STORMWATER MANAGEMENT REPORT

NEW INDUSTRIAL MANUFACTURING AND WAREHOUSING FACILITY FOR TACO COMFORT SOLUTIONS, Inc.

33 Broad Street
One Weybosset Hill
Floor 7
Providence, RI 02903
www.woodardcurran.com

woodardcurran.com

0234511.00
Taco Comfort Solutions, Inc.
July 2023

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1. INTRODUCTION

This Stormwater Management Plan is for a proposed Manufacturing and Warehousing Facility (the Project) to be located at 35 Carlsbad Street, Cranston, Rhode Island for Taco Comfort Solutions, Inc. The proposed manufacturing and warehousing facility (the Site) will be located within existing Lots 3141 and 3744 on Assessor's Plat 7, bound by Carolina St, Carlsbad St, Burnham Ave and the Washington Secondary Bike Path. The drawings provided in Appendix A depict the proposed project Site.

The proposed project Site is currently used by Taco Comfort Solutions, Inc. to serve as employee parking and truck and trailer storage. The proposed project includes but is not limited to; a new 97,860-square foot (SF) manufacturing and warehousing facility, parking lots, loading/shipping dock, drainage system, water service connections, sewer service connections, natural gas service connections and landscaping. The drawings provided in Appendix A depict the Project.

The Project includes the installation of a closed conduit drainage system to collect stormwater within the Site. The stormwater will be directed to two underground infiltration chamber systems with outlet control structures connecting to the City of Cranston MS4 within Carlsbad Street and Burnham Avenue. The information and calculations presented in this report demonstrate how the Project meets each of the applicable Rhode Island Department of Environmental Management (RIDEM) Stormwater Minimum Standards.

A portion of the Site is encumbered by an Environmental Land Use Restriction (ELUR). Accordingly, the Project is being coordinated with the RIDEM Land Revitalization & Sustainable Materials Management Department and the RIDEM Remediation Regulations. A draft Remedial Action Work Plan (RAWP) has been prepared and submitted to RIDEM for review under a separate application.

2. EXISTING CONDITIONS

2.1 Site Description

The Site occupies 5.05 acres in the northern sector of Cranston, bounded by the Washington Secondary Trail bike path to the east, Burnham Avenue to the south, Carlsbad Street to the west, and Carolina Street to the north. The Site was previously developed with multiple buildings used by the Providence Box and Lumber Co. and a rail spur from the former rail line (currently the bike path). The buildings were demolished 15+ years ago. The southern portion of the Site was then developed 10+ years ago as a truck and trailer staging area and a parking lot for Taco Comfort Solutions, Inc. employees. The existing site predominately consists of asphalt and crushed stone ground cover. The northern paved area used for truck and trailer parking drains to a infiltration basin approved by RIDEM as a Groundwater Discharge (GWD #14-001). The center of the site is vacant and enclosed by a fence. The surface in this area consists of stone over landscape fabric.

Lot 3141 (the 35 Carlsbad Street property) became subject to the RIDEM Remediation Regulations in 2005 (Case No. 2005-097) and RIDEM issued a Remedial Approval Letter in 2009 for the proposed remedial activities that included the construction of the environmental cap. Upon completion of the cap construction, an Environmental Land Use Restriction (ELUR) was recorded on lot 3141 in 2015. The ELUR was established to maintain the use of the property as industrial/commercial and to maintain established engineered barriers. The ELUR does not currently include lot 3744 (the 0 Carlsbad Street property). As part of the Project, the existing ELUR for 35 Carlsbad Street will be removed and replaced with a new ELUR that will include both the 35 Carlsbad Street property and the 0 Carlsbad Street property. As previously discussed with RIDEM, the expanded ELUR is necessary due to the amount of earthwork and transfer of soils between the two sites that will be required to construct the Project.

The Site currently discharges to the City of Cranston's existing closed conduit drainage system that outfalls directly to Spectacle Pond. Spectacle Pond is classified by RIDEM as SB1{A} and all Class SB criteria apply to the Project and the proposed stormwater best management practices (BMPs). Spectacle Pond is on the State of Rhode Island 2022 303(d) List of Impaired Waters for total phosphorus, dissolved oxygen, and excess algal growth. Total Daily Maximum Loads (TMDLs) were developed in the 2007 report "Total Maximum Daily Loads for Phosphorus To Address 9 Eutrophic Ponds in RI", found in Appendix C. The report states the existing Spectacle Pond watershed consists of 57% impervious cover and the existing load based on the Reckhow formula was 216 kg/yr. The resulting phosphorus TMDL limits Spectacle Pond to 68 kg/year. The Site does not contain wetlands and does not meet the definition of a Land Use with Higher Potential Pollutant Loads (LUHPPL) per the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM).

The project Site is approximately 55% impervious ground cover with 2.80 acres of the 5.05 acre project site consisting of asphalt parking lots. Therefore, the project Site exceeds the minimum requirements set by the RISDISM for a project to qualify as a redevelopment.

2.2 Site Topography

The Site slopes from the northeast corner to the southeast corner and towards Carlsbad Street to the west. The grades of the Site range from approximately elevation 70'± to 54'± (NAVD88). A topographic survey of the Site was performed by Crossman Engineering on April 6, 2022. Existing site conditions are depicted on the drawings in Appendix A.

2.3 Existing Conditions Watersheds

The Site has four (4) existing conditions watersheds. Watershed EX-1 is on the northern portion of the project Site at the corner of Carolina St. and Carlsbad St. Watershed Ex-1 drains to an existing infiltration basin previously approved by RIDEM as a Groundwater Discharge (GWD #14-001). Watershed EX-2 and Watershed EX-3 both discharge to Spectacle Pond via the existing City of Cranston MS4. Watershed Ex-4 is a small, grassed area that discharges to Carolina St. The existing watersheds are depicted on Figure 2-1.

2.4 Soils Data

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey, Site soils are comprised primarily of Sudbury sandy loam (Ss) and Urban land (Ur). The NRCS Soil Survey classified Ss as Hydrologic Soil Group (HSG) B and Ur as unrated HSG. Soil information is provided in Appendix B.

Onsite soil explorations consisted of test pits and borings. 15 test pits were completed by JRD Inc. and observed by Woodard & Curran and Lahlaf Geotechnical Consulting, Inc. (LGCI) in November 2022. 17 borings were completed in December 2022 by Northern Drill Service, Inc. (NDS) and observed by LGCI. The completed RIDEM Soil Evaluation Forms and LGCI's Geotechnical Report are provided in Appendix B. These field explorations revealed that the Site soils consist of human transported material (fill) to depths ranging from 1 foot to 12 feet beneath the ground surface. The fill is underlain in some areas by buried organic or subsoil followed by sand and gravel extending to the termination depths of the test pits and borings. Two additional borings, B-101 and B-102, were advanced by LGCI and NDS in February 2023 and extended to depths of 49 feet and 53.5 feet beneath the ground surface, respectively. Test pit and boring locations are shown on the drawings included in Appendix A.

2.5 Groundwater

According to the Geotechnical Report supplied by LGCI, the groundwater elevations observed during test pit explorations within the project Site range between elevations 44' and 47'. The borings conducted by LGCI and NDS resulted in observed groundwater elevations range between elevations 41' and 51'. The proposed subsurface infiltration chamber systems were designed using groundwater elevation information from test pits TP-2, TP-4 and TP-10 as well as boring B-15.

2.6 Flood Zone

According to the National Flood Insurance Program (NFIP) Flood Insurance Rate Map (FIRM) for Providence County, Rhode Island (Map Number 44007C0312H, Panel 445396 – revised October 2, 2015. The entire site is within the Federal Emergency Management Agency (FEMA) Zone "X" – Area of Minimal Flood Hazard. A FIRMETTE of the Site, which represents an excerpt of the FIRM, is provided as Figure 2-2.

3. PROPOSED CONDITIONS

The Project consists of the construction of a new 97,860-square foot (SF) manufacturing and warehousing facility. The proposed facility will include space for manufacturing, warehousing and a small testing laboratory. Site improvements include 115,000± square feet (SF) of paved parking and drive aisles, landscaped areas, sidewalks, and curbing. Post-construction, 4.65 acres of the 5.05 acre project Site will be impervious surfaces consisting of asphalt parking lots, concrete sidewalks, drive isles and the roof of the proposed facility. Taco Comfort Solution, Inc.'s Safety Director confirmed that the proposed building will not receive or ship hazardous substances. Therefore, the loading dock area is not considered a Land Use with Higher Potential Pollutant Loading (LUHPPL). A letter from the Owner stating that no LUHPPLs will be present on site is included in Appendix D.

The proposed Site development involves significant earthwork for two reasons. First, the proposed building operations require the finished floor of the entire building be at the same elevation. Therefore, the Site will be regraded to accommodate that need. As a result, the elevation of the southern portion of the Site consisting of a surface parking lot will be raised and supported by retaining walls. Second, the in-situ fill soils do not provide suitable bearing capacity for the proposed building. Therefore, the fill within the building footprint will be excavated and blended with crushed stone to meet the gradation requirements for Structural Fill prior to backfilling in compacted lifts.

The entire footprint of the proposed manufacturing and warehousing facility is within Lot 3141 which is currently encumbered by the ELUR established in 2015. Lot 3744 on the south end of the Site is not currently encumbered by an ELUR and will be raised to meet the proposed finished grade. Due to the earthwork required to meet the proposed grades, the ELUR will be expanded to encompass both lots 3141 and 3744 to avoid the cost and difficulty of separately managing the soils.

Proposed stormwater management features will collect and treat runoff prior to discharge to the City's drainage system. The project's stormwater management features include a closed conduit drainage system and subsurface infiltration chambers. The bottom of the infiltration chambers will be constructed at an elevation that is a minimum four feet above estimated seasonal high groundwater within the native sand and gravel layer. In the event urban fill soils are discovered below the proposed infiltration chambers, it will be removed and replaced with medium coarse sand. There will be an increased amount of impervious cover under post-development conditions due to the addition of new roof area at the Site. The proposed closed conduit drainage system has been designed to capture the Site's 4.88 acres of new and disturbed impervious and pervious area. The proposed stormwater Best Management Practices (BMPs) are depicted on the drawings in Appendix A.

3.1 Proposed Conditions Watersheds

The proposed Site has one (1) proposed watershed, identified by its discharge location or DP: the City of Cranston MS4. The proposed project Site has eight (8) sub catchments consisting of asphalt parking lots, asphalt drive isles, landscaped areas and the proposed facility roof. The majority of the project Site will be captured by the proposed drainage network to be treated and infiltrated with a portion of the captured stormwater ultimately discharging to the City's existing MS4 in Burnham Avenue and Carlsbad Street. The proposed watersheds are shown on Figure 3-1.

4. STORMWATER CALCULATIONS

The stormwater calculations presented in this section include the pre- and post-development runoff volumes and peak rates of runoff from the Site provided in Appendix C and Appendix D respectively, as well as water quality calculations provided in Appendix E. The groundwater recharge standard does not apply because this project is a redevelopment on filled soils with an Environmental Land Use Restriction.

4.1 Hydrologic Methodology

A hydrologic analysis was performed to calculate and compare the peak rates of runoff for the existing and proposed conditions. The analysis was performed using HydroCAD® modeling software, developed by HydroCAD® Software Solutions LLC. The HydroCAD® software is based upon the Soil Conservation Service (SCS) Technical Release 20 – Urban Hydrology for Small Watersheds (TR-20), which is an industry accepted standard. The HydroCAD® model calculates peak rates of runoff by considering various hydrologic parameters and the stormwater structural measures that directly influence the rate at which runoff is conveyed from a watershed. The hydrologic parameters that were applied to perform these calculations are as follows:

- Design Event: The project was evaluated under the Water Quality Volume (WQV), 1-, 2-, 10-, and 25-year 24-hour NRCC Rainfall Events. Rainfall depths associated with each event were obtained from the Extreme Precipitation in New York & New England Interactive Web Tool developed by Cornell, NRCS, and NRCC for Cranston, Rhode Island and are presented in Table 4-1.

Table 4-1: Rainfall Depths – Cranston, Rhode Island

Rainfall Event	Rainfall Depth (inches)
WQV	1.20
1-Year	2.70
2-year	3.21
10-year	4.74
25-year	5.93

- Curve Number: Curve numbers are specific to each watershed and are a function of the perviousness of the watershed cover, the underlying soil type, and antecedent moisture conditions. Cover types for existing and proposed conditions were applied based on the Existing Conditions Survey and Proposed Site Plan provided in Appendix A. Underlying soil type HSG D was applied based on the soil data presented in Appendix B and visual observation. The curve numbers were calculated using the Separate Pervious/Impervious Runoff method in HydroCAD®. Curve number calculations for each watershed are presented in Appendix C and Appendix D.

- Time of Concentration: The time of concentration represents the time for runoff from the hydrologically distant point of a watershed to reach the discharge location. The time of concentration is specific to each watershed and is a function of the slope, length, and surface roughness of the flow path. Flow paths for existing and proposed conditions were delineated using the existing and proposed topography (depicted in Figure 2-1 and 3-1, respectively. Calculations for the time of concentration for each watershed are presented in Appendix C and Appendix D. A minimum time of concentration of 6.0 minutes was used.

- Watershed Area: The watershed boundaries were delineated using the existing and proposed topography depicted in Appendix A. The existing and proposed watershed boundaries are illustrated on Figure 2-1 and Figure 3-1 respectively. Watershed areas are included with the calculations provided in Appendix C and Appendix D.

4.2 Existing and Proposed Hydrologic Analysis

The ultimate design point for all existing and proposed watersheds on the project Site is Spectacle Pond. The pre- and post-construction hydrologic analysis of the project Site was conducted to measure peak flows discharging to the existing City of Cranston MS4 on both Carlsbad Street (1A) and Burnham Avenue (1B). A description of the two design points, including comparison of the pre- and post-construction peak discharge rates at these points, is provided in the following sections. Stormwater runoff was attenuated to meat peak flows up to the 25-year storm.

4.2.1 Design Point 1A: Carlsbad Street

Design point 1A represents the discharges to the existing City of Cranston MS4 on Carlsbad Street. The design point receives runoff from watersheds EX-1, EX-2, and EX-4 under existing conditions and watersheds PR-1, PR-2, Pr-3 and PR-4 under proposed conditions as depicted in Figures 2-1 and 3-1 respectively.

Table 4-2: Design Point 1A Summary

Conditions	Peak Rate of Runoff (CFS)				
	WQV	1-Year	2-Year	10-Year	25-Year
Pre-Construction	1.25	3.45	4.19	6.44	8.71
Post-Construction	0.34	1.94	2.67	4.39	6.81
Difference	-0.91	-1.51	-1.52	-2.05	-1.90

4.2.2 Design Point 1B: Burnham Avenue

Design point 1B represents the discharges to the existing City of Cranston MS4 on Burnham Avenue. The design point receives runoff from watershed EX-3 under existing conditions and watersheds PR-5, PR-6, Pr-7, and PR-8 under proposed conditions as depicted in figures 2-1 and 3-1 respectively.

Table 4-3: Design Point 1B Summary

Conditions	Peak Rate of Runoff (CFS)				
	WQV	1-Year	2-Year	10-Year	25-Year
Pre-Construction	3.47	9.54	11.59	17.65	22.32
Post-Construction	0.32	3.82	5.06	7.96	11.90
Difference	-3.15	-5.63	-6.53	-9.69	-10.42

4.3 Hydraulic Analysis

A hydraulic analysis of the proposed closed conduit drainage system was performed using Hydraflow Storm Sewers Extension for AutoCAD Civil 3D version 12.0, developed by Autodesk. Hydraflow uses the energy-based standard step method to compute the hydraulic profile within a closed conduit drainage system to evaluate the capacity of the system. Hydraflow also uses the Rational Method to calculate peak rates of runoff. The Intensity-Duration-Frequency (IDF) rainfall data used in calculating the peak rates of runoff is from the Extreme Precipitation in New York & New England Interactive Web Tool developed by Cornell, NRCS, and NRCC.

The analysis was performed with a tailwater condition within the existing drainage manholes in Carlsbad Street and Burnham Avenue to simulate the existing City of Cranston MS4 flowing at capacity. The hydraulic model for Design Point 1A at Carlsbad St. used a starting hydraulic grade line at elevation 58.74′ NAVD88. The hydraulic model for Design Point 1B at Burnham Ave. used a starting hydraulic grade line at elevation 50.63′ NAVD88.

The proposed closed conduit drainage system has been sized to adequately convey stormwater runoff for up to a 25-year storm event. The analysis also demonstrates that the proposed catch basin inlets have been designed to capture runoff for up to the 25-year storm event without bypass offsite. Results from the Hydraflow analysis can be found in Appendix E.

4.4 Water Quality

Spectacle Pond is listed as an impaired waterbody for total phosphorus, dissolved oxygen, and excess algal growth in the Rhode Island 303(d) List of Impaired Waters report. A TMDL for Spectacle Pond sets a target for phosphorus concentration at 20ug/l to reduce the phosphorus concentrations in a downstream water body. The impaired condition of the receiving water requires there be no net increase of phosphorus under post-construction conditions. Existing and proposed pollutant loading calculations for phosphorus discharged to Spectacle Pond were performed using the Simple Method presented in Section H.3 of the RISDISM. Calculations are included in Appendix E.

Stormwater treatment is proposed to be provided through two systems totaling a ±7,000 square footprint of subsurface detention chambers within the proposed pavement areas. The water quality volume that will be retained within the subsurface detention chamber sections is equivalent to a 1.2″ storm event. Treating the 1.2″ storm event (12,175 CF) will achieve a phosphorus removal efficiency of 100% and allow the project to meet the phosphorus loading

requirement of no net increase. The removal efficiency was based on the University of New Hampshire Stormwater Center Performance Curve for Infiltration Trenches (dated 2017). The performance curve supporting the phosphorus loading calculations can be found in Appendix E. Table 4-4 below summarizes the Site's phosphorus loads.

Table 4-4: Spectacle Pond Phosphorus Pollutant Loading

Phosphorus (lbs/year)		
Existing	**Proposed**	**Net**
5.55	0.90	-4.64

4.5 BMP Descriptions

The following BMPs have been designed in accordance with the requirements set forth in the RISDISM.

4.5.1 Deep Sump Hooded Catch Basins

The project Site will utilize deep sump hooded catch basins throughout the proposed drainage system to serve as pre-treatment for the proposed infiltration chamber systems. As discussed during the pre-application meeting on May 2, 2023, deep sump hooded catch basins used in conjunction with isolator rows are an acceptable BMP. The meeting minutes for the pre-application meeting can be found in Appendix F.

4.5.2 Subsurface Infiltration Chambers

The project Site will be utilizing subsurface chamber infiltration systems to treat stormwater runoff and meet the stormwater recharge requirements. The project site drains to two infiltration systems located in the north and south portions of the project Site. Both systems will be constructed using the StormTech MC-3500d chambers and have been sized to with the use of outlet control structures to attenuate the 25-year storm was required by the RISDISM for a redevelopment project. The proposed infiltration chamber system in the north of the project Site will be constructed with the bottom of the system in natural soils, below the existing urban fill on the project site. The southern proposed infiltration chamber system will be constructed with a 12" sand bedding connected the system to natural soils and providing the required separation from the groundwater observed in the Geotechnical Report found in Appendix B.

5. STORMWATER MANAGEMENT STANDARDS COMPLIANCE

This section discusses the project's compliance with the Minimum Stormwater Standards set forth in the RISDISM. As stated above, the project site qualifies as a redevelopment. Therefore, only Standards 2, 3, and 7-11 must be addressed as stated in the RISDIM. A summary of each standard is provided below (in italics) for reference purposes, and a description regarding the project's compliance with the standard is also provided.

- Minimum Standard 2 – Groundwater Recharge

Stormwater must be recharged within the same subwatershed to maintain baseflow at pre-development recharge levels to the maximum extent practicable.

Required groundwater recharge volume calculations for the project Site are included in Appendix E. HydroCAD calculations for proposed groundwater recharge are included in Appendix D. The Groundwater Recharge Worksheet shows that the proposed infiltration for the project Site (0.335 ac-ft) exceeds the required groundwater recharge volume (0.2325 ac-ft); therefore, Standard 2 will be met.

- Minimum Standard 3 – Water Quality

Stormwater runoff must be treated before discharge.

Water quality volume calculations for the proposed stormwater improvements, including subsurface detention chambers, are included in Appendix E. The Water Quality Volume Calculation Worksheet demonstrates that the provided water quality volume for Spectacle Pond (18,814 CF) is greater than the required water quality volume (15,282 CF); therefore, Standard 3 will be met.

Additionally, pollutant loading calculations for total phosphorus are included in Appendix E. These calculations demonstrate that pollutant loading under proposed conditions will not exceed existing conditions.

- Minimum Standard 7 – Pollution Protection

All development sites require the use of source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality.

A Soil Erosion and Sediment Control Plan is provided in Appendix G.

- Minimum Standard 8 – Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads (LUHPPLs) require the use of specific source control and pollution prevention measures and the specific stormwater BMPs approved for such use.

The proposed impervious areas discharging runoff to the proposed stormwater BMPs are not considered a LUHPPL by RIDEM Standards. A letter from the owner stating that the facility will not handle hazardous materials is found in Appendix D.

- Minimum Standard 9 – Illicit Discharges

All illicit discharges to stormwater management systems are prohibited.

There are no known existing illicit discharges to the stormwater management system and none are proposed.

- Minimum Standard 10 – Construction Erosion & Sedimentation Control

Erosion and sedimentation control (ESC) practices must be utilized during the construction phase as well as during any land disturbing activities.

Construction Erosion & Sedimentation Controls are depicted on the drawings in Appendix A.

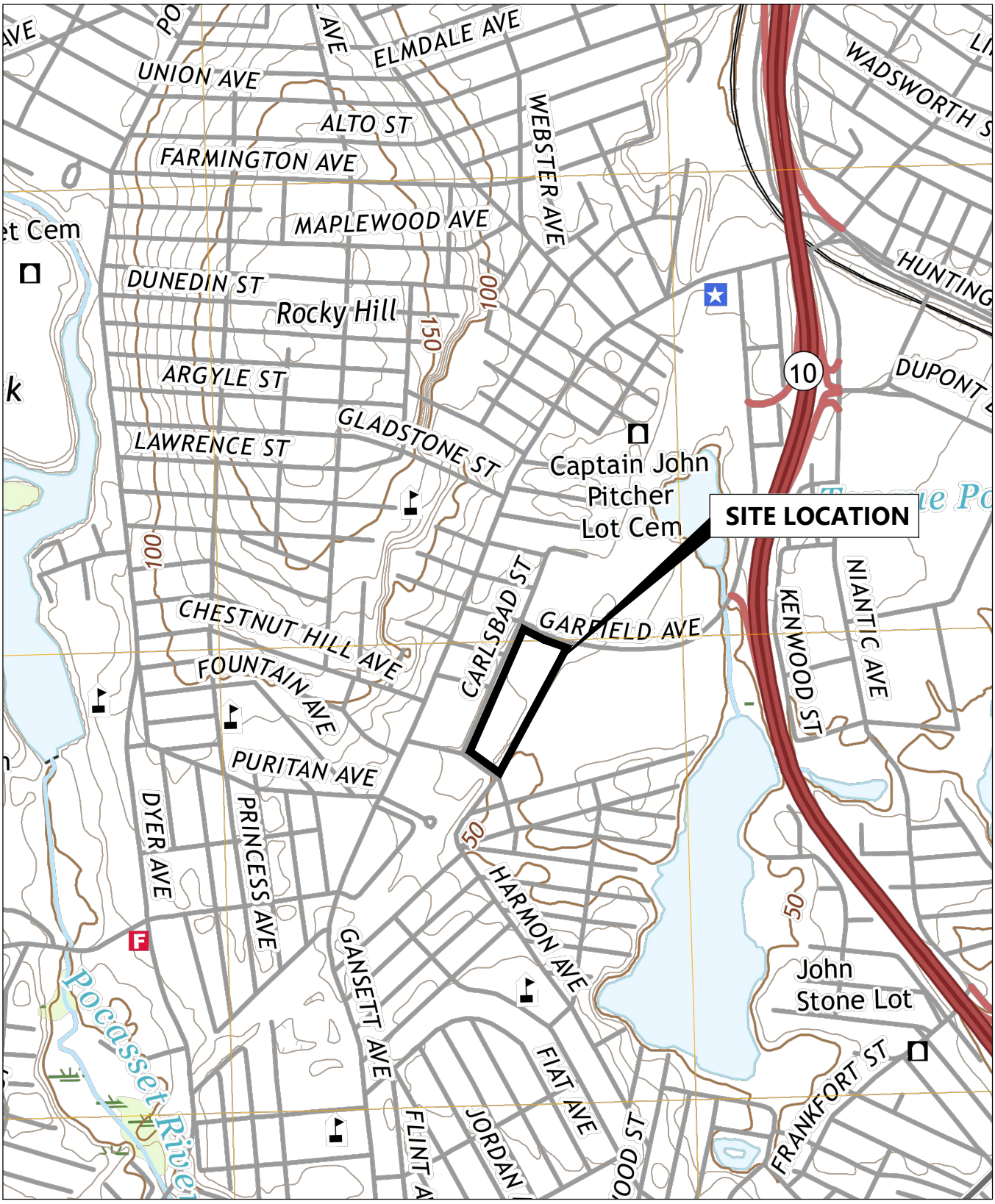
- Minimum Standard 11 – Stormwater Management System Operation & Maintenance

The stormwater management system, including all structural stormwater controls and conveyances, must have an operation and maintenance plan to ensure it continues to function as designed.

A Stormwater Management System Operation & Maintenance Plan is provided in Appendix H.

Figure 1-1: Site Locus

PLOT SCALE: 1:1



BAR SCALE
1" = 1000'
CHECK GRAPHIC SCALE BEFORE USING

Woodard & Curran	Client Info: TACO COMFORT SOLUTIONS, INC. 35 CARLSBAD STREET CRANSTON, RHODE ISLAND 02920	Job No: 0234511.00 Date: JULY 2023 Scale: AS NOTED Des by: GRB Drn by: GRB Chk by: CG	Drawing Title SITE LOCUS MAP	Drawing Number **FIGURE 1-1**

\\woodardcurran.net\shared\projects\0234511.00 taco 35 carlsbad\wip\drawings\figures\02334511.00-site locus

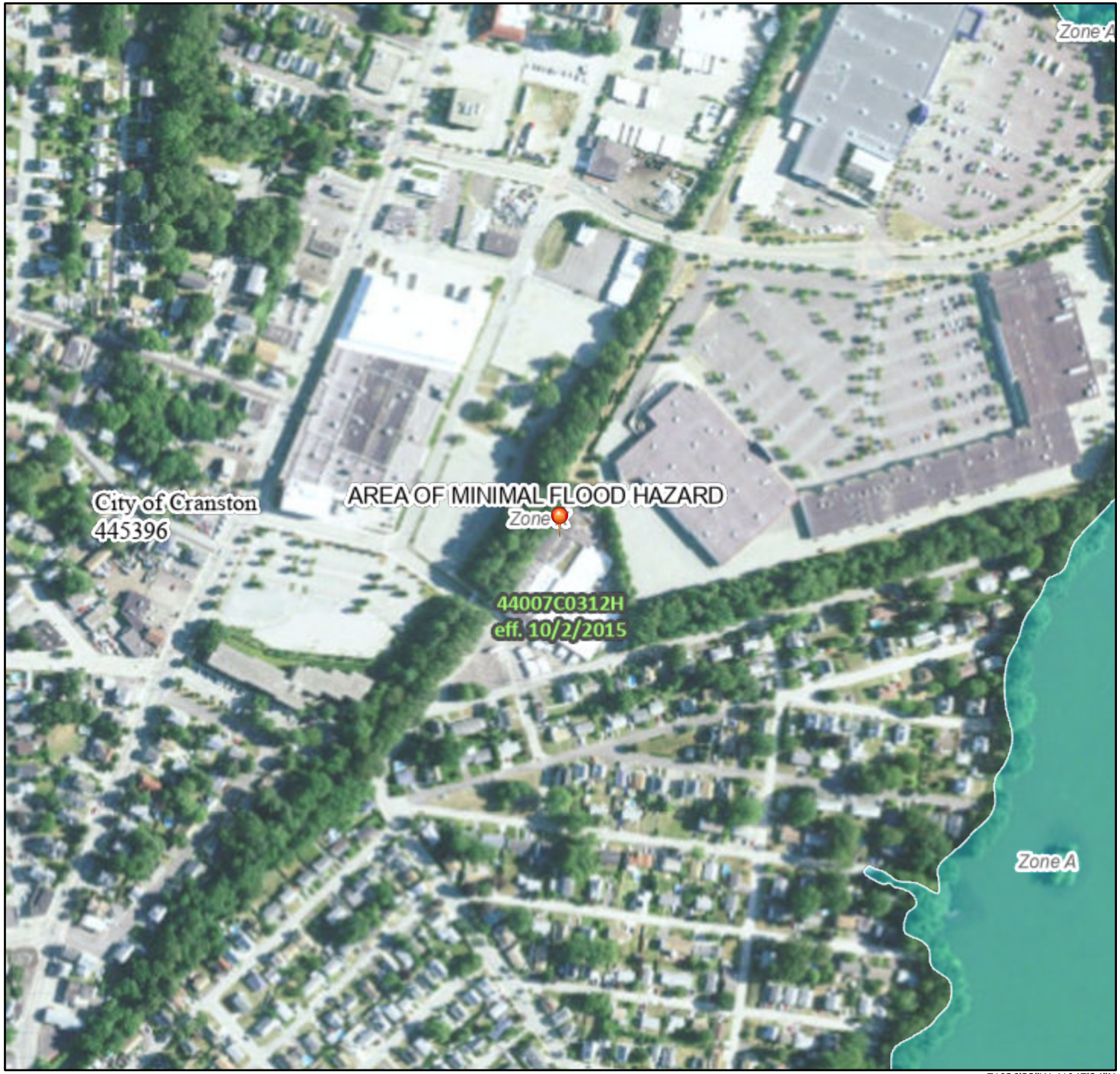
Figure 2-1: Existing Watersheds (Bound Separately)

Figure 2-2: FEMA Firmette

National Flood Hazard Layer FIRMette

FEMA

71°27'10"W 41°47'51"N



71°26'32"W 41°47'24"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/28/2023 at 3:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 3-1: Proposed Watersheds (Bound Separately)

Figure 4-1: Subcatchment Area Plan (Bound Separately)

APPENDIX A: DRAWINGS (BOUND SEPARATELY)

APPENDIX B: SOILS INFORMATION

LGCI
Lahlaf Geotechnical Consulting, Inc.

March 3, 2023

Mr. Jon Giampietro
Senior Vice President of Operations
Taco Comfort Solutions
1160 Cranston Street
Cranston, RI 02920
Phone: (401) 942-8000 x 575
Mobile: (401) 632-3462
E-mail: JonGia@TacoComfort.com

Re: **Geotechnical Report**
Proposed Manufacturing Building
Cranston, Rhode Island
LGCI Project No. 2252-Rev. 1

Dear Mr. Giampietro:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed a geotechnical study for the proposed Manufacturing Building in Cranston, Rhode Island. We are submitting our geotechnical report electronically.

The soil and rock samples from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil and rock samples after three (3) months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

Lahlaf Geotechnical Consulting, Inc.

Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

LGCI
Lahlaf Geotechnical Consulting, Inc.

GEOTECHNICAL REPORT
PROPOSED MANUFACTURING BUILDING
CRANSTON, RHODE ISLAND

LGCI Project No. 2252-Rev. 1
March 3, 2023

Prepared for:

Taco Comfort Solutions
1160 Cranston Street
Cranston, RI 02920
Phone: (401) 942-8000

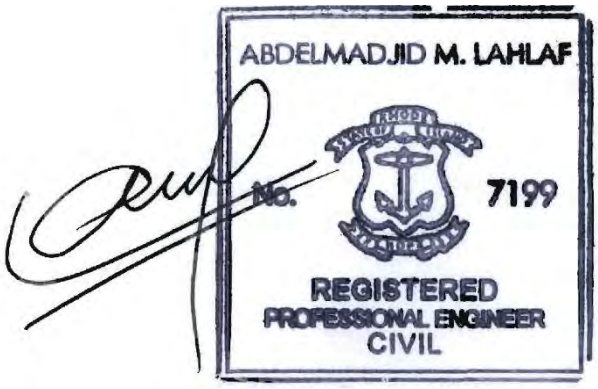
GEOTECHNICAL REPORT
PROPOSED MANUFACTURING BUILDING
CRANSTON, RHODE ISLAND
LGCI Project No. 2252-Rev. 1
March 3, 2023

Prepared for:

Taco Comfort Solutions
1160 Cranston Street
Cranston, RI 02920
Phone: (401) 942-8000

Prepared by:

LAHLAF GEOTECHNICAL CONSULTING, INC.
100 Chelmsford Road, Suite 2
Billerica, Massachusetts 01862
Phone: (978) 330-5912
Fax: (978) 330-5056



Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

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1. PROJECT INFORMATION

1.1 Project Authorization

This geotechnical report presents the results of the subsurface explorations and a geotechnical evaluation performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed Manufacturing Building in Cranston, Rhode Island. To date, we have performed our services in two phases as follows.

We performed our original services in general accordance with our proposal No. 22037-Rev. 1 dated September 7, 2022, revised on September 19, 2022. Mr. Jon Giampietro of Taco Comfort Solutions (TCS) authorized our original services by signing our proposal on October 9, 2022.

We performed additional services in general accordance with our proposed No. 23012 dated February 9, 2023. Mr. Jon Giampietro of TCS authorized our additional services by signing our proposal on February 13, 2023.

1.2 Purpose and Scope of Services

The purpose of our geotechnical services was to perform subsurface explorations at the site for the proposed manufacturing building, and to provide foundation design and construction recommendations. LGCI performed the following services:

- Coordinated our exploration locations with TCS and with Mr. Robert Kelliher of Thermo-Mechanical Systems Corporation (TMSC), the project manager.

- Marked the exploration locations at the site and notified Dig Safe Systems Inc. (Dig Safe) and the City of Cranston for utility clearance.

- Engaged a drilling subcontractor for a total of six (6) days to advance nineteen (19) soil borings at the site, including four (4) days to advance seventeen (17) soil borings as part of our original services and two (2) days to advance an additional two (2) soil borings as part of our additional services.

- Observed fifteen (15) test pits performed at the site by an excavator subcontractor hired by TMSC.

- Provided an LGCI geotechnical engineer at the site to coordinate and observe the test pits and borings, describe the soil samples, and prepare field logs.

- Submitted fourteen (14) soil samples from the test pits for laboratory testing, including four (4) samples included in our scope, six (6) additional samples approved by the owner as part of our original services, and four (4) samples as part of our additional services. The laboratory tests included eight (8) grain size analyses, two (2) organic content tests on fill from

explorations performed as part of our original services, and four (4) organic content tests on buried organic soil from our additional service explorations.

- Prepared this geotechnical report containing the results of our subsurface explorations and our recommendations for foundation design and construction.

Upon the completion of our original services, LGCI submitted a geotechnical report dated January 16, 2023. This geotechnical report includes the results of our original services and supersedes the aforementioned report.

Our scope does not include preparing specifications, reviewing contract documents, attending meetings, or providing construction services. LGCI would be pleased to perform these services when needed. Recommendations for unsupported slopes, stormwater management, erosion control, pavement design, slope stability analyses, liquefaction and/or site-specific seismic analysis, pile analysis and design, and cost or quantity estimates are not included in our scope of work.

LGCI's scope of services does not include an environmental assessment for the presence or absence of wetlands or analytical testing for hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site, or mold in the soil or in any structure at the site. Any statements regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

1.3 Site Description

Our understanding of the site is based on our field observations, our discussions with TMSC, and on the following documents:

- Document titled: "Environmental Land Usage Restriction," (ELUR Document) dated January 19, 2015, and provided to LGCI by TMSC via e-mail on March 21, 2022.

- Drawing C-200 titled: "Civil Proposed Site Plan, Taco, Inc., 1160 Cranston Street, Cranston, RI 02920, 35 Carlsbad Building," (Site Plan) prepared by Woodard & Curran, dated August 2022, and provided to LGCI by TMSC via email on August 23, 2022.

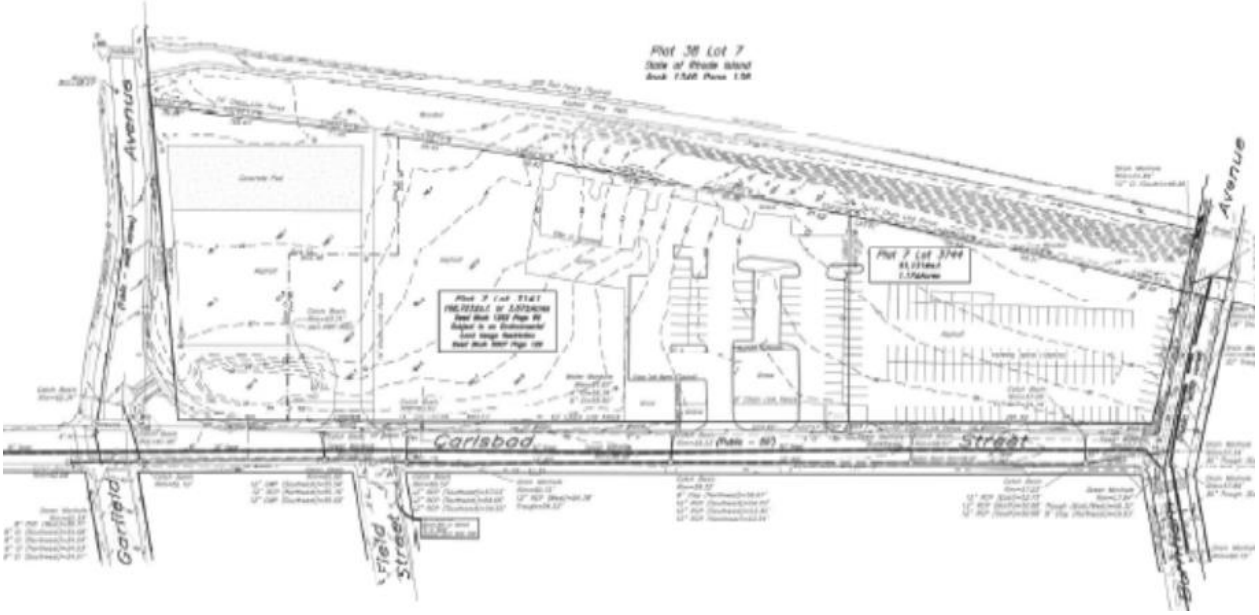
- Drawing titled: "Exiting Conditions, Assessors Plat 7-3, Lots 3141 & 3744, 35 Carlsbad Street, Cranston, RI 02920," (Existing Conditions Plan), prepared by Crossman Engineering, dated April 5, 2022, and provided to LGCI by TMSC on August 23, 2022.

The site is located east of the existing TCS building located at 1160 Cranston Street in Cranston, Rhode Island as shown in Figure 1. The site is bordered by Carlsbad Street on the western side, by Burnham Street on the southern side, by Carolina Street on the northern side, and by Washington Secondary Trail on the eastern side. The site is currently used as a parking lot and tractor trailer storage yard. The site consists of asphalt and concrete parking areas and grass

landscape features. A portion of the site is capped with crushed stone and geotextile fabric due to an Environmental Land Usage Restriction (EULR) described below.

Based on the Site Plan, the grades at the site generally range from El. 52 feet near Burnham Street near the southeastern corner of the site and El. 70 feet near Carolina Street near the northeastern corner of the site. The existing grades within the general area of the proposed building (described in Section 1.4) range between El. 57 feet near the southern side of the proposed building and El. 68 feet near the northern side of the proposed building. The existing grades within the general area of the proposed northern parking lot range between El. 62 feet and El. 69 feet. The existing grades within the general area of the proposed southern parking lot range between El. 54 feet and El. 59 feet.

Based on the Existing Conditions Plan, the site is divided into two (2) lots as shown in the plan below: a northern Lot 3141 zoned C-4 on the northern side and M-2 on the southern side, and a southern Lot 3744 zoned M-2. Lot 3141 comprises most of the site and has an area of about 3.87 acres. Lot 3744 has an area of about 1.17 acres.



Excerpt from Existing Conditions Plan

We understand that the northern portion of the site, i.e., Lot 3141, has an EULR. Based on the ELUR Document, we understand that the site is capped and that the top several feet of soil consist of contaminated soil. We understand that as a result of the ELUR on Lot 3141, materials excavated from the northern portion of the site, i.e., Lot 3141, cannot be transferred or reused on the southern side in Lot 3744.

1.4 Project Description

Our understanding of the proposed construction is based on our discussions with TMSC and the documents listed in Section 1.3.

We understand that TCS is planning to develop the site into a new manufacturing building. We understand that the proposed construction will consist of a one-story manufacturing building located on the northern side of the site that will have a footprint of about 85,500 square feet. The proposed building will be located entirely in Lot 3141. We understand that the proposed building will not have a basement.

We understand that the proposed grading, including the finished floor elevation of the proposed building, is a work in progress and will be finalized based on the results of this report and on the environmental constraints from the ELUR. The grading information described herein is preliminary and is based on the drawings listed in Section 1.3.

Based on the Site Plan, the proposed building will have a first finished floor elevation (FFE) of El. 64 feet; thus, requiring cuts of up to 4 feet on the northern side and fills of up to 7 feet on the southern side to achieve the proposed grade of the building.

We understand that the proposed construction will also consist of paved parking lots located to the north and south of the proposed building. The proposed grades within the proposed northern parking lot will range between El. 62 feet and El. 68 feet, requiring cuts of about 2 feet and fills of about 2.5 feet to achieve the proposed grades. The proposed grades within the proposed southern parking lot will range between El. 56 feet and El. 62 feet, requiring fills ranging between 2 and 6 feet to achieve the proposed grades. The northern parking lot will be accessible from Carolina Street via an access road. The southern parking lot will be accessible from Burnham Street via an access road.

We understand that after the proposed grades are finalized, the magnitude of the cuts and fill described above may change slightly. However, the general pattern of the earthwork operation will still remain as consisting of slights cuts on the northern side and fill on the southern side of the site.

1.5 Elevation Datum

We understand that the elevations provided in the Site Plan and Existing Conditions Plan are referenced with respect to the North American Vertical Datum of 1988 (NAVD88). Elevations are in feet.

2. SITE AND SUBSURFACE CONDITIONS

2.1 Surficial Geology

LGCI reviewed a surficial geologic map titled: "Geologic Map of Providence Quadrangle, Rhode Island, Surficial Geology," prepared by J. Hiram Smith in 1956, Geological Survey, Map GQ-84.

The surficial geologic map of the site indicates that the natural soils in the general vicinity of the site consist of outwash plains.

The outwash plains consist of sorted sand and local deposits of coarse gravel.

The Surficial Geologic Map is shown in Figure 2.

2.2 LGCI's Explorations

2.2.1 General

LGCI coordinated our exploration locations with TMSC and marked the exploration locations in the field. LGCI notified Dig Safe and the City of Cranston for utility clearance prior to starting our explorations at the site.

Unless notified otherwise, we will dispose of the soil and rock samples obtained during our explorations after three (3) months.

2.2.2 LGCI's Test Pits

LGCI observed fifteen (15) test pits (TP-1 to TP-15) excavated at the site by JRD, Inc. of Assonet, Massachusetts on November 14 and 15, 2022. The test pits were excavated using a Deere 710G backhoe. The test pits extended to depths ranging between 9 feet and 12 feet beneath the ground surface. Upon completion, the test pits were backfilled with the excavated material in 12-inch to 18-inch lifts and tamped with the excavator bucket.

An LGCI geotechnical engineer observed and logged the test pits in the field.

2.2.3 LGCI's Soil Borings

As part of our original services, LGCI engaged Northern Drilling Services, Inc. (NDS) of Northborough, Massachusetts to advance seventeen (17) soil borings (B-1 to B-17) at the site between December 19 and 22, 2022. The borings were advanced with a Mobile B-53 ATV Drill Rig using 3 ¼" inner diameter hollow stem augers. The borings extended to depths ranging between 12 and 22 feet beneath the ground surface. Upon completion, the boreholes were backfilled with the soil cuttings and sand. The ground surface was restored with asphalt cold patch in paved areas.

During our additional services, LGCI engaged NDS to advance an additional two (2) soil borings (B-101 & B-102) at the site on February 17 and 20, 2023. The borings were advanced with a Mobile B-48 ATV Drill Rig using drive and wash boring techniques with 4-inch casings. Borings B-101 and B-102 extended to depths ranging between 49 and 53.5 feet beneath the ground surface, respectively. Upon completion, the boreholes were backfilled with the soil cuttings and gravel. The ground surface was restored with asphalt cold patch.

NDS performed Standard Penetration Tests (SPT) and obtained split spoon samples with an automatic hammer at typical depth intervals of 2 feet or 5 feet as noted on the boring logs in general accordance with ASTM D-1586.

An LGCI geotechnical engineer observed and logged the borings in the field.

2.2.4 Exploration Logs and Locations

The boring and test pit locations are shown in Figure 3. Appendix A contains LGCI's test pit logs. Appendix B contains LGCI's boring logs. Tables 1 and 2 include summaries of LGCI's test pits and borings, respectively.

2.3 Subsurface Conditions

The subsurface description in this report is based on a limited number of explorations and is intended to highlight the major soil strata encountered during our explorations. The subsurface conditions are known only at the actual exploration locations. Variations may occur and should be expected between exploration locations. The boring and test pit logs represent conditions that we observed at the time of our explorations and were edited, as appropriate, based on the results of the laboratory test data and inspection of the soil samples in the laboratory. The strata boundaries shown in our boring and test pit logs are based on our interpretations and the actual transitions may be gradual. Graphic soil symbols are for illustration only.

The soil strata encountered in LGCI's test pits and borings were as follows, starting at the ground surface.

Asphalt – Asphalt was encountered at the ground surface in test pits TP-1 to TP-4, TP-11, and TP-13 and in borings B-1 to B-6, B-12, B-14 to B-16, B-101, and B-102. The thickness of the asphalt ranged between 0.2 feet and 0.4 feet.

Topsoil – A layer of surficial organic topsoil was encountered at the ground surface in test pits TP-5 to TP-7, TP-10, and TP-12, and in borings B-7 and B-13. The thickness of the topsoil ranged between 0.2 feet and 2 feet beneath the ground surface.

Crushed Stone – A layer of crushed stone was encountered at the ground surface in test pits TP-8 to TP-9, and TP-14 to TP-15, and in borings B-8 to B-11, and B-17. The thickness of the crushed stone ranged between 0.3 feet and 0.5 feet.

Fill – A layer of fill was encountered beneath the asphalt, topsoil, or crushed stone in all test pits and borings, except in test pit TP-7. The fill extended to depths ranging between 1 foot and 12 feet beneath the ground surface. The samples in this layer were mostly described as silty sand, well graded sand, or poorly graded sand. Two (2) samples were described as well graded gravel. The fines content in the fill ranged between 0 and 30 percent, but was in most samples less than 20 percent. The gravel content in the fill ranged between 0 and 30 percent. When described as gravel, the sand content in the fill ranged between 15 and 30 percent. The fill contained traces of organic soil, brick, roots, concrete, asphalt, wood, plastic, glass, clay pipe, and construction debris.

The SPT N-values in this layer ranged between 3 blows per foot (bpf) and 54 bpf, with most values ranging below 15 bpf, indicating very loose to medium dense material. Please note that the high SPT N-values recorded in the fill may be due to obstructions such as cobbles and boulders present in the fill and may not represent the true density of the fill. Also, the deeper fill was generally looser than the shallow fill. The excavation effort in the fill layer was described as easy to moderate.

Buried Organic Soil – A layer of buried organic soil was encountered beneath the fill in test pits TP-4 and TP-6, and in borings B-2, B-4, and B-102 performed within or near the southern side of the proposed building. The buried organic soil extended to depths ranging between 8 feet and 11 feet beneath the ground surface. The samples in this layer were described as silty sand. The fines content in the buried organic soil ranged between 20 and 35 percent and the gravel content ranged between 5 and 10 percent. The buried organic soil contained traces of organic soil and roots.

The SPT N-values in this layer ranged between 2 and 10 bpf, indicating very loose to loose material. The excavation effort within this layer was described as easy.

Buried Subsoil – A layer of buried subsoil was encountered beneath the fill in test pits TP-1, TP-3, and TP-5. The buried subsoil extended to depths ranging between 5 feet and 7.7 feet beneath the ground surface. The samples in this layer were described as silty sand and well graded sand. The fines content in the buried subsoil ranged between 10 and 20 percent and the gravel content ranged between 15 and 20 percent. The buried subsoil contained traces of organic soil and roots.

The excavation effort within this layer was described as easy, indicating loose material.

Sand and Gravel – A layer of sand and gravel was encountered beneath the topsoil, fill, buried organic soil, or buried subsoil in all test pits and borings. The sand and gravel extended to the termination depths of the test pits and borings, except in borings B-101 and B-102 where the sand and gravel extended to depths of 33 feet and 44 feet beneath the ground surface, respectively. The samples in this layer were mostly described as poorly graded sand and well graded sand. Five (5) samples were described as silt, three (3) samples were described as silty sand, and two (2) samples were described as well graded gravel. The fines content in this layer ranged between 0 and 40 percent, with most samples containing less than 25 percent fines. The gravel content ranged between 0 and 35 percent. When described as gravel or silt, the sand

content in this layer ranged between 20 and 45 percent. The silt was described as non-plastic. One (1) sample within this layer contained traces of weathered rock.

The SPT N-values in this layer ranged between 3 bpf and 66 bpf, with most values ranging between 10 bpf and 31 bpf, indicating mostly medium dense material. Please note that the high SPT N-values recorded in the sand and gravel may be due to obstructions such as cobbles and boulders present in the sand and gravel and may not represent the true density of the sand and gravel.

Silt – A layer of silt was encountered beneath the sand and gravel in boring B-101 and within the sand and gravel layer in boring B-102. The silt extended to depths of 45 feet and 39 feet beneath the ground surface in borings B-101 and B-102, respectively. The samples within this layer were described as silt with sand. The sand content within this layer ranged between 10 and 20 percent. The silt was described as non-plastic to moderately plastic. A few samples within this layer contained traces of weathered rock.

The SPT N-values in this layer ranged between 3 bpf and 12 bpf, indicating soft to medium stiff silt. Split spoon refusal was encountered on apparent rock within this layer in boring B-101 at a depth of 45 feet beneath the ground surface.

Weathered Rock – A layer of weathered rock was encountered beneath the sand and gravel in boring B-102 at a depth of 44 feet beneath the ground surface. The weathered rock extended to a depth of 46 feet beneath the ground surface. The sample within this layer was described as silty sand. The fines content within this layer ranged between 20 and 25 percent and the gravel content ranged between 20 and 25 percent.

Split spoon refusal was encountered on rock within this layer at a depth of 46 feet beneath the ground surface.

Rock – Split spoon refusals were encountered in borings B-101 and B-102 at depths of 45 feet and 46 feet beneath the ground surface, respectively.

To confirm and characterize the rock, rock was cored in boring B-101. The rock consisted of a very soft to soft, fresh, moderately fractured to sound, black, fine-grained, Shale. The rock core recovery was 100 percent, and the Rock Quality Designation (RQD) was 56.7 percent. The coring rate ranged between 2.0 and 4.0 minutes per foot (min./ft.).

2.4 Groundwater

Groundwater was encountered in test pits TP-1 to TP-5, and in all borings except in borings B-1 and B-11 at depths ranging between 6.0 and 22.0 feet beneath the ground surface, as shown in Tables 1 and 2 and in the boring and test pit logs.

The groundwater information reported herein is based on observations made during or shortly after the completion of drilling or excavation. In addition, water was introduced into borings B-

101 and B-102 during drilling. Therefore, the reported groundwater levels may not represent the actual groundwater conditions, as additional time may be required for the groundwater levels to stabilize. The groundwater information presented in this report only represents the conditions encountered at the time and location of the explorations. Seasonal fluctuation should be anticipated.

2.5 Laboratory Test Data

LGCI submitted eight (8) soil samples collected from the test pits for grain-size analysis. The results of the grain-size analyses are provided in the test data sheets included in Appendix C and are summarized in the table below.

Grain-Size Analysis Test Results

Test Pit No.	Sample No.	Stratum	Sample Depth (ft.)	Percent Gravel	Percent Sand	Percent Fines
TP-4	Grab	Fill	0.3 – 3.0	31.6	56.8	11.6
TP-5	Grab	Silt	7.7 – 12.0	0.1	40.1	59.8
TP-6	Grab	Fill	1.5 – 8.5	32.6	55.5	11.9
TP-7	Grab	Sand and Gravel	2.0 – 5.0	25.5	72.7	1.8
TP-8	Grab	Fill	0.3 – 5.5	29.4	56.4	14.2
TP-9	Grab	Fill	0.3 – 5.0	49.4	42.1	8.5
TP-10	Grab	Fill	0.8 – 6.5	17.3	76.6	6.1
TP-15	Grab	Fill	0.3 – 4.0	46.4	49.2	4.4

LGCI also submitted two (2) soil samples from the fill strata in test pits TP-3 (from 0.5 feet to 4 feet) and TP-13 (from 0.5 feet to 5 feet) to a laboratory for organic content tests, and the tests indicated organic contents (by weight) of 2.6 and 2.2 percent, respectively. LGCI also submitted four (4) soil samples from the buried organic soil stratum in the borings B-2 (from 8 feet to 10 feet), B-4 (from 6 feet to 8 feet), and B-102 (from 8 feet to 10 feet), and from test pit TP-4 (from 6.5 to 9.0 feet). The results from these tests will be provided separately.

3. EVALUATION AND RECOMMENDATIONS

3.1 General

Based on our understanding of the proposed construction, our observation of our borings, and the results of our laboratory testing, there are a few issues that we would like to highlight for consideration and discussion.

3.1.1 Asphalt, Surficial Topsoil, Existing Fill, Buried Topsoil, and Buried Subsoil

- Asphalt, topsoil, existing fill, crushed stone cap, buried topsoil, and buried subsoil were encountered in the borings. These materials are not suitable to support foundations.

- The asphalt and the surficial topsoil should be removed from within the entire construction area, including the proposed building footprint and the proposed driveways and parking lots.

- The existing fill was observed to be variable in composition and was generally very loose to medium dense. In addition, variable amounts of organic matter were noted in several of the fill samples. Existing fill that was not placed with strict moisture, density, and gradation control presents risk of unpredictable settlement that may result in poor performance of floor slabs and foundations. Due to these risks, the existing fill as well as the buried topsoil and buried subsoil should be entirely removed from within the proposed building footprint. We anticipate that the removal will extend up to depths of about 12 feet. The removal may extend to greater depths at locations not explored by LGCI. Laterally, the removal should extend beyond the proposed building footprint a distance equal to the distance between the bottom of the proposed footings and the top of the natural sand and gravel, or 5 feet, whichever is greater.

- We recommend segregating the buried organic topsoil and buried subsoil from the existing fill. After the excavation of the existing fill and the buried organic topsoil and buried subsoil is completed, the existing fill may be placed back in 9-inch loose lifts and compacted to 95 percent relative compaction. Whereas the existing fill generally contained a fines content higher than 10 percent, we recommend improving the existing fill to meet the gradation of Structural Fill by blending it with crushed stone and use the blend under footings and within 3 feet from the bottom of the proposed slab. We estimate that a blending ratio of about 2 parts crushed stone to 5 parts existing fill would produce a blend that meets the gradation requirements for Structural Fill. The blending ratios may be revised during construction based on grain-size analyses on bulk samples. The Structural Fill should extend to within the zone of influence of footings, i.e., within a zone defined by a line inclined at 45 degrees and extending from the outside edge of the proposed footing downward and outward.

- The blending of the existing fill with crushed stone will generate surplus material, mainly of existing fill. The surplus material could be reused to raise the grades at the site including in the southern lot (Lot 3744). This would require combining the two lots and applying, if possible, the ELUR on the combined lot. If this is not possible, a cost benefit analysis should be performed to compare the cost of the excavation, blending, replacement, and disposal of the surplus material to another option such as ground improvements by means of aggregate piers as described later in this report.

- The subgrade of footings should be prepared in accordance with the recommendations in Section 4.1.

- Within paved areas, the existing fill, should be removed to the top of the natural sand and gravel or to a depth of 18 inches beneath the bottom of the proposed pavement. Where organic soil is exposed, the organic soil should be removed. Where existing fill or buried subsoil are exposed, the existing fill deeper than 18 inches beneath the bottom of the proposed pavement can remain in place provided that it is firm and unyielding following proofrolling and compaction as described in Section 4.1.

3.1.2 Aggregate Piers

Aggregate piers (APs) are typically relatively short, stiff elements of compacted aggregate which improve the existing fill. These elements are typically installed by augering holes ranging from 20 inches to 36 inches in diameter. Aggregate (new crushed stone, recycled concrete, or other granular material) is then introduced into the hole and is generally compacted in one-foot lifts by repeated penetrations with the vibrator, which can be mounted to a crane or tracked carrier. The vibratory or ramming energy densifies the aggregate in the element; thus, producing high modulus aggregate piers. The installation of APs also densifies the surrounding soil depending on the type of soil. These high modulus elements reinforce the treatment zone and increase the composite friction angle and stiffness of the reinforced soil mass. The design of APs is typically verified with a modulus load test.

Where the subsurface conditions include a layer of organic soil and/or peat, the aggregate piers should be grouted in order to reduce the potential for bulging of the AP elements in the soft organic material or peat.

The work of the specialty contractor installing the APs should be coordinated with that of the site contractor who should perform pre-trenching for possible boulders, abandoned foundations, metal pipes, or other obstructions before the installation of the APs.

While the AP installation generates little spoils. Where it is not desired to generate spoils during the improvement process, vertical displacement APs could be used. These are installed by driving a mandrel and hammer to the design depth, feeding the backfill material through the hollow mandrel, and compacting the backfill in one-foot lifts using the hammer; thus, generating no spoils. Vertical displacement APs are typically installed with diameters

ranging between 12 and 16 inches to typical depths ranging between 15 and 35 feet, and to depths of up to 60 feet where needed.

The length of the APs should be based on improvements that reduce the total and differential settlement to within the thresholds established for the project for both static and earthquake loads.

To reduce the length of the APs, we believe that the APs should be installed from the current grade, before placing the Structural Fill required to raise the grades. This option will result in shorter APs under the proposed slab. However, this option will likely require more AP elements under the proposed slab.

The ground improvement technologies are patented, and the design is performed by the specialty contractors. We recommend that if the ground improvement option is selected, the project plans and specifications for ground improvement be performance-based, allowing a variety of ground improvement contractors the opportunity to bid the work. Specifications should indicate the required allowable bearing pressure for footings and slabs, and the allowable total and differential settlements for the structure, including static and earthquake induced settlement. In addition, we recommend that the specifications require that the supporting design calculations be available for review by the design team. Ground improvement contractors should also be provided with grading plans and subsurface information associated with the proposed structure for use in preparing their bids.

3.1.3 Shallow Foundations

Based on the results of the borings, the subsurface conditions are suitable to support shallow spread and continuous footings bearing on Structural Fill placed directly on top of the sand and gravel layer after entirely removing the asphalt, the existing fill, the buried topsoil, and the buried subsoil, or on ground improved with aggregate piers. Our recommendation for net allowable bearing capacity in the sand and gravel is presented in Section 3.2.1.

3.2 Foundation Recommendations

3.2.1 Footing Design

- We recommend entirely removing the surficial topsoil, buried organic soil, buried subsoil, and the existing fill from within the proposed building footprint or improving the site with APs as described in Section 3.1.

- We recommend supporting the proposed building on spread footings bearing on Structural Fill placed directly on the natural sand and gravel or on ground improved with APs.

- We recommend designing the proposed footings using a net allowable bearing pressure of 4 kips per square foot (ksf). We recommend that the footings bear on a minimum of 12 inches of Structural Fill placed directly on top of the natural sand or on ground improved

with APs. The Structural Fill should extend at least on foot laterally beyond the limits of the footings.

- Footing subgrades should be prepared in accordance with the recommendations in Section 4.1.

- All foundations should be designed in accordance with *The Rhode Island State Building Code* (RISBC).

- Exterior footings and footings in unheated areas should be placed at a minimum depth of 4.5 feet below the final exterior grade to provide adequate frost protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.

- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.

- A representative of LGCI should be engaged to observe that the subgrade has been prepared in accordance with our recommendations.

3.2.2 Settlement Estimates

Based on our experience with similar soils and designs using a net allowable bearing pressure of 4 ksf, we anticipate that the total settlement will be approximately 1 inch, and that the differential settlement of the footings will be 3/4 inch or less over a distance of 25 feet. We believe that total and differential settlements of this magnitude are tolerable for a similar structure. However, the tolerance of the proposed structure to the predicted total and differential settlements should be assessed by the structural engineer.

If the site is improved using APs, the specialty contractor should design the APs to limit the settlement within the limits listed above.

3.3 Concrete Slab Considerations

3.3.1 Slabs-on-Grade

- Floor slabs should be constructed as a slabs-on-grade bearing on a minimum of 12 inches of Structural Fill placed directly on top of the natural sand and gravel or on top of ground improved with APs. The subgrade of the slabs should be prepared as described in Section 4.1.

- To reduce the potential for dampness in the proposed floor slab, the project architect may consider placing a vapor barrier beneath the floor slab. The vapor barrier should be protected from puncture during the placement of the proposed slab reinforcement.

- For the design of the floor slab bearing on the materials described above, we recommend using a modulus of subgrade reaction, k_{s1}, of 80 tons per cubic foot (tcf). Please note that the values of k_{s1} are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$Modulus\ of\ Subgrade\ \mathrm{Re}action\ (k_s) = k_{s1} * \left(\frac{B+1}{2B}\right)^2$$

where:

k_s = Coefficient of vertical subgrade reaction for loaded area;
k_{s1} = Coefficient of vertical subgrade reaction for a 1 x 1 square foot area; and
B = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed during the construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.

- The backfill in interior utility trenches should be properly compacted.

- In order for the movement of exterior slabs not to be transmitted to foundations or superstructures, exterior slabs, such as approach slabs and sidewalks, should be isolated from the superstructure.

3.3.2 Under-slab Drains and Waterproofing

Based on the groundwater level observed in the borings, we believe that an under-slab drainage system is not required.

If the proposed building includes an elevator pit or other structure that extends beneath the FFE, such elevator pit or other structure should be designed to be waterproof.

3.4 Seismic Design

Based on the SPT N-values from the borings, we estimate that the seismic criteria for the site are as follows:

- Site Class: D
- Spectral Response Acceleration at short period (Ss): 0.178g
- Spectral Response Acceleration at 1 sec. (S_1): 0.063g
- Site Coefficient Fa (Table 1613.5.3(1)): 1.6
- Site Coefficient Fv (Table 1613.5.3(2): 2.4
- Adjusted spectral response S_{MS}: 0.285g
- Adjusted spectral response S_{M1}: 0.151g

A few low SPT N-values were recorded in borings B-4, B-5, and B-6 advanced on the southern side of the proposed building as part of our explorations performed as part of our original services. To explore whether low SPTs are present deeper than the bottom of the explorations performed as part of our original services, additional borings B-101 and B-102 were advanced to the top of rock. Borings B-101 and B-102 indicated that the low SPT N-values recorded in borings B-4, B-5, and B-6 were isolated, i.e., they were not indicative of a distinct, loose sublayer within the sand and gravel layer. Accordingly, and based on the SPT N-value data from the borings, the site soils are not susceptible to liquefaction.

3.5 Lateral Pressures for Wall Design

3.5.1 Lateral Earth Pressures

Lateral earth pressures for the design of below-grade walls, if any, and site retaining walls are provided below.

Coefficient of Active Earth Pressure, K_A:	0.31
Coefficient of At-Rest Earth Pressure, K_o:	0.47
Coefficient of Passive Earth Pressure, K_p:	3.3
Total Unit Weight γ:	125 pcf

Note: The values in the table are based on a friction angle for the backfill of 32 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and on a vertical wall face.

- Exterior walls of below-ground spaces and other retaining walls braced at the top to restrain movement/rotation, should be designed using the "at-rest" pressure coefficient.

- We recommend placing free-draining material within the 3 feet immediately behind retaining walls.

- We recommend providing weep holes at the bottom of site retaining walls, including temporary SOE systems, to promote drainage where possible. Alternatively, a pipe should

be placed at the base of the wall to collect the water. Groundwater collected by the wall drains should be discharged into a lower area if gravity flow is possible.

- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent the disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key. In any case, the passive pressures should be neglected in the top 4 feet.

- Where a permanent vertical uniform load will be applied to the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary lateral construction surcharge load of 100 pounds per square foot (psf) should be applied uniformly over the height of the wall.

- We recommend using an ultimate friction factor of 0.5 between the natural sand and gravel or Structural Fill and the bottom of the wall. Below-grade walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning.

- The design of retaining walls should include the seismic increment to the lateral earth pressures.

3.5.2 Perimeter Drains

- We recommend that free-draining material be placed within 3 feet of the exterior of walls of below-ground spaces, if any. To reduce the potential for dampness in below-ground spaces, proposed below-ground walls should be damp-proofed.

- We recommend that drains be provided behind the exterior of walls of below-ground spaces. The drains should consist of 4-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile for separation and filtration.

To the extent possible, groundwater collected by the wall drains should be discharged in a lower area if gravity flow is possible. In any case, the groundwater collected by the wall drains should be discharged in accordance with municipal, state, and other applicable standards.

3.6 Parking Lots, Driveways, and Sidewalks

3.6.1 General

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways, parking lots, and sidewalks after preparation of the subgrade as described in Section 4.1.

- We recommend entirely removing the existing asphalt and the surficial topsoil from within the footprint of the proposed driveways and parking lots.

- The existing fill should be improved in accordance with the recommendations in Section 4.1.

- Cobbles and boulders should be removed to at least 18 inches below the bottom of the pavement.

3.6.2 Sidewalks

- Sidewalks should be placed on a minimum of 12 inches of Structural Fill with less than 5 percent fines.

- To reduce the potential for heave caused by surface water penetrating under the sidewalk, the joints between sidewalk concrete sections should be sealed with a waterproof compound. The sidewalks should be sloped away from the building or other vertical surfaces to promote flow of water. To the extent possible, roof leaders should not discharge onto sidewalk surfaces.

3.6.3 Pavement Sections

A typical, minimum, standard-duty pavement section that could be used for parking areas is as follows:

1.5"	Asphalt "Top Course"
2.0"	Asphalt "Base Course"
8"	Aggregate Base (Gravel Borrow, RIDOT M.01.09; Table 1, Column 1)

A typical, minimum, heavy-duty pavement section that could be used in access roads and for areas of heavy traffic is as follows:

2.0"	Asphalt "Top Course"
2.5"	Asphalt "Base Course"
12"	Aggregate Base (Gravel Borrow, RIDOT M.01.09; Table 1, Column 1)

The pavement sections shown above represent minimum thicknesses representative of typical local construction practices for similar use. Periodic maintenance should be anticipated.

Pavement material types and construction procedures should conform to specifications of the Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, 2004 Edition with the latest amendment.

Areas to receive relatively highly concentrated, sustained loads such as dumpsters, loading areas, and storage bins are typically installed over a rigid pavement section to distribute concentrated loads and reduce the possibility of high stress concentrations on the subgrade. Typical rigid pavement sections consist of 6 inches of concrete placed over a minimum of 12 inches of subbase material.

3.7 Underground Utilities

Boulders at the bottom of utility trenches should be removed to at least 12 inches below the pipe invert and the resulting excavation should be backfilled with suitable backfill. Utilities should be placed on suitable bedding material in accordance with the manufacturer's recommendations. "Cushion" material should be placed, by hand, above the utility pipe in maximum 6-inch lifts. The lift should be compacted by hand to avoid damage to the utility. Where the bedding/cushion material consists of crushed stone, it should be wrapped in a geotextile fabric.

Compaction of fill in utility trenches should be in accordance with our recommendations in Section 4.3. To reduce the potential for damage to utilities, placement and compaction of fill immediately above the utilities should be performed in accordance with the manufacturer's recommendations.

4. CONSTRUCTION CONSIDERATIONS

4.1 Subgrade Preparation

- Organic materials, existing fill, buried organic soil, buried subsoil, abandoned utilities, buried foundations, and other below-ground structures should be entirely removed from within the footprint of the proposed building and site structures, including site retaining walls, and exterior stairs, if any, before the start of foundation work. The excavation should be restored with Structural Fill. Alternatively, the ground should be improved with APs.

- Tree stumps, root balls, and roots larger than ½ inch in diameter should be removed and the cavities filled with suitable material and compacted per Section 4.3 of this report.

- Cobbles and boulders should be removed at least 6 inches from beneath footings and 18 inches beneath the bottom of slabs and paved areas. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas.

- The bottom of the excavation resulting from the removal of the existing fill or natural soil should be compacted with a dynamic vibratory compactor imparting a minimum of 40 kips of force to the subgrade.

- The base of the footing excavations in granular soil should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade.

- After the surficial materials are removed to a depth of 18 inches within the proposed paved areas in accordance with the recommendations in Section 3.1, the exposed existing fill and buried subsoil deeper than 18 inches beneath the bottom of the proposed pavement should be improved by compacting the exposed surface with at least six (6) passes of a vibratory roller compactor imparting a dynamic effort of at least 40 kips. Where soft zones of soil are observed, the soft soil should be removed, and the grade should be restored using Ordinary Fill to the bottom of the proposed subbase layer. If pumping of the existing fill or buried subsoil deeper than 18 inches beneath the bottom of the proposed pavement is observed, the soft and/or pumping material should be removed and replaced.

- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill, shown in Section 4.3.1.

- Fill placed under the subbase of paved areas should meet the gradation and compaction requirements of Ordinary Fill, shown in Section 4.3.2.

- Fill placed in the top 12 inches beneath sidewalks should consist of Structural Fill with less than 5 percent fines.

- Loose or soft soils identified during the compaction of the footing or floor slab subgrades should be excavated to a suitable bearing stratum, as determined by the representative of LGCI. Grades should be restored by backfilling with Structural Fill or crushed stone.

- When crushed stone is required in the drawings or is used for the convenience of the contractor, it should be wrapped in a geotextile fabric for separation except where introduction of the geotextile fabric promotes sliding. A geotextile fabric should not be placed between the bottoms of the footings and the crushed stone.

- An LGCI representative should observe the exposed subgrades prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill, or crushed stone wrapped in a filter fabric.

- APs that are damaged as a result of excavation for footings should be repaired in accordance with the requirements of the specialty contractor installing the APs.

- Before fill is placed under footings or to raise the grades, the aggregate piers should be exposed, and the subgrade should be compacted to a firm and unyielding conditions.

- An LGCI geotechnical representative should observe the installation of the aggregate piers and the modulus test. An LGCI geotechnical representative should also observe the exposed subgrades prior to fill and concrete placement to verify that the exposed the aggregate piers are properly exposed.

4.2 Subgrade Protection

The onsite fill and natural soils are frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final six inches of soil just before pouring the concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Filling operations should be halted during freezing weather.

Materials with high fines contents are typically difficult to handle when wet, as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

4.3 Fill Materials

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel free from organic matter, clay, surface coatings, and deleterious materials, and should conform to the gradation requirements shown below.

4.3.1 Structural Fill

The Structural Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of the optimum moisture content.

Sieve Size Percent	Passing by Weight
3 inches	100
1 ½ inch	80-100
½ inch	50-100
No. 4	30-85
No. 20	15-60
No. 60	5-35
No. 200*	0-10

* 0 – 5 for the top 12 inches under sidewalks, exterior slabs, pads, and walkways

4.3.2 Ordinary Fill

Ordinary Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of the optimum moisture content.

Sieve Size Percent	Passing by Weight
6 inches	100
1 inch	50-100
No. 4	20-100
No. 20	10-70
No. 60	5-45
No. 200	0-20

4.4 Reuse of Onsite Materials

The reuse of the existing fill and excavated natural sand and gravel, if applicable, should be in accordance with the recommendations in Section 3.1.1. The buried topsoil and buried subsoil should be segregated from the existing fill before reusing and/or improving the existing fill.

The contractor should avoid mixing the reusable soils with fine-grained and/or organic soils. The soils to be reused should be excavated and stockpiled separately for compliance testing. Soils with 20 percent or greater fines contents are generally very sensitive to moisture content variations and are susceptible to frost. Such soils are very difficult to compact at moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during the compaction of onsite soils with fines contents of 20 percent or greater. The contractor should be prepared to remove and replace such soils if pumping occurs.

To improve the existing fill, the existing fill should be blended with ¾-inch or 1 ½-inch crushed stone at the ratio listed in Section 3.1.1. Grain-size analyses should be performed on the blended material and the blending ratio should be adjusted as needed based on the results of the grainsize analyses.

Due to the large scale of earth moving operations, we recommend that excavated materials slated for reuse be protected from wetness, including by means of tarps.

Materials to be used as fill should first be tested for compliance with the applicable gradation specifications.

4.5 Groundwater Control Procedures

Based on the groundwater levels measured in our borings, we do not anticipate that major groundwater control procedures will be needed during construction. We anticipate that filtered sump pumps installed in a series of sump pump pits located at least three feet below the bottom of planned excavations may be sufficient to handle groundwater and surface runoff that may enter the excavation during wet weather. The contractor should be prepared to use multiple sump pumps to maintain a dry excavation during the removal of the existing fill.

The contractor should be permitted to employ whatever commonly accepted means and practices are necessary to maintain the groundwater level below the bottom of the excavation and to maintain a dry excavation during wet weather. Groundwater levels should be maintained at a minimum of 1 foot below the bottom of the excavations during construction. The placement of reinforcing steel or concrete in standing water should not be permitted.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile fabric. Alternatively, the crushed stone should be entirely removed after the sump pump is no longer in use, and the sump pump pit should be restored with suitable backfill.

4.6 Temporary Excavations

All excavations to receive human traffic should be constructed in accordance with OSHA guidelines.

The site soils should generally be considered Type "C" and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have shoring designed by a professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain the stability of the excavation sides and bottom.

5. RECOMMENDATIONS FOR FUTURE WORK

We recommend engaging LGCI to perform the following services:

- Prepare Earth Moving Specifications and APs, if needed, and review the geotechnical aspect of contract drawings.

- Review contractor submittals and Request for Information (RFIs);

- Provide a field engineer during construction to observe the removal of the unsuitable soil, the improvement of the existing fill, to observe the subgrade of footings and slabs, and to observe the installation of ground improvement as well as the modulus test, if the ground improvement option is selected.

6. REPORT LIMITATIONS

Our analyses and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations, and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of Taco Comfort Solutions for the Proposed Manufacturing Building in Cranston, Rhode Island as conceived at this time.

7. REFERENCES

In addition to the references included in the text of the report, we used the following references:

Rhode Island State Building Code (Feb. 2022), comprised of the International Building Code of 2018 (IBC-2018) and RI amendments.

The Department of Labor, Occupational Safety and Health Administration (1989), "Occupational Safety and Health Standards - Excavations; Final Rule," 20 CFR Part 1926, Subpart P.

USGS Cranston, RI topographic map from http://mapserver.mytopo.com.

Table 1 - Summary of LGCI's Test Pits
Proposed Manufacturing Building
Cranston, RI
LGCI Project No. 2252

Test Pit No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Asphalt / **Topsoil** Depth / El. (ft.)	Bottom of Crushed Stone Depth / El. (ft.)	Bottom of Fill Depth / El. (ft.)	Bottom of Buried Organic Soil / **Buried Subsoil** Depth / El. (ft.)	Bottom of Sand and Gravel Depth / El. (ft.)	Bottom of Test Pit Depth / El. (ft.)
TP-1	56.0	10.0 / **46.0**	0.3 / **55.7**	- / -	4.0 / **52.0**	**5.0** / **51.0**	10.0 [3]/ **46.0**	10.0 / **46.0**
TP-2	55.0	9.5 / **45.5**	0.3 / **54.7**	- / -	5.5 / **49.5**	- / -	10.0 [3]/ **45.0**	10.0 / **45.0**
TP-3	57.0	10.0 / **47.0**	0.3 / **56.7**	- / -	4.0 / **53.0**	**5.0** / **52.0**	10.3 [3]/ **46.7**	10.3 / **46.7**
TP-4	56.0	10.5 / **45.5**	0.3 / **55.7**	- / -	6.5 / **49.5**	9.0 / **47.0**	11.0 [3]/ **45.0**	11.0 / **45.0**
TP-5	56.0	12.0 / **44.0**	**2.0** / **54.0**	- / -	6.7 / **49.3**	**7.7** / **48.3**	12.0 [3]/ **44.0**	12.0 / **44.0**
TP-6	59.0	- / -	**1.5** / **57.5**	- / -	8.5 / **50.5**	11.0 / **48.0**	12.0 [3]/ **47.0**	12.0 / **47.0**
TP-7	62.0	- / -	**2.0** / **60.0**	- / -	- / -	- / -	10.0 [3]/ **52.0**	10.0 / **52.0**
TP-8	64.0	- / -	- / -	0.3 / **63.7**	5.5 / **58.5**	- / -	9.0 [3]/ **55.0**	9.0 / **55.0**
TP-9	67.0	- / -	- / -	0.3 / **66.7**	5.0 / **62.0**	- / -	10.0 [3]/ **57.0**	10.0 / **57.0**
TP-10	62.0	- / -	**0.8** / **61.2**	- / -	6.5 / **55.5**	- / -	10.0 [3]/ **52.0**	10.0 / **52.0**
TP-11	68.0	- / -	0.3 / **67.7**	- / -	1.5 / **66.5**	- / -	9.0 [3]/ **59.0**	9.0 / **59.0**
TP-12	69.0	- / -	**0.5** / **68.5**	- / -	1.0 / **68.0**	- / -	10.0 [3]/ **59.0**	10.0 / **59.0**
TP-13	68.0	- / -	0.3 / **67.7**	- / -	5.0 / **63.0**	- / -	10.0 [3]/ **58.0**	10.0 / **58.0**
TP-14	65.0	- / -	- / -	0.3 / **64.7**	6.0 / **59.0**	- / -	9.0 [3]/ **56.0**	9.0 / **56.0**
TP-15	63.0	- / -	- / -	0.3 / **62.7**	4.0 / **59.0**	- / -	9.0 [3]/ **54.0**	9.0 / **54.0**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.
2. Groundwater was measured during excavation, at the end of excavation, after excavation, or based on sample moisture whichever is shallower.
3. Test pit terminated in the sand and gravel layer.
4. "-" means groundwater or layer was not encountered.

Table 2 - Summary of LGCI's Borings
Proposed Manufacturing Building
Cranston, RI
LGCI Project No. 2252

Boring No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Asphalt / **Topsoil** / *Crushed Stone* Depth / El. (ft.)	Bottom of Fill Depth / El. (ft.)	Bottom of Buried Organic Soil Depth / El. (ft.)	Bottom of Sand and Gravel Depth / El. (ft.)	Bottom of Silt Depth / El. (ft.)	Top of Rock / Weathered Rock Depth / El. (ft.)	Bottom of Boring Depth / El. (ft.)
2022 Borings									
B-1	58.0	- / **-**	0.3 / **57.7**	8.0 / **50.0**	- / **-**	12.0 [3]/ **46.0**	- / **-**	- / **-**	12.0 / **46.0**
B-2	57.0	8.0 / **49.0**	0.3 / **56.7**	8.0 / **49.0**	10.0 / **47.0**	12.0 [3]/ **45.0**	- / **-**	- / **-**	12.0 / **45.0**
B-3	58.0	12.0 / **46.0**	0.3 / **57.7**	6.0 / **52.0**	- / **-**	22.0 [3]/ **36.0**	- / **-**	- / **-**	22.0 / **36.0**
B-4	58.0	10.0 / **48.0**	0.3 / **57.7**	6.0 / **52.0**	8.0 / **50.0**	22.0 [3]/ **36.0**	- / **-**	- / **-**	22.0 / **36.0**
B-5	60.0	14.0 / **46.0**	0.2 / **59.8**	8.0 / **52.0**	- / **-**	22.0 [3]/ **38.0**	- / **-**	- / **-**	22.0 / **38.0**
B-6	60.0	10.0 / **50.0**	0.3 / **59.7**	8.0 / **52.0**	- / **-**	22.0 [3]/ **38.0**	- / **-**	- / **-**	22.0 / **38.0**
B-7	61.0	14.0 / **47.0**	**0.7** / **60.3**	10.0 / **51.0**	- / **-**	22.0 [3]/ **39.0**	- / **-**	- / **-**	22.0 / **39.0**
B-8	63.0	19.0 / **44.0**	*0.3* / **62.7**	8.0 / **55.0**	- / **-**	22.0 [3]/ **41.0**	- / **-**	- / **-**	22.0 / **41.0**
B-9	65.0	19.0 / **46.0**	*0.3* / **64.7**	6.0 / **59.0**	- / **-**	22.0 [3]/ **43.0**	- / **-**	- / **-**	22.0 / **43.0**
B-10	66.0	19.0 / **47.0**	*0.3* / **65.7**	6.0 / **60.0**	- / **-**	21.0 [3]/ **45.0**	- / **-**	- / **-**	21.0 / **45.0**
B-11	68.0	- / **-**	*0.5* / **67.5**	6.5 / **61.5**	- / **-**	22.0 [3]/ **46.0**	- / **-**	- / **-**	22.0 / **46.0**
B-12	66.0	20.0 / **46.0**	0.3 / **65.7**	2.0 / **64.0**	- / **-**	22.0 [3]/ **44.0**	- / **-**	- / **-**	22.0 / **44.0**
B-13	67.0	20.0 / **47.0**	**0.2** / **66.8**	4.0 / **63.0**	- / **-**	22.0 [3]/ **45.0**	- / **-**	- / **-**	22.0 / **45.0**
B-14	68.0	22.0 / **46.0**	0.3 / **67.7**	4.0 / **64.0**	- / **-**	22.0 [3]/ **46.0**	- / **-**	- / **-**	22.0 / **46.0**
B-15	59.0	13.0 / **46.0**	0.3 / **58.7**	10.4 / **48.6**	- / **-**	22.0 [3]/ **37.0**	- / **-**	- / **-**	22.0 / **37.0**
B-16	56.0	10.0 / **46.0**	0.4 / **55.6**	6.8 / **49.2**	- / **-**	12.0 [3]/ **44.0**	12.0 [3]/ **44.0**	- / **-**	12.0 / **44.0**
B-17	61.0	20.0 / **41.0**	*0.3* / **60.7**	4.0 / **57.0**	- / **-**	22.0 [3]/ **39.0**	- / **-**	- / **-**	22.0 / **39.0**
2023 Borings									
B-101	58.0	8.0 / **50.0**	0.3 / **57.7**	10.5 / **47.5**	- / **-**	33.0 / **25.0**	45.0 / **13.0**	45.0 [4]/ **13.0**	53.5 / **4.5**
B-102	57.0	6.0 / **51.0**	0.3 / **56.7**	12.0 / **45.0**	10.0 / **47.0**	44.0 / **13.0**	39.0 / **18.0**	44.0 [4]/ **13.0**	49.0 / **8.0**

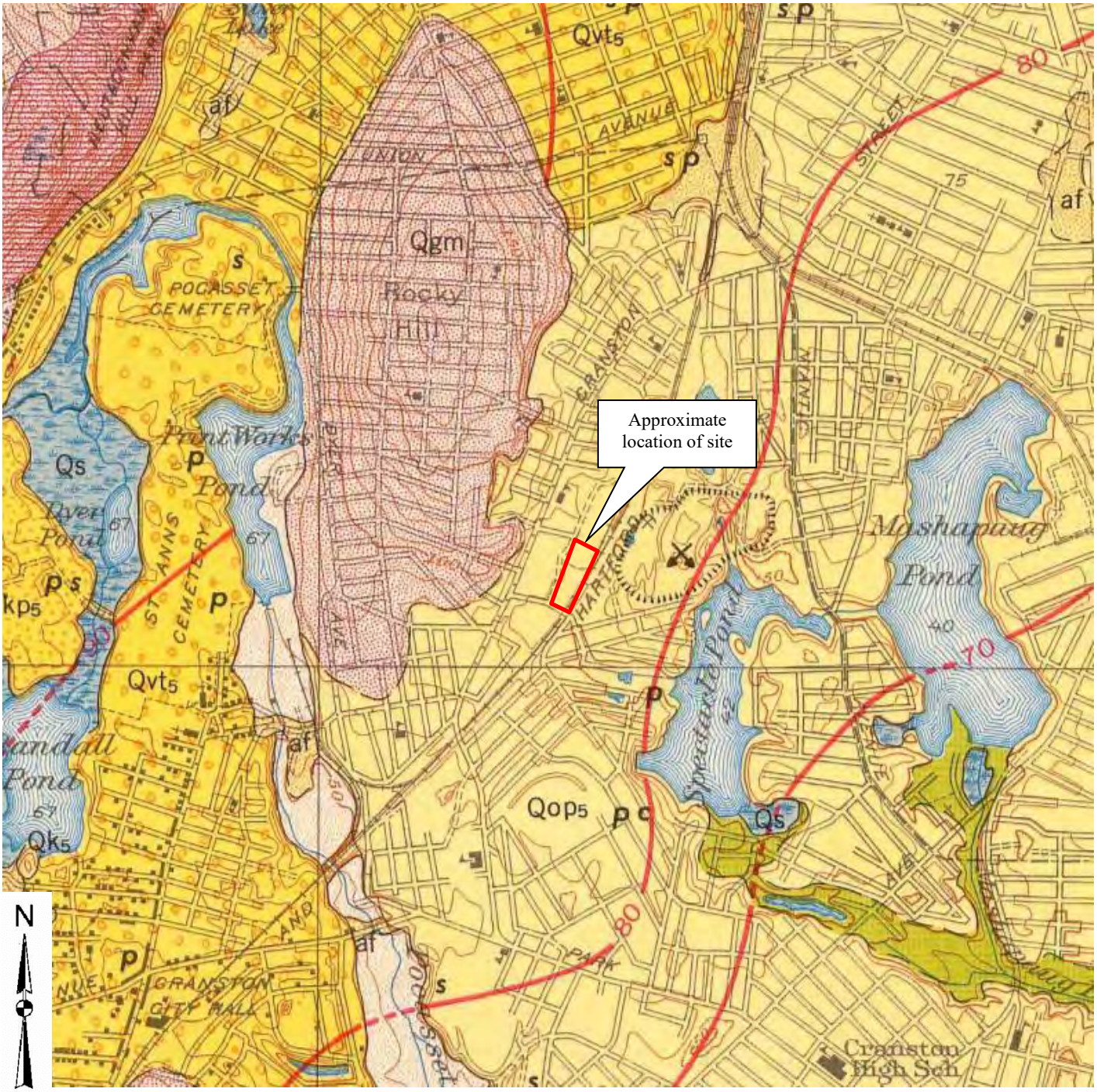
1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.
2. Groundwater was measured during drilling, at the end of drilling, after drilling, or based on sample moisture whichever is shallower.
3. Boring terminated in the sand and gravel layer.
4. Boring terminated in rock.
5. "-" means groundwater or layer was not encountered.

Contour Intervals: 10 feet

0.4 mi

Note: Figure based on USA Topo Maps of Cranston, RI obtained from https://viewer.nationalmap.gov/

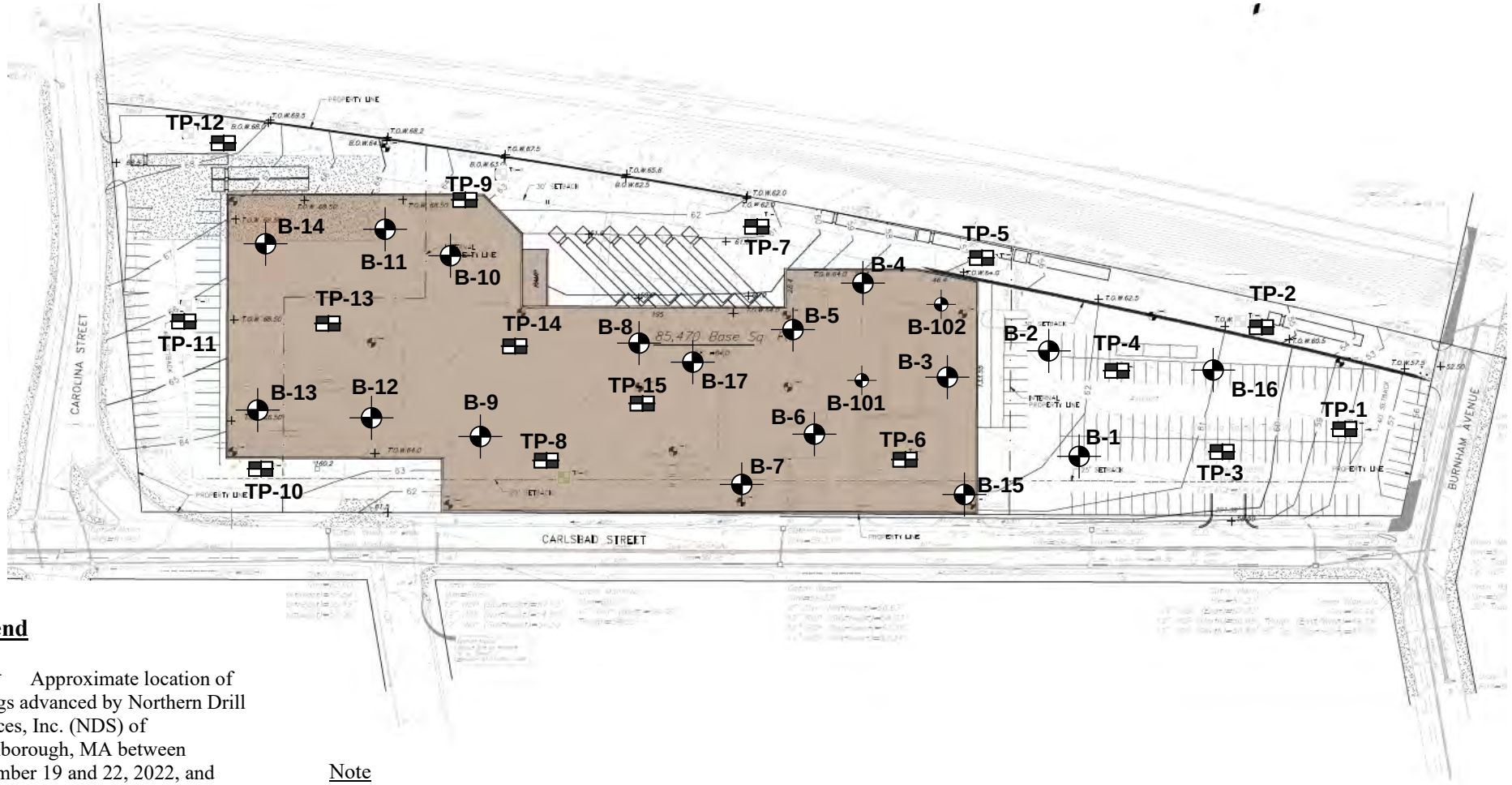
Client:	Project:	Figure 1 – Site Location Map	
Taco Comfort Solutions	Proposed Manufacturing Building		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Cranston, RI	LGCI Project No.: 2252	Date: Mar. 2023



Qop5 — Outwash plains
Sorted sand and local deposits of coarse gravel.

Figure based on map titled: "Geologic Map of the Providence Quadrangle, Rhode Island, Surficial Geology," prepared by J. Hiram Smith in 1956, Geological Survey, Map GQ-84.

Client:	Project:	Figure 2 – Surficial Geologic Map	
Taco Comfort Solutions	Proposed Manufacturing Building		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Cranston, RI	LGCI Project No.: 2252	Date: Mar. 2023



Legend

Approximate location of borings advanced by Northern Drill Services, Inc. (NDS) of Northborough, MA between December 19 and 22, 2022, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).

Approximate location of borings advanced by NDS on February 17 and 20, 2023, and observed by LGCI.

Approximate location of test pit advanced by JRD, Inc. of Assonet, MA on November 14 and 15, 2022, and observed by Inc. LGCI.

Note

Figure based on drawing C-200 titled: "Civil Proposed Site Plan," prepared by Wood & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical via e-mail on August 23, 2022.

0 40 80 120

Approximate Scale (ft.)

Client:	Project:	Figure 3 – Exploration Location Plan	
Taco Comfort Solutions	Proposed Manufacturing Building		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Cranston, RI	LGCI Project No.: 2252	Date: Mar. 2023

Appendix A – LGCI's Test Pit Logs

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near southern side of prop. parking lot
COORDINATES: NA
SURFACE EL.: 56 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** 10.0 ft. / El. 46.0 ft.

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 12.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Asphalt	0.3 / 55.7	0 ft. - 0.3 ft.: Asphalt
	55.0	E		Fill		0.3 ft. - 4 ft.: Silty SAND (SM), fine to coarse, 20-25% fines, 10-15% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, trace of brick, brown, moist
2.5	52.5				4.0 / 52.0	
5.0		E		Buried Subsoil	5.0 / 51.0	4 ft. - 5 ft.: Silty SAND with Gravel (SM), fine to coarse, ~20% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, orange-brown, moist
	50.0	E		Sand and Gravel		5 ft. - 10 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 25-30% fine to coarse subrounded gravel, light brown, moist to wet
7.5	47.5					
10.0					10.0 / 46.0 ▼	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-2

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near SE portion of prop. parking lot
COORDINATES: NA
SURFACE EL.: 55 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** 9.5 ft. / El. 45.5 ft. Seeping in side of excavation

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 11.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Asphalt	0.3 / 54.7	0 ft. - 0.3 ft.: Asphalt REMARK 1: Asphalt cut using pneumatic jackhammer.
2.5	52.5	E		Fill		0.3 ft. - 4 ft.: Silty SAND (SM), fine to coarse, 15-20% fines, 10-15% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, trace of roots, brown, moist
5.0	50.0	E				4 ft. - 5.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 20-25% fine to coarse subrounded gravel, trace of roots, orange-brown, moist
7.5	47.5	E		Sand and Gravel	5.5 / 49.5	5.5 ft. - 10 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~25% fine to coarse subrounded gravel, light brown, moist to wet
10.0	45.0				10.0 / 45.0	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-3

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near western side of prop. parking lot
COORDINATES: NA
SURFACE EL.: 57 ft. (see note 1) **TOTAL DEPTH:** 10.3 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: 10.0 ft. / El. 47.0 ft.

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 12.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Asphalt	0.3 / 56.7	0 ft. - 0.3 ft.: Asphalt
	55.0	E		Fill	4.0 / 53.0	0.3 ft. - 4 ft.: Silty SAND (SM), fine to coarse, 25-30% fines, ~10% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, trace of brick, brown, moist
2.5						
	52.5	E		Buried Subsoil	5.0 / 52.0	4 ft. - 5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of roots, orange-brown, moist
5.0						
	50.0	E	1	Sand and Gravel	10.3 / 46.7	5 ft. - 10.3 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 25-30% fine to coarse subrounded gravel, light brown, moist to wet REMARK 1: Groundwater seeping in sides of excavation at depth of 10 feet. Bottom of test pit at 10.3 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.
7.5						
	47.5					
10.0						

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-4

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near northern side of prop. parking lot
COORDINATES: NA
SURFACE EL.: 56 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** 10.5 ft. / El. 45.5 ft.

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 9.0' x 4.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Asphalt	0.3 / 55.7	0 ft. - 0.3 ft.: Asphalt
	55.0	E		Fill		0.3 ft. - 3 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse subangular gravel, trace of asphalt, dark brown, moist
2.5						
	52.5	E				3 ft. - 4.5 ft.: Silty SAND (SM), fine to medium, ~15% fines, 10-15% fine to coarse subrounded gravel, trace of organic soil, trace of roots, light brown, moist
5.0		E				4.5 ft. - 6.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine to coarse subrounded gravel, brown, moist
	50.0				6.5 / 49.5	
7.5		E		Buried Organic Soil		6.5 ft. - 9 ft.: Silty SAND (SM), fine to medium, 30-35% fines, trace of organic soil, trace of roots, black, moist
	47.5				9.0 / 47.0	
10.0		E		Sand and Gravel		9 ft. - 11 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 20-25% fine to coarse subrounded gravel, light brown, moist to wet
	45.0				11.0 / 45.0	Bottom of test pit at 11.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
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Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-5

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE EL.: 56 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** 12.0 ft. / El. 44.0 ft.

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 10.0' x 4.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	55.0	E		Topsoil	2.0	0 ft. - 2 ft.: Topsoil
2.5	52.5	E	1	Fill	54.0 6.7	2 ft. - 6.7 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 5-10% fine to coarse subrounded gravel, trace of organic soil, brown, moist REMARK 1: Layer of buried organic soil encountered on southern side of test pit between depths of 5.3 feet and 6.7 feet.
5.0	50.0					
7.5		E		Buried Subsoil	49.3 7.7	6.7 ft. - 7.7 ft.: Silty SAND (SM), fine to coarse, 15-20% fines, trace of roots, orange-brown, moist
	47.5	E		Sand and Gravel	48.3	7.7 ft. - 12 ft.: Sandy SILT (ML), slightly plastic, 40-45% mostly fine sand, gray to orange, moist to wet
10.0	45.0				12.0 ▼	
						Bottom of test pit at 12.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-6

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near SW corner of prop. building
COORDINATES: NA
SURFACE EL.: 59 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 10.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El. (ft.)	Material Description
	57.5	E		Topsoil	1.5 / 57.5	0 ft. - 1.5 ft.: Topsoil
2.5		E		Fill		1.5 ft. - 8.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse subrounded gravel, trace of wood, brown, moist
	55.0	M	1			REMARK 1: Abandoned concrete foundation encountered at depth of 4 feet.
5.0						
	52.5					
7.5		E			8.5 / 50.5	
	50.0	E		Buried Organic Soil	11.0 / 48.0	8.5 ft. - 11 ft.: Silty SAND (SM), fine to coarse, 25-30% fines, trace of organic soil, black, moist
10.0						
	47.5	E		Sand and Gravel	12.0 / 47.0	11 ft. - 12 ft.: Silty SAND (SM), fine to medium, ~15% fines, orange to gray, moist
						Bottom of test pit at 12.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-7

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near prop. trailer parking and loading dock
COORDINATES: NA
SURFACE EL.: 62 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 8.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Topsoil	2.0 / 60.0	0 ft. - 2 ft.: Topsoil
2.5	60.0 / 57.5	M		Sand and Gravel	5.0 / 55.0	2 ft. - 5 ft.: Poorly Graded SAND with Gravel (SP), mostly medium, 0-5% fines, 25-30% fine to coarse angular gravel, brown, moist
5.0						5 ft. - 10 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist
7.5	55.0	E				
10.0	52.5				10.0 / 52.0	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-8

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near western side of prop. building
COORDINATES: NA
SURFACE EL.: 64 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 9.0' x 5.5'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Crushed Stone	0.3 / 63.7	0 ft. - 0.3 ft.: Crushed stone REMARK 1: Geotextile fabric encountered under crushed stone layer.
	62.5					0.3 ft. - 5.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 25-30% mostly fine subrounded gravel, trace of organic soil, trace of brick, trace of asphalt, brown, moist
2.5		E		Fill		
	60.0					
5.0			2		5.5 / 58.5	REMARK 2: Piece of concrete encountered at depth of 5.5 feet. Possible foundation on utility duct. 5.5 ft. - 9 ft.: Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
	57.5					
7.5		E		Sand and Gravel		
	55.0		3		9.0 / 55.0	REMARK 3: Test pit terminated due to sidewall collapse at depth of 9 feet. Bottom of test pit at 9.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-9

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near eastern side of prop. building
COORDINATES: NA
SURFACE EL.: 67 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 10.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Crushed Stone	0.3 / 66.7	0 ft. - 0.3 ft.: Crushed stone REMARK 1: Geotextile fabric encountered under crushed stone layer.
	65.0					0.3 ft. - 5 ft.: Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, subangular, 5-10% fines, 40-45% fine to coarse sand, trace of asphalt, brown, moist
2.5		E		Fill		
	62.5					
5.0					5.0 / 62.0	5 ft. - 10 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, ~5% fines, light brown, moist
	60.0					
7.5		E		Sand and Gravel		
	57.5					
10.0					10.0 / 57.0	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
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Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-10

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near western side of prop. parking lot
COORDINATES: NA
SURFACE EL.: 62 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 9.0' x 4.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Topsoil	0.8 / 61.2	0 ft. - 0.8 ft.: Topsoil REMARK 1: Geotextile fabric encountered under topsoil layer.
2.5	60.0	E	2	Fill	6.5 / 55.5	0.8 ft. - 6.5 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 5-10% fines, 15-20% fine to coarse subangular gravel, brown, moist REMARK 2: Fill extended to a depth of 5.0 feet on the western side of the test pit and 6.5 feet on the eastern side.
5.0	57.5					
7.5	55.0	E		Sand and Gravel	10.0 / 52.0	6.5 ft. - 10 ft.: Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
10.0	52.5					Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-11

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near northern side of prop. parking lot
COORDINATES: NA
SURFACE EL.: 68 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 8.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	67.5	E		Asphalt	0.3 / 67.7	0 ft. - 0.3 ft.: Asphalt
		E		Fill	1.5 / 66.5	0.3 ft. - 1.5 ft.: Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, trace of asphalt, brown, moist
2.5	65.0					
5.0	62.5	E		Sand and Gravel		1.5 ft. - 9 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~20% fine to coarse subrounded gravel, light brown, moist
7.5	60.0					
			1		9.0 / 59.0	REMARK 1: Test pit terminated at depth of 9 feet due to sides of excavation collapsing.
						Bottom of test pit at 9.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Fax: (978) 330-5056

TEST PIT LOG

TP-12

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/14/22 **DATE COMPLETED:** 11/14/22
TEST PIT LOCATION: Near NE corner of prop. parking lot
COORDINATES: NA
SURFACE EL.: 69 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 8.0' x 5.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Topsoil	0.5 / 68.5	0 ft. - 0.5 ft.: Topsoil REMARK 1: Geotextile fabric encountered under topsoil layer.
		E		Fill	1.0 / 68.0	0.5 ft. - 1 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 25-30% fine to coarse subrounded gravel, trace of organic soil, light brown, moist
	67.5					1 ft. - 10 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 25-30% fine to coarse subrounded gravel, 5-10% cobbles up to about 6 inches in diameter, light brown, moist
2.5						
	65.0					
5.0		E		Sand and Gravel		
	62.5					
7.5						
	60.0					
10.0					10.0 / 59.0	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-13

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near northern side of prop. building
COORDINATES: NA
SURFACE EL.: 68 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 10.0' x 3.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	67.5	E		Asphalt	0.3 / 67.7	0 ft. - 0.3 ft.: Asphalt
						0.3 ft. - 5 ft.: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 25-30% fine to coarse subrounded gravel, trace of organic soil, trace of brick, trace of concrete, trace of asphalt, brown, moist
2.5	65.0	E		Fill		
5.0					5.0 / 63.0	
	62.5	E		Sand and Gravel		5 ft. - 10 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 15-20% fine to coarse subrounded gravel, 0-5% cobbles up to about 8" in diameter, light brown, moist
7.5	60.0					
10.0					10.0 / 58.0	Bottom of test pit at 10.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-14

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near eastern side of prop. building
COORDINATES: NA
SURFACE EL.: 65 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 8.0' x 5.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E	1	Crushed Stone	0.3 / 64.7	0 ft. - 0.3 ft.: Crushed stone
		E				0.3 ft. - 3 ft.: Silty SAND (SM), fine to medium, 20-25% fines, 10-15% fine to coarse subrounded gravel, trace of organic soil, trace of concrete, trace of brick, trace of roots, trace of clay pipe, buried building foundation, brown, moist
		M				REMARK 1: Pieces of abandoned concrete foundation encountered between depths of 0.3 feet and 3 feet.
2.5	62.5					
		M		Fill		3 ft. - 6 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist (appears reworked)
		E				
5.0	60.0		2		6.0 / 59.0	REMARK 2: Clay pipe encountered at depth of 6 feet.
		E		Sand and Gravel		6 ft. - 9 ft.: Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
7.5	57.5		3		9.0 / 56.0	REMARK 3: Test pit terminated at depth of 9 feet due to sides of excavation collapsing.
						Bottom of test pit at 9.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

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Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-15

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 11/15/22 **DATE COMPLETED:** 11/15/22
TEST PIT LOCATION: Near western side of prop. building
COORDINATES: NA
SURFACE EL.: 63 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: Not encountered

EXCAVATION SUBCONTRACTOR: JRD Inc.
EXCAVATION FOREMAN: Mike Devmorvill
EXCAVATOR TYPE/MODEL: Deere 710G
WEATHER: 40's / Sunny
TEST PIT DIMENSIONS: 10.0' x 6.0'
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	62.5	E		Crushed Stone	0.3 / 62.7	0 ft. - 0.3 ft.: Crushed stone
2.5	60.0	E	1	Fill	4.0 / 59.0	0.3 ft. - 4 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 45-50% fine to coarse angular gravel, brown, moist REMARK 1: Piece of possible abandoned building foundation encountered at depth of 2 feet.
5.0 7.5	57.5 55.0	E		Sand and Gravel	9.0 / 54.0	4 ft. - 9 ft.: Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist Bottom of test pit at 9.0 feet. Test pit backfilled with excavated materials in 12-inch to 18-inch lifts and tamped with the excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

Appendix B – LGCI's Boring Logs

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/22/22 **DATE COMPLETED:** 12/22/22
BORING LOCATION: Near NW corner of prop. parking lot
COORDINATES: NA
SURFACE El.: 58 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: Not encountered
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	2-3-6 (9)	18/12		Asphalt	0.3 / 57.7	Top 4": Asphalt S1 - Silty SAND (SM), fine to coarse, 20-25% fines, 5-10% fine subrounded gravel, trace of organic soil, trace of asphalt, brown, moist
	55.0	2	S2	6-7-3-2 (10)	24/13				S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine to coarse subrounded gravel, brown, moist
5		4	S3	4-5-2-2 (7)	24/9		Fill		S3 - Top 3": Silty SAND (SM), fine to medium, 20-25% fines, trace of organic soil, trace of asphalt, brown, moist Bot. 6": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine to coarse subangular gravel, brown, moist
		6	S4	3-3-2-2 (5)	24/15				S4 - Silty SAND (SM), fine to medium, 20-25% fines, trace of organic soil, dark brown, moist
	50.0	8	S5	2-2-6-9 (8)	24/19			8.0 / 50.0	S5 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, light brown, moist
10		10	S6	16-29-24-25 (53)	24/15		Sand and Gravel		S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 30-35% fine to coarse angular gravel, light brown, moist
		12						12.0	Bottom of borehole at 12.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
	45.0								
15									
	40.0								
20									
	35.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-2
PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/22/22 **DATE COMPLETED:** 12/22/22
BORING LOCATION: Near NE corner of prop. parking lot
COORDINATES: NA
SURFACE El.: 57 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 8.0 ft. / El. 49.0 ft. Based on sample moisture
AT END OF DRILLING: 9.0 ft. / El. 48.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	11-10-5 (15)	18/14		Asphalt	0.3 / 56.7	Top 3": Asphalt
	55.0	2	S2	6-4-5-6 (9)	24/5		Fill		S1 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, brown, moist
		4	S3	6-4-2-2 (6)	24/7				S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 5-10% fines, 25-30% coarse angular gravel, trace of concrete, light brown, moist
5		6	S4	4-4-3-2 (7)	24/11				S3 - Similar to S2, trace of organic soil
	50.0	8	S5	0-2-7-4 (9)	24/10		Buried Organic Soil	8.0 / 49.0	S4 - Similar to S2, trace of organic soil
10		10	S6	6-6-4-4 (10)	24/16		Sand and Gravel	10.0 / 47.0	S5 - Silty SAND (SM), fine to medium, 25-30% fines, 5-10% fine to coarse angular gravel, trace of organic soil, black, wet
	45.0	12						12.0	S6 - Silty SAND (SM), fine, 20-25% fines, gray, wet
									Bottom of borehole at 12.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
15									
	40.0								
20									
	35.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-3
PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/21/22 **DATE COMPLETED:** 12/21/22
BORING LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE El.: 58 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 15.0 ft. / El. 43.0 ft. Based on sample moisture
AT END OF DRILLING: 12.0 ft. / El. 46.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 / 57.7	Top 4": Asphalt
		0.5	S1	22-10-8 (18)	18/17				S1 - Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, 0-5% fine subrounded gravel, light brown, moist
		2	S2	6-6-5-6 (11)	24/15		Fill		S2 - Similar to S1, 10-15% fine to coarse subangular gravel, trace of organic soil
	55.0	4	S3	2-5-5-3 (10)	24/15				S3 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, ~15% fine to coarse subrounded gravel, trace of organic soil, brown, moist
5		6	S4	5-6-5-4 (11)	24/14			6.0 / 52.0	S4 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, ~15% fine to coarse subrounded gravel, brown, moist
	50.0	8							
10		10	S5	7-18-14-12 (32)	24/22				S5 - Similar to S4
		12					Sand and Gravel		
	45.0								
15		15	S6	5-4-9-19 (13)	24/22				S6 - Well Graded SAND (SW), fine to coarse, 0-5% fines, light brown, wet
		17							
	40.0								
20		20	S7	3-16-44-51 (60)	24/24				S7 - Similar to S6
		22						22.0	
	35.0								Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/21/22 **DATE COMPLETED:** 12/21/22
BORING LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE El.: 58 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 10.0 ft. / El. 48.0 ft. Based on sample moisture
AT END OF DRILLING: 13.0 ft. / El. 45.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 / 57.7	Top 3": Asphalt
		0.5	S1	14-12-8 (20)	18/14				S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, trace of organic soil, brown, moist
	55.0	2	S2	9-10-6-4 (16)	24/15		Fill		S2 - Similar to S1
5		4	S3	4-3-2-2 (5)	24/11				S3 - Similar to S1
		6	S4	2-1-1-2 (2)	24/17			6.0 / 52.0	S4 - Silty SAND (SM), fine to medium, 20-25% fines, trace of organic soil, brown, moist
	50.0	8	S5	4-4-4-13 (8)	24/8		Buried Organic Soil	8.0 / 50.0	S5 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 15-20% fine to coarse subangular gravel, light brown, moist
10		10	S6	13-12-10-9 (22)	24/16				S6 - Similar to S5, wet
	45.0	12							
15		15	S7	1-1-4-4 (5)	24/21		Sand and Gravel		S7 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, gray, wet
	40.0	17							
20		20	S8	1-4-4-6 (8)	24/17				S8 - Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, 10-15% fine to coarse subangular gravel, light brown, wet
	35.0	22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-5

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/20/22 **DATE COMPLETED:** 12/20/22
BORING LOCATION: Near eastern side of prop. building
COORDINATES: NA
SURFACE El.: 60 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 15.0 ft. / El. 45.0 ft. Based on sample moisture
AT END OF DRILLING: 14.0 ft. / El. 46.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.2 / 59.8	Top 2": Asphalt
		0.5	S1	15-7-7 (14)	18/13				S1 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of brick, brown, moist
		2	S2	5-4-6-5 (10)	24/1				S2 - Piece of brick
		4					Fill		
5	55.0		S3	6-3-3-4 (6)	24/11				S3 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 15-20% fine to coarse subangular gravel, light brown, moist
		6	S4	2-3-2-2 (5)	24/17				S4 - Silty SAND (SM), fine to coarse, ~20% fines, 5-10% fine to coarse subangular gravel, trace of organic soil, brown, moist
		8						8.0 / 52.0	
			S5	2-2-2-3 (4)	24/20				S5 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, trace of fine gravel, light brown, moist
10	50.0	10	S6	3-4-4-6 (8)	24/18				S6 - Similar to S5
		12							
15	45.0						Sand and Gravel		
		15	S7	1-2-2-4 (4)	24/19				S7 - Sandy SILT (ML), non-plastic, 30-35% fine to medium sand, gray, wet
		17							
20	40.0								
		20	S8	14-12-10-8 (22)	24/21				S8 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine to coarse subrounded gravel, brown, wet
		22						22.0	
25	35.0								Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
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100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/20/22 **DATE COMPLETED:** 12/20/22
BORING LOCATION: Near center of prop. building
COORDINATES: NA
SURFACE El.: 60 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 10.0 ft. / El. 50.0 ft. Based on sample moisture
AT END OF DRILLING: 13.5 ft. / El. 46.5 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	5-8-6 (14)	18/18		Asphalt	0.3 59.7	Top 4": Asphalt S1 - Silty SAND (SM), fine to medium, 20-25% fines, 5-10% fine subrounded gravel, trace of organic soil, trace of asphalt, brown, moist
		2	S2	5-14-13-9 (27)	24/9				S2 - Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, 10-15% fine to coarse subrounded gravel, brown, moist
		4	S3	4-4-6-4 (10)	24/16		Fill		S3 - Similar to S2
5	55.0	6	S4	2-3-5-6 (8)	24/10				S4 - Silty SAND (SM), fine to medium, 15-20% fines, trace of organic soil, brown, moist
		8	S5	2-4-4-4 (8)	24/16			8.0 52.0	S5 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
10	50.0	10	S6	4-5-5-6 (10)	24/17				S6 - Similar to S5, wet
		12							
15	45.0	15	S7	3-2-1-2 (3)	24/20		Sand and Gravel		S7 - Top 10": Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, brown, wet Bot. 10": Sandy SILT (ML), non-plastic, 30-35% fine sand, gray, wet
		17							
20	40.0	20	S8	9-12-13-14 (25)	24/19				S8 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine subrounded gravel, brown, wet
		22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
25	35.0								

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/21/22 **DATE COMPLETED:** 12/21/22
BORING LOCATION: Near western side of prop. building
COORDINATES: NA
SURFACE El.: 61 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 14.0 ft. / El. 47.0 ft. Based on sample moisture
AT END OF DRILLING: 15.5 ft. / El. 45.5 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
	60.0	0	S1	2-6-8-6 (14)	24/8		Topsoil	0.7 60.3	S1 - Silty SAND (SM), fine to medium, 15-20% fines, trace of organic soil, trace of asphalt, brown, moist
		2	S2	2-4-2-3 (6)	24/3		Fill		S2 - Silty SAND (SM), fine to coarse, ~20% fines, 5-10% fine to coarse subrounded gravel, trace of organic soil, trace of asphalt, black, moist
5		4	S3	5-6-3-5 (9)	24/6				S3 - Similar to S2
	55.0	6	S4	6-4-4-6 (8)	24/10				S4 - Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, angular, 10-15% fines, 25-30% fine to coarse sand, trace of organic soil, dark brown, moist
		8	S5	5-4-2-5 (6)	24/9				S5 - Silty SAND (SM), fine to medium, 20-25% fines, 0-5% fine angular gravel, gray, moist (appears reworked)
10		10	S6	7-3-3-5 (6)	24/14			10.0 51.0	S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, brown, moist
	50.0	12	S7	4-8-8-15 (16)	24/8				S7 - Similar to S6
		14	S8	9-9-8-41 (17)	24/19				S8 - Similar to S6, wet
15									
	45.0	16					Sand and Gravel		
20		20	S9	9-10-10-12 (20)	24/8				S9 - Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, angular, 5-10% fines, 20-25% fine to coarse sand, brown, wet
	40.0	22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings and four bags of sand.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/19/22 **DATE COMPLETED:** 12/19/22
BORING LOCATION: Near eastern side of prop. building
COORDINATES: NA
SURFACE El.: 63 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 20.0 ft. / El. 43.0 ft. Based on sample moisture
AT END OF DRILLING: 19.0 ft. / El. 44.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	2-3-5-10 (8)	24/11		Crushed Stone	0.3 / 62.7	S1 - Top 3": Crushed stone Bot. 8": Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of brick, brown, moist
	60.0	2	S2	7-8-7-5 (15)	24/14				S2 - Poorly Graded SAND with Gravel (SP), fine to medium, 0-5% fines, 15-20% fine to coarse subangular gravel, brown, moist
5		4	S3	6-7-6-7 (13)	24/19		Fill		S3 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, trace of organic soil, trace of brick, light brown, most
		6	S4	5-5-5-8 (10)	24/18				S4 - Similar to S3
	55.0	8	S5	4-5-5-5 (10)	24/19			8.0 / 55.0	S5 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
10		10	S6	3-5-6-6 (11)	24/18				S6 - Similar to S5
	50.0	12							
15		15	S7	3-6-9-4 (15)	24/17		Sand and Gravel		S7 - Similar to S5
	45.0	17							
20		20	S8	2-6-5-15 (11)	24/18				S8 - Similar to S5, wet
	40.0	22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/19/22 **DATE COMPLETED:** 12/19/22
BORING LOCATION: Near western side of prop. building
COORDINATES: NA
SURFACE El.: 65 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 20.0 ft. / El. 45.0 ft. Based on sample moisture
AT END OF DRILLING: 19.0 ft. / El. 46.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	5-6-12-11 (18)	24/15		Crushed Stone	0.3 64.7	S1 - Top 3": Crushed stone Bot. 12": Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of brick, black, moist
		2	S2	6-3-4-2 (7)	24/16		Fill		S2 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, trace of organic soil, brown, moist
		4	S3	2-3-5-6 (8)	24/14				S3 - Silty SAND (SM), fine to medium, 20-25% fines, 5-10% fine to coarse subrounded gravel, trace of organic soil, black, moist
5	60.0	6	S4	4-3-5-5 (8)	24/6			6.0 59.0	S4 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
		8							
10	55.0	10	S5	3-5-6-7 (11)	24/17				S5 - Similar to S4
		12					Sand and Gravel		
15	50.0	15	S6	7-10-10-10 (20)	24/18				S6 - Similar to S4
		17							
20	45.0	20	S7	6-10-15-17 (25)	24/24				S7 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, wet
		22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings.
25	40.0								

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/19/22 **DATE COMPLETED:** 12/19/22
BORING LOCATION: Near eastern side of prop. building
COORDINATES: NA
SURFACE El.: 66 ft. (see note 1) **TOTAL DEPTH:** 21 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 19.0 ft. / El. 47.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
	65.0	0	S1	6-7-6-5 (13)	24/15		Crushed Stone	0.3 65.7	S1 - Top 3": Crushed stone Bot. 12": Silty SAND (SM), fine to medium, ~20% fines, 5-10% fine subangular gravel, trace of asphalt, trace of brick, trace of organic soil, brown, moist
		2	S2	6-5-3-2 (8)	24/14		Fill		S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, trace of organic soil, light brown, moist
5		4	S3	12-25-17-15 (42)	24/7				S3 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 5-10% fines, 25-30% fine to coarse angular gravel, trace of organic soil, light brown, moist
	60.0	6	S4	37-36-30-23 (66)	24/16			6.0 60.0	S4 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, 25-30% fine to coarse angular gravel, light brown, moist
		8							
		9	S5	14-22-18-23 (40)	24/16				S5 - Similar to S4
10									
	55.0	11							
							Sand and Gravel		
		14	S6	8-7-3-3 (10)	24/14				S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 5-10% fine to coarse subangular gravel, light brown, moist
15									
	50.0	16							
		19	S7	5-9-9-10 (18)	24/16				S7 - Similar to S6, wet
20									
	45.0	21						21.0	Bottom of borehole at 21.0 feet. Borehole backfilled with drill cuttings.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/19/22 **DATE COMPLETED:** 12/19/22
BORING LOCATION: Near NE corner of prop. building
COORDINATES: NA
SURFACE El.: 68 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: Not encountered
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	6-10-11-11 (21)	24/14		Crushed Stone	0.5	S1 - Top 6": Crushed stone
								67.5	Bot. 8": Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of asphalt, brown, moist
	65.0	2	S2	14-14-15-12 (29)	24/8		Fill		S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 25-30% fine to coarse angular gravel, trace of organic soil, trace of asphalt, brown, moist
5		4	S3	15-19-19-18 (38)	24/15				S3 - Similar to S2, black
		6	S4	14-13-12-12 (25)	24/17			6.5	S4 - Top 6": Similar to S2, black
	60.0	8	S5	10-8-8-8 (16)	24/16			61.5	Bot. 11": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, ~15% fine to coarse subrounded gravel, light brown, moist
10		10	S6	9-12-10-13 (22)	24/17				S5 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist
		12							S6 - Similar to S5
	55.0						Sand and Gravel		
15		15	S7	4-6-6-7 (12)	24/16				S7 - Similar to S5
		17							
	50.0								
20		20	S8	11-10-8-8 (18)	24/19				S8 - Similar to S5
		22						22.0	
	45.0								Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/20/22 **DATE COMPLETED:** 12/20/22
BORING LOCATION: Near western side of prop. building
COORDINATES: NA
SURFACE El.: 66 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 20.0 ft. / El. 46.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 / 65.7	Top 3": Asphalt
	65.0	0.5	S1	14-16-13 (29)	18/13		Fill		S1 - Silty SAND with Gravel (SM), fine to coarse, ~15% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of brick, light brown, moist
		2	S2	10-10-12-9 (22)	24/15			2.0 / 64.0	S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine to coarse subangular gravel, light brown, moist
		4	S3	5-7-10-10 (17)	24/16				S3 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
5	60.0	6	S4	4-5-7-8 (12)	24/18				S4 - Similar to S3
		8							
10		10	S5	5-8-6-8 (14)	24/18		Sand and Gravel		S5 - Similar to S3, fine to medium, trace coarse
	55.0	12							
15		15	S6	5-11-6-8 (17)	24/16				S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist
	50.0	17							
20		20	S7	5-9-9-10 (18)	24/15				S7 - Similar to S6, wet
	45.0	22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

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PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/20/22 **DATE COMPLETED:** 12/20/22
BORING LOCATION: Near NW corner of prop. building
COORDINATES: NA
SURFACE El.: 67 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 20.0 ft. / El. 47.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.2 / 66.8	S1 - Topsoil
	65.0	2	S1	5-6-6-5 (12)	24/2		Fill		S2 - Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, angular, 5-10% fines, 15-20% fine to coarse sand, trace of organic soil, brown, moist
		4	S2	4-5-7-14 (12)	24/5			4.0 / 63.0	
5			S3	10-12-10-9 (22)	24/13				S3 - Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, 10-15% fine to coarse subangular gravel, brown, moist
	60.0	6	S4	10-9-9-10 (18)	24/12				S4 - Similar to S3
		8							
10		10	S5	7-10-9-8 (19)	24/16				S5 - Similar to S3
	55.0	12					Sand and Gravel		
15		15	S6	11-10-8-12 (18)	24/17				S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist
	50.0	17							
20		20	S7	8-12-17-17 (29)	24/18				▽ S7 - Similar to S6, wet
	45.0	22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-14
PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/19/22 **DATE COMPLETED:** 12/19/22
BORING LOCATION: Near NE corner of prop. building
COORDINATES: NA
SURFACE El.: 68 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 22.0 ft. / El. 46.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
							Asphalt	0.3 / 67.7	Top 3": Asphalt
		0.5	S1	16-20-10 (30)	18/16		Fill		S1 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 20-25% fine to coarse subangular gravel, trace of organic soil, trace of brick, trace of asphalt, brown, moist
		2	S2	20-16-18-13 (34)	24/12				S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 20-25% fine to coarse subangular gravel, light brown, moist
	65.0							4.0 / 64.0	
		4	S3	7-15-16-20 (31)	24/13				S3 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 25-30% fine to coarse angular gravel, light brown, moist
5		6	S4	18-17-16-14 (33)	24/15				S4 - Similar to S3
	60.0	8							
10		10	S5	11-14-15-13 (29)	24/21		Sand and Gravel		S5 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
	55.0	12							
15		15	S6	12-14-11-9 (25)	24/18				S6 - Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 15-20% fine to coarse subrounded gravel, light brown, moist
	50.0	17							
20		20	S7	9-17-18-15 (35)	24/21				S7 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, 5-10% fine subrounded gravel, light brown, moist to wet
		22						22.0 ▽	
	45.0								Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-15
PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/21/22 **DATE COMPLETED:** 12/21/22
BORING LOCATION: Near SW corner of prop. building
COORDINATES: NA
SURFACE El.: 59 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 40's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 15.0 ft. / El. 44.0 ft. Based on sample moisture
AT END OF DRILLING: 13.0 ft. / El. 46.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	18-13-5 (18)	18/14		Asphalt	0.3 / 58.7	Top 4": Asphalt S1 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine to coarse subrounded gravel, light brown, moist
		2	S2	8-11-14-11 (25)	24/0				S2 - No recovery
	55.0	4	S3	5-5-4-5 (9)	24/17		Fill		S3 - Well Graded SAND (SW), fine to coarse, 0-5% fines, 5-10% fine subrounded gravel, light brown, moist
5		6	S4	6-8-7-4 (15)	24/17				S4 - Similar to S3
	50.0	8							
10		10	S5	1-1-13-17 (14)	24/21			10.4 / 48.6	S5 - Top 5": Silty SAND (SM), fine to medium, 25-30% fines, trace of organic soil, brown, moist Bot. 16": Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, light brown, moist
		12							
	45.0								
15		15	S6	10-10-11-30 (21)	24/8		Sand and Gravel		S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 20-25% fine to coarse angular gravel, brown, wet
		17							
	40.0								
20		20	S7	2-4-11-21 (15)	24/19				S7 - Well Graded SAND with Silt (SW-SM), fine to coarse, 5-10% fines, 5-10% fine subrounded gravel, brown, wet
		22						22.0	Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.
	35.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-16

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/22/22 **DATE COMPLETED:** 12/22/22
BORING LOCATION: Near SE corner of prop. parking lot
COORDINATES: NA
SURFACE El.: 56 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
WEATHER: 40's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 10.0 ft. / El. 46.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark
	55.0	0.5	S1	11-7-4 (11)	18/16	
		2	S2	2-2-3-5 (5)	24/15	
		4	S3	4-2-1-1 (3)	24/11	
5	50.0	6	S4	1-2-3-9 (5)	24/17	
		8	S5	17-16-19-22 (35)	24/16	
10	45.0	10	S6	31-23-20-18 (43)	24/12	
		12				
15	40.0					
20	35.0					
25						

Strata	Depth El.(ft.)	Material Description
Asphalt	0.4 / 55.6	Top 5": Asphalt
Fill		S1 - Silty SAND (SM), fine to coarse, 15-20% fines, 5-10% fine to coarse subangular gravel, trace of organic soil, trace of asphalt, brown, moist
		S2 - Silty SAND (SM), fine to medium, 15-20% fines, 0-5% fine subrounded gravel, trace of organic soil, brown, moist
		S3 - Similar to S2, trace of asphalt
		S4 - Top 9": Similar to S2, trace of asphalt
	6.8 / 49.2	
Sand and Gravel		Bot. 8": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 20-25% fine to coarse subangular gravel, light brown, moist
		S5 - Similar to S4 Bot. 8"
		S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse angular gravel, gray, wet
	12.0	
		Bottom of borehole at 12.0 feet. Borehole backfilled with drill cuttings. Ground surface restored with asphalt cold patch.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-17
PAGE 1 OF 1

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 12/22/22 **DATE COMPLETED:** 12/22/22
BORING LOCATION: Near center of prop. building
COORDINATES: NA
SURFACE El.: 61 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
WEATHER: 30's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 20.0 ft. / El. 41.0 ft. Based on sample moisture
AT END OF DRILLING: Dry at the end of drilling
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Tim Tucker
DRILLING METHOD: Hollow Stem Auger (3-1/4" I.D.)
DRILL RIG TYPE/MODEL: Mobile B-53 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
	60.0	0	S1	11-34-20-12 (54)	24/10	1	Crushed Stone	0.3	S1 - Top 3": Crushed stone
								60.7	Bot. 7": Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 20-25% fine to coarse angular gravel, trace of organic soil, trace of roots, orange-brown, moist
		2	S2	5-11-19-12 (30)	24/16		Fill		REMARK 1: Encountered possible abandoned foundation between depths of 2 feet and 4 feet.
									S2 - Piece of concrete
		4						4.0	
5			S3	13-13-10-9 (23)	24/10			57.0	S3 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 20-25% fine to coarse angular gravel, light brown, moist
	55.0	6	S4	18-13-15-16 (28)	24/24				S4 - Poorly Graded SAND (SP), fine to medium, trace coarse, 0-5% fines, 10-15% fine to coarse subangular gravel, light brown, moist
		8							
10		10	S5	5-7-5-6 (12)	24/20				S5 - Poorly Graded SAND (SP), fine to medium, trace coarse, 0-5% fines, ~5% fine subrounded gravel, light brown, moist
	50.0	12					Sand and Gravel		
15		15	S6	10-6-5-5 (11)	24/16				S6 - Similar to S5
	45.0	17							
20		20	S7	3-4-5-7 (9)	24/24				S7 - Similar to S6
	40.0	22						22.0	
25									Bottom of borehole at 22.0 feet. Borehole backfilled with drill cuttings.

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-101

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 2/17/23 **DATE COMPLETED:** 2/17/23
BORING LOCATION: Near southern side of prop. building
COORDINATES: NA
SURFACE El.: 58 ft. (see note 1) **TOTAL DEPTH:** 53.5 ft.
WEATHER: 50's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 8.0 ft. / El. 50.0 ft. Based on sample moisture
AT END OF DRILLING: 13.0 ft. / El. 45.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Drive and wash with 4-inch casing
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NX
LOGGED BY: TG **CHECKED BY:** NP

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	8-5-8 (13)	18/2		Asphalt	0.3 / 57.7	Top 3": Asphalt S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, ~10% fine angular gravel, trace of asphalt, trace of brick, brown, moist
		2	S2	12-6-4-3 (10)	24/12	1			S2 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist REMARK 1: Organic soil washing up in drill cuttings at depth of 3 feet.
	55.0	4	S3	6-6-7-6 (13)	24/10		Fill		S3 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, 5-10% fine subrounded gravel, brown, moist (appears reworked)
5		6	S4	7-5-4-2 (9)	24/11				S4 - Similar to S3
	50.0	8	S5	2-1-2-2 (3)	24/6				S5 - Silty SAND (SM), fine to coarse, 20-25% fines, 0-5% fine subrounded gravel, trace of organic soil, brown, wet
10		10	S6	12-11-10-11 (21)	24/14			10.5 / 47.5	S6 - Top 6": Similar to S5, 15-20% fines Bot. 8": Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, orange-brown, wet
	45.0	12	S7	8-7-9-12 (16)	24/13				S7 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, brown, wet
15		14	S8	17-25-17-12 (42)	24/7				S8 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 5-10% fines, 20-25% fine to coarse angular gravel, brown, wet
		16	S9	16-9-10-15 (19)	24/4				S9 - Similar to S8, ~15% fine to coarse angular gravel
	40.0	18					Sand and Gravel		
		19	S10	10-10-9-7 (19)	24/2				S10 - Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, 10-15% fine to coarse subangular gravel, light brown, wet
20		21							
	35.0	24							S11 - Similar to S10, 0-5% fine subrounded gravel
25				8-7-8-6					

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-101

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		24	S11	(15)	24/8				
		26							
	30.0						Sand and Gravel		
		29							S12 - Well Graded GRAVEL with Sand (GW), fine to coarse, subrounded, 0-5% fines, 25-30% fine to coarse sand, brown, wet
30			S12	5-2-6-3 (8)	24/2				
		31							
	25.0					2		33.0	
								25.0	REMARK 2: Strata change assumed based on drilling effort and change in color of drill water.
		34							
			S13	8-4-4-10 (8)	24/9				S13 - SILT with Sand (ML), moderately plastic, ~20% fine to coarse sand, gray, wet
35		36							
	20.0								
		39					Silt		
			S14	4-5-7-7 (12)	24/14				S14 - Similar to S13
40		41							
	15.0								
		44							
			S15	57-53	12/10				S15 - SILT (ML), non-plastic, 10-15% fine sand, trace of weathered rock, gray, wet
45		45						45.0	
								13.0	
	10.0								
		48.5					Rock		C1 - Min./ft.: 4.0, 3.1, 2.5, 2.6, 2.0 REC. = 60"/60" = 100% RQD = 34"/60" = 56.67% Very soft to soft, fresh, moderately fractured to sound, fine-grained, black, SHALE
50			C1		60/60				
	5.0								
		53.5						53.5	
									Bottom of borehole at 53.5 feet. Borehole backfilled with drill cuttings and 0.5 bags of gravel. Ground surface restored with asphalt cold patch.
55									
	0.0								
60									

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

B-102

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

DATE STARTED: 2/20/23 **DATE COMPLETED:** 2/20/23
BORING LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE El.: 57 ft. (see note 1) **TOTAL DEPTH:** 49 ft.
WEATHER: 50's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 6.0 ft. / El. 51.0 ft. Based on sample moisture
AT END OF DRILLING: 8.0 ft. / El. 49.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: Jon Beirholm
DRILLING METHOD: Drive and wash with 4-inch casing
DRILL RIG TYPE/MODEL: Mobile B-48 ATV Rig
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: NP **CHECKED BY:** TG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0.5	S1	14-10-12 (22)	18/13		Asphalt	0.3 / 56.7	Top 3": Asphalt S1 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 5-10% fines, 0-5% fine subrounded gravel, trace of asphalt, brown, moist
	55.0	2	S2	10-10-8-6 (18)	24/16		Fill		S2 - Similar to S1, trace of organic soil, no asphalt
5		4	S3	8-7-10-8 (17)	24/0				S3 - No recovery
		6	S4	12-7-9-7 (16)	24/17				S4 - Poorly Graded SAND (SP), fine, 0-5% fines, light brown, wet
	50.0	8	S5	4-4-6-9 (10)	24/22		Buried Organic Soil	8.0 / 49.0	S5 - Silty SAND (SM), fine to medium, 25-30% fines, trace of organic soil, trace of roots, black, wet
10		10	S6	6-6-7-7 (13)	24/12		Fill	10.0 / 47.0	S6 - Poorly Graded SAND with Silt (SP-SM), fine to medium, 10-15% fines, trace of organic soil, trace of roots, brown, wet
	45.0	12	S7	1-2-1-1 (3)	24/13		Silt	12.0 / 45.0	S7 - Sandy SILT (ML), non-plastic, 40-45% fine sand, light brown, wet
		14	S8	1-2-2-2 (4)	24/7				S8 - Similar to S7
15		16							
	40.0					1		17.5 / 39.5	REMARK 1: Strata change assumed.
		19	S9	10-9-11-8 (20)	24/11		Sand and Gravel		S9 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, 20-25% fine to coarse subangular gravel, light brown, wet
20		21							
	35.0								
		24							S10 - Similar to S9, 5-10% fines
25				16-9-10-10					

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing C-200 titled: "Civil Proposed Site Plan," prepared by Woodard & Curran, dated August 2022, and provided to LGCI by Thermo-Mechanical Systems Corporation via e-mail on August 23, 2022.

LGCI
Lahlaf Geotechnical Consulting, Inc.
100 Chelmsford Rd Suite 2
Billerica, MA 01862
Telephone: 9783305912
Fax: 9783305056

BORING LOG

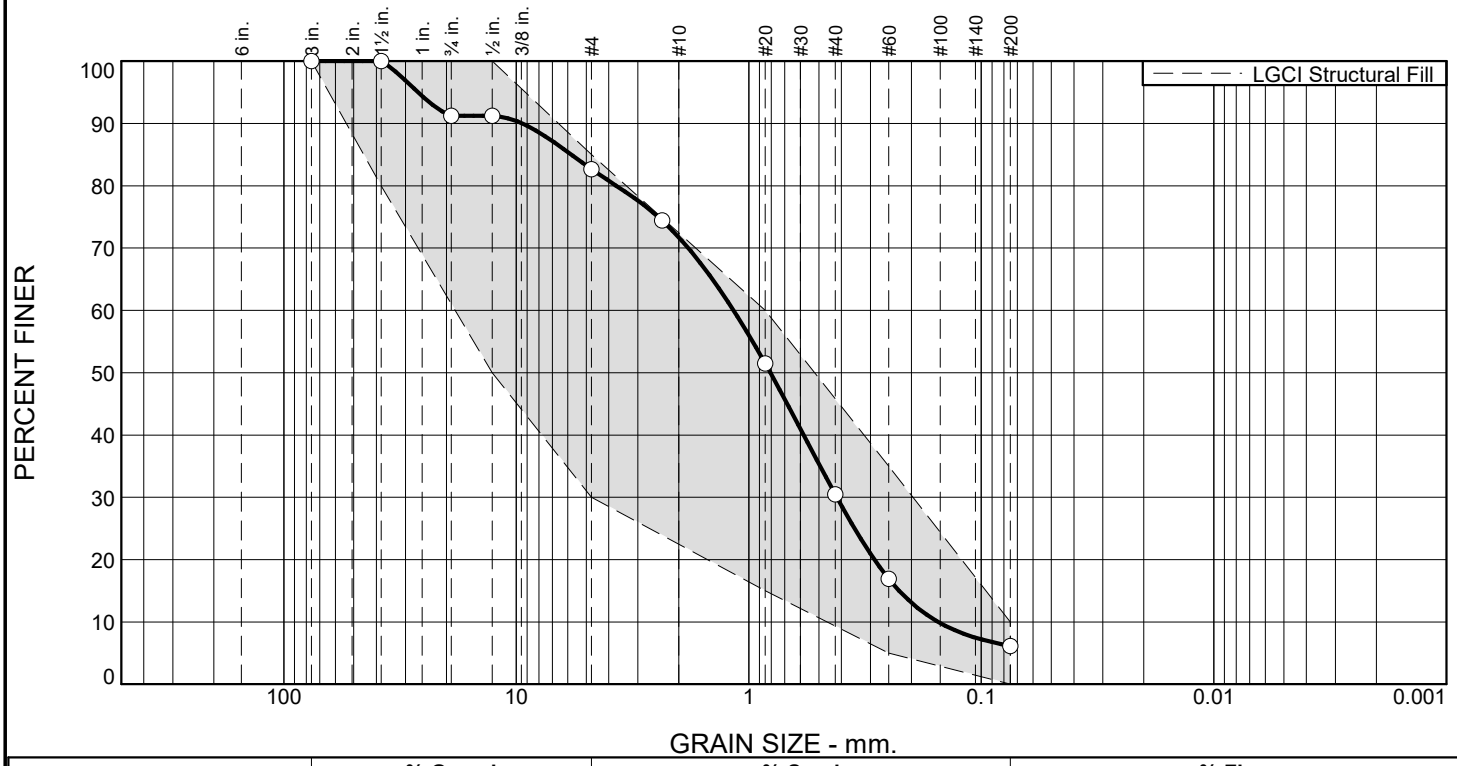
B-102

CLIENT: Taco Comfort Solutions
PROJECT NAME: Prop. Manufacturing Building
LGCI PROJECT NUMBER: 2252
PROJECT LOCATION: Cranston, RI

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		24	S10	(19)	24/18				
		26							
	30.0								
		29					Sand and Gravel		S11 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 5-10% fines, ~20% fine to coarse subrounded gravel, light brown, wet
30			S11	6-7-8-7 (15)	24/15				
		31							
	25.0								
		34						34.0	
			S12	3-4-3-4 (7)	24/22		Silt	23.0	S12 - SILT with Sand (ML), slightly plastic, ~20% fine sand, gray, wet
35		36							
	20.0							39.0	
		39						18.0	S13 - Silty SAND with Gravel (SM), fine to coarse, 35-40% fines, 25-30% fine to coarse angular gravel, trace of weathered rock, gray, wet
40			S13	6-5-13-11 (18)	24/20		Sand and Gravel		
		41							
	15.0							44.0	
		44						13.0	
45			S14	61-36-64/4" (100/10")	16/12		Weathered Rock		S14 - Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 20-25% fine subrounded gravel, gray, wet (weathered rock)
		45.3						46.0	
						2		11.0	REMARK 2: Drill bit refusal encountered at depth of 46 feet on rock. Drilled to depth of 49 feet o confirm presence of rock.
	10.0						Rock		
								49.0	
50									Bottom of borehole at 49.0 feet. Borehole backfilled with drill cuttings and 3.5 bags of gravel. Ground surface restored with asphalt cold patch.
	5.0								
55									
	0.0								
60									

Appendix C – Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.7	8.6	11.0	41.2	24.4	6.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	91.3		
0.5"	91.2	50.0 - 100.0	
#4	82.7	30.0 - 85.0	
#8	74.4		
#20	51.5	15.0 - 60.0	
#40	30.5		
#60	16.9	5.0 - 35.0	
#200	6.1	0.0 - 10.0	

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 5-10% fines, 15 20% fine to coarse subangular gravel, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 9.4240 D_{85}= 5.7993 D_{60}= 1.1630
D_{50}= 0.8078 D_{30}= 0.4179 D_{15}= 0.2253
D_{10}= 0.1534 C_u= 7.58 C_c= 0.98

Remarks

Fill sample.

Date Received: 11/14/2022 **Date Tested:** 12/7/2022

Tested By: MBH

Checked By: JPE

Location: Test Pit TP-10
Sample Number: Grab **Depth:** 0.8'-6.5'

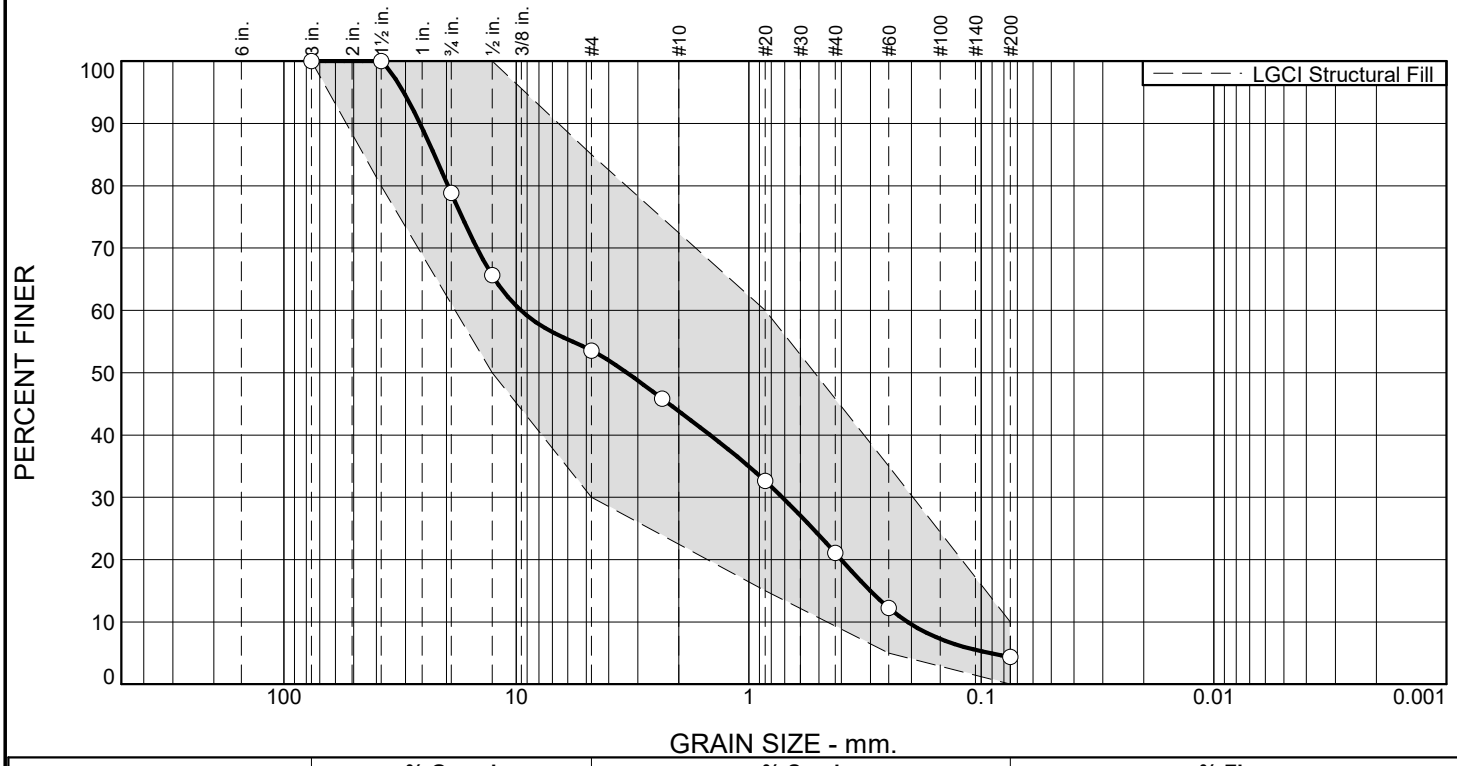
Date Sampled: 11/14/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.2	25.2	9.8	22.7	16.7	4.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	78.8		
0.5"	65.7	50.0 - 100.0	
#4	53.6	30.0 - 85.0	
#8	45.8		
#20	32.6	15.0 - 60.0	
#40	21.1		
#60	12.3	5.0 - 35.0	
#200	4.4	0.0 - 10.0	

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 45-50% fine to coarse angular gravel, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 25.9597 D_{85}= 22.5272 D_{60}= 9.5529
D_{50}= 3.3428 D_{30}= 0.7180 D_{15}= 0.2999
D_{10}= 0.2075 C_u= 46.04 C_c= 0.26

Remarks

Fill sample.

Date Received: 11/15/2022 **Date Tested:** 12/7/2022

Tested By: JPE

Checked By: MBH

Location: Test Pit TP-15
Sample Number: Grab **Depth:** 0.3'-4.0'

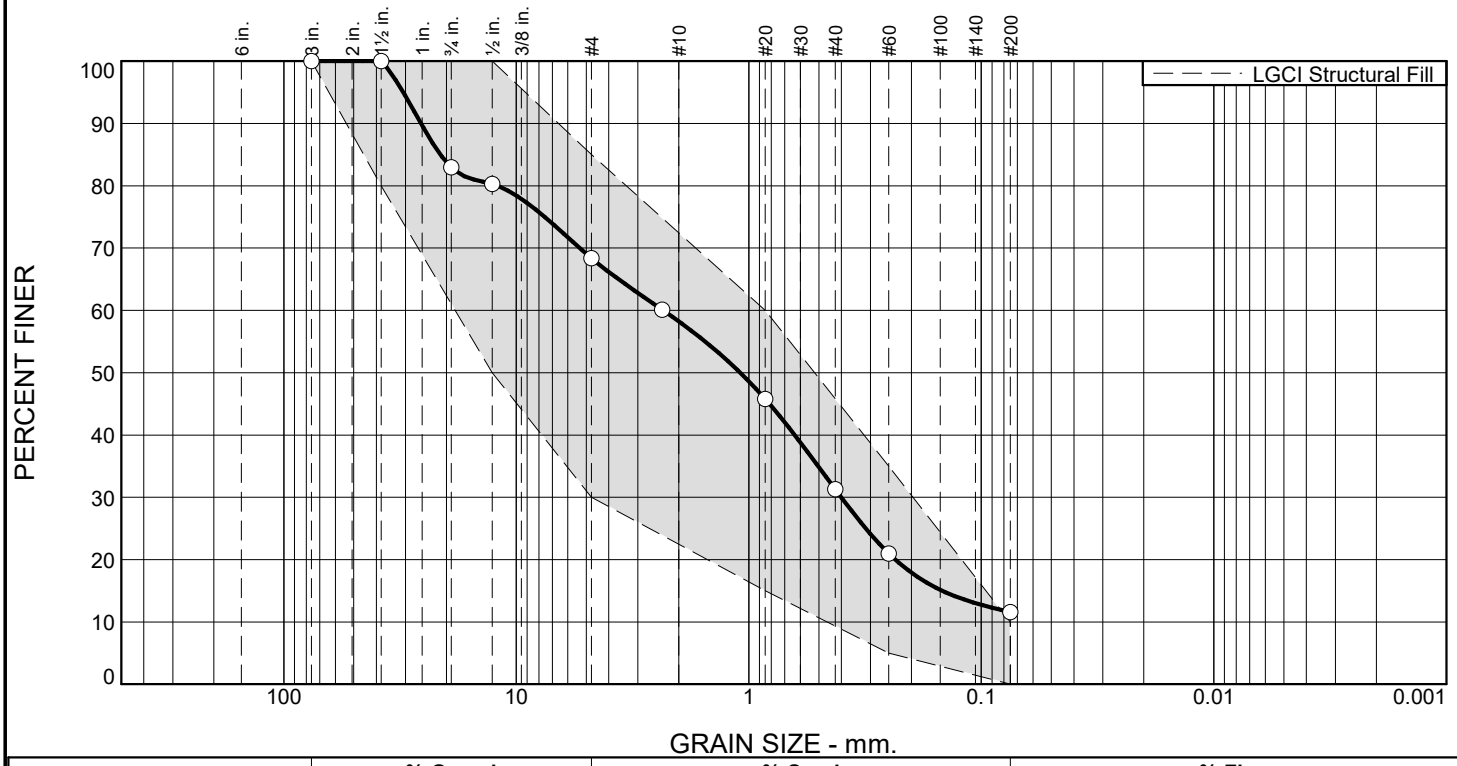
Date Sampled: 11/15/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.0	14.6	10.2	26.9	19.7	11.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	83.0		
0.5"	80.3	50.0 - 100.0	
#4	68.4	30.0 - 85.0	
#8	60.1		
#20	45.8	15.0 - 60.0	
#40	31.3		
#60	21.0	5.0 - 35.0	
#200	11.6	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse subangular gravel, trace of asphalt, dark brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=**

Coefficients

D_{90}= 25.7072 D_{85}= 21.2158 D_{60}= 2.3324
D_{50}= 1.0880 D_{30}= 0.3999 D_{15}= 0.1472
D_{10}= C_u= C_c=

Remarks

Fill sample.

Date Received: 11/14/2022 **Date Tested:** 12/7/2022

Tested By: MBH

Checked By: JPE

Location: Test Pit TP-4
Sample Number: Grab **Depth:** 0.3'-3.0'

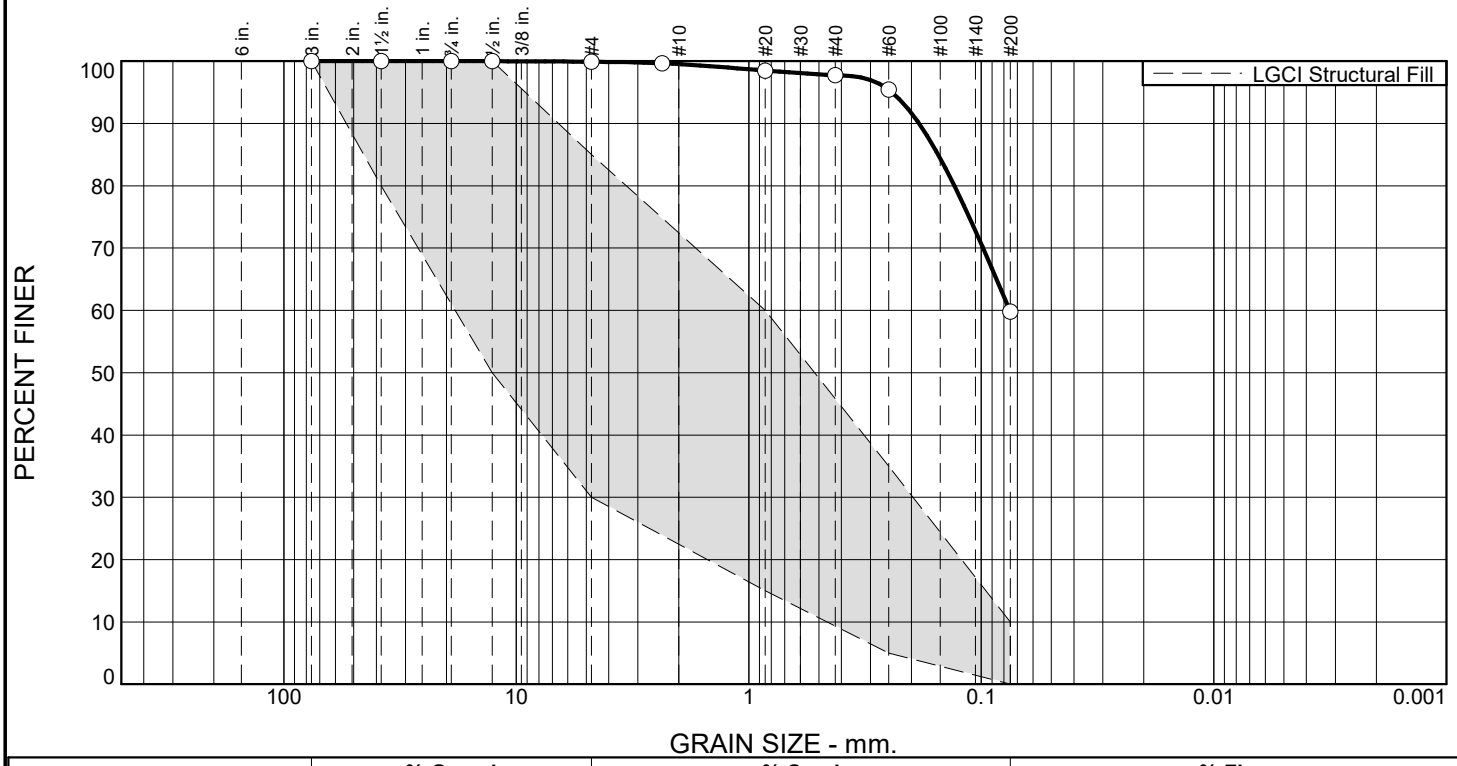
Date Sampled: 11/14/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.4	1.7	38.0	59.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	100.0		
0.5"	100.0	50.0 - 100.0	
#4	99.9	30.0 - 85.0	X
#8	99.7		
#20	98.5	15.0 - 60.0	X
#40	97.8		
#60	95.4	5.0 - 35.0	X
#200	59.8	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Sandy SILT (ML), slightly plastic, 40-45% mostly fine sand, gray to orange

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 0.1851 D_{85}= 0.1532 D_{60}= 0.0754
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural silt sample.

Date Received: 11/16/22 **Date Tested:** 11/16/22

Tested By: TG

Checked By: NP

Location: Test Pit TP-5
Sample Number: Grab **Depth:** 7.7'-12.0'

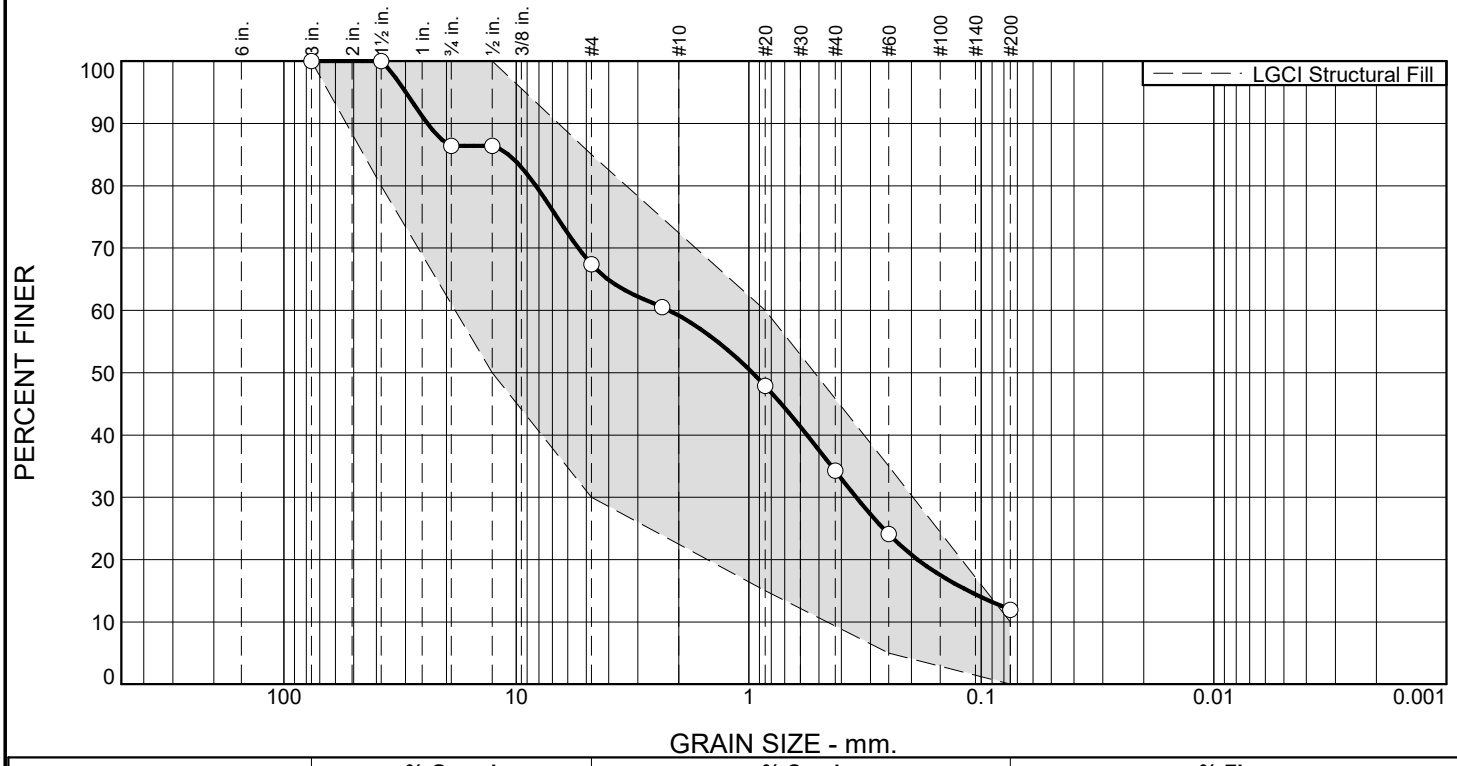
Date Sampled: 11/16/22

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.6	19.0	8.2	25.0	22.3	11.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	86.4		
0.5"	86.4	50.0 - 100.0	
#4	67.4	30.0 - 85.0	
#8	60.5		
#20	47.9	15.0 - 60.0	
#40	34.2		
#60	24.1	5.0 - 35.0	
#200	11.9	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse subrounded gravel, trace of wood, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 24.1357 D_{85}= 10.7801 D_{60}= 2.2016
D_{50}= 0.9652 D_{30}= 0.3449 D_{15}= 0.1138
D_{10}= C_u= C_c=

Remarks

Fill sample.

Date Received: 11/15/2022 **Date Tested:** 12/7/2022

Tested By: JPE

Checked By: MBH

Location: Test Pit TP-6
Sample Number: Grab **Depth:** 1.5'-8.5'

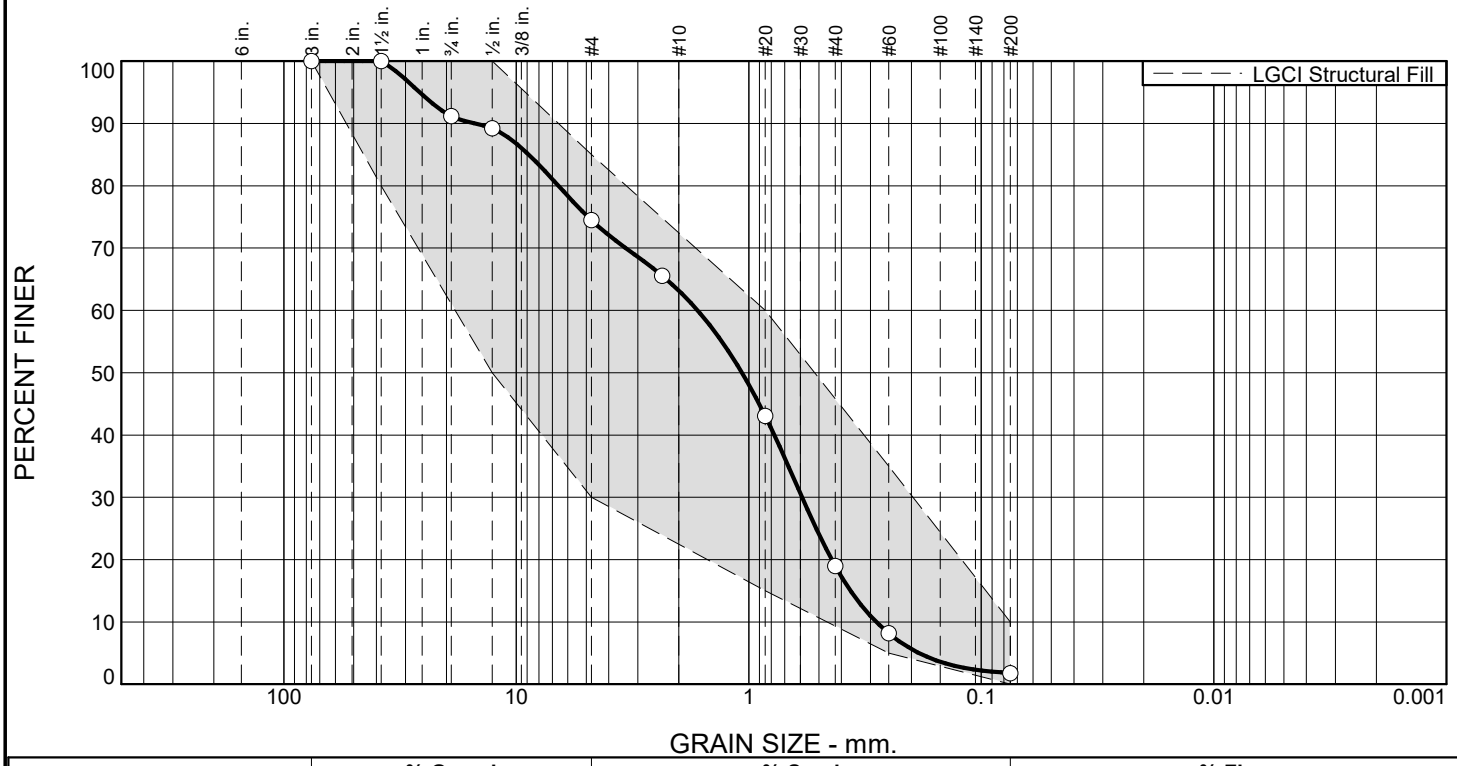
Date Sampled: 11/15/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.8	16.7	11.3	44.2	17.2	1.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	91.2		
0.5"	89.2	50.0 - 100.0	
#4	74.5	30.0 - 85.0	
#8	65.6		
#20	43.1	15.0 - 60.0	
#40	19.0		
#60	8.2	5.0 - 35.0	
#200	1.8	0.0 - 10.0	

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Gravel (SP), mostly medium, 0-5% fines, 25-30% fine to coarse angular gravel, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 14.9807 D_{85}= 8.8286 D_{60}= 1.6609
D_{50}= 1.0692 D_{30}= 0.5902 D_{15}= 0.3651
D_{10}= 0.2829 C_u= 5.87 C_c= 0.74

Remarks

Natural sand and gravel sample.

Date Received: 11/15/2022 **Date Tested:** 12/7/2022

Tested By: JPE

Checked By: MBH

Location: Test Pit TP-7
Sample Number: Grab **Depth:** 2.0'-5.0'

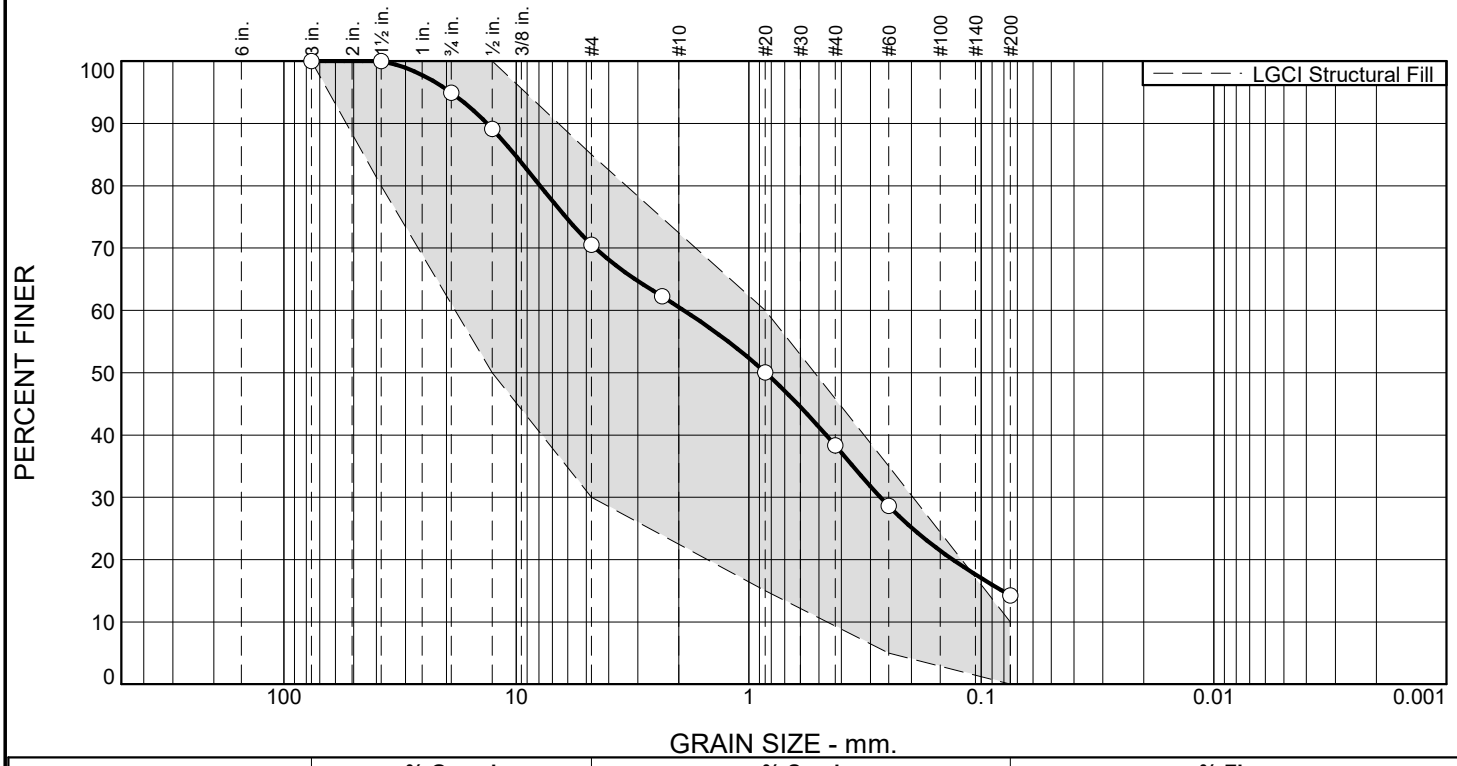
Date Sampled: 11/15/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.0	24.4	10.1	22.2	24.1	14.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	95.0		
0.5"	89.2	50.0 - 100.0	
#4	70.6	30.0 - 85.0	
#8	62.3		
#20	50.1	15.0 - 60.0	
#40	38.3		
#60	28.6	5.0 - 35.0	
#200	14.2	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 25-30% mostly fine subrounded gravel, trace of organic soil, brick, asphalt, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 13.3623 D_{85}= 10.1329 D_{60}= 1.8998
D_{50}= 0.8470 D_{30}= 0.2713 D_{15}= 0.0813
D_{10}= C_u= C_c=

Remarks

Fill sample.

Date Received: 11/14/22 **Date Tested:** 11/14/22

Tested By: NP

Checked By: JPE

Location: Test Pit TP-8
Sample Number: Grab **Depth:** 0.3'-5.5'

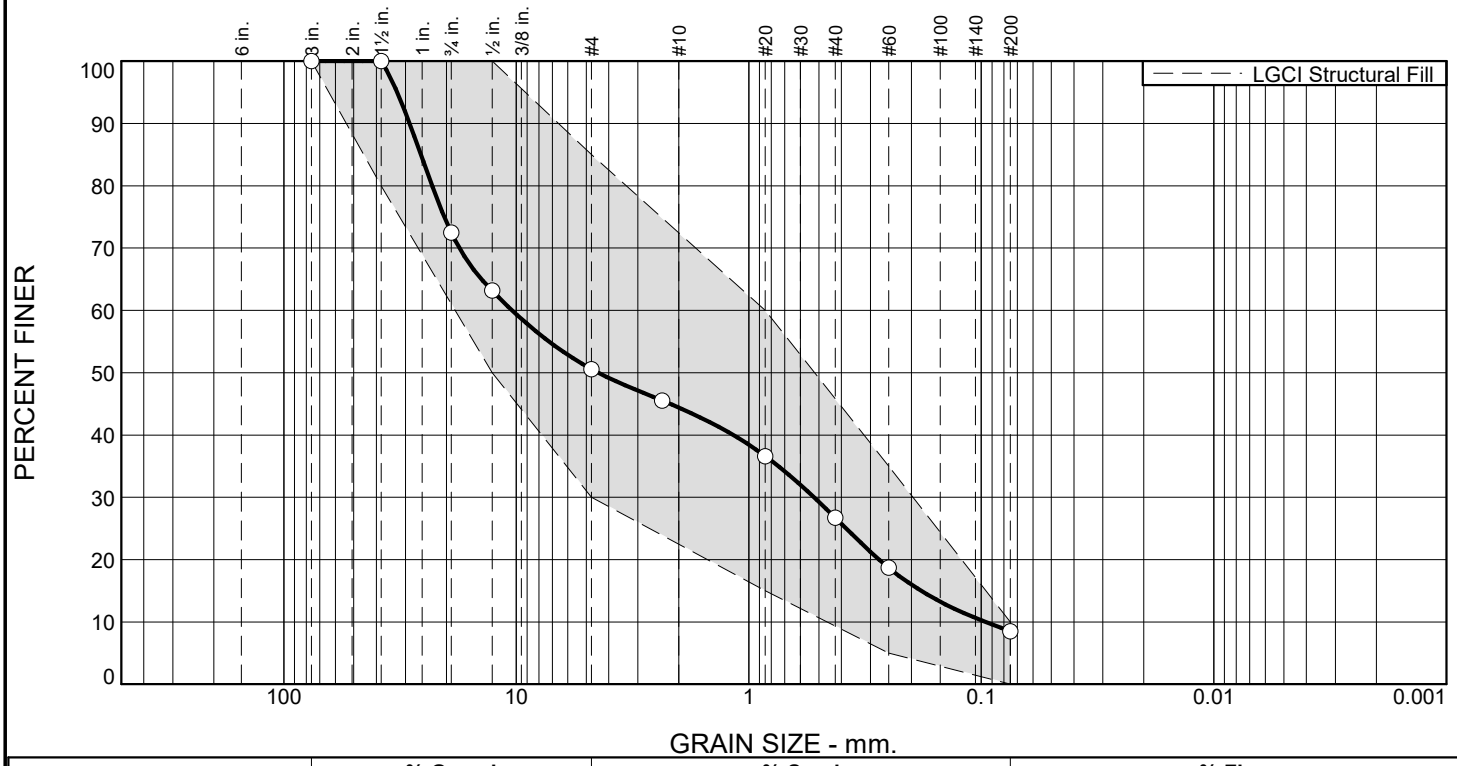
Date Sampled: 11/14/22

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	27.5	21.9	6.2	17.7	18.2	8.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	72.5		
0.5"	63.2	50.0 - 100.0	
#4	50.6	30.0 - 85.0	
#8	45.5		
#20	36.6	15.0 - 60.0	
#40	26.7		
#60	18.7	5.0 - 35.0	
#200	8.5	0.0 - 10.0	

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Well Graded GRAVEL with Silt and Sand (GW-GM), fine to coarse, subangular, 5-10% fines, 40-45% fine to coarse sand, trace of asphalt, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP-GM **AASHTO (M 145)=**

Coefficients

D_{90}= 28.7736 D_{85}= 25.7266 D_{60}= 10.4090
D_{50}= 4.4422 D_{30}= 0.5247 D_{15}= 0.1815
D_{10}= 0.0960 C_u= 108.47 C_c= 0.28

Remarks

Fill sample.

Date Received: 11/14/2022 **Date Tested:** 12/7/2022

Tested By: MBH

Checked By: JPE

Location: Test Pit TP-9
Sample Number: Grab **Depth:** 0.3'-5.0'

Date Sampled: 11/14/2022

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Taco Comfort Solutions
Project: Proposed Manufacturing Building, Cranston, RI

Project No: 2252 **Figure**

GeoTesting EXPRESS

Client:	Lahlaf Geotechnical Consulting				
Project:	Prop. Manufacturing Bldg				
Location:	Cranston, RI			Project No:	GTX-316439
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/05/22	Checked By:	ank
Depth :	---	Test Id:	696832		

Moisture, Ash, and Organic Matter - ASTM D2974

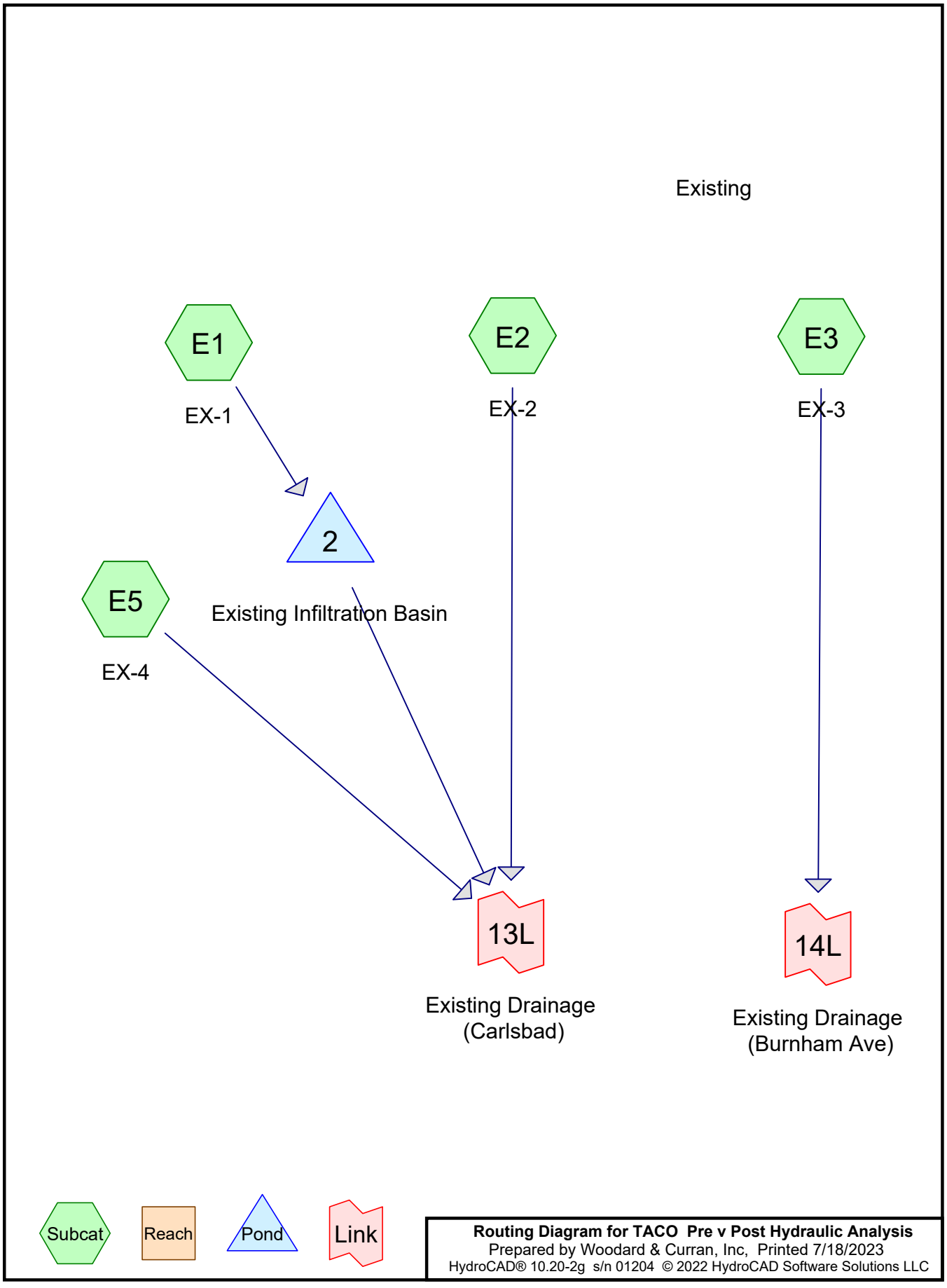
Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
TP-13	Fill	0.3-5	Moist, dark brown sand with gravel	11	97.8	2.2
TP-3	Fill	0.3-4	Moist, dark brown sand with gravel	6	97.4	2.6

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 105º C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440º C

APPENDIX C: PRE-DEVELOPMENT ANALYSIS

- **Pre-Development HydroCAD Report**
- **Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island (Bound Separately)**

Pre-Development HydroCAD Report



Routing Diagram for TACO Pre v Post Hydraulic Analysis
Prepared by Woodard & Curran, Inc, Printed 7/18/2023

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 7801 RI Kent-C
Rainfall events imported from "NRCS-Rain.txt" for 7802 RI Providence-C

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQV	NRCC 24-hr	A	Default	24.00	1	1.20	2
2	1-Year	NRCC 24-hr	A	Default	24.00	1	2.70	2
3	2-Year	NRCC 24-hr	A	Default	24.00	1	3.21	2
4	10-Year	NRCC 24-hr	A	Default	24.00	1	4.74	2
5	25-Year	NRCC 24-hr	A	Default	24.00	1	5.93	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.880	84	50-75% Grass cover, Fair, HSG D (E1, E2, E3, E5)
1.280	96	Gravel surface, HSG D (E2, E3)
2.890	98	Paved parking, HSG D (E1, E2, E3)
5.050	**95**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
5.050	HSG D	E1, E2, E3, E5
0.000	Other	
5.050		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.880	0.000	0.880	50-75% Grass cover, Fair	E1, E2, E3, E5
0.000	0.000	0.000	1.280	0.000	1.280	Gravel surface	E2, E3
0.000	0.000	0.000	2.890	0.000	2.890	Paved parking	E1, E2, E3
0.000	**0.000**	**0.000**	**5.050**	**0.000**	**5.050**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	2	55.00	54.50	42.0	0.0119	0.010	0.0	12.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: EX-1 Runoff Area=0.920 ac 67.39% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=93 Runoff=0.88 cfs 0.047 af

SubcatchmentE2: EX-2 Runoff Area=1.090 ac 23.85% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=95 Runoff=1.25 cfs 0.067 af

SubcatchmentE3: EX-3 Runoff Area=3.030 ac 66.34% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=95 Runoff=3.47 cfs 0.187 af

SubcatchmentE5: EX-4 Runoff Area=0.010 ac 0.00% Impervious Runoff Depth=0.25"
Tc=6.0 min CN=84 Runoff=0.00 cfs 0.000 af

Pond 2: Existing Infiltration Basin Peak Elev=58.76' Storage=624 cf Inflow=0.88 cfs 0.047 af
Discarded=0.14 cfs 0.047 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.047 af

Link 13L: Existing Drainage (Carlsbad) Inflow=1.25 cfs 0.067 af
Primary=1.25 cfs 0.067 af

Link 14L: Existing Drainage (Burnham Ave) Inflow=3.47 cfs 0.187 af
Primary=3.47 cfs 0.187 af

Total Runoff Area = 5.050 ac Runoff Volume = 0.301 af Average Runoff Depth = 0.71"
42.77% Pervious = 2.160 ac 57.23% Impervious = 2.890 ac

Summary for Subcatchment E1: EX-1

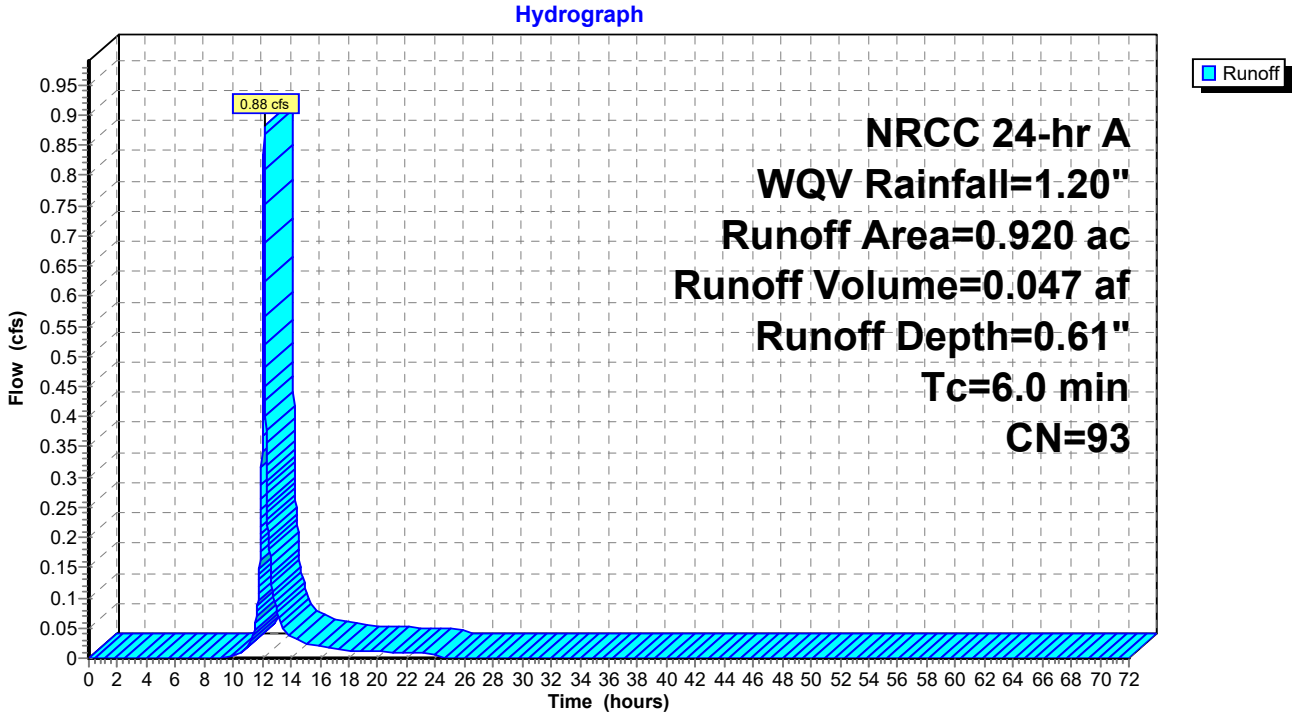
Runoff = 0.88 cfs @ 12.13 hrs, Volume= 0.047 af, Depth= 0.61"
Routed to Pond 2 : Existing Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.300	84	50-75% Grass cover, Fair, HSG D
0.620	98	Paved parking, HSG D
0.920	93	Weighted Average
0.300	84	32.61% Pervious Area
0.620	98	67.39% Impervious Area

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

Subcatchment E1: EX-1



Summary for Subcatchment E2: EX-2

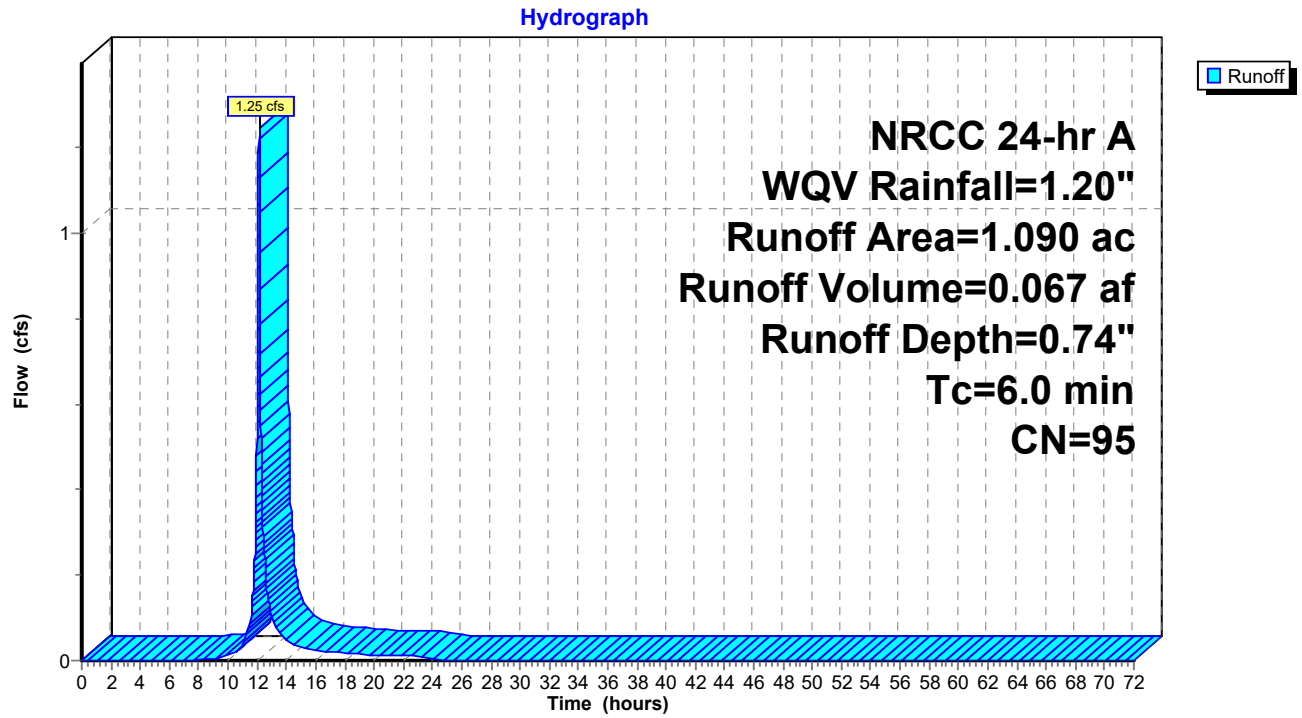
Runoff = 1.25 cfs @ 12.13 hrs, Volume= 0.067 af, Depth= 0.74"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.090	84	50-75% Grass cover, Fair, HSG D
0.260	98	Paved parking, HSG D
0.740	96	Gravel surface, HSG D
1.090	95	Weighted Average
0.830	95	76.15% Pervious Area
0.260	98	23.85% Impervious Area

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

Subcatchment E2: EX-2



Summary for Subcatchment E3: EX-3

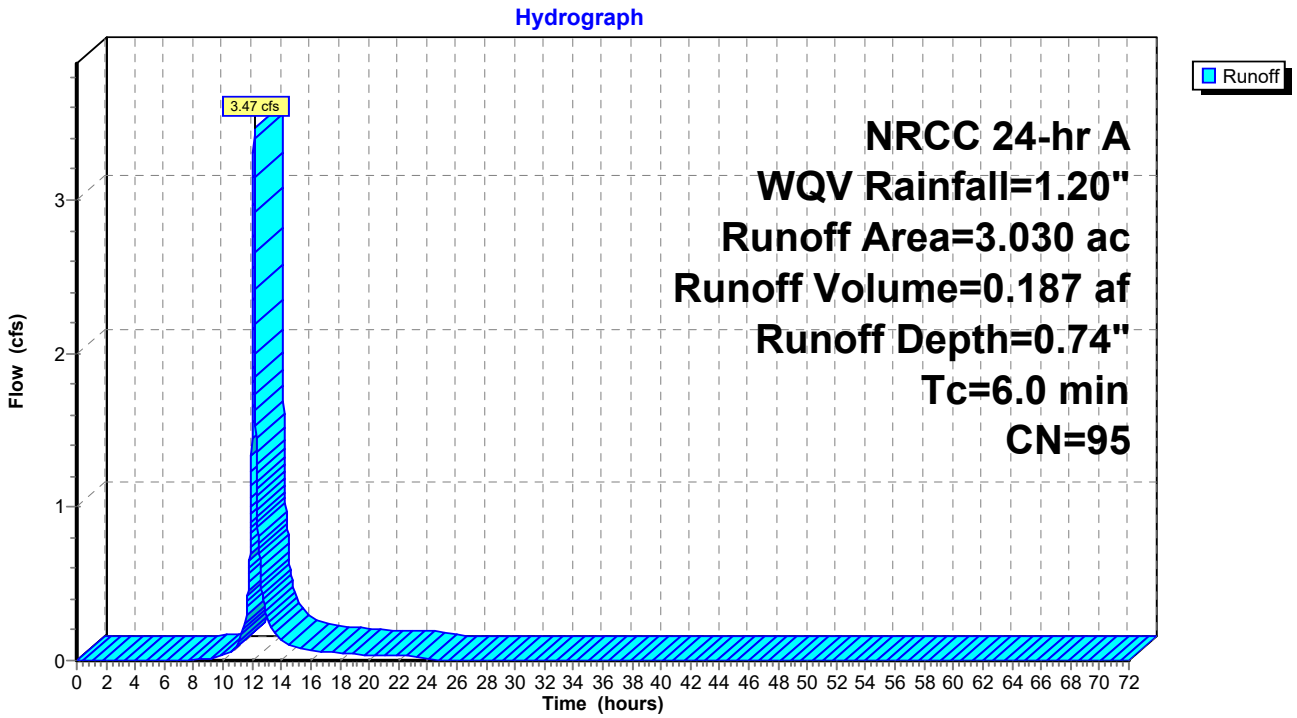
Runoff = 3.47 cfs @ 12.13 hrs, Volume= 0.187 af, Depth= 0.74"
Routed to Link 14L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.480	84	50-75% Grass cover, Fair, HSG D
2.010	98	Paved parking, HSG D
0.540	96	Gravel surface, HSG D
3.030	95	Weighted Average
1.020	90	33.66% Pervious Area
2.010	98	66.34% Impervious Area

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

Subcatchment E3: EX-3



Summary for Subcatchment E5: EX-4

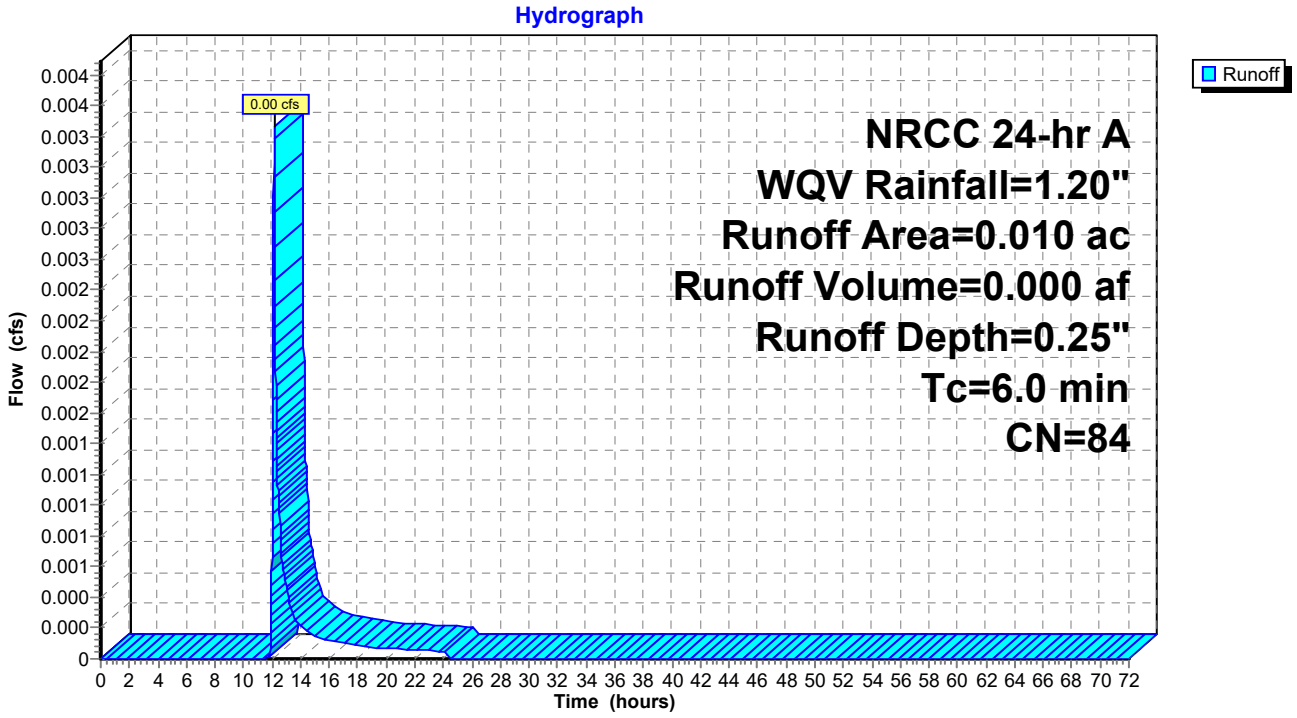
Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 0.25"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.010	84	50-75% Grass cover, Fair, HSG D
0.010	84	100.00% Pervious Area

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

Subcatchment E5: EX-4



Summary for Pond 2: Existing Infiltration Basin

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=470)

Inflow Area = 0.920 ac, 67.39% Impervious, Inflow Depth = 0.61" for WQV event
Inflow = 0.88 cfs @ 12.13 hrs, Volume= 0.047 af
Outflow = 0.14 cfs @ 12.59 hrs, Volume= 0.047 af, Atten= 84%, Lag= 27.7 min
Discarded = 0.14 cfs @ 12.59 hrs, Volume= 0.047 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 13L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 58.76' @ 12.59 hrs Surf.Area= 2,512 sf Storage= 624 cf
Flood Elev= 61.50' Surf.Area= 4,900 sf Storage= 10,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.0 min (851.4 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	10,693 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

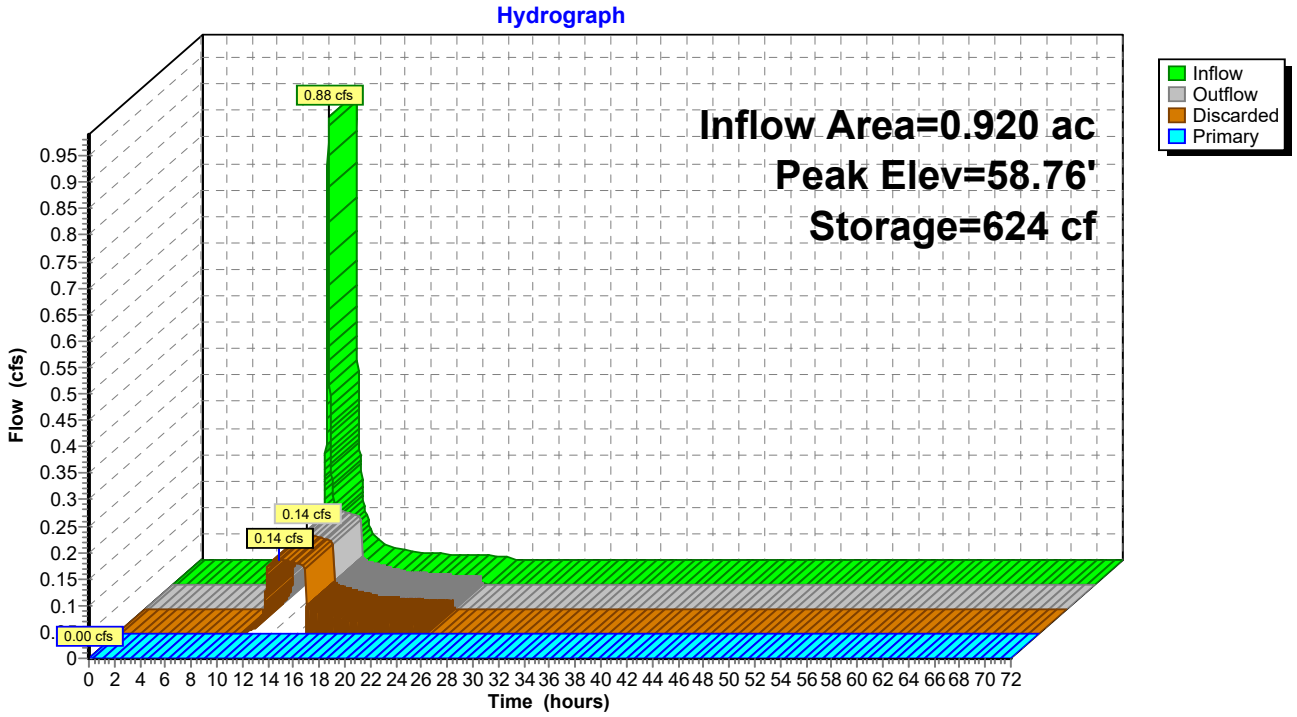
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.50	2,306	0	0
59.00	2,703	1,252	1,252
60.00	3,539	3,121	4,373
61.00	4,433	3,986	8,359
61.50	4,900	2,333	10,693

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.00' / 54.50' S= 0.0119 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.65'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.30'	**Nyloplast 24" Grate** Head (feet) 0.00 0.14 0.23 0.31 0.37 0.43 0.47 0.53 Disch. (cfs) 0.000 1.000 2.000 3.000 4.000 5.000 6.000 7.000
#4	Discarded	58.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.14 cfs @ 12.59 hrs HW=58.76' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.50' TW=51.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 6.55 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Nyloplast 24" Grate** (Controls 0.00 cfs)

Pond 2: Existing Infiltration Basin



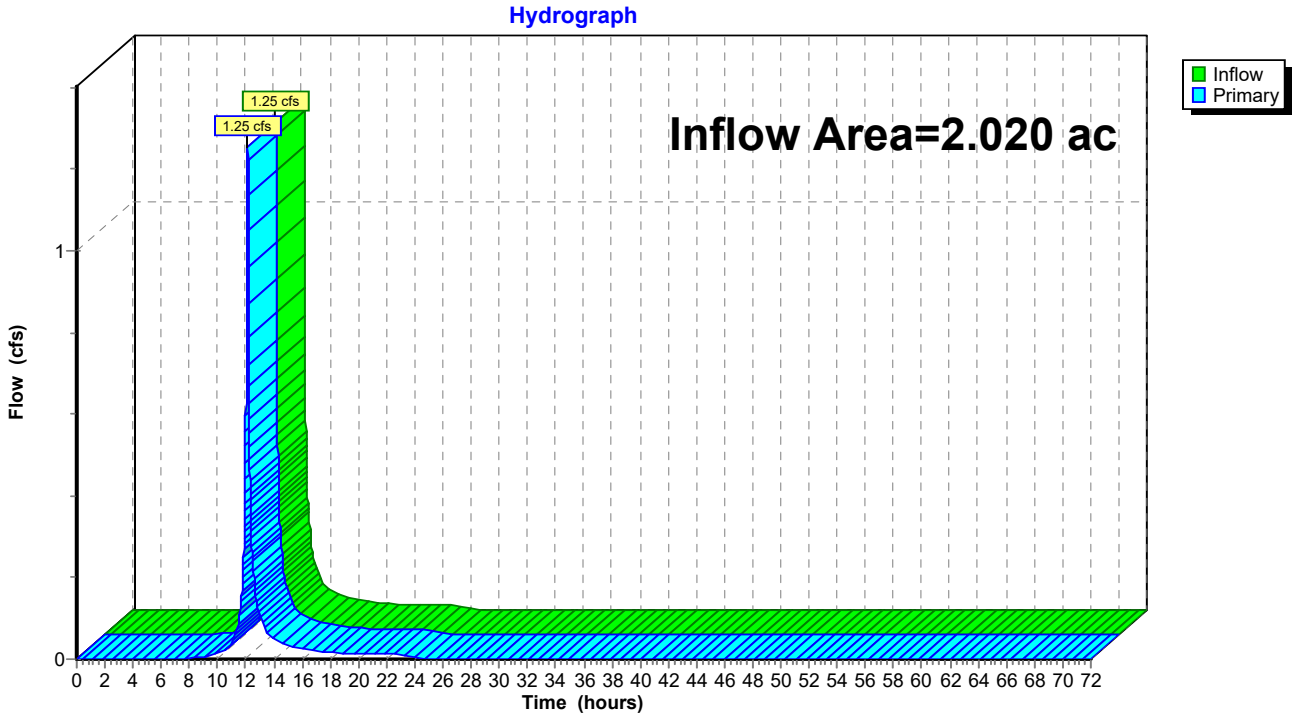
Summary for Link 13L: Existing Drainage (Carlsbad)

Inflow Area = 2.020 ac, 43.56% Impervious, Inflow Depth = 0.40" for WQV event
Inflow = 1.25 cfs @ 12.13 hrs, Volume= 0.067 af
Primary = 1.25 cfs @ 12.13 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 51.68'

Link 13L: Existing Drainage (Carlsbad)

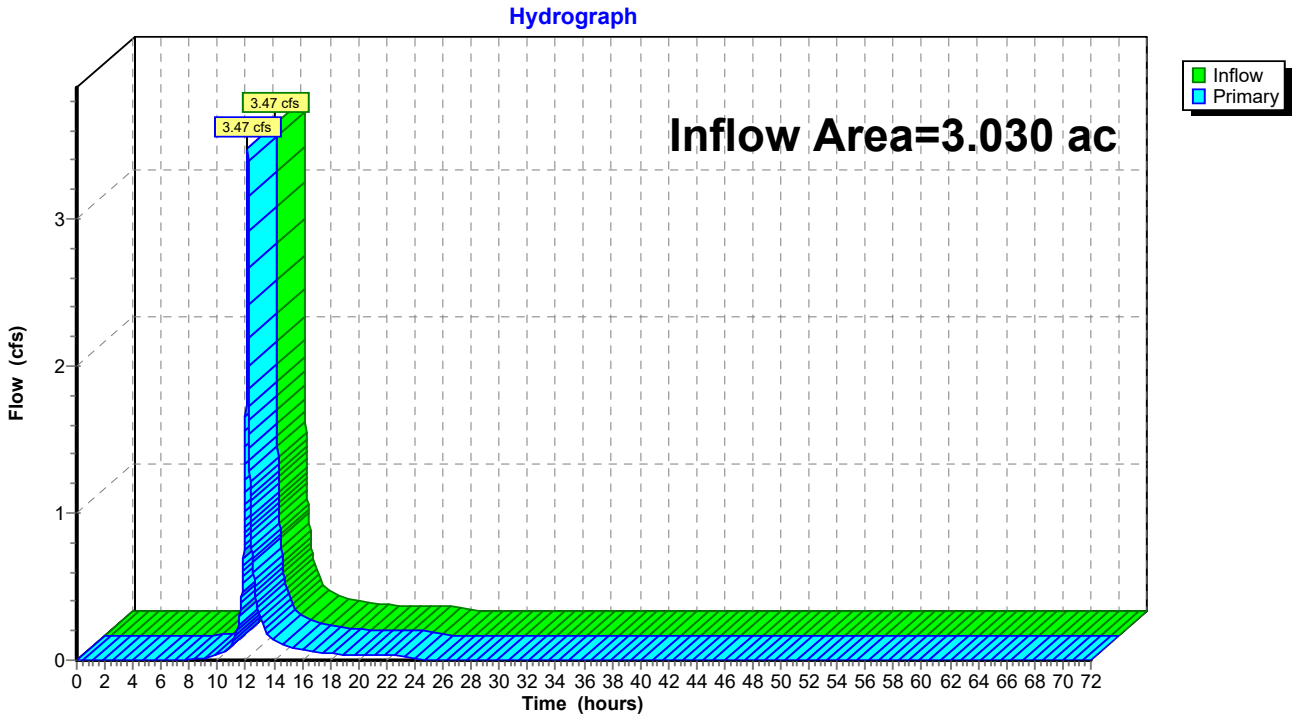


Summary for Link 14L: Existing Drainage (Burnham Ave)

Inflow Area = 3.030 ac, 66.34% Impervious, Inflow Depth = 0.74" for WQV event
Inflow = 3.47 cfs @ 12.13 hrs, Volume= 0.187 af
Primary = 3.47 cfs @ 12.13 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 14L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E1: EX-1 Runoff Area=0.920 ac 67.39% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=93 Runoff=2.72 cfs 0.151 af

Subcatchment E2: EX-2 Runoff Area=1.090 ac 23.85% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=95 Runoff=3.43 cfs 0.196 af

Subcatchment E3: EX-3 Runoff Area=3.030 ac 66.34% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=95 Runoff=9.54 cfs 0.545 af

Subcatchment E5: EX-4 Runoff Area=0.010 ac 0.00% Impervious Runoff Depth=1.27"
Tc=6.0 min CN=84 Runoff=0.02 cfs 0.001 af

Pond 2: Existing Infiltration Basin Peak Elev=59.65' Storage=3,174 cf Inflow=2.72 cfs 0.151 af
Discarded=0.18 cfs 0.151 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.151 af

Link 13L: Existing Drainage (Carlsbad) Inflow=3.45 cfs 0.197 af
Primary=3.45 cfs 0.197 af

Link 14L: Existing Drainage (Burnham Ave) Inflow=9.54 cfs 0.545 af
Primary=9.54 cfs 0.545 af

Total Runoff Area = 5.050 ac Runoff Volume = 0.893 af Average Runoff Depth = 2.12"
42.77% Pervious = 2.160 ac 57.23% Impervious = 2.890 ac

Summary for Subcatchment E1: EX-1

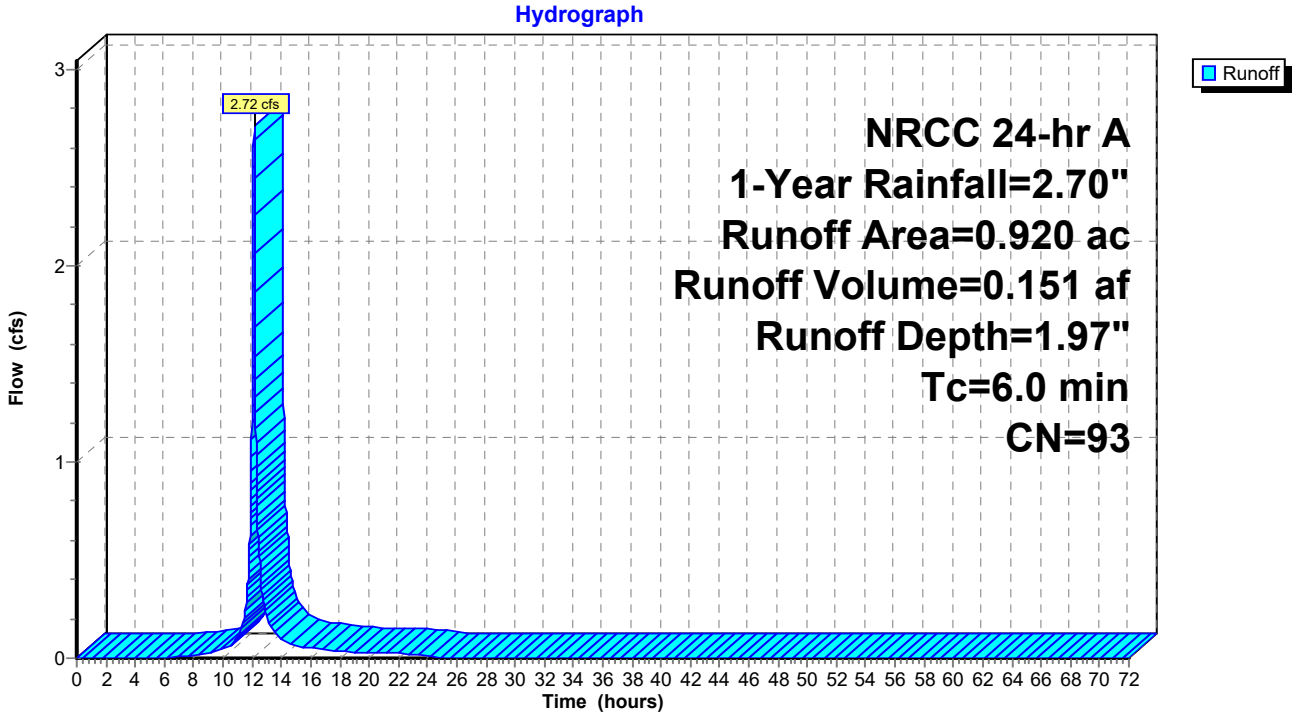
Runoff = 2.72 cfs @ 12.13 hrs, Volume= 0.151 af, Depth= 1.97"
Routed to Pond 2 : Existing Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.300	84	50-75% Grass cover, Fair, HSG D
0.620	98	Paved parking, HSG D
0.920	93	Weighted Average
0.300	84	32.61% Pervious Area
0.620	98	67.39% Impervious Area

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

Subcatchment E1: EX-1



Summary for Subcatchment E2: EX-2

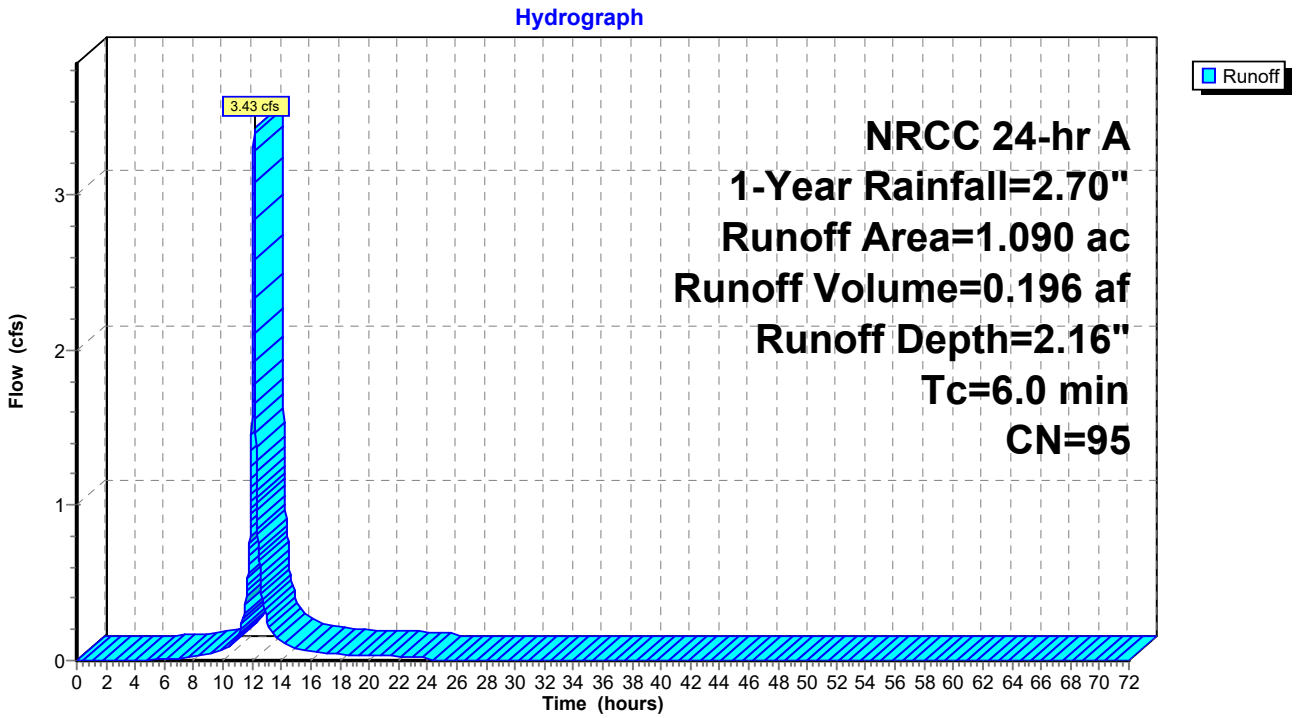
Runoff = 3.43 cfs @ 12.13 hrs, Volume= 0.196 af, Depth= 2.16"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.090	84	50-75% Grass cover, Fair, HSG D
0.260	98	Paved parking, HSG D
0.740	96	Gravel surface, HSG D
1.090	95	Weighted Average
0.830	95	76.15% Pervious Area
0.260	98	23.85% Impervious Area

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

Subcatchment E2: EX-2



Summary for Subcatchment E3: EX-3

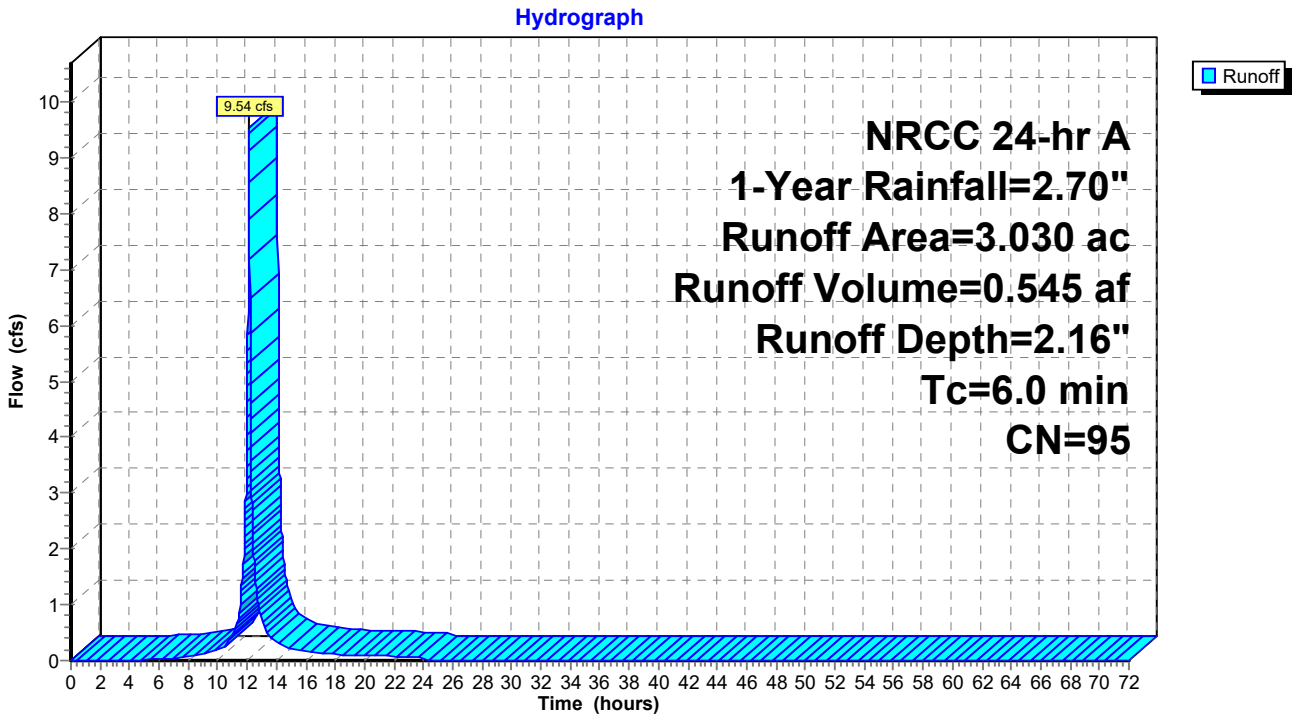
Runoff = 9.54 cfs @ 12.13 hrs, Volume= 0.545 af, Depth= 2.16"
Routed to Link 14L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.480	84	50-75% Grass cover, Fair, HSG D
2.010	98	Paved parking, HSG D
0.540	96	Gravel surface, HSG D
3.030	95	Weighted Average
1.020	90	33.66% Pervious Area
2.010	98	66.34% Impervious Area

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

Subcatchment E3: EX-3



Summary for Subcatchment E5: EX-4

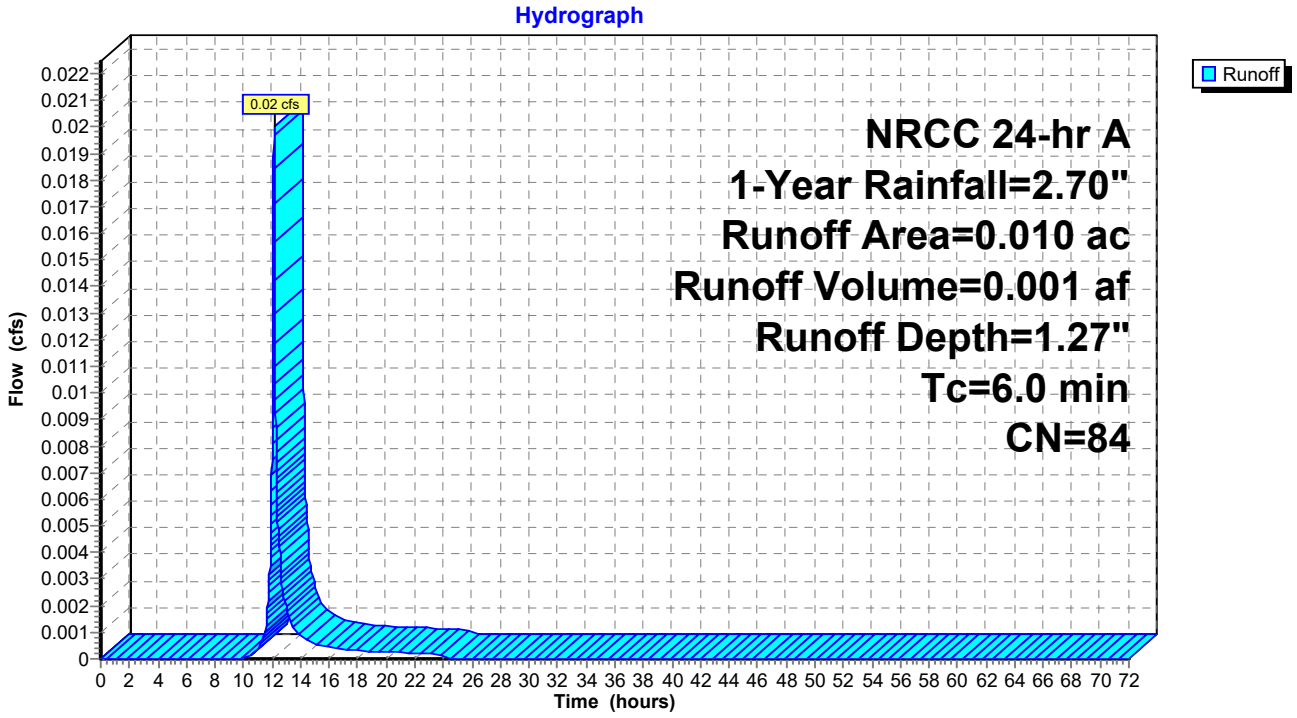
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 1.27"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.010	84	50-75% Grass cover, Fair, HSG D
0.010	84	100.00% Pervious Area

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

Subcatchment E5: EX-4



Summary for Pond 2: Existing Infiltration Basin

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=135)

Inflow Area = 0.920 ac, 67.39% Impervious, Inflow Depth = 1.97" for 1-Year event
Inflow = 2.72 cfs @ 12.13 hrs, Volume= 0.151 af
Outflow = 0.18 cfs @ 13.16 hrs, Volume= 0.151 af, Atten= 93%, Lag= 61.8 min
Discarded = 0.18 cfs @ 13.16 hrs, Volume= 0.151 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 13L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 59.65' @ 13.16 hrs Surf.Area= 3,243 sf Storage= 3,174 cf
Flood Elev= 61.50' Surf.Area= 4,900 sf Storage= 10,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 157.9 min (950.4 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	10,693 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

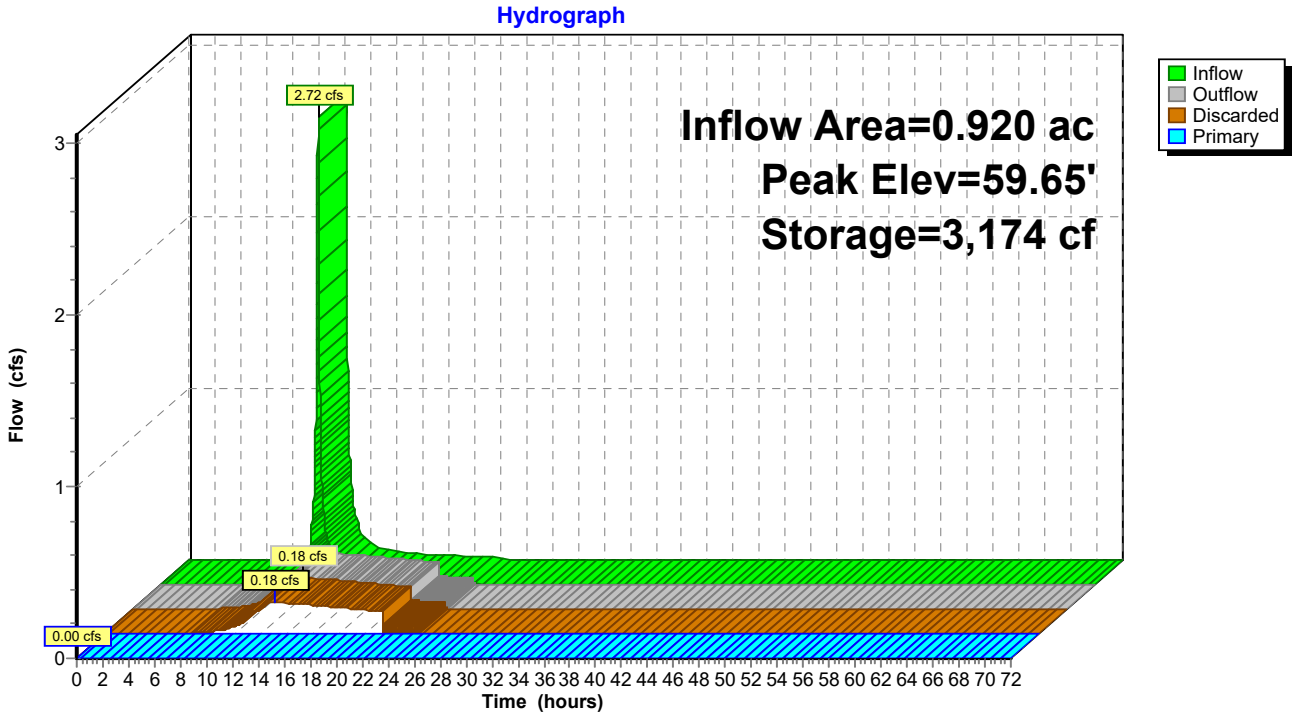
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.50	2,306	0	0
59.00	2,703	1,252	1,252
60.00	3,539	3,121	4,373
61.00	4,433	3,986	8,359
61.50	4,900	2,333	10,693

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.00' / 54.50' S= 0.0119 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.65'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.30'	**Nyloplast 24" Grate** Head (feet) 0.00 0.14 0.23 0.31 0.37 0.43 0.47 0.53 Disch. (cfs) 0.000 1.000 2.000 3.000 4.000 5.000 6.000 7.000
#4	Discarded	58.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 13.16 hrs HW=59.65' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=58.50' TW=51.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 6.55 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Nyloplast 24" Grate** (Controls 0.00 cfs)

Pond 2: Existing Infiltration Basin



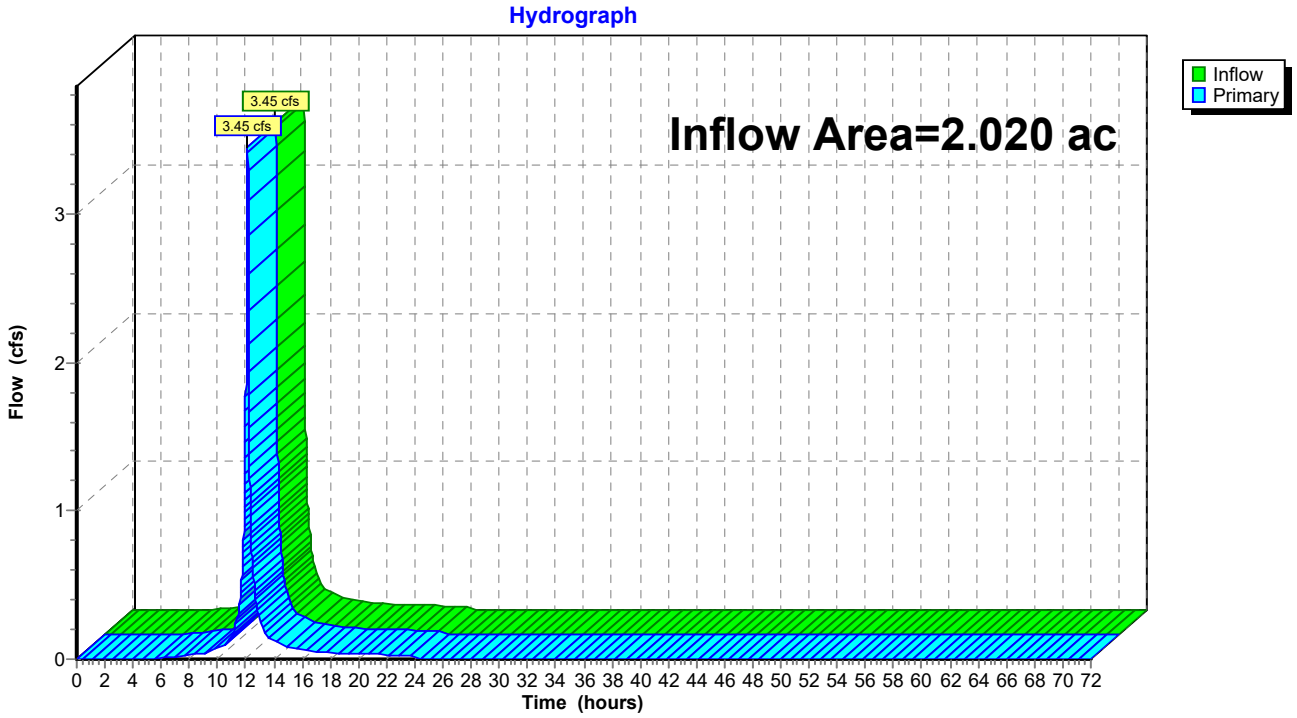
Summary for Link 13L: Existing Drainage (Carlsbad)

Inflow Area = 2.020 ac, 43.56% Impervious, Inflow Depth = 1.17" for 1-Year event
Inflow = 3.45 cfs @ 12.13 hrs, Volume= 0.197 af
Primary = 3.45 cfs @ 12.13 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 51.68'

Link 13L: Existing Drainage (Carlsbad)

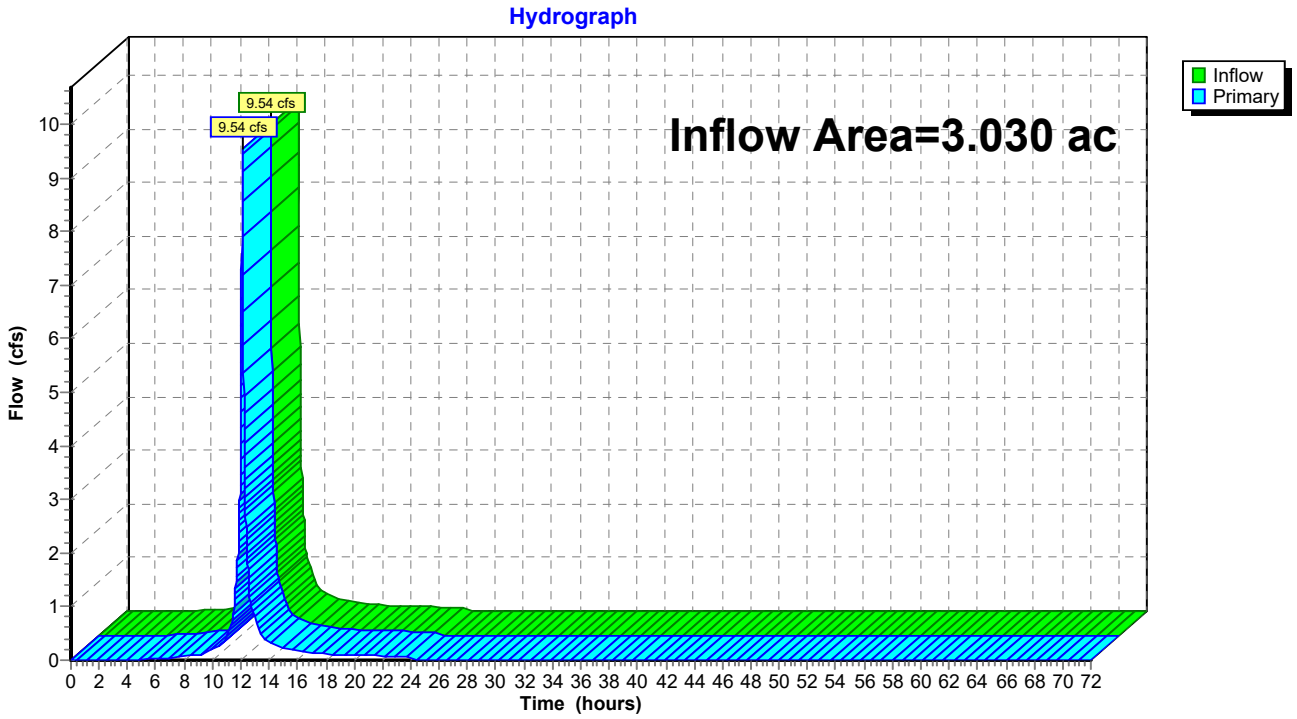


Summary for Link 14L: Existing Drainage (Burnham Ave)

Inflow Area = 3.030 ac, 66.34% Impervious, Inflow Depth = 2.16" for 1-Year event
Inflow = 9.54 cfs @ 12.13 hrs, Volume= 0.545 af
Primary = 9.54 cfs @ 12.13 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 14L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: EX-1 Runoff Area=0.920 ac 67.39% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=93 Runoff=3.35 cfs 0.188 af

SubcatchmentE2: EX-2 Runoff Area=1.090 ac 23.85% Impervious Runoff Depth=2.65"
Tc=6.0 min CN=95 Runoff=4.17 cfs 0.241 af

SubcatchmentE3: EX-3 Runoff Area=3.030 ac 66.34% Impervious Runoff Depth=2.65"
Tc=6.0 min CN=95 Runoff=11.59 cfs 0.670 af

SubcatchmentE5: EX-4 Runoff Area=0.010 ac 0.00% Impervious Runoff Depth=1.69"
Tc=6.0 min CN=84 Runoff=0.03 cfs 0.001 af

Pond 2: Existing Infiltration Basin Peak Elev=59.91' Storage=4,059 cf Inflow=3.35 cfs 0.188 af
Discarded=0.19 cfs 0.181 af Primary=0.04 cfs 0.007 af Outflow=0.24 cfs 0.188 af

Link 13L: Existing Drainage (Carlsbad) Inflow=4.19 cfs 0.250 af
Primary=4.19 cfs 0.250 af

Link 14L: Existing Drainage (Burnham Ave) Inflow=11.59 cfs 0.670 af
Primary=11.59 cfs 0.670 af

Total Runoff Area = 5.050 ac Runoff Volume = 1.101 af Average Runoff Depth = 2.62"
42.77% Pervious = 2.160 ac 57.23% Impervious = 2.890 ac

Summary for Subcatchment E1: EX-1

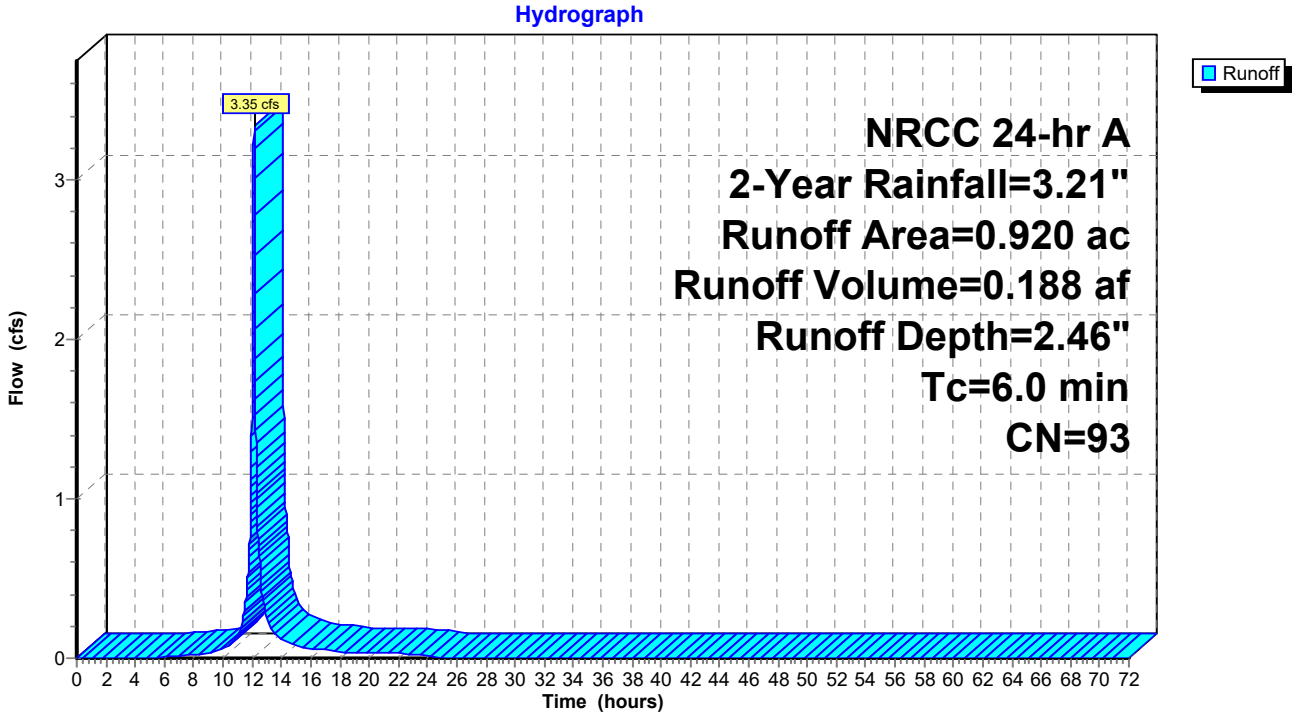
Runoff = 3.35 cfs @ 12.13 hrs, Volume= 0.188 af, Depth= 2.46"
Routed to Pond 2 : Existing Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.300	84	50-75% Grass cover, Fair, HSG D
0.620	98	Paved parking, HSG D
0.920	93	Weighted Average
0.300	84	32.61% Pervious Area
0.620	98	67.39% Impervious Area

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

Subcatchment E1: EX-1



Summary for Subcatchment E2: EX-2

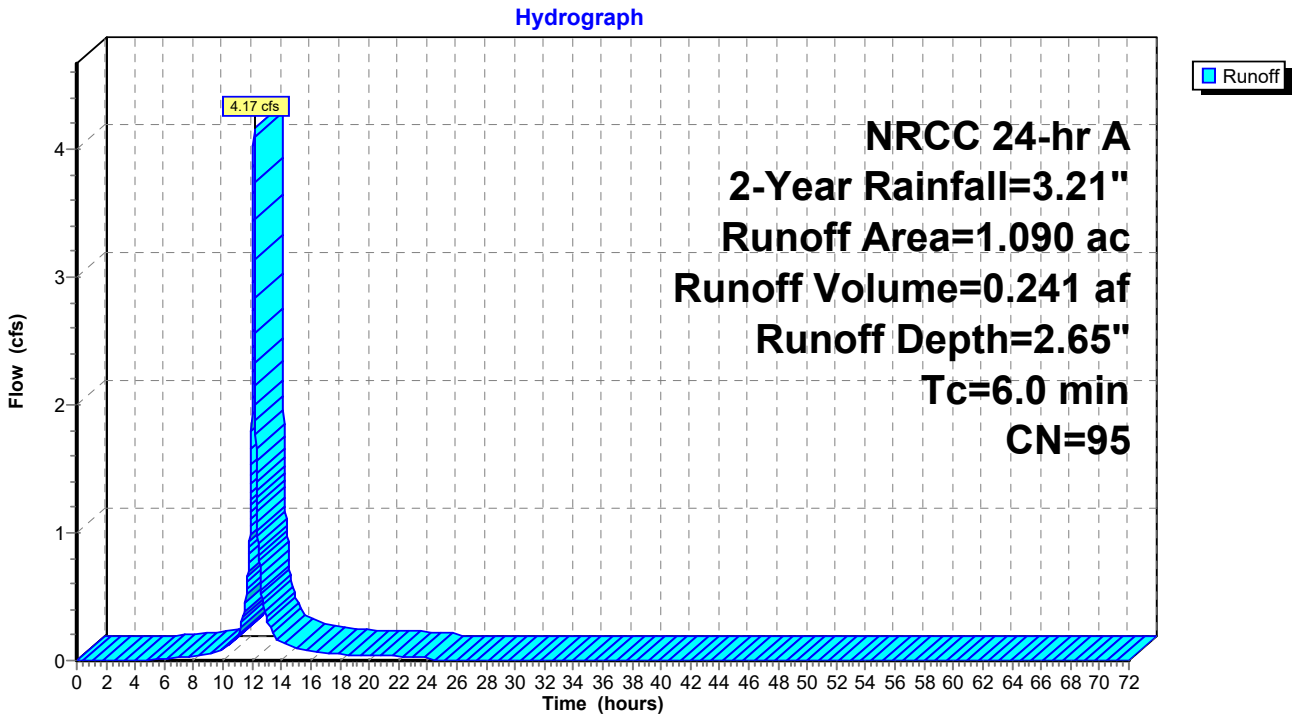
Runoff = 4.17 cfs @ 12.13 hrs, Volume= 0.241 af, Depth= 2.65"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.090	84	50-75% Grass cover, Fair, HSG D
0.260	98	Paved parking, HSG D
0.740	96	Gravel surface, HSG D
1.090	95	Weighted Average
0.830	95	76.15% Pervious Area
0.260	98	23.85% Impervious Area

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

Subcatchment E2: EX-2



Summary for Subcatchment E3: EX-3

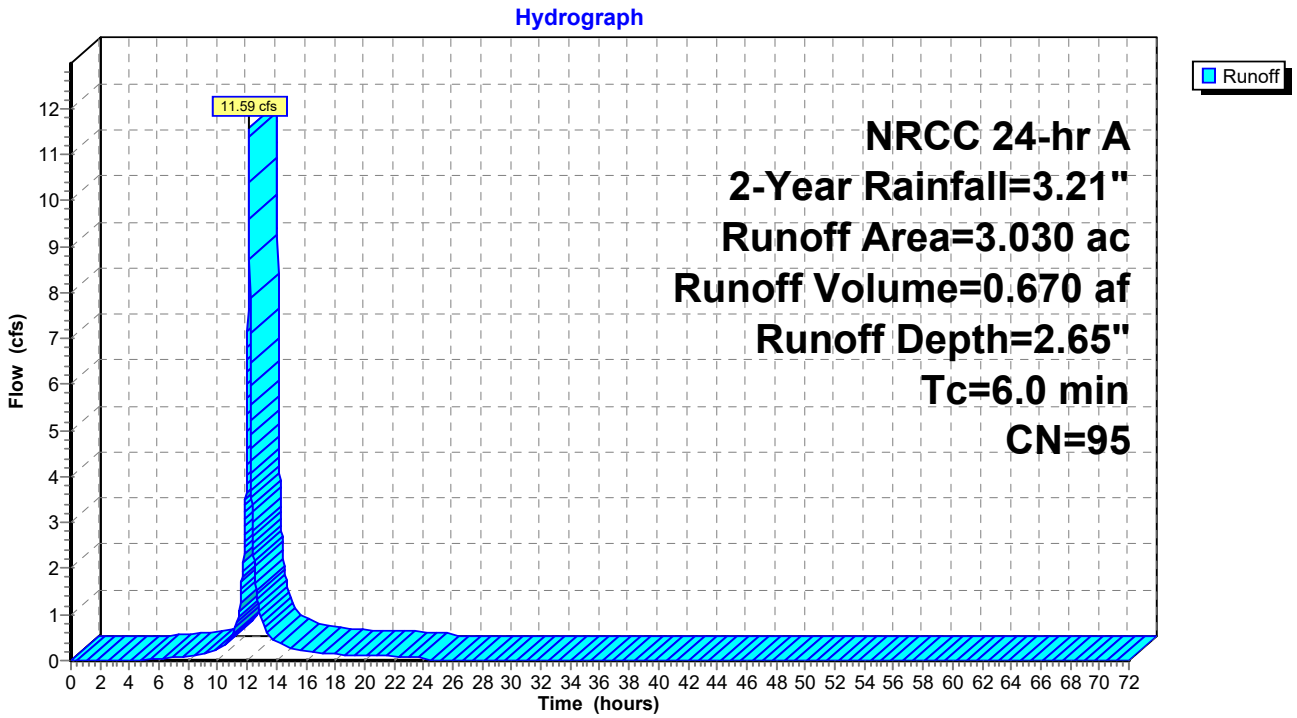
Runoff = 11.59 cfs @ 12.13 hrs, Volume= 0.670 af, Depth= 2.65"
Routed to Link 14L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.480	84	50-75% Grass cover, Fair, HSG D
2.010	98	Paved parking, HSG D
0.540	96	Gravel surface, HSG D
3.030	95	Weighted Average
1.020	90	33.66% Pervious Area
2.010	98	66.34% Impervious Area

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

Subcatchment E3: EX-3



Summary for Subcatchment E5: EX-4

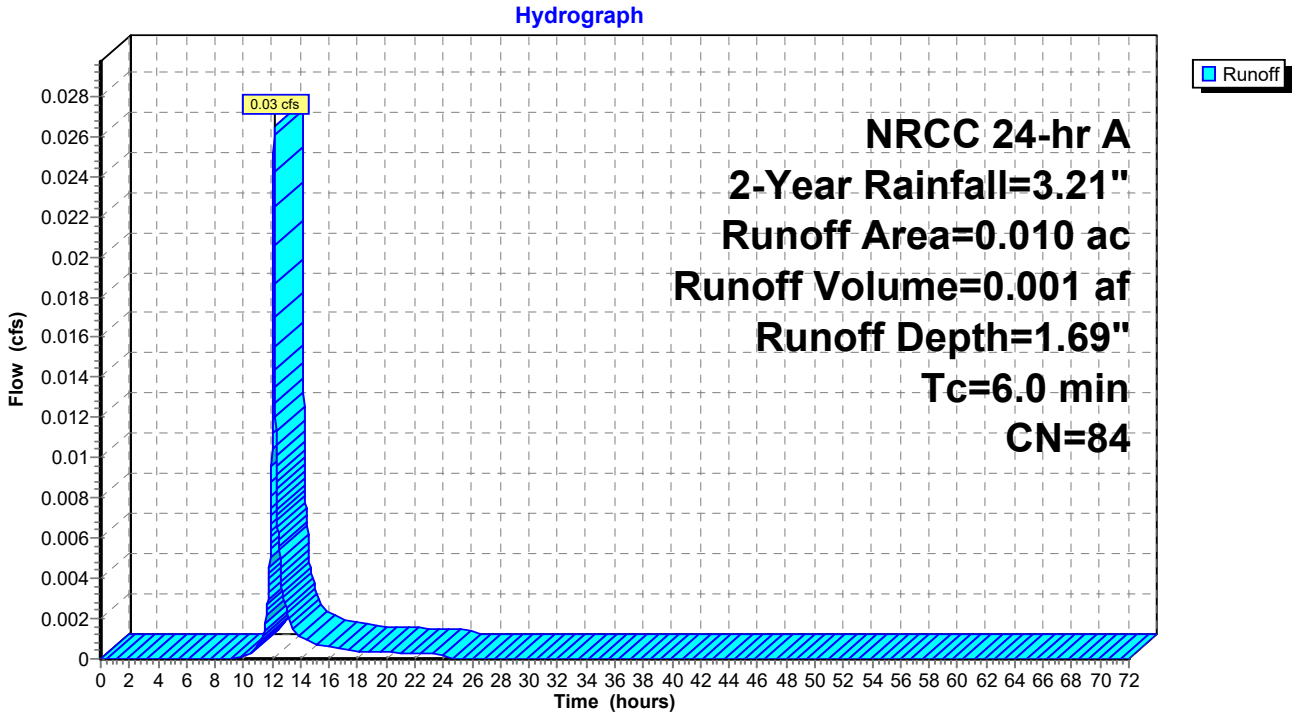
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 1.69"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.010	84	50-75% Grass cover, Fair, HSG D
0.010	84	100.00% Pervious Area

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

Subcatchment E5: EX-4



Summary for Pond 2: Existing Infiltration Basin

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=51)

Inflow Area = 0.920 ac, 67.39% Impervious, Inflow Depth = 2.46" for 2-Year event
Inflow = 3.35 cfs @ 12.13 hrs, Volume= 0.188 af
Outflow = 0.24 cfs @ 13.09 hrs, Volume= 0.188 af, Atten= 93%, Lag= 57.5 min
Discarded = 0.19 cfs @ 13.09 hrs, Volume= 0.181 af
Primary = 0.04 cfs @ 13.09 hrs, Volume= 0.007 af
Routed to Link 13L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 59.91' @ 13.09 hrs Surf.Area= 3,464 sf Storage= 4,059 cf
Flood Elev= 61.50' Surf.Area= 4,900 sf Storage= 10,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 182.6 min (969.7 - 787.2)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	10,693 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

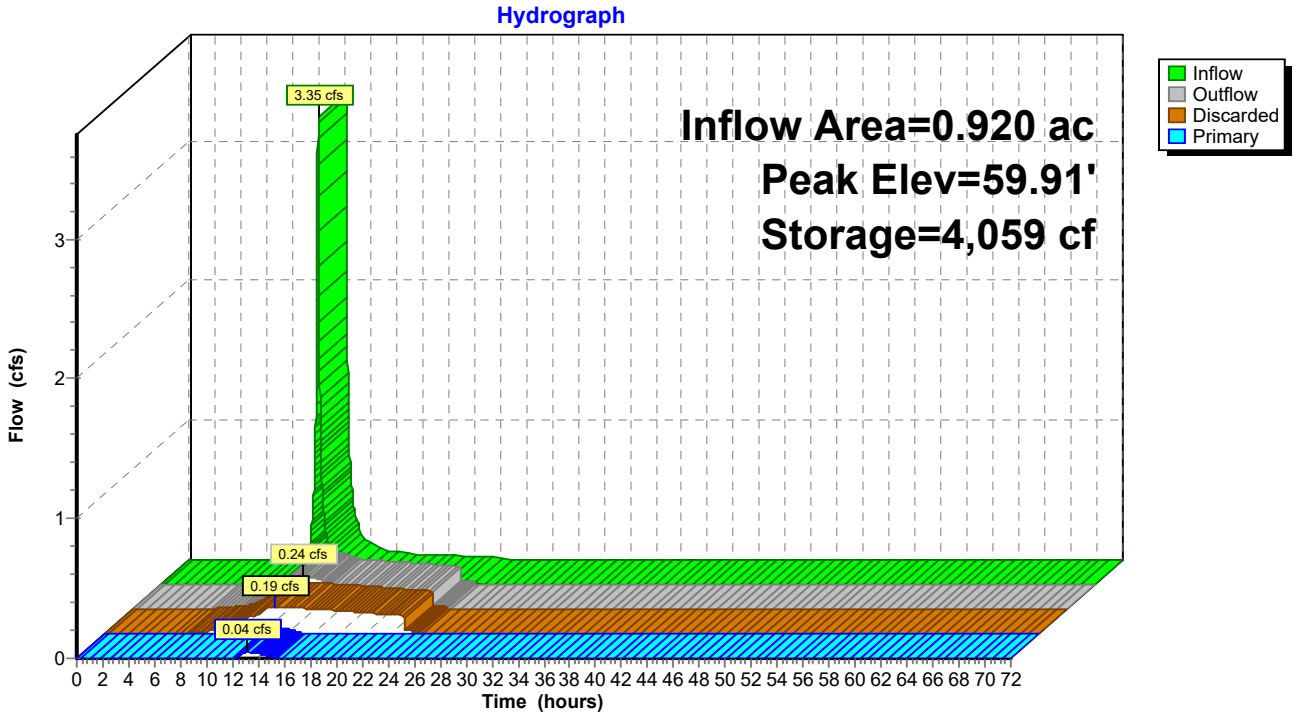
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.50	2,306	0	0
59.00	2,703	1,252	1,252
60.00	3,539	3,121	4,373
61.00	4,433	3,986	8,359
61.50	4,900	2,333	10,693

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.00' / 54.50' S= 0.0119 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.65'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.30'	**Nyloplast 24" Grate** Head (feet) 0.00 0.14 0.23 0.31 0.37 0.43 0.47 0.53 Disch. (cfs) 0.000 1.000 2.000 3.000 4.000 5.000 6.000 7.000
#4	Discarded	58.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.19 cfs @ 13.09 hrs HW=59.91' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.04 cfs @ 13.09 hrs HW=59.91' TW=51.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.04 cfs of 7.94 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 2.02 fps)
  └**3=Nyloplast 24" Grate** (Controls 0.00 cfs)

Pond 2: Existing Infiltration Basin



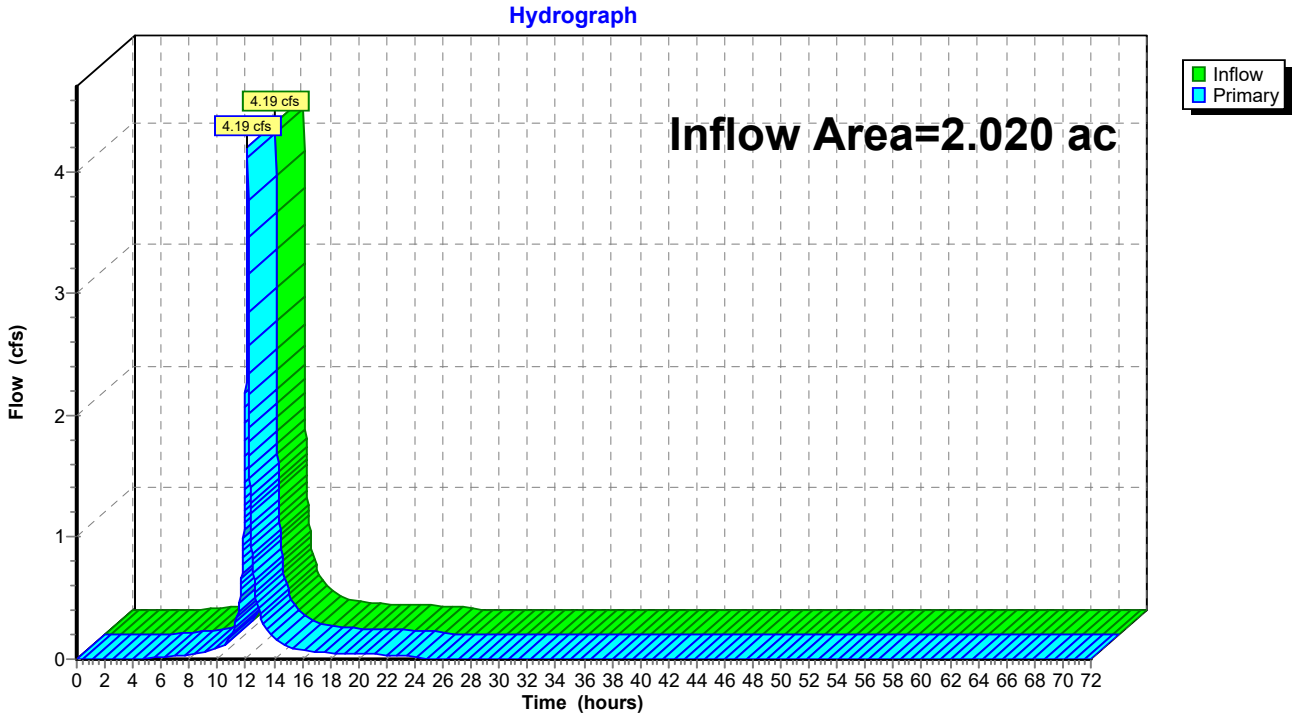
Summary for Link 13L: Existing Drainage (Carlsbad)

Inflow Area = 2.020 ac, 43.56% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 4.19 cfs @ 12.13 hrs, Volume= 0.250 af
Primary = 4.19 cfs @ 12.13 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 51.68'

Link 13L: Existing Drainage (Carlsbad)

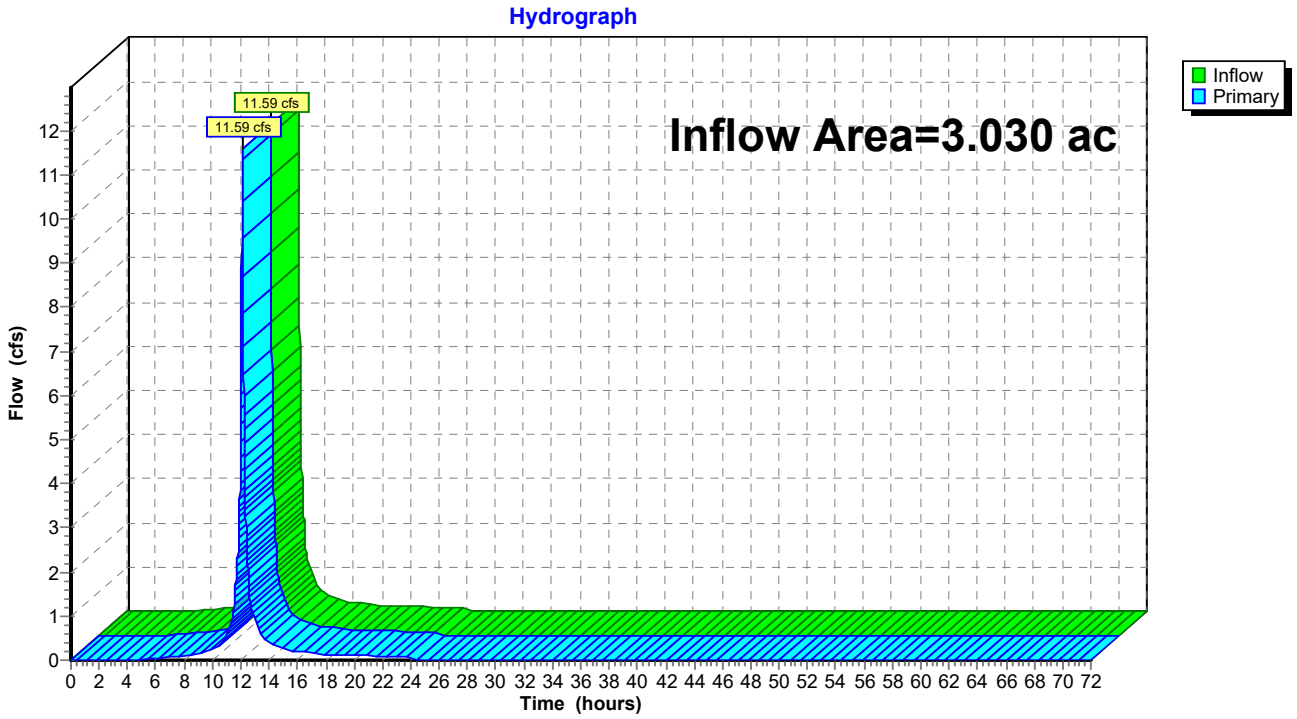


Summary for Link 14L: Existing Drainage (Burnham Ave)

Inflow Area = 3.030 ac, 66.34% Impervious, Inflow Depth = 2.65" for 2-Year event
Inflow = 11.59 cfs @ 12.13 hrs, Volume= 0.670 af
Primary = 11.59 cfs @ 12.13 hrs, Volume= 0.670 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 14L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: EX-1 Runoff Area=0.920 ac 67.39% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=93 Runoff=5.21 cfs 0.302 af

SubcatchmentE2: EX-2 Runoff Area=1.090 ac 23.85% Impervious Runoff Depth=4.16"
Tc=6.0 min CN=95 Runoff=6.35 cfs 0.378 af

SubcatchmentE3: EX-3 Runoff Area=3.030 ac 66.34% Impervious Runoff Depth=4.16"
Tc=6.0 min CN=95 Runoff=17.65 cfs 1.051 af

SubcatchmentE5: EX-4 Runoff Area=0.010 ac 0.00% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=84 Runoff=0.05 cfs 0.003 af

Pond 2: Existing Infiltration Basin Peak Elev=60.41' Storage=5,891 cf Inflow=5.21 cfs 0.302 af
Discarded=0.22 cfs 0.239 af Primary=0.86 cfs 0.063 af Outflow=1.07 cfs 0.302 af

Link 13L: Existing Drainage (Carlsbad) Inflow=6.44 cfs 0.444 af
Primary=6.44 cfs 0.444 af

Link 14L: Existing Drainage (Burnham Ave) Inflow=17.65 cfs 1.051 af
Primary=17.65 cfs 1.051 af

Total Runoff Area = 5.050 ac Runoff Volume = 1.734 af Average Runoff Depth = 4.12"
42.77% Pervious = 2.160 ac 57.23% Impervious = 2.890 ac

Summary for Subcatchment E1: EX-1

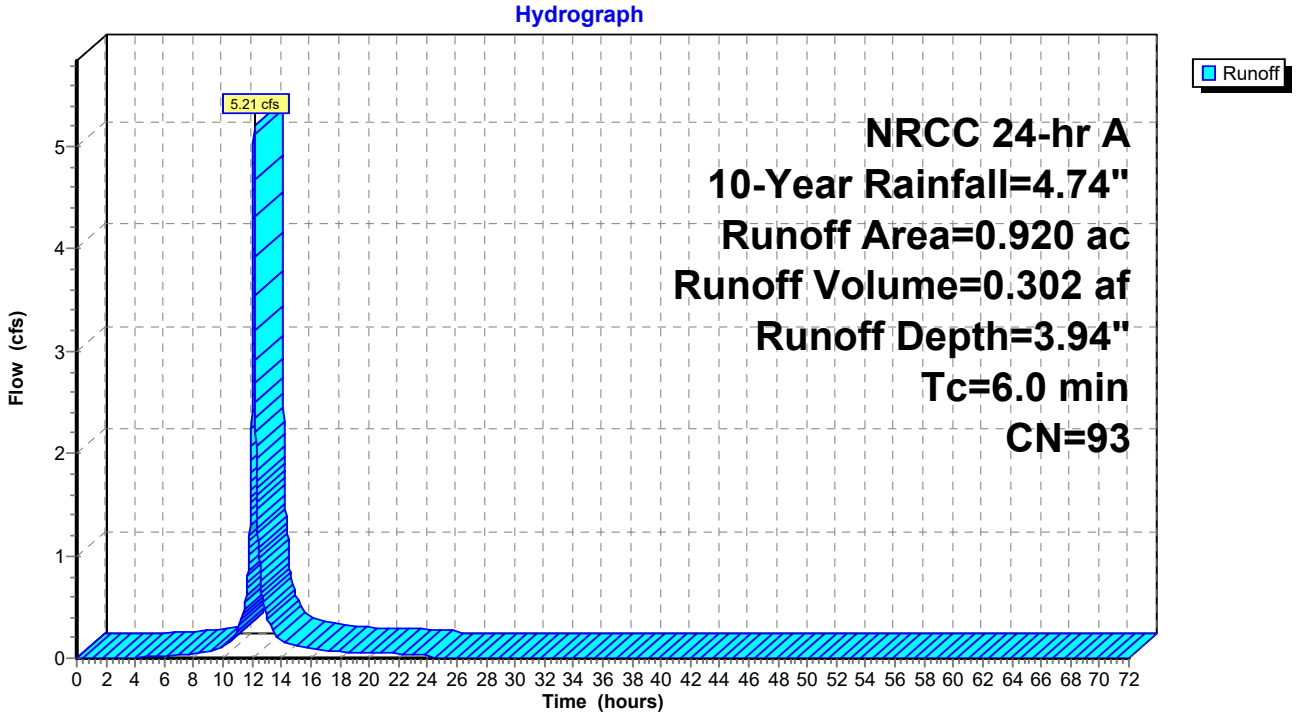
Runoff = 5.21 cfs @ 12.13 hrs, Volume= 0.302 af, Depth= 3.94"
Routed to Pond 2 : Existing Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.300	84	50-75% Grass cover, Fair, HSG D
0.620	98	Paved parking, HSG D
0.920	93	Weighted Average
0.300	84	32.61% Pervious Area
0.620	98	67.39% Impervious Area

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

Subcatchment E1: EX-1



Summary for Subcatchment E2: EX-2

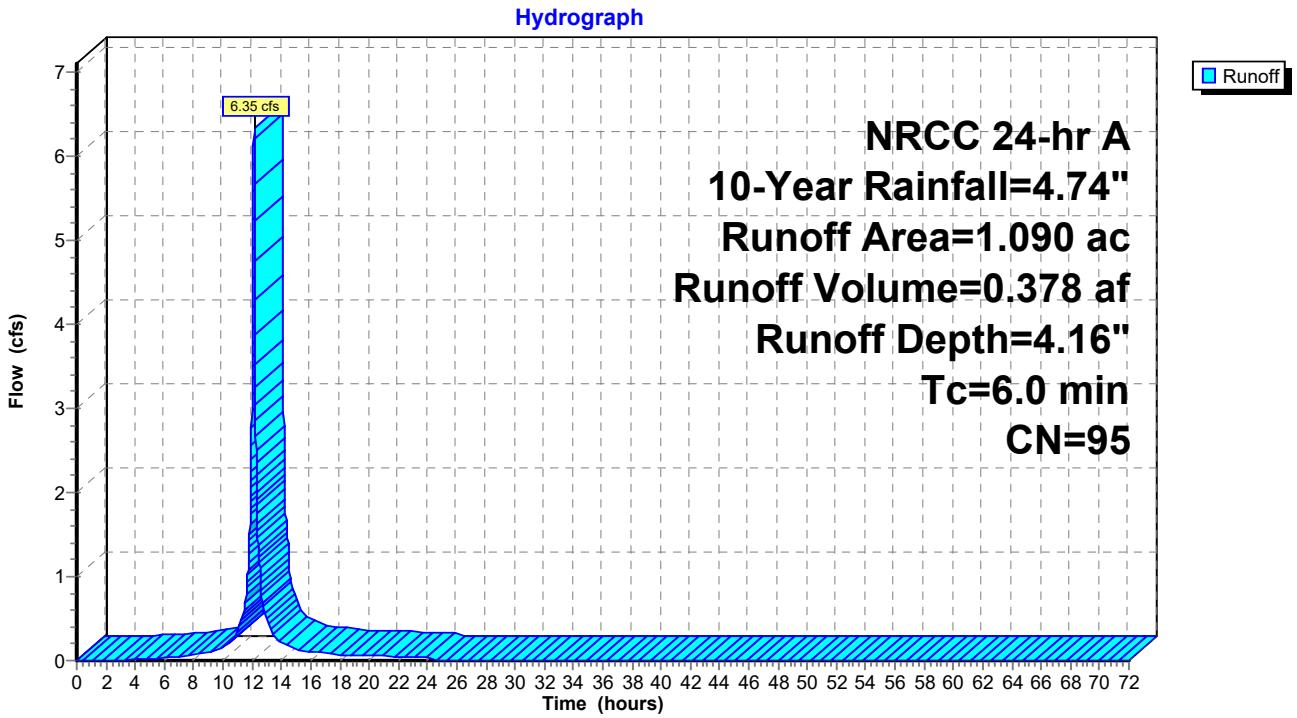
Runoff = 6.35 cfs @ 12.13 hrs, Volume= 0.378 af, Depth= 4.16"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.090	84	50-75% Grass cover, Fair, HSG D
0.260	98	Paved parking, HSG D
0.740	96	Gravel surface, HSG D
1.090	95	Weighted Average
0.830	95	76.15% Pervious Area
0.260	98	23.85% Impervious Area

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

Subcatchment E2: EX-2



Summary for Subcatchment E3: EX-3

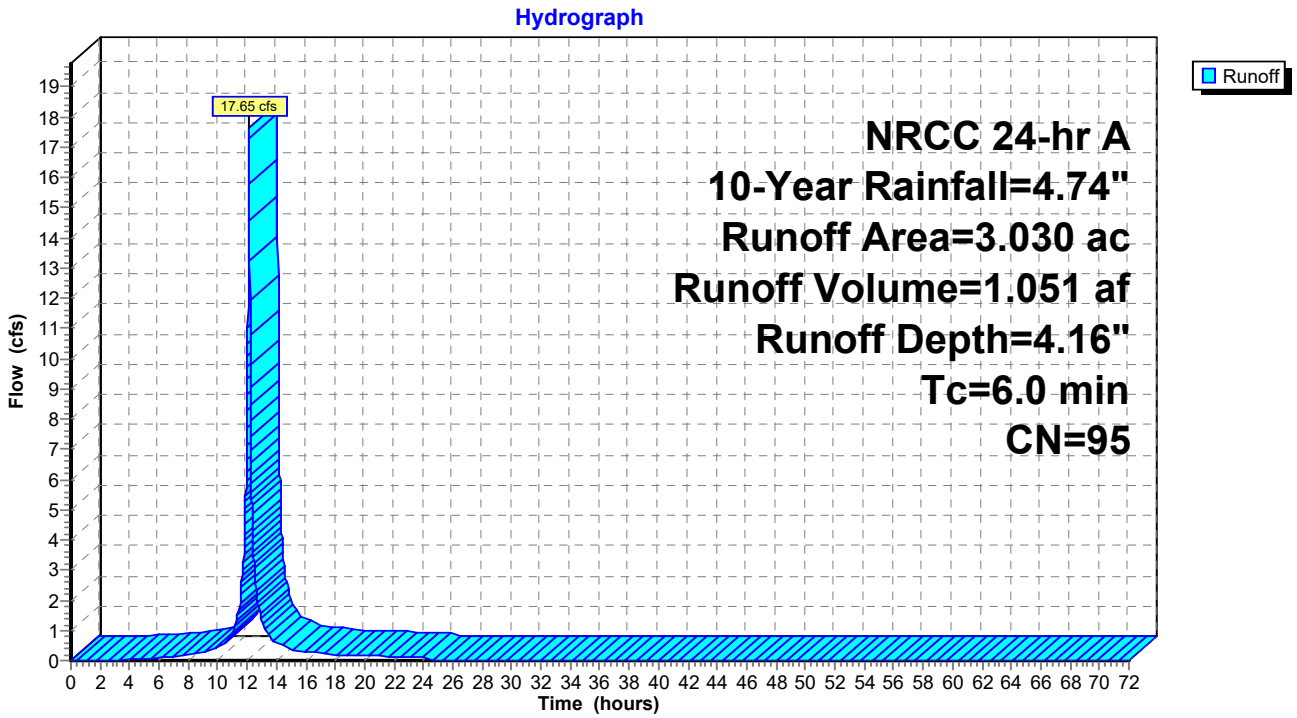
Runoff = 17.65 cfs @ 12.13 hrs, Volume= 1.051 af, Depth= 4.16"
Routed to Link 14L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.480	84	50-75% Grass cover, Fair, HSG D
2.010	98	Paved parking, HSG D
0.540	96	Gravel surface, HSG D
3.030	95	Weighted Average
1.020	90	33.66% Pervious Area
2.010	98	66.34% Impervious Area

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

Subcatchment E3: EX-3



Summary for Subcatchment E5: EX-4

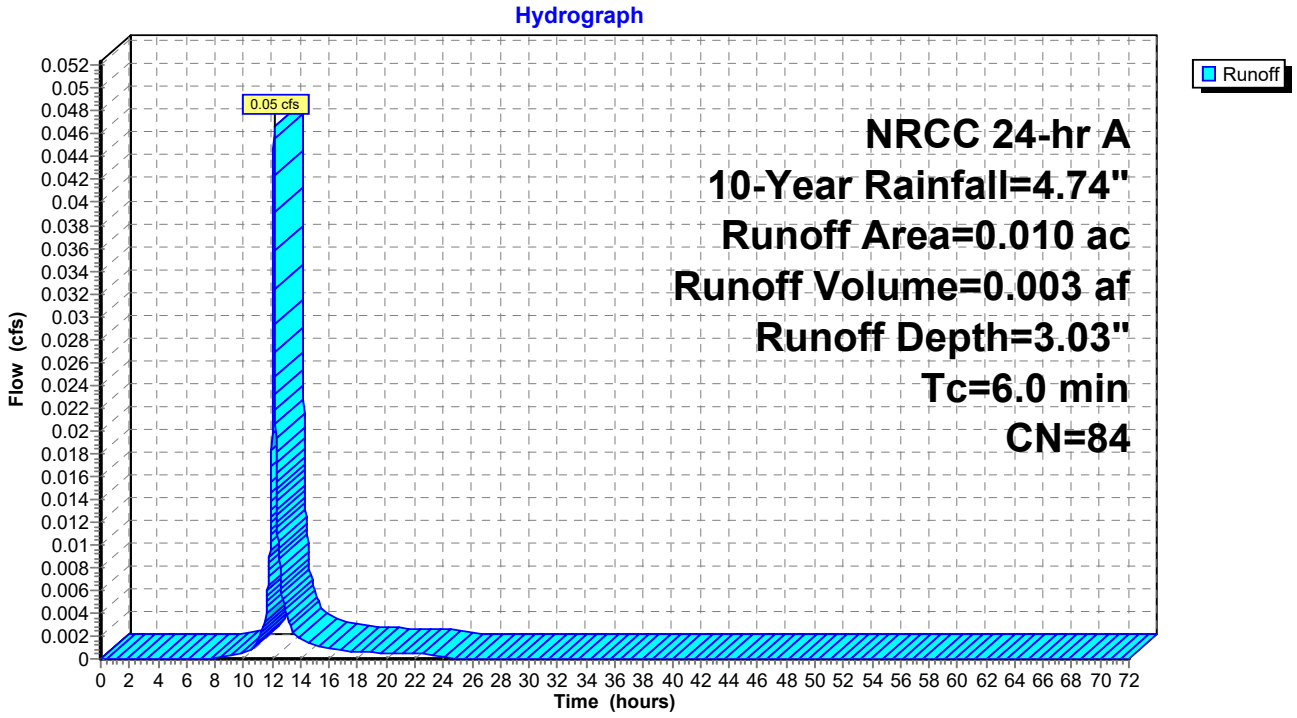
Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 3.03"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.010	84	50-75% Grass cover, Fair, HSG D
0.010	84	100.00% Pervious Area

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

Subcatchment E5: EX-4



Summary for Pond 2: Existing Infiltration Basin

Inflow Area = 0.920 ac, 67.39% Impervious, Inflow Depth = 3.94" for 10-Year event
Inflow = 5.21 cfs @ 12.13 hrs, Volume= 0.302 af
Outflow = 1.07 cfs @ 12.42 hrs, Volume= 0.302 af, Atten= 79%, Lag= 17.2 min
Discarded = 0.22 cfs @ 12.42 hrs, Volume= 0.239 af
Primary = 0.86 cfs @ 12.42 hrs, Volume= 0.063 af
Routed to Link 13L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 60.41' @ 12.42 hrs Surf.Area= 3,904 sf Storage= 5,891 cf
Flood Elev= 61.50' Surf.Area= 4,900 sf Storage= 10,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 187.7 min (963.9 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	10,693 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

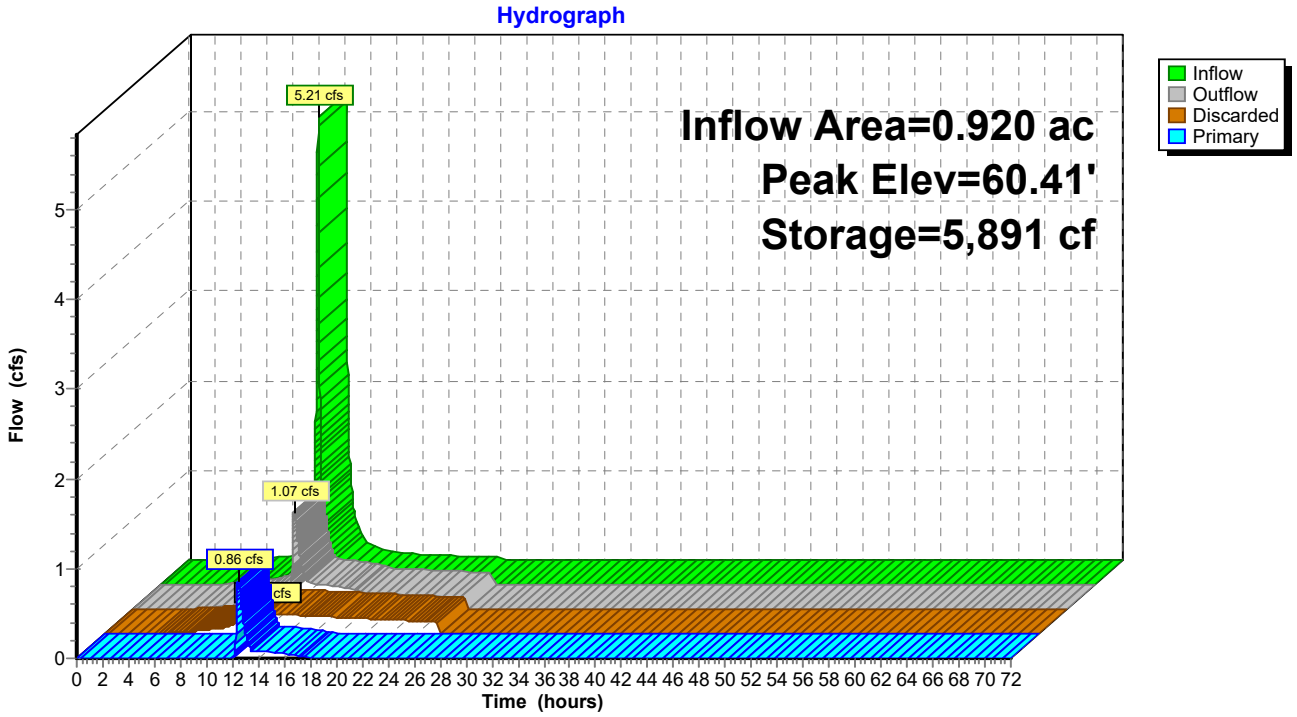
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.50	2,306	0	0
59.00	2,703	1,252	1,252
60.00	3,539	3,121	4,373
61.00	4,433	3,986	8,359
61.50	4,900	2,333	10,693

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.00' / 54.50' S= 0.0119 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.65'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.30'	**Nyloplast 24" Grate** Head (feet) 0.00 0.14 0.23 0.31 0.37 0.43 0.47 0.53 Disch. (cfs) 0.000 1.000 2.000 3.000 4.000 5.000 6.000 7.000
#4	Discarded	58.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.22 cfs @ 12.42 hrs HW=60.41' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.86 cfs @ 12.42 hrs HW=60.41' TW=51.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.86 cfs of 8.38 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 3.95 fps)
└**3=Nyloplast 24" Grate** (Custom Controls 0.77 cfs)

Pond 2: Existing Infiltration Basin



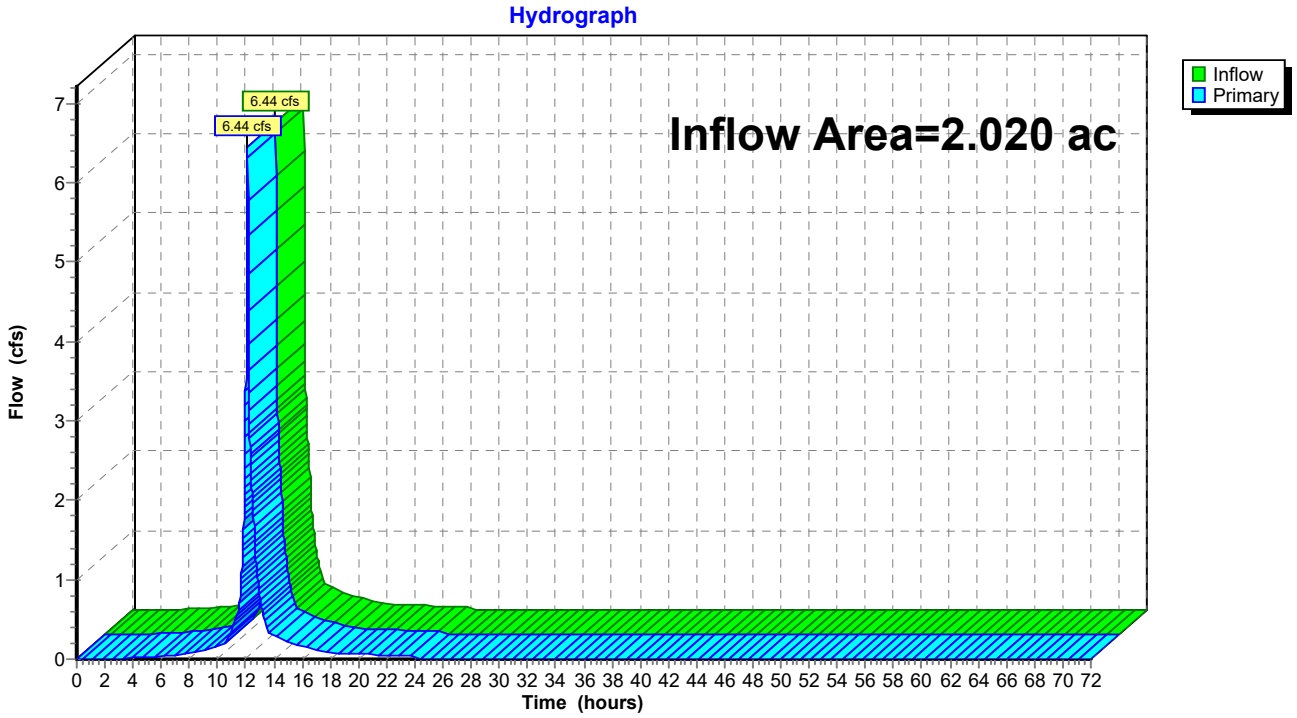
Summary for Link 13L: Existing Drainage (Carlsbad)

Inflow Area = 2.020 ac, 43.56% Impervious, Inflow Depth = 2.64" for 10-Year event
Inflow = 6.44 cfs @ 12.13 hrs, Volume= 0.444 af
Primary = 6.44 cfs @ 12.13 hrs, Volume= 0.444 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 51.68'

Link 13L: Existing Drainage (Carlsbad)

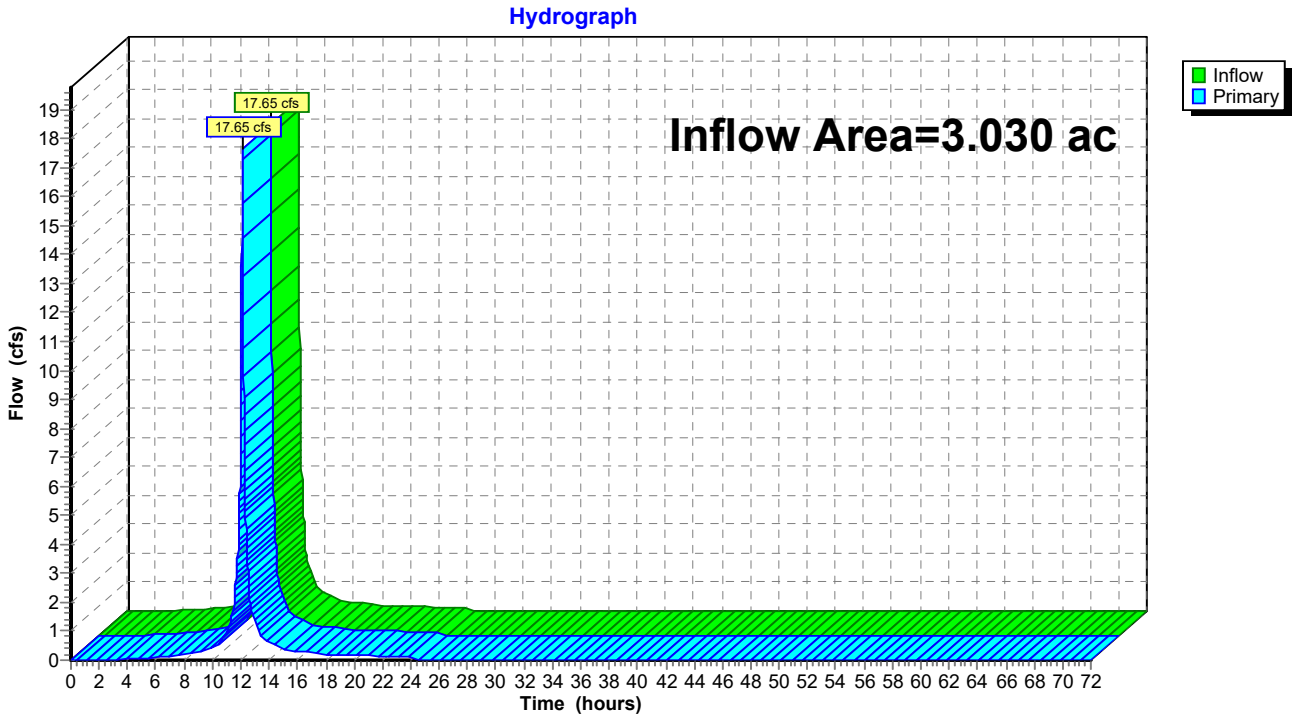


Summary for Link 14L: Existing Drainage (Burnham Ave)

Inflow Area = 3.030 ac, 66.34% Impervious, Inflow Depth = 4.16" for 10-Year event
Inflow = 17.65 cfs @ 12.13 hrs, Volume= 1.051 af
Primary = 17.65 cfs @ 12.13 hrs, Volume= 1.051 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 14L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: EX-1 Runoff Area=0.920 ac 67.39% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=93 Runoff=6.65 cfs 0.392 af

SubcatchmentE2: EX-2 Runoff Area=1.090 ac 23.85% Impervious Runoff Depth=5.34"
Tc=6.0 min CN=95 Runoff=8.03 cfs 0.485 af

SubcatchmentE3: EX-3 Runoff Area=3.030 ac 66.34% Impervious Runoff Depth=5.34"
Tc=6.0 min CN=95 Runoff=22.32 cfs 1.349 af

SubcatchmentE5: EX-4 Runoff Area=0.010 ac 0.00% Impervious Runoff Depth=4.13"
Tc=6.0 min CN=84 Runoff=0.06 cfs 0.003 af

Pond 2: Existing Infiltration Basin Peak Elev=60.59' Storage=6,600 cf Inflow=6.65 cfs 0.392 af
Discarded=0.23 cfs 0.264 af Primary=2.80 cfs 0.128 af Outflow=3.02 cfs 0.392 af

Link 13L: Existing Drainage (Carlsbad) Inflow=8.71 cfs 0.617 af
Primary=8.71 cfs 0.617 af

Link 14L: Existing Drainage (Burnham Ave) Inflow=22.32 cfs 1.349 af
Primary=22.32 cfs 1.349 af

Total Runoff Area = 5.050 ac Runoff Volume = 2.230 af Average Runoff Depth = 5.30"
42.77% Pervious = 2.160 ac 57.23% Impervious = 2.890 ac

Summary for Subcatchment E1: EX-1

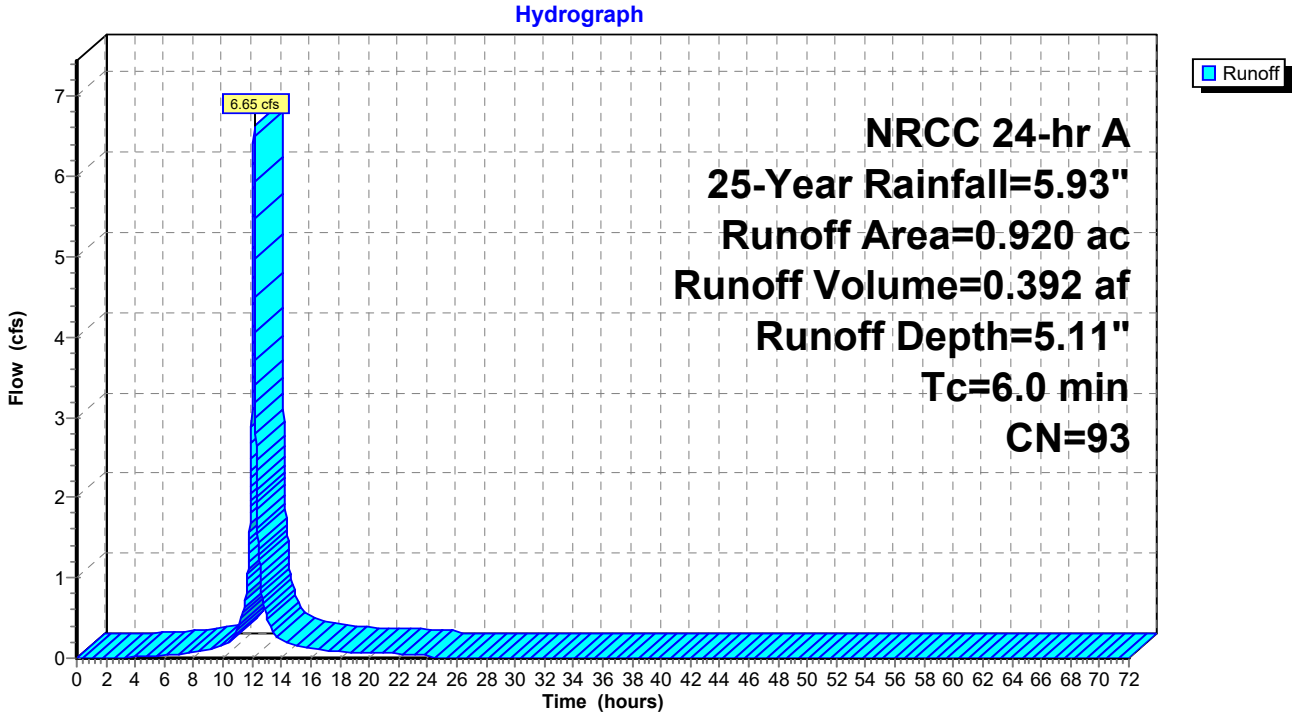
Runoff = 6.65 cfs @ 12.13 hrs, Volume= 0.392 af, Depth= 5.11"
Routed to Pond 2 : Existing Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.300	84	50-75% Grass cover, Fair, HSG D
0.620	98	Paved parking, HSG D
0.920	93	Weighted Average
0.300	84	32.61% Pervious Area
0.620	98	67.39% Impervious Area

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

Subcatchment E1: EX-1



Summary for Subcatchment E2: EX-2

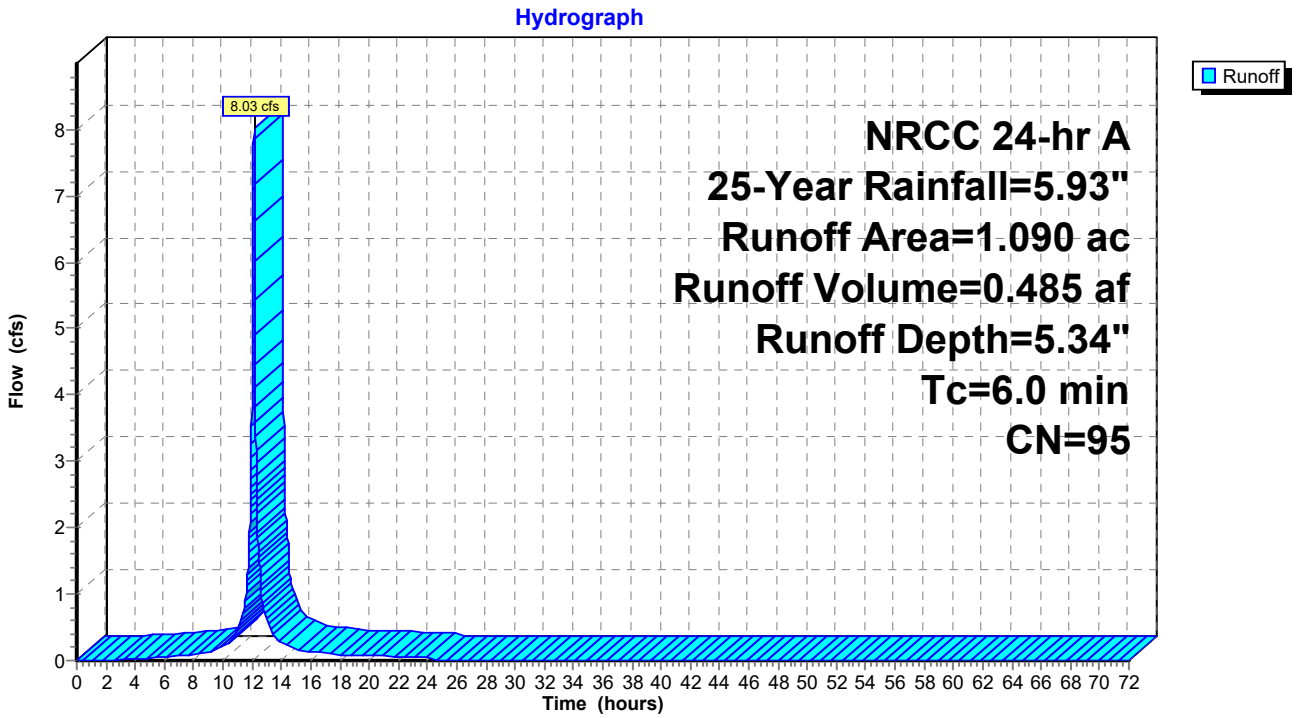
Runoff = 8.03 cfs @ 12.13 hrs, Volume= 0.485 af, Depth= 5.34"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.090	84	50-75% Grass cover, Fair, HSG D
0.260	98	Paved parking, HSG D
0.740	96	Gravel surface, HSG D
1.090	95	Weighted Average
0.830	95	76.15% Pervious Area
0.260	98	23.85% Impervious Area

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

Subcatchment E2: EX-2



Summary for Subcatchment E3: EX-3

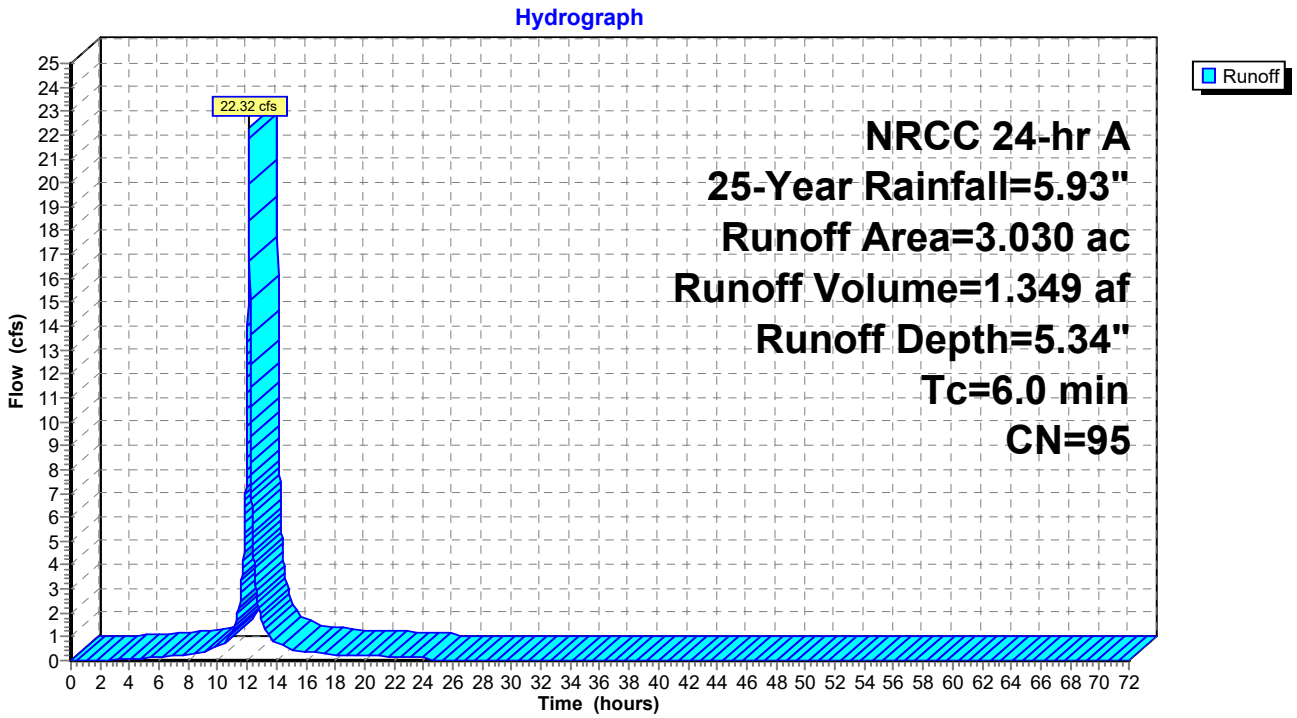
Runoff = 22.32 cfs @ 12.13 hrs, Volume= 1.349 af, Depth= 5.34"
Routed to Link 14L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.480	84	50-75% Grass cover, Fair, HSG D
2.010	98	Paved parking, HSG D
0.540	96	Gravel surface, HSG D
3.030	95	Weighted Average
1.020	90	33.66% Pervious Area
2.010	98	66.34% Impervious Area

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

Subcatchment E3: EX-3



Summary for Subcatchment E5: EX-4

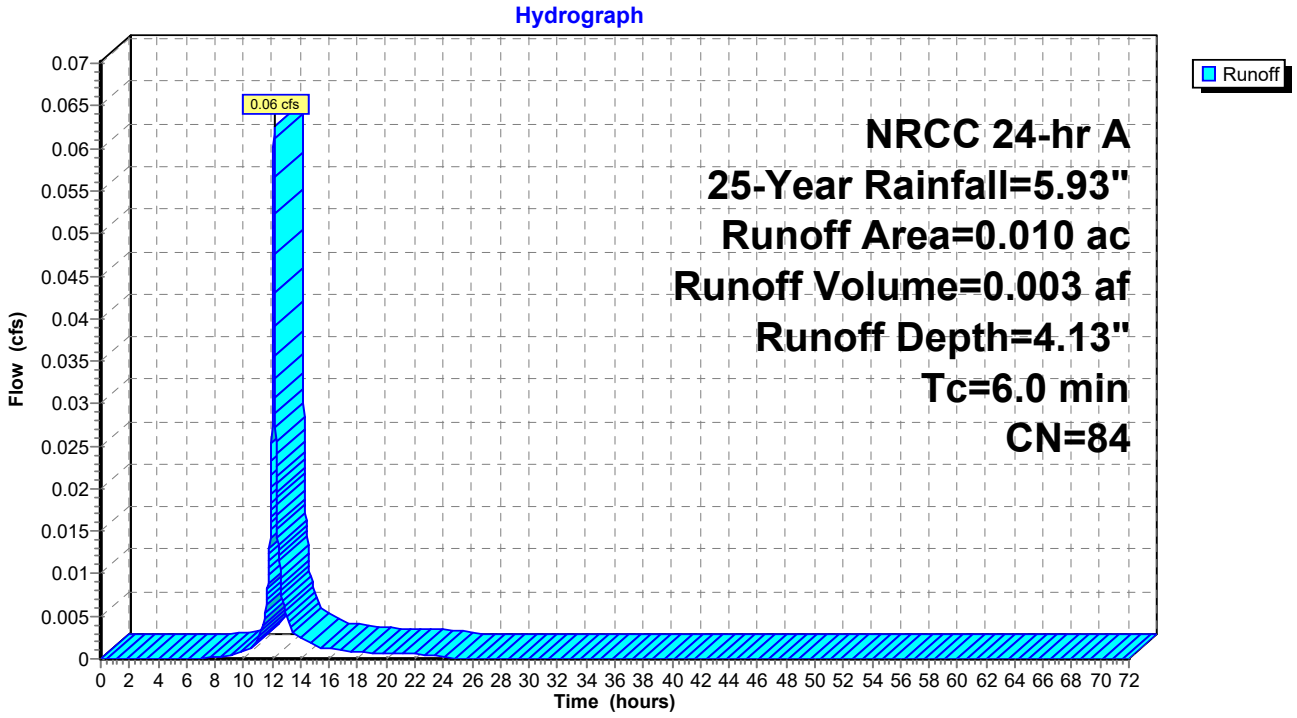
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 4.13"
Routed to Link 13L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.010	84	50-75% Grass cover, Fair, HSG D
0.010	84	100.00% Pervious Area

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

Subcatchment E5: EX-4



Summary for Pond 2: Existing Infiltration Basin

Inflow Area = 0.920 ac, 67.39% Impervious, Inflow Depth = 5.11" for 25-Year event
Inflow = 6.65 cfs @ 12.13 hrs, Volume= 0.392 af
Outflow = 3.02 cfs @ 12.24 hrs, Volume= 0.392 af, Atten= 55%, Lag= 6.6 min
Discarded = 0.23 cfs @ 12.24 hrs, Volume= 0.264 af
Primary = 2.80 cfs @ 12.24 hrs, Volume= 0.128 af
Routed to Link 13L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 60.59' @ 12.24 hrs Surf.Area= 4,063 sf Storage= 6,600 cf
Flood Elev= 61.50' Surf.Area= 4,900 sf Storage= 10,693 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 163.0 min (933.4 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	10,693 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

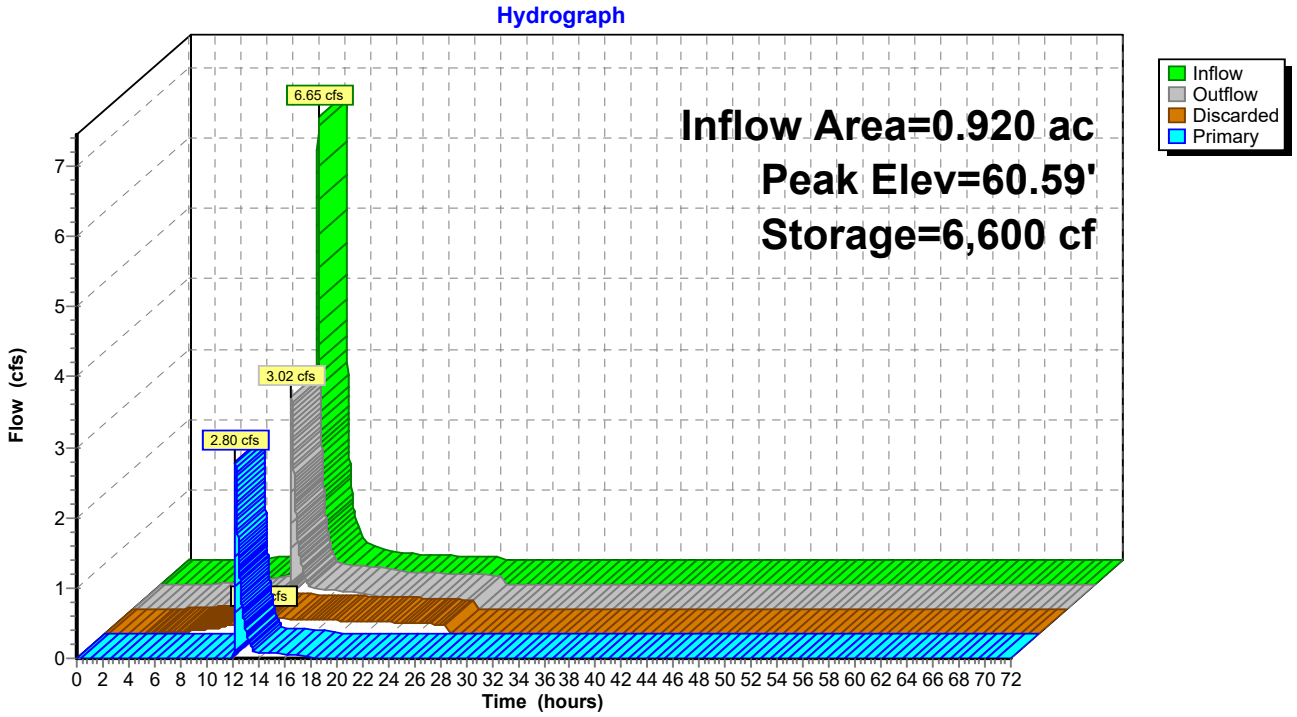
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.50	2,306	0	0
59.00	2,703	1,252	1,252
60.00	3,539	3,121	4,373
61.00	4,433	3,986	8,359
61.50	4,900	2,333	10,693

Device	Routing	Invert	Outlet Devices
#1	Primary	55.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 55.00' / 54.50' S= 0.0119 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.65'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.30'	**Nyloplast 24" Grate** Head (feet) 0.00 0.14 0.23 0.31 0.37 0.43 0.47 0.53 Disch. (cfs) 0.000 1.000 2.000 3.000 4.000 5.000 6.000 7.000
#4	Discarded	58.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 12.24 hrs HW=60.59' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=2.79 cfs @ 12.24 hrs HW=60.59' TW=51.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.79 cfs of 8.53 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.10 cfs @ 4.45 fps)
  └**3=Nyloplast 24" Grate** (Custom Controls 2.70 cfs)

Pond 2: Existing Infiltration Basin



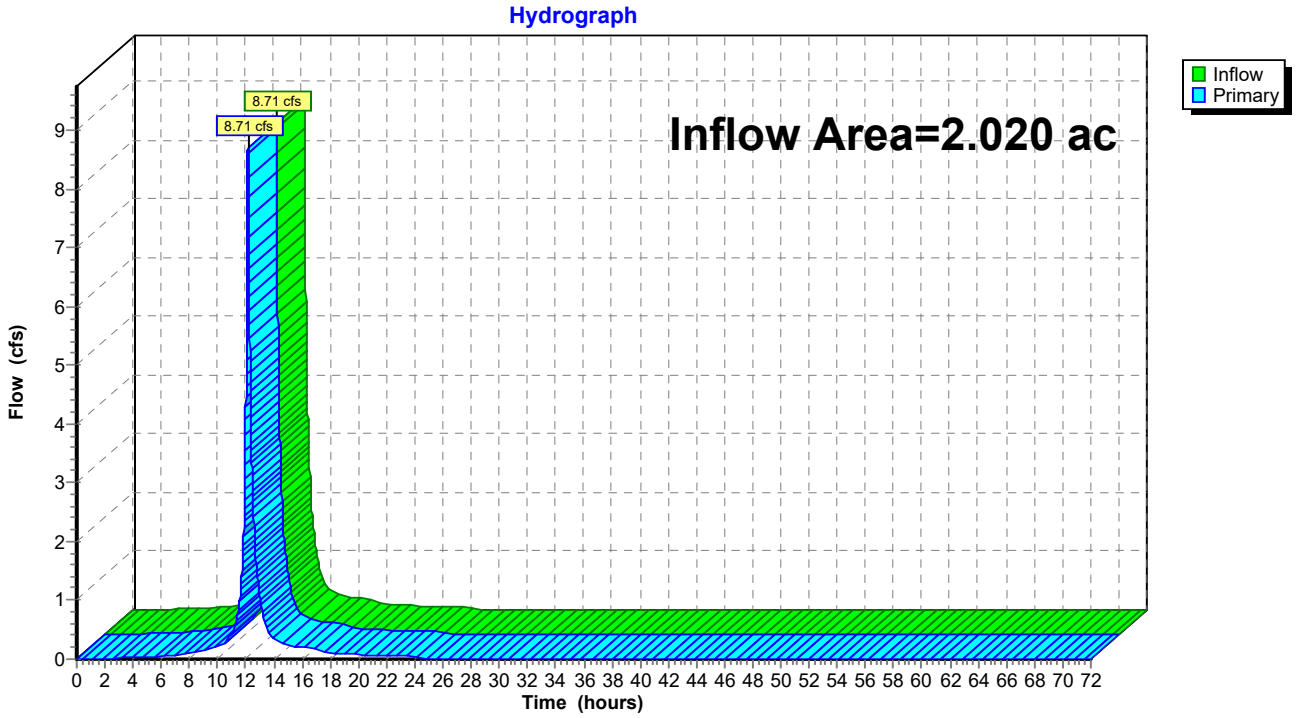
Summary for Link 13L: Existing Drainage (Carlsbad)

Inflow Area = 2.020 ac, 43.56% Impervious, Inflow Depth = 3.67" for 25-Year event
Inflow = 8.71 cfs @ 12.15 hrs, Volume= 0.617 af
Primary = 8.71 cfs @ 12.15 hrs, Volume= 0.617 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 51.68'

Link 13L: Existing Drainage (Carlsbad)

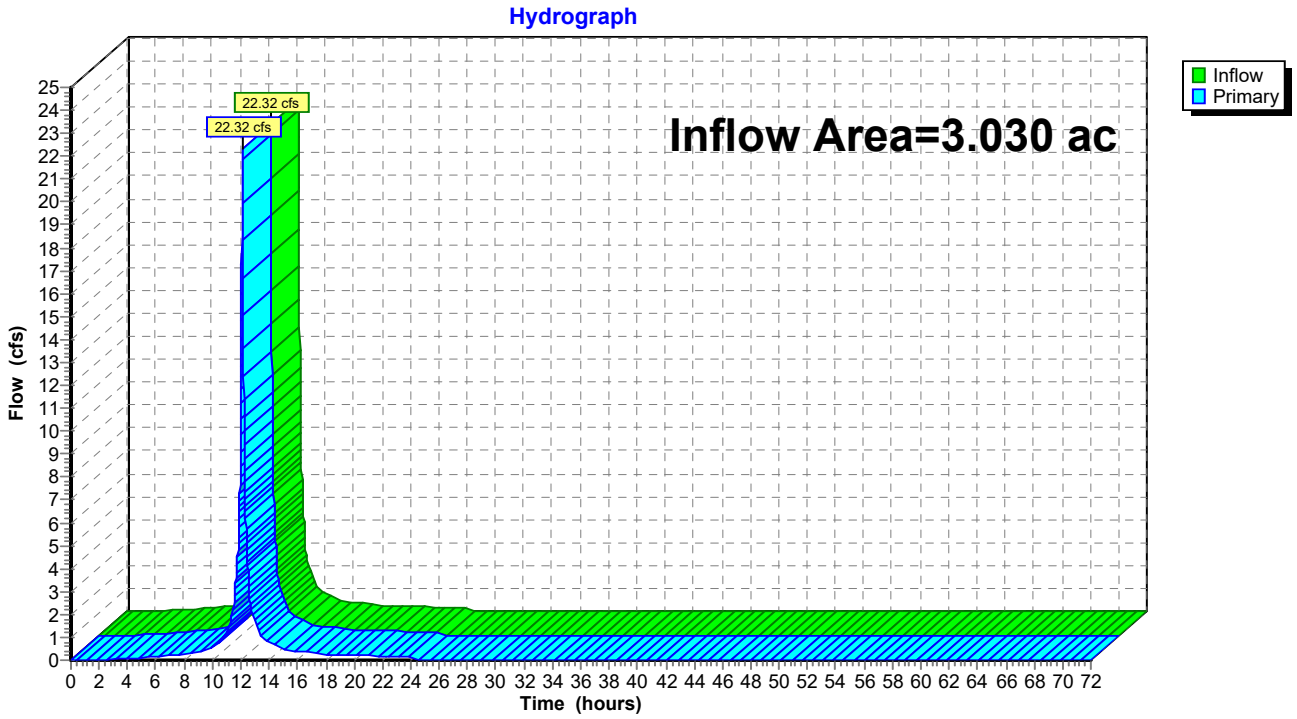


Summary for Link 14L: Existing Drainage (Burnham Ave)

Inflow Area = 3.030 ac, 66.34% Impervious, Inflow Depth = 5.34" for 25-Year event
Inflow = 22.32 cfs @ 12.13 hrs, Volume= 1.349 af
Primary = 22.32 cfs @ 12.13 hrs, Volume= 1.349 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 14L: Existing Drainage (Burnham Ave)

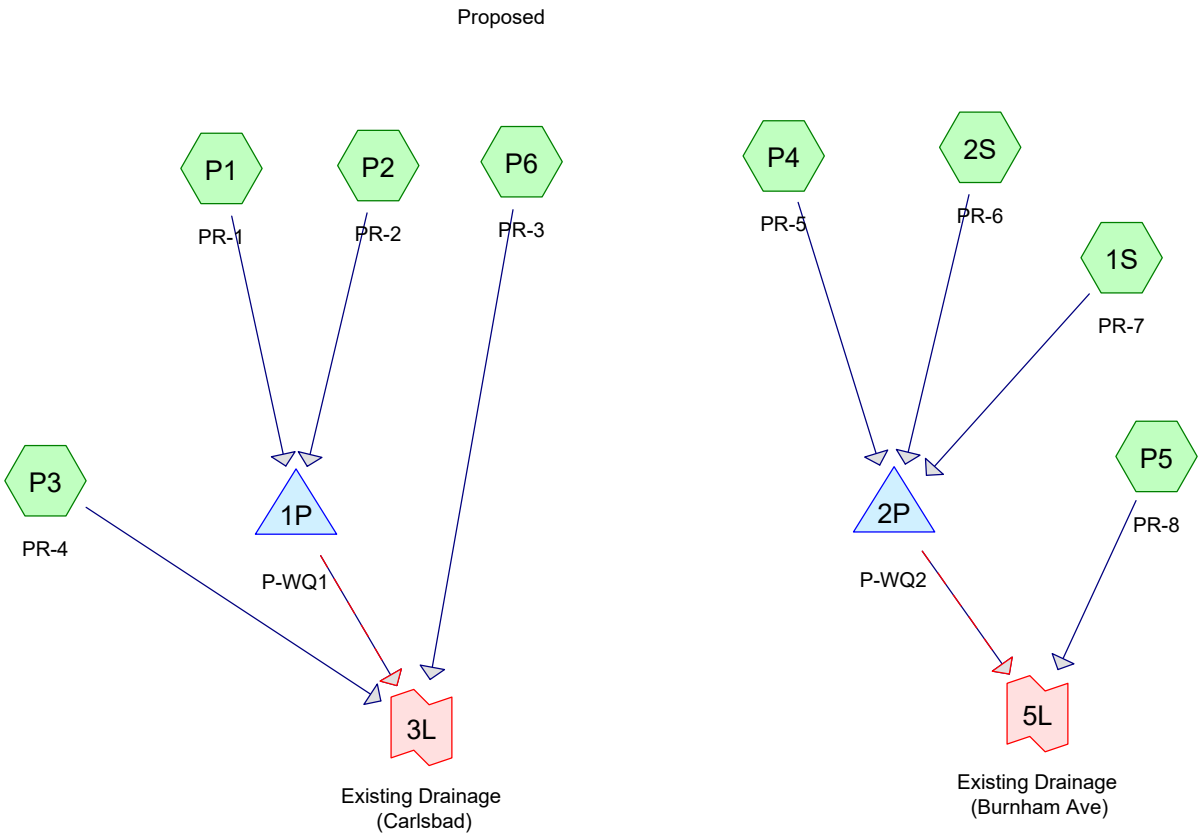


Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island (Bound Separately)

APPENDIX D: POST-DEVELOPMENT ANALYSIS

- **Post-Development HydroCAD Report**
- **Land Use with Higher Potential For Pollutant Loading Certification Letter**

- **Post-Development HydroCAD Report**



Subcat Reach Pond Link

Routing Diagram for TACO Pre v Post Hydraulic Analysis
Prepared by Woodard & Curran, Inc, Printed 7/18/2023

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 7801 RI Kent-C
Rainfall events imported from "NRCS-Rain.txt" for 7802 RI Providence-C

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQV	NRCC 24-hr	A	Default	24.00	1	1.20	2
2	1-Year	NRCC 24-hr	A	Default	24.00	1	2.70	2
3	2-Year	NRCC 24-hr	A	Default	24.00	1	3.21	2
4	10-Year	NRCC 24-hr	A	Default	24.00	1	4.74	2
5	25-Year	NRCC 24-hr	A	Default	24.00	1	5.93	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.402	80	>75% Grass cover, Good, HSG D (1S, P2, P3, P4, P5, P6)
0.820	98	Paved parking, HSG A (1S)
1.620	98	Paved parking, HSG D (P2, P3, P4, P5, P6)
0.920	98	Roofs, HSG A (P1)
1.320	98	Unconnected roofs, HSG A (2S)
5.082	**97**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.060	HSG A	1S, 2S, P1
0.000	HSG B	
0.000	HSG C	
2.022	HSG D	1S, P2, P3, P4, P5, P6
0.000	Other	
5.082		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.402	0.000	0.402	>75% Grass cover, Good	1S, P2, P3, P4, P5, P6
0.820	0.000	0.000	1.620	0.000	2.440	Paved parking	1S, P2, P3, P4, P5, P6
0.920	0.000	0.000	0.000	0.000	0.920	Roofs	P1
1.320	0.000	0.000	0.000	0.000	1.320	Unconnected roofs	2S
3.060	**0.000**	**0.000**	**2.022**	**0.000**	**5.082**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	59.00	58.67	33.0	0.0100	0.012	0.0	12.0	0.0
2	2P	52.50	50.25	225.0	0.0100	0.013	0.0	18.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: PR-7 Runoff Area=0.890 ac 92.13% Impervious Runoff Depth=0.89"
Tc=6.0 min CN=97 Runoff=1.19 cfs 0.066 af

Subcatchment2S: PR-6 Runoff Area=1.320 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=98 Runoff=1.88 cfs 0.108 af

SubcatchmentP1: PR-1 Runoff Area=0.920 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=98 Runoff=1.31 cfs 0.076 af

SubcatchmentP2: PR-2 Runoff Area=0.430 ac 74.42% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=93 Runoff=0.41 cfs 0.022 af

SubcatchmentP3: PR-4 Runoff Area=0.100 ac 70.00% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=93 Runoff=0.10 cfs 0.005 af

SubcatchmentP4: PR-5 Runoff Area=0.930 ac 89.25% Impervious Runoff Depth=0.81"
Tc=6.0 min CN=96 Runoff=1.15 cfs 0.063 af

SubcatchmentP5: PR-8 Runoff Area=0.240 ac 91.67% Impervious Runoff Depth=0.89"
Tc=6.0 min CN=97 Runoff=0.32 cfs 0.018 af

SubcatchmentP6: PR-3 Runoff Area=0.252 ac 71.43% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=93 Runoff=0.24 cfs 0.013 af

Pond 1P: P-WQ1 Peak Elev=55.42' Storage=0.021 af Inflow=1.72 cfs 0.097 af
Discarded=0.40 cfs 0.097 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.40 cfs 0.097 af

Pond 2P: P-WQ2 Peak Elev=49.19' Storage=0.053 af Inflow=4.22 cfs 0.238 af
Discarded=0.96 cfs 0.238 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.96 cfs 0.238 af

Link 3L: Existing Drainage (Carlsbad) Inflow=0.34 cfs 0.018 af
Primary=0.34 cfs 0.018 af

Link 5L: Existing Drainage (Burnham Ave) Inflow=0.32 cfs 0.018 af
Primary=0.32 cfs 0.018 af

Total Runoff Area = 5.082 ac Runoff Volume = 0.371 af Average Runoff Depth = 0.88"
7.91% Pervious = 0.402 ac 92.09% Impervious = 4.680 ac

Summary for Subcatchment 1S: PR-7

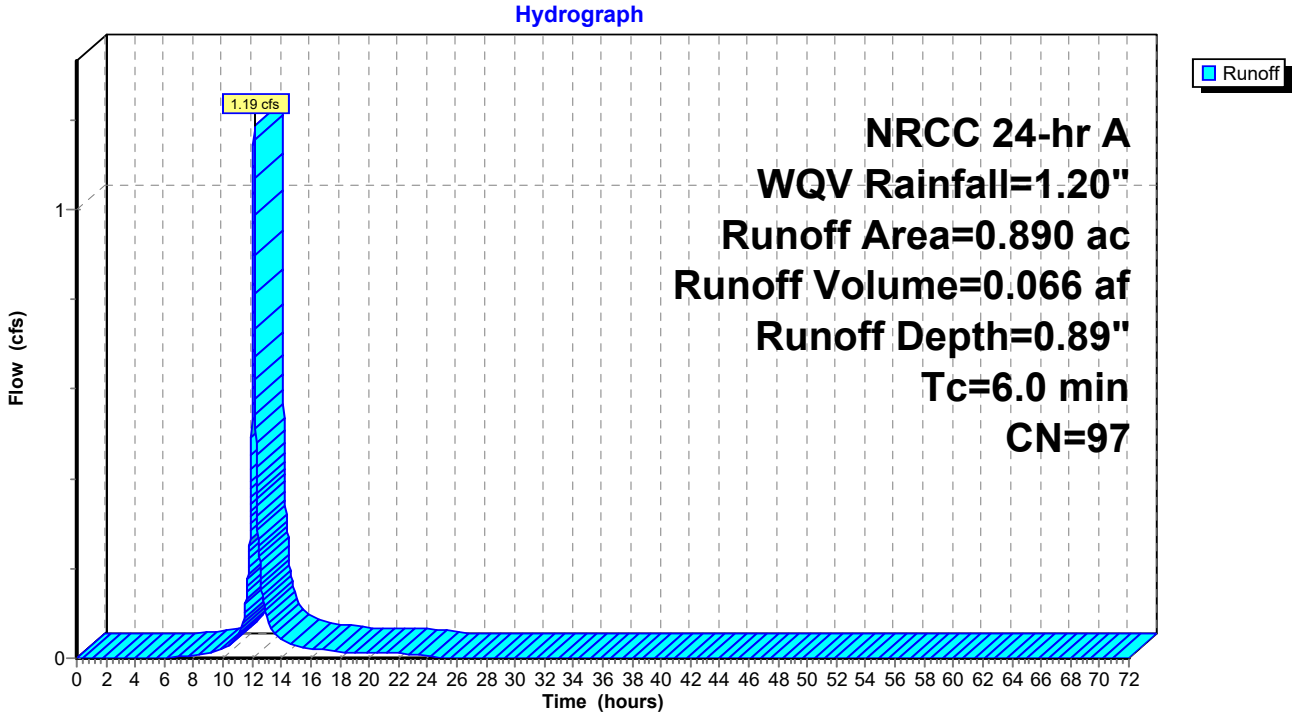
Runoff = 1.19 cfs @ 12.13 hrs, Volume= 0.066 af, Depth= 0.89"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.820	98	Paved parking, HSG A
0.070	80	>75% Grass cover, Good, HSG D
0.890	97	Weighted Average
0.070	80	7.87% Pervious Area
0.820	98	92.13% Impervious Area

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

Subcatchment 1S: PR-7



Summary for Subcatchment 2S: PR-6

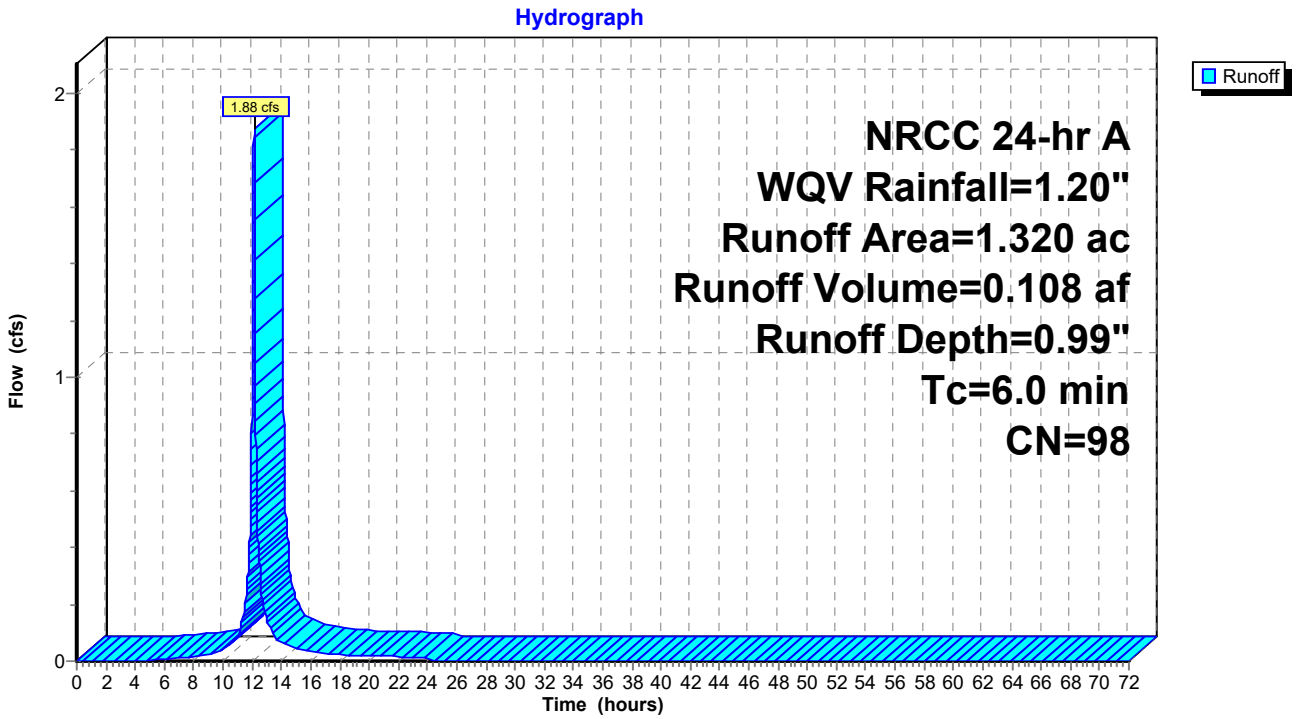
Runoff = 1.88 cfs @ 12.13 hrs, Volume= 0.108 af, Depth= 0.99"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
1.320	98	Unconnected roofs, HSG A
1.320	98	100.00% Impervious Area
1.320		100.00% Unconnected

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

Subcatchment 2S: PR-6



Summary for Subcatchment P1: PR-1

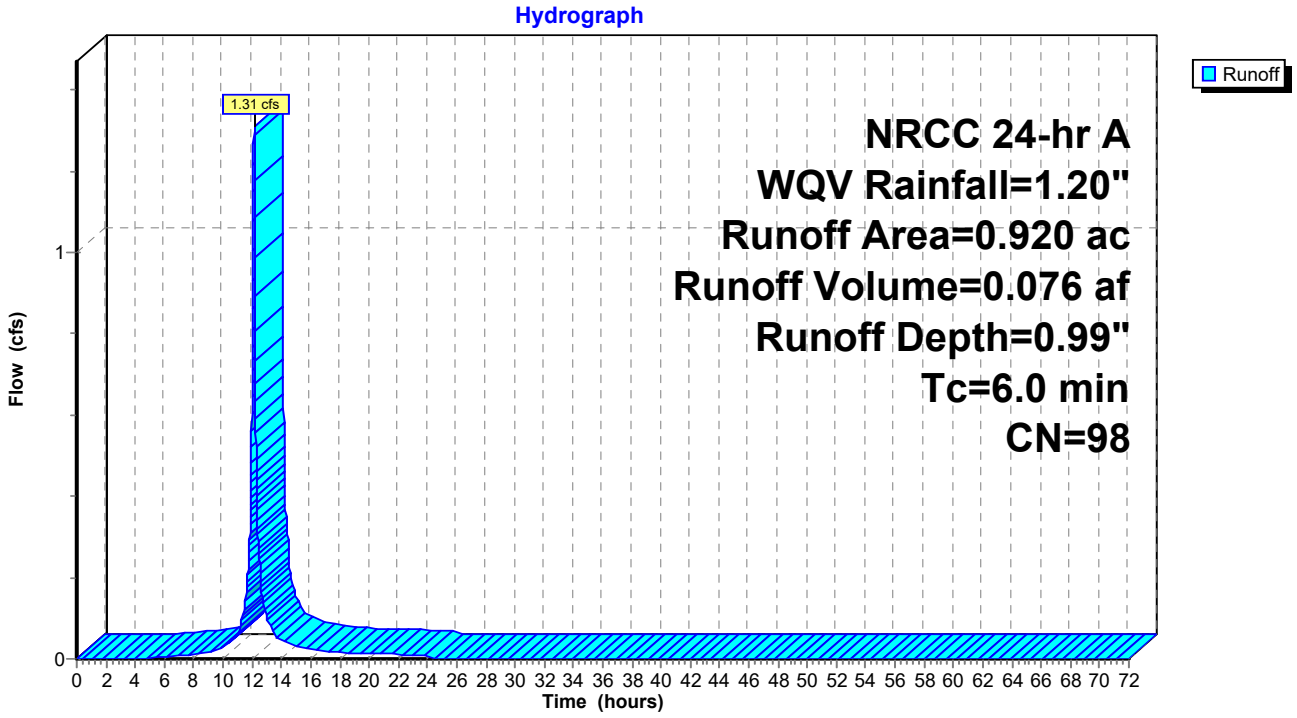
Runoff = 1.31 cfs @ 12.13 hrs, Volume= 0.076 af, Depth= 0.99"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.920	98	Roofs, HSG A
0.920	98	100.00% Impervious Area

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

Subcatchment P1: PR-1



Summary for Subcatchment P2: PR-2

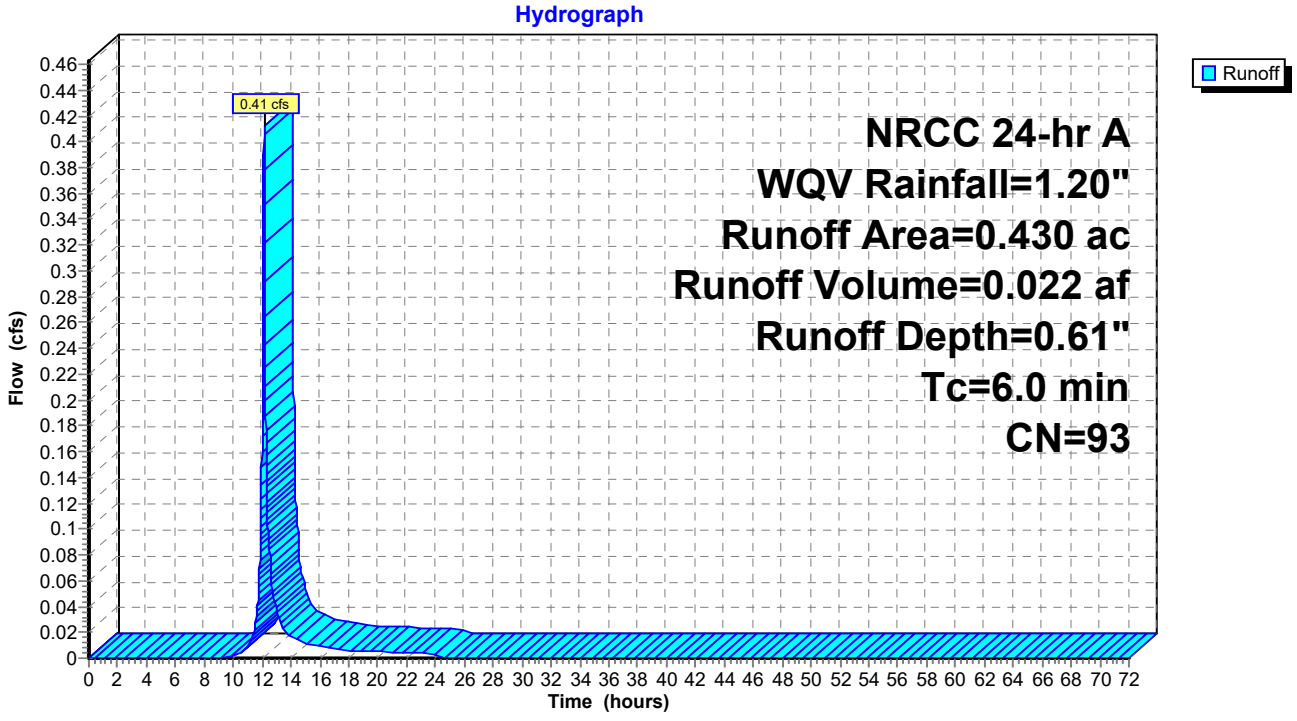
Runoff = 0.41 cfs @ 12.13 hrs, Volume= 0.022 af, Depth= 0.61"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.320	98	Paved parking, HSG D
0.110	80	>75% Grass cover, Good, HSG D
0.430	93	Weighted Average
0.110	80	25.58% Pervious Area
0.320	98	74.42% Impervious Area

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

Subcatchment P2: PR-2



Summary for Subcatchment P3: PR-4

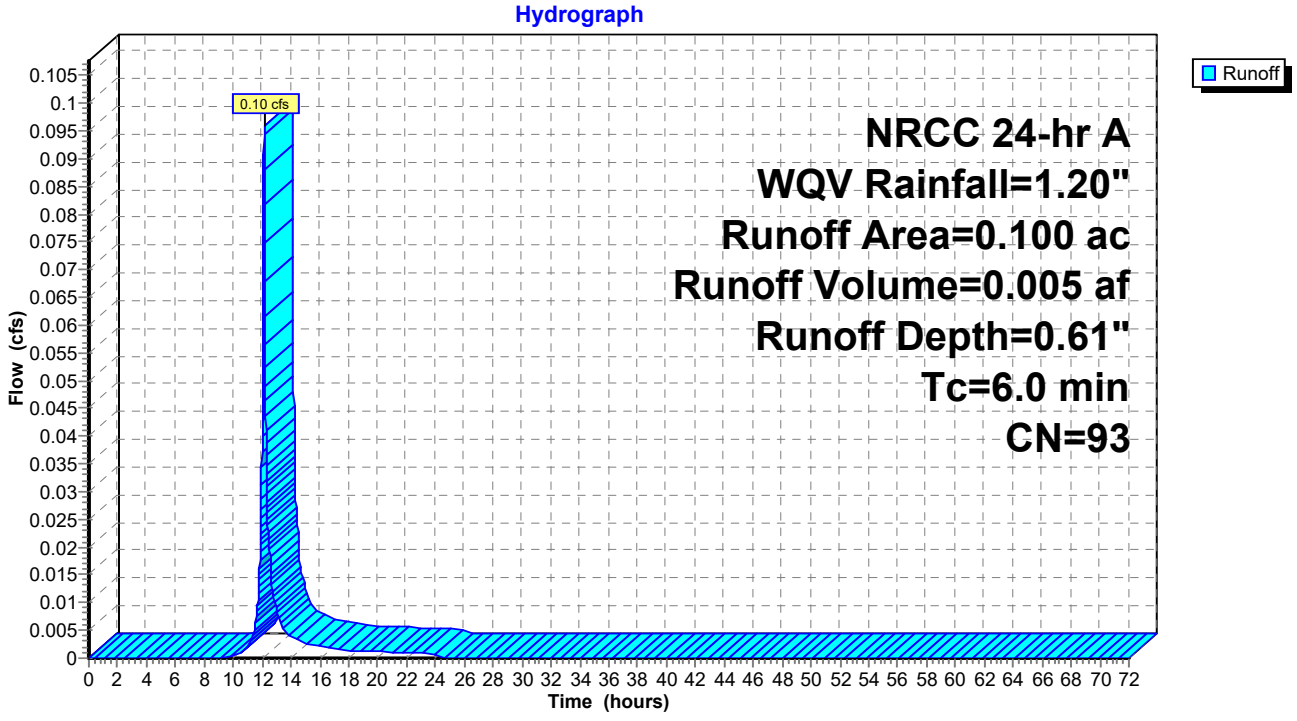
Runoff = 0.10 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 0.61"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.100	93	Weighted Average
0.030	80	30.00% Pervious Area
0.070	98	70.00% Impervious Area

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

Subcatchment P3: PR-4



Summary for Subcatchment P4: PR-5

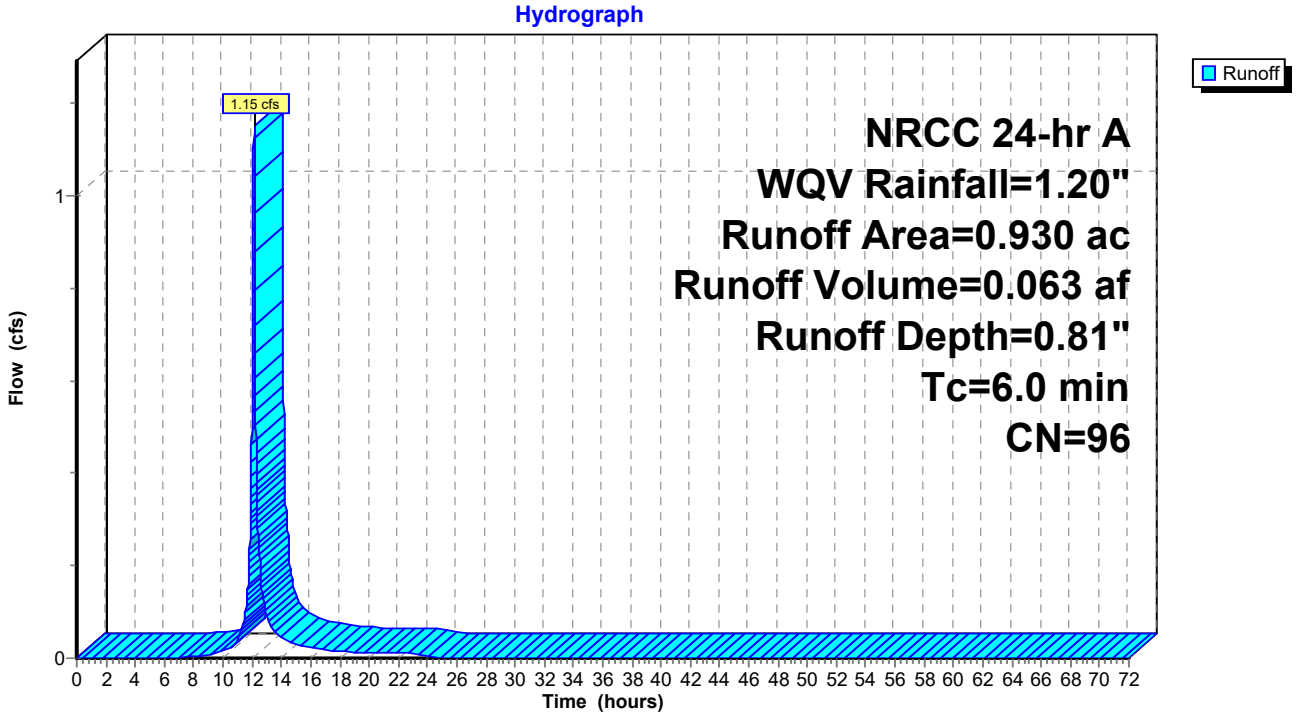
Runoff = 1.15 cfs @ 12.13 hrs, Volume= 0.063 af, Depth= 0.81"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.830	98	Paved parking, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.930	96	Weighted Average
0.100	80	10.75% Pervious Area
0.830	98	89.25% Impervious Area

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

Subcatchment P4: PR-5



Summary for Subcatchment P5: PR-8

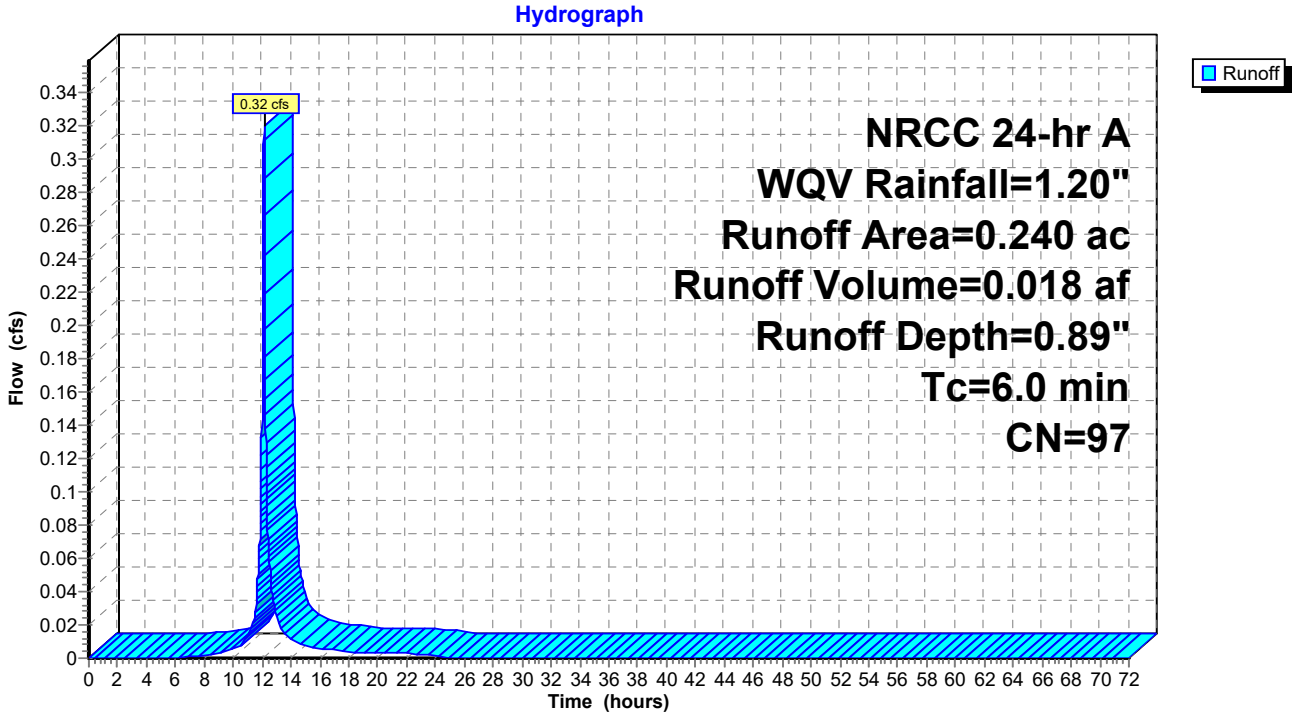
Runoff = 0.32 cfs @ 12.13 hrs, Volume= 0.018 af, Depth= 0.89"
Routed to Link 5L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.220	98	Paved parking, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.240	97	Weighted Average
0.020	80	8.33% Pervious Area
0.220	98	91.67% Impervious Area

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

Subcatchment P5: PR-8



Summary for Subcatchment P6: PR-3

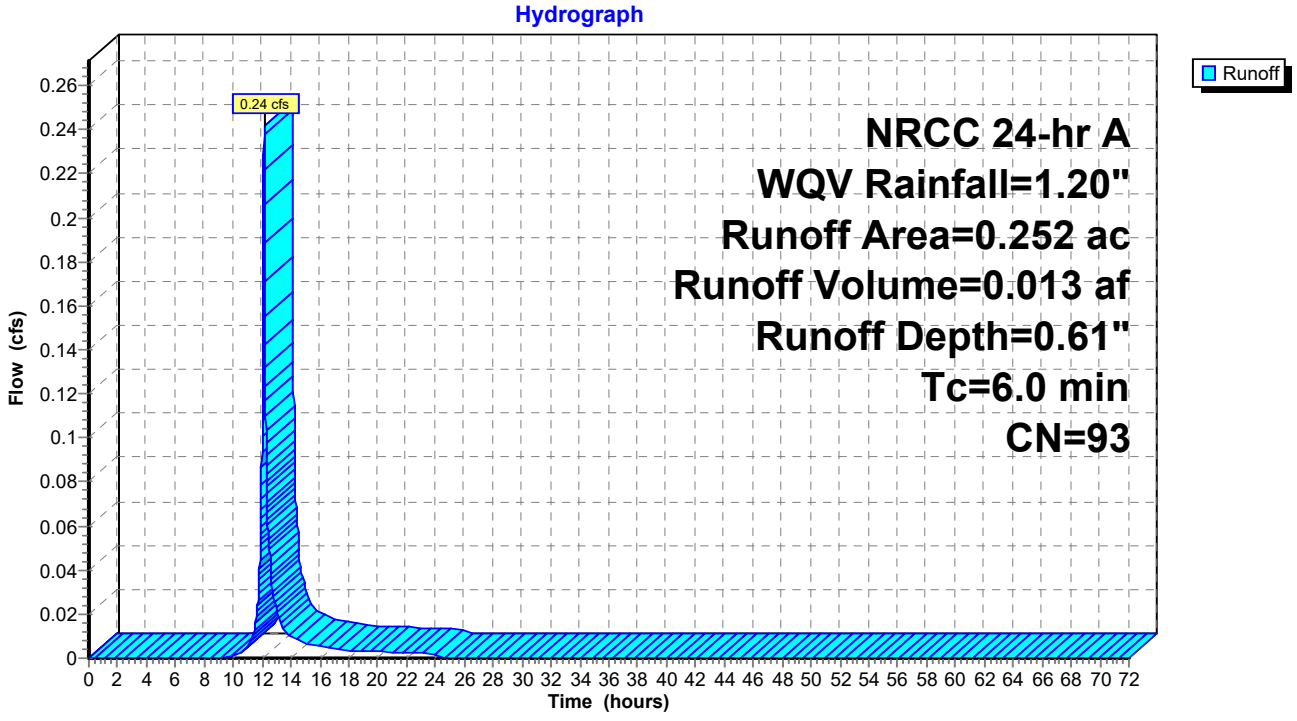
Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.013 af, Depth= 0.61"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A WQV Rainfall=1.20"

Area (ac)	CN	Description
0.180	98	Paved parking, HSG D
0.072	80	>75% Grass cover, Good, HSG D
0.252	93	Weighted Average
0.072	80	28.57% Pervious Area
0.180	98	71.43% Impervious Area

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

Subcatchment P6: PR-3



Summary for Pond 1P: P-WQ1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=530)

Inflow Area = 1.350 ac, 91.85% Impervious, Inflow Depth = 0.87" for WQV event
Inflow = 1.72 cfs @ 12.13 hrs, Volume= 0.097 af
Outflow = 0.40 cfs @ 11.97 hrs, Volume= 0.097 af, Atten= 77%, Lag= 0.0 min
Discarded = 0.40 cfs @ 11.97 hrs, Volume= 0.097 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 3L : Existing Drainage (Carlsbad)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 3L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 55.42' @ 12.39 hrs Surf.Area= 0.048 ac Storage= 0.021 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.5 min (800.1 - 787.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	54.50'	0.068 af	**22.75'W x 91.74'L x 5.50'H Field A** 0.264 af Overall - 0.093 af Embedded = 0.171 af x 40.0% Voids
#2A	55.25'	0.093 af	**ADS_StormTech MC-3500 d +Cap**x 36 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 36 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		0.161 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	55.90'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	59.00'	**12.0" Round Culvert** L= 33.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.67' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.40 cfs @ 11.97 hrs HW=54.56' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=54.50' TW=0.00' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=54.50' TW=0.00' (Dynamic Tailwater)
3=Culvert (Controls 0.00 cfs)

Pond 1P: P-WQ1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

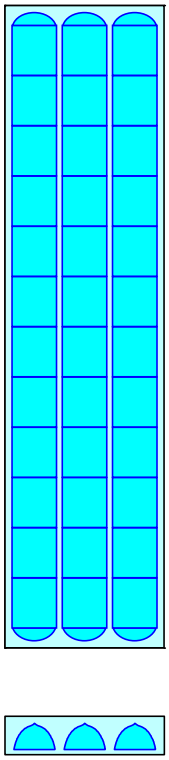
12 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 89.74' Row Length +12.0" End Stone x 2 = 91.74' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

36 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 4,047.7 cf Chamber Storage

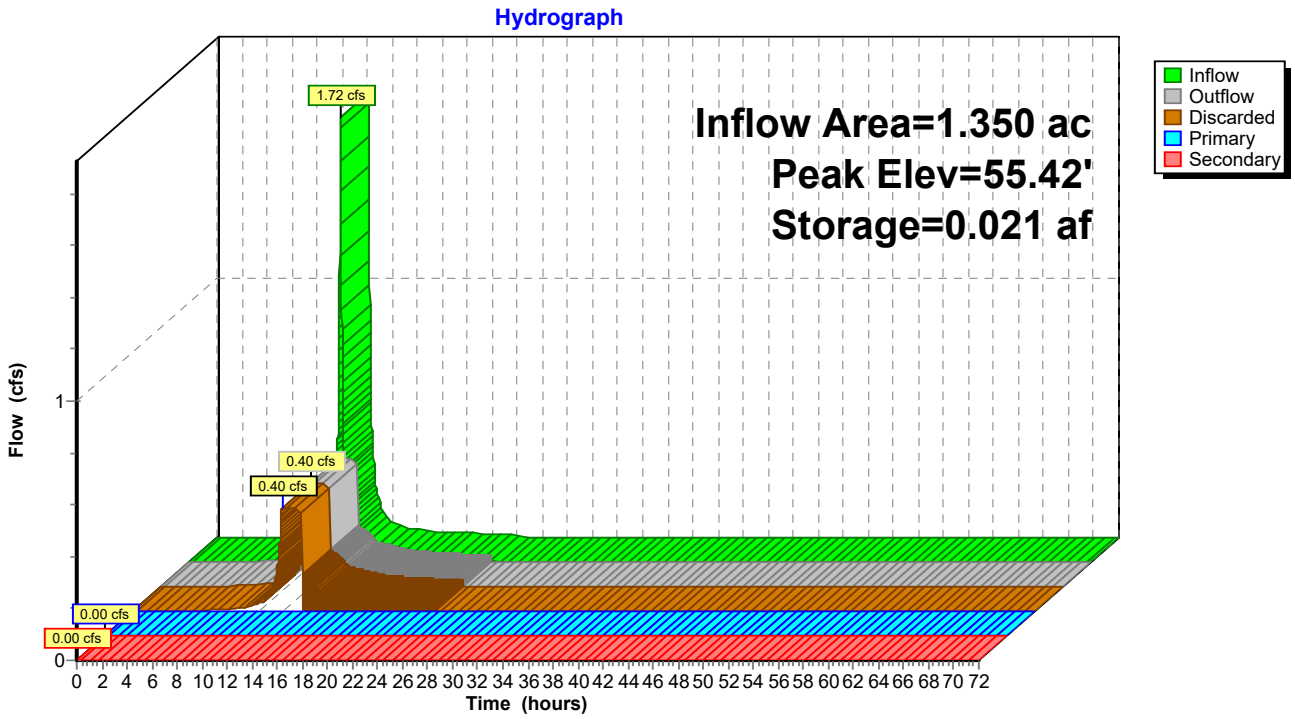
11,479.0 cf Field - 4,047.7 cf Chambers = 7,431.3 cf Stone x 40.0% Voids = 2,972.5 cf Stone Storage

Chamber Storage + Stone Storage = 7,020.2 cf = 0.161 af
Overall Storage Efficiency = 61.2%
Overall System Size = 91.74' x 22.75' x 5.50'

36 Chambers
425.1 cy Field
275.2 cy Stone



Pond 1P: P-WQ1


Hydrograph
Inflow Area=1.350 ac
Peak Elev=55.42'
Storage=0.021 af
Inflow
Outflow
Discarded
Primary
Secondary
1.72 cfs
0.40 cfs
0.40 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0
1
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond 2P: P-WQ2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=528)

Inflow Area = 3.140 ac, 94.59% Impervious, Inflow Depth = 0.91" for WQV event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.238 af
Outflow = 0.96 cfs @ 11.96 hrs, Volume= 0.238 af, Atten= 77%, Lag= 0.0 min
Discarded = 0.96 cfs @ 11.96 hrs, Volume= 0.238 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 5L : Existing Drainage (Burnham Ave)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 5L : Existing Drainage (Burnham Ave)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 49.19' @ 12.39 hrs Surf.Area= 0.115 ac Storage= 0.053 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.2 min (800.3 - 787.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.25'	0.160 af	**37.08'W x 134.76'L x 5.50'H Field A** 0.631 af Overall - 0.231 af Embedded = 0.400 af x 40.0% Voids
#2A	49.00'	0.231 af	**ADS_StormTech MC-3500 d +Cap**x 90 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 90 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	52.50'	**18.0" Round Culvert** L= 225.0' Ke= 0.500 Inlet / Outlet Invert= 52.50' / 50.25' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Primary	49.50'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.96 cfs @ 11.96 hrs HW=48.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.25' TW=0.00' (Dynamic Tailwater)
3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.25' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 2P: P-WQ2 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

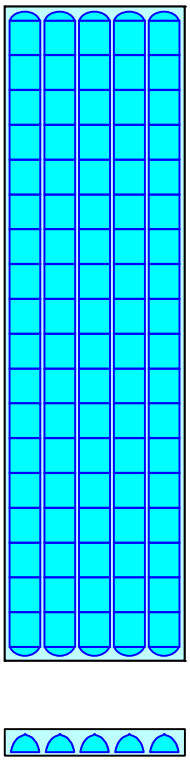
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

90 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 10,044.7 cf Chamber Storage

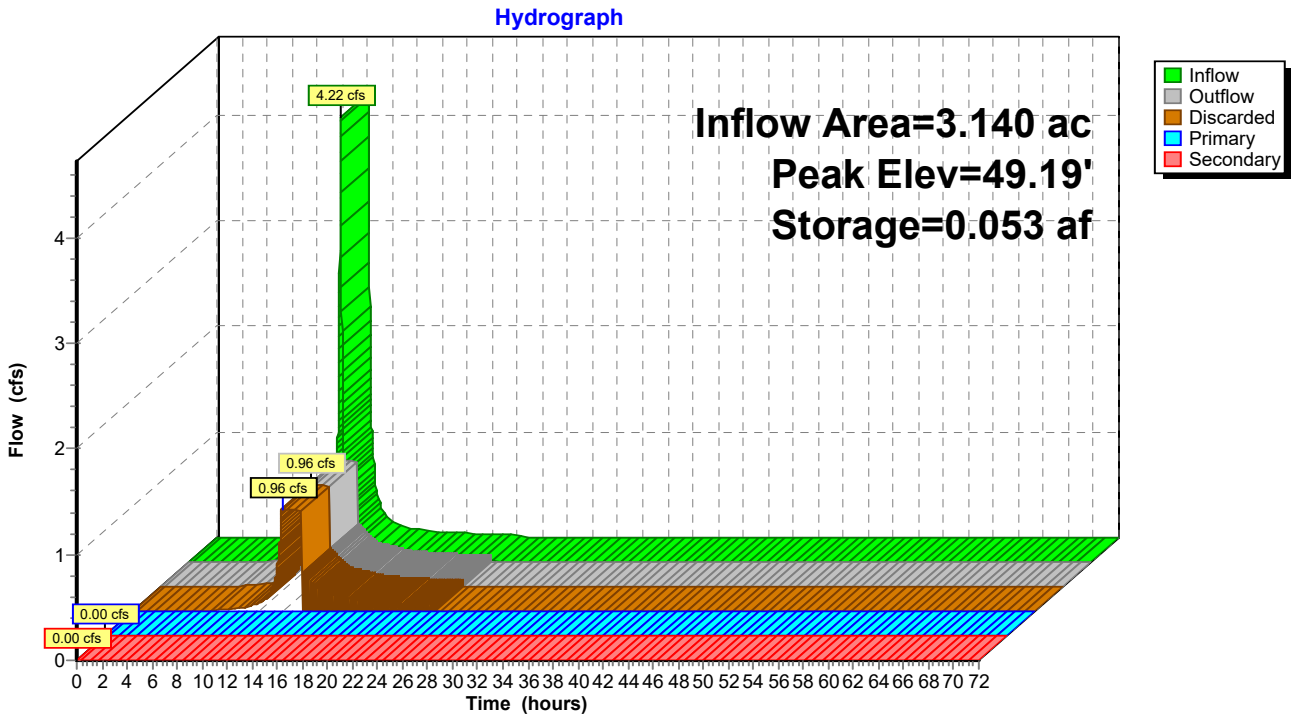
27,485.4 cf Field - 10,044.7 cf Chambers = 17,440.7 cf Stone x 40.0% Voids = 6,976.3 cf Stone Storage

Chamber Storage + Stone Storage = 17,021.0 cf = 0.391 af
Overall Storage Efficiency = 61.9%
Overall System Size = 134.76' x 37.08' x 5.50'

90 Chambers
1,018.0 cy Field
646.0 cy Stone



Pond 2P: P-WQ2

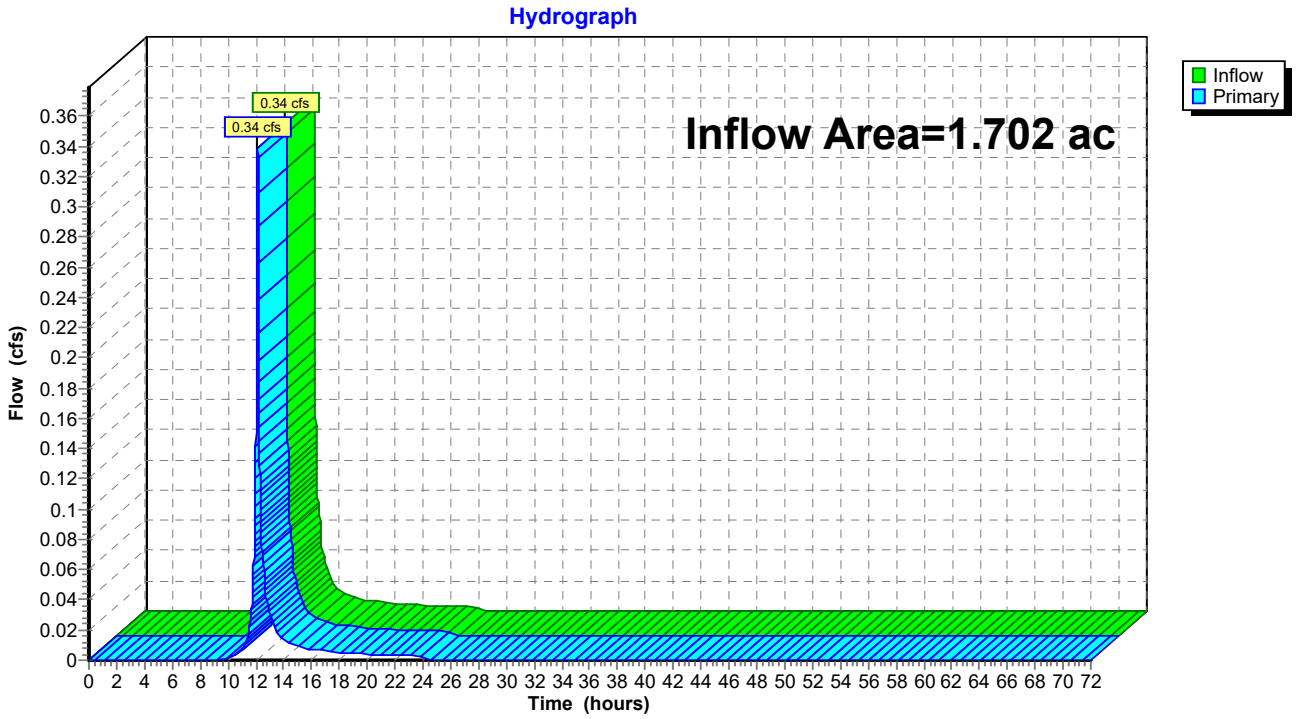

Hydrograph
Inflow Area=3.140 ac
Peak Elev=49.19'
Storage=0.053 af
Inflow
Outflow
Discarded
Primary
Secondary
4.22 cfs
0.96 cfs
0.96 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0 1 2 3 4
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Link 3L: Existing Drainage (Carlsbad)

Inflow Area = 1.702 ac, 87.54% Impervious, Inflow Depth = 0.13" for WQV event
Inflow = 0.34 cfs @ 12.13 hrs, Volume= 0.018 af
Primary = 0.34 cfs @ 12.13 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3L: Existing Drainage (Carlsbad)

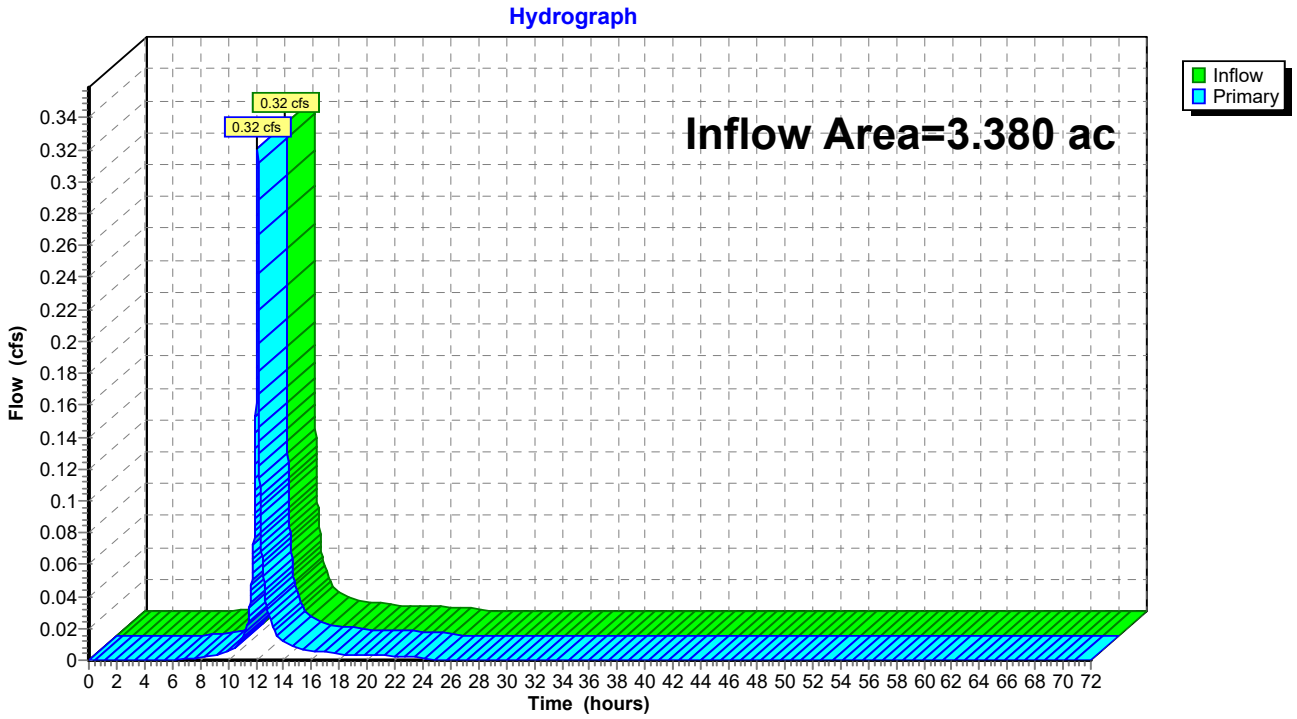


Summary for Link 5L: Existing Drainage (Burnham Ave)

Inflow Area = 3.380 ac, 94.38% Impervious, Inflow Depth = 0.06" for WQV event
Inflow = 0.32 cfs @ 12.13 hrs, Volume= 0.018 af
Primary = 0.32 cfs @ 12.13 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 5L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: PR-7 Runoff Area=0.890 ac 92.13% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=97 Runoff=2.95 cfs 0.175 af

Subcatchment2S: PR-6 Runoff Area=1.320 ac 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=4.45 cfs 0.272 af

SubcatchmentP1: PR-1 Runoff Area=0.920 ac 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=3.10 cfs 0.189 af

SubcatchmentP2: PR-2 Runoff Area=0.430 ac 74.42% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=93 Runoff=1.27 cfs 0.071 af

SubcatchmentP3: PR-4 Runoff Area=0.100 ac 70.00% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=93 Runoff=0.30 cfs 0.016 af

SubcatchmentP4: PR-5 Runoff Area=0.930 ac 89.25% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=96 Runoff=3.01 cfs 0.175 af

SubcatchmentP5: PR-8 Runoff Area=0.240 ac 91.67% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=97 Runoff=0.79 cfs 0.047 af

SubcatchmentP6: PR-3 Runoff Area=0.252 ac 71.43% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=93 Runoff=0.75 cfs 0.041 af

Pond 1P: P-WQ1 Peak Elev=56.64' Storage=0.069 af Inflow=4.37 cfs 0.260 af
Discarded=0.40 cfs 0.205 af Primary=1.32 cfs 0.055 af Secondary=0.00 cfs 0.000 af Outflow=1.72 cfs 0.260 af

Pond 2P: P-WQ2 Peak Elev=50.30' Storage=0.160 af Inflow=10.41 cfs 0.622 af
Discarded=0.96 cfs 0.482 af Primary=3.46 cfs 0.140 af Secondary=0.00 cfs 0.000 af Outflow=4.41 cfs 0.622 af

Link 3L: Existing Drainage (Carlsbad) Inflow=1.95 cfs 0.112 af
Primary=1.95 cfs 0.112 af

Link 5L: Existing Drainage (Burnham Ave) Inflow=3.82 cfs 0.187 af
Primary=3.82 cfs 0.187 af

Total Runoff Area = 5.082 ac Runoff Volume = 0.987 af Average Runoff Depth = 2.33"
7.91% Pervious = 0.402 ac 92.09% Impervious = 4.680 ac

Summary for Subcatchment 1S: PR-7

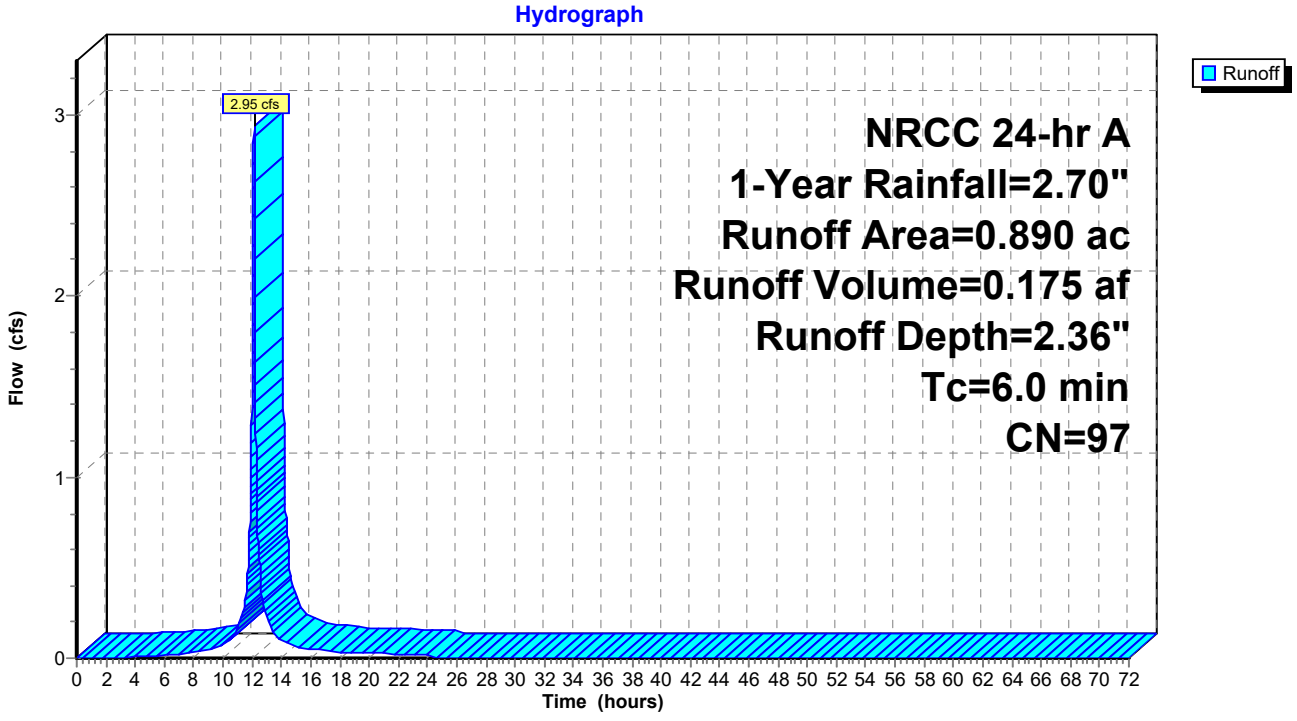
Runoff = 2.95 cfs @ 12.13 hrs, Volume= 0.175 af, Depth= 2.36"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.820	98	Paved parking, HSG A
0.070	80	>75% Grass cover, Good, HSG D
0.890	97	Weighted Average
0.070	80	7.87% Pervious Area
0.820	98	92.13% Impervious Area

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

Subcatchment 1S: PR-7



Summary for Subcatchment 2S: PR-6

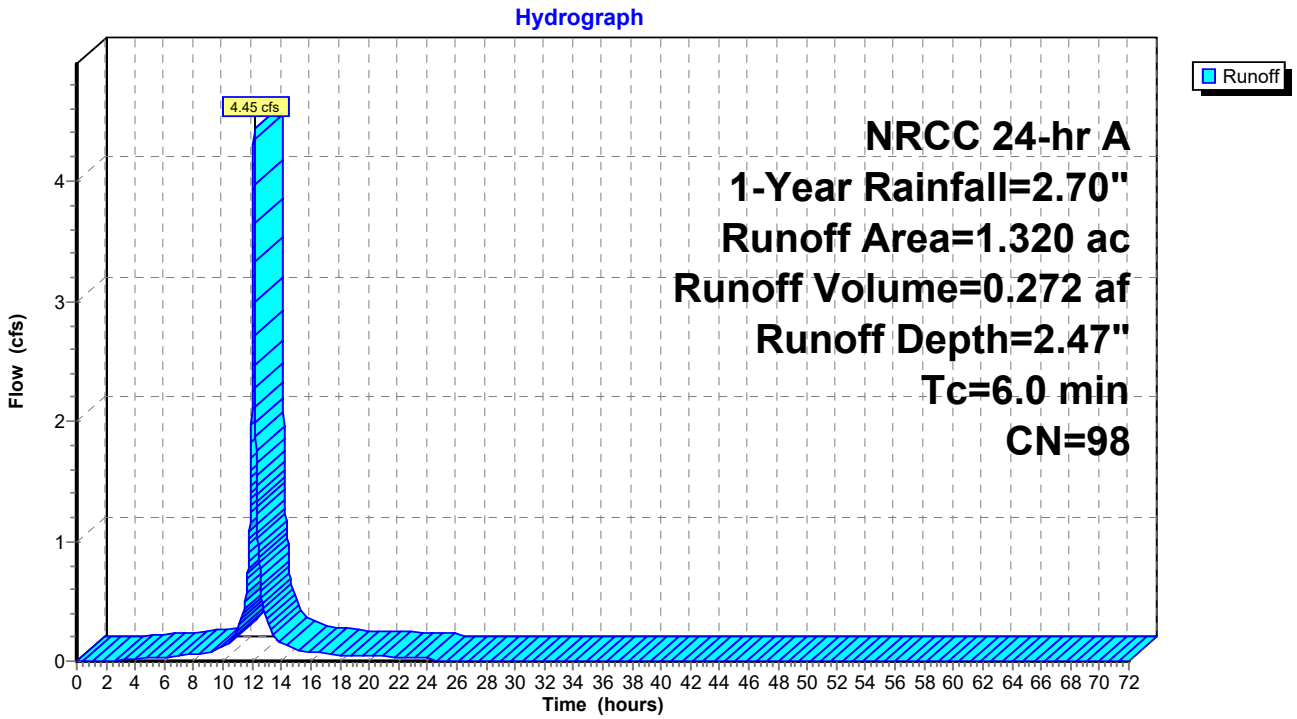
Runoff = 4.45 cfs @ 12.13 hrs, Volume= 0.272 af, Depth= 2.47"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
1.320	98	Unconnected roofs, HSG A
1.320	98	100.00% Impervious Area
1.320		100.00% Unconnected

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

Subcatchment 2S: PR-6



Summary for Subcatchment P1: PR-1

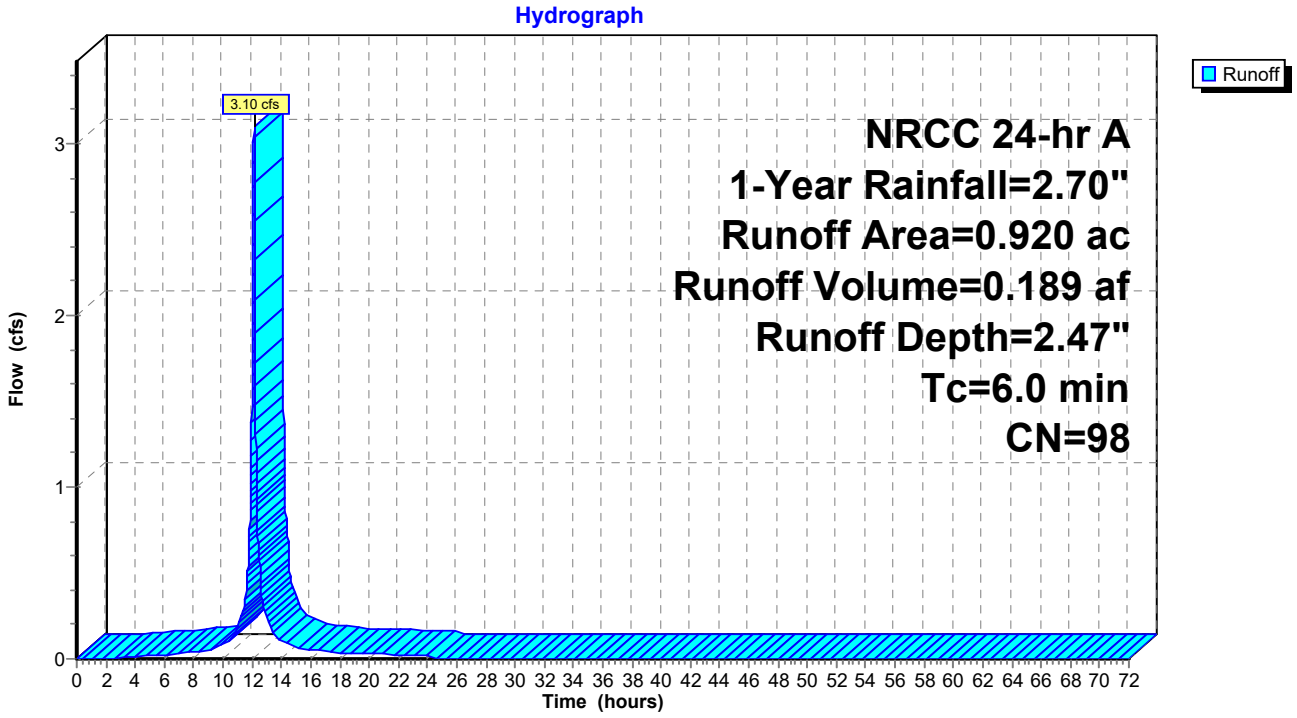
Runoff = 3.10 cfs @ 12.13 hrs, Volume= 0.189 af, Depth= 2.47"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.920	98	Roofs, HSG A
0.920	98	100.00% Impervious Area

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

Subcatchment P1: PR-1



Summary for Subcatchment P2: PR-2

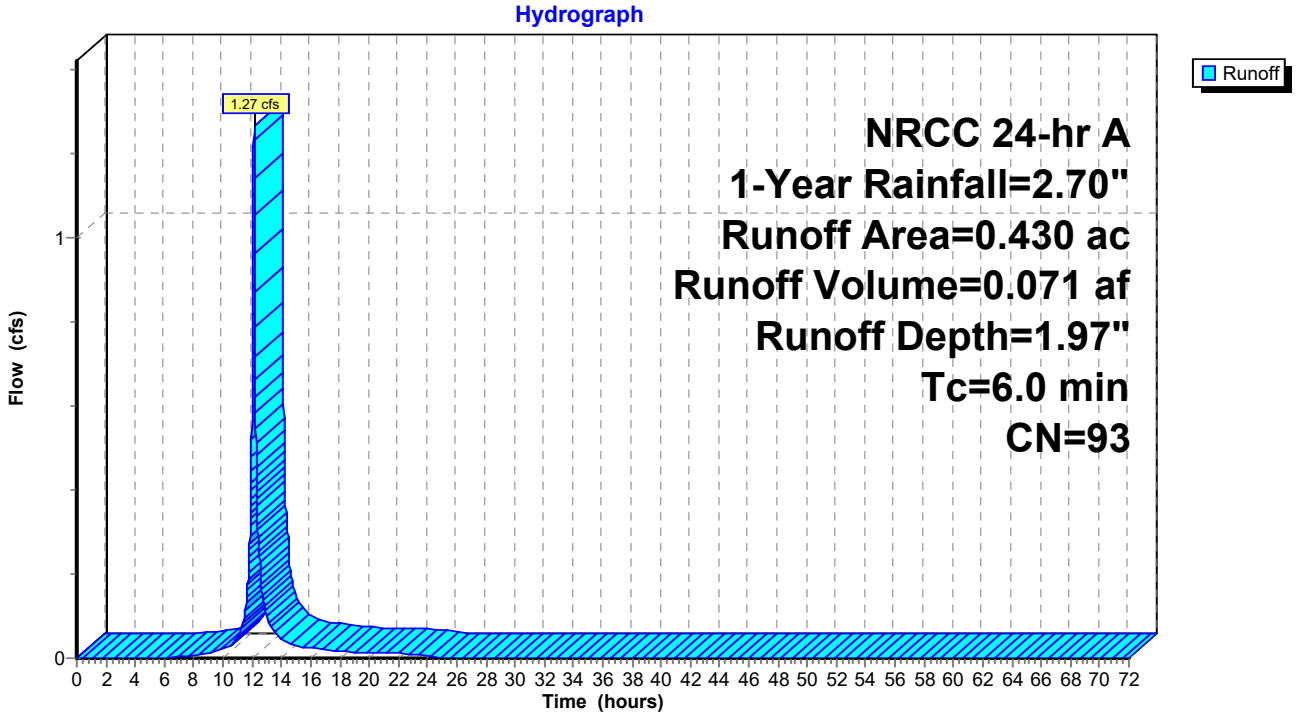
Runoff = 1.27 cfs @ 12.13 hrs, Volume= 0.071 af, Depth= 1.97"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.320	98	Paved parking, HSG D
0.110	80	>75% Grass cover, Good, HSG D
0.430	93	Weighted Average
0.110	80	25.58% Pervious Area
0.320	98	74.42% Impervious Area

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

Subcatchment P2: PR-2



Summary for Subcatchment P3: PR-4

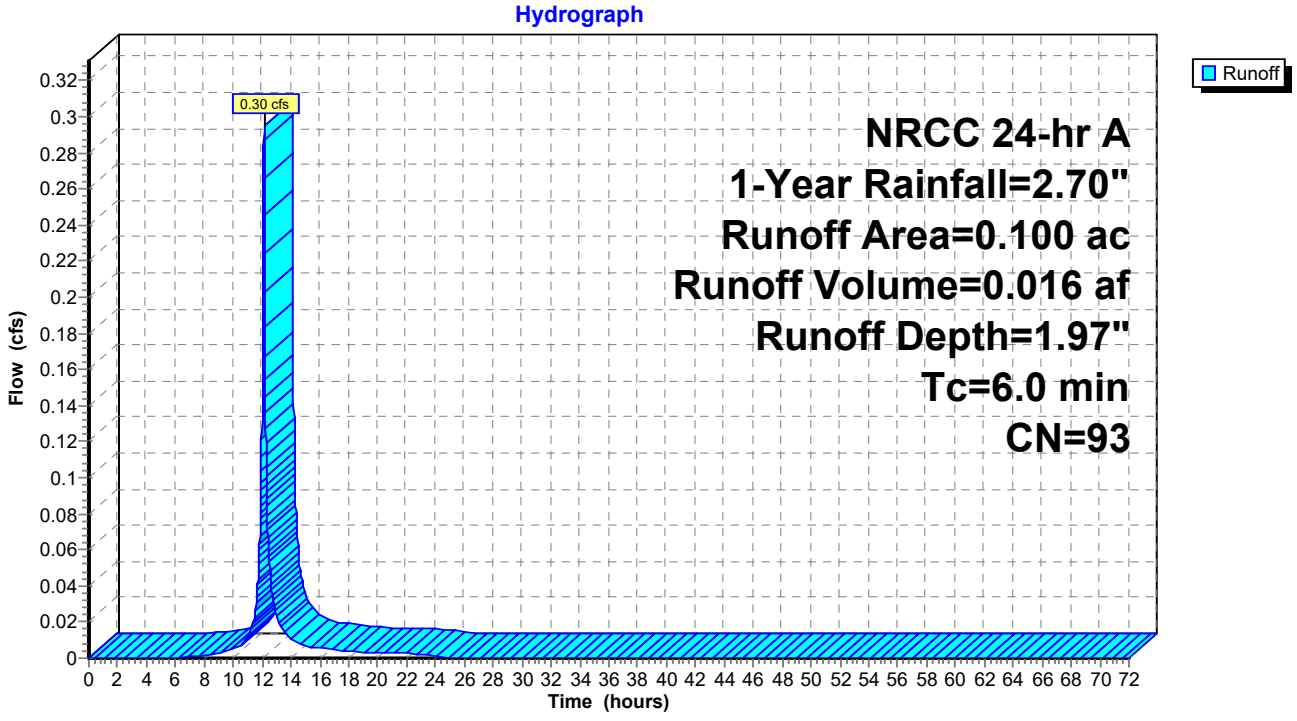
Runoff = 0.30 cfs @ 12.13 hrs, Volume= 0.016 af, Depth= 1.97"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.100	93	Weighted Average
0.030	80	30.00% Pervious Area
0.070	98	70.00% Impervious Area

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

Subcatchment P3: PR-4



Summary for Subcatchment P4: PR-5

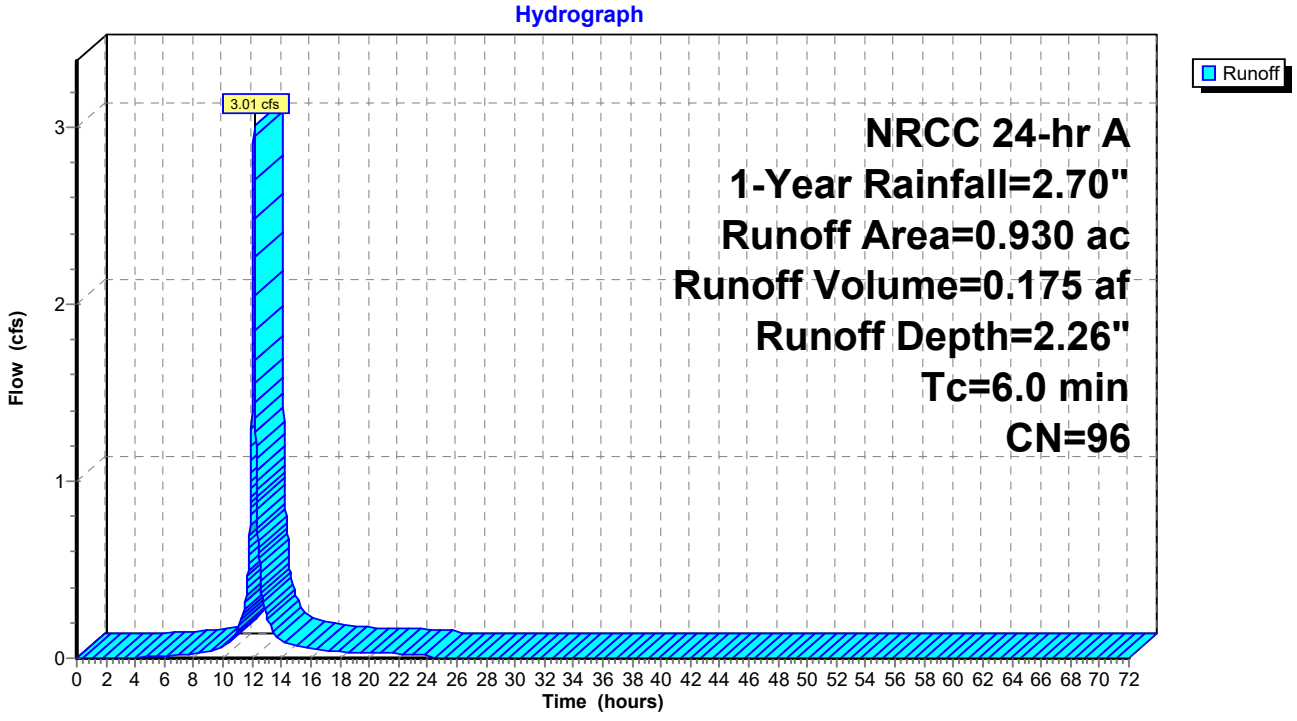
Runoff = 3.01 cfs @ 12.13 hrs, Volume= 0.175 af, Depth= 2.26"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.830	98	Paved parking, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.930	96	Weighted Average
0.100	80	10.75% Pervious Area
0.830	98	89.25% Impervious Area

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

Subcatchment P4: PR-5



Summary for Subcatchment P5: PR-8

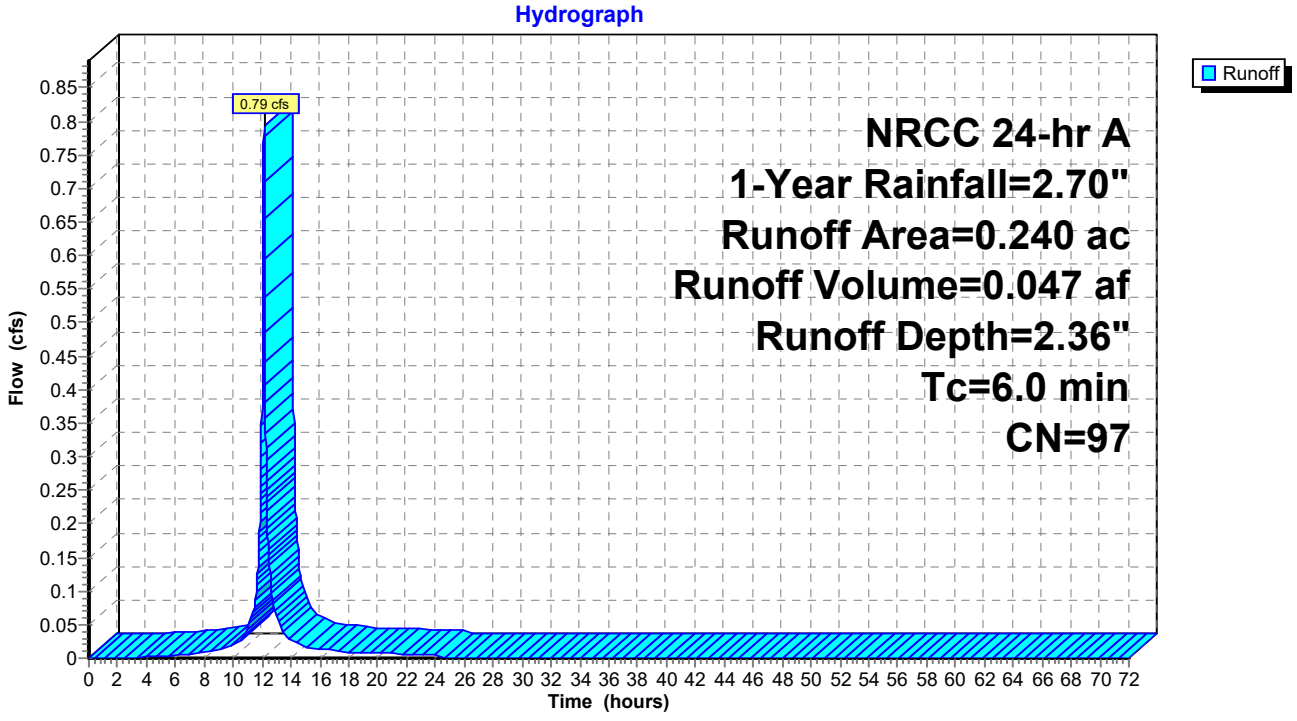
Runoff = 0.79 cfs @ 12.13 hrs, Volume= 0.047 af, Depth= 2.36"
Routed to Link 5L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.220	98	Paved parking, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.240	97	Weighted Average
0.020	80	8.33% Pervious Area
0.220	98	91.67% Impervious Area

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

Subcatchment P5: PR-8



Summary for Subcatchment P6: PR-3

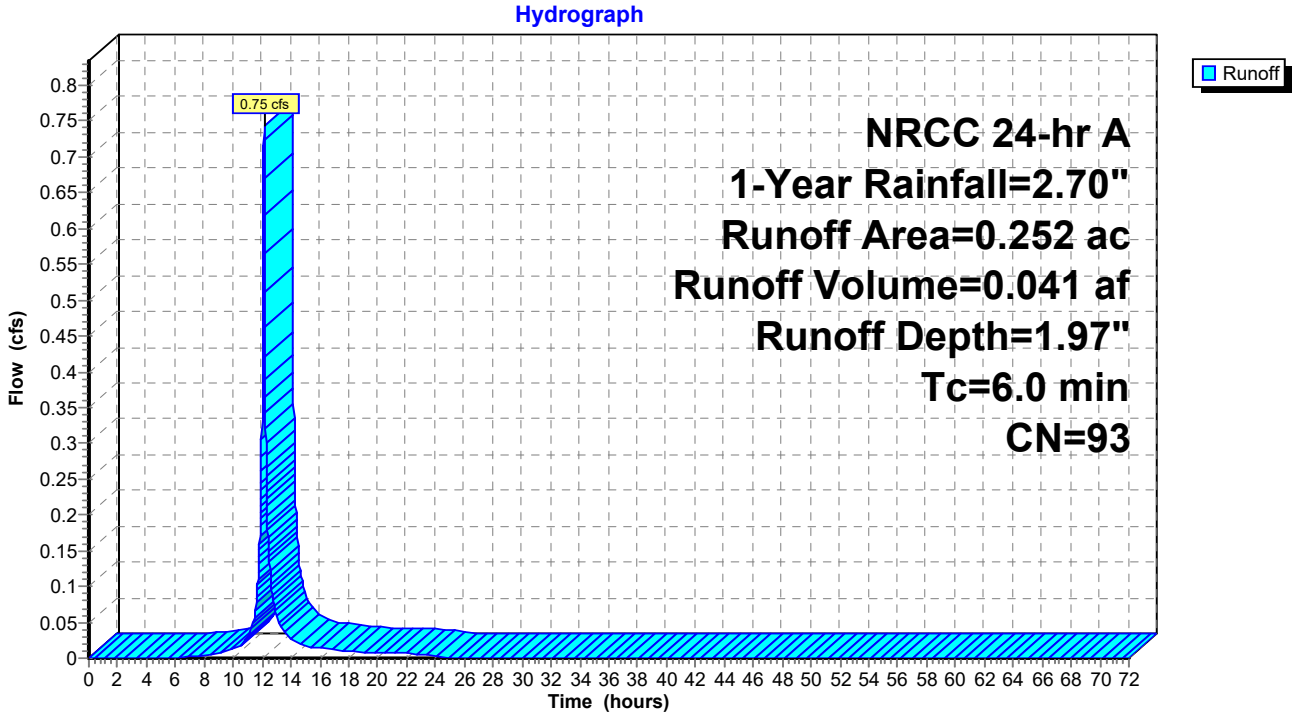
Runoff = 0.75 cfs @ 12.13 hrs, Volume= 0.041 af, Depth= 1.97"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 1-Year Rainfall=2.70"

Area (ac)	CN	Description
0.180	98	Paved parking, HSG D
0.072	80	>75% Grass cover, Good, HSG D
0.252	93	Weighted Average
0.072	80	28.57% Pervious Area
0.180	98	71.43% Impervious Area

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

Subcatchment P6: PR-3



Summary for Pond 1P: P-WQ1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=442)

Inflow Area = 1.350 ac, 91.85% Impervious, Inflow Depth = 2.31" for 1-Year event
Inflow = 4.37 cfs @ 12.13 hrs, Volume= 0.260 af
Outflow = 1.72 cfs @ 12.26 hrs, Volume= 0.260 af, Atten= 61%, Lag= 8.0 min
Discarded = 0.40 cfs @ 11.62 hrs, Volume= 0.205 af
Primary = 1.32 cfs @ 12.26 hrs, Volume= 0.055 af
Routed to Link 3L : Existing Drainage (Carlsbad)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 3L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 56.64' @ 12.26 hrs Surf.Area= 0.048 ac Storage= 0.069 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 26.7 min (794.4 - 767.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	54.50'	0.068 af	**22.75'W x 91.74'L x 5.50'H Field A** 0.264 af Overall - 0.093 af Embedded = 0.171 af x 40.0% Voids
#2A	55.25'	0.093 af	**ADS_StormTech MC-3500 d +Cap**x 36 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 36 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		0.161 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	55.90'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	59.00'	**12.0" Round Culvert** L= 33.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.67' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.40 cfs @ 11.62 hrs HW=54.56' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=1.32 cfs @ 12.26 hrs HW=56.64' TW=0.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Orifice Controls