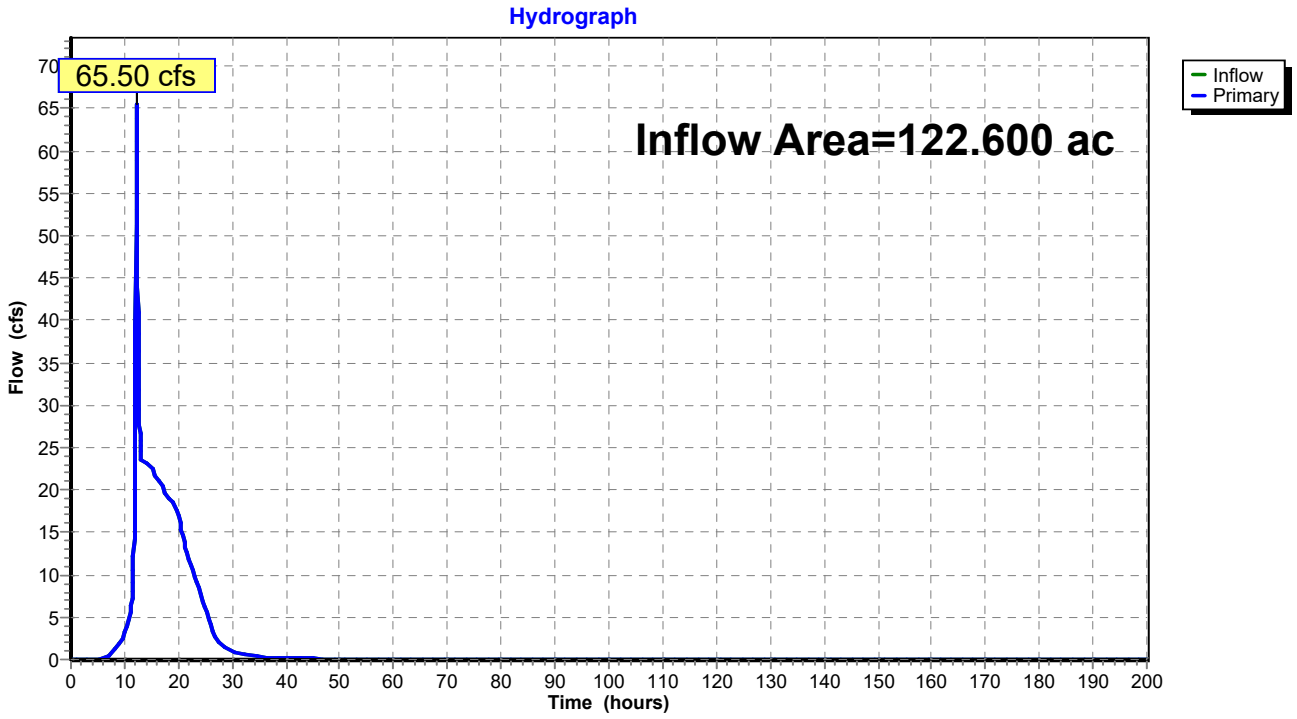


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 2.29" for 10-yr event
Inflow = 65.50 cfs @ 12.21 hrs, Volume= 23.350 af
Primary = 65.50 cfs @ 12.21 hrs, Volume= 23.350 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

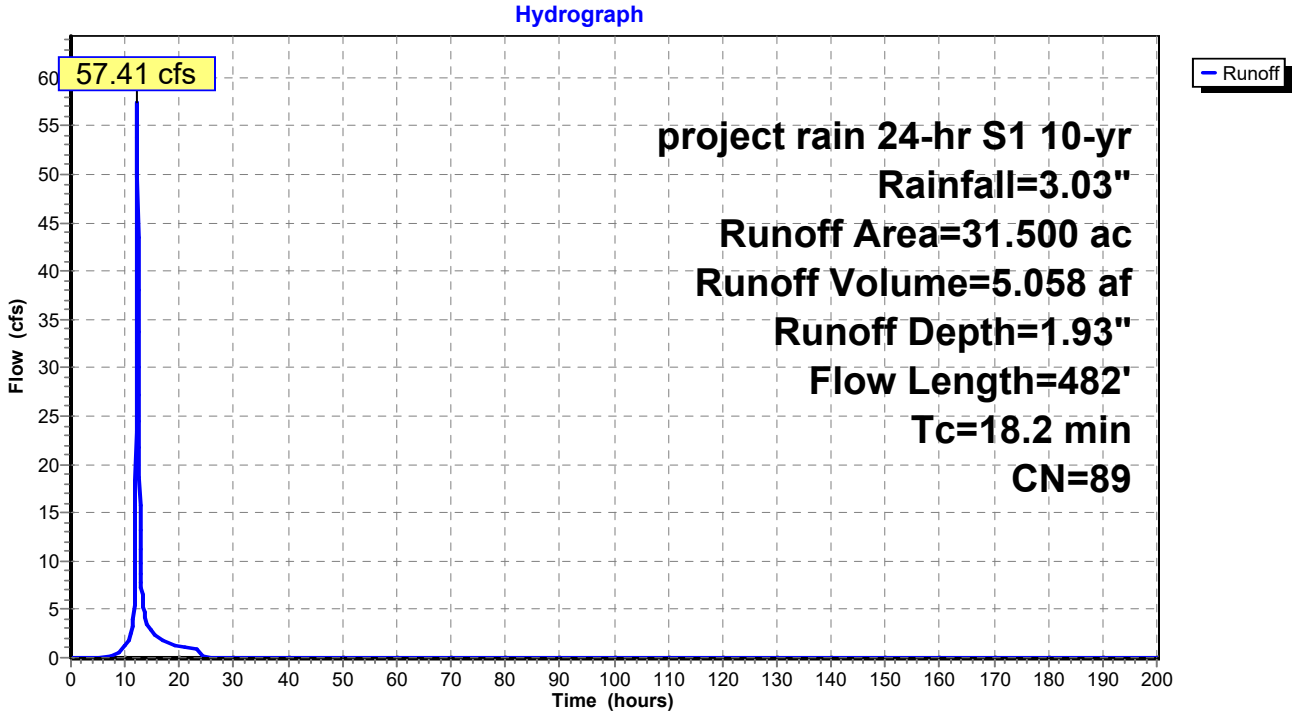
Runoff = 57.41 cfs @ 12.21 hrs, Volume= 5.058 af, Depth= 1.93"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

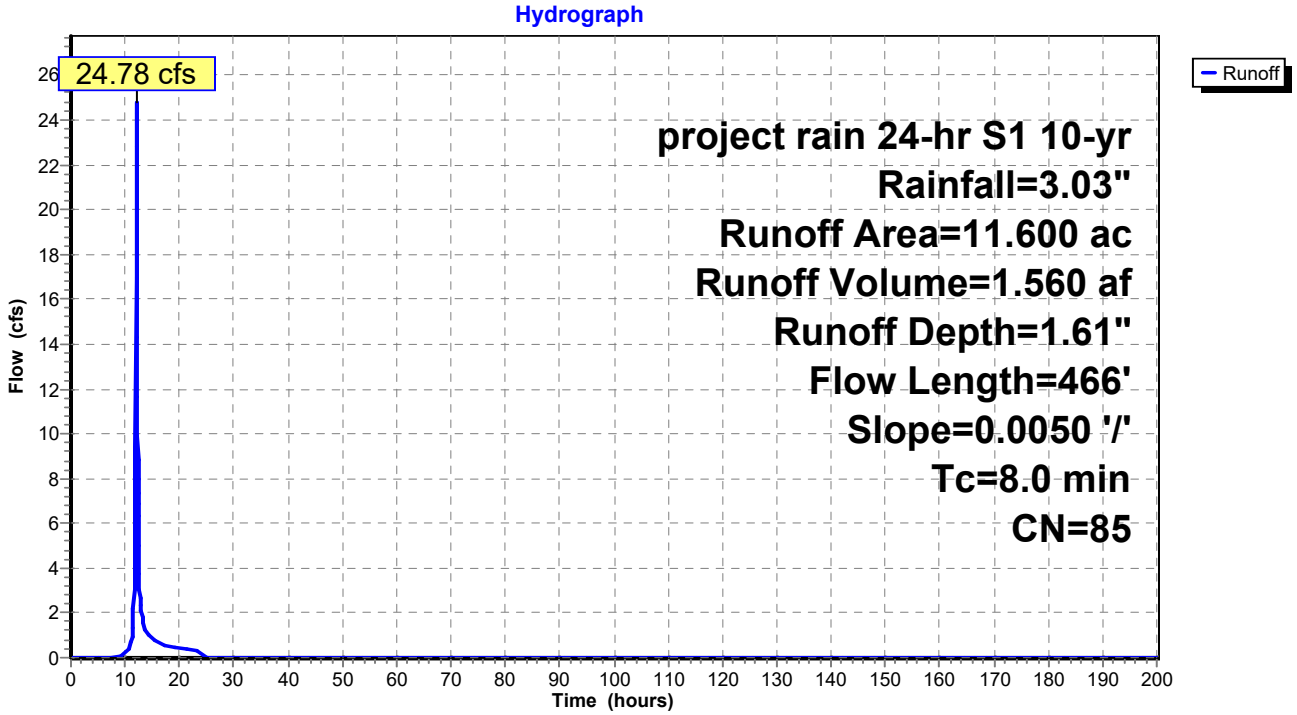
Runoff = 24.78 cfs @ 12.07 hrs, Volume= 1.560 af, Depth= 1.61"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

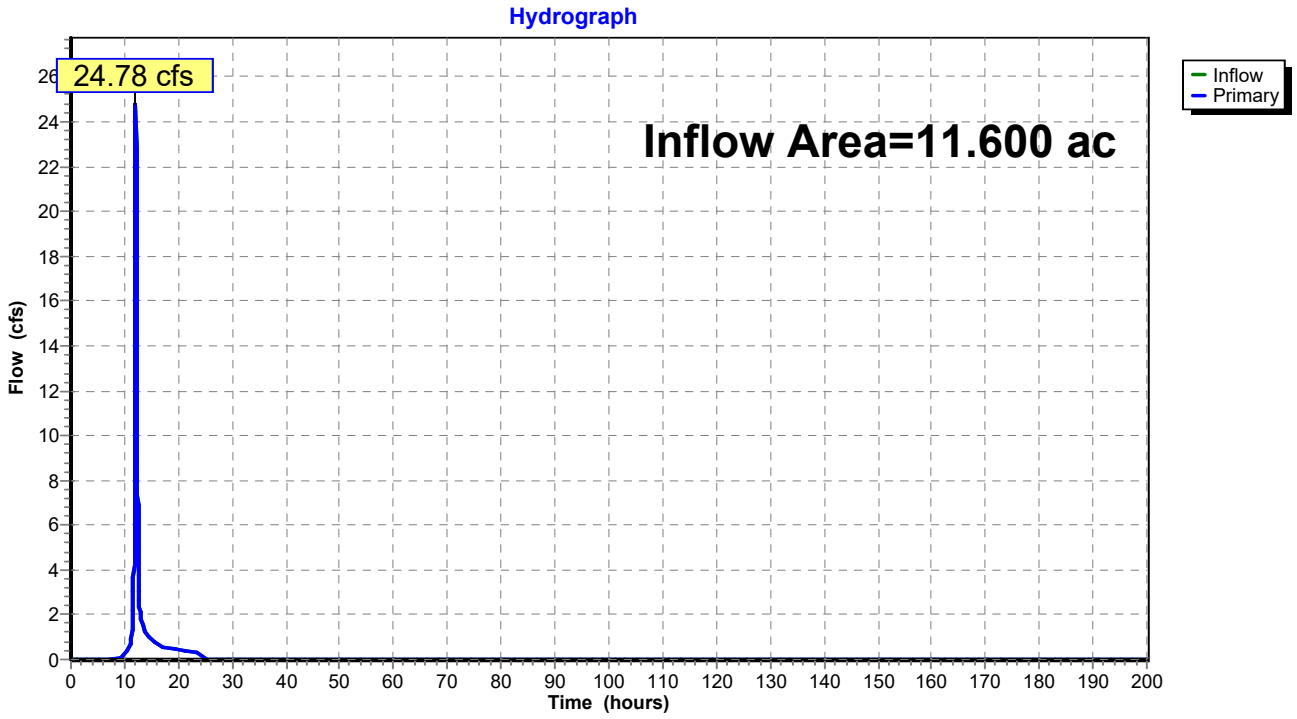


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 1.61" for 10-yr event
Inflow = 24.78 cfs @ 12.07 hrs, Volume= 1.560 af
Primary = 24.78 cfs @ 12.07 hrs, Volume= 1.560 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

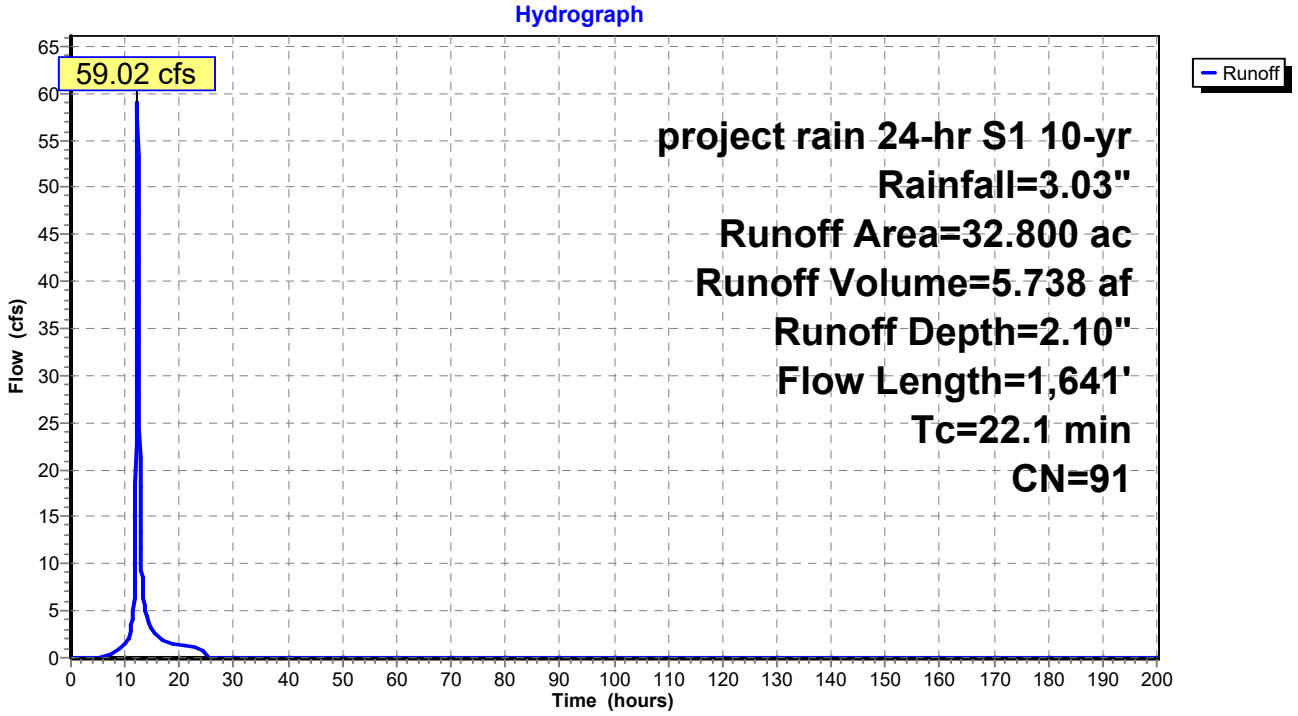
Runoff = 59.02 cfs @ 12.26 hrs, Volume= 5.738 af, Depth= 2.10"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

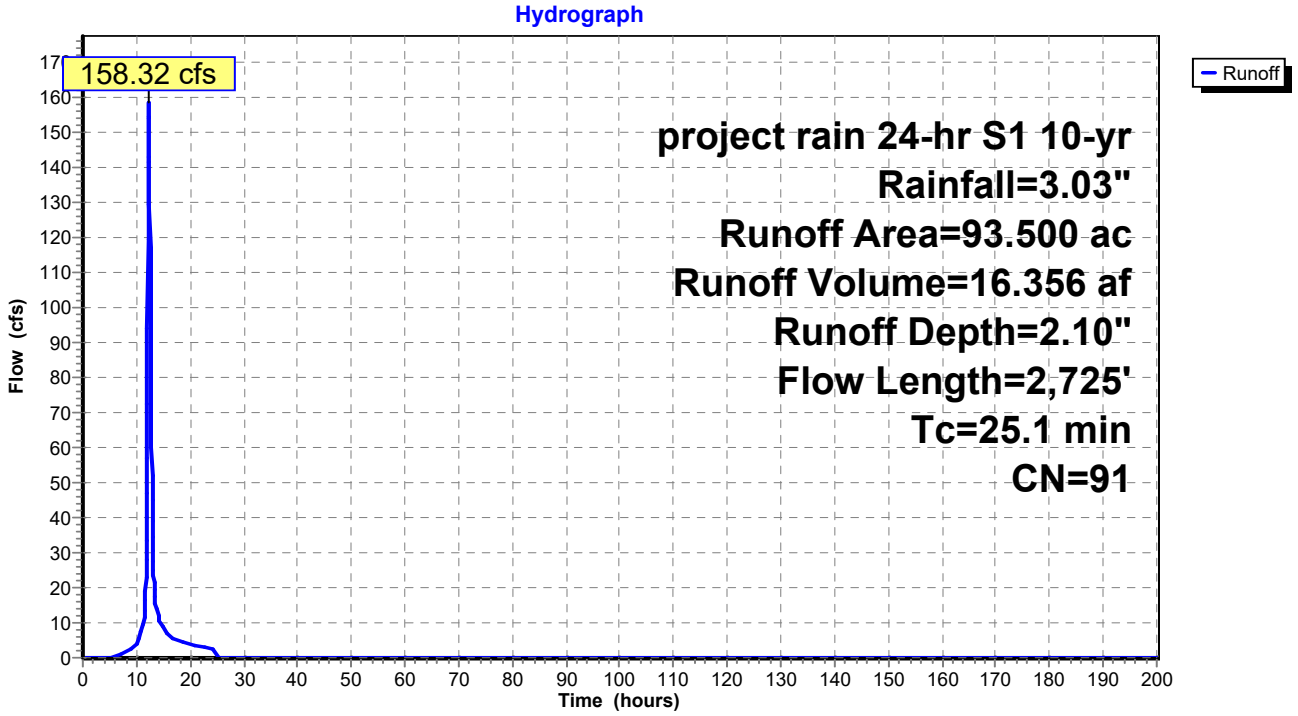
Runoff = 158.32 cfs @ 12.30 hrs, Volume= 16.356 af, Depth= 2.10"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 2.10" for 10-yr event
Inflow = 158.32 cfs @ 12.30 hrs, Volume= 16.356 af
Outflow = 5.74 cfs @ 16.75 hrs, Volume= 16.154 af, Atten= 96%, Lag= 267.3 min
Primary = 5.74 cfs @ 16.75 hrs, Volume= 16.154 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 593.03' @ 16.75 hrs Surf.Area= 337,610 sf Storage= 1,184,563 cf (511,982 cf above start)

Plug-Flow detention time= 6,035.1 min calculated for 0.713 af (4% of inflow)
Center-of-Mass det. time= 1,259.9 min (2,082.3 - 822.3)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

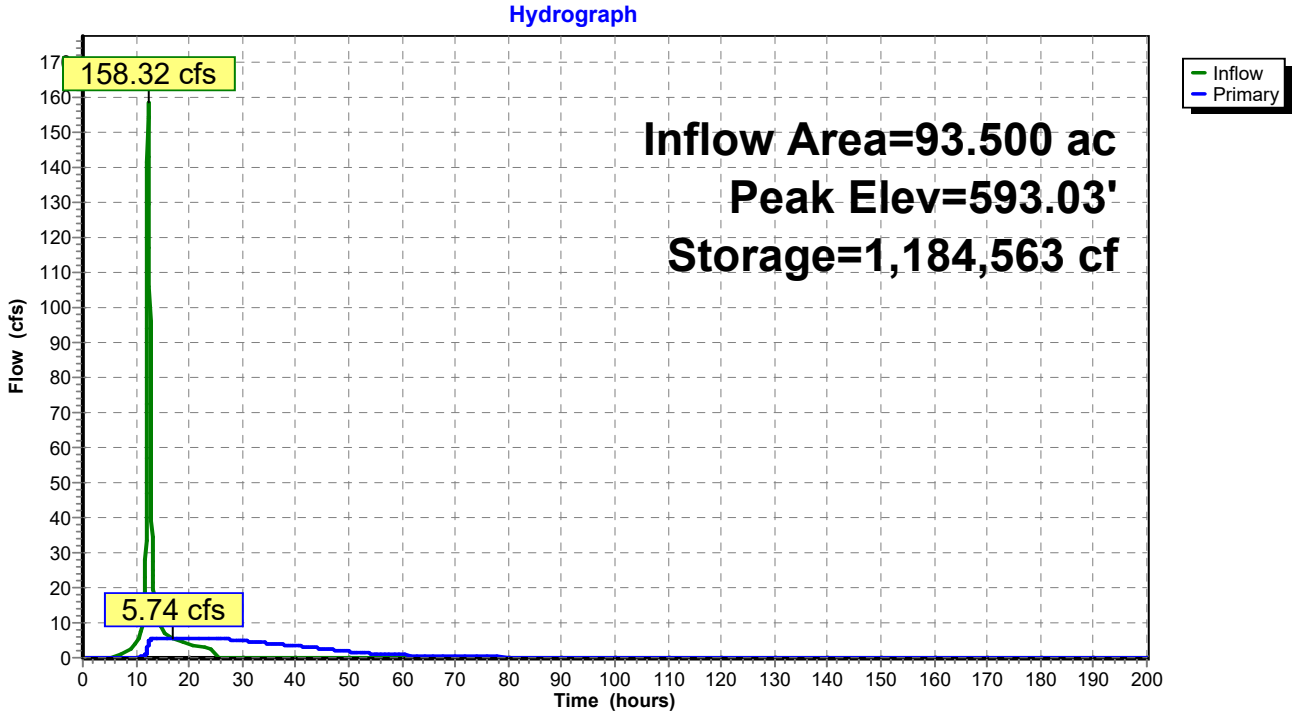
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.74 cfs @ 16.75 hrs HW=593.03' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 5.74 cfs @ 4.68 fps)
  - **2=Culvert** (Passes 5.74 cfs of 6.02 cfs potential flow)
  - **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

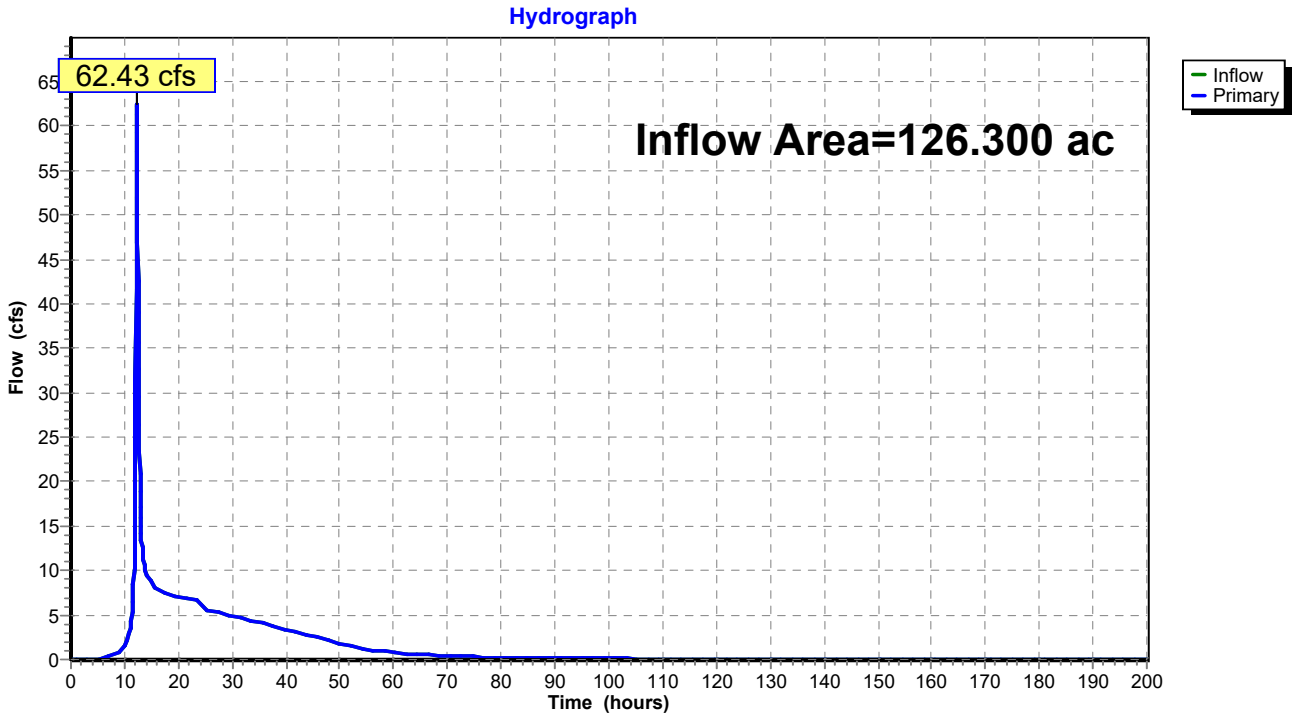


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 2.08" for 10-yr event
Inflow = 62.43 cfs @ 12.26 hrs, Volume= 21.892 af
Primary = 62.43 cfs @ 12.26 hrs, Volume= 21.892 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

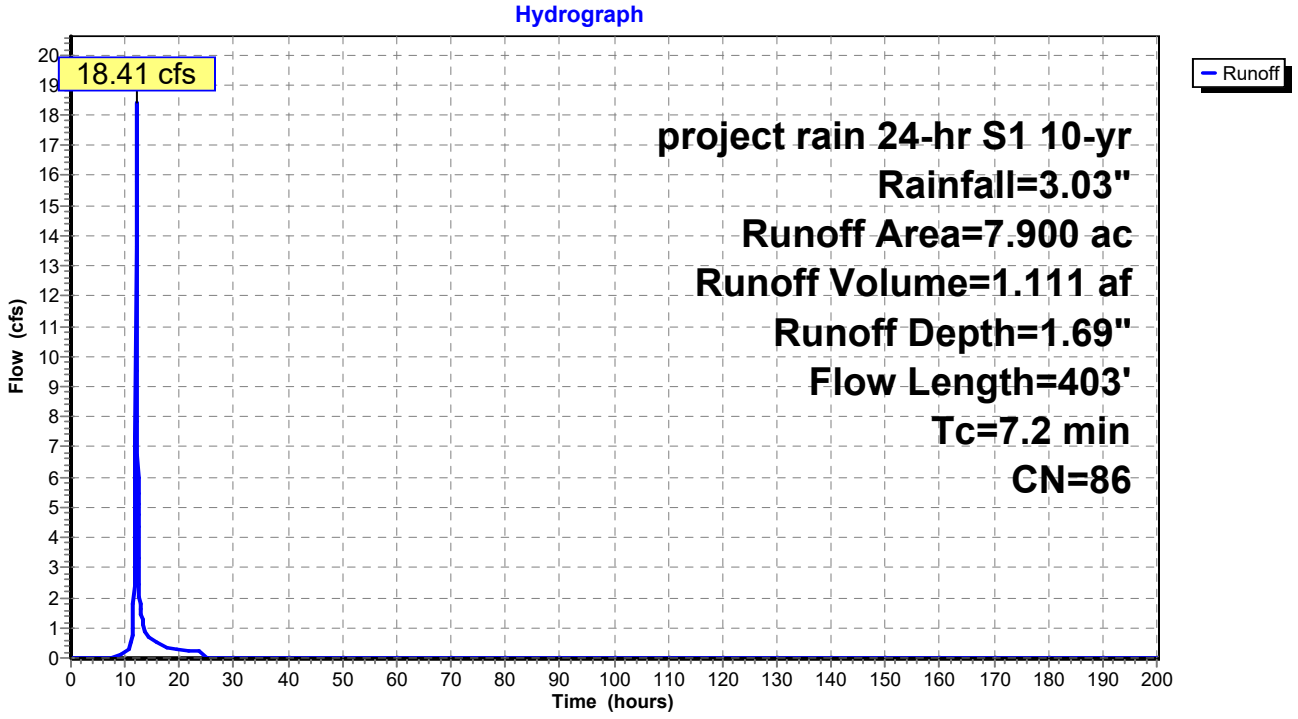
Runoff = 18.41 cfs @ 12.06 hrs, Volume= 1.111 af, Depth= 1.69"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 10-yr Rainfall=3.03"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

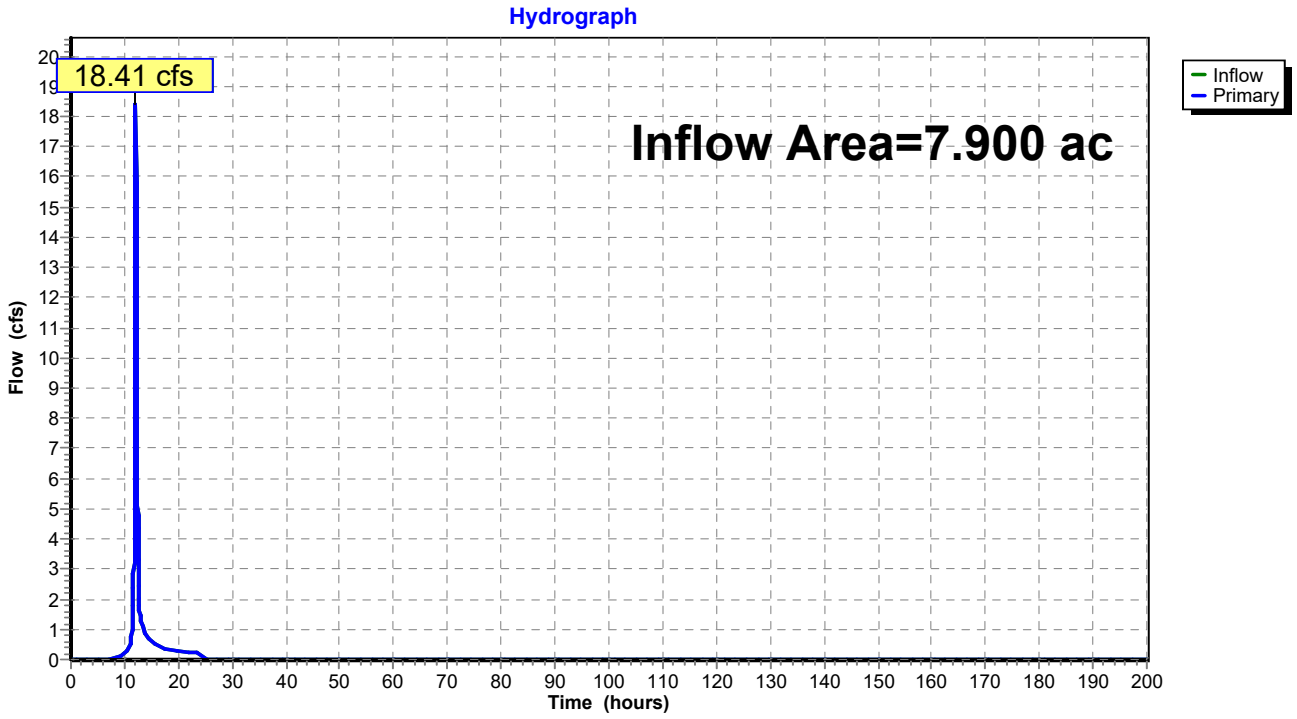


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 1.69" for 10-yr event
Inflow = 18.41 cfs @ 12.06 hrs, Volume= 1.111 af
Primary = 18.41 cfs @ 12.06 hrs, Volume= 1.111 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

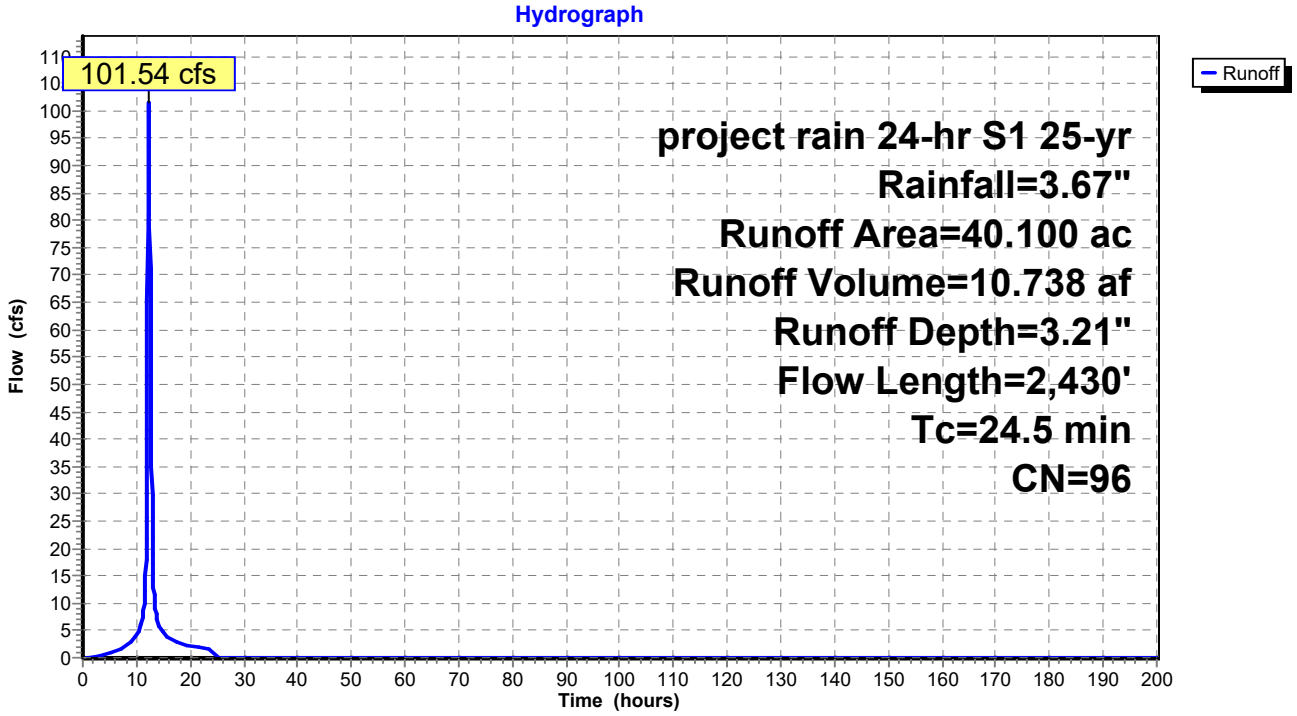
Runoff = 101.54 cfs @ 12.28 hrs, Volume= 10.738 af, Depth= 3.21"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 3.21" for 25-yr event
Inflow = 101.54 cfs @ 12.28 hrs, Volume= 10.738 af
Outflow = 7.75 cfs @ 13.71 hrs, Volume= 10.733 af, Atten= 92%, Lag= 85.8 min
Primary = 7.75 cfs @ 13.71 hrs, Volume= 10.733 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.70' @ 13.71 hrs Surf.Area= 10.752 ac Storage= 6.176 af

Plug-Flow detention time= 360.5 min calculated for 10.730 af (100% of inflow)
Center-of-Mass det. time= 362.2 min (1,148.8 - 786.6)

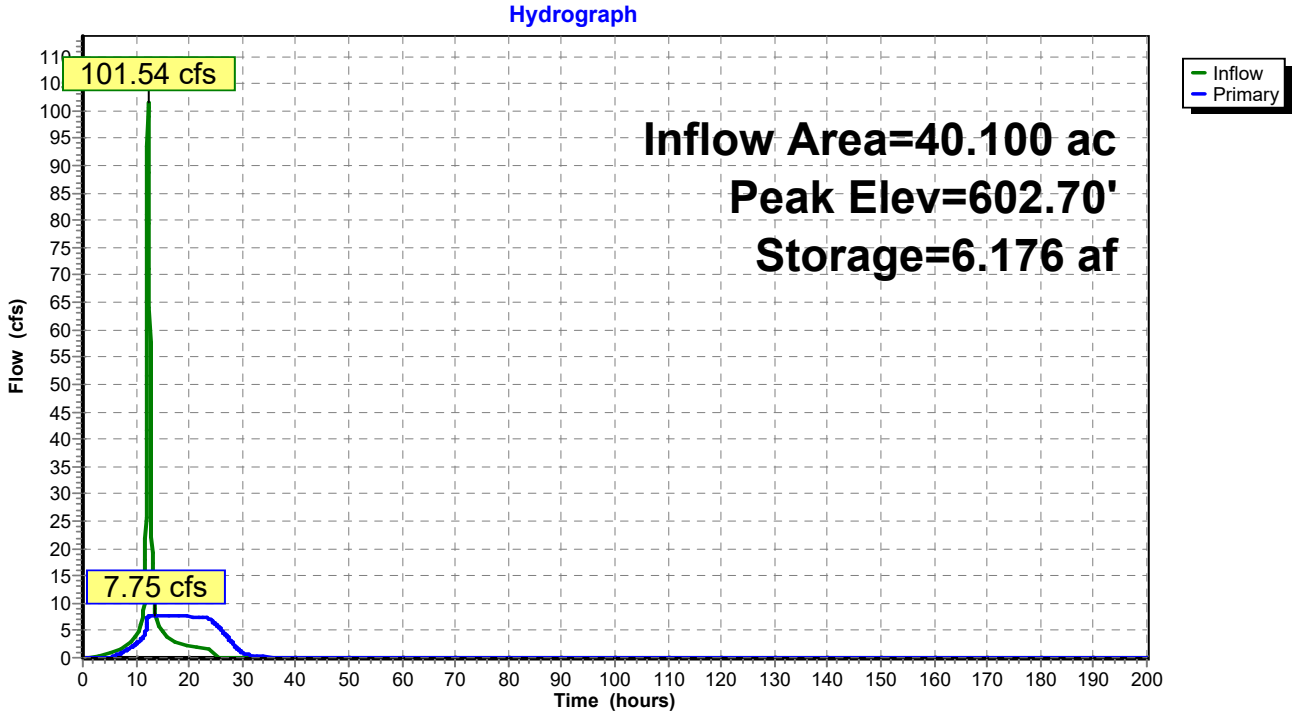
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.75 cfs @ 13.71 hrs HW=602.70' TW=598.31' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.75 cfs of 9.98 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.75 cfs @ 9.87 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

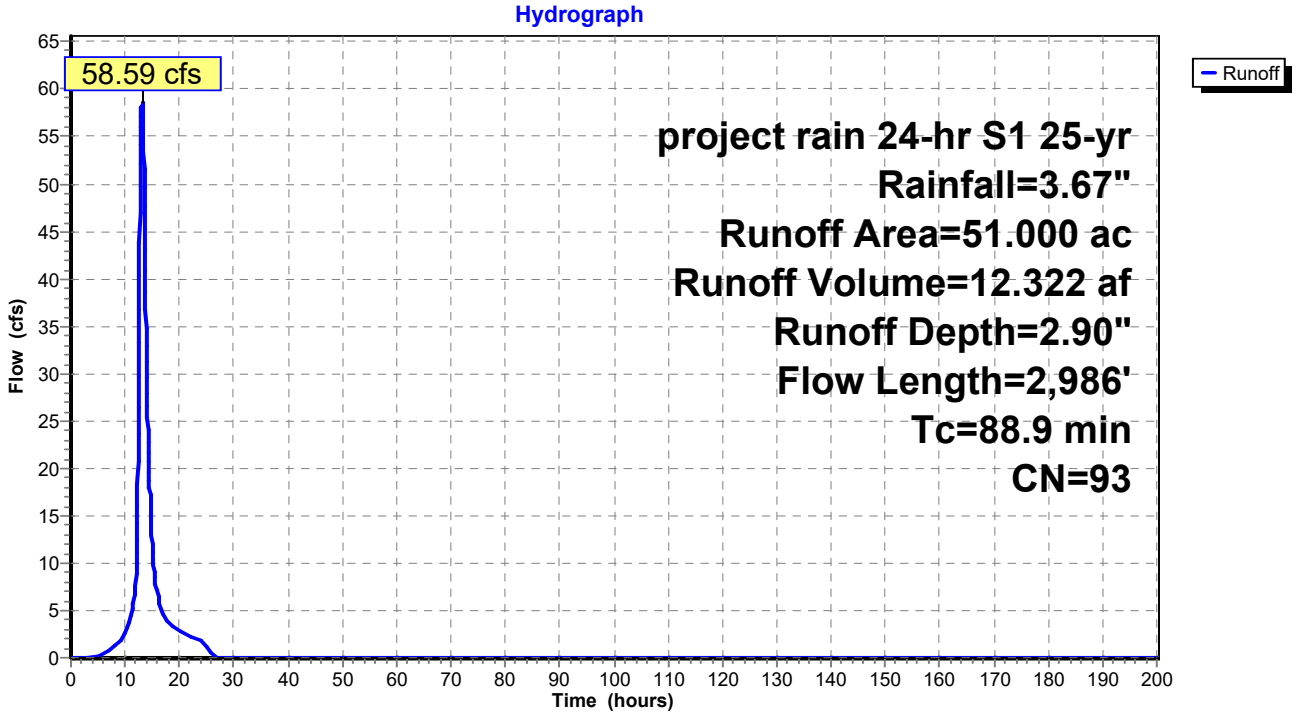
Runoff = 58.59 cfs @ 13.13 hrs, Volume= 12.322 af, Depth= 2.90"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 2.90" for 25-yr event
Inflow = 58.59 cfs @ 13.13 hrs, Volume= 12.322 af
Outflow = 12.90 cfs @ 14.89 hrs, Volume= 12.291 af, Atten= 78%, Lag= 105.0 min
Primary = 12.90 cfs @ 14.89 hrs, Volume= 12.291 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 601.73' @ 14.89 hrs Surf.Area= 11.283 ac Storage= 6.485 af

Plug-Flow detention time= 313.5 min calculated for 12.291 af (100% of inflow)
Center-of-Mass det. time= 311.8 min (1,175.6 - 863.9)

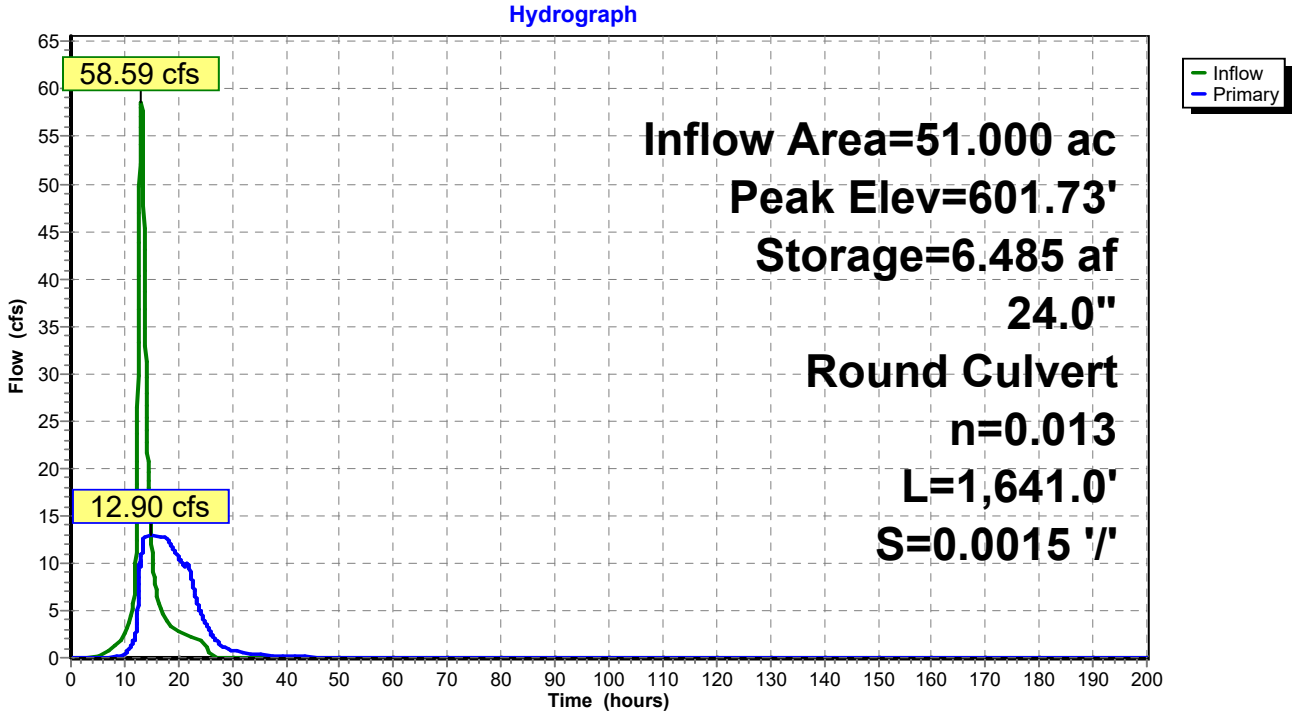
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.90 cfs @ 14.89 hrs HW=601.73' TW=584.17' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 12.90 cfs @ 4.10 fps)

Pond 05: Ex Collection Sump



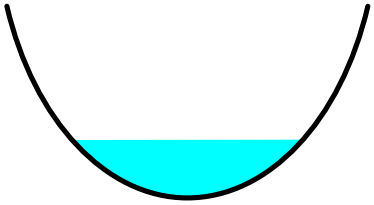
Summary for Reach 06a: Reach A Upper

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 3.21" for 25-yr event
Inflow = 7.75 cfs @ 13.71 hrs, Volume= 10.733 af
Outflow = 7.75 cfs @ 13.75 hrs, Volume= 10.733 af, Atten= 0%, Lag= 2.2 min
Routed to Reach 06b : Reach A Lower

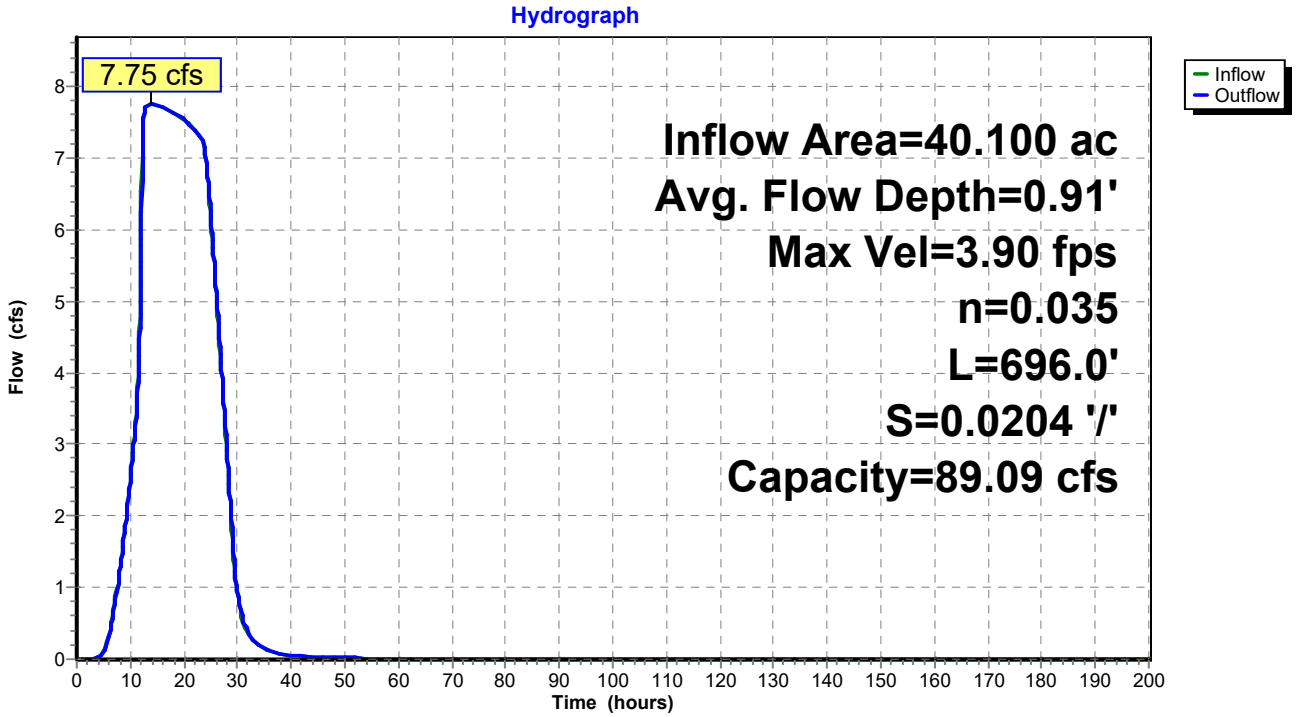
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.90 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 13.3 min

Peak Storage= 1,386 cf @ 13.75 hrs
Average Depth at Peak Storage= 0.91' , Surface Width= 3.30'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'



Reach 06a: Reach A Upper



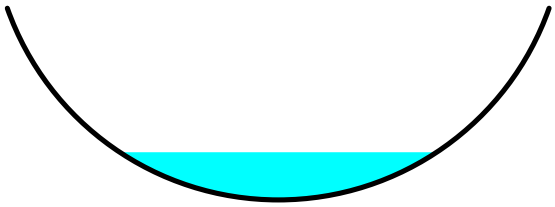
Summary for Reach 06b: Reach A Lower

Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 3.03" for 25-yr event
Inflow = 20.64 cfs @ 14.69 hrs, Volume= 23.024 af
Outflow = 20.64 cfs @ 14.71 hrs, Volume= 23.024 af, Atten= 0%, Lag= 1.2 min
Routed to Link 07 : Ex Analysis Point A

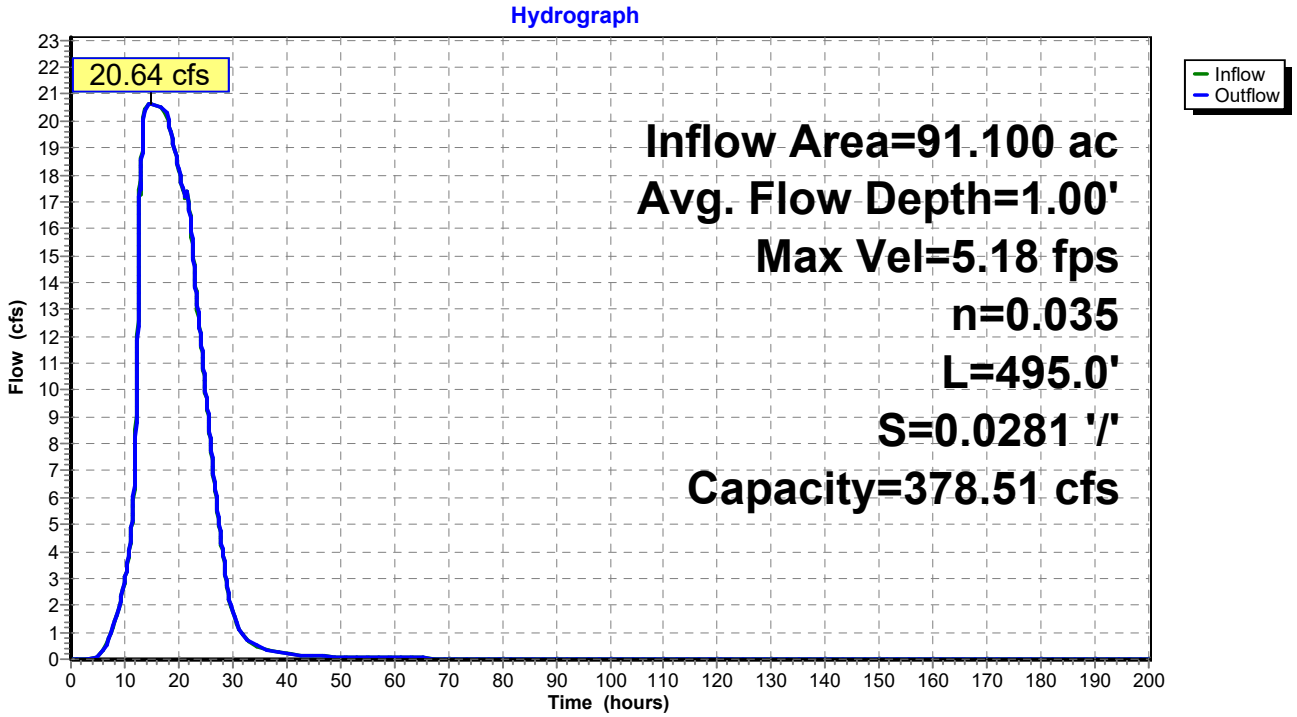
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.18 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 7.2 min

Peak Storage= 1,970 cf @ 14.71 hrs
Average Depth at Peak Storage= 1.00' , Surface Width= 5.99'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



Reach 06b: Reach A Lower

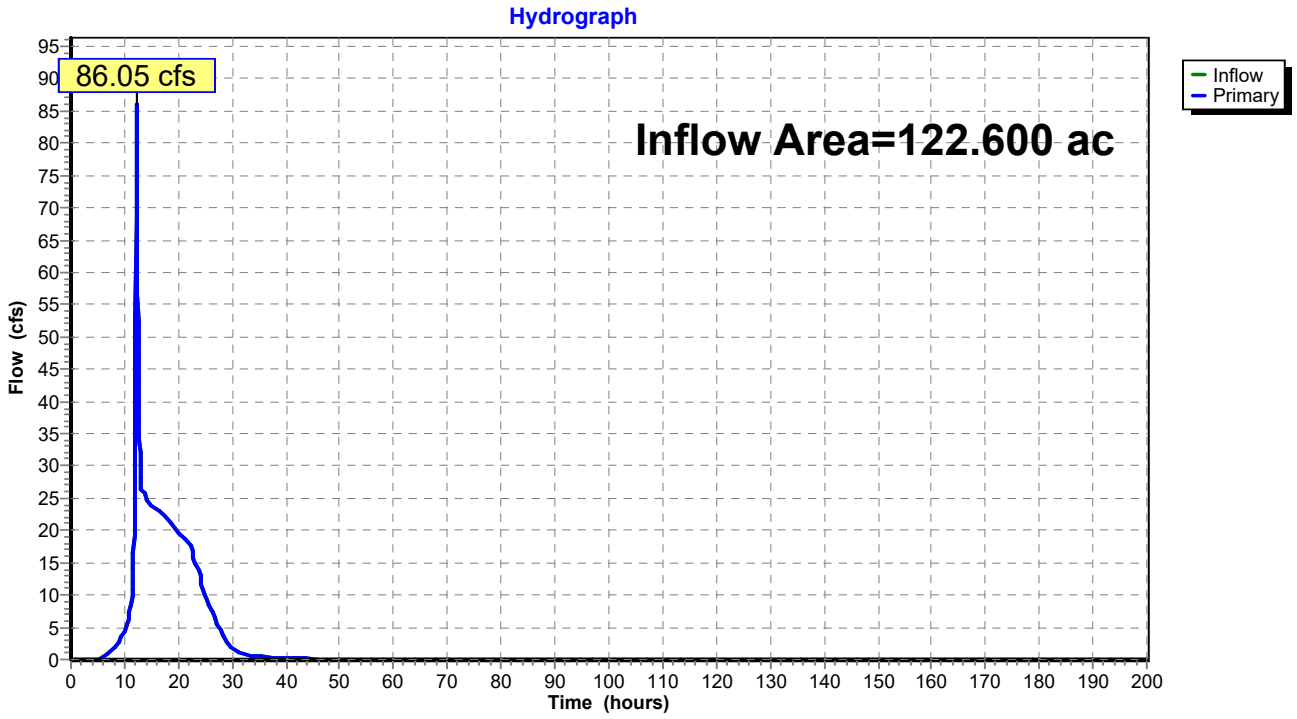


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 2.90" for 25-yr event
Inflow = 86.05 cfs @ 12.21 hrs, Volume= 29.625 af
Primary = 86.05 cfs @ 12.21 hrs, Volume= 29.625 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

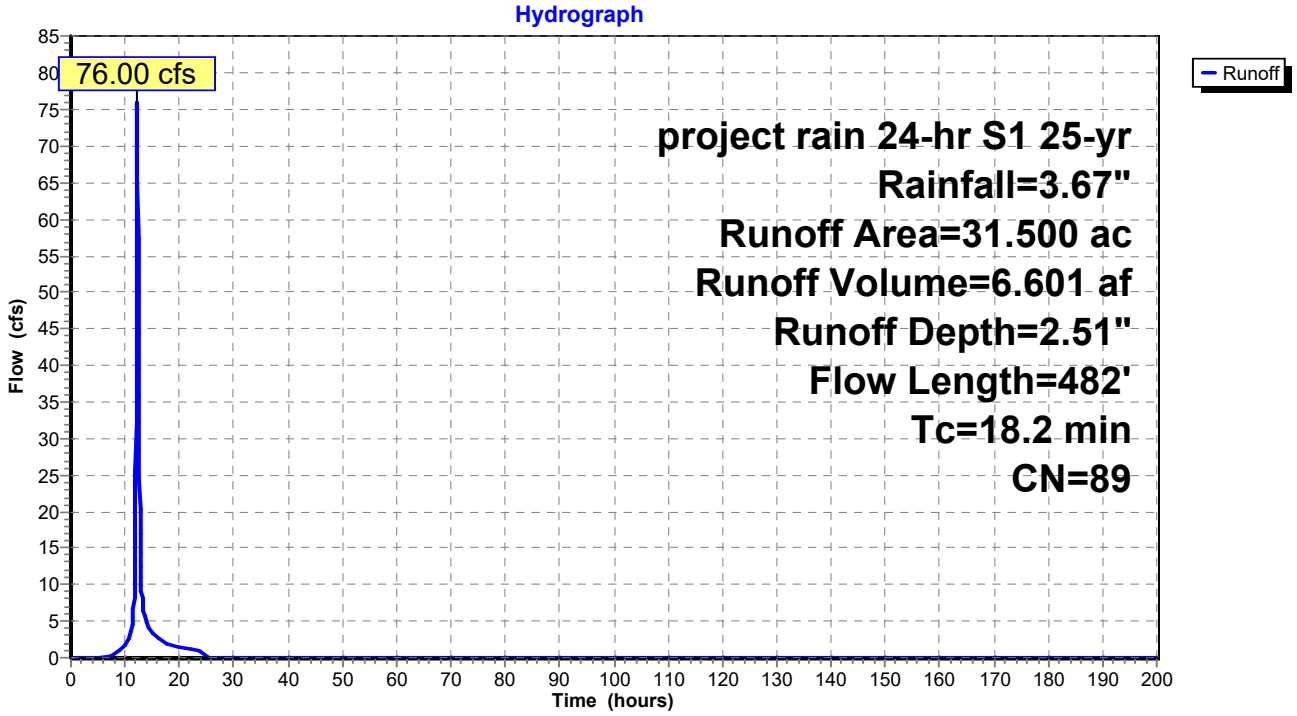
Runoff = 76.00 cfs @ 12.21 hrs, Volume= 6.601 af, Depth= 2.51"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

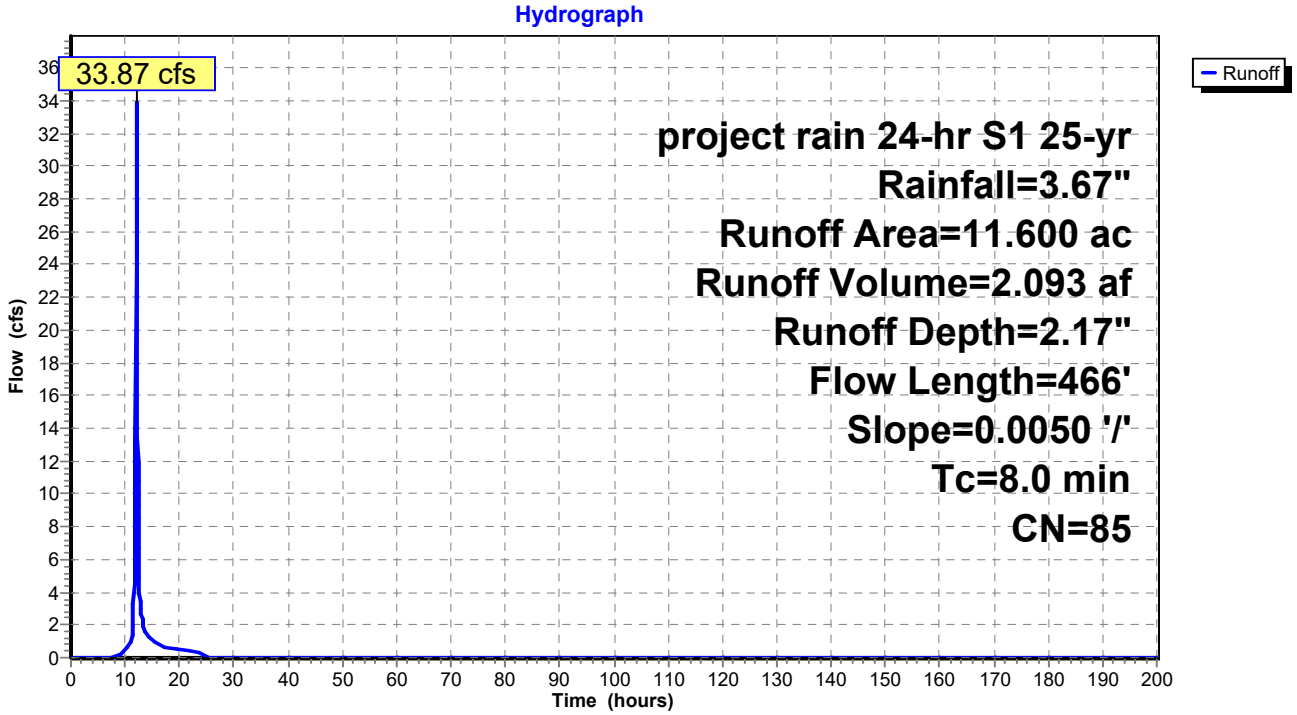
Runoff = 33.87 cfs @ 12.07 hrs, Volume= 2.093 af, Depth= 2.17"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

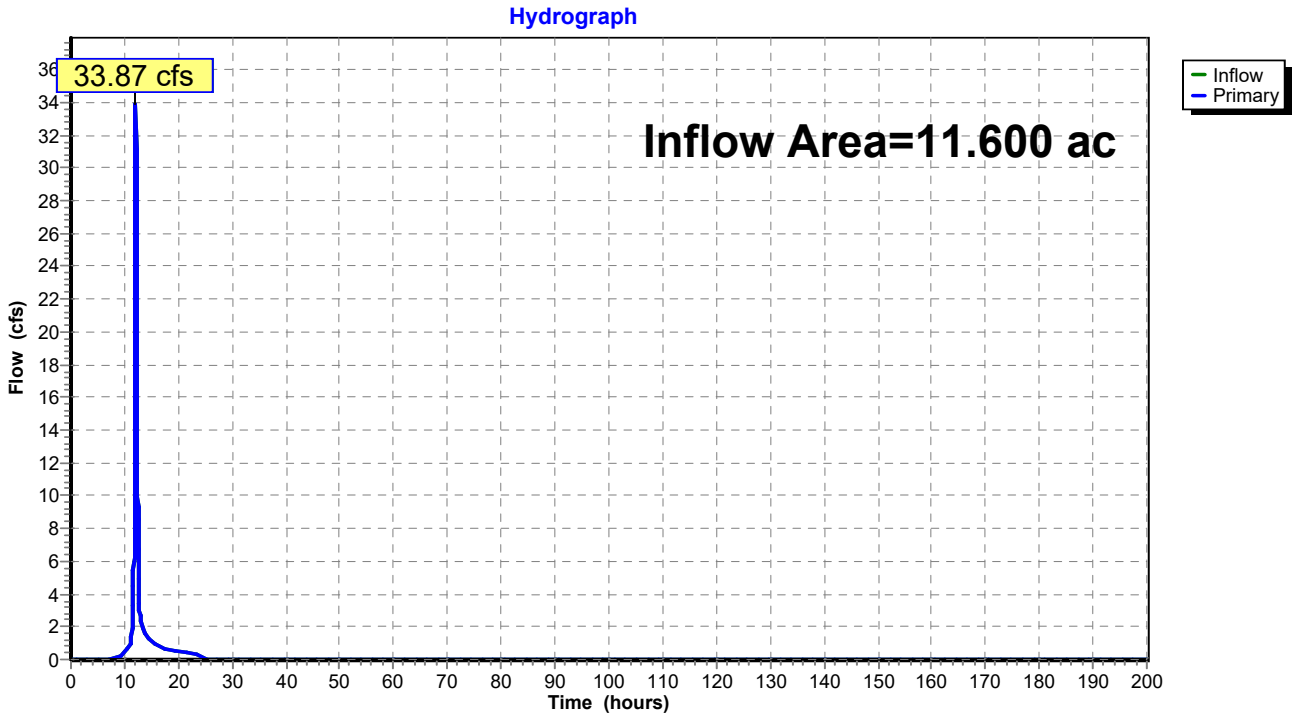


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 2.17" for 25-yr event
Inflow = 33.87 cfs @ 12.07 hrs, Volume= 2.093 af
Primary = 33.87 cfs @ 12.07 hrs, Volume= 2.093 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

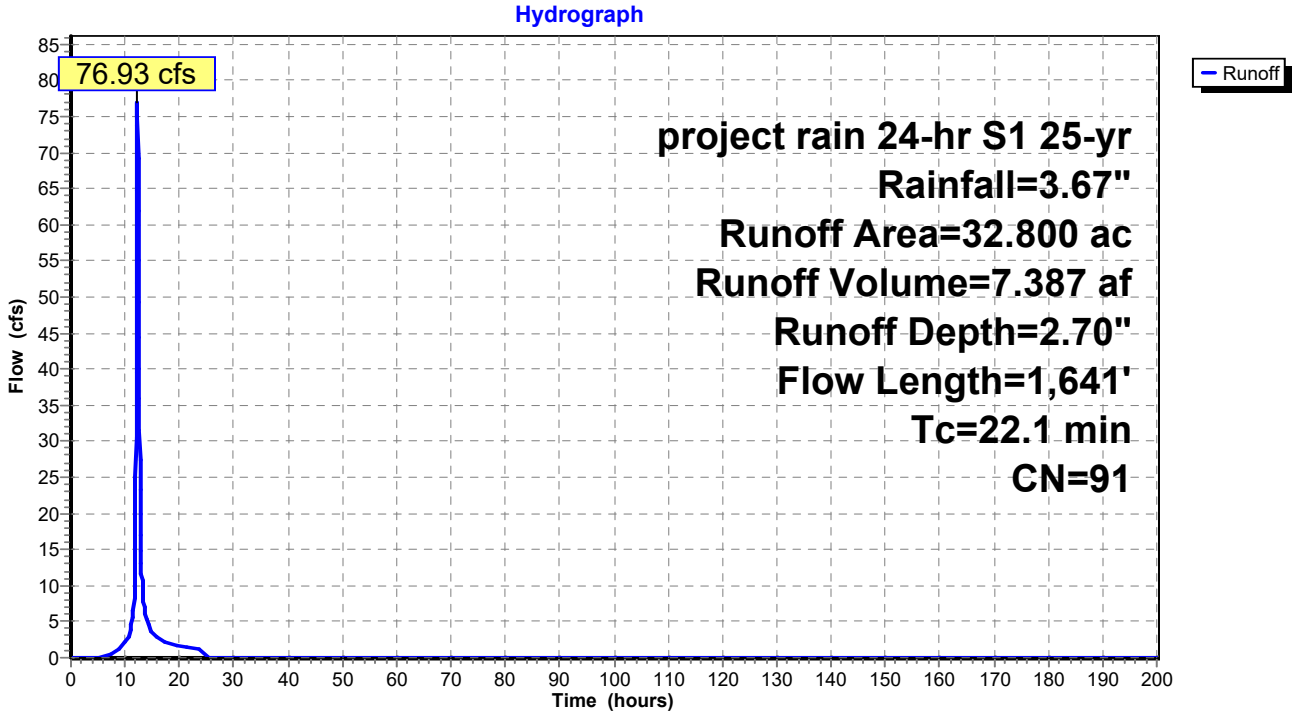
Runoff = 76.93 cfs @ 12.26 hrs, Volume= 7.387 af, Depth= 2.70"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

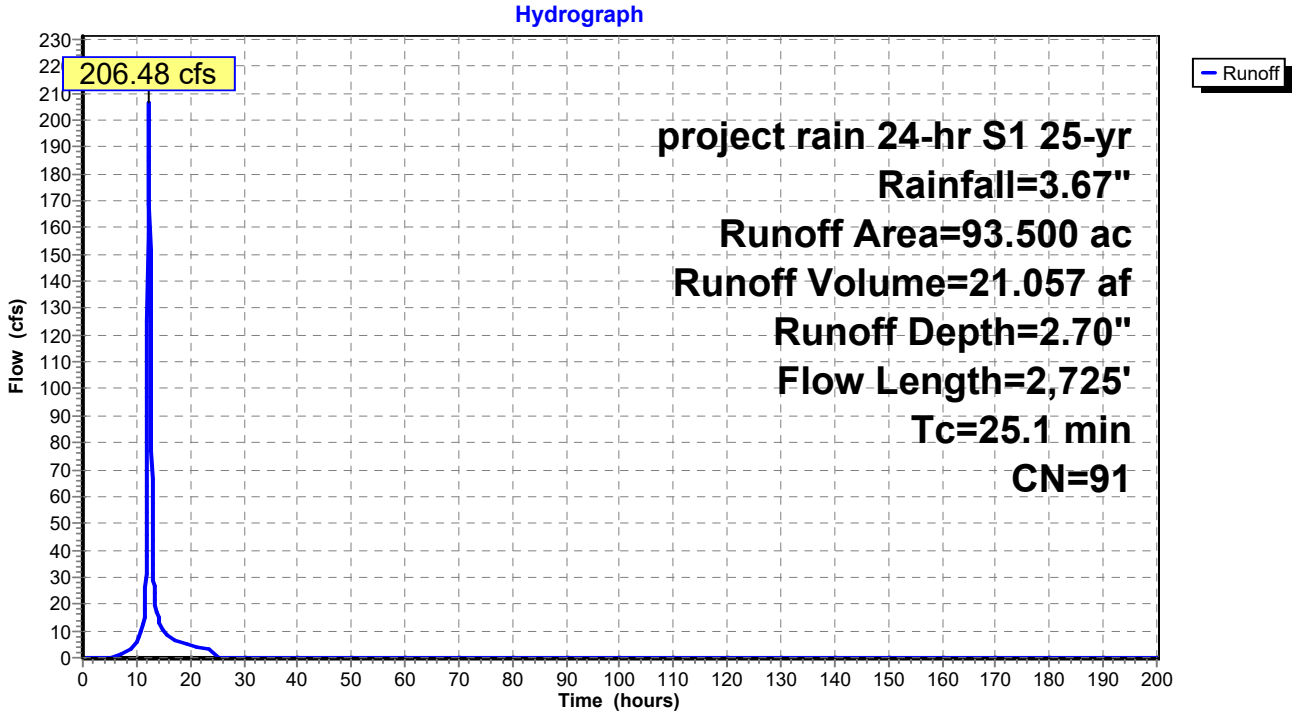
Runoff = 206.48 cfs @ 12.30 hrs, Volume= 21.057 af, Depth= 2.70"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 2.70" for 25-yr event
Inflow = 206.48 cfs @ 12.30 hrs, Volume= 21.057 af
Outflow = 6.11 cfs @ 17.54 hrs, Volume= 20.842 af, Atten= 97%, Lag= 314.8 min
Primary = 6.11 cfs @ 17.54 hrs, Volume= 20.842 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 593.92' @ 17.54 hrs Surf.Area= 349,979 sf Storage= 1,359,098 cf (686,517 cf above start)

Plug-Flow detention time= 3,221.5 min calculated for 5.402 af (26% of inflow)
Center-of-Mass det. time= 1,425.6 min (2,239.4 - 813.8)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

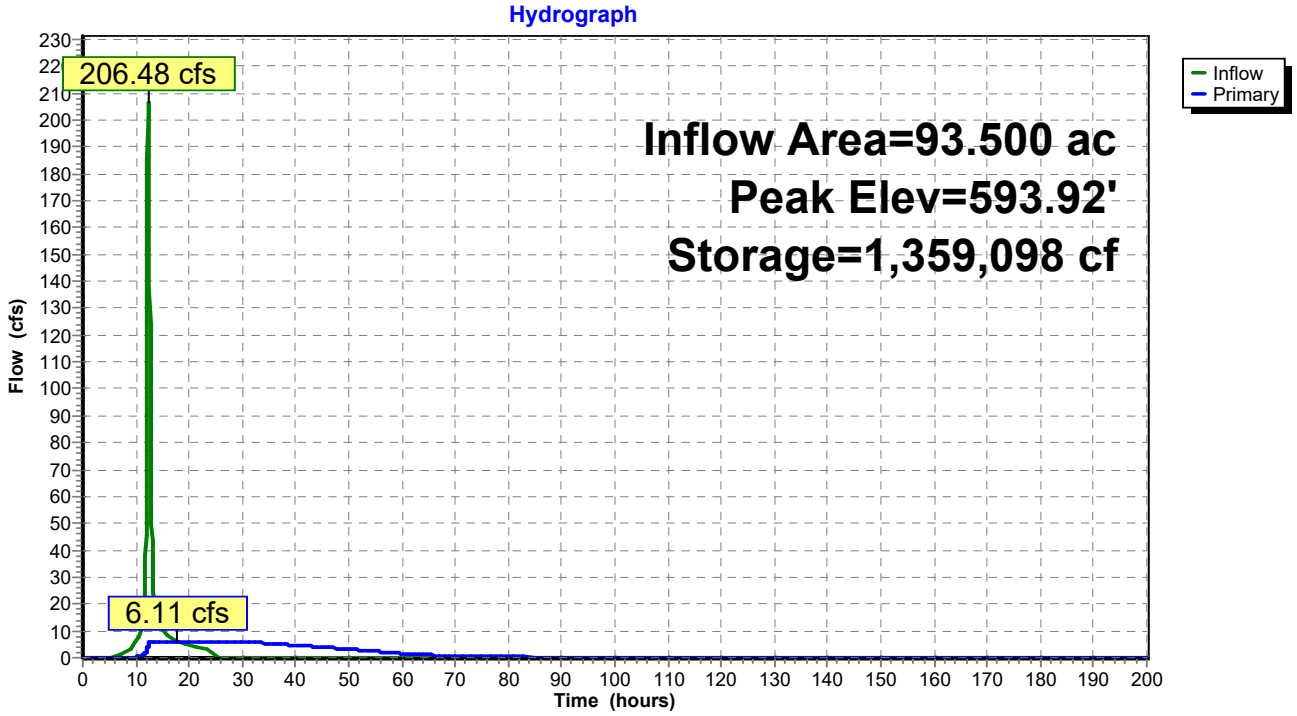
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.11 cfs @ 17.54 hrs HW=593.92' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 6.11 cfs @ 4.98 fps)
  - **2=Culvert** (Passes 6.11 cfs of 7.00 cfs potential flow)
  - **3=Grate** (Controls 0.00 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

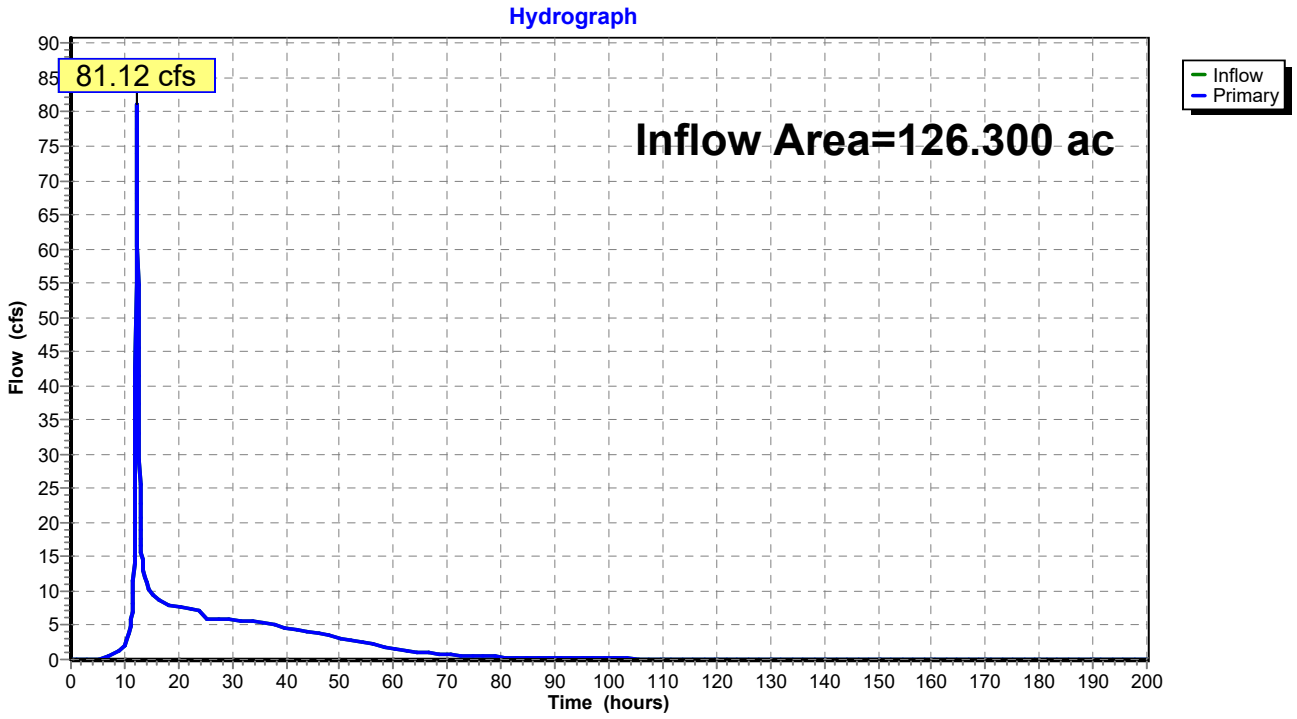


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 2.68" for 25-yr event
Inflow = 81.12 cfs @ 12.26 hrs, Volume= 28.229 af
Primary = 81.12 cfs @ 12.26 hrs, Volume= 28.229 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

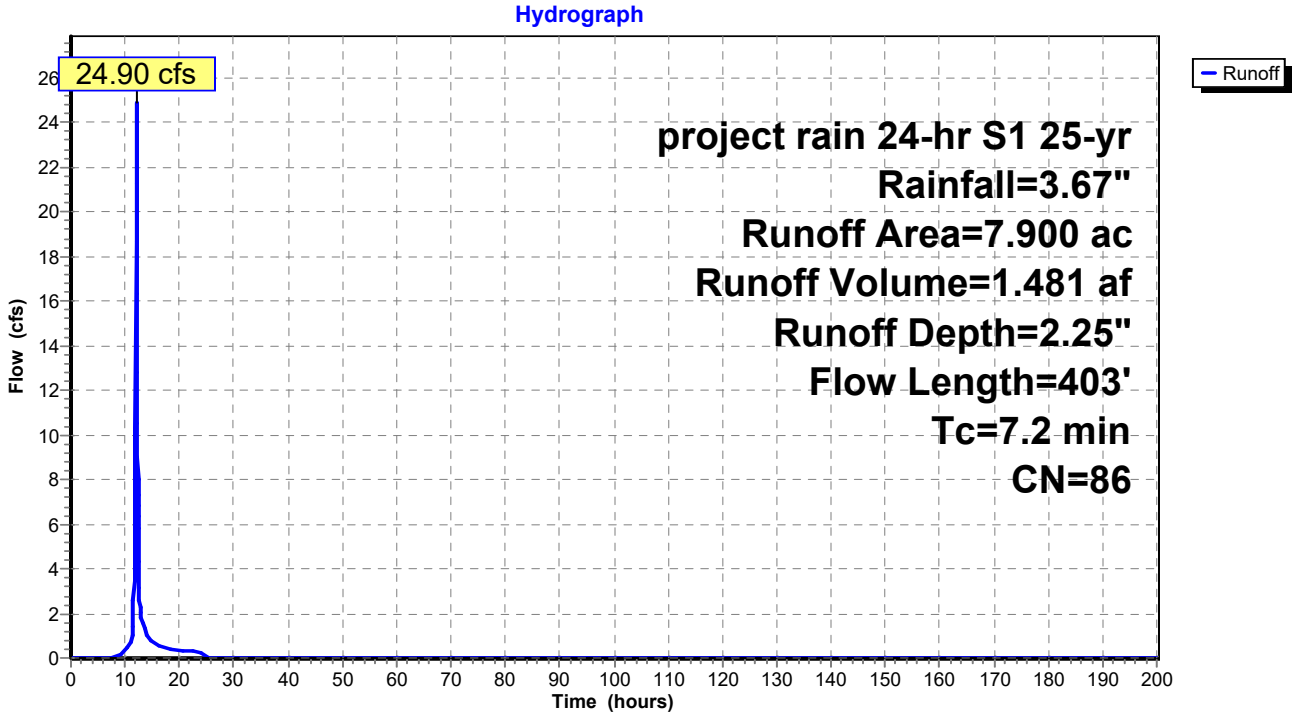
Runoff = 24.90 cfs @ 12.06 hrs, Volume= 1.481 af, Depth= 2.25"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 25-yr Rainfall=3.67"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

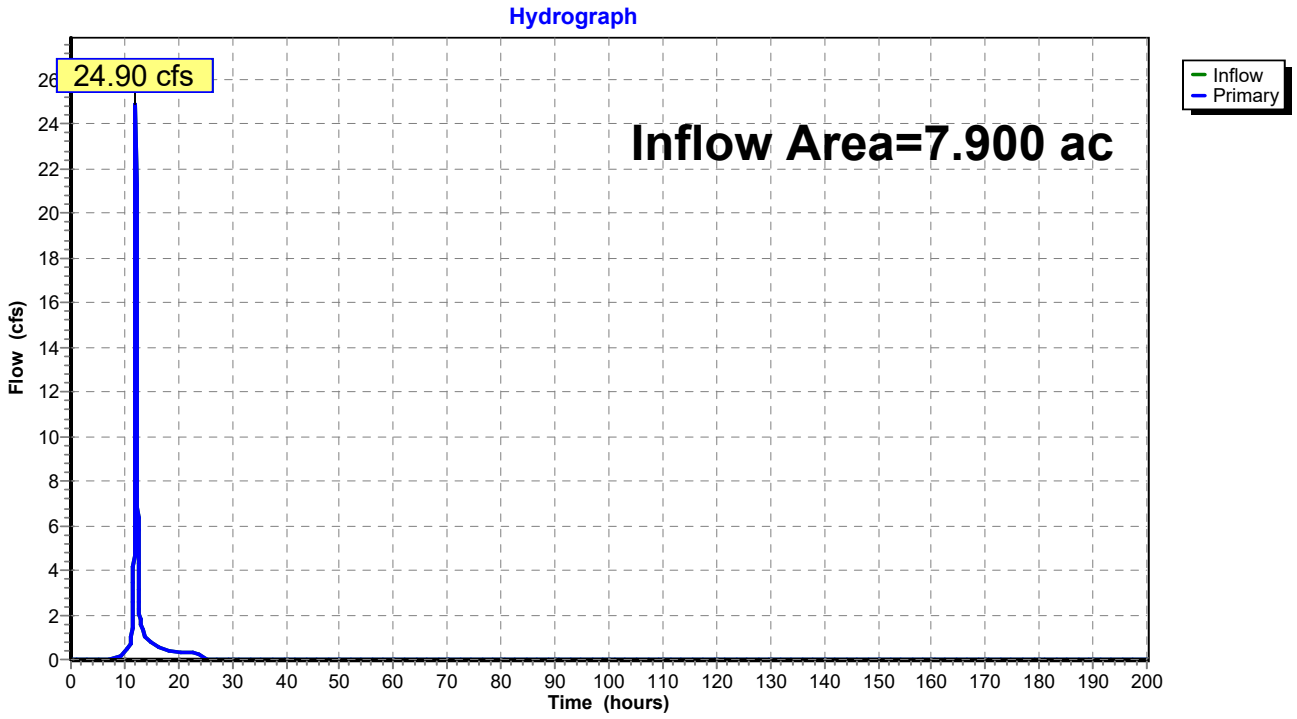


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 2.25" for 25-yr event
Inflow = 24.90 cfs @ 12.06 hrs, Volume= 1.481 af
Primary = 24.90 cfs @ 12.06 hrs, Volume= 1.481 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

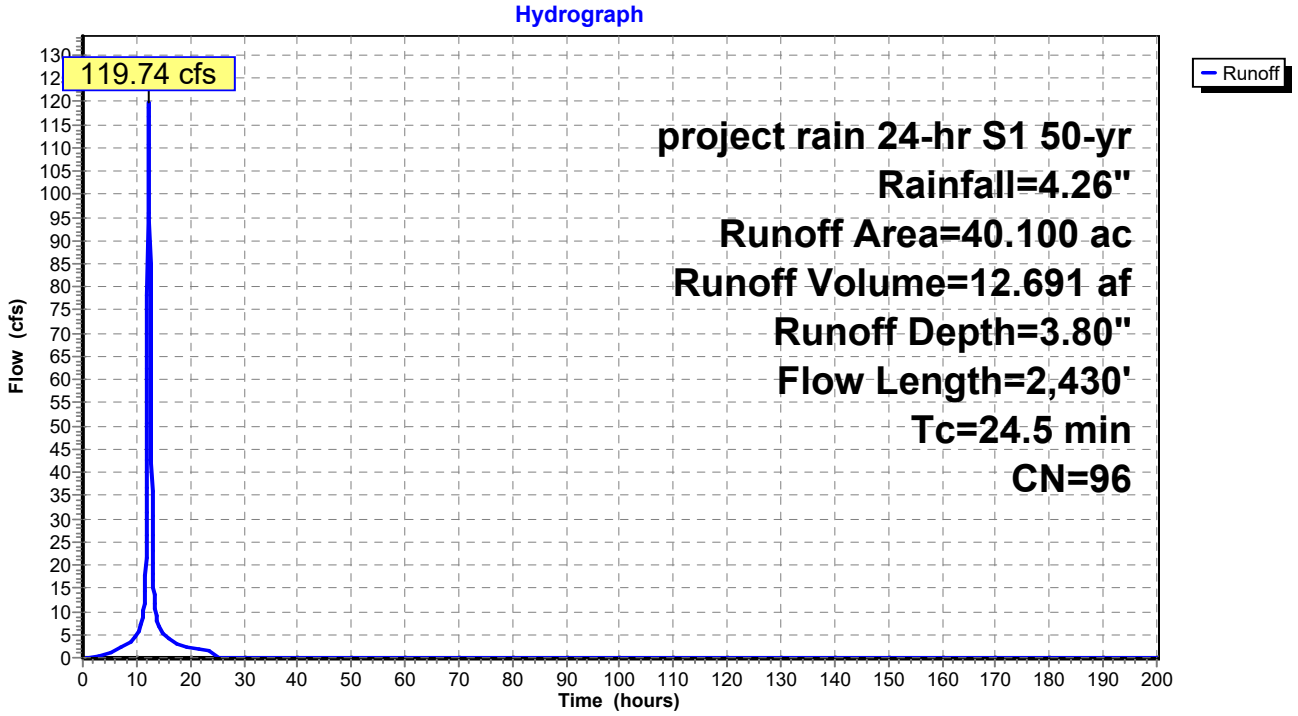
Runoff = 119.74 cfs @ 12.28 hrs, Volume= 12.691 af, Depth= 3.80"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 3.80" for 50-yr event
Inflow = 119.74 cfs @ 12.28 hrs, Volume= 12.691 af
Outflow = 7.86 cfs @ 13.93 hrs, Volume= 12.685 af, Atten= 93%, Lag= 99.1 min
Primary = 7.86 cfs @ 13.93 hrs, Volume= 12.685 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.82' @ 13.93 hrs Surf.Area= 12.468 ac Storage= 7.561 af

Plug-Flow detention time= 428.8 min calculated for 12.685 af (100% of inflow)
Center-of-Mass det. time= 428.4 min (1,210.7 - 782.3)

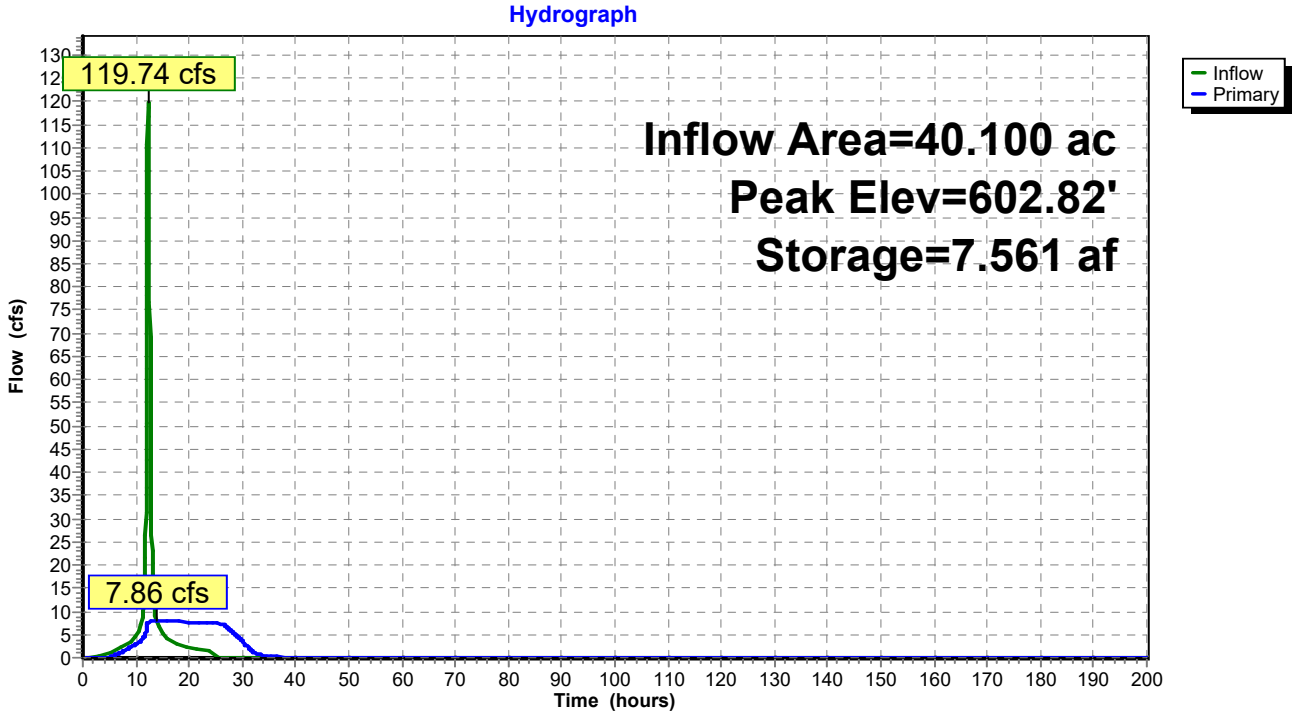
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.86 cfs @ 13.93 hrs HW=602.82' TW=598.31' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.86 cfs of 10.13 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.86 cfs @ 10.01 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

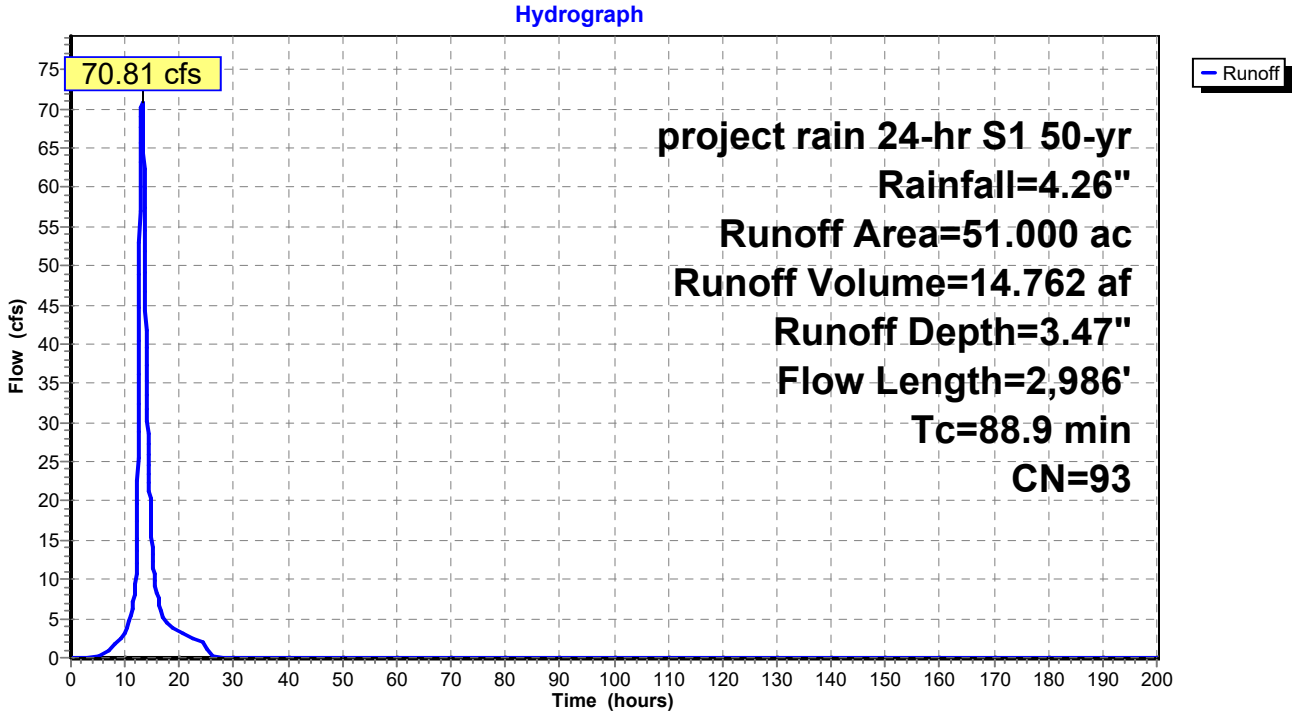
Runoff = 70.81 cfs @ 13.13 hrs, Volume= 14.762 af, Depth= 3.47"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 3.47" for 50-yr event
Inflow = 70.81 cfs @ 13.13 hrs, Volume= 14.762 af
Outflow = 13.03 cfs @ 15.08 hrs, Volume= 14.730 af, Atten= 82%, Lag= 117.0 min
Primary = 13.03 cfs @ 15.08 hrs, Volume= 14.730 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 601.86' @ 15.08 hrs Surf.Area= 16.633 ac Storage= 8.182 af

Plug-Flow detention time= 349.1 min calculated for 14.730 af (100% of inflow)
Center-of-Mass det. time= 347.6 min (1,205.9 - 858.3)

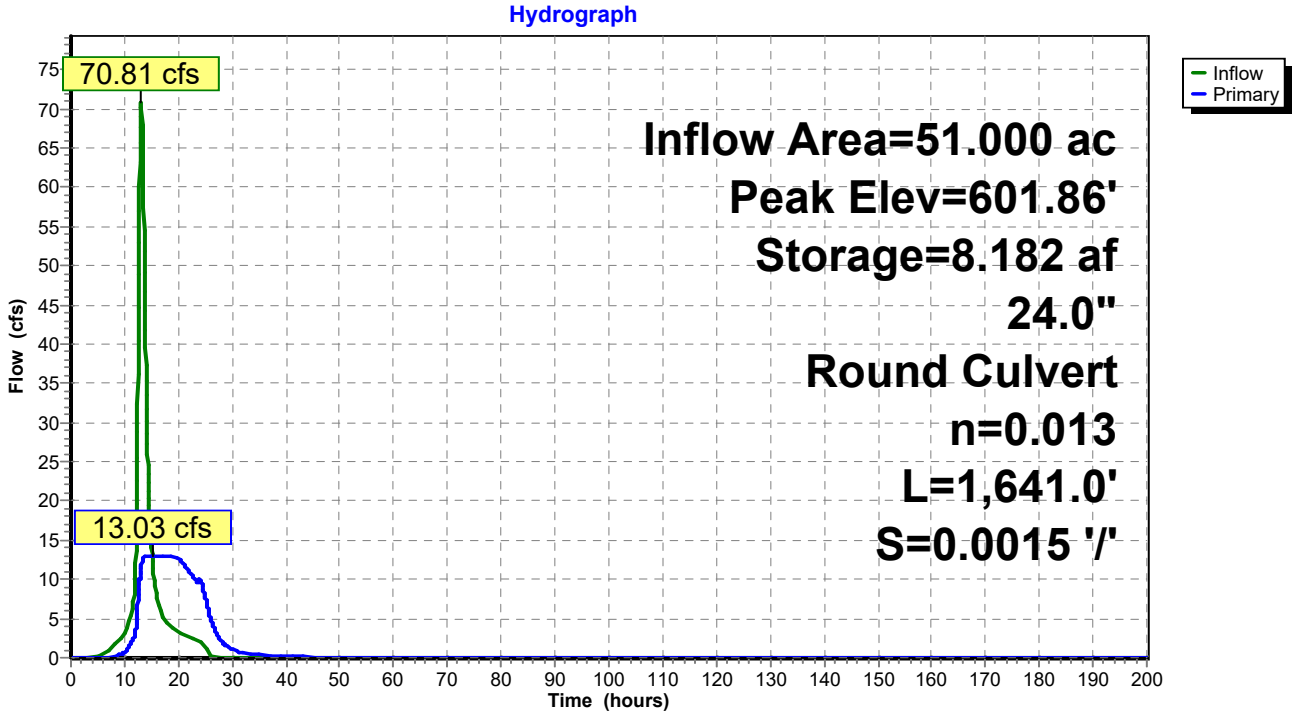
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=13.03 cfs @ 15.08 hrs HW=601.86' TW=584.17' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 13.03 cfs @ 4.15 fps)

Pond 05: Ex Collection Sump



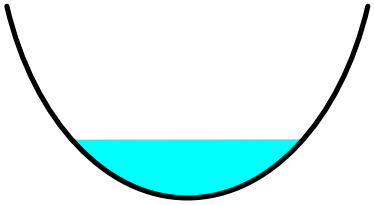
Summary for Reach 06a: Reach A Upper

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 3.80" for 50-yr event
Inflow = 7.86 cfs @ 13.93 hrs, Volume= 12.685 af
Outflow = 7.86 cfs @ 13.97 hrs, Volume= 12.685 af, Atten= 0%, Lag= 2.2 min
Routed to Reach 06b : Reach A Lower

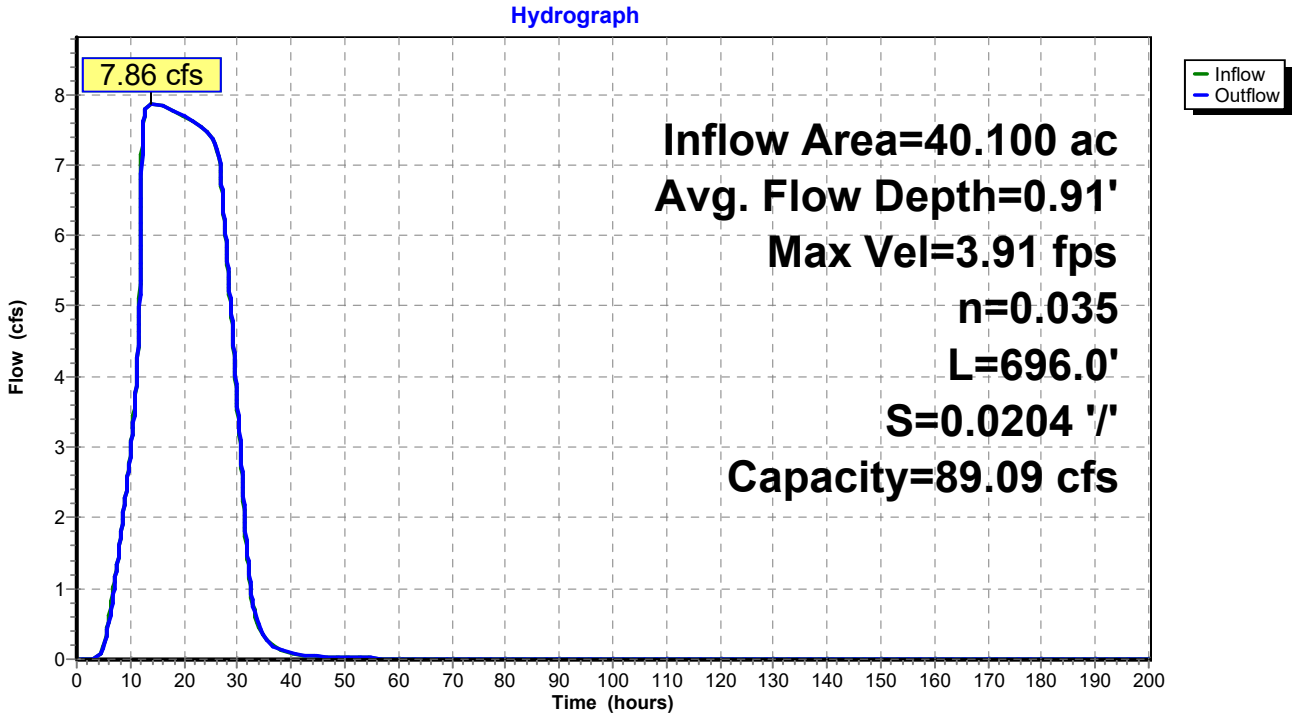
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.91 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 12.5 min

Peak Storage= 1,400 cf @ 13.97 hrs
Average Depth at Peak Storage= 0.91' , Surface Width= 3.31'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'



Reach 06a: Reach A Upper



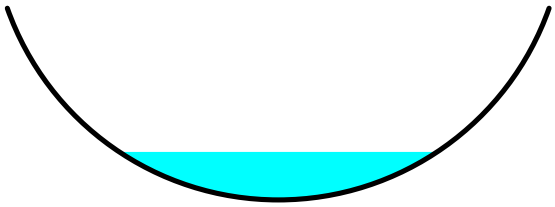
Summary for Reach 06b: Reach A Lower

Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 3.61" for 50-yr event
Inflow = 20.89 cfs @ 14.85 hrs, Volume= 27.416 af
Outflow = 20.89 cfs @ 14.87 hrs, Volume= 27.415 af, Atten= 0%, Lag= 1.1 min
Routed to Link 07 : Ex Analysis Point A

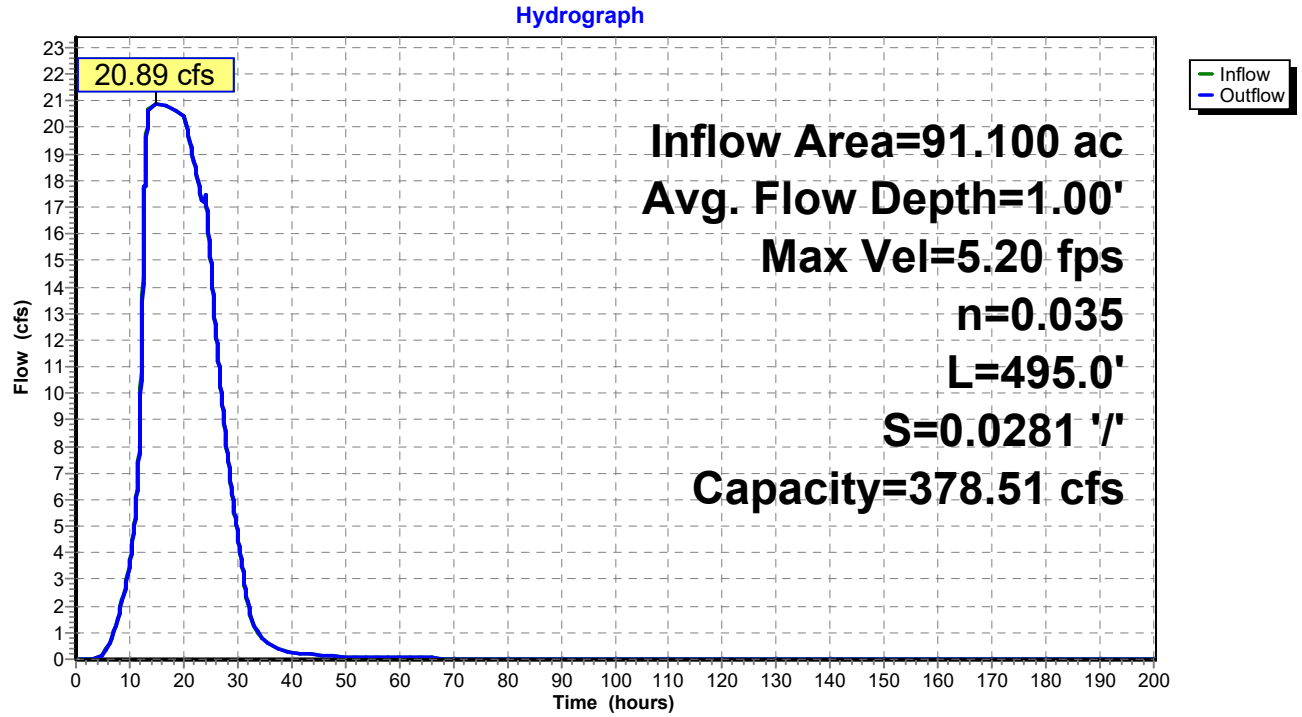
Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.20 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 6.8 min

Peak Storage= 1,987 cf @ 14.87 hrs
Average Depth at Peak Storage= 1.00' , Surface Width= 6.01'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



Reach 06b: Reach A Lower

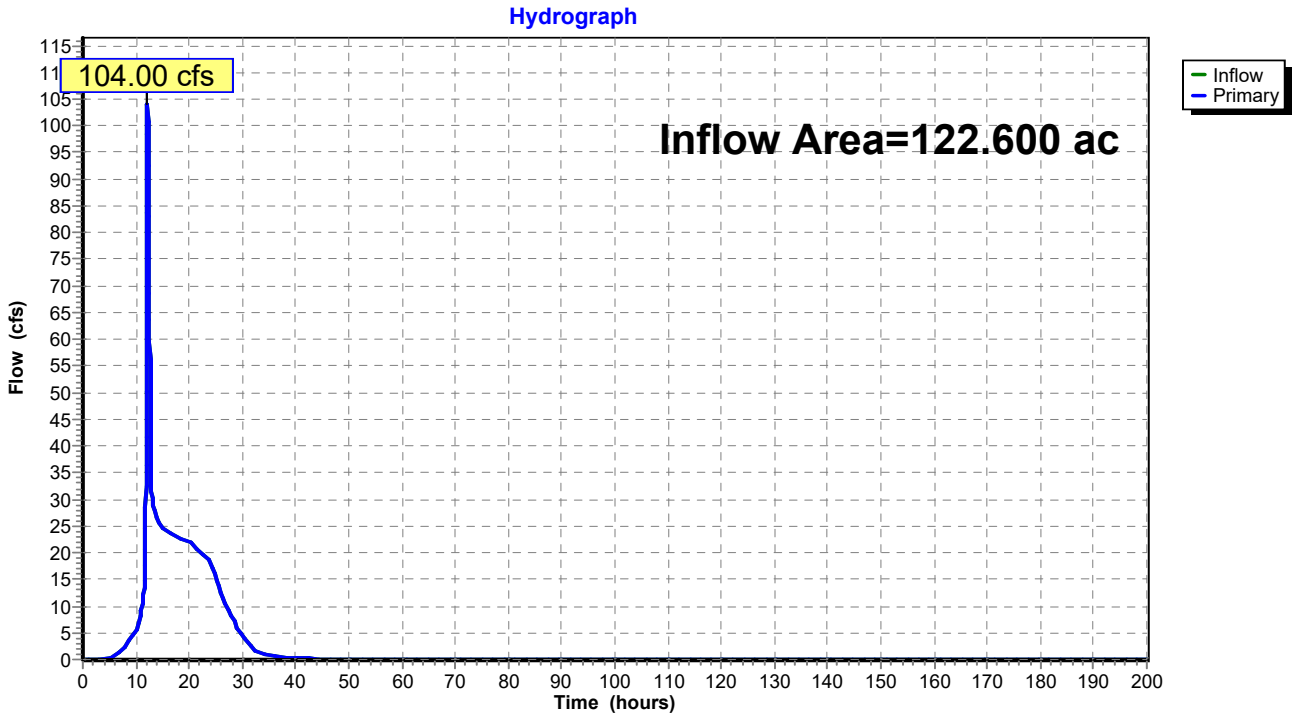


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 3.47" for 50-yr event
Inflow = 104.00 cfs @ 12.21 hrs, Volume= 35.469 af
Primary = 104.00 cfs @ 12.21 hrs, Volume= 35.469 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

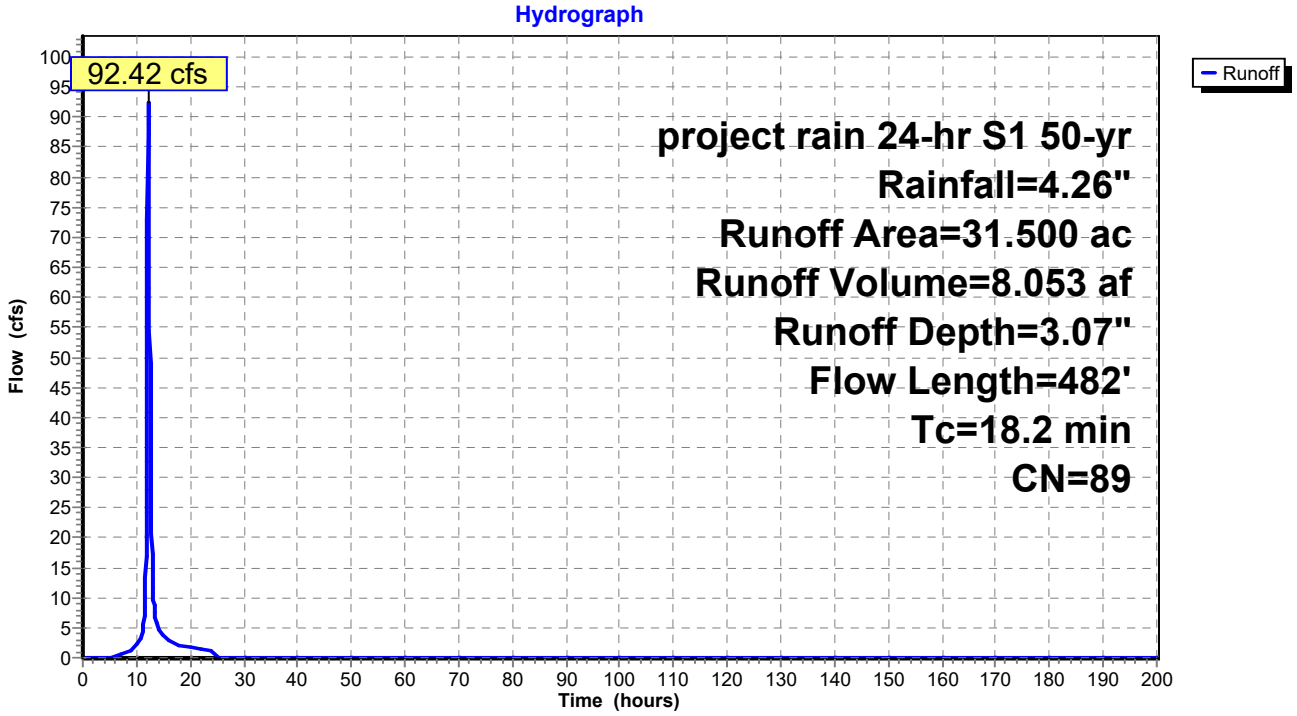
Runoff = 92.42 cfs @ 12.20 hrs, Volume= 8.053 af, Depth= 3.07"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

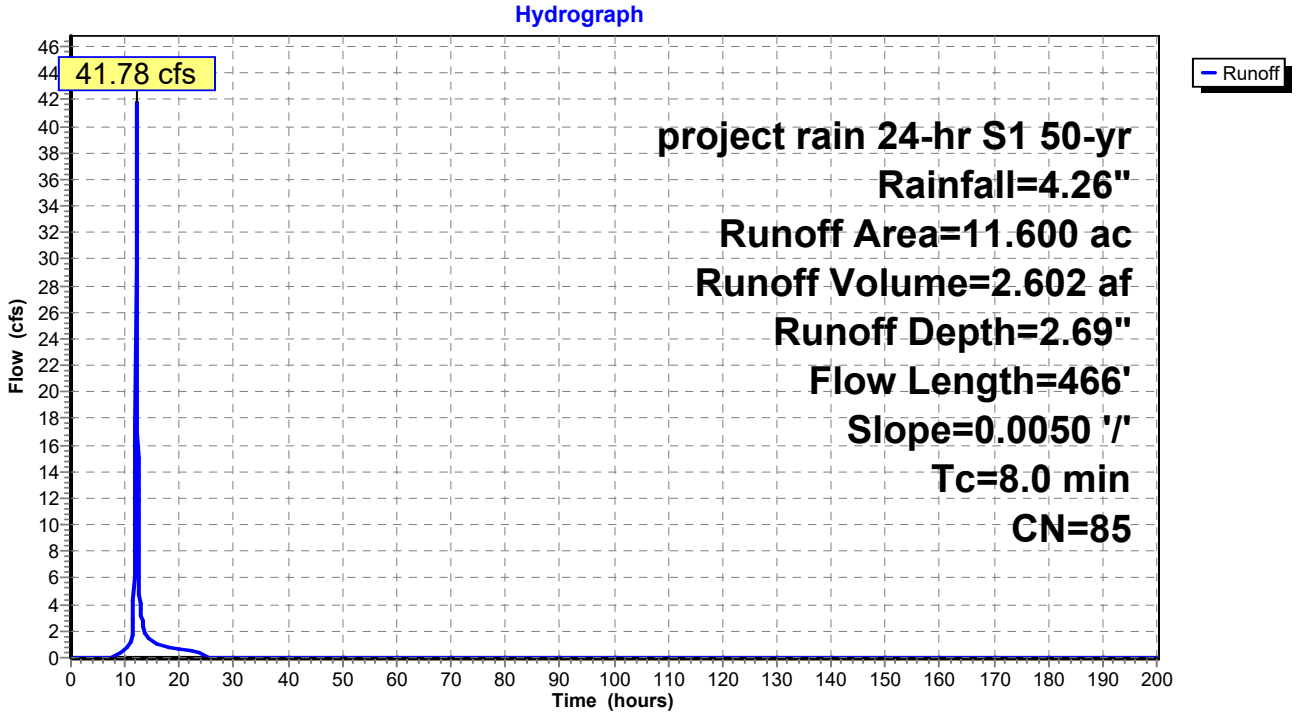
Runoff = 41.78 cfs @ 12.07 hrs, Volume= 2.602 af, Depth= 2.69"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

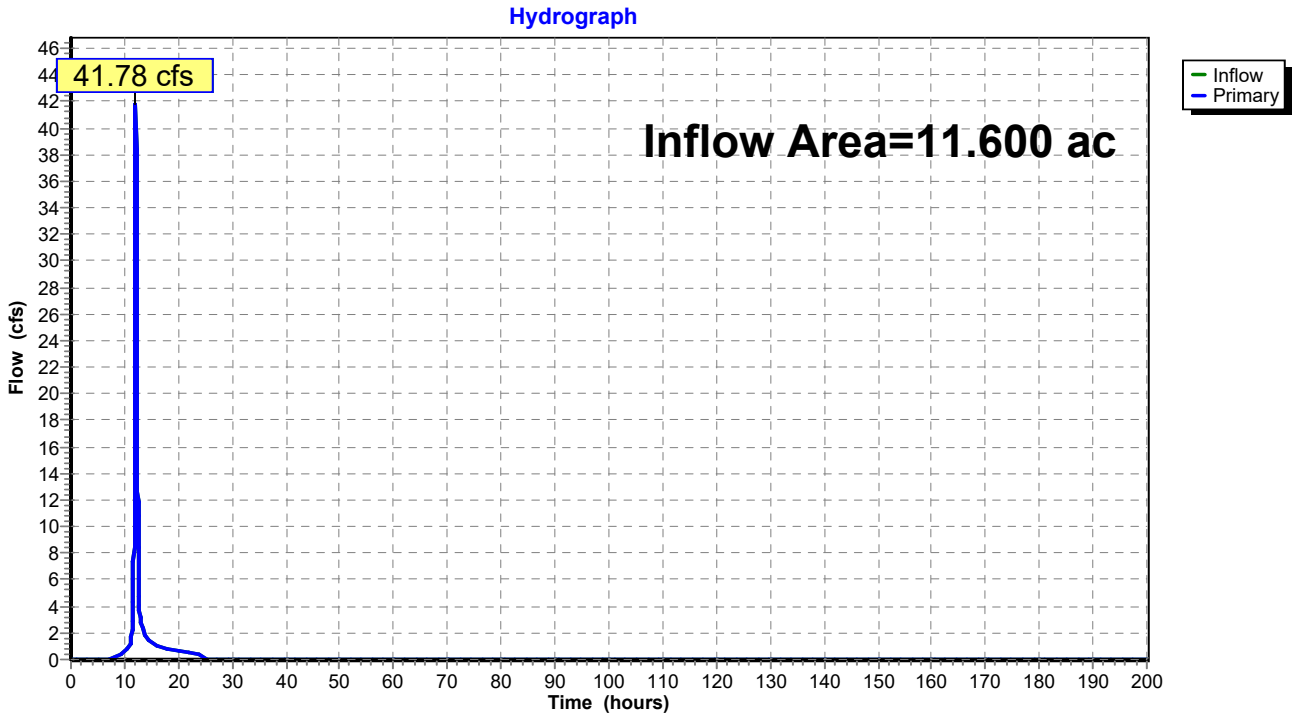


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 2.69" for 50-yr event
Inflow = 41.78 cfs @ 12.07 hrs, Volume= 2.602 af
Primary = 41.78 cfs @ 12.07 hrs, Volume= 2.602 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

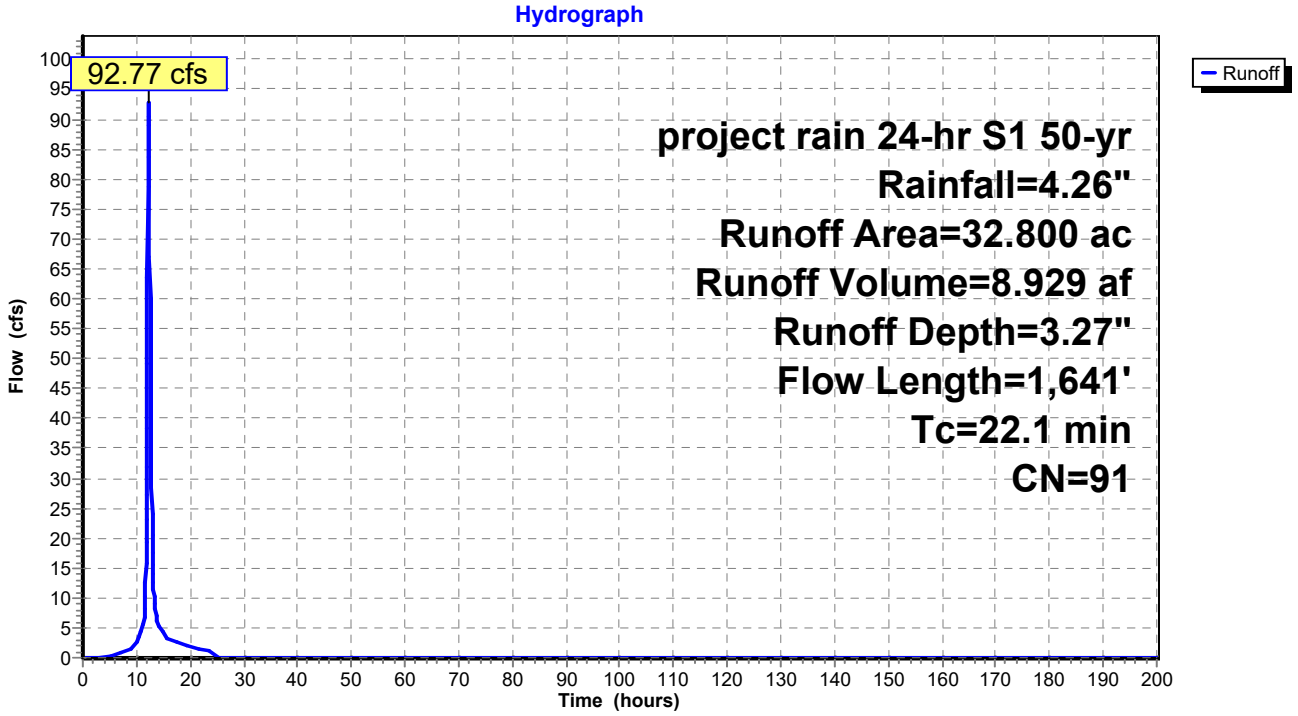
Runoff = 92.77 cfs @ 12.26 hrs, Volume= 8.929 af, Depth= 3.27"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

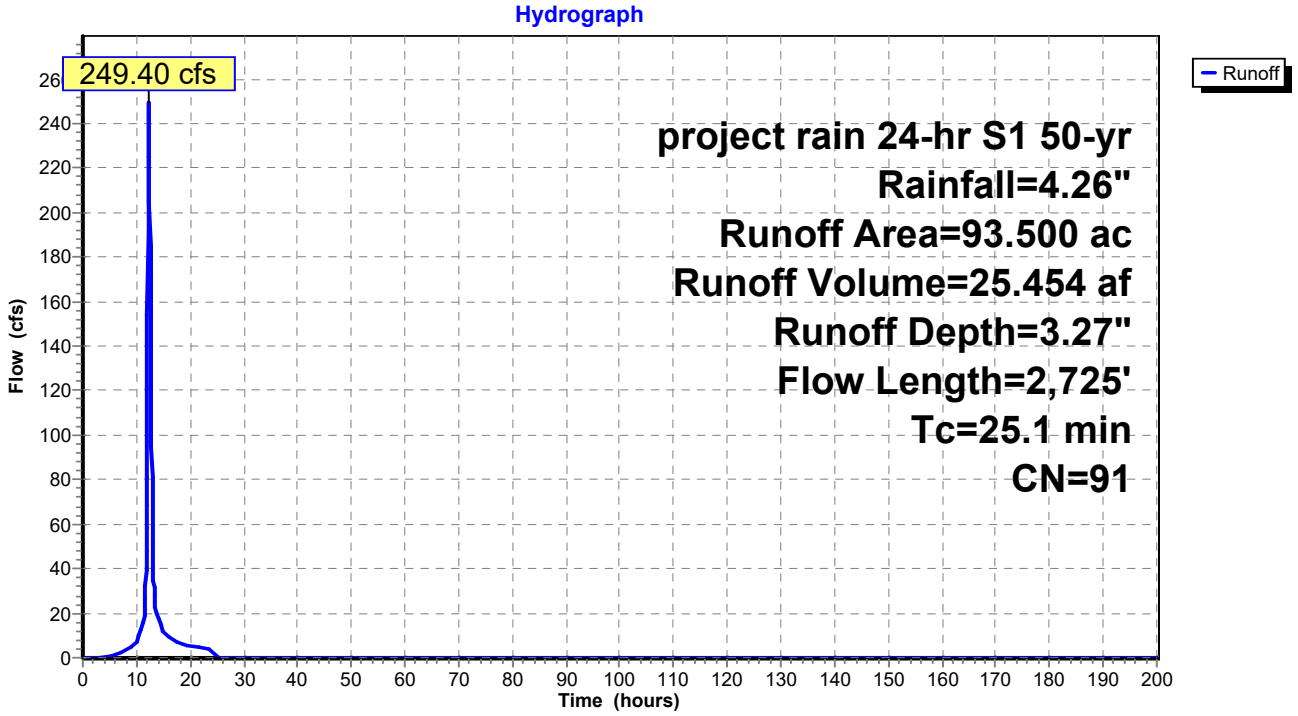
Runoff = 249.40 cfs @ 12.30 hrs, Volume= 25.454 af, Depth= 3.27"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 3.27" for 50-yr event
Inflow = 249.40 cfs @ 12.30 hrs, Volume= 25.454 af
Outflow = 6.43 cfs @ 18.18 hrs, Volume= 25.228 af, Atten= 97%, Lag= 353.4 min
Primary = 6.43 cfs @ 18.18 hrs, Volume= 25.228 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 594.73' @ 18.18 hrs Surf.Area= 359,045 sf Storage= 1,525,507 cf (852,926 cf above start)

Plug-Flow detention time= 2,980.6 min calculated for 9.788 af (38% of inflow)
Center-of-Mass det. time= 1,589.0 min (2,396.8 - 807.7)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

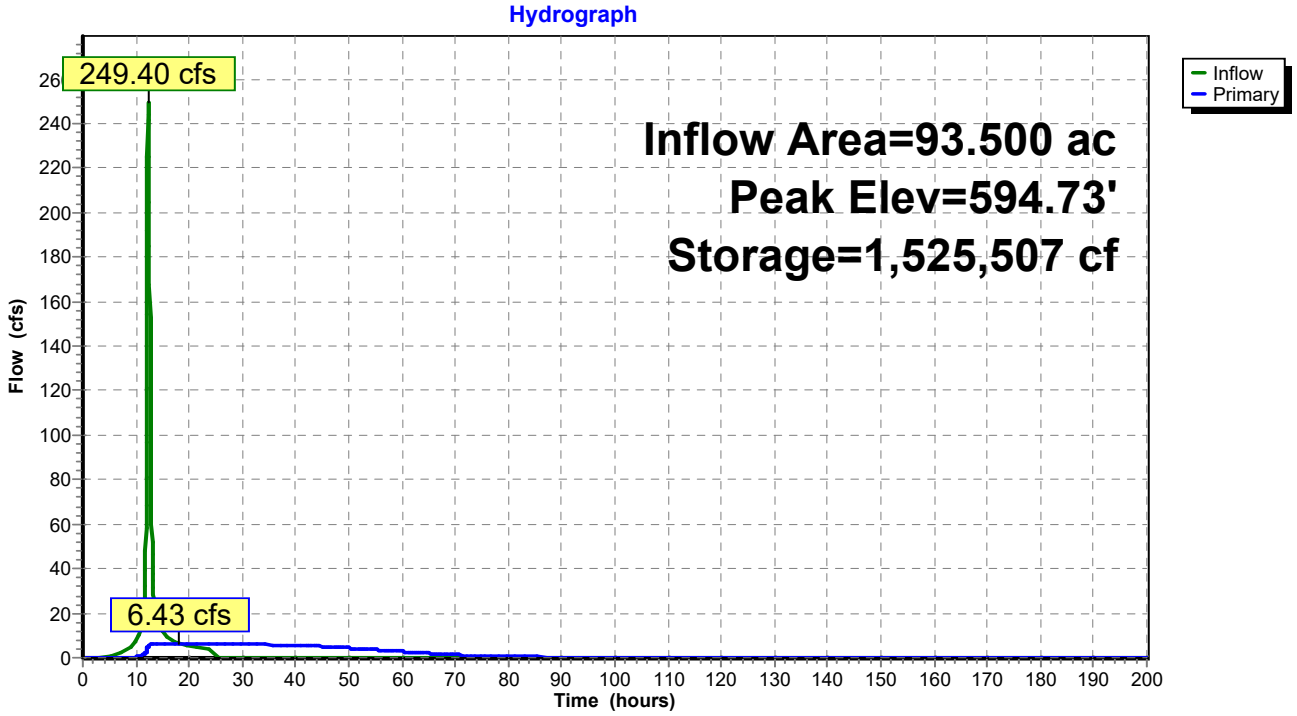
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.43 cfs @ 18.18 hrs HW=594.73' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 6.43 cfs @ 5.24 fps)
  - **2=Culvert** (Passes < 7.78 cfs potential flow)
  - **3=Grate** (Passes < 16.28 cfs potential flow)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

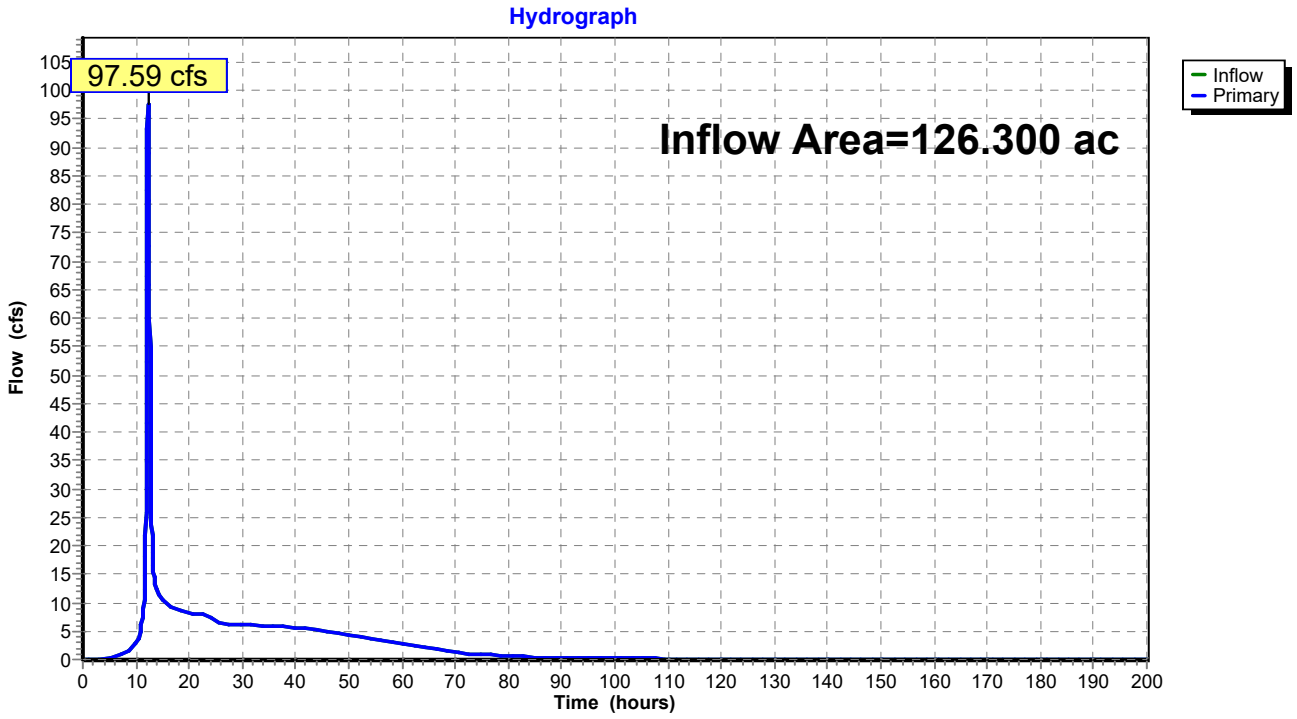


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 3.25" for 50-yr event
Inflow = 97.59 cfs @ 12.26 hrs, Volume= 34.157 af
Primary = 97.59 cfs @ 12.26 hrs, Volume= 34.157 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

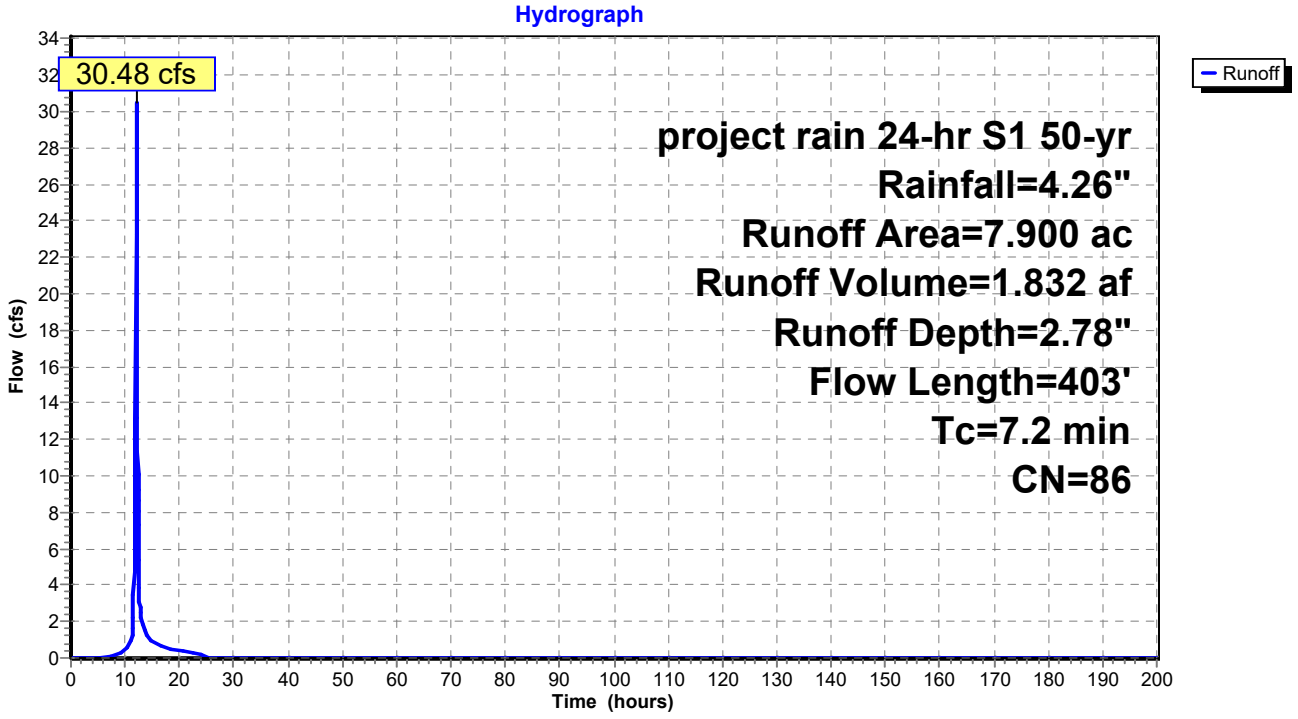
Runoff = 30.48 cfs @ 12.06 hrs, Volume= 1.832 af, Depth= 2.78"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 50-yr Rainfall=4.26"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

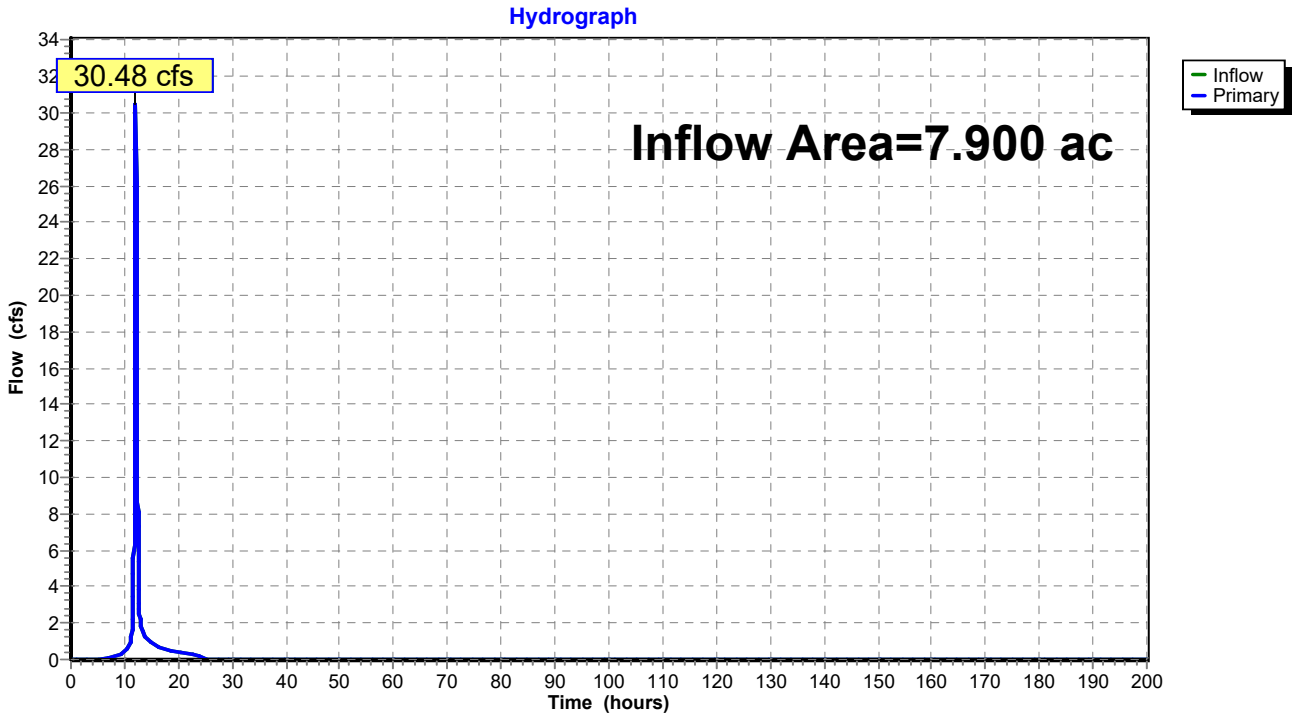


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 2.78" for 50-yr event
Inflow = 30.48 cfs @ 12.06 hrs, Volume= 1.832 af
Primary = 30.48 cfs @ 12.06 hrs, Volume= 1.832 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Summary for Subcatchment 02: Ex Subarea A-2

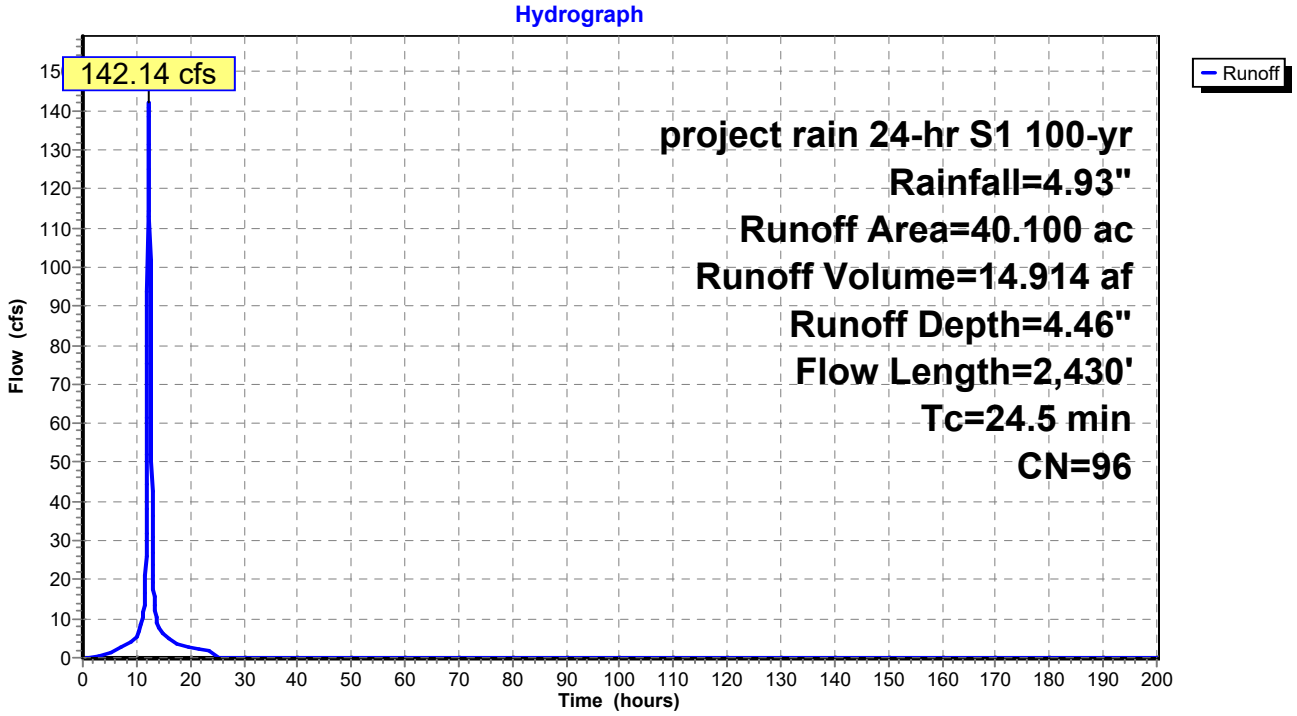
Runoff = 142.14 cfs @ 12.28 hrs, Volume= 14.914 af, Depth= 4.46"
Routed to Pond 03 : Ex Kidney Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

Area (ac)	CN	Description
35.600	98	Paved parking, HSG D
4.000	80	>75% Grass cover, Good, HSG D
0.500	98	Water Surface, 0% imp, HSG D
40.100	96	Weighted Average
4.500		11.22% Pervious Area
35.600		88.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0100	0.86		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
16.1	850	0.0030	0.88		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.5	1,480	0.0020	3.78	340.49	**Channel Flow, Channel Flow** Area= 90.0 sf Perim= 32.0' r= 2.81' n= 0.035 Earth, dense weeds
24.5	2,430	Total			

Subcatchment 02: Ex Subarea A-2



Summary for Pond 03: Ex Kidney Pond

Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 4.46" for 100-yr event
Inflow = 142.14 cfs @ 12.28 hrs, Volume= 14.914 af
Outflow = 7.98 cfs @ 14.18 hrs, Volume= 14.908 af, Atten= 94%, Lag= 113.6 min
Primary = 7.98 cfs @ 14.18 hrs, Volume= 14.908 af
Routed to Reach 06a : Reach A Upper

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 602.95' @ 14.18 hrs Surf.Area= 14.265 ac Storage= 9.230 af

Plug-Flow detention time= 504.9 min calculated for 14.905 af (100% of inflow)
Center-of-Mass det. time= 506.5 min (1,284.6 - 778.2)

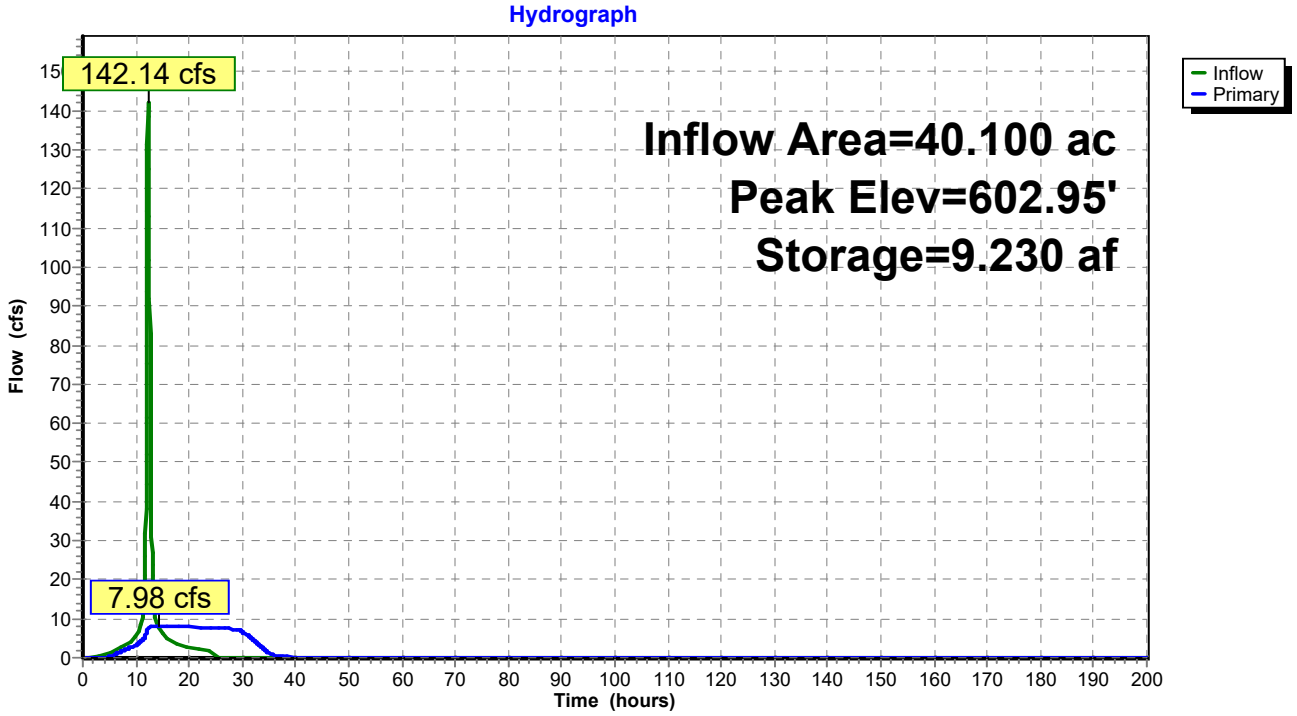
Volume	Invert	Avail.Storage	Storage Description
#1	598.00'	9.978 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
598.00	0.470	0.000	0.000
599.00	0.509	0.490	0.490
600.00	0.543	0.526	1.016
601.00	0.578	0.561	1.576
602.00	0.613	0.595	2.172
603.00	15.000	7.807	9.978

Device	Routing	Invert	Outlet Devices
#1	Primary	598.00'	**15.0" Round Culvert** L= 105.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 598.00' / 597.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	598.00'	**12.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.98 cfs @ 14.18 hrs HW=602.95' TW=598.32' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 7.98 cfs of 10.28 cfs potential flow)
↑—**2=Orifice** (Orifice Controls 7.98 cfs @ 10.16 fps)

Pond 03: Ex Kidney Pond



Summary for Subcatchment 04: Ex Subarea A-3

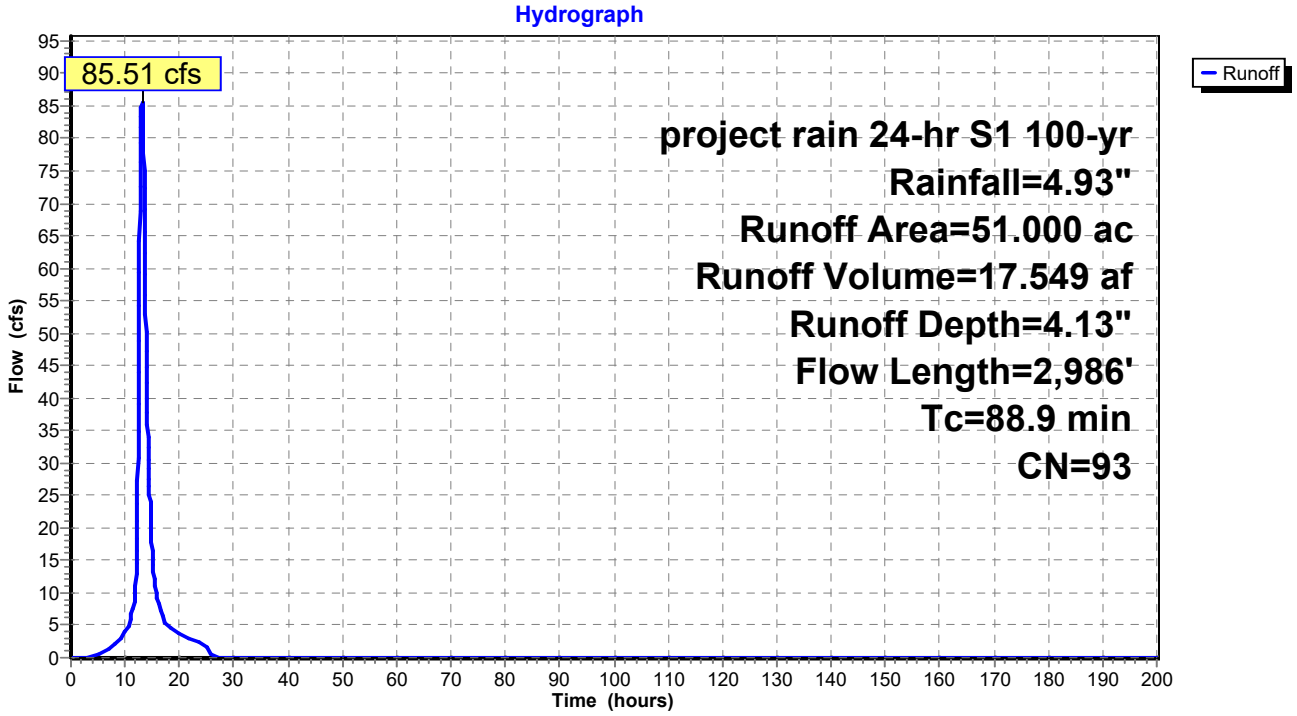
Runoff = 85.51 cfs @ 13.13 hrs, Volume= 17.549 af, Depth= 4.13"
Routed to Pond 05 : Ex Collection Sump

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

	Area (ac)	CN	Description
*	39.100	98	Paved parking, HSG D
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.800	96	Gravel surface, HSG D (Offsite)
	2.200	73	Brush, Good, HSG D
	51.000	93	Weighted Average
	11.900		23.33% Pervious Area
	39.100		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.4	100	0.0100	0.05		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.17"
6.7	456	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
9.8	670	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
38.0	1,760	0.0023	0.77		**Shallow Concentrated Flow, Shallow Conc (Offsite)** Unpaved Kv= 16.1 fps
88.9	2,986	Total			

Subcatchment 04: Ex Subarea A-3



Summary for Pond 05: Ex Collection Sump

Inflow Area = 51.000 ac, 76.67% Impervious, Inflow Depth = 4.13" for 100-yr event
Inflow = 85.51 cfs @ 13.13 hrs, Volume= 17.549 af
Outflow = 13.15 cfs @ 15.28 hrs, Volume= 17.517 af, Atten= 85%, Lag= 129.1 min
Primary = 13.15 cfs @ 15.28 hrs, Volume= 17.517 af
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Peak Elev= 601.96' @ 15.28 hrs Surf.Area= 21.407 ac Storage= 10.246 af

Plug-Flow detention time= 398.5 min calculated for 17.513 af (100% of inflow)
Center-of-Mass det. time= 399.5 min (1,252.5 - 853.0)

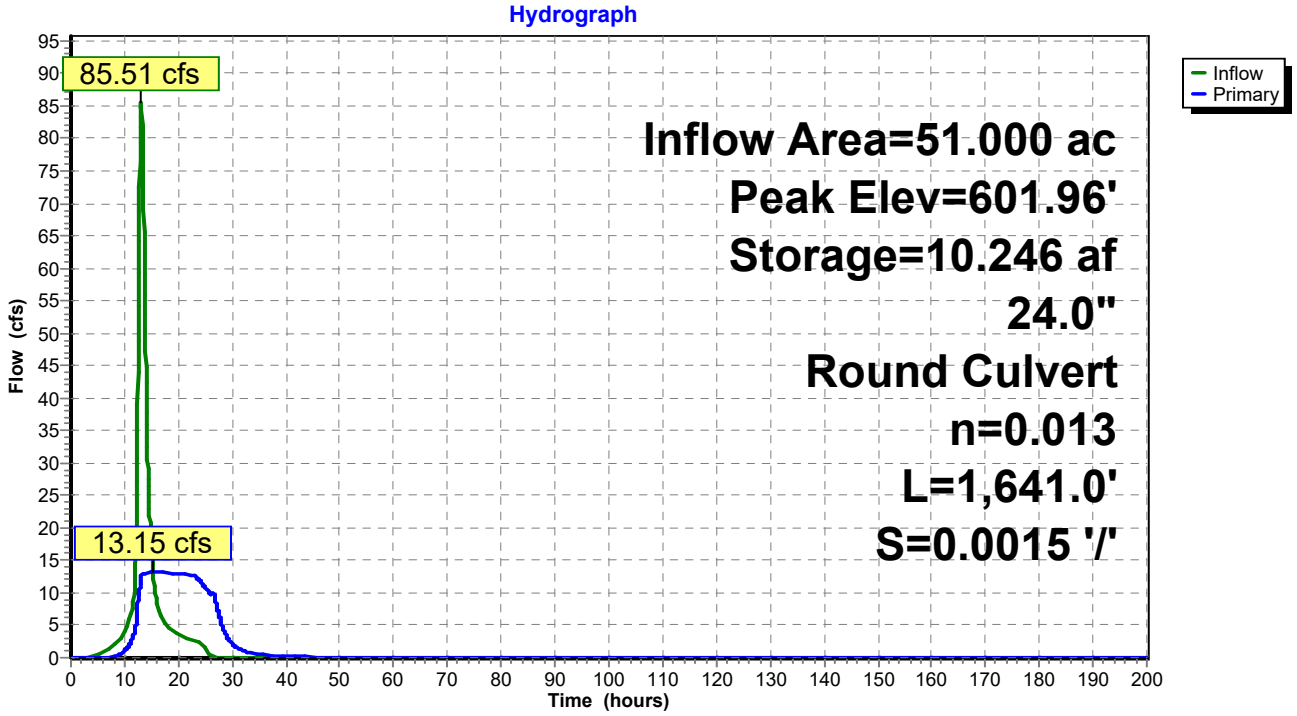
Volume	Invert	Avail.Storage	Storage Description
#1	596.45'	11.050 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
596.45	1.000	0.000	0.000
601.50	1.000	5.050	5.050
602.00	23.000	6.000	11.050

Device	Routing	Invert	Outlet Devices
#1	Primary	596.45'	**24.0" Round Culvert** L= 1,641.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 596.45' / 593.99' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=13.15 cfs @ 15.28 hrs HW=601.96' TW=584.18' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 13.15 cfs @ 4.19 fps)

Pond 05: Ex Collection Sump



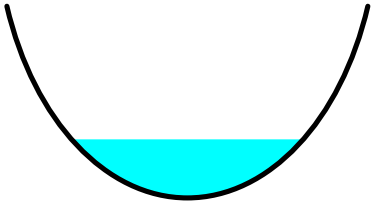
Summary for Reach 06a: Reach A Upper

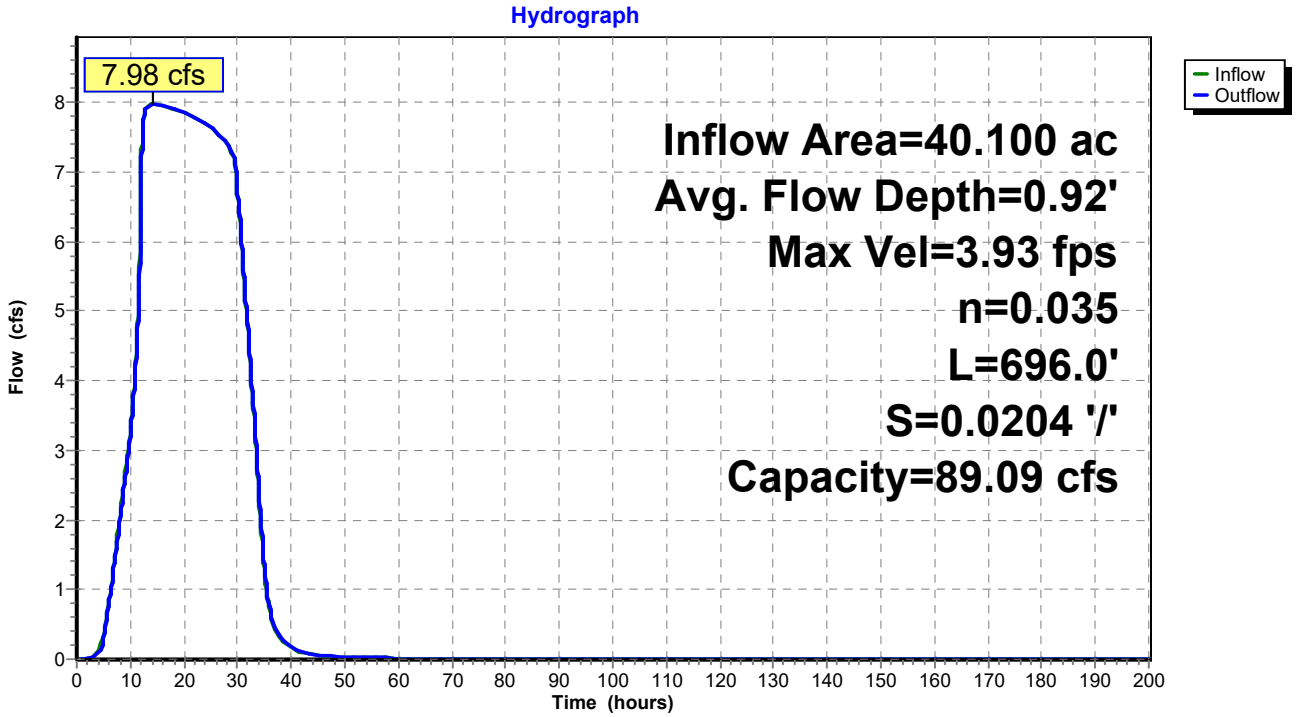
Inflow Area = 40.100 ac, 88.78% Impervious, Inflow Depth = 4.46" for 100-yr event
Inflow = 7.98 cfs @ 14.18 hrs, Volume= 14.908 af
Outflow = 7.98 cfs @ 14.21 hrs, Volume= 14.908 af, Atten= 0%, Lag= 2.2 min
Routed to Reach 06b : Reach A Lower

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.93 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 11.8 min

Peak Storage= 1,414 cf @ 14.21 hrs
Average Depth at Peak Storage= 0.92' , Surface Width= 3.32'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 89.09 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 696.0' Slope= 0.0204 '/'
Inlet Invert= 597.40', Outlet Invert= 583.17'





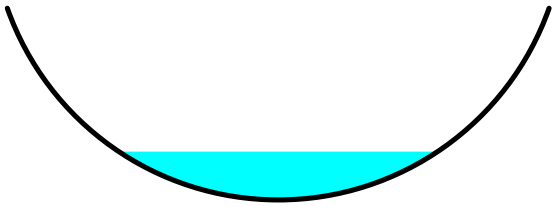
Summary for Reach 06b: Reach A Lower

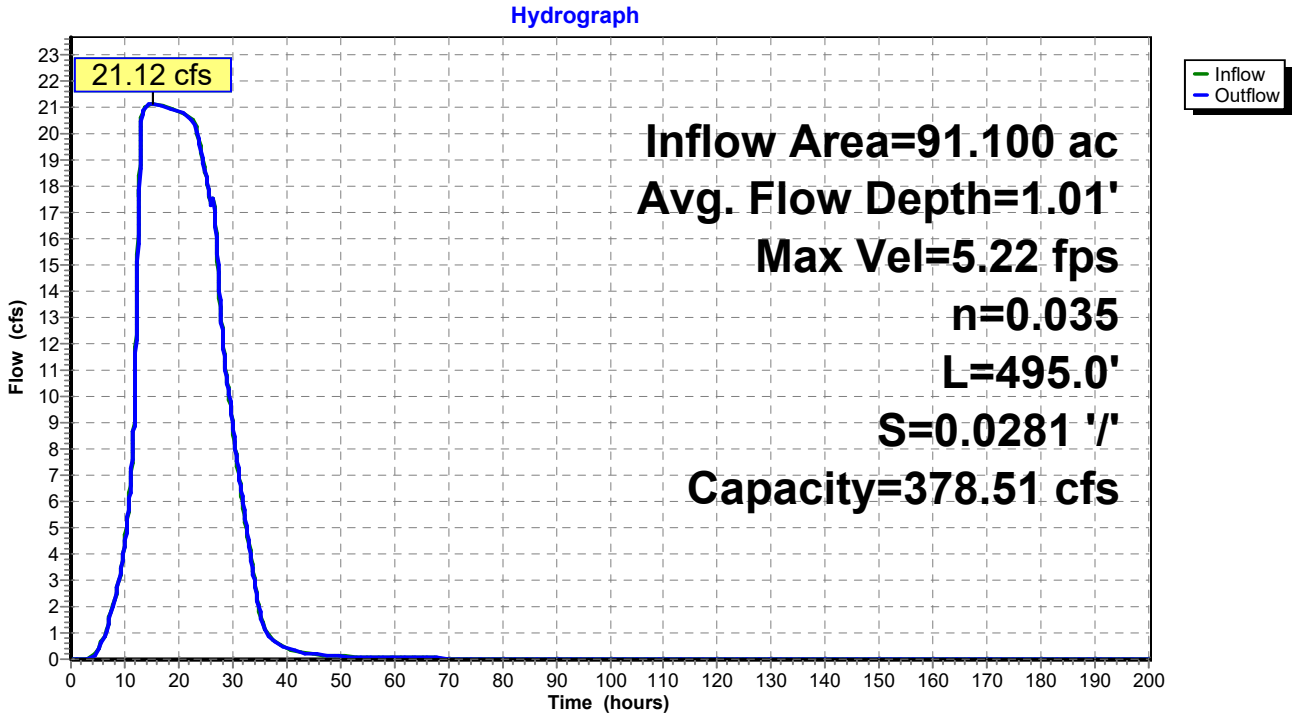
Inflow Area = 91.100 ac, 82.00% Impervious, Inflow Depth > 4.27" for 100-yr event
Inflow = 21.12 cfs @ 15.04 hrs, Volume= 32.425 af
Outflow = 21.12 cfs @ 15.06 hrs, Volume= 32.425 af, Atten= 0%, Lag= 1.1 min
Routed to Link 07 : Ex Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.22 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 6.4 min

Peak Storage= 2,003 cf @ 15.06 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 6.02'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 378.51 cfs

12.00' x 4.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 495.0' Slope= 0.0281 '/'
Inlet Invert= 583.17', Outlet Invert= 569.25'



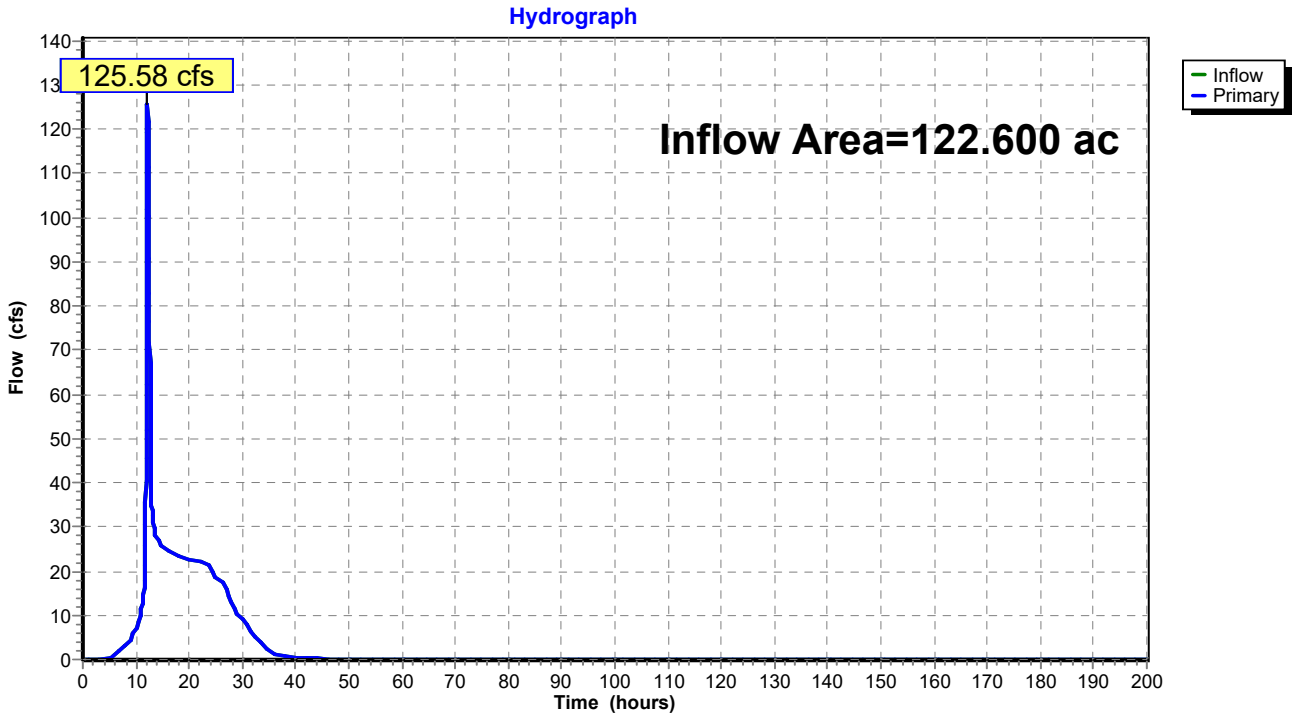


Summary for Link 07: Ex Analysis Point A

Inflow Area = 122.600 ac, 75.86% Impervious, Inflow Depth = 4.13" for 100-yr event
Inflow = 125.58 cfs @ 12.21 hrs, Volume= 42.151 af
Primary = 125.58 cfs @ 12.21 hrs, Volume= 42.151 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 07: Ex Analysis Point A



Summary for Subcatchment 7S: Ex Subarea A-1

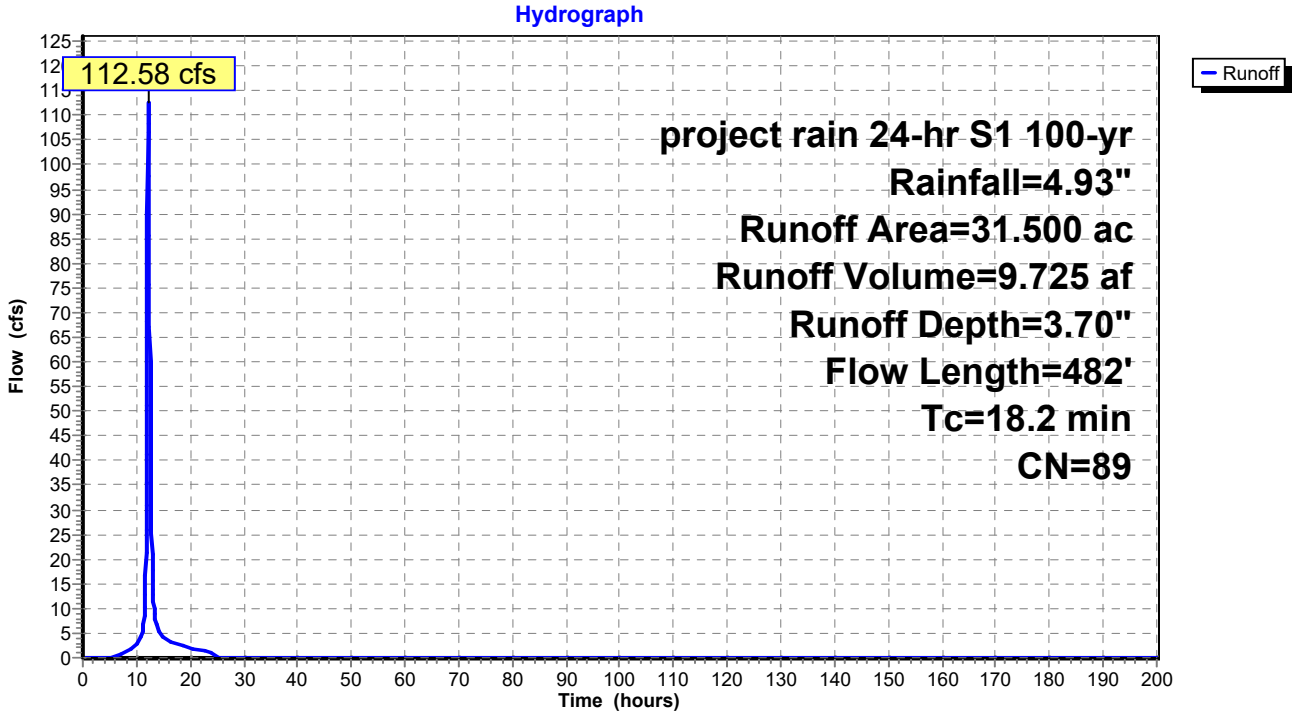
Runoff = 112.58 cfs @ 12.20 hrs, Volume= 9.725 af, Depth= 3.70"
Routed to Link 07 : Ex Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

	Area (ac)	CN	Description
*	17.100	98	Paved parking, HSG D
*	2.000	73	Brush, Good, HSG D (Offsite)
*	0.700	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	1.200	98	Paved parking, HSG D (Offsite)
	5.200	80	>75% Grass cover, Good, HSG D
	5.100	73	Brush, Good, HSG D
	31.500	89	Weighted Average
	13.200		41.90% Pervious Area
	18.300		58.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0300	0.16		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
1.8	197	0.0130	1.84		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
1.3	185	0.0130	2.31		**Shallow Concentrated Flow, Shallow Conc** Paved Kv= 20.3 fps
5.0					**Direct Entry, Assumed Tc for SS thru Plastics to AP A**
18.2	482	Total			

Subcatchment 7S: Ex Subarea A-1



Summary for Subcatchment 08: Ex Subarea B-1

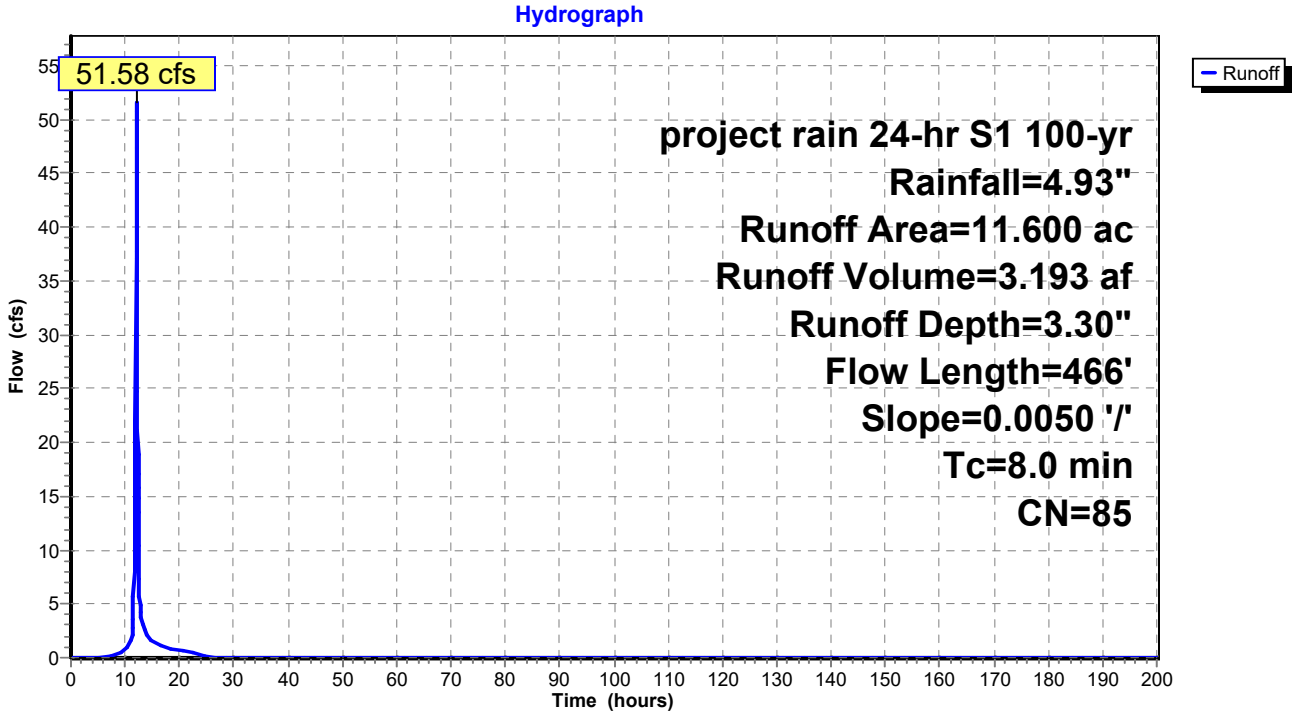
Runoff = 51.58 cfs @ 12.06 hrs, Volume= 3.193 af, Depth= 3.30"
Routed to Link 09 : Ex Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

Area (ac)	CN	Description
5.600	98	Paved parking, HSG D
6.000	73	Brush, Good, HSG D
11.600	85	Weighted Average
6.000		51.72% Pervious Area
5.600		48.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	100	0.0050	0.65		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.17"
5.4	366	0.0050	1.14		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
8.0	466	Total			

Subcatchment 08: Ex Subarea B-1

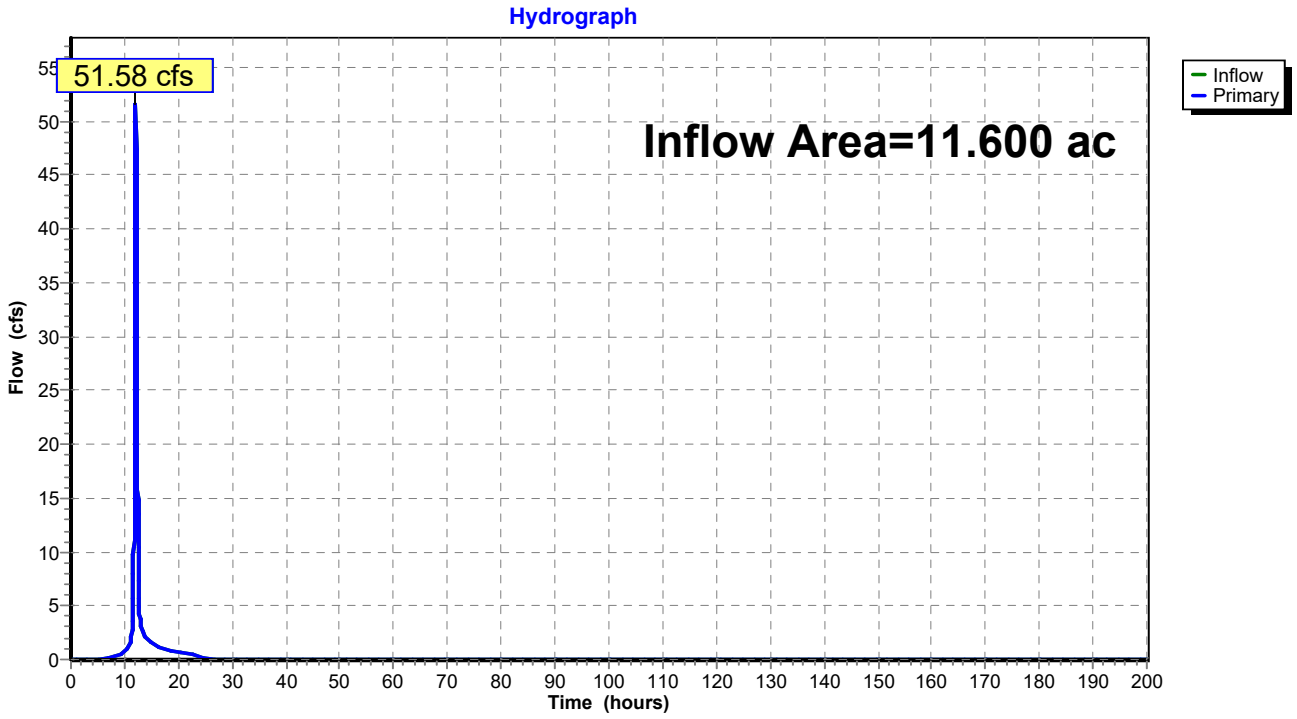


Summary for Link 09: Ex Analysis Point B

Inflow Area = 11.600 ac, 48.28% Impervious, Inflow Depth = 3.30" for 100-yr event
Inflow = 51.58 cfs @ 12.06 hrs, Volume= 3.193 af
Primary = 51.58 cfs @ 12.06 hrs, Volume= 3.193 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 09: Ex Analysis Point B



Summary for Subcatchment 10: Pr Subarea A-1

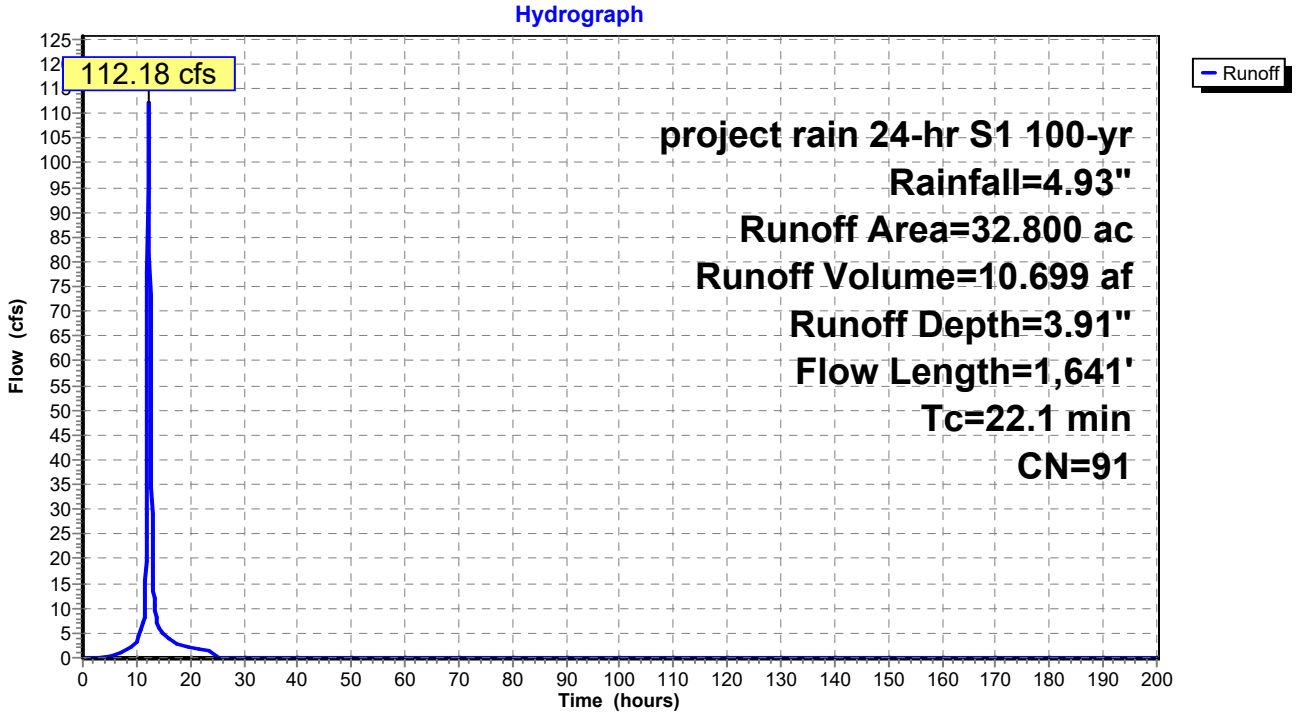
Runoff = 112.18 cfs @ 12.26 hrs, Volume= 10.699 af, Depth= 3.91"
Routed to Link 13 : Pr Analysis Point A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

	Area (ac)	CN	Description
*	2.800	98	Paved parking, HSG D (Road and Public Road in ROW)
*	2.000	73	Brush, Good, HSG D (Offsite)
*	1.800	80	>75% Grass cover, Good, HSG D (ROW and Public ROW)
*	7.400	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	17.300	98	Paved parking, HSG D (Lots @ 70% IMP)
*	0.600	96	Gravel surface, HSG D (Offsite)
*	0.200	80	>75% Grass cover, Good, HSG D (Offsite)
*	0.700	98	Paved parking, HSG D (Offsite)
	32.800	91	Weighted Average
	12.000		36.59% Pervious Area
	20.800		63.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow (Assumed)** Grass: Short n= 0.150 P2= 2.17"
3.4	330	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Assumed)** Unpaved Kv= 16.1 fps
3.0	1,211	0.0090	6.83	21.46	**Pipe Channel, SS (Assumed)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
22.1	1,641	Total			

Subcatchment 10: Pr Subarea A-1



Summary for Subcatchment 11: Pr Subarea A-2

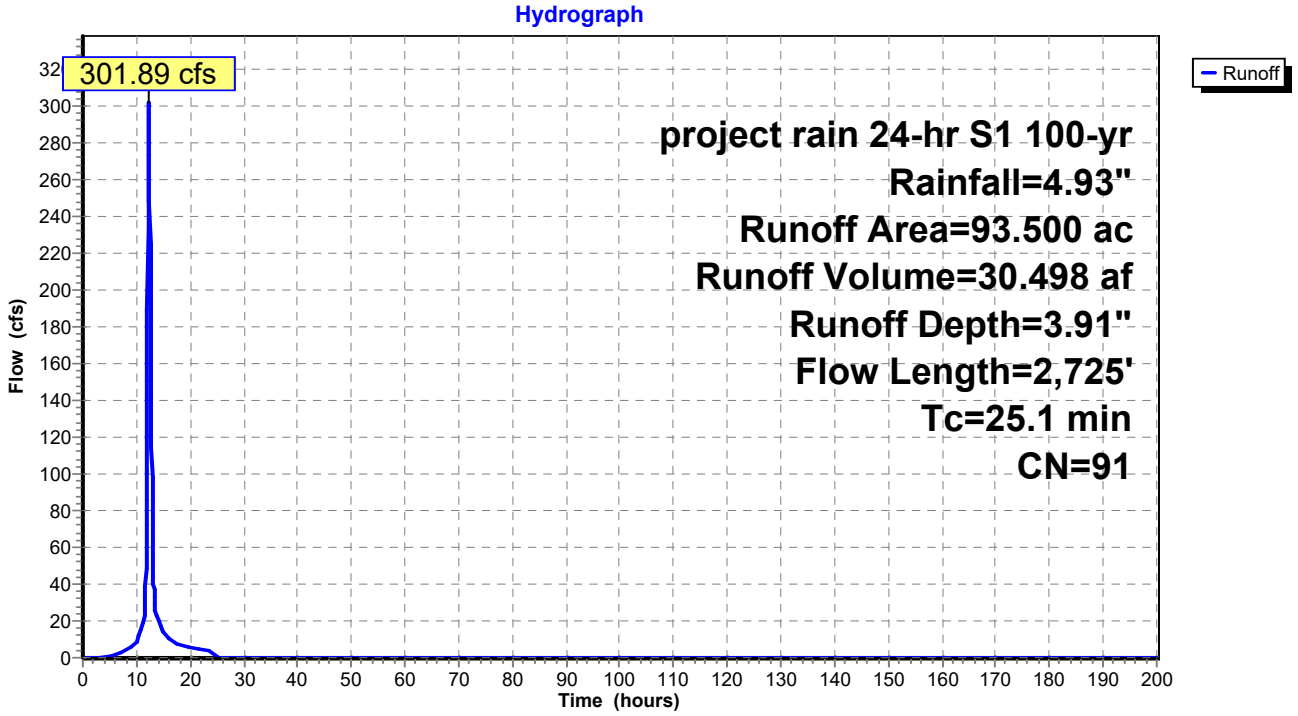
Runoff = 301.89 cfs @ 12.29 hrs, Volume= 30.498 af, Depth= 3.91"
Routed to Pond 12 : PR SWMF A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

	Area (ac)	CN	Description
*	31.000	98	Paved parking, HSG D (ROAD & Building)
	6.350	98	Water Surface, 0% imp, HSG D
	16.500	80	>75% Grass cover, Good, HSG D
*	8.300	80	>75% Grass cover, Good, HSG D (Lots @ 30% Pervious)
*	19.100	98	Paved parking, HSG D (Lots @ 70% IMP)
*	2.450	96	Gravel surface, HSG D (Substation Area)
*	8.900	73	Brush, Good, HSG D (Offsite)
*	0.900	96	Gravel surface, HSG D (Offsite)
	93.500	91	Weighted Average
	43.400		46.42% Pervious Area
	50.100		53.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0100	0.11		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 2.17"
2.8	330	0.0150	1.97		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
6.6	2,295	0.0050	5.81	627.91	**Channel Flow, Perimeter Channel (Dimention @ Halfway Pt)** Area= 108.0 sf Perim= 32.8' r= 3.29' n= 0.040 Earth, cobble bottom, clean sides
25.1	2,725	Total			

Subcatchment 11: Pr Subarea A-2



Summary for Pond 12: PR SWMF A

Inflow Area = 93.500 ac, 53.58% Impervious, Inflow Depth = 3.91" for 100-yr event
Inflow = 301.89 cfs @ 12.29 hrs, Volume= 30.498 af
Outflow = 6.77 cfs @ 18.75 hrs, Volume= 30.257 af, Atten= 98%, Lag= 387.5 min
Primary = 6.77 cfs @ 18.75 hrs, Volume= 30.257 af
Routed to Link 13 : Pr Analysis Point A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Starting Elev= 590.00' Surf.Area= 295,658 sf Storage= 672,581 cf
Peak Elev= 595.63' @ 18.75 hrs Surf.Area= 368,953 sf Storage= 1,720,337 cf (1,047,756 cf above start)

Plug-Flow detention time= 2,975.6 min calculated for 14.817 af (49% of inflow)
Center-of-Mass det. time= 1,778.0 min (2,579.8 - 801.8)

Volume	Invert	Avail.Storage	Storage Description
#1	590.00'	2,542,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	584.00'	55,389 cf	**Forebay (North) (Prismatic)** Listed below (Recalc)
#3	584.00'	33,522 cf	**Forebay (East) (Prismatic)** Listed below (Recalc)
#4	580.00'	583,671 cf	**Deep Pool (Prismatic)** Listed below (Recalc)
		3,215,128 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
590.00	147,829	0	0
592.00	175,427	323,256	323,256
594.00	203,203	378,630	701,886
596.00	225,189	428,392	1,130,278
598.00	247,675	472,864	1,603,142
600.00	269,946	517,621	2,120,763
601.50	292,432	421,784	2,542,547

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	4,689	0	0
586.00	7,082	11,771	11,771
588.00	9,938	17,020	28,791
589.00	11,463	10,701	39,492
590.00	20,332	15,898	55,389

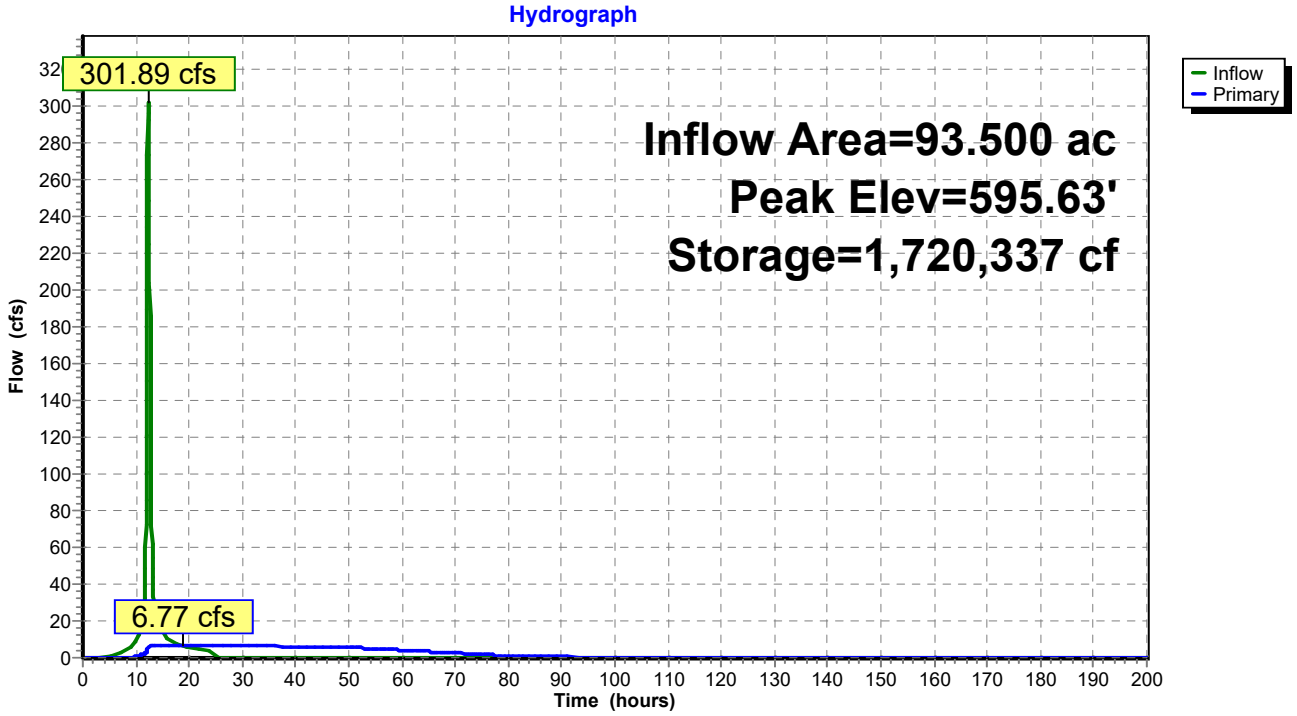
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
584.00	820	0	0
586.00	3,325	4,145	4,145
588.00	6,305	9,630	13,775
589.00	7,888	7,097	20,872
590.00	17,412	12,650	33,522

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	29,839	0	0
582.00	40,383	70,222	70,222
584.00	51,248	91,631	161,853
586.00	62,480	113,728	275,581
588.00	73,904	136,384	411,965
589.00	79,711	76,808	488,773
590.00	110,085	94,898	583,671

Device	Routing	Invert	Outlet Devices
#1	Primary	589.00'	**15.0" Round Culvert** L= 775.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 585.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	590.00'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 590.00' / 589.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 1	594.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	599.50'	**60.0' long x 100.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.77 cfs @ 18.75 hrs HW=595.63' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 6.77 cfs @ 5.52 fps)
  - **2=Culvert** (Passes < 8.54 cfs potential flow)
  - **3=Grate** (Passes < 24.59 cfs potential flow)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12: PR SWMF A

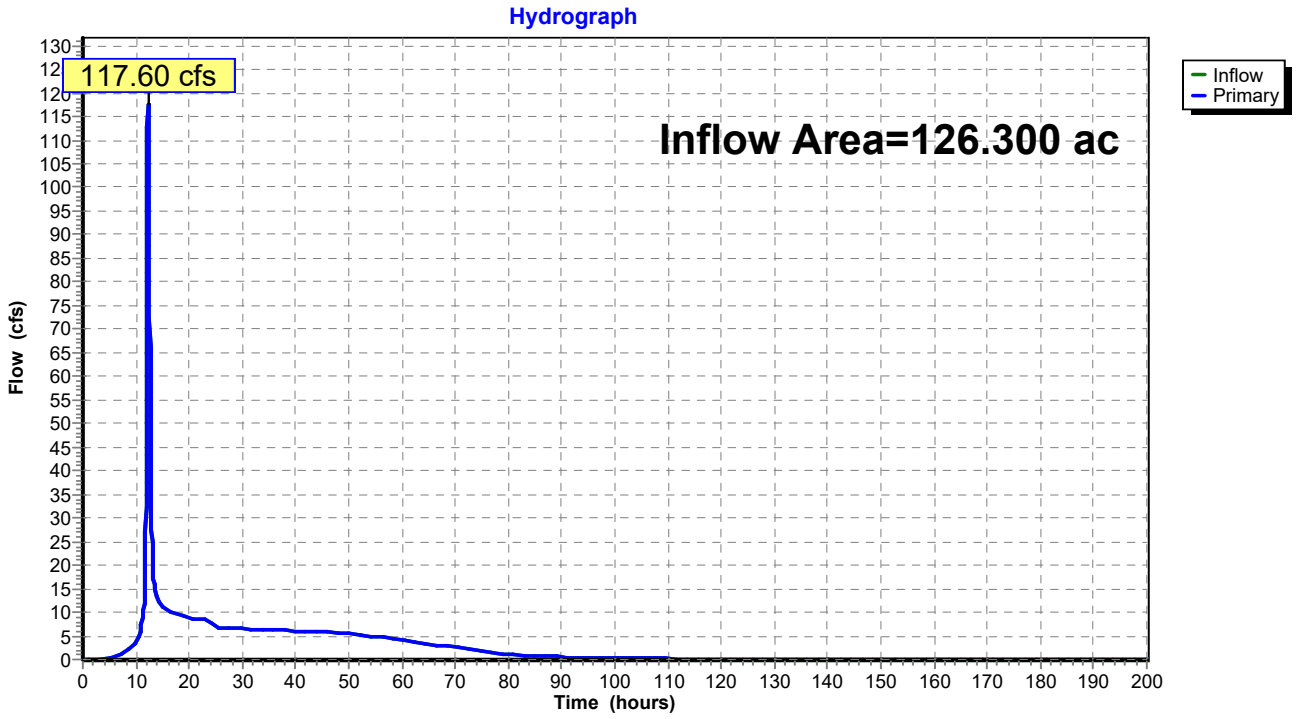


Summary for Link 13: Pr Analysis Point A

Inflow Area = 126.300 ac, 56.14% Impervious, Inflow Depth > 3.89" for 100-yr event
Inflow = 117.60 cfs @ 12.26 hrs, Volume= 40.956 af
Primary = 117.60 cfs @ 12.26 hrs, Volume= 40.956 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 13: Pr Analysis Point A



Summary for Subcatchment 14: Pr Subarea B-1

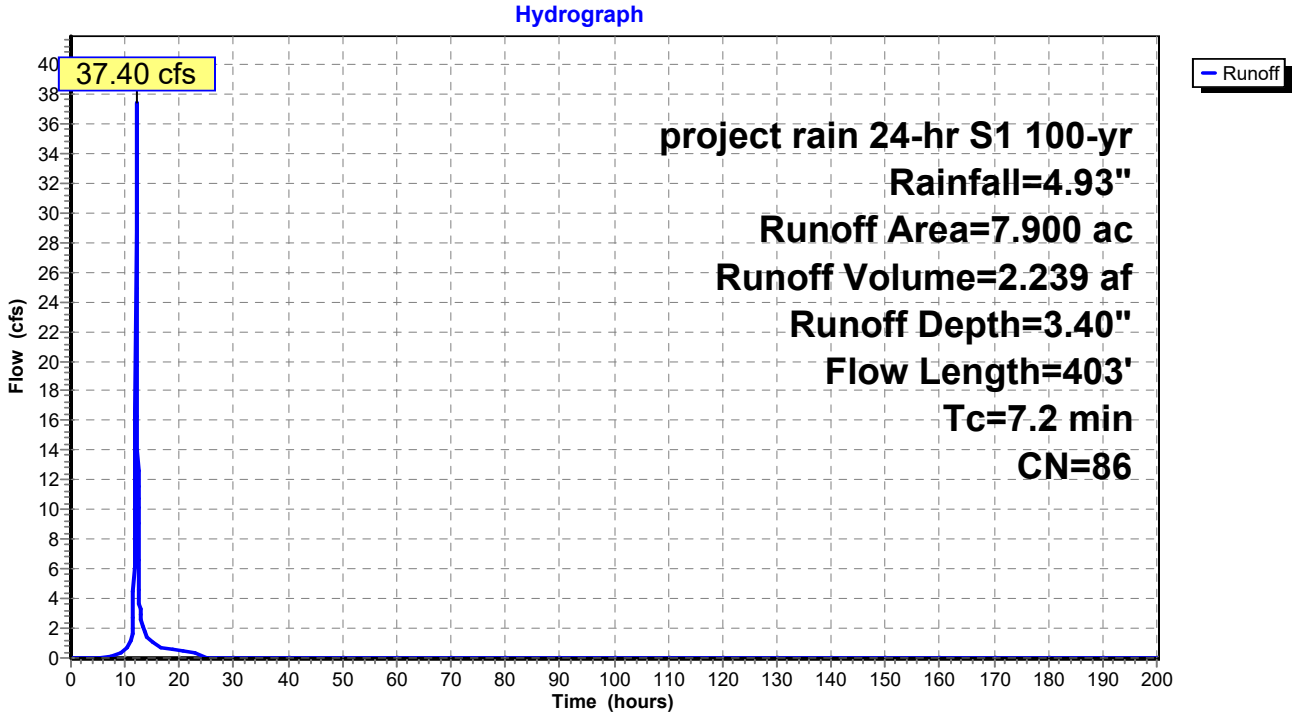
Runoff = 37.40 cfs @ 12.06 hrs, Volume= 2.239 af, Depth= 3.40"
Routed to Link 15 : Pr Analysis Point B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
project rain 24-hr S1 100-yr Rainfall=4.93"

Area (ac)	CN	Description
5.100	80	>75% Grass cover, Good, HSG D
2.800	96	Gravel surface, HSG D
7.900	86	Weighted Average
7.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.0100	0.38		**Sheet Flow, Sheet Flow (Gravel)** n= 0.030 P2= 2.17"
2.2	213	0.0100	1.61		**Shallow Concentrated Flow, Shallow Conc (Gravel)** Unpaved Kv= 16.1 fps
0.7	90	0.0200	2.28		**Shallow Concentrated Flow, Shallow Conc** Unpaved Kv= 16.1 fps
7.2	403	Total			

Subcatchment 14: Pr Subarea B-1

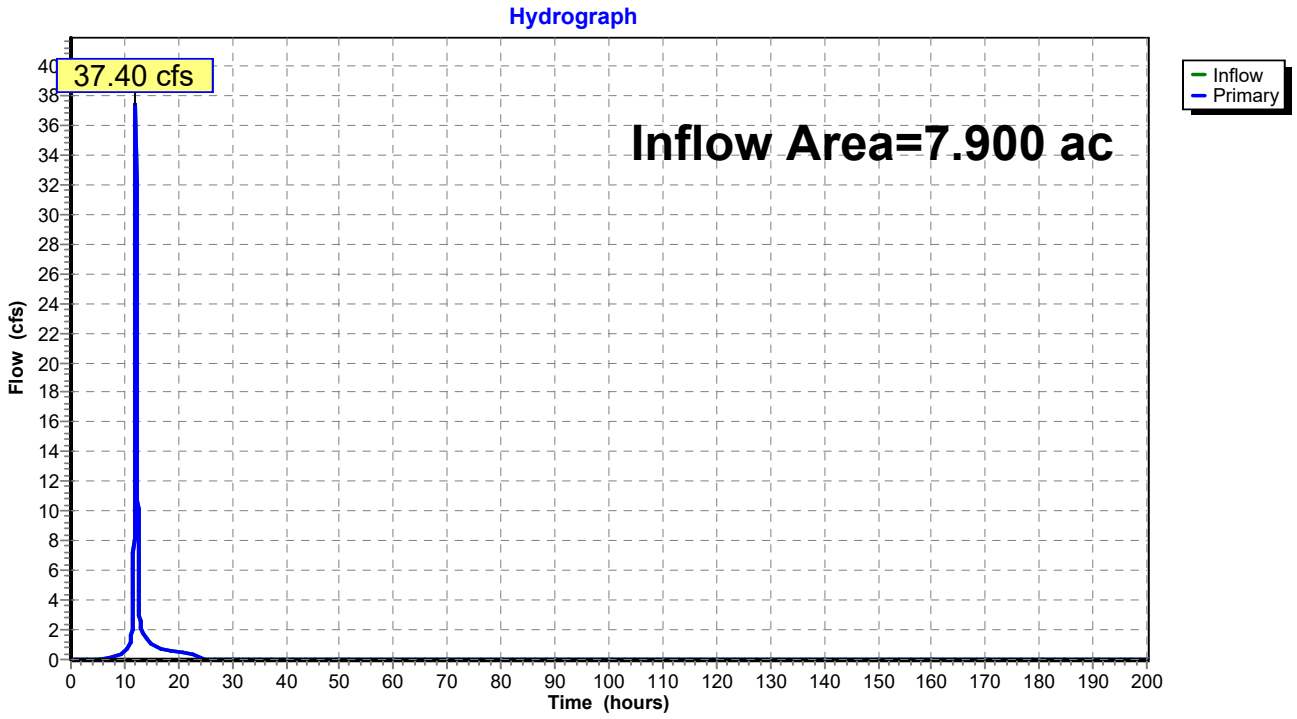


Summary for Link 15: Pr Analysis Point B

Inflow Area = 7.900 ac, 0.00% Impervious, Inflow Depth = 3.40" for 100-yr event
Inflow = 37.40 cfs @ 12.06 hrs, Volume= 2.239 af
Primary = 37.40 cfs @ 12.06 hrs, Volume= 2.239 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Link 15: Pr Analysis Point B



Appendix 3
Channel Protection and Stormwater Management Facility Calculations

Figure 06 – Channel Protection Volume Exhibit
SWMF Channel Protection Volume Calculations
SWMF Channel Protection Orifice & Spillway Calculations
SWMF Forebay and Deep Pool Sizing Calculations

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CALCULATIONS:

Project: **Channel Protection Volume Calculations**
Riverview Innovation and Tech. Campus

Project No.: **2968**
Date: **3/11/2026**
By: **JGC**
Sheet **1 of 3**

NOTE: CPV Requirements (NYSDEC SWMD Chapter 9) for this redevelopment project are met by reducing 1year post development peak discharge rates. However, CPv Volume is provided in the SWMF as part of the quanity controls which would satisfy the Chapter 4 criteria for New Development.

COMPUTE CHANNEL PROTECTION VOLUME - STORMWATER MANAGEMENT FACILITY

Channel Protection Volume: Provide 24 hours of extended detention (T) for one-year event.

Design Storms 1-YEAR (in) 1.78

1. DETERMINE THE VALUE OF THE UNIT PEAK DISCHARGE (qu) USING TR-55 AND TYPE II

PROPERTY LIMITS= **119.80 acres**

COMPOSITE RUNOFF CURVE NUMBER (CN) **92** *(COMPSITE CN FOR ONLY PROPERY LIMITS)*

Ia = (200/CN - 2) **Ia VALUE =** **0.174**

Ia/P **Ia/P VALUE =** **0.098**

TIME OF CONCENTRATION (Tc) = **0.418 hrs.** *(PR SUBAREA A-2, SEE DRAINAGE CALCS)*

Peak Unit Discharge, (qu) (Exhibit 4-II) **qu =** **590 csm/in**

When T=24 hours, find qo/qi (Figure 3-15) **qo/qi =** **0.030**

$Vs/Vr = 0.683 - 1.43(qo/qi) + 1.64(qo/qi)^2 - 0.804(qo/qi)^3$
where Vs = channel protection storage (Cpv) and Vr = volume of runoff in inches

Vs/Vr **Vs/Vr VALUE =** **0.642**

Direct Runoff, Q (Figure 2-1) **Q VALUE =** **0.30 inches**

Channel Protection Storage, Vs
Vs = Cpv = (Vs/Vr)(Q)(1/12)(AREA)

Vs **Vs VALUE =** **1.921 ac-ft**
83699 CF **CPv =** **83699 CF**

Release Rate over 24 Hours 83699 ft^3 / [(24 hr) (3600 sec / hr)] = **0.969 cfs**

CHANNEL PROTECTION VOLUME PROVIDED

ELEVATION (ft)	CONTOUR AREA (ft^2)	TOTAL STORAGE (ft^3)
590.00	147,828	0
592.00	175,427	323,255
594.00	203,203	701,885

701,885 > 83,699
OK

Figure 2-1 Solution of runoff equation.

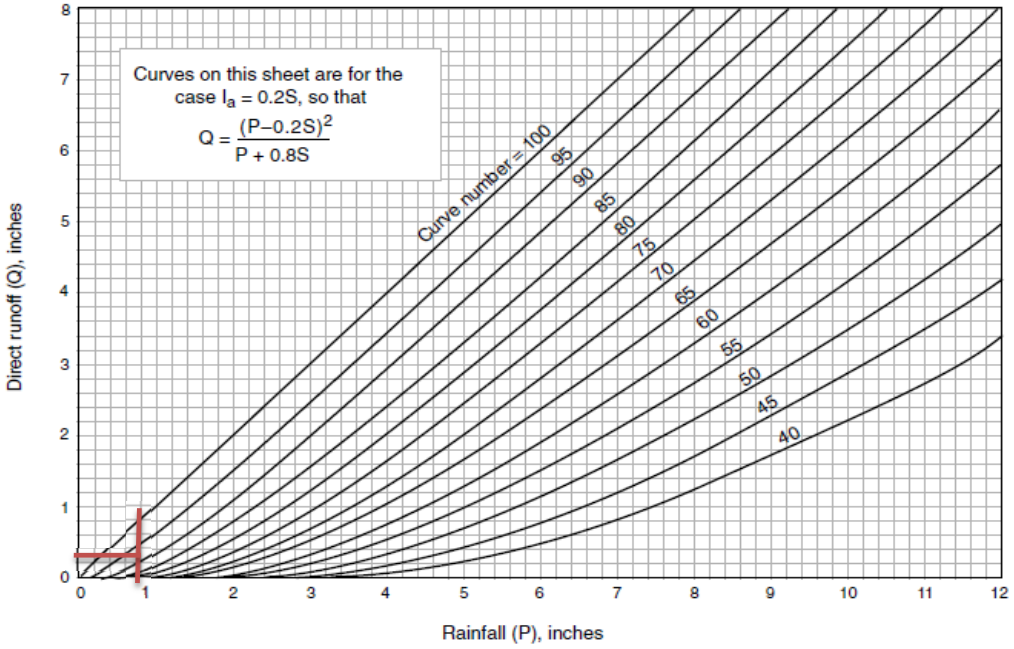


Figure 3-15. Detention Time vs. Discharge Ratios
(Source: Maryland Department of the Environment, 1998)

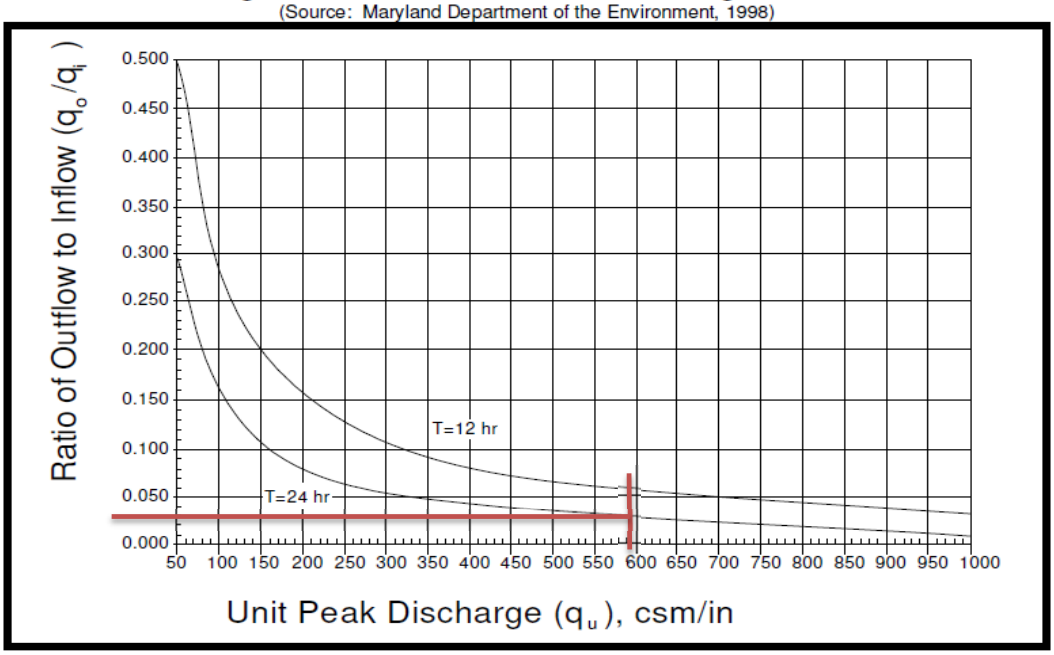
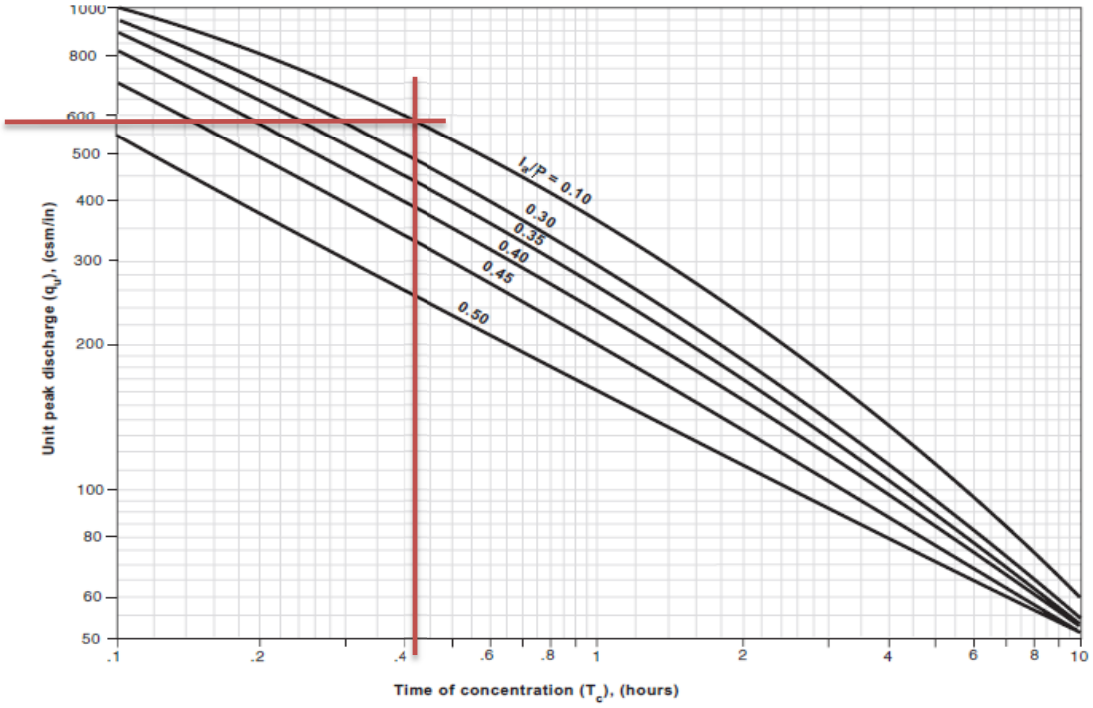


Exhibit 4-II Unit peal discharge (q_u) for NRCS (SCS) type II rainfall distribution



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CALCULATIONS:

Project: **Orifice / Spillway Calculations**
Riverview Innovation and Tech. Campus

Project No.:	**2968**
Date:	**3/11/2026**
By:	**JGC**
Sheet	**1 of 1**

COMPUTE OFIFICE DIAMETER

Required Channel Protection Volume (RCPv)= **83699 cf**

Elevation at RCPv = **590.55**

Flow Required to release RCPv over 24 Hrs.= **0.97 cfs**

OUTLET ORIFICE = **12 inch dimeter**

Invert @ Orifice = **590** Average Head = **0.02 ft**

Center of Orifice = **0.5 FT**

Q = CA[2GH]1/2= **Q= 0.60 cfs**
Where C= 0.6

If Avearge Outflow Rate using oriface < Rate to release RCPv over 24 hrs "OK"
*(unless using smallest recommended orifice of 3")

0.598 < 0.97

OK

SPILLWAY CALCULATION

Extreme Flood Protection, Q of undetained 100-year inflow Hydrograph

100-year Storm Event Inflow (Q) to SMWF = **302** cfs

Height (H) from Spillway Invert to Top of Berm= **2.00** ft

Q =(0.666)*C*L*((2g)^.5)H^(3/2) L = **39.92** ft **Use L = 50 ft**
Where C= 0.5

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CALCULATIONS:

Project: **Forebay / Deep Pool Sizing Calculations**
Riverview Innovation and Tech. Campus

Project No.:	**2968**
Date:	**3/11/2026**
By:	**JGC**
Sheet	**1 of 1**

WATER QUALITY VOLUME, WQv

Note: WQv calculated for the SWMF is to be used for pond sizing calculations only, and does not apply to overall site WQv Requirements.

DRAINAGE AREA (A) TO FACILITY= **93.50 acres**

IMPERVIOUS AREA = **53.45 acres**

90 PERCENTILE RAINFALL EVENT = **1.00 inches**

CURVE NUMBER (CN) = **92.0**

TIME OF CONCENTRATION (Tc) = **0.418 hours**

IMPERVIOUS COVER (I) = **0.57**

RUNOFF COEFFICENT (Rv) = **0.56**
Rv = 0.05 + (I)(0.9)

WATER QUALITY VOLUME (WQv) = **4.398 acre-ft** **191591 cf**
WQv = P * Rv * A / 12

PRE-TREATMENT VOLUME (NORTH FOREBAY)

10% WQv * 55% = 10,538 ft^3 (required)

* Recieves Approx 55% of Post Construction Area

ELEVATION (ft)	CONTOUR AREA (ft^2)	TOTAL STORAGE (ft^3)
584.00	See Hydrographs (PR SWMF A)	0
590.00	See Hydrographs (PR SWMF A)	55,389
		55,389 > 10,538 OK

PRE-TREATMENT VOLUME (EAST FOREBAY)

10% WQv = 8,622 ft^3 (required)

* Recieves Approx 45% of Post Construction Area

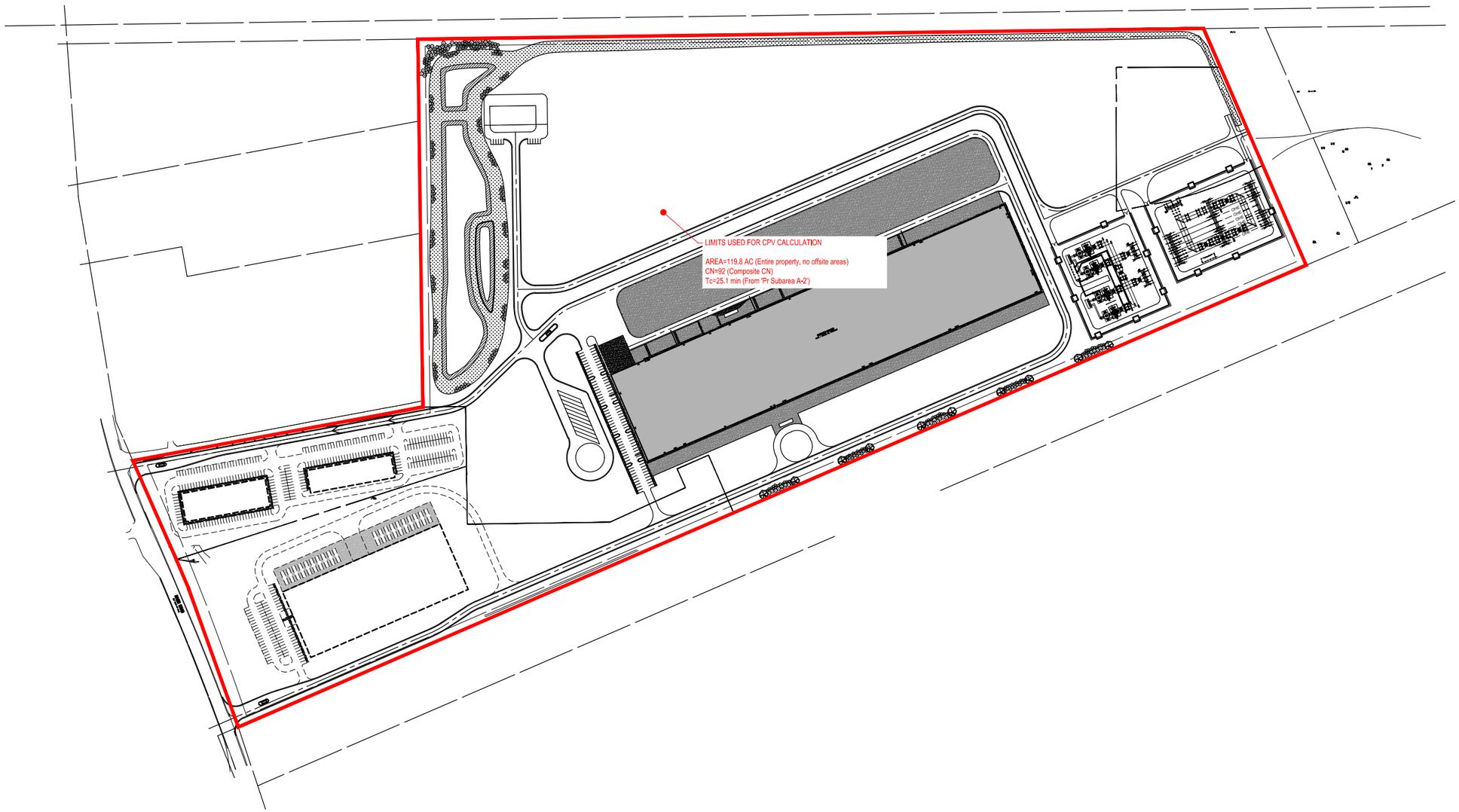
ELEVATION (ft)	CONTOUR AREA (ft^2)	TOTAL STORAGE (ft^3)
584.00	See Hydrographs (PR SWMF A)	0
590.00	See Hydrographs (PR SWMF A)	33,522
		33,522 > 8,622 OK

PERMANENT POOL VOLUME (DEEP POOL)

50% WQv = 95,796 ft^3 (required)

ELEVATION (ft)	CONTOUR AREA (ft^2)	TOTAL STORAGE (ft^3)
582.00	See Hydrographs (PR SWMF A)	0
590.00	See Hydrographs (PR SWMF A)	583,671
		583,671 > 95,796 OK

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GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

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Drawing Alteration

The following is an excerpt from the New York State Education Law Article 145 Section 7209 and applies to this drawing:

"It is a violation of this law for any person, unless he is acting under the direction of a licensed professional engineer or land surveyor to alter any item in any way. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration."

	REVISIONS	DATE	BY
7			
6			
5			
4			
3			
2			
1			

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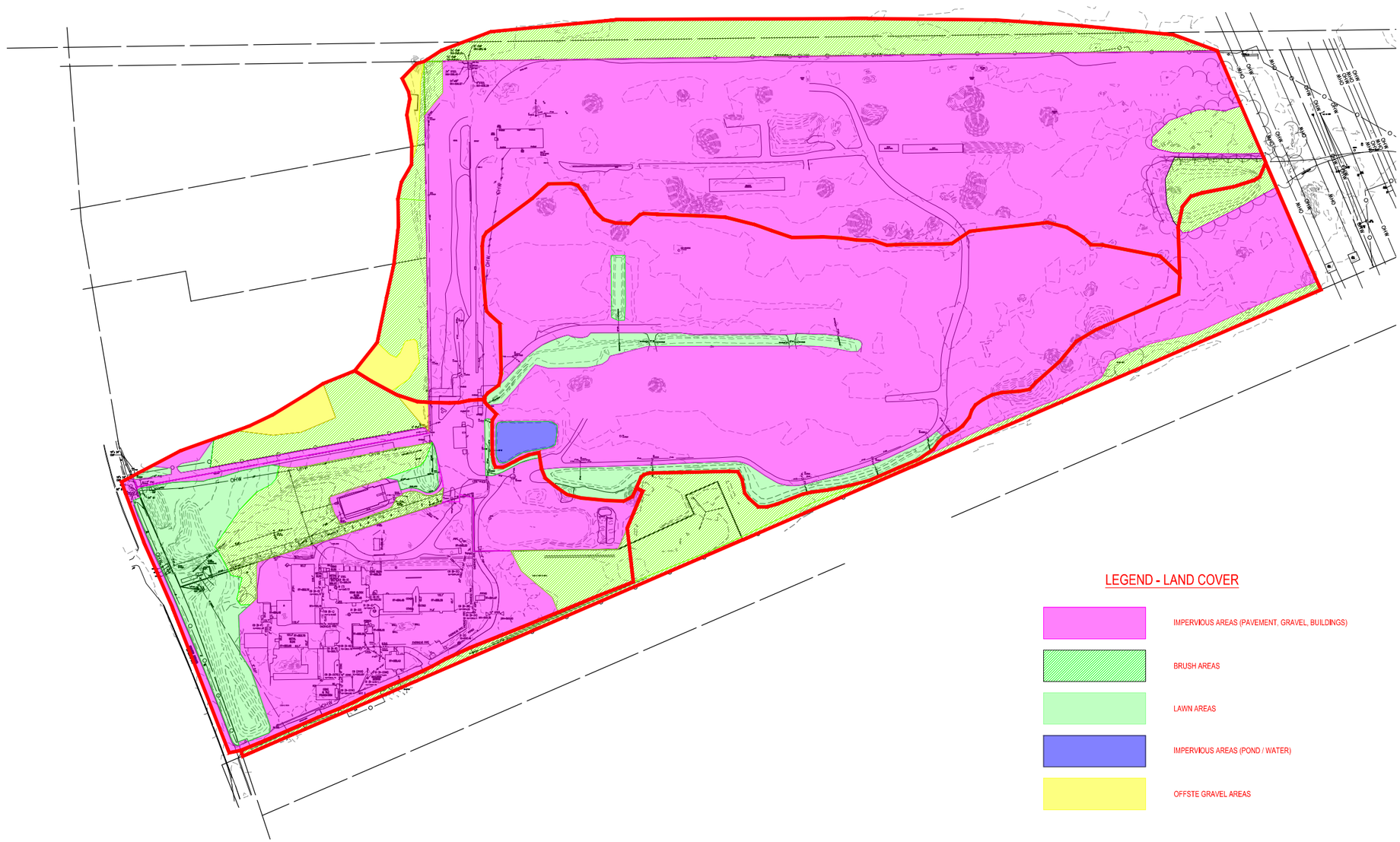
PROJECT: RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS
LOCATION: TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK STATE
CLIENT: INVENTUM ENGINEERING
441 CARLISLE DRIVE
HERNDON, VIRGINIA 20170
DRAWING TITLE: CHANNEL PROTECTION VOLUME EXHIBIT

PROJECT MANAGER	
PGV	
PROJECT ENGINEER	
JGC	
DRAWN BY	
JGC	
SCALE	DATE ISSUED
AS NOTED	MARCH 2026
PROJECT NO.	
2968	
DRAWING NO.	
FIGURE 06	

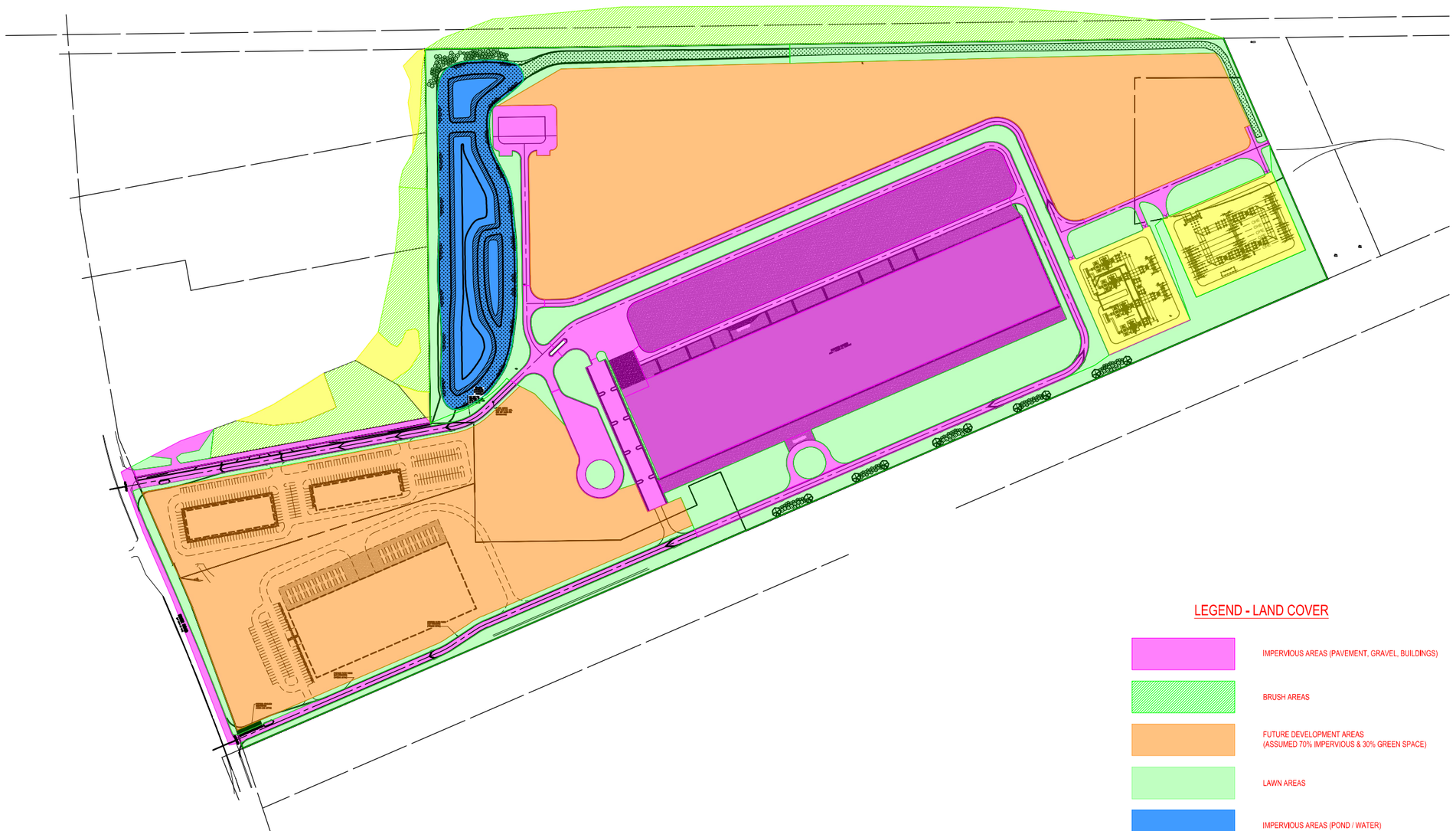
Appendix 4
Stormwater Quality

Figure 07 – Existing Conditions Landcover Exhibit
Figure 08 – Proposed Conditions Landcover Exhibit

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DWW
DWW
DWW

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LEGEND - LAND COVER

- IMPERVIOUS AREAS (PAVEMENT, GRAVEL, BUILDINGS)
- BRUSH AREAS
- FUTURE DEVELOPMENT AREAS (ASSUMED 70% IMPERVIOUS & 30% GREEN SPACE)
- LAWN AREAS
- IMPERVIOUS AREAS (POND / WATER)
- OFFSTE GRAVEL AREAS

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

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	DATE	BY
7		
6		
5		
4		
3		
2		
1		

REVISIONS

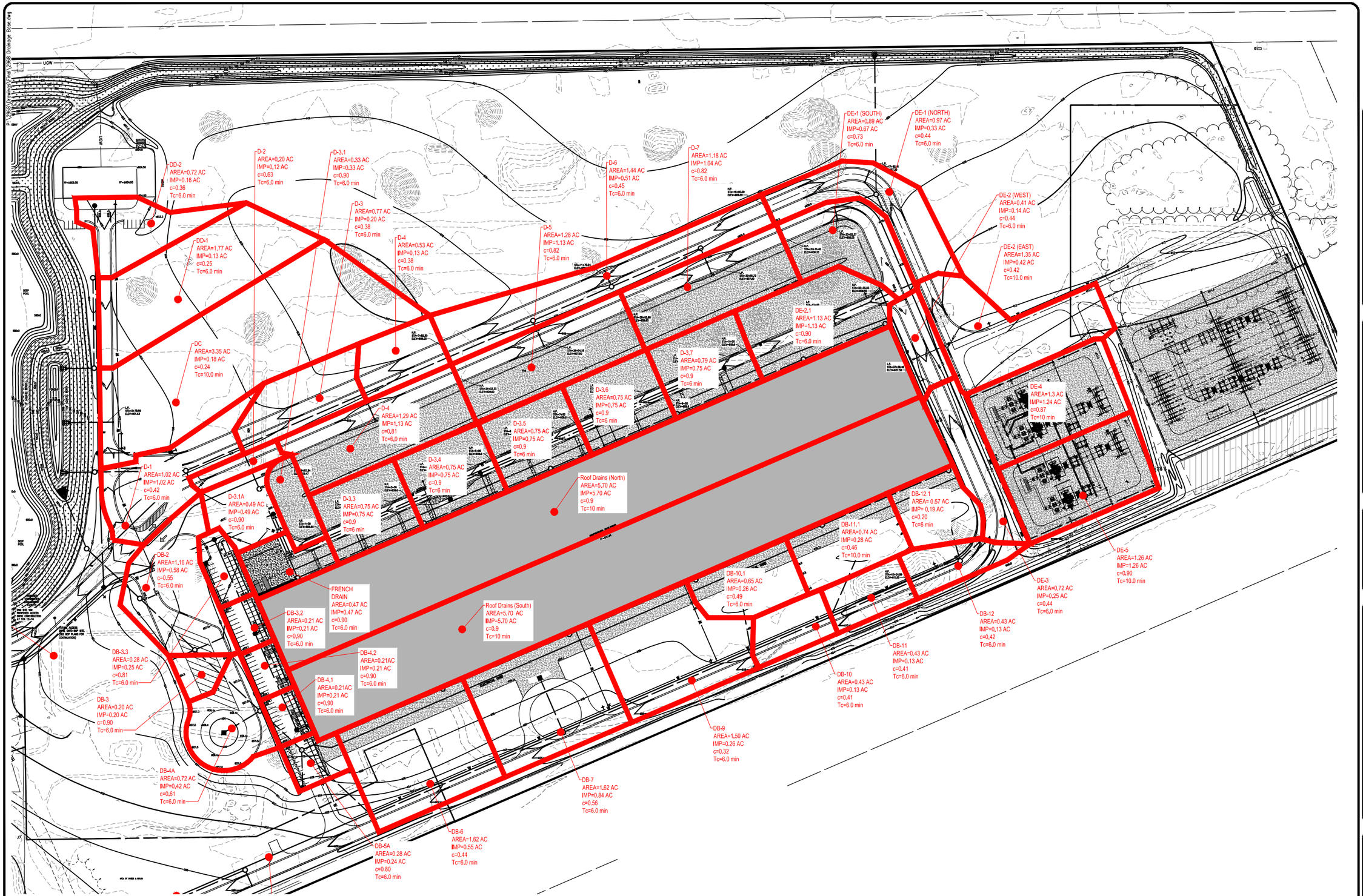
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FAIRPORT, NEW YORK 14450
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585-377-7360

PROJECT: RIVERVIEW INNOVATION & TECHNOLOGY CAMPUS
LOCATION: TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK STATE
CLIENT: INVENTIUM ENGINEERING
441 CARLISLE DRIVE
HERNDON, VIRGINIA 20170
DRAWING TITLE: PROPOSED LAND COVER EXHIBIT

PROJECT MANAGER	PCV
PROJECT ENGINEER	JGC
DRAWN BY	JGC
SCALE	AS NOTED
DATE ISSUED	MARCH 2026
PROJECT NO.	2968
DRAWING NO.	FIGURE 08

Appendix 5
Storm Sewers

Figure 09 –Storm Sewer Map
Storm Sewer Sizing Calculations
Rip-Rap Outlet Sizing Calculations


DD-2
AREA=0.72 AC
IMP=0.16 AC
c=0.36
Tc=6.0 min
DD-1
AREA=1.77 AC
IMP=0.13 AC
c=0.25
Tc=6.0 min
DC
AREA=3.35 AC
IMP=0.18 AC
c=0.24
Tc=10.0 min
D-1
AREA=1.02 AC
IMP=1.02 AC
c=0.42
Tc=6.0 min
D-2
AREA=0.20 AC
IMP=0.12 AC
c=0.63
Tc=6.0 min
D-3,1
AREA=0.33 AC
IMP=0.33 AC
c=0.90
Tc=6.0 min
D-3
AREA=0.77 AC
IMP=0.20 AC
c=0.38
Tc=6.0 min
D-4
AREA=0.53 AC
IMP=0.13 AC
c=0.38
Tc=6.0 min
D-5
AREA=1.28 AC
IMP=1.13 AC
c=0.82
Tc=6.0 min
D-6
AREA=1.44 AC
IMP=0.51 AC
c=0.45
Tc=6.0 min
D-7
AREA=1.18 AC
IMP=1.04 AC
c=0.82
Tc=6.0 min
DE-1 (SOUTH)
AREA=0.89 AC
IMP=0.67 AC
c=0.73
Tc=6.0 min
DE-1 (NORTH)
AREA=0.97 AC
IMP=0.33 AC
c=0.44
Tc=6.0 min
DE-2 (WEST)
AREA=0.41 AC
IMP=0.14 AC
c=0.44
Tc=6.0 min
DE-2 (EAST)
AREA=1.35 AC
IMP=0.42 AC
c=0.42
Tc=10.0 min
DE-2.1
AREA=1.13 AC
IMP=1.13 AC
c=0.90
Tc=6.0 min
D-4
AREA=1.29 AC
IMP=1.13 AC
c=0.81
Tc=6.0 min
D-3,6
AREA=0.75 AC
IMP=0.75 AC
c=0.9
Tc=6 min
D-3,7
AREA=0.79 AC
IMP=0.75 AC
c=0.9
Tc=6 min
D-3,5
AREA=0.75 AC
IMP=0.75 AC
c=0.9
Tc=6 min
D-3,4
AREA=0.75 AC
IMP=0.75 AC
c=0.9
Tc=6 min
D-3,3
AREA=0.75 AC
IMP=0.75 AC
c=0.9
Tc=6 min
D-3,1A
AREA=0.49 AC
IMP=0.49 AC
c=0.90
Tc=6.0 min
Roof Drains (North)
AREA=5.70 AC
IMP=5.70 AC
c=0.9
Tc=10 min
DE-4
AREA=1.3 AC
IMP=1.24 AC
c=0.87
Tc=10 min
DB-12.1
AREA= 0.57 AC
IMP= 0.19 AC
c=0.20
Tc=6 min
DB-11.1
AREA=0.74 AC
IMP=0.28 AC
c=0.46
Tc=10.0 min
DB-10.1
AREA=0.65 AC
IMP=0.26 AC
c=0.49
Tc=6.0 min
DB-12
AREA=0.43 AC
IMP=0.13 AC
c=0.42
Tc=6.0 min
DB-11
AREA=0.43 AC
IMP=0.13 AC
c=0.41
Tc=6.0 min
DB-10
AREA=0.43 AC
IMP=0.13 AC
c=0.41
Tc=6.0 min
DE-3
AREA=0.72 AC
IMP=0.25 AC
c=0.44
Tc=6.0 min
DE-5
AREA=1.26 AC
IMP=1.26 AC
c=0.90
Tc=10.0 min
DB-2
AREA=1.16 AC
IMP=0.58 AC
c=0.55
Tc=6.0 min
FRENCH DRAIN
AREA=0.47 AC
IMP=0.47 AC
c=0.90
Tc=6.0 min
DB-3,2
AREA=0.21 AC
IMP=0.21 AC
c=0.90
Tc=6.0 min
Roof Drains (South)
AREA=5.70 AC
IMP=5.70 AC
c=0.9
Tc=10 min
DB-4.2
AREA=0.21AC
IMP=0.21 AC
c=0.90
Tc=6.0 min
DB-4.1
AREA=0.21AC
IMP=0.21 AC
c=0.90
Tc=6.0 min
DB-3,3
AREA=0.28 AC
IMP=0.25 AC
c=0.81
Tc=6.0 min
DB-3
AREA=0.20 AC
IMP=0.20 AC
c=0.90
Tc=6.0 min
DB-4A
AREA=0.72 AC
IMP=0.42 AC
c=0.61
Tc=6.0 min
DB-9
AREA=1.50 AC
IMP=0.26 AC
c=0.32
Tc=6.0 min
DB-7
AREA=1.62 AC
IMP=0.84 AC
c=0.56
Tc=6.0 min
DB-6
AREA=1.62 AC
IMP=0.55 AC
c=0.44
Tc=6.0 min
DB-5A
AREA=0.28 AC
IMP=0.24 AC
c=0.80
Tc=6.0 min
UGW
DEEP POOL
ENGINEER'S NOTE:
CONTRACTOR SHALL REVIEW ALL SITE UTILITIES AND COORDINATE WITH ALL UTILITY COMPANIES PRIOR TO CONSTRUCTION.

BME ASSOCIATES

Project:	Riverview
Project No:	2968
Date:	03/12/26
By:	DTT
Sheet	1 of 8

STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	D-7	D-6	6.0	0.8	1.18	0.97				0.97	6.0	5.12	4.95	18	HDPE	0.012	211	0.50	1.06	8.06	0.58	4.84	0.7	D-6	6.7
INV	601.49	600.43																							
MH	D-6	D-5	6.0	0.5	1.44	0.65	D-7	6.7	0.97	1.62	6.7	4.98	8.04	24	HDPE	0.012	186	0.50	0.93	17.37	0.48	5.42	0.6	D-5	7.3
INV	600.43	599.50																							
MH	D-5	D-4	6.0	0.8	1.28	1.05	D-6	7.3	1.62	2.67	7.3	4.87	12.98	24	HDPE	0.012	402	0.50	2.01	17.37	0.67	6.14	1.1	D-4	8.4
INV	599.50	597.49																							
MH	D-4	D-3	6.0	0.4	0.53	0.20	D-5	8.4	2.67	2.87	8.4	4.68	13.43	24	HDPE	0.012	291	0.50	1.46	17.37	0.69	6.18	0.8	D-3	9.2
INV	597.49	596.04																							
MH	D-3.7	D-3.6	6.0	0.9	0.79	0.71				0.71	6.0	5.12	3.64	15	HDPE	0.012	200	0.50	1.00	4.96	0.66	4.47	0.7	D-3.6	6.7
INV	604.90	603.90																							
MH	D-3.6	D-3.5	6.0	0.9	0.75	0.68	D-3.7	6.7	0.71	1.39	6.7	4.97	6.89	18	HDPE	0.012	200	0.50	1.00	8.06	0.75	5.17	0.6	D-3.5	7.4
INV	603.65	602.65																							
MH	D-3.5	D-3.4	6.0	0.9	0.75	0.68	D-3.6	7.4	1.39	2.06	7.4	4.86	10.01	24	HDPE	0.012	221	0.50	1.11	17.37	0.55	5.77	0.6	D-3.4	8.0
INV	602.15	601.04																							
MH	D-3.4	D-3.3	6.0	0.9	0.75	0.68	D-3.5	8.0	2.06	2.74	8.0	4.75	12.98	24	HDPE	0.012	179	0.50	0.89	17.37	0.67	6.14	0.5	D-3.3	8.5
INV	601.04	600.15																							
MH	D-3.3	D-3.2	6.0	0.9	0.75	0.68	D-3.4	8.5	2.74	3.41	8.5	4.66	15.91	24	HDPE	0.012	194	0.50	0.97	17.37	0.82	6.30	0.5	D-3.2	9.0
INV	600.15	599.18																							
MH	D-3.2F	D-3.2E	6.0	0.9	1.14	1.03				1.03	6.0	5.12	5.25	18	HDPE	0.012	194	0.50	0.97	8.06	0.61	4.91	0.7	D-3.2E	6.7
INV	607.50	606.53																							
MH	D-3.2E	D-3.2D	6.0	0.9	1.14	1.03	D-3.2F	6.7	1.03	2.05	6.7	4.99	10.24	24	HDPE	0.012	300	0.50	1.50	17.37	0.56	5.80	0.9	D-3.2D	7.5
INV	606.03	604.53																							
MH	D-3.2D	D-3.2C	6.0	0.9	1.14	1.03	D-3.2E	7.5	2.05	3.08	7.5	4.83	14.88	24	HDPE	0.012	300	0.50	1.50	17.37	0.75	6.27	0.8	D-3.2C	8.3
INV	604.53	603.03																							

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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	D-3.2C	D-3.2B	6.0	0.9	1.14	1.03	D-3.2D	8.32	3.08	4.10	8.3	4.70	19.28	36	HDPE	0.01	300	0.50	1.50	51.20	0.42	6.67	0.7	D-3.2E	9.1
INV	602.03	600.53																							
MH	D-3.2B	D-3.2A	6.0	0.9	1.14	1.03	D-3.2C	9.1	4.10	5.13	9.1	4.58	23.47	36	HDPE	0.01	300	0.50	1.50	51.20	0.47	7.08	0.7	D-3.2A	9.8
INV	600.53	599.03																							
MH	TD	D-3.2A	6.0	0.9	0.47	0.42				0.42	6.0	5.12	2.16	12	HDPE	0.01	8	27.70	2.22	20.36	0.23	17.31	0.0	D-3.2A	6.0
INV	603.25	601.03																							
MH	D-3.2A	D-3.2	0.0	0.0	0.00	0.00	D-3.2B	9.8	5.13	5.55	9.8	4.47	24.81	36	HDPE	0.01	57	1.50	0.86	88.69	0.35	10.58	0.1	D-3.2	9.9
							TD	6.0	0.42																
INV	599.03	598.18																							
MH	D-3.2	D-3.1	0.0	0.0	0.00	0.00	D-3.2A	9.9	5.55	8.96	9.9	4.45	39.92	36	HDPE	0.01	154	0.50	0.77	51.20	0.70	8.10	0.3	D-3.1	10.2
							D-3.3	9.0	3.41																
INV	598.18	597.41																							
MH	D-3.1A	D-3.1	6.0	0.9	0.49	0.44				0.44	6.0	5.12	2.26	12	HDPE	0.01	78	5.89	4.59	9.39	0.32	9.66	0.1	D-3.1	6.1
INV	604.00	599.41																							
MH	D-3.1	D-3	6.0	0.9	0.33	0.30	D-3.1A	6.1	0.44	9.70	10.2	4.41	42.76	36	HDPE	0.01	100	1.37	1.37	84.76	0.51	12.05	0.1	D-3	10.3
							D-3.2	10.2	8.96																
INV	597.41	596.04																							
MH	D-3	D-2	6.0	0.4	0.77	0.31	D-3.1	10.3	9.70	12.88	10.3	4.39	56.49	36	HDPE	0.01	131	1.00	1.31	72.41	0.70	11.46	0.2	D-2	10.5
							D-4	9.2	2.87																
INV	596.04	594.73																							
MH	D-2	D-1	6.0	0.6	0.20	0.12	D-3	10.5	12.88	13.00	10.5	4.36	56.66	36	HDPE	0.01	199	1.00	1.99	72.41	0.70	11.47	0.3	D-1	10.8
INV	594.73	592.74																							
MH	D-1	D	6.0	0.4	1.02	0.41	D-2	10.8	13.00	13.40	10.8	4.32	57.89	36	HDPE	0.01	55	5.90	3.25	175.89	0.38	22.01	0.0	D	10.8
INV	592.74	589.50																							

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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DB12.1	DB-12	6.0	0.2	0.57	0.11				0.11	6.0	5.12	0.58	12	HDPE	0.012	104	0.86	0.90	3.59	0.27	3.34	0.5	DB-12	6.5
INV	604.50	603.60																							
MH	DB-12	DB-11	6.0	0.4	0.43	0.18	DB12.1	6.5	0.11	0.29	6.5	5.01	1.48	12	HDPE	0.012	307	0.50	1.53	2.74	0.53	3.57	1.4	DB-11	8.0
INV	603.60	602.07																							
MH	DB-11.1	DB-11	10.0	0.5	0.74	0.34				0.34	10.0	4.43	1.51	12	HDPE	0.012	151	1.61	2.43	4.91	0.37	5.42	0.5	DB-11	10.5
INV	604.50	602.07																							
MH	DB-11	DB-10	6.0	0.4	0.43	0.18	DB-11.1	10.5	0.34	0.81	10.5	4.37	3.54	15	HDPE	0.012	190	0.50	0.95	4.96	0.65	4.45	0.7	DB-10	11.2
INV	601.82	600.87					DB-12	8.0	0.29																
MH	DB-10.1	DB-10	6.0	0.5	0.65	0.32				0.32	6.0	5.12	1.63	12	HDPE	0.012	106	3.19	3.38	6.91	0.32	7.07	0.2	DB-10	6.2
INV	604.50	601.12																							
MH	DB-10	DB-9	6.0	0.4	0.43	0.18	DB-10.1	6.2	0.32	1.31	11.2	4.27	5.57	24	HDPE	0.012	300	0.50	1.50	17.37	0.38	4.85	1.0	DB-9	12.2
INV	600.12	598.62					DB-11	11.2	0.81																
MH	DB-9	DB-8	6.0	0.3	1.50	0.48	DB-10	12.2	1.31	1.79	12.2	4.13	7.38	24	HDPE	0.012	145	0.50	0.73	17.37	0.45	5.28	0.5	DB-8	12.7
INV	598.62	597.89																							
MH	DB-8	DB-7	0.0	0	0.00	0.00	DB-9	12.7	1.79	1.79	12.7	4.07	7.27	24	HDPE	0.012	155	0.50	0.77	17.37	0.45	5.26	0.5	DB-7	13.2
INV	597.89	597.12																							
MH	DB-7	DB-6	6.0	0.6	1.62	0.91	DB-8	13.2	1.79	2.69	13.2	4.01	10.80	24	HDPE	0.012	300	0.50	1.50	17.37	0.59	5.89	0.8	DB-6	14.0
INV	597.12	595.62																							
MH	DB-6	DB-5	6.0	0.4	1.62	0.71	DB-7	14.0	2.69	3.41	14.0	3.91	13.32	24	HDPE	0.012	208	0.40	0.83	15.53	0.75	5.61	0.6	DB-5	14.6
INV	595.62	594.79																							
MH	DB-5A	DB-5	6.0	0.8	0.28	0.22				0.22	6.0	5.12	1.15	12	HDPE	0.012	84	7.55	6.31	10.63	0.23	9.06	0.2	DB-5	6.2
INV	602.10	595.79																							
MH	DB-5.5	DB-5.4	6.0	0.9	1.14	1.03				1.03	6.0	5.12	5.25	18	HDPE	0.012	300	0.50	1.50	8.06	0.61	4.91	1.0	DB-5.4	7.0
INV	607.50	606.00																							

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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DB-5.4	DB-5.3	6.0	0.9	1.14	1.03	DB-5.5	7.02	1.03	2.05	7.0	4.92	10.10	24	HDPE	0.012	300	0.50	1.50	17.37	0.56	5.78	0.9	DB-5.3	7.9
INV	605.50	604.00																							
MH	DB-5.3	DB-5.2	6.0	0.9	1.14	1.03	DB-5.4	7.9	2.05	3.08	7.9	4.77	14.68	24	HDPE	0.012	300	0.50	1.50	17.37	0.74	6.26	0.8	DB-5.2	8.7
INV	604.00	602.50																							
MH	DB-5.2	DB-5.1	6.0	0.9	1.14	1.03	DB-5.3	8.7	3.08	4.10	8.7	4.64	19.03	36	HDPE	0.012	300	0.50	1.50	51.20	0.41	6.65	0.8	DB-5.1	9.4
INV	601.50	600.00																							
MH	DB-5.1	DB-5	6.0	0.9	1.14	1.03	DB-5.2	9.4	4.10	5.13	9.4	4.52	23.18	36	HDPE	0.012	335	1.86	6.23	98.76	0.32	11.21	0.5	DB-5	9.9
INV	600.00	593.77																							
MH	DB-5	DB-4	0.0	0	0.00	0.00	DB-5.1	9.9	5.13	8.76	14.6	3.84	33.65	36	HDPE	0.012	124	0.40	0.50	45.80	0.66	7.17	0.3	DB-4	14.9
INV	593.79	593.29					DB-5A	6.15	0.22																
							DB-6	14.6	3.41																
MH	DB-4A	DB-4	6.0	0.6	0.72	0.43				0.43	6.0	5.12	2.21	12	HDPE	0.012	92	7.73	7.11	10.75	0.30	10.60	0.1	DB-4	6.1
INV	602.40	595.29																							
MH	DB-4.2	DB-4.1	6.0	0.9	0.21	0.19				0.19	6.0	5.12	0.97	12	HDPE	0.012	17	0.50	0.09	2.74	0.40	3.15	0.1	DB-4.1	6.1
INV	604.68	604.60																							
MH	DB-4.1	DB-4	6.0	0.9	0.21	0.19	DB-4.2	6.1	0.19	0.38	6.1	5.10	1.93	12	HDPE	0.012	22	43.00	9.31	25.37	0.18	18.88	0.0	DB-4	6.1
INV	604.60	595.29																							
MH	DB-4	DB-3	0.0	0	0.00	0.00	DB-4A	6.1	0.43	9.57	14.9	3.81	36.46	36	HDPE	0.012	195	0.40	0.78	45.80	0.71	7.27	0.4	DB-3	15.4
INV	593.29	592.51					DB-4.1	6.1	0.38																
							DB-5	14.9	8.76																
MH	DB-3.3	DB-3.2	6.0	0.8	0.28	0.22				0.22	6.0	5.12	1.15	12	HDPE	0.012	110	0.50	0.55	2.74	0.45	3.31	0.6	DB-3.2	6.6
INV	604.01	603.46																							
MH	DB-3.2	DB-3.1	6.0	0.9	0.21	0.19	DB-3.3	6.6	0.22	0.41	6.6	5.01	2.07	12	HDPE	0.012	60	0.50	0.30	2.74	0.68	3.88	0.3	DB-3.1	6.8
INV	603.46	603.16																							

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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DB-3.1	DB-3	0.0	0	0.00	0.00	DB-3.2	6.81	0.41	0.41	6.8	4.96	2.05	12	HDPE	0.01	68	12.78	8.65	13.83	0.26	12.59	0.1	DB-3	6.9
INV	603.16	594.51																							
MH	DB-3	DB-2	6.0	0.9	0.20	0.18	DB-3.1	6.9	0.41	10.16	15.4	3.76	38.23	36	HDPE	0.01	164	0.40	0.66	45.80	0.73	7.32	0.4	DB-2	15.7
INV	592.51	591.85					DB-4	15.4	9.57																
MH	DB-2	DB-1	6.0	0.6	1.16	0.70	DB-3	15.7	10.16	10.86	15.7	3.72	40.42	36	HDPE	0.01	159	0.40	0.64	45.80	0.77	7.37	0.4	DB-1	16.1
INV	591.85	591.21																							
MH	DB-1	DB	0.0	0	0.00	0.00	DB-2	16.1	10.86	10.86	16.1	3.68	40.01	36	HDPE	0.01	117	1.03	1.21	73.49	0.53	10.68	0.2	DB	16.3
INV	591.21	590.00																							
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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DC-1	DC	10.0	0.2	3.35	0.80				0.80	10.0	4.43	3.56	12	HDPE	0.012	63	11.94	7.57	13.37	0.34	14.16	0.1	DC	10.1
INV	597.57	590.00																							
MH																									
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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DD-2	DD-1	6.0	0.4	0.72	0.26				0.26	6.0	5.12	1.33	12	HDPE	0.012	197	1.52	3.00	4.77	0.35	5.11	0.6	DD-1	6.6
INV	599.00	596.00																							
MH	DD-1	DD	6.0	0.3	1.77	0.44	DD-2	6.6	0.26	0.70	6.6	4.99	3.50	12	HDPE	0.012	55	10.97	6.00	12.81	0.35	13.67	0.1	DD	6.7
INV	596.00	590.00																							
MH																									
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STORM SEWER NETWORK CALCULATIONS

	Drainage Structure		Local				Upstream contribution			Total cA	Controlling Tc	I	Q (cfs)	Pipe			Length of pipe (ft.)	% slope	Diff. In INV	Capacity (cfs)	Ratio of liquid to dia of pipe	velocity (fps)	flow time (min)	Next Point	
	From	To	Tc	c	A	cA	From	Tc	cA					DIA (in)	MATL	n								To	Tc
MH	DE-5	DE-4	10.0	0.9	1.26	1.10				1.10	10.0	4.43	4.86	18	HDPE	0.012	318	0.50	1.59	8.06	0.57	4.82	1.1	DE-4	11.1
INV	610.00	608.41																							
MH	DE-4	DE-3	10.0	0.9	1.26	1.10	DE-5	11.1	1.10	2.19	11.1	4.28	9.38	18	HDPE	0.012	54	10.64	5.78	37.20	0.33	17.23	0.1	DE-3	11.2
INV	608.41	602.63																							
MH	DE-3	DE-2	6.0	0.4	0.72	0.32	DE-4	11.2	2.19	2.51	11.2	4.27	10.71	24	HDPE	0.012	223	0.50	1.12	17.37	0.58	5.87	0.6	DE-2	11.8
INV	602.63	601.51																							
MH	DE-2.1	DE-2	6.0	0.9	1.13	1.02				1.02	6.0	5.12	5.20	18	HDPE	0.012	194	0.50	0.97	8.06	0.60	4.90	0.7	DE-2	6.7
INV	602.48	601.51																							
MH	DE-2(W	DE-2	6.0	0.4	0.41	0.18				0.18	6.0	5.12	0.92	12	HDPE	0.012	40	10.81	4.30	12.72	0.18	9.35	0.1	DE-2	6.1
INV	605.81	601.51																							
MH	DE-2(E)	DE-2	10.0	0.4	1.35	0.57				0.57	10.0	4.43	2.51	12	HDPE	0.012	9	22.27	2.06	18.25	0.25	16.35	0.0	DE-2	10.0
INV	605.57	603.51																							
MH	DE-2	DE-1	10.0	0.4	1.35	0.57	DE-2.1	6.7	1.02	2.33	10.0	4.43	10.33	24	HDPE	0.012	210	0.50	1.05	17.37	0.57	5.82	0.6	DE-1	10.6
INV	601.51	600.46					DE-2(W	6.1	0.18																
							DE-2(E	10.0	0.57																
MH	DE-1(N)	DE-1	6.0	0.4	0.97	0.43				0.43	6.0	5.12	2.18	12	HDPE	0.012	36	7.83	2.80	10.82	0.30	10.62	0.1	DE-1	6.1
INV	603.27	600.47																							
MH	DE-1(S)	DE-1	6.0	0.7	0.89	0.65				0.65	6.0	5.12	3.32	12	HDPE	0.012	95	3.79	3.60	7.53	0.46	9.26	0.2	DE-1	6.2
INV	604.07	600.47																							
MH	DE-1	DE	0.0	0	0.00	0.00	DE-1(S	6.2	0.65	3.41	10.6	4.34	14.81	24	HDPE	0.012	291	0.50	1.46	17.37	0.75	6.26	0.8	DE	11.4
INV	600.46	599.00					DE-1(N	6.1	0.43																
							DE-2	10.6	2.33																

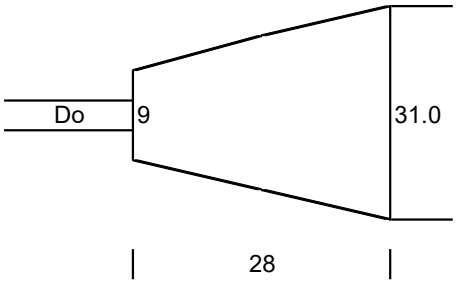
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CALCULATIONS :

Project: Rip Rap Calculations

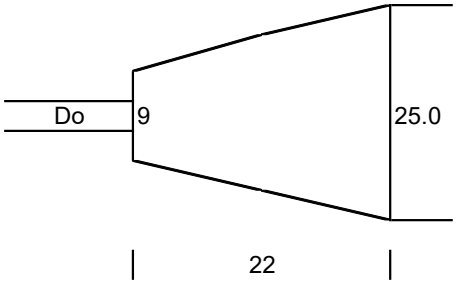
Project No.: 2968
Date: 3/12/2026
By: DTT
Sheet 1 of 2

DESIGNATION	**D**	
Do-DIA. OF PIPE	36	in
DISCHARGE	57.9	cfs
d50 RIP-RAP SIZE	0.7	ft
La-LENGTH OF APRON	28.0	ft
W=Do+La	31.0	ft
SY OF RIP RAP	62	sy
MIN BLANKET THICKNESS	19	in
AVE WEIGHT	75	lbs



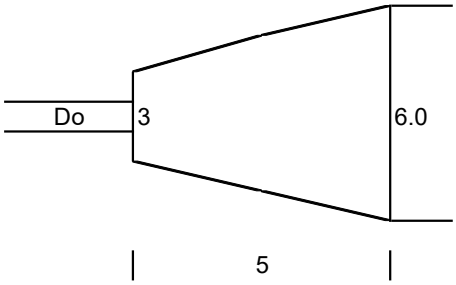
NOTES:

DESIGNATION	**DB**	
Do-DIA. OF PIPE	36	in
DISCHARGE	40.0	cfs
d50 RIP-RAP SIZE	0.6	ft
La-LENGTH OF APRON	22.0	ft
W=Do+La	25.0	ft
SY OF RIP RAP	42	sy
MIN BLANKET THICKNESS	16	in
AVE WEIGHT	50	lbs



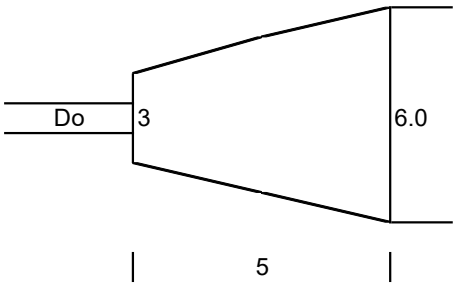
NOTES:

DESIGNATION	**DC**	
Do-DIA. OF PIPE	12	in
DISCHARGE	3.6	cfs
d50 RIP-RAP SIZE	0.5	ft
La-LENGTH OF APRON	5.0	ft
W=Do+La	6.0	ft
SY OF RIP RAP	5	sy
MIN BLANKET THICKNESS	14	in
AVE WEIGHT	50	lbs



NOTES:

DESIGNATION	**DD**	
Do-DIA. OF PIPE	12	in
DISCHARGE	3.5	cfs
d50 RIP-RAP SIZE	0.5	ft
La-LENGTH OF APRON	5.0	ft
W=Do+La	6.0	ft
SY OF RIP RAP	5	sy
MIN BLANKET THICKNESS	14	in
AVE WEIGHT	50	lbs



NOTES:

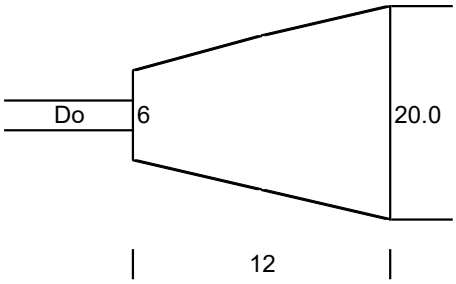
BME ASSOCIATES

CALCULATIONS :

Project: Rip Rap Calculations

Project No.:	2968
Date:	3/12/2026
By:	DTT
Sheet	1 of 2

DESIGNATION	**DE**	
Do-DIA. OF PIPE	24	in
DISCHARGE	14.8	cfs
d50 RIP-RAP SIZE	0.4	ft
La-LENGTH OF APRON	12.0	ft
W=Do+La	20.0	ft
SY OF RIP RAP	17	sy
MIN BLANKET THICKNESS	11	in
AVE WEIGHT	50	lbs



NOTES:

Appendix 6
Water and Sewer

Water and Sewer Use Estimates

BME ASSOCIATES

CALCULATIONS **:**

Project: Riverview Innovation and Tech Center

Domestic Water and Sanitary Use

Project No.: 2968
Date: 3/10/2026
By: JGC
Sheet 1 of 1

Domestic Water and Wastewater Estimated Use

**** Note all water useage rates are approximate per the New York State Design Standards for Intermediate Sized Wastewater Treatment Systems March 5, 2014, Table B-3 (Typical Per-Unit Hydraulic Loading Rates)***

LOCATION & USE	UNITS	TOTALS
BCP Site -		
Factory/Distribution Warehouse (495,000 sf Building)		
30 gpd per employee w/ showers	200 Employees	6000 gpd
Factory/Distribution Warehouse (Existing 10,675 sf Building)		
20 gpd per employee	10 Employees	200 gpd
Factory/Distribution Warehouse (Future Potential Development)		
30 gpd per employee w/ showers	150 Employees	4500 gpm
Plastics -		
Factory/Distribution Warehouse (150,000 sf Industrial Building)		
30 gpd per employee w/ showers	100 Employees	3000 gpd
Site 109		
Office Building (30,000 sf Commerical Building)		
15 gpd per employee	75 Employees	1125 gpd
Office Building (24,000 sf Commerical Building)		
15 gpd per employee	75 Employees	1125 gpd
Site 108		
Factory/Distribution Warehouse (160,650 sf Building)		
30 gpd per employee w/ showers	100 Employees	3000 gpd
Resturant (100 seats inside 47,960 sf Building)		
35 gpd per seat	100 seats	3500 gpd
Apartments (10x 2-bedroom units inside 47,960 sf Building)		
110 gpd per bedroom	20 bedrooms	2200 gpd
Marina (25 slips)		
20 gpd per slip	20 slips	400 gpd
Total Estimated Water & Sewer Use		**25050 gpd**

Appendix F – HASP

Environmental Footprint Summary

Core Element	Metric		Unit of Measure	Footprint						
				Site Carrying and General Conditions	Fence Removal and Reinstallation	Excavation and Site Grading	Structural Demolition	Access Road Installation	Revegetation	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0	0.1	0.3	0.0	0.0	0.4
	M&W-2	% of refined materials from recycled or reused material	%			100.0%	0.0%		0.0%	24.1%
	M&W-3	Unrefined materials used on-site	Tons	1,000.027	60.000	2,600.005	0.000	2,800.020	28,390.000	34,850.1
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0%	100.0%	0.0%		100.0%	39.6%	40.5%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	525.0	0.0	0.0	0.0	525.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%			0.0%				0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.4	0.0	0.0	0.4
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	1.0	0.0	0.0	0.0	1.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	3,585.8	13.7	759.0	1,312.5	1,790.2	4,483.3	11,944.6
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.000	0.000	0.000	0.000	0.000	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	3,911.6	8.3	526.3	1,482.8	1,816.6	621.6	8,367.1
	A-2	On-site HAP emissions	Pounds	0.1	0.0	0.0	0.0	0.1	0.0	0.2
	A-3	Total NOx, SOx, and PM emissions	Pounds	4,322.6	15.6	1,169.7	1,609.7	2,179.8	5,486.5	14,784.0
	A-3A	Total NOx emissions	Pounds	3,942.7	14.2	824.4	1,461.4	1,989.1	5,007.7	13,239.6
	A-3B	Total SOx emissions	Pounds	263.1	1.0	92.6	99.2	132.2	332.3	920.4
	A-3C	Total PM emissions	Pounds	116.9	0.4	252.7	49.1	58.4	146.5	624.1
	A-4	Total HAP emissions	Pounds	29.1	0.1	5.6	9.8	13.6	32.9	91.2
	A-5	Total greenhouse gas emissions	Tons CO2e*	292.4	1.1	61.5	107.9	146.2	366.5	975.7
Land & Ecosystems	Qualitative Description									

** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:

Site Specific
Health and Safety Plan V1

TONAWANDA COKE

3875 River Road

NYSDEC Site No. 915055/OU2 (aka Site 109)

Submitted to:

Honeywell International, Inc.

Submitted by:

140 Lee Street

Buffalo, NY 14210

December 2024

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Authorization Signatures

This Site-Specific Health and Safety Plan (HASP) has been reviewed and approved by the individuals below. The undersigned certify that to the best of their knowledge this HASP meets the safety requirements as defined by the project specifications and all known applicable governing regulatory requirements.

John Yensan, President OSC	Date
Alen Trpevski, Project Manager OSC	Date
Matt Reardon, Site Superintendent OSC	Date
Paul Mulvey, Director HS&E OSC	Date

Conformance Signatures

All Individuals working on this Project, including subcontractors must read and sign.

The following personnel have read and fully understand the contents of this Site-Specific Health and Safety Plan and further agree to all requirements contained herein.

Name	Affiliation	Date	Signature

Emergency Contact List
Site 109

AGENCY	Contact	Phone Number
Owner's Representative	John Black Project Manager	571-217-6761
OSC	Matt Reardon Site Superintendent	716-570-0717
	Alen Trpevski Project Manager	716-818-3390
	John Yensan President	716-583-4400
	Paul Mulvey Director HS&E	702-677-2967
Kenmore Mercy	Medical emergency	911 (direct) 716-447-6100
Utilities	Water Gas Electric	811/911

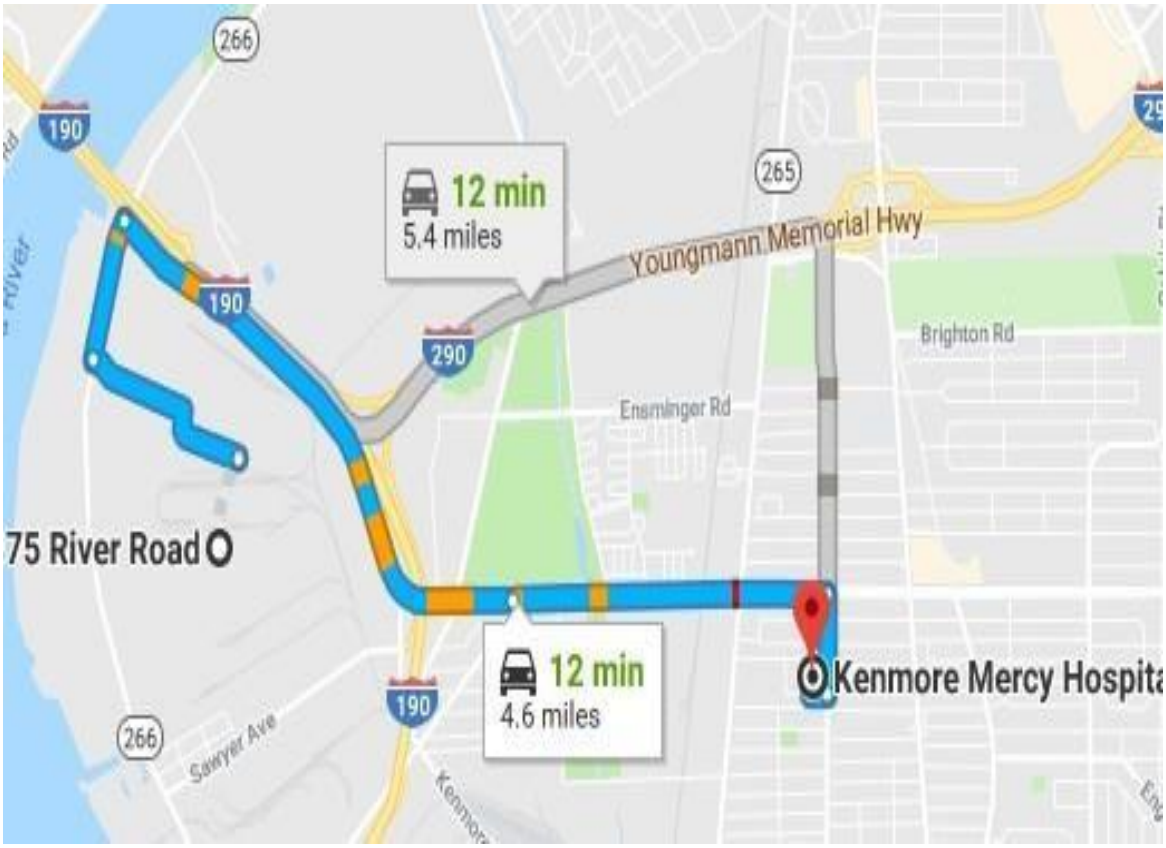
AGENCY	Contact	Phone Number
Site Emergency	Police, Fire Dept., Ambulance	911
Fire Department	River Road Volunteer Fire Dept	911
Police Department & Security	Town of Tonawanda Police Dept	911
Ambulance		911
Poison Control	American Association of Poison Controls	1-800-222-1222
US EPA Release Report Number	National Response Center	1-800-424-8802
HAZARDOUS MATERIALS	CHEMTREC	1-800-424-9300 CCN 1011139

EMERGENCY - LOCAL MEDICAL

KENMORE MERCY HOSPITAL

2950 ELMWOOD AVE, KENMORE, NY 14127

DIAL 911 FOR EMERGENCY / DIRECT (716)- 447-6100



- Turn right onto River Road
- Turn right onto Grand Island Blvd (about 2 miles)
- Merge onto Sheridan Dr.
- Go about 1.5 miles and turn right onto Elmwood Ave.
- Make a sharp right and hospital is on left

OSC Medical Consultant:

Medcor, Inc.
4805 W. Prime Parkway
McHenry, Illinois 60050
800-775-5866

Non-medical Emergency:

Focus Urgent Care
2094 Niagara Falls Blvd
Amherst, NY 14228
(716) 710-8072

SITE/PROJECT BACKGROUND AND SCOPE

Honeywell International, Inc. (Honeywell) has contracted OSC, Inc. for the remediation of a portion of the former Tonawanda Coke Corporation (TCC) property in Tonawanda, NY. Remediation will be per requirements of the New York State Inactive Hazardous Waste Site Program (aka State Superfund). Inventum Engineering, PC is providing technical guidance for the project.

The work includes, but is not limited, to the following:

- Mobilization
- Installation of erosion and sediment controls
- Installation of site temporary features (waste/equipment decontamination pads, temporary access roads, and temporary utilities)
- Cleaning/decontamination of above ground structures deemed to remain on site
- Demolition of buildings and structures not to remain on site
- Treatment/neutralization of surface soils and water as reasonably feasible
- Grading
- Utility Installation with Confined Space Entry to Clear a Blocked 36-inch Storm Sewer
- Soil Cover Placement
- Restoration and seed stabilization
- Demobilization

APPLICABILITY and REFERENCES

OSC has developed the following site Health and Safety Plan (HASP) in accordance with the project contract requirements and Federal, State and Local regulations. It is intended for individuals performing work at the site and not for those considered visitors doing observation only. All operations and equipment used in conjunction with this contract shall, at a minimum, comply with the following:

- New York State Superfund Program
- Project Health and Safety Plan (this HASP)
- Remedial Action Work Plan (RAWP)
- OSHA 29 CFR 1910: Occupational Safety and Health Standards – General Industry
- OSHA 29 CFR 1926: Safety and Health Regulations for Construction
- EPA 9285.1-03: Office of Emergency and Remedial Response – Standard Operating Safety Guides
- OSC Corporate Health, Safety and Environmental Program Manual
- Orientation and Training (Supervision, Laborers, Operators & Visitors)
- Activity Hazard Analysis (AHA)

- Standard Operating Procedures; Emergency Response, Reporting, Incident Investigation, Inspections, Audits, Work Procedures, Hazard Communication, Hot Work, Confined Space, Fire Prevention, Control of Hazardous Energy (Lockout, Tagout, Tryout), Excavations, Controlled Work Zones including decontamination, Ladders, Steps, Stairs, Scaffolding Contractor/Vendor Safety Checklist, Heavy Equipment Operation, Forklift Operation, Powered Aerial Platforms
- Substance Abuse Policy
- Receive site orientation training regarding the project requirements contained in this HASP. Site orientation will be conducted by OSC's Health and Safety Officer (HSO) named in Section 2.0 of this HASP.
- Acknowledgement in writing, on page 4 of this HASP titled Conformance Signatures that they have received the site-specific orientation and therefore, have been trained in and understand the contents of this HASP and the general site safety requirements.

The health and safety protocol that is established in this HASP is based upon the known site conditions and or conditions anticipated to be present from established site data. This HASP is a living document that shall be updated and or revised over the term of this contract as warranted by change in site conditions, scope of work, methods and improvement measures. A copy of this HASP shall be maintained at the project site.

DEFINITIONS

The Owner/Client: Honeywell International, Inc.

The Engineer: Inventum

Client Representative: GES

The Contractor: OSC – Company retained to conduct the project.

The Project: Site 109 RAWP

The Project Site: The area designated as the Contractor work location.

Contractor Work Area: An area of the Project site which includes the support zone, access road, staging area.

Active Full Time Project Personnel: All personnel who are permanently assigned to the project and required to perform work. Does not include visitors or vendors visiting the site temporarily who are required to be always escorted by an authorized and trained project employee.

Qualified Person: A person with a recognized degree, or professional certificate, along with extensive knowledge and experience in the subject field who is capable of doing design, analysis, evaluation and specifications.

Competent Person: A person who is capable of identifying existing any predictable hazards in their surroundings/working conditions which are unsanitary, hazardous or dangerous to employees, and who has OSC authorization to take prompt corrective measures to eliminate them.

Authorized Personnel: A person that is approved or assigned by their employer to perform a specific type of duty/duties, or to be at a specific location(s) at the Project site.

Stop Work Authority: HS&E personnel, qualified and competent persons, owner representatives and all project employees shall have the authority to stop work in any situation deemed unsafe to those working on the project site, or in any situation that poses a risk to the environment. Work will remain stopped until the involved parties correct their impact or conditions as per the requirements of this HASP.

WORK AREA VISITOR REQUIREMENTS

A safe location, where visitors can observe site activities of interest will be identified by the Site Superintendent. Anyone visiting the site will receive site-specific instructions from the Site Superintendent. All visitors shall be escorted by site trained personnel after signing in and completing orientation. Visitor orientation will include, as necessary.

- OSC Project Safety Orientation and RIVERVIEW/Honeywell general site orientation
- Project Hazard Communication system
- Activity Hazard Analysis (AHA) / Job Hazard Analysis (JHA) review (as needed)
- Work Permit Process (as needed)
- Safety Meetings and Inspections
- PPE requirements
- Decontamination procedures (if needed)
- Emergency procedures, and
- Any other site-specific information that the Site Superintendent deems necessary.

Any visitor wishing to enter an established contamination reduction zone (CRZ) if applicable, or exclusion zone will be required to provide the Site Superintendent with documentation of medical monitoring and training equivalent to the requirements of this HASP for that area. Only authorized visitors with written proof that they have been medically certified and trained in accordance with project requirements will be permitted to enter the CRZ and/or exclusion area.

The only exception to this rule is for emergency personnel who may enter the work area without fully complying with the requirements of this subsection. Emergency crews will be quickly briefed as to site conditions and hazards by the Site Superintendent.

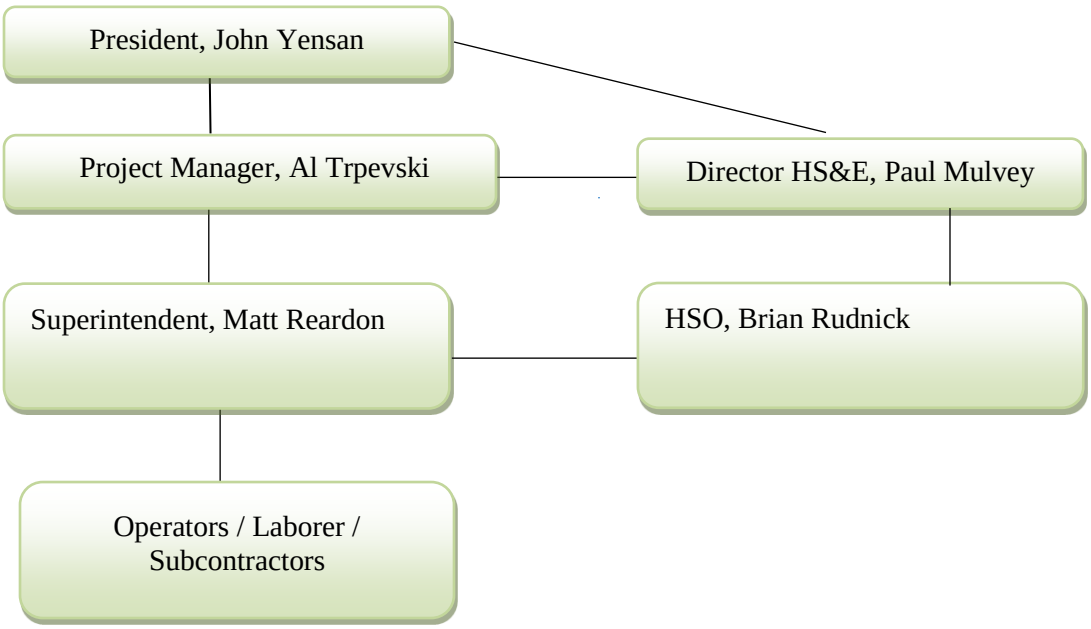
HEALTH and SAFETY ORGANIZATION

The following OSC management personnel will be assigned to this Project:

- President – John Yensan
- Project Manager – Alen Trpevski
- Superintendent – Matt Reardon
- Site Health & Safety Officer – Brian Rudnick
- Corporate Director of HS&E – Paul Mulvey

In addition to the above-listed management, OSC will provide the appropriate number of operators and laborers, as well as the required subcontractors for this project.

OSC ORGANIZATION CHART



PERSONNEL RESPONSIBILITIES

PROJECT MANAGER AND SUPERINTENDENT

The Project Manager will be responsible for the overall direction and completion of this contract. The Project Manager reports to the President and will be responsible for managing and coordinating all project related activities; as well as serving at OSC's primary contact with the Owner and/or Owner's Representative. The Site Superintendent will be responsible for overseeing contractor and subcontractor operations in the field. The Site Superintendent will report directly to the Project Manager.

Project Managers and Superintendents will be responsible for the following:

- Assure daily compliance with the Corporate HS&E Manual and this HASP during the project.
- Implement the procedures and guidelines outlined in this HASP throughout the project.
- Implement incident investigations. The Site Superintendent will notify INVENTUM management and the OSC Director HS&E immediately. Documentation will be maintained on OSC's Incident Report (see attachment I). The Incident Report will be submitted to RIVERVIEW/Honeywell by OSC. The HSO will conduct an incident investigation with support from the Superintendent and Director.
- Perform and support site safety audits and address all deficiencies.
- Provide incentive and motivation for safe work practices, as well as discipline for unsafe work practices.
- Ensuring a copy of this HASP is onsite always.
- Conduct initial site orientation meetings.

HEALTH AND SAFETY OFFICER (HSO)

The HSO will handle health and safety management on the project and will report to the Director HS&E. Specific duties of the HSO include:

- Overall implementation, enforcement and maintenance of this HASP.
- Act as a point of contact for all project site health and safety concerns.
- Conduct initial training of the contents of this HASP; as well periodic training for when rules/regulations change, new equipment or procedures are introduced, additional skills are needed, and new hazards are presented. Report observations in the daily safety meetings and update AHAs and training accordingly.
- Conduct daily meetings regarding health and safety.
- Supervising any additional HS&E requirements that are needed for this project.

The HSO will monitor the jobsite health and safety via inspection at the start and completion of each day's work; as well as monitoring the jobsite for this purpose throughout the day. The initial daily inspection will be recorded on OSC's inspection and audit form (Attachment I). Corrective actions and end-of-the-day inspection results will be recorded in the HSO's project safety logbook. Any deficiencies will be promptly corrected. All corrective and improvement measures will be reviewed with project personnel at the morning daily safety briefing. Intentional violations of the site HS&E regulations will be grounds for disciplinary action, which could include temporary suspension

or termination of personnel and/or expulsion of vendor and/or subcontractor personnel from the site.

HSE TECHNICIANS (not anticipated for this project)
The HSO will assign qualified technicians (air monitoring, material sampling, equipment specific and job design professionals) to each work crew or task in potentially hazardous areas as warranted.

OSC CORPORATE MEDICAL CONSULTANT
A Medical Consultant will be available to provide call-in emergency medical consulting to OSC personnel on an around-the-clock basis.

Medcor Inc.
4805 W. Prime Parkway
McHenry, IL, 60050
800-775-5866

SUBCONTRACTORS
All subcontractors shall be prequalified according to the OSC subcontractor/vendor prequalification requirements including Certificates of Insurance that meet or exceed the project contract requirements (See RIVERVIEW/Honeywell Project Subcontractor Insurance Requirements Under Separate Cover).

All subcontractor employees shall be required to attend a project safety orientation prior to starting work on site (See Training and Orientation Requirements of this HASP). Subcontractors are responsible for health and safety as it pertains to their operations at the project site and shall provide the required OSC HS&E supporting documentation. Documented proof of training shall be provided for all subcontractor employees. All subcontractors are responsible for providing their employees with the proper site-specific PPE required to perform their work as well as ensuring that all tools and equipment are properly inspected and maintained. Subcontractors are responsible for ensuring that their employees conform to all HS&E project requirements and applicable government regulations.

TRAINING and ORIENTATION

Personnel, including subcontractors, shall be provided with the training required to comply with this HASP. Training documentation (training certificates, attendance rosters) will be filed and maintained onsite by the Site Superintendent and will be made available for inspection upon request. Training documentation will be kept in an organized manner for each individual worker.

Full-time active project personnel working onsite must have received the following.

- Required safety training as defined by OSHA CFR 1926.21 for construction.
- OSHA 1926.65, HAZWOPER (employees potentially exposed to hazardous chemicals)
- Medical clearance - fit for work, (includes medical surveillance for specific occupations and probable contaminants) negative drug screen, clearance for respirator use, fit test, and training for the type of respirator required.

Supervisor Training – in addition to the above all designated supervisors shall have as a minimum received training that covers competent person training for the specific operation they are responsible for (i.e. excavation trenching and shoring, confined space, rigging, hot work, etc.), first aid and CPR, record keeping, incident investigation, employee substance abuse i.e., reasonable suspicion), HS&E documentation requirements.

SITE SPECIFIC TRAINING

Documentation of training, provided by a qualified safety professional, will be maintained as necessary for the following topics:

- OSC Site Specific Orientation
- Activity Hazard Analysis & Safe work procedures (AHA Review)
- Project Hazard Awareness training
- PPE requirements & possible decontamination procedures
- Heat/Cold Stress
- Fall Protection
- Heavy Equipment Operation (Authorized, Unauthorized)
- Powered Industrial Fork Truck Operation (Authorized, Unauthorized)
- Control of Hazardous Energy Lockout/Tagout and Air Gapping Requirements (1 ft visible air gap)
- Incident reporting
- Emergency response & available services (medical, fire, inclement weather, tornado, bomb threat, signals and procedures)
- Hoisting and Rigging
- Respirator use, maintenance, inspection, medical clearance and fit test
- Excavation hazards and protective measures
- Confined Space
- Dust, Erosion and sediment control
- Noise control measures

- OSC's STAC program
- Authority to stop work (all employees) and the buddy system "No One Works Alone".

JOB SPECIFIC SPECIALIZED TRAINING & MEDICAL CLEARANCE

OSC employees will participate in the company's annual medical surveillance program which evaluates "fit for duty" condition. These evaluations will be provided by a licensed health care professional.

Employees that may be exposed to elevated levels of contaminants or that wish to use tight-fitting respirators on a voluntary basis will require a current medical evaluation and be respiratory qualified in compliance with OSHA 1910.134.

MEETINGS

Attendance at HS&E meetings will be documented and filed onsite.

- Daily Morning Safety Brief prior to the start of work.
- Sign off on daily JHA
- Prior to the beginning of each work task, all involved workers shall be required to attend a task-specific HS&E meeting to review task-specific health and safety requirements pertinent to the day's tasks (JHA review - job hazards and protective measures).

WEEKLY HS&E MEETINGS

Onsite supervisory personnel shall be required to attend HS&E meetings as scheduled and conducted by the owner representative, to review project and/or task specific procedures. Topics to be discussed at these meetings may include but are not limited to.

- AHA – review for all definable features of work, hazards, and controls
- STAC - employee work observations and recommendations
- Audit/Inspection findings, and recommendations for improvement
- Necessary training requirements and site work rules.
- Change in work practices and/or work conditions, incident reports.
- Precautions and work practices related to scheduled site activities.
- New or modified site wide procedures or requirements.
- Discussion of potential hazards or hazardous operations.
- Equipment rules and requirements.
- Restrictions on the handling of materials.
- PPE requirements.
- Delegation of responsibility (emergency backup personnel, competent persons, etc.).
- Review of emergency response for anticipated situations (medical, fire, inclement weather, snow emergency, bomb threat, environmental release/spill) and communication methods (alarms, radio, voice, and hand signals).

- Dust, Erosion and Sediment Control
- Heavy Equipment Operation
- Hazard Communication.
- Respirator use, maintenance, inspection, medical clearance, and fit test
- Excavation Hazards and Protective Measures

HS&E AUDITS

The OSC HSE Director will make project site visits to assure compliance with this HASP and aid as needed. Site audits will be made minimally on a quarterly basis using the company's audit criteria. An audit finding report will be submitted to the project manager and superintendent within 3 days of the site visit. Highlighted deficiencies must be corrected immediately if not done so during the site visit.

SUBSTANCE ABUSE SCREENING

OSC maintains a drug free workplace. The company prohibits the use, manufacture, sale, possession, or transfer of illegal drugs, alcohol, and controlled substances on project sites.

OSC requires pre-employment, reasonable suspicion, and random substance abuse testing (random testing for project-assigned personnel only as required by contractual agreement). Post injury screening may also be conducted in conjunction with reasonable suspicion. Employees as a minimum will undergo a NIDA 9 panel quick drug screen for illegal drugs before working on the project. Drug and alcohol screens shall be managed by OSC using laboratories certified by HHS under the National Laboratory Certification Program (NLCP).

Reasonable suspicion testing may be triggered by direct observations of employee behavior or drug-related paraphernalia. Site personnel who have been observed using alcohol or controlled substances on site or during breaks at off-site locations after which they return to work will be requested to take an alcohol or drug test. Reasonable suspicion includes possession (on person or in vehicles) of alcohol or controlled substances on site as well as paraphernalia that suggest drug use. Site personnel who exhibit signs, symptoms, or behaviors of drug or alcohol use as interpreted by a reasonable person and verified by another reasonable person will also be requested to take a drug and/or alcohol test.

NOTE - Prescription drugs taken without an authorized prescription for use is considered an illegal drug. Also, in case of any injury, incident, or emergency, employees may be required to undergo a quick screen for illegal drugs, alcohol (breath), or prescribed medication. Submission to substance abuse testing is a condition of employment. Failure or refusal to submit to substance abuse testing is treated the same as a positive result. All reports will be maintained at OSC's main office. Any positive results will be referred to OSC Senior Management for further action.

PROJECT OVERVIEW AND TASK RISK ANALYSIS

TASK/RISK ANALYSIS

An Activity Hazard Analysis (AHA) shall be developed for significant features of work which breaks jobs down into individual tasks, defining the potential hazard of that activity, and the proper protective and control measures that shall be taken to minimize the hazard. AHA's shall be modified as warranted by safe work observations, audit, and incident investigation. Assessment of the work hazards associated with the scope of work for this project is provided in the Table 1.0 below. PPE requirements for most work is anticipated to be primarily in modified level D; ANSI approved hard hat, safety glasses, hearing protection, puncture resistant gloves, steel toed boots or steel toed rubber boots (dependent on soil conditions and chemical exposure), high visibility shirt or traffic vest, and as needed chemical resistant gloves/disposable coveralls/ full face shield.

TABLE 1.0 OVERALL JOB HAZARD EXPOSURE	
	Potential Exposure
Mobilization and temporary facilities and controls; establishment of work zones: hazard warning signs, OSC designated work area signage including barricades and area delineation, address safe work surface needs, add lighting, traffic controls, dust, fire and erosion controls.	Low
Installation of erosion and sediment control	Moderate
Installation of site temporary features (waste/equipment decontamination pads, roads)	Moderate
Demolition of buildings and structure not to remain on site	Moderate
Treatment/neutralization of surface soils and water as reasonably feasible per RAWP	Moderate/High
Utility Installation with Confined Space Entry to Clear Blocked 36-inch Storm Sewer	Moderate
Soil Cover Placement	
Restoration and seed stabilization	Low
Demobilization	Low

Low: Non-intrusive work – Minimal hazard/chance of exposure. Slight: Non-intrusive work / Possible HS&E hazards with tools. – Little chance of exposure. Moderate: Non-intrusive work / Possible HS&E hazards with powered tools, heavy equipment and/or working near or in water – Little chance of exposure to contaminants. Moderate/High: Intrusive work / Possible HS&E hazards with equipment – Exposure to contaminants is possible. High: Intrusive work / Possible HS&E hazards with equipment – Exposure to contaminants is probable.

CONTAMINATE/CHEMICAL HAZARDS

EXISTING SITE HAZARDS
Based on information provided in the RAWP there are several possible contaminates ranging from minimal to moderate hazardous exposure potential in the soil, groundwater, and surface water.

Although several coal tar constituent chemicals of concern are volatile, the product has been standing open for an extended period time. Much of the volatile and semi-volatile fraction is expected to have been released to the atmosphere minimizing the air pathway (inhalation).

Of the remaining constituent chemicals of concern, the likely exposures are skin absorption/contact and ingestion. These exposure pathways will be controlled using PPE (barrier) and proper hygiene (decontamination).

The following table lists the chemical constituents that may be of concern:

See next page

Sample Matrix	Sample Date	Parameter	Parameter Concentration		Industrial Standard		Data Source	Table Page Location
Surface Soil	12/21/2005	Benzo(a)pyrene	4,100	ug/kg	1,100	ug/kg		Table 1a, 2 of 70
Suburface Soil	8/24/2015	Benzo(b)fluorantene	2,000 to 4,600	ug/kg	1,100	ug/kg		Table 1b, 6 of 70
Surface Soil	8/17/2005 to 8/18/2005	Benzo(a)anthracene	13,000 to 20,000	ug/kg	11,000	ug/kg	GHD, 2018, Remedial Investigation/Feasibility Study Work Plan, Prepared for Tonawanda Coke Corporation, June.	Table 2, 11 of 70
Surface Soil	8/17/2005 to 8/18/2005	Benzo(a)pyrene	6,000 to 21,000	ug/kg	1,100	ug/kg		Table 2, 11 of 70
Surface Soil	8/17/2005 to 8/18/2005	Benzo(b)fluoranthene	13,000 to 32,000	ug/kg	11,000	ug/kg		Table 2, 11 of 70
Surface Soil	8/17/2005 to 8/18/2005	Chrysene	12,000 to 21,000	ug/kg	11,000	ug/kg		Table 2, 11 of 70
Surface Soil	8/17/2005 to 8/18/2005	Dibenz(a,h)anthracene	1,300 to 1,700	ug/kg	1,110	ug/kg		Table 2, 11 of 70
Surface Soil	8/18/2005	Indeno(1,2,3-cd)pyrene	15,000	ug/kg	11,000	ug/kg		Table 2, 11 of 70
Subsurface Soils	6/19/1989	Benzo(a)pyrene	2,400 to 11,000	ug/kg	1,100	ug/kg		Table 3, 16 of 70
Subsurface Soils	6/19/1989	Benzo(b)fluorantene	17,000	ug/kg	11,000	ug/kg		Table 3, 16 of 70
Subsurface Soils	6/19/1989	Dibenz(a,h)anthracene	2,200 to 11,000	ug/kg	1,100	ug/kg		Table 3, 16 of 70
Groundwater	10/18/1985 to 12/12/1989	Cyanide	0.22 to 2.75	mg/L	0.2	mg/L		Table 4, 37, 41, 45, 53, & 57 of 70
Groundwater	8/1/1986	1,4-Dichlorobenzene	29	ug/L	3	ug/L		Table 4, 38 of 70
Groundwater	11/1/1985 to 12/19/1989	Benzene	2.08 to 84	ug/L	1	ug/L		Table 4, 38, 42, & 54, of 70
Groundwater	8/1/1986	Chlorobenzene	22	ug/L	5	ug/L		Table 4, 38 of 70
Groundwater	11/1/1985	Xylenes	19 to 36	ug/L	5	ug/L		Table 4, 38 of 70
Groundwater	11/1/1985 to 8/1/1986	Toluene	11 to 59	ug/L	5	ug/L		Table 4, 38 of 70
Groundwater	6/26/1989 to 7/16/1991	Iron	2.597 to 160	mg/L	0.3	mg/L		Table 4, 36, 40, 48, 52, & 56 of 70
Groundwater	6/26/1989 to 7/16/1991	Manganese	0.801 to 11.2	mg/L	0.3	mg/L		Table 4, 37, 41, 49, & 57 of 70
Groundwater	11/1/1985	Phenolics	0.050 to 0.06	mg/L	0.001	mg/L		Table 4, 37 & 41 of 70
Groundwater	6/28/1989 to 12/13/1989	1,1,1-Trichloroethane	7 to 12.2	ug/L	5	ug/L		Table 4, 38 & 42 of 70
Groundwater	12/13/1989 to 12/20/1989	Methylene chloride	5.15 to 6.96	ug/L	5	ug/L		Table 4, 42 & 54 of 70
Groundwater	6/26/1989	Selenium	0.0116	mg/L	0.01	mg/L		Table 4, 49 of 70
Groundwater	6/26/1989	Nickel	0.153	mg/L	0.1	mg/L		Table 4, 53 of 70
Groundwater	7/16/1991	Cadmium	0.19	mg/L	0.005	mg/L		Table 4, 56 of 70
Surface Water	11/1/1985 to 8/1/1986	Benzene	23 to 48	ug/L	1	ug/L		Table 5, 62 of 70
Surface Water	11/1/1985	Xylenes	7	ug/L	5	ug/L		Table 5, 62 of 70
Surface Water	10/19/1989 to 7/8/1992	Toluene	12 to 24	ug/L	5	ug/L		Table 5, 62 of 70
Surface Water	3/15/1990 to 7/8/1992	Iron	1.09 to 472	mg/L	0.3	mg/L		Table 5, 62 & 64 of 70
Surface Water	3/15/1990 to 7/8/1992	Manganese	0.47 to 3.91	mg/L	0.3	mg/L		Table 5, 62, 64, & 66 of 70
Surface Water	3/15/1990	Nickel	0.14 to 0.216	mg/L	0.1	mg/L	GHD, 2018, Remedial Investigation/Feasibility Study Work Plan, Prepared for Tonawanda Coke Corporation, June.	Table 5, 62 & 64 of 70
Surface Water	11/1/1985 to 8/1/1986	Phenolics	0.039 to 0.61	mg/L	0.001	mg/L		Table 5, 63 of 70
Surface Water	12/19/1989	Methylene Chloride	52	ug/L	5	ug/L		Table 5, 66 of 70
Surface Water	3/15/1990	Chromium Total	0.086	mg/L	0.05	mg/L		Table 5, 64 of 70
Surface Water	7/8/1992	Lead	0.025	mg/L	0.025	mg/L		Table 5, 66 of 70
Sediment	3/15/1990	Benzo(a)pyrene	4,530	ug/kg	1,100	ug/kg		Table 5, 69 of 70
Sediment	3/15/1990	Dibenz(a,h)anthracene	3,430	ug/kg	1,100	ug/kg		Table 5, 69 of 70

Notes:

1 The compounds and results are representative of the site conditions at the time the samples were collected. This does not represent all samples or compounds detected, but is considered representative of the data set for this and related TCC Sites

2 Abbreviations used:

ug/kg = micrograms per kilogram

ug/L = micrograms per liter

mg/L = milligrams per liter

ug/kg = micrograms per kilogram

CHEMICALS BROUGHT ONSITE

The use of chemical products onsite will follow the requirements set forth in OSHA 29 CFR 1910.1200 (OSHA's Hazard Communication Standard), applicable Federal, State and Local regulations. The potential hazards associated with these products will be mitigated through site specific training, administrative controls (e.g. labeling and storage) and use of the prescribed PPE.

Safety Data Sheets (SDS) for all chemicals brought onsite, will be available for review at the project site upon request. Chemical products shall be labeled which shall include, product name, manufacturers name, hazard warning, identifier, and hazard pictogram.

The following table provides exposure guidelines for common hazardous chemicals that may be brought to the site, if required, for use during this project. The Site Superintendent will be notified before any new chemicals (chemicals not listed on the below table) are brought onsite.

HAZARD SUMMARY FOR CHEMICALS BROUGHT ONSITE					
Substance	**Route of Entry**	**Exposure Symptoms**	**Treatment**	**8 Hour TWA**	**STEL and IDLH**
Diesel Fuel	• Skin contact • Eye contact • Inhalation • Ingestion	• Harmful if comes in contact with or is absorbed throughout the skin. • Contact may cause skin and eyes irritation. • Prolonged or repeated exposure may cause liver or blood forming organ damage. • May cause skin irritation or dermatitis.	• Eyes: Irrigate immediately. • Skin: Flush with soap and water. • Inhalation: Remove victim to fresh air and provide respiratory support if needed. • Ingestion: Seek medical attention.	300 ppm	STEL: 500 ppm
Grease, Oil and Hydraulic Fluids	• Skin contact • Eye contact • Inhalation • Ingestion	• May be slightly irritating to skin and eyes. • Inhalation may cause headaches. • Ingestion could result in nausea and vomiting.	• Eyes: Irrigate immediately. • Skin: Flush with soap and water. • Inhalation: Remove victim to fresh air and provide respiratory support if needed. • Ingestion: Seek medical attention.	N/A	N/A
Gasoline Petroleum Distillates	• Skin contact • Eye contact • Inhalation • Ingestion	• Acute: Central nervous system effects. Chemical pneumonitis if aspirated into the lungs. • Chronic: Benzene is a confirmed carcinogen. Long term exposure caused kidney and liver cancer in rats/Chemical.	• Eyes: Irrigate immediately. • Skin: Flush with soap and water. • Inhalation: Remove victim to fresh air and provide respiratory support if needed. • Ingestion: Seek medical attention.	300ppm	500ppm STEL

GENERAL PHYSICAL HAZARDS AND STANDARD PROTECTIVE MEASURES

(See Attachment I, AHA for more specific details)

Activity: All *general work activities* (manual laboring, accessing work areas, supervising, inspecting).
Potential Hazard: noise, slips, trips and falls, struck by, pinched, falling debris, shock, heat/cold stress
Procedures to Mitigate Hazard: Minimum site required PPE (Level D ANSI rated hard hat, eye protection, safety boots, high visibility traffic vest or equivalent clothing, cut/abrasion resistant gloves. Hearing protection (when "you need to raise your voice to hear yourself talk") is required whenever using powered hand tools, when operating heavy equipment with no enclosed cab or near loud noise sources. Inspect work area for hazards, overhead power lines, obstructions, slip, trip, fall hazards, uneven surfaces, and vermin. Manage work area; flag, mark, delineate and cover, identify with appropriate hazard warning signs. Clearly label open pits, wells, and other fall hazards (soft barricade 15 feet back, hard barricade 2 feet back). Practice extreme caution in all work areas. 3 points of contact will be used during equipment access/egress, Walk with purpose, pick feet up and setup down, keep hands out of pockets, use handrails, stay on designated paths, and don't take short cuts through the site. Avoid stepping or standing on uneven or unsteady surfaces. In high heat situations stay well hydrated. Personnel will adhere to the heat and cold stress precautions provided in this HASP. All employees have stop work responsibility and authority for safety concerns.

Activity: *Manual Material Handling*
Potential Hazard: Strain, pinched, struck by, lacerations,
Procedures to Mitigate Hazard: Hands and feet clear of pinch points, glove use required. Observe the OSC lifting program (50 lbs maximum). Use good body mechanics when lifting, lift objects with your legs and not your back, keep the back straight and object lifted the power zone. Do not twist, pick your feet up and turn. Utilize equipment whenever possible - forklift, drum cart or other appropriate equipment. Seek assistance if it is needed.

Activity: General traffic from operations (heavy equipment, trucks, pedestrian, etc.)
Potential Hazard: Struck by, crush, fire, and burn
Procedures to Mitigate Hazard: Standard site required PPE. Traffic barricades and directional signs provide ground spotters/flagman equipment traffic, with high visibility, traffic vests or equivalent clothing. Minimum 35 ft. clearance from heavy equipment operations, leveling, compacting, separating and loading out. Develop and implement a traffic control program when site activities occur adjacent to non-OSC vehicular traffic.

Activity: *Site maintenance, materials storage and house keeping*
Potential Hazard: Slip, trip, fall, fire, burn, chemical hazards, eye, skin, struck by.
Procedures to Mitigate Hazard: Personnel will properly store all equipment. Remove all scrap material from the work area and place in designated storage/lay down areas for disposal. Delineate work areas and identify with appropriate Hazard Warning Signs. Handling of materials per products SDS and developed proper storage of all flammable and combustible materials; > 20 feet from ignition sources or protected with ½ hour fire barrier (indoors). Likewise, all

flammable/combustible liquid will be segregated from the ignition source >20 ft. Store all hazardous materials in approved containers. Keep all solvent wastes, oily rags and liquids in fire resistant containers. One 20 lb. ABC Extinguisher should be provided in storage areas (within 75 ft. away no closer than 20 ft.).

Activity: *Operation of hand and power tools*
Potential Hazard: Eye, hand, face, foot injuries, electrocution, noise, fire, burn.
Procedures to Mitigate Hazard: Tool use per Mfg.'s guidelines. Inspect tools before use; verify that guards and safety devices are in place before, during and after operation. Use GFCI plugged in at source for all corded tools. Red tag and remove all defective tools from service. Maintain and inspect the tools per the manufacturer's recommendations. All personnel will utilize the proper eye protection and hearing protection.

Activity: *Operating Heavy Equipment* (Excavators, Compactors, Dozers, Skid Steers, Rough Terrain Fork Trucks, Powered Aerial Platforms and Trucks.
Potential Hazard: Struck by, caught between, crushed, rollover, fire, burn
Procedures to Mitigate Hazard: Equipment operation only by competent and authorized operators. Before use, equipment will be inspected by the operator and verified to be in safe operating condition. Inspection of the machine/equipment will be conducted at the beginning of each shift, during which the equipment may be used, to determine that the brakes and operating systems are in proper working. Any machinery found to be unsafe will be tagged out of service until repaired. All inspections will be documented in the equipment log book. Fire Extinguishers will be present on all equipment and inspected during daily inspections and certified yearly. Only designated personnel, with appropriate training and authorization shall operate machinery and mechanized equipment. A controlled work zone shall be established for demolition, sorting, and loading operations. Likewise, a ground spotter shall be provided to assure personnel stay clear when an operator's rear view is obstructed (i.e. backing). Dust control measures (water misting during intrusive activities with water hose or equivalent misting equipment). Utilize the appropriate warning signs and backup alarms. All site personnel working near heavy machinery/equipment will wear reflective clothing (i.e. vests), and use 2-way radio communication to alert operator of their whereabouts.

Activity: Excavating and Working in Excavations:
Potential Hazard: Cave in, collapse, chemical exposure, struck by, entrapment
Procedures to Mitigate Hazard: Per OSHA requirements, provide protective systems of trenches when deeper than 5 feet and entry is necessary. Inspect the excavations/trenches regularly for changing conditions. Ensure that the material from the excavations/trenches is being placed away from the edge, to prevent cave-ins and pit (instability (> 2 feet back). Backfill the excavations as required by the approved contract requirements, to minimize the number of open excavations and control zones.
All excavation work shall be supervised by a competent person who will determine what protective measures are required, what those controls will be and how they will be implemented (testing, monitoring, benching, sloping, shoring, means of egress, dewatering, etc.). The competent person will inspect the excavations and controls to ensure reinforced structures are barricaded or marked, with barricade tape or traffic cones, during active excavations. If an excavation must remain open

prior to backfill, those excavations must be fenced or barricaded (> 6 ft. from edge). Compliance with OSHA 29 CFR 1926 Subpart P will be maintained.
Atmosphere monitoring will be conducted prior to entry and during work activities in excavations/trenches.

Activity: *Working around or near utilities* (Utilities hazards overhead and or underground).
Potential Hazard: Stored energy hazards (electrical, gas, water, sewer, etc.).
Procedures to Mitigate Hazard: Stay a minimum of 10-feet away from energized lines. Spotter required when it is possible for equipment to get within 10-feet of energized lines.

Activity: *Servicing equipment*.
Potential Hazard: Uncontrolled release of hazardous energy (electrical, mechanical, kinetic, pressure, heat, chemical, any type of stored or potential energy).
Procedures to Mitigate Hazard: The lock-out/tag-out procedure provided in this HASP will be followed when working on machines and equipment in which the unexpected energizing / start-up of the machines or equipment, or release of stored energy could cause injury to employees.

Activity: Working from elevated heights (> 6 feet) with an open edge to the next lowest.
Potential Hazard: Fall
Procedures to Mitigate Hazard: All work from elevated heights shall be performed as supervised by a competent person. In all cases proper fall protection shall be utilized including a personal fall restraint system or a personal fall arrest system. Maintain 100% tie-off.

BIOLOGICAL HAZARDS

BITES AND STINGS
Animal bites or stings are usually irritants that cause localized swelling, itching and minor pain and can be handled with first aid treatment. The bites of certain snakes and spiders can contain sufficient poison to warrant medical attention. Diseases that may require medical attention can be transmitted from some animal bites. Examples are rabies (mainly from dogs, skunks, raccoons, and foxes), Lyme disease (transmitted from ticks) and encephalitis (transmitted from mosquitoes).

Personnel with known allergic reactions to bee stings should carry the appropriate medication and must notify the Director HS&E and Site Superintendent of his/her condition prior to reporting for work at the site.

TICKS, CHIGGERS AND LYME DISEASE
Ticks and chiggers may be present in vegetated areas during the spring, summer and fall seasons. Preventative measure include protective clothing that covers the entire body, tucking pant legs into boots or socks and tucking long-sleeved shirt into pants; head/hair protection; and the use of insect repellant containing DEET on all exposed areas and coveralls. Project personnel should check their bodies thoroughly for ticks and should bathe soon after returning home. Remove any ticks carefully, using a gentle firm, tugging motion with fine tweezers. If site employees feel they have been bitten they should notify the Site Superintendent immediately.

SNAKES

If project personnel encounter a potentially dangerous snake – stop work, remove yourself and other workers from the immediate area and notify the Superintendent. The supervisor will contact an appropriate site representative to request that the hazard be removed. Do not re-enter the work area until you have been cleared by the HSO to do so.

TOXIC PLANTS
Poison Ivy, poison sumac and poison oak may be present during the spring, summer and fall seasons. Avoid contact with these plants, if possible. If a project worker has come in contact, the affected area should be washed thoroughly with soap and cool water. Care should be taken when handling clothing or any other items that have come in contact with the poisonous plant. If an allergic reaction occurs, a physician's advice should be sought.

BLOODBORNE PATHOGENS

29 CFR 1910.1030 requires that all first aid responders who may come in contact with potentially infectious materials be trained and protected from exposure. Furthermore, there is a risk for any site employee to be exposed from discarded needles and/or contaminated sharps.

All employees on this project will:

- Avoid contact with any blood or potentially contaminated object.
- Use caution when picking up or moving objects (stones, brush, debris, etc.).
- Wear leather gloves and not touch suspect objects; and
- Contact the Site Superintendent who will contact the Engineer to remove suspect objects.

In addition to the above requirements, the following will apply when potential exposure to bloodborne pathogens exists:

- Key personnel will be required to receive bloodborne pathogen awareness training.
- No eating, drinking, smoking, or applying lip balm will be permitted in the designated work, decontamination, and first aid areas.
- First aid kits will be equipped with the proper PPE (i.e. gloves, CPR shields and respirators).
- If a garment (gloves included) is contaminated by blood, or other potentially infectious materials, the garment(s) will be removed as soon as possible.
- After an exposure incident, a confidential medical evaluation and follow-up will be conducted and immediately available to the employee. The Site Superintendent will coordinate all medical arrangements.

RADIOLOGICAL HAZARDS

No radiological hazards are expected during this project.

SITE SECURITY

All onsite personnel and visitors will be required to sign in at the guard station before entering the work site. OSC will maintain, onsite, all records of site access. Visitors will be required to be knowledgeable of and conform to this HASP, prior to accessing work zones. Vehicular traffic will be permitted in the designated parking area as permitted by the owner. Access to the controlled work and traffic zones is restricted to authorized vehicles only. Prior to leaving the site for breaks, lunches, or end of shift, all personnel and visitors will be required to sign-out at the guard station.

SITE LAYOUT

See RAWP

BUDDY SYSTEM

Working alone is prohibited. All field personnel will be assigned a co-worker who will watch for hazards or problems their co-worker might encounter. Communication between employees must always be maintained. Workers will pre-determine hand signals, or other means of emergency signals, for communication when respiratory protection or distance makes communication difficult. Visual contact must remain between the two co-workers; they must remain near each other in order to assist in case of an emergency.

SITE COMMUNICATIONS PLAN

Each work crew, operator and manager will be equipped with a two-way radio or use pre-designated oral and visual safety signals. In the event of an emergency when two-way radio communication is not available, oral and visual safety signals have been established to protect project personnel. These signals will be presented to personnel for all phases of operation before conducting any task. These safety signals will ensure quick communication during adverse or emergency situations. Examples of established signals, and their meanings, are provided below.

Visual Signal	Indication
Hand gripping throat	Out of air, can't breathe
Wave hands over head from side to side	Attention: stand by for next signal
Swing hands from the direction of person receiving the signal to directly overhead and through a circle	Come here
Pointed finger with extended arm	Look in that direction
Grip partner's wrist with one or both hands	Leave the area immediately
Hand on top of head	Need assistance
Thumbs up	Ok, I'm alright, I understand
Thumbs down	No, negative
Audio Signal	**Indication**
Short blast of air or vehicle horn	Caution look here
Three long blasts of air or vehicle horn	Leave the area

PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE will be selected, used, maintained, and stored in accordance with OSHA 29 CFR 1926 Subpart E, and applicable manufacturer recommendations. Engineering, administrative and/or work practice controls to minimize hazards will be implemented where feasible, followed by PPE.

MINIMUM LEVELS OF PROTECTION

Level D personal protective equipment that is to be always worn by project personnel at the site includes.

- ANSI approved safety glasses with side shields
- Leather safety boots (ANSI or ASTM)
- Hardhat (ANSI Rated)
- High visibility vest or equivalent high visibility clothing
- Appropriate clothing (long sleeve shirts and pants) and Tyvek coveralls if required.
- Gloves (leather minimally), nitrile chemical barrier as required
- Hearing protection (around powered equipment, using powered hand tools, torch cutting)
- Tick Protection as needed

Modified D PPE will be used when the possibility of dermal hazardous chemical contact, but not inhalation exposure exists and includes;

- The above minimum PPE
- Mono-goggles with face shield in chemical splash situations
- Impermeable chemical barrier gloves (i.e., nitrile) if handling contaminated material
- Coated disposable coveralls (Tyvek or equivalent) if exposure to hazardous chemicals exits
- Face shield and safety glasses with work where the potential for flying debris hazards is present (i.e., chipping, grinding, steel on steel impact activities)

Level C PPE will be used when there is the possibility of inhalation of hazardous concentrations (or unknown concentrations) of particulates, vapors or fumes at or above OSHA PELs or pre-designated action levels (see section Air Monitoring below). Level C PPE includes.

- Modified level D PPE
- Air purifying respirator (powered full-face (PAPR) or non-powered full face)
- Appropriate filtering media (particulate, mercury, organic, or combination cartridge)

NOTE: OSC employees are given the option of using an air purifying respirator for voluntary use.

Level B is not anticipated for this project but may be made available if necessary.

Level D and Modified Level D are the primary anticipated PPE during this project. These minimum levels of protection are considered preliminary and may change based upon initial exposure assessment and routine assessments as work progresses. No change to the specified level of

protection will be made without the approval of the Site Superintendent and in agreement with the Director HS&E.

SELECTION OF PROTECTION LEVELS

PPE will be used when project and support activities involve known, or suspected, contamination; when vapors, gases or particulates may be generated by site activities; or when direct contact with skin may occur. Respirators protect the lungs against airborne toxicants. Chemical resistant clothing protects skin from contact with harmful and absorbable chemicals.

Level D: Protection will be used when no airborne contaminant exposure is likely and job functions do not require the use of respiratory equipment or chemical resistive clothing. The equipment for this level of protection is described above and is expected to be the minimum for the project.

Level D Modified: Protection will be modified when additional contact hazards have been identified such as splash hazards and contaminated or nuisance dust.

Level C: Protection that will be provided when airborne contaminants have been identified and which requires the use of air purifying respiratory equipment to keep exposures below health-based limits. Examples of respiratory protection for this project are half or full-face air purifying respirators (powered and non-powered) with appropriate cartridges (i.e. P-100 cartridges for particulate, Black Organic Vapor – VOC, Brown/Gold Acid Gas, etc.).

Level B: Protection that will be provided when the highest level of respiratory protection is needed with partial body or skin protection. Equipment for this level of protection will include a minimum of the following:

- SCBA, PAPR or airline respirator depending on contaminate and situation
- Chemical resistant protective clothing for hazards identified.
- Hardhat or helmet for hazards identified.
- Chemical resistant gloves with liners for hazards identified.
- Chemical resistant safety shoes or boot covers for hazards identified.

Level B is not expected for this project.

HEARING PROTECTION

Project personnel will be provided hearing protection and required to use it whenever conducting tasks where exposures may exceed 90 dB as indicated in the following table;

	Sound Level at Operator		
Equipment	Average, dB	Range	TWA, dBA
Earth Moving:			
Front End Loader	88	85-91	
Back Hoe	86.5	79-89	
Bull Dozer	96	89-103	
Roller	90	79-93	
Scraper	96	84-102	
Excavator	86	83-92	89.6*
Truck	96	89-103	
Paver	101	100-102	
Power Units:			
Generators	<85		
Compressors	<85		
Impact:			
Pile Driver (diesel/pneum.)	98	82-105	
Pile Driver (gravity)	82.5	62-91	
Pneumatic Breaker	106	94-111	
Hydraulic Breaker	95.5	90-100	
Pneumatic Chipper	109		
Other Equipment			
Compactor/Vibrator	94.5	85-98	86.1
Compressed Air Blower	104		
Power Saw	88.5	78-95	
Electric Drill	102		

Noise Standards	Noise Level
OSHA (at worker's ear)	90 dB (A) TWA
Day Time Community (at property line)	65 dB (A)

*Open windows

OSC has monitored sound levels for various tasks and operations that may be conducted during the project to both verify that the levels cited above are accurate and to serve as exposure indicators. Sound levels have been measured for each task or operation reasonably expected of having noise levels that could result in exposures above 90 dB as an 8-hr. TWA. Regardless of the results however, OSC employees will be required to use hearing protection under pre-defined conditions.

Hearing protection will be required whenever an employee is either using a powered tool or working near loud noises (excavators or working in heavy equipment with windows open). Hearing protection may be obtained from the Site Superintendent. Each employee is responsible for wearing hearing protection when required. Replacements may be obtained from the Site Superintendent, if necessary. Employees are encouraged to use hearing protection voluntarily if communications are not compromised.

RESPIRATORY PROTECTION

Project personnel may be required to use respiratory protection to reduce their exposure to airborne hazardous substances. The standard requirements that determine the selection and use of respirators depend on the hazards present. Respirators will also be made available in the project work area.

Only respirators that are approved by the National Institute for Occupation Safety and Health (NIOSH) are allowed. Use must follow the regulatory requirements set forth by OSHA 29 CFR 1910.134 and OSHA 29 CFR 1926.103.

OSC employees may voluntarily use a filtering facepiece in conditions when respiratory protection is not mandatory. Employees that are medically cleared to use an APR may wear any type of respirator voluntarily. All voluntary use of respirators require a written medical opinion from a PLHCP allowing their use and Appendix D from the 1910.134 standards will be made available for review to personnel voluntarily wearing a respirator.

Medical Clearance & Fit Testing

All personnel who are assigned to tasks where a respirator is needed must have prior medical clearance. Medical evaluations and fit testing are provided by OSC. Fit test records and all project personnel medical documentation will be filed and maintained onsite, by the Site Superintendent.

Medical limitations and restrictions will be strictly enforced. No employee will be permitted to use a respirator if he/she has any facial abnormality or facial hair that may affect the fit or seal of their respirator.

Training

All personnel who are required to wear a respirator will receive training (in addition to required annual training) from the Site Superintendent on the use, maintenance, proper care, and inspection of their respirators. Attendance at all training will be documented. Attendance records will be maintained onsite by the Site Superintendent and will be available for inspection upon request.

Inspection

All respirators to be used at the jobsite will be inspected for damage by the employee, prior to use. After they are trained, every employee will be responsible for the inspection of their own respirator. The following elements will be inspected.

- Tightness of the connections
- Face piece
- Headbands
- Inhalation valve
- Cartridge or filter fittings
- Signs of deterioration

Any malformation, distortion, missing parts, cracks, etc. in the respirator will cause the equipment to be deemed useless until a qualified technician can properly repair the respirator. If necessary, a new respirator will be issued.

Respirator Type

The type of respirator, and who is required to wear them, will be identified on a task specific level by the Site Superintendent, in consultation with the Director HS&E, based on the type of work that will be performed and the potential for exposure to airborne contaminants.

Standard Procedure for Use

All personnel will adhere to the following standard operating procedure for respirator use.

- Carefully inspect the respirator prior to entering potentially contaminated work areas.
- Conduct positive and negative pressure leak tests each time the respirator is to be used.
- Do not remove the respirator in contaminated work areas.
- Wear a respirator with straps inside disposable garment hood (as applicable)

Cleaning and disinfecting

Any reusable respirator must be cleaned after each use. The steps required to clean a respirator after use are.

- Remove the cartridge and headbands.
- Disassemble all respirator parts.
- Wash all parts, except for the cartridge and headband, in a cleaner-disinfectant solution or use soap and hot water or use an approved respirator cleaning wipe.
- Rinse all parts completely in clean, warm water.
- Air dry in a clean, sanitary area.
- Re-assemble the respirator.
- Store the cleaned respirator in a sealed bag.

Storage

Respirators will be stored in a sealed bag to protect against dust, sunlight, extreme temperature, moisture, and abrasives. Respirators should be stored so that the face piece and exhalation valve will rest in a normal position and function will not be impaired by the elastic setting in an abnormal position. The respirator should not be hung to store or air dried by its strap.

EXCAVATION SAFETY

OSC maintains strict procedure for soil excavations. The safety of all employees during these operations depends on the soil structure and stability, contamination, weather conditions, buried utilities and structures and superimposed loads. Excavations are not to be entered, without approval from SSHO, during this project however minimum entry procedures are provided for background purposes.

Prior to excavating any material onsite, steps will be taken to ensure the work zone is clear from utilities. These steps shall include:

1. Calling 811 to mark public utilities,
2. Open any manholes within the area to determine direction of storm sewers,
3. Utilize Ground Penetrating Radar (GPR) across work zones and mark utilities.
4. OSC will work with the Engineer to get access to any former plant drawings.

When excavating within a wet, sandy area, or if the area has been backfilled at any time, it is likely to be very unstable. All personnel working in these conditions must be cautious and provide extra sloping, if possible. A change in weather conditions, such as heavy rain or snow, can loosen the soil, and increase the risk of a collapse. If the area of excavation is prone to collapse precautions, such as covering the area, should be taken. Heavy equipment or materials should be kept as far away as possible from the excavation area because they can also increase the risk of collapse. All excavated soil should be removed from the rim of the area and contained if possible.

An excavation competent person must be on site anytime entry into an excavation greater than 3-feet deep is necessary. Should entry become necessary, the OSC Director HSE will be consulted and an entry-specific AHA prepared.

When deeper than five feet, to prevent collapsing soil the excavation must be sloped, shored, or somehow contained before any personnel may enter. A secured ladder will be provided for

employees who are working in depths of more than four feet and spacing between will not exceed 25 feet from the work location of in excavation personnel. The ladder will not be removed until all employees have exited the excavation site.

All excavation sites will be inspected daily by an OSC designated competent person. All activity will cease if the competent person and/or the site superintendent find the site hazardous. The competent person will inspect any time there is a change in conditions (i.e., weather, water, heavy equipment operation, etc.).

LOCKOUT/TAGOUT POLICY

For work, repairs or maintenance, equipment will be locked out (deenergized). This procedure ensures the safety of all personnel by deactivating any movable, electrical, or pressurized equipment. This policy applies to all machinery or equipment that can be moved either using electrical power, hydraulic power, compressed air, steam, or energy stored in springs/suspension devices. Damaged tags will be placed on all movable equipment and machinery.

Only project personnel and supervisors are authorized to lockout machinery/equipment. Every employee is responsible for his/her own equipment and nobody else is permitted to remove a lock or tag except the authorized employee. Any violation of this policy is cause for strict disciplinary action.

LOCKOUT PROCEDURES

Lockout devices are used to prevent the accidental re-energizing of equipment.

De-energizing Circuits and Equipment: Disconnect the circuits and equipment, to be worked on, from all electrical sources and release stored energy that could accidentally re-energize equipment. This applies particularly to the overhead crane should it be necessary to dismantle it.

Application of Locks and Tags: Only authorized personnel are allowed to place a lock and tag on each disconnecting – means used to de-energize the circuits or equipment before the work begins. A lock prevents unauthorized personnel from re-energizing the equipment or circuits. A tag prohibits unauthorized operation of the disconnecting device.

Verification of De-energized Condition of Circuits/Equipment: Prior to work on equipment, OSC requires that a "qualified" employee verify that the equipment is de-energized and cannot be restarted. This is typically done by a visible break in the conductors (i.e. air gap) of one foot or more.

Re-energizing Circuits and Equipment: Before circuits or equipment are re-energized, the following steps must be taken in the following order:

- A "qualified" employee conducts tests and verifies that all tools and devices have been removed.
- All exposed employees are warned to stay clear of the circuits and equipment.
- Authorized personnel will remove their own locks and tags.

- The Site Superintendent will conduct a visual inspection of the area to be sure all employees are clear of the circuits and equipment.

ELECTRICAL

Only qualified and authorized personnel may work on or around electrical equipment. OSC personnel are not permitted to work on or within 10-feet of exposed high voltage energized lines or equipment. Live or hot work must be contracted to a qualified third party unless specific authorization is given by the OSC Director HS&E. The following shall be observed.

- Prior to work conducted near live exposed high voltage current carrying lines or equipment, the voltage of the line will be evaluated and a safe working distance for heavy equipment will be set.
- Only NEC certified electrical tools may be used on this portion of the project.
- A ground fault circuit interrupter (GFCI) shall be utilized with all portable electric tools; plugged in at the source and tested prior to use. All electrical equipment shall be properly grounded or guarded (double insulated tools, GFCI).
- Single phase electrical tools must be plugged into properly grounded receptacles.
- The use of extension cords is discouraged. If their use is necessary, extension cords must never be used in traffic areas where they may be a hazard, or where they may become unplugged. Extension cords will always be grounded.
- Any energized electrical equipment, operating at 50 volts or higher, must be protected by a cabinet or other approved enclosure with warning signs that are immediately visible.

FALL PROTECTION

All work from elevated heights > 6 ft. with an open side to the next lowest level shall be performed as supervised by a competent person. In all cases proper fall protection systems shall be utilized as determined by the competent person for fall protection; restraint systems (PFRS, guard rails, and warning lines (restricted for unprotected edge work where traditional systems are not practical).

Fall restraint consisting of a full body harness and a restraint lanyard shall be used at all times when in any scissor lift, aerial lift, boom lift, or other such device commonly referred to as a Mobile Elevated Work Platform (MEWP.) All personnel operating MEWP's shall be certified in their operation prior to use and shall review and follow the OSC Fall Rescue Plan in the event of a fall.

Whenever possible, fall restraint shall be used over fall arrest.

INCIDENT PREVENTION PROCEDURES

SAFETY TASK ANALYSIS CARD

The Safety Task Analysis Card (STAC) process is a required component of all OSC projects. The STAC is a pre-printed, bi-fold card that must be completed by each employee at least once per week. The card is used by the employee as a reference tool throughout their work shift. STAC card observations are used to address new work tasks, changing conditions, and/or potential hazards.

STAC's are used in addition to safe work permits and/or approved work procedures. The STAC is designed to be an ongoing learning tool. By breaking jobs into small parts, workers can identify hazards and eliminate or control them. It is intended as a tool to help employees make observations and correct fellow employee at risk behaviors.

The STAC must be completed by each employee at least once per week. This is the minimum requirement. Project personnel found participating in or observing risky actions without submitting a properly completed STAC will be coached on the need to do so.

Project supervisors and/or the Site Superintendent will review submitted STACs with employees during tailgate safety meetings and identify corrective actions.

FIRE PREVENTION and PROTECTION

Emergency response and contingency procedures provided in this HASP will be in effect throughout all phases of work. Included are firefighting equipment, alarm systems, and procedures for handling fire emergencies. Project specific firefighting equipment will be inspected monthly at a minimum basis and maintained in proper working order. Firefighting equipment will always be in an accessible place at the site.

All mobile equipment will be equipped with a fire extinguisher. Unless such placement would create an alternate or greater hazard.

Fire extinguishers will be immediately available when working with or near combustible or flammable items. In general we will utilize DOT approved ABC fire extinguishers whenever feasible.

SITE HOUSEKEEPING

The following housekeeping guidelines apply at this site:

- Excess material and debris will be kept clear from working areas.
- Combustible materials will be removed at regular intervals and all wastes will be properly disposed of at frequent intervals.
- Containers will be provided for the collection and separation of all discarded materials and refuse. Covers and identification will be provided for all containers used for flammable or harmful substances.

MECHANICAL EQUIPMENT

The following guidelines apply when dealing with the inspection and operation of equipment.

- All vehicles and equipment used on the site must be checked at the beginning of each shift to assure that all parts that affect safe operation are in proper working condition and are free from defects. An inspection form must be completed and filed with the Site Superintendent.

- Personnel will not be permitted to operate equipment when there is an obstructed view to the rear or sides unless there is a spotter.
- Employees will not work or walk under or between any equipment that had suspended parts or held aloft unless/until the parts are substantially blocked to prevent falling and shifting.
- Hydraulic leaks must be addressed immediately by stopping the equipment, preventing further leaking and cleaning any hydraulic fluid spills/leaks. Notify the Site Superintendent immediately for proper corrective actions to be determined.

HIGH PRESSURE WASHERS

OSC requires that only authorized personnel operate high pressure washers. Personnel will follow manufacturers specifications on use. This policy is intended to protect both OSC employees as well as any property where the equipment will be used. The following guidelines apply:

- The lance must always be pointed at the specific work area.
- Personnel will remain at least 25 feet away from the washer and the item being washed.
- Care should be taken to ensure the proper footing of the operator.
- The operator will wear the following personal protective equipment: Hard hat with face shield, goggles, safety boots, and hearing protection, Other PPE required by the equipment manufacturer will also be required. PVC rain or chemical resistant suit and heavy gloves; as well as any additional equipment to protect against chemicals, as needed.
- OSC requires that all operators be trained in the emergency shutdown procedures and general equipment maintenance of high-pressure washers.
- Under no circumstances will an operator be allowed to make modifications to a power washer while on the job.

VEHICLE and EQUIPMENT SAFETY

Only trained and qualified personnel may operate equipment and vehicles. This policy is intended to protect all employees and client properties. The guidelines for this policy are as follows.

- Each unit is to be inspected prior to its use on site and then inspected periodically depending on the equipment involved and the manufacturer's specifications.
- No repair work, or refueling, will be done while the vehicles or equipment are in operation. The engine is to be turned off and all buckets, blades, gates, or booms must be lowered to the ground, or a substantial support.
- Equipment backup alarms must be operational and audible over the surrounding noise levels. If this is not the case, an assistant must be assigned to the operator, and they will be required to clear the way.
- Only authorized personnel are permitted to ride in company vehicles and equipment.
- Under no circumstances will an employee be permitted to get on or off a moving vehicle.
- Operators must wear the following PPE: Boots/sturdy work shoes, ear protection devices when the noise level is excessive (see hearing protection section), heavy work gloves.(as necessary,) hardhats and safety eyewear with side shields are required whenever outside of

an enclosed cab. Safety glasses and hearing protection are required inside if cab windows are open.
- The operator must always wear seatbelts when provided by the manufacturer.
- Cell phone use is prohibited during operation of motorized vehicles and equipment.
    - If a cell phone must be used the operator must make safe the equipment (by lowering all buckets, booms, etc. and turning off the engine prior to using the cell phone.
- To ensure the proper visibility all windshields, side windows, mirrors and lights will be cleaned as often as necessary.

TRUCKS

The following guidelines apply to truck operators:

- A current driver's license must be carried always,
- Drivers will check loaded material to ensure against loss of shifting during transit,
- All DOT regulation will be followed,
- Non-OSC drivers must receive site-specific instructions upon arrival such as remaining in the truck, appropriate/required PPE, where to tarp loads, applicable traffic patterns, proper entry procedures, etc.

EXCAVATING EQUIPMENT

OSC has the following requirements for operating excavators and skid-steers.

- A daily pre-use equipment inspection sheet must be completed and filed with the site superintendent.
- Prior to their use onsite, the equipment's brakes, cables and hoses must be checked and in good working order.
- When the equipment is moving, all blades, buckets and bowls will be carried close to the ground but high enough to avoid any obstacles on the ground. If not in motion, they must be lowered to the ground or to a substantial support.
- No employees are permitted to ride on a boom, bucket, bowl, or any other heavy equipment extension.
- All safety equipment must be properly installed, and in good working condition, before a piece of equipment is used on this project.

SANITATION

Except for mobile crews having transportation readily available, work sites will have toilets provided that adhere to the following requirements: One toilet for 20 or less employees; one toilet seat and one urinal per 40 employees; if there are 200+ employees, on toilet seat and one urinal per 50 workers.

Adequate washing/showering facilities will be provided on sites where there are harmful substances, and they will be in close proximity to the site. An acceptable supply of portable water will be provided onsite, and it will be clearly marked as such. Portable water containers will have tightly sealed tops and a tap.

DAILY INSPECTIONS

The Site Superintendent will monitor jobsite hazard mitigation through inspections at the start and throughout each workday.

Any safety violations will be recorded and corrected. All observed safety violations will be immediately corrected, the person responsible will be coached on the correct procedures, and this violation will be reviewed at the next safety meeting with all employees as a lesson learned. If an employee has excessive violations of the site safety rules, it will be grounds for disciplinary action which could lead to; termination of OSC personnel or expulsion if an onsite subcontractor personnel.

INCIDENT REPORTING

OSC will prepare and maintain incident reports that include corrective actions. These reports will be provided to the Engineer representative within 48 hours of the incident and as needed. Each incident report will be reviewed by the OSC Director of HS&E. Verbal notification to the client will be as soon as possible.

Any occupational incident, which results in the death of one or more employees will be reported to OSHA within 8 hours. The inpatient hospitalization of an employee and all amputations or loss of an eye will be reported within 24 hours. All such incidents will be reported by OSC to the nearest OSHA Area Director during normal business hours or at the National Hotline 800-321-OSHA (6742). Employees are to report all incidents/accidents no matter how slight they are to their immediate supervisor.

Employees are to immediately correct or report any hazards or unsafe conditions found in the workplace and have a questioning attitude when they do not understand something.

In addition to OSC's internal reporting requirements, RIVERVIEW/Honeywell requires all incidents (adverse events) to be investigated and based on severity requires notification of the incident within specified timelines. Adverse events are divided into three tiers: Tier 1 events are the most significant and serious events, followed by Tier 2, which are significant events but not as serious as Tier 1 events, and Tier 3 events are essentially all other events that do not meet the criteria for Tier 1 or Tier 2 events. Tier 1 events are to be reported within 2 hours, Tier 2 events are to be reported within 24 hours, and Tier 3 events are to be reported when possible.
Adverse events include the following:

Tier 1:

- A release to air, water or soil that has an actual or potential off-site adverse environmental impact.
- One or more on-site fatalities.
- Three or more employees, contractors or visitors admitted to a hospital.
- Any off-site fatalities, injuries, or harmful exposures resulting from RIVERVIEW/Honeywell products or operations.

- Any security incident that may be immediately dangerous to life or property including fires, explosions, bomb threats, chemical release, radiation release, and release of a biological or chemical agent (aerosolized or gaseous form).
- Suspicious materials, packages or letters that pose an immediate risk to employees.
- Government representatives alleging or suggesting criminal non-compliance.
- Receipt or notice of any regulatory agency directive or other type of injunctive device designed to curtail or restrict operations; and,
- Community injuries or diagnoses of illnesses allegedly associated with a company-related incident, event or release to air, water or soil.

Tier 2:

- Employee or contractor lost workday injuries/illnesses.
- Employee, contractor or visitor recordable injuries/illnesses (Criteria:
- "RIVERVIEW/Honeywell Global Recordkeeping Requirements").
- An environmental excursion that does not also trigger Tier 1 reporting.
- A release to the air, water or soil that only narrowly avoided an adverse environmental impact or had the potential to be an excursion.
- Discovery of potential or actual evidence of contaminated groundwater from current or former operations that does not otherwise meet the definition of a Tier 1 Event.
- Suspicious activities in or around RIVERVIEW/Honeywell facilities or processes that may present a potential security risk.
- Allegations of previously unknown health/safety/environmental effects caused by products, processes, emissions or discharges (Reference: Risk Management and Reporting (Pstew-3)).
- Written notification from a governmental agency alleging non-compliance of any kind.
- Proposal or imposition of a HSER fine, penalty or corrective action.
- Receipt of a non-routine request for information from a governmental agency.
- A non-routine regulatory agency inspection.
- Audits (Peer review, Self-assessments, SBU, Third party findings and recommendations)
- Significant community activism or adverse media coverage not associated with an episodic event.
- A product recall imposed by a regulatory agency.
- Transportation-related events that result in Tier 2 impacts.
- Notice of an allegation from a third party or regulatory agency of environmental impacts from operations on current or formerly operated RIVERVIEW/Honeywell facilities.
- Demands, including voluntary agreements, to conduct a site investigation or remedial measures to respond to environmental impacts from operations on current or formerly operated RIVERVIEW/Honeywell facilities.

Tier 3:

The following Tier 3 events shall be entered into the event tracking system within seven (7) calendar days:

- On-site or off-site employees, contractor employees or visitor injuries/illnesses where first-aid treatment or evaluation is provided by a Medical or Para-Medical Professional.

- A regulatory agency inspection (which is not a Tier 1 or Tier 2 Event and may still be underway) with no notice of fine, penalty or corrective action.

Adverse events must be reported to the PM, the INVENTUM engineering manager, and the RM, as soon as possible following the event. All Tier 1 and Tier 2 adverse events must be investigated, and a written investigation report must be prepared and submitted to the RIVERVIEW/Honeywell Event Reporting System.

MEDICAL SURVEILLANCE

MEDICAL EXAMINATIONS

OSC field personnel are provided with a thorough medical examination to assess fitness for the project and to provide baseline health data for subsequent reference. Examinations are conducted by a qualified health care provider and repeated annually (unless abnormal test results, annual "questionnaire" answers or other problems dictate more frequent observation). Either a copy of the physician's "fit for duty" statement for each employee or a statement of certification of same prepared by the OSC Director HS&E will be provided.

During the medical examination employees are evaluated for their ability to wear respiratory protection. This evaluation includes, at a minimum, an examination of the cardiopulmonary system; including forced vital capacity (FVC) and forced expiratory volume C 1 second (FEV 1.0). When indicated by the physician, other tests of the respiratory and cardiovascular systems may be performed based on an individual's past history, findings from testing, and/or based upon the type of equipment the individual may be required to use.

Following is an example of a baseline yearly medical examination:

Medical Monitoring Protocol				
Exam Components	**Baseline**	**Annual**	**Interim**	**Exit**
Vital Signs	Yes	Yes	Yes	Yes
Vision Screening (Includes Peripheral and Color)	Yes	Yes	Yes	Yes
Urine Drug Screen	Yes	Yes	As needed	As needed
DOT hearing	Yes	Yes	No	Yes
Spirometry	Yes	3	Yes	Yes
Chest X-Ray (asbestos work only)	Yes	Yes	No	Yes
Review of History	Yes	Yes	Yes	Yes
Physical Exam	Yes	Yes	Yes	Yes
Notes:				

NOTE: Any employee who develops a lost time injury or illness during the period of this contract will be evaluated by a certified health care provider. The project supervisor will be provided with a written statement that indicates the employee's fitness and ability to return to work, signed by the medical consultant prior to allowing the employee to re-enter the work zone.

AIR MONITORING

Volatile Organic Compound monitoring (breathing zone) shall be performed when odors are detected. Monitoring will be conducted using a MultiRAE Lite with an 11.7 lamp. Work resulting in readings of 0.6 ppm or greater TWA after 15 minutes of measurement shall stop and the OSC Director of HSE will be contacted for further evaluation.

Any time a confined space or enclosed building area is entered initially the air shall be characterized using real-time monitors for oxygen content, LEL, and other potential hazards such as carbon monoxide or hydrogen sulfide exposure.

The need for additional air monitoring or exposure measurements will be determined as specific work tasks are developed. Air monitoring and sampling shall be specified in the relevant AHA as approved by the Director HS&E.

CONFINED SPACE ENTRY PROCEDURES

The following guidelines outline the minimum acceptable criteria that will be utilized by OSC and subcontractor personnel for all confined space entry operations.

All project specific confined space entries will be thoroughly reviewed by the designated HSO. Confined Space Permits shall be issued and approved in conjunction with the INVENTUM Project Manager. Personnel entering and working in confined spaces will be required to adhere to the OSHA Permit-Required Confined Space Standard 29 CFR 1926.1200 and the OSHA General Duty Clause. Affected project personnel are instructed in these OSHA regulations as part of the OSC employee training program.

The HSO will be responsible for reviewing the applicable entry protocol with the field team, prior to confined space entry.

DEFINITIONS

CONFINED SPACE: There are two types of confined spaces: permit required and non-permit required. OSHA's "PRCS Evaluation Procedures and Decision Flow Chart" will be used to evaluate the potential for permit required confined spaces.

PERMIT REQUIRED CONFINED SPACE (PRCS): The space contains, or has the potential to contain:

- A hazardous atmosphere. A hazardous atmosphere is defined as any space where the oxygen is below 19.5% or above 23.5%, combustible vapors are above 10% LEL, or high toxic concentrations are present which may cause death, incapacitation or an impaired ability to self-rescue.
- The space contains a material that may engulf an entrant.

- The space has an internal configuration that may trap or asphyxiate entrants.
- The space contains any other serious heal, safety or environmental hazard.

NON-PERMIT REQUIRED CONFINED SPACES: OSHA defined a non-permit required confined space as a PRCS in which all serious hazards have been eliminated. Non-permit required confined spaces will be re-evaluated by the HSO using the "PRCS Evaluation Procedure and Decision Flow Chart" whenever they or their characteristics change in a way that could lead to reclassification as a PRCS.

PERSONNEL RESPONSIBILITIES

Entry Supervisors

OSC will designate an entry supervisor to oversee the confined space entry and ensure that personnel engaged in PRCS entry operations will comply with this procedure. Entry supervisors will:

- Verify that all tests specified by the permit have been conducted and that all procedure and equipment specified by the permit are in place before endorsing the permit and allowing the entry to begin.
- Terminate the entry and cancel the permit when the entry operations covered by the entry permit have been completed, or whenever a condition that is not allowed under the entry permit arises in or near the PRCS.
- Verify that rescue services are available and that the means for summoning them are operable.
- Remove all unauthorized individuals who enter, or attempt to enter, the PRCS during entry operations.
- Determine that the entry operations are consistent with the terms of the entry permit and that acceptable entry conditions are maintained.

Attendants

The entry supervisor will designate a qualified attendant for each PRCS operation. To be qualified, an attendant must know the hazards that authorized entrants may encounter during an entry (including information on the mode, signs and symptoms, and consequences of exposure) and must be aware of the behavioral symptoms of hazard exposure. Attendants will:

- Remain outside the PRCS during entry operations until relieved by another attendant.
- Warn all unauthorized entrants that they must stay clear of the PRCS, or that they must immediately exit if they have entered the PRCS.
- Inform the entry supervisor, if unauthorized personnel have entered the PRCS.
- Continuously maintain an accurate count of entrants in the PRCS and ensure that the means used to identify authorized entrants accurately identifies the entrants.
- Communicate with authorized entrants, as necessary, to monitor entrant status and to alert entrants of the need to evacuate the PRCS.
- Monitor the activities both inside and outside the PRCS.

- Immediately order evacuation of the PRCS if a prohibited condition is detected, the behavioral effects of hazard exposure in an authorized entrant are observed, or a situation outside the PRCS is found that could endanger the authorized entrants; or if the attendant cannot effectively and safely perform his/her duties and responsibilities.
- Perform non-entry rescues, as specified by the Confined Space Entry Permit; summon rescue and other emergency services as soon as it is determined that authorized entrants may need assistance to escape from PRCS hazards.

Attendants will NOT, under any circumstances.

- Monitor more than one occupied PRCS at any given time;
- Perform any duty that might interfere with their primary duty to monitor and protect the authorized entrant; or
- Enter the PRCS for rescue purposes.

Entrants

Authorized PRCS entrants will be identified on each Confined Space Entry Permit. Authorized entrants will;

- Know the hazards, including information on the mode, signs or symptoms, and consequences of exposure.
- Properly use the PPE provided for the PRCS entry.
- Communicate with the attendant, as necessary, so the attendant can monitor entrant status and alert entrants of any need to evacuate the PRCS.
- Evacuate the PRCS and alert the attendant whenever they recognize any warning signs or symptoms of exposure to a dangerous situation; or they detect a prohibited condition; or whenever the attendant or entry supervisor orders the evacuation; or when an evacuation alarm is activated.

TRAINING

All project personnel will be instructed not to enter PRCSs without the proper permit and without following the procedure and practices outline in this SOP and in the Confined Space Entry Permit. Personnel, who are required to enter a PRCS, or act as an attendant or entry supervisor, will be trained to acquire the understanding, knowledge and skills necessary for the safe performance of their assigned responsibilities and duties.

Entrants will receive training on:

- The means and methods used to communicate with attendants; as well as the means attendants will use to notify them of emergencies.
- The operation of any specialized equipment that is expected to be used, including monitoring and rescue equipment.
- Evacuation signals and procedures; as well as the need for entrants to notify the attendant and evacuate the PRCS if they detect any dangerous conditions.

Attendants will receive training on:

- The procedures for monitoring inside and outside the PRCS and recognizing the conditions that might be hazardous to entrants;
- Procedures for communicating with entrants;
- Procedures for evacuating entrants from the PRCS and when evacuation is required;
- Procedures for controlling access to the PRCS;
- Their responsibility to remain outside the PRCS during entry, unless they are relieved by another attendant, and
- Non-entry rescue procedures. Entry Supervisors will receive training on;
- Verifying that the Confined Space Entry Permit has been completed properly;
- Procedures for verifying that all tests specified by the Permit have been conducted;
- Requirements for verifying that all the procedures and equipment specified by the Permit are in place before allowing entry to begin;
- Procedures for determining if conditions are acceptable for entry;
- Authorizing entry operations; and
- Terminating entry.

All training will be conducted:

- Before the employee is first assigned confined space duties (initial training);
- Before a change in assigned duties;
- Whenever there is a change in permit space operations that presents a hazard about which employee has not previously been trained, and
- Whenever project management, involved regulatory officials, or the project engineer has reason to believe that there are inadequacies in the knowledge or use of these procedures.

When complete, training will be certified by the instructor. The certification will list the names of the personnel presenting and receiving training and the dates of training. Training certification documentation will be maintained as part of the Project file kept at the site and in the individual personnel files in the home office.

PRCS ENTRY PROCEDURE

Atmospheric Testing

Before an employee enters any confined space, the entry supervisor will test the internal atmosphere with a calibrated, direct reading instrument to determine if acceptable entry conditions exist for the following conditions, in the given order:

Condition	Acceptable Parameter(s)	
A.	Oxygen Content	Above 19.5% and Below 23.5%
B.	Flammable Gases and Vapors	Less than 10% LEL
C.	Potential Toxic Air Contaminants	Below Action Levels for PPE

Continuous systems which cannot be isolated (i.e. sewers) or activities which generate significant airborne contaminants (i.e. welding) will be continuously monitored during entry, unless forced mechanical ventilation is used and has been shown to maintain an acceptable atmosphere.

Entry

The HSO will use the "PRCS Evaluation Procedures and Decision Flow Chart" to verify the presence of a PRCS. If it is determined that a PRCS does exist, the HSO will review the confined space entry procedures with entry personnel; post OSHA required danger signs at the entrances to the PRCS and notify Project personnel of the PRCS location(s); notify offsite emergency response services of the PRCS; and prepare a Confined Space Entry Permit.

Confined Space Permit

The entry supervisor will be responsible for completing the Confined Space Entry Permit. All items on the Permit must be completed. The entry supervisor will verify that all entry personnel are aware of the specific hazards that are associated with the PRCS; that all necessary safety equipment and materials are in place; that all emergency response procedures are in place; and that the pre-entry air monitoring results indicate acceptable entry conditions, before signing the permit.

Pre-entry Briefing

The entry supervisor will conduct a pre-entry briefing with the attendants and authorized entrants to discuss the requirements of the Permit and to ensure that all involved personnel understand their responsibilities and the specific hazards associated with the PRCS. A pre-entry briefing will be conducted for each attendant and entrant, prior to entry and whenever new hazards are identified.

Entry Authorization

The entry supervisor will sign the Confined Space Entry Permit after the Permit has been completed, all safety equipment is in place, air monitoring results are acceptable, the pre-entry briefing has been conducted and the rescue procedures have been established. Once the permit has been signed:

- Entrants will wear all necessary safety and rescue equipment;
- The Permit will be posted at, or near, the PRCS entrance, and
- Entry procedures will begin.

Permit Exit and Cancellation

Each Entry Permit will be valid for one shift only. Expired and canceled Permits will be returned to the Site Superintendent who will file them with the Project documents. Permits will be canceled if:

- A new hazard is identified or encountered;
- An entrant is seriously injured and requires evacuation and/or rescue; or

- A change in the scope of work requires new activities which may create previously unanticipated hazards that could cause serious death or injury.

RESCUE/EMERGENCY RESPONSE

Offsite Rescue and Emergency Services

Offsite rescue and emergency service personnel will be informed by the HSO of the hazards they may confront when called to the jobsite to perform services. These services will be identifies and notified prior to any entry. Entry will not be performed if emergency rescue services are not available. The rescue/emergency service personnel will be provided access to all permit spaces from which the rescue may be necessary, so that the emergency responders can develop appropriate rescue plans and conduct rescue operations.
Non-entry Rescue

Non-entry rescues, retrieval systems or methods will be used whenever an authorized entrant enters a PRCS, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

Each authorized entrant will use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level or above the entrant's head. Retrieval lines will be attached to a mechanical device or a fixed point outside the Permit space, in such a manner that rescues can begin as soon as the rescuer becomes aware of the necessity. The mechanical device will be ready to retrieve personnel from vertical PRCSs more than five feet deep.

DECONTAMINATION PROCEDURES

Decontamination of equipment and personnel will be performed as necessary to limit the potential migration of contaminants outside the project limits. All equipment and personnel will be decontaminated before leaving the property.

Personnel and equipment decontamination procedures to be employed when exiting contaminated work areas at this site are summarized in the following subsections.

PERSONNEL HYGENE and DECONTAMINATION

Personnel will be made aware of any personal habit that may allow contaminants into or onto their body. All personnel will check that regularly worn PPE (i.e. hardhats and liners, eye protection, etc.) is clean and in good condition. Disposable outer PPE (coveralls, gloves, boot covers) will be worn. Any products used for personal consumption are prohibited in exclusionary work areas. Break areas will be limited to specific areas where eating, drinking, smoking, etc. and the storage of these items will be allowed.

A typical personnel decontamination sequence is presented below:

- Step 1: Scrape the gross contamination from boots and outer gloves. Wash them using soap in a water solution and rinse with water into a designated container in the contamination reduction zone.
- Step 2: Remove the tape from and around boots an outer gloves and deposit in a collection drum (if disposable) or store on a rack (if reusable). Remove the over boots and outer gloves and place in a collection drum (if disposable) or wash and place on a rack (if reusable).
- Step 3: Remove respirator cartridge and place in a collection drum.
- Step 4: Remove disposable coveralls and place in a collection drum. Remove boots and store in an appropriate location. Remove disposable inner gloves and dispose of them in a collection drum.
- Step 5: Remove hardhat and safety glasses: Decontaminate as necessary (wash with sanitizing solution [MSA sanitizing solution or equivalent], rinse with potable water and allow to dry at the end of each day).
- Step 6: Remove respirator, if used, and deposit in a plastic liner. Avoid touching face with fingers. Respirators will be washed in a sanitizing solution (MSA sanitizer or equivalent), rinsed with portable water and allowed to air dry at the end of each day.
- Step 7: Thoroughly wash and rinse any exposed skin with water and biodegradable soap using bucket 1. Rinse in bucket 2. Re-rinse in bucket 3. Shower and launder all personal clothing as soon as possible upon completing daily activities.

Personnel hygiene, hand and face washing, following decontamination will take place in the project support area.

EQUIPMENT DECONTAMINATION

The Site Superintendent will be responsible for inspecting decontaminated vehicles, equipment, and material contaminated work areas, to ensure proper decontamination. The Site Superintendent will document in the Safety Inspection Log that each piece of equipment utilized in an exclusion zone has been properly decontaminated.

The standard operating procedure for the use of high-pressure washers will be strictly followed.

HEAVY EQUIPMENT DECONTAMINATION

As a general practice, equipment, such as excavators, will remain within the work zone for the duration of the project. This ensures the minimization of the potential migration of contaminants outside the project limits. In addition, the sequence of work has been designed to avoid the movement of machinery and personnel over areas within the work zones.

Generally heavy equipment, and large materials used in potentially contaminated areas equipment will be decontaminated as outlined below.

- Conduct gross removal of solids at point of use.
- Degrease, as necessary.
- Decontamination will be performed within the limits of the contamination reduction zone.

TOOLS AND SMALL EQUIPMENT DECONTAMINATION

Tools and smaller equipment that may have come in contact with potentially contaminated materials will be decontaminated using the procedures outlined below;

- Flush and wipe components to remove debris and other gross contamination.
- Clean with potable water and non-phosphate detergent (i.e. Alconox) using a brush or high- pressure washer, as necessary, to remove particulate matter and surface films.
- Rinse thoroughly with potable water.
- Allow to air dry for as long as possible.

NON-DISPOSABLE SAMPLING EQUIPMENT

Non-disposable sampling equipment that may have come into contact with potentially contaminated materials will be decontaminated prior to collecting each sample as follows;

- Clean with potable water and non-phosphate detergent using a brush, if necessary, to remove all visible foreign matter.
- Rinse thoroughly with potable water.
- Rinse thoroughly with de-ionized water.
- Visually inspect the openings and treads for solid materials.

Allow to air dry as long as possible on a clean polyethylene sheet or aluminum foil.

DISPOSAL of DECONTAMINATION WASTES

Equipment and solvents used for decontamination will be decontaminated or disposed of properly. All aqueous liquids generated in the personnel and equipment decontamination process will be collected, characterized, and appropriately disposed of or run through an existing water treatment facility. Disposable PPE will be containerized in drums as needed and properly disposed of.

EMERGENCY EQUIPMENT and FIRST AID REQUIREMENTS

Emergency and first aid equipment to be maintained onsite by OSC will include the following.

- Approved, portable, emergency eye wash flush bottles will be available
- At least one industrial first aid kit will be provided and maintained
- First aid and CPR kit locations will be specifically marked by the Site Superintendent and stocked with adequate water and other supplies to cleanse and decontaminate burns, wounds or lesions.
- 10# ABC type dry chemical fire extinguishers will be provided at all project site locations where flammable materials present a fire risk. Mobile equipment will be equipped with a minimum of 2-pound extinguishers when feasible. Extinguishers will be inspected monthly and certified annually.

Medical facilities that need to be contacted due to an onsite emergency, as well as directions to the nearest hospital, are identified at the beginning of this HASP. The tables stating the emergency contact information and hospital location will be posted in a prominent location(s) onsite.

If a site worker becomes injured or ill, Red Cross/American Heart Association recommended first aid procedures shall be followed. First aid, or other appropriate initial reactions, will be provided by the certified first aid technician that is closest to the incident.

NOTE: When protective clothing has been grossly contaminated during an incident, contaminants may be transferred to the treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, protective clothing should be removed and disposed of. If the worker can be moved, he/she will be taken to the personnel decontamination station where decontamination procedures, additional first aid or preparation for transport to the hospital will be accomplished. If the victim could not be decontaminated, the rescue service provider must be notified of the situation.

If the injury to the worker is of a chemical nature, the procedures listed below are to be followed.

Eye Exposure: If contaminated solids or liquids get into the eyes, wash eyes immediately using large amounts of water while lifting the lower and upper eyelids occasionally. Wash for at least 15 minutes. Obtain medical attention.
Skin Exposure: If contaminated solids or liquids get on the skin, promptly wash the contaminated skin using soap and water. Immediately obtain medical attention.
Respiratory Exposure: Immediately move the victim to fresh air. Obtain immediate medical attention.
Ingestion Exposure: Identify what contaminant was swallowed. Follow the appropriate procedure described in the SDS and obtain medical attention as soon as possible.

NOTE: Any person who is transported to the hospital for treatment related to an exposure injury will take with them the appropriate information (i.e. SDSs) on the chemical to which he/she has been exposed. SDSs for known or suspected chemicals to exist onsite will be stored in OSC's project field office and maintained by the Site Superintendent.

EMERGENCY RESPONSE and CONTINGENCY PLAN

The following Emergency Response and Contingency Plan includes the following:

- Preventative measures are included in the daily review of tasks that are to be performed that day at the safety briefing.
- Personnel training and regular HS&E meetings are conducted to reduce the likelihood of incidents.
- Mitigation measures to limit the scope of any incident are implemented.
- Contingency actions to respond to and remedy the effects of incidents.

REPORTING AN EMERGENCY

Minor: Workers will immediately notify the Site Superintendent and state the following:

- Name of injured person
- Exact location of emergency
- Describe the emergency.
- State whether fire department is needed.
- State whether emergency personnel are needed.

The Site Superintendent will:

- Call emergency services if required.
- Prepare investigation report with Site HSO

Major: Workers will immediately notify the Site Superintendent stating the same points that are listed under a minor emergency. However, with a major emergency the worker must state that this is a major emergency. The Site Superintendent will:

- Call emergency services
- Coordinate emergency service access to the incident
- Call OSC's Corporate Director HS&E
- Prepare an initial incident report
- Cooperate with OSC Corporate Director of HS&E for Incident Incestigation

PRE-PLANNING

Arrangements for emergency services will be made prior to initiating onsite operations. Emergency response procedures will be covered as part of the project personnel's training. This training will include, but not be limited to;

- Emergency chain of command.
- Communication methods and signals.
- Location of phones and emergency numbers.
- Use of emergency equipment.
- Evacuation and emergency procedures.
- Offsite support.

- Site-specific hazards.
- Decontamination procedures.
- Standard operating procedures, and
- Location and use of the first aid equipment

Emergency numbers listed earlier along with maps to medical services will be printed and located in site office trailer or Superintendent's truck.

WEATHER

In the event of severe weather (lightning, high winds, etc.), the Site Superintendent will notify project personnel. As the storm approaches, all work will stop, loose objects will be secured, and site personnel will take shelter at a location pre-arranged by the Site Superintendent. After the severe weather has passed, and prior to work startup, the Site Superintendent will inspect the site for hazards.

Lightning – Any visual sighting of lightning will result in stopping outside work activities. Work will not commence until 30 minutes after the last observed strike within 10 miles (can be verified using a weather app on your phone)

High Winds – Winds higher than 30 mph will cause all exterior hoisting and lifting to cease. Crane operators have the authority to stop lifts at lower wind speeds based on their discretion.

SPILL CONTAINMENT PROCEDURES

The purpose of this section is to prevent and control accidental discharge of contaminating materials to surface soils and waterways (or groundwater); and to minimize and abate the hazards to human health and the environment. These procedures will be reviewed with project personnel prior to startup and thereafter as necessary during regular weekly HS&E meetings and daily briefings. Please see spill response procedures listed below.

EMERGENCY NUMBERS

The names and phone numbers of emergency services and offices to be contacted in the event of a spill, or any other onsite emergency, is provided in the Contact Information portion located at the beginning of this HASP. These phone numbers will be posted by the Site Superintendent in prominent positions throughout the Project site.

DEFINITIONS

For the purposes of this plan, spoils are defined as any material that is accidentally or intentionally leaked, pumped, poured, dumped, or emitted onto the ground, surface water, groundwater or air. All spilled material will be considered hazardous, cleaned up following the established spill response procedures; and reported as required.

Spills will be categorized as: Priority 1 or Priority 2.

Priority 1 Spills: Result in a significant release of contamination into the air, or onto the ground, outside the exclusion zone.

Priority 2 Spills: Result in minor spill, less than five (5) gallons and not reportable, which can be easily cleaned up.

POTENTIAL SOURCES and PREVENTATIVE MEASURES

The contracted work has potential spill sources. These include, but are not limited to:

Potential Spill Source	Preventative Measure(S)
Transporting waste material to selected offsite disposal facilities	In general the Site Superintendent will be require to verify that all transportation vehicles used in support of this contract are equipped with the appropriate spill response equipment, and that the drivers have received the proper spill response training and maintain all their require federal and state licenses and certifications. Loads will be secured, tied down and covered, and transport vehicles will be checked by the Site Superintendent prior to release from the site.
Re-fueling onsite equipment	OSC will prohibit the long term storing of diesel fuel. OSC will limit the amount of fuel kept onsite to only that required for weekly equipment usage.
General spill prevention requirements	Easily accessible spill response stations will be set up containing absorbent pillows, floor dry, shovels and brushes to be used in the event of a spill. The location will be known to all project personnel.

SPILL RESPONSE PROCEDURES

INITIAL CONTAINMENT AND RESPONSE

In the event of a spill, the following initial containment and response procedure must be implemented immediately.

- **Administer first aid to injured person(s).** Any employee that observes a spill will act immediately to remove and /or protect the injured person from a life-threatening situation. First aid and/or decontamination procedure will be implemented as appropriate.
- **Warn other people and/or vehicles of the hazard.** Personnel will act to prevent any unsuspecting persons from encountering the spilled materials by alerting nearby people and by obtaining assistance of other personnel who are familiar with spill control and clean up training.
- **Stop the spill at the source, if possible.** Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as up righting a drum, closing a valve, or temporarily sealing a hole with a plug. OSC personnel will not make more than a brief effort, prior to notifying the Site Superintendent.
- **Notify the Site Superintendent.** Using available onsite communication systems, or other rapid communication procedures, the Site Superintendent will be notified of the spill, including information on the material spilled, quality, personnel injuries and immediate life-threatening hazards. The Site Superintendent will notify the the Engineer representative and emergency contacts immediately (See Emergency Contact List).

NOTE: If a flammable liquid is involved in the spill, remove all ignition sources, and monitor for explosive conditions with an LEL meter during cleanup. Also, remove any surrounding materials that might chemically react with the spilled materials.

SPILL CONTAINMENT

The Site Superintendent and HSO will make a rapid assessment of any spill at the site; apply the appropriate HS&E considerations to the use of PPE in the spill release zone; and direct primary containment measures. Depending on the nature of the spill, primary containment measures may include, but are not limited to.

- Constructing a temporary containment berm to control the horizontal flow of the spill using absorbent pads, booms, sandbags, sand and/or other inert materials.
- Placing drums under the leak to collect the spilling material before it flows onto the ground.
- Digging a sump, installing a polyethylene liner, and diverting the spilled material to the sump
- Transferring the material from its original container to another container

Spills that occur between the project site and the offsite disposal facility will be initially contained by the driver using on-board spill response equipment.

SPILL CLEANUP

The Site Superintendent, HSO, and Project Manager will develop an incident-specific spill clean-up plan for Priority 1 spills that will take into consideration the associated hazards, quantity of spilled material, disposal methods and costs. The incident specific spill clean-up plan will be reviewed for acceptance by the Wood representative and/or other Federal, State or Local oversight personnel. Once approved, the spill clean-up plan will be implemented under the direct supervision of the Site Superintendent.

Generally, all visually detectable spills, leaks or releases of fuel oil will be collected and cleaned up using absorbent pads, booms, sandbags, sand and/or other inert materials as practicable using the response procedures outlined below. Emergency spill kits will be kept in each vehicle.

Spill Type	Response
Waste oil on the ground	Contain the spill and excavate the visually contaminated soils. Containerize, sample for classification purposes, and dispose offsite.
Building/paved surfaces	Contain the spill. Power wash the contaminated are(s). Collect and containerize the resultant wastewater for onsite treatment.
Vehicle	Power wash the vehicle. Collect, contain, and treat the resultant decontamination fluids.
Heavy Equipment hydraulic fluid leak	Stop the equipment immediately. Clean up spill and/or leaking fluid. Contact Site Superintendent for repair approach.
Waste from truck spilled on roadway	Contain the spilled material. Collect, containerize, and remove the spilled material. Sample for waste classification purposes. Dispose of material offsite.

POST-SPILL INSPECTION
The Site Superintendent, HSO, Project Manager and the Owner representative will jointly inspect the spill site to determine that the spill has been cleaned up to the satisfaction of all involved parties.

Reporting
In the event of a spill incident, the Site Superintendent or HSO will immediately contact the Project Manager and the Owner representative; initiate the emergency procedure steps that are provided in this HASP and Complete a Spill Report Form for submittal to the Project Manager and the the Owner project representative.

OSC will be responsible for reporting any Priority 1 spills immediately following the incident. A written report will be submitted within seven days after the telephone call reporting the incident. The written report will include the item spilled, quantity, identification, and manifest numbers, whether the amount spilled is EPA/State/District reportable, exact location of occurrence, containment procedures used, anticipated clean-up and disposal procedures and disposal of spill residue.

HEAT/COLD STRESS

HEAT

The Site Superintendent will visually monitor the project personnel for signs of heat overexposure. The Site Superintendent will be responsible for implementing the following program when the ambient air temperature exceeds 85°F (heat stress monitoring).

SYMPTOMS
Weakness, dizziness, fainting, nausea, headaches, cool and clammy skin, profuse sweating, slurred speech, weak pulse and dilated pupils.

PROCEDURE
Personnel who wear PPE allow their body heat to accumulate and may experience an elevation of their body temperature. Heat, heat exhaustion and heat stroke can be experienced which, if not remedied, can threaten health and life. A current edition of the American Red Cross Standard First Aid book or equivalent will be maintained onsite at all times so that the Site Superintendent and all personnel will be able to recognize the symptoms of heat emergency and be capable of controlling them.

When PPE is worn (especially level C) the suggested guidelines for ambient temperature and maximum wear time per excursion are as follows:

Ambient Temperature (°F)	Maximum Wear Time Per Excursion (Minutes)
Above 90	15
85 – 90	30
80 – 85	60

70 – 80	90
60 – 70	120
50 – 60	180

One method for measuring the effectiveness of employees' rest-recovery regime is by monitoring their heart as follows:

- During a 3-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute and the last 30 seconds of the third minute.
- Double that count.
- If the recovery rate during the last 30 seconds of the first minute is at 110 beats per minute or less and the deceleration between the first, second and third minute is at least 10 beats/minute, the work recovery regime is acceptable. If the employee's rate is above the specified, a longer rest period is required, and accompanied by an increased intake of fluids.

COLD

Whole body protection will be provided to all Project personnel who will have prolonged exposure to cold air. The Site Superintendent will use the equivalent chill temperature when determining the combined cooling effect of wind and low temperatures on exposed skin or when determining the proper clothing insulation requirements. The following clothing will help in cold weather.

- Appropriate underclothing (wool or other cloth)
- Outer coats that repel wind and moisture
- Face, head and ear coverings
- Extra pairs of socks
- Insulated safety boots
- Wool glove liners or wind and water repellant gloves

Personnel who are working in continuous cold weather are required to warm themselves on a regular basis in the onsite trailer. Drinks will be provided to personnel to prevent dehydration. The Site Superintendent will follow the work practices and recommendations for cold stress threshold limit values as stated by the current edition of the Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices by the American Conference of Governmental Industrial Hygienists, or equivalent cold stress prevention methods.

LOGS, REPORTS and RECORDKEEPING

The following reports will be prepared and be available as indicated below. Copies of permits and forms required for this project are provided in Attachment 1.

Type	Frequency
AHA	Prior to start of work
Employee Daily Safety Brief	Daily
Air Monitoring Reports	As needed
Incident Report	As required, within 48 hours

The above logs and reports will be prepared by the Site Superintendent, the HSO, or the designated representative, at the frequency noted above. Completed logs and reports will be maintained stored on site in the project field office. Copies shall be provided to the Owner representative as requested.

HOT WORK PERMIT PROCEDURES

OSC will follow specific procedures to ensure all hot work activities, welding, burning, cutting, sparking and other ignition source work is completed safely without incident (no fires, injuries, or property damage). All hot work shall require an approved hot work permit issued by the OSC Site Superintendent prior to commencing work. The hot work permit shall define the minimum acceptable procedures and precautions that shall be taken for all phases of the hot work; prior to start of work, as well as during and after hot work is completed. A permit shall be issued daily for each specific location, type of hot work, protective measures, date, time duration and completion time. Hot work permits will be available for review by the Owner Representative. Completed and signed permits shall be returned to the Site HSO at the end of the workday. Copies of completed permits shall be maintained in the OSC field office for review.

AUTHORIZATION OF EQUIPMENT OPERATORS

All heavy equipment operators working on the site will be approved as competent either through OSC's in-house program or through local labor union process. Training requirements for approval are as follows.

Heavy Equipment Operators

- Determination of competency by a certified operator
- On-the-job mentoring under a competent person

The mentoring may be adjusted based on an operator's previous experience. In addition, operators may need to obtain state-specific crane licenses/permits.

Crane Operators

- Formal classroom with written qualification
- Determination of proficiency by a certified operator
- On-the-job mentoring for under a competent person
- Have CCO license for the crane being operated.

The formal classroom and mentoring may be adjusted based on an operator's previous experience. In addition to the certification, operators may need to obtain state-specific licenses/permits.

Appendix G – Green and Sustainable Remediation & GHG Tracking Metrics

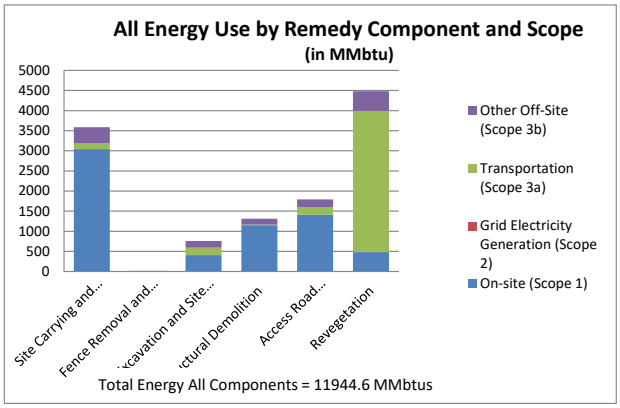
Environmental Footprint Summary

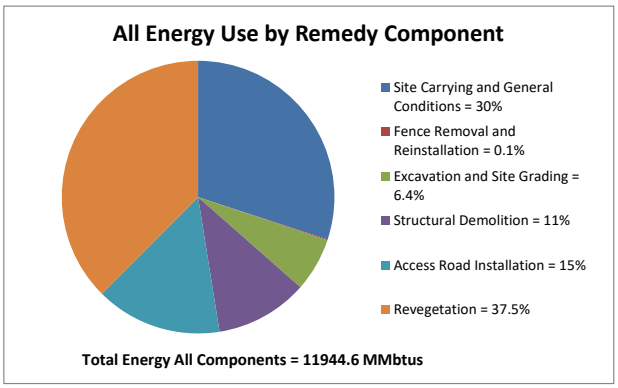
Core Element	Metric		Unit of Measure	Footprint						
				Site Carrying and General Conditions	Fence Removal and Reinstallation	Excavation and Site Grading	Structural Demolition	Access Road Installation	Revegetation	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0	0.1	0.3	0.0	0.0	0.4
	M&W-2	% of refined materials from recycled or reused material	%			100.0%	0.0%		0.0%	24.1%
	M&W-3	Unrefined materials used on-site	Tons	1,000.027	60.000	2,600.005	0.000	2,800.020	28,390.000	34,850.1
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0%	100.0%	0.0%		100.0%	39.6%	40.5%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	525.0	0.0	0.0	0.0	525.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%			0.0%				0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.4	0.0	0.0	0.4
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	1.0	0.0	0.0	0.0	1.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	3,585.8	13.7	759.0	1,312.5	1,790.2	4,483.3	11,944.6
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.000	0.000	0.000	0.000	0.000	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	3,911.6	8.3	526.3	1,482.8	1,816.6	621.6	8,367.1
	A-2	On-site HAP emissions	Pounds	0.1	0.0	0.0	0.0	0.1	0.0	0.2
	A-3	Total NOx, SOx, and PM emissions	Pounds	4,322.6	15.6	1,169.7	1,609.7	2,179.8	5,486.5	14,784.0
	A-3A	Total NOx emissions	Pounds	3,942.7	14.2	824.4	1,461.4	1,989.1	5,007.7	13,239.6
	A-3B	Total SOx emissions	Pounds	263.1	1.0	92.6	99.2	132.2	332.3	920.4
	A-3C	Total PM emissions	Pounds	116.9	0.4	252.7	49.1	58.4	146.5	624.1
	A-4	Total HAP emissions	Pounds	29.1	0.1	5.6	9.8	13.6	32.9	91.2
	A-5	Total greenhouse gas emissions	Tons CO2e*	292.4	1.1	61.5	107.9	146.2	366.5	975.7
Land & Ecosystems	Qualitative Description									

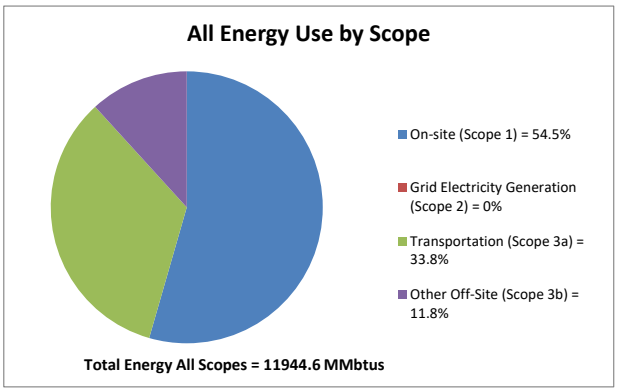
** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:







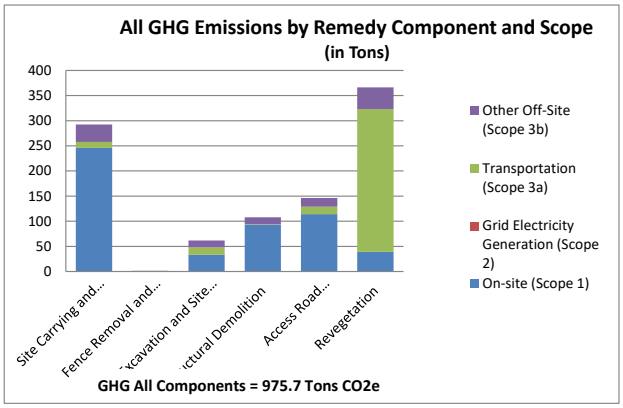
Total Energy
MMbtus

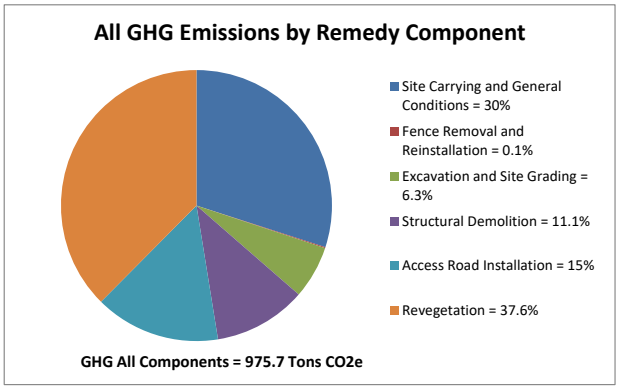
	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total	
On-site (Scope 1)	3,040.9	6.5	409.1	1,152.7	1,412.2	483.3	6,504.6	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Electricity
nsportation (Scope 3a)	145.2	5.6	182.7	12.2	180.7	3,508.8	4,035.2	Tran
her Off-Site (Scope 3b)	399.8	1.6	167.2	147.6	197.3	491.3	1,404.7	Oth
Total	3,585.8	13.7	759.0	1,312.5	1,790.2	4,483.3	11,944.6	

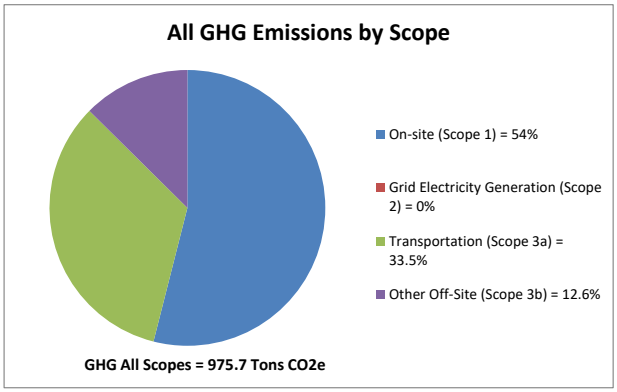
Site Carrying and General Conditions = 30%
Fence Removal and Reinstallation = 0.1%
Excavation and Site Grading = 6.4%
Structural Demolition = 11%
Access Road Installation = 15%
Revegetation = 37.5%

On-site (Scope 1) = 54.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 33.8%
Other Off-Site (Scope 3b) = 11.8%

Total Energy All Components = 11944.6 MMbtus
Total Energy All Scopes = 11944.6 MMbtus







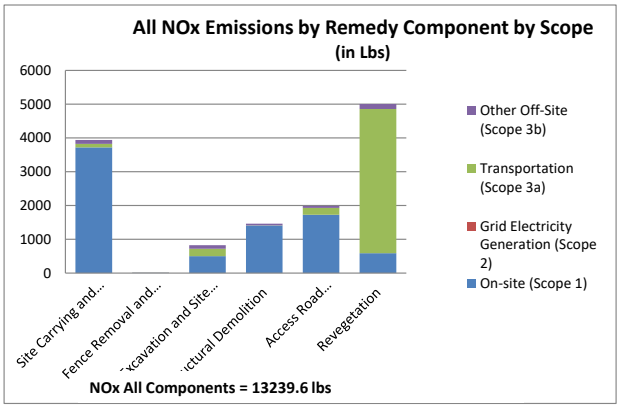
GHG
Tons CO2e

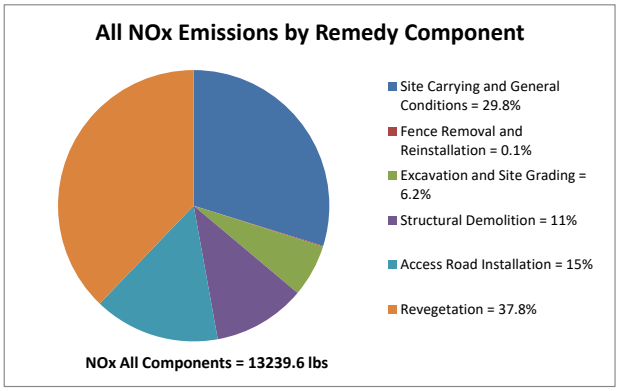
	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total	
On-site (Scope 1)	246.1	0.5	33.1	93.3	114.3	39.1	526.5	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	l Electricity
sportation (Scope 3a)	11.7	0.5	14.8	1.0	14.6	284.0	326.4	Tran
er Off-Site (Scope 3b)	34.6	0.1	13.6	13.7	17.3	43.4	122.8	Oth
Total	292.4	1.1	61.5	107.9	146.2	366.5	975.7	

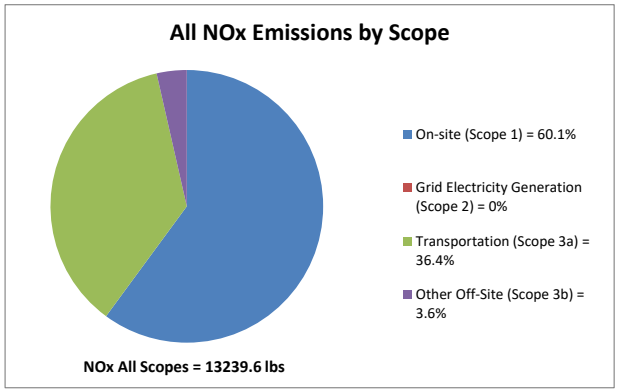
Site Carrying and General Conditions = 30%
Fence Removal and Reinstallation = 0.1%
Excavation and Site Grading = 6.3%
Structural Demolition = 11.1%
Access Road Installation = 15%
Revegetation = 37.6%

On-site (Scope 1) = 54%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 33.5%
Other Off-Site (Scope 3b) = 12.6%

GHG All Components = 975.7 Tons CO2e
GHG All Scopes = 975.7 Tons CO2e







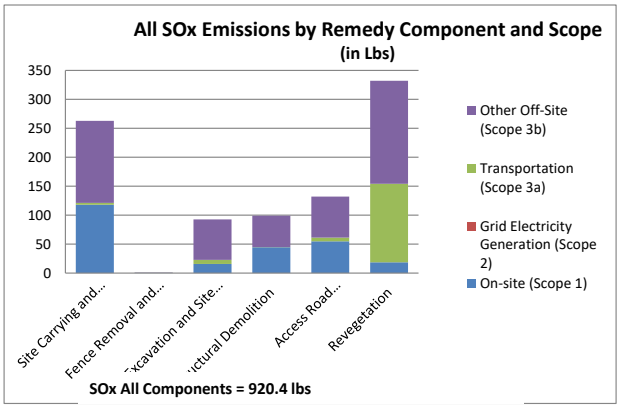
NOx lbs

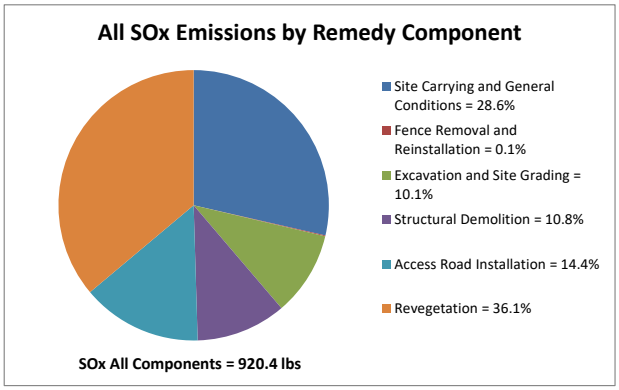
	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total	
On-site (Scope 1)	3,719.0	7.9	500.4	1,409.8	1,727.1	591.0	7,955.3	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Electricity
sportation (Scope 3a)	106.7	5.9	221.4	5.0	203.5	4,270.2	4,812.8	Tran
er Off-Site (Scope 3b)	116.9	0.4	102.6	46.6	58.5	146.5	471.5	Oth
Total	3,942.7	14.2	824.4	1,461.4	1,989.1	5,007.7	13,239.6	

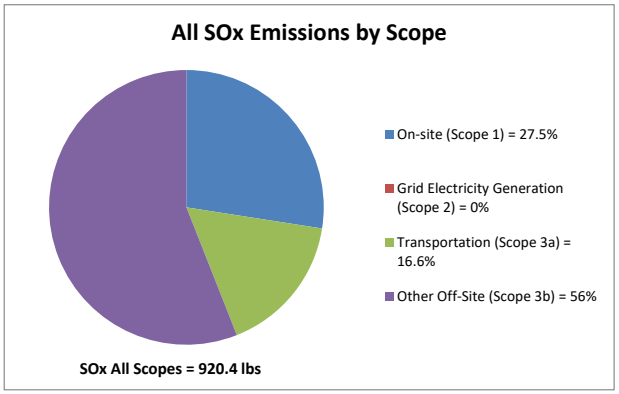
Site Carrying and General Conditions = 29.8%
Fence Removal and Reinstallation = 0.1%
Excavation and Site Grading = 6.2%
Structural Demolition = 11%
Access Road Installation = 15%
Revegetation = 37.8%

On-site (Scope 1) = 60.1%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 36.4%
Other Off-Site (Scope 3b) = 3.6%

NOx All Components = 13239.6 lbs
NOx All Scopes = 13239.6 lbs







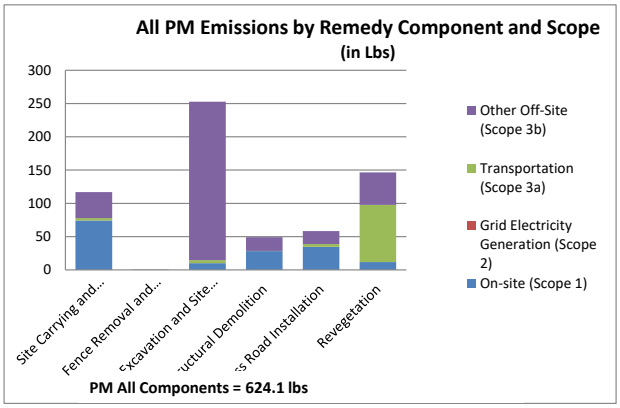
SOx lbs

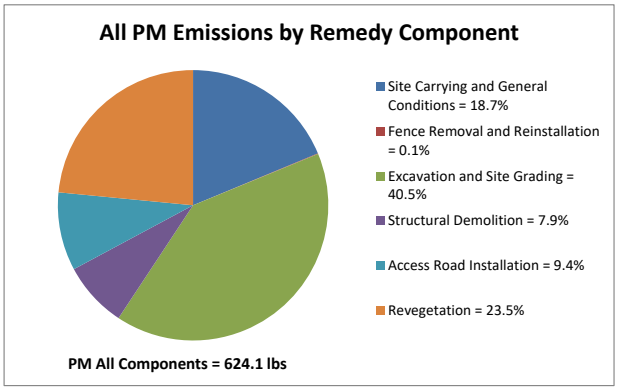
	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total	
On-site (Scope 1)	118.1	0.3	15.9	44.8	54.9	18.8	252.7	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	l Electricity
sportation (Scope 3a)	3.1	0.2	7.0	0.1	6.4	135.6	152.4	Tran
er Off-Site (Scope 3b)	141.8	0.5	69.7	54.3	71.0	178.0	515.3	Oth
Total	263.1	1.0	92.6	99.2	132.2	332.3	920.4	

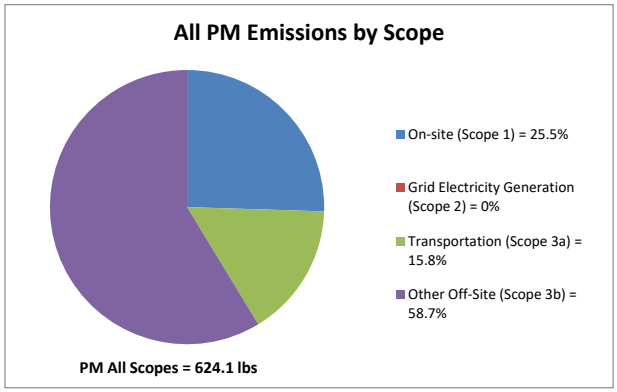
Site Carrying and General Conditions = 28.6%
Fence Removal and Reinstallation = 0.1%
Excavation and Site Grading = 10.1%
Structural Demolition = 10.8%
Access Road Installation = 14.4%
Revegetation = 36.1%

On-site (Scope 1) = 27.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 16.6%
Other Off-Site (Scope 3b) = 56%

SOx All Components = 920.4 lbs
SOx All Scopes = 920.4 lbs







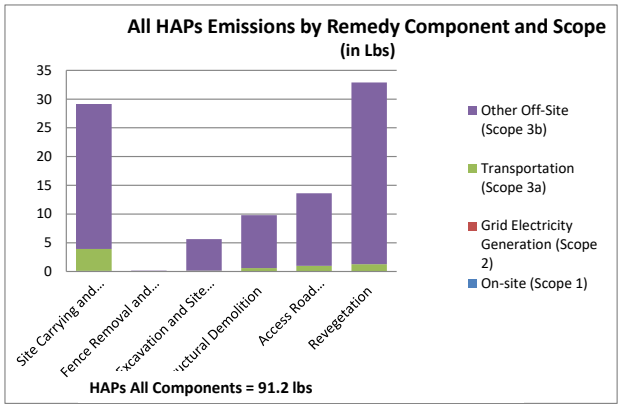
PM lbs

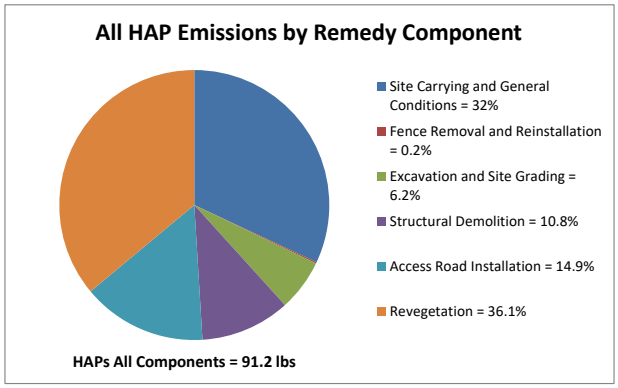
	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total	
On-site (Scope 1)	74.4	0.2	10.0	28.2	34.5	11.8	159.1	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Electricity
sportation (Scope 3a)	3.5	0.1	4.5	0.3	4.4	85.8	98.7	Tran
er Off-Site (Scope 3b)	39.0	0.1	238.2	20.6	19.5	48.8	366.3	Oth
Total	116.9	0.4	252.7	49.1	58.4	146.5	624.1	

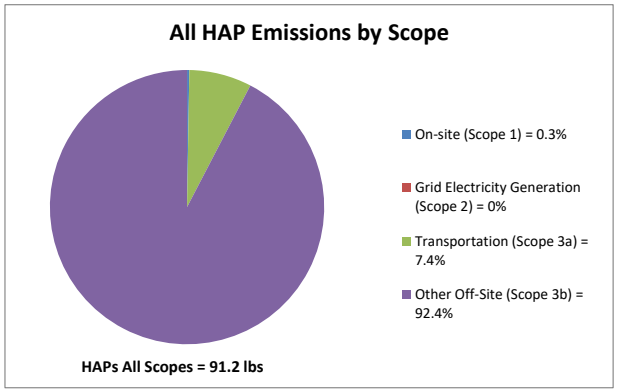
Site Carrying and General Conditions = 18.7%
Fence Removal and Reinstallation = 0.1%
Excavation and Site Grading = 40.5%
Structural Demolition = 7.9%
Access Road Installation = 9.4%
Revegetation = 23.5%

On-site (Scope 1) = 25.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 15.8%
Other Off-Site (Scope 3b) = 58.7%

PM All Components = 624.1 lbs
PM All Scopes = 624.1 lbs







HAPs
lbs

	Site Carryi	Fence Rem	Excavation	Structural	Access Roa	Revegetati	Total
On-site (Scope 1)	0.1	0.0	0.0	0.0	0.1	0.0	0.2
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sportation (Scope 3a)	3.8	0.1	0.1	0.5	0.9	1.3	6.7
er Off-Site (Scope 3b)	25.2	0.1	5.5	9.2	12.6	31.6	84.2
Total	29.1	0.1	5.6	9.8	13.6	32.9	91.2

Site Carrying and General Conditions = 32%
Fence Removal and Reinstallation = 0.2%
Excavation and Site Grading = 6.2%
Structural Demolition = 10.8%
Access Road Installation = 14.9%
Revegetation = 36.1%

On-site (Scope 1) = 0.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 7.4%
Other Off-Site (Scope 3b) = 92.4%

HAPs All Components = 91.2 lbs
HAPs All Scopes = 91.2 lbs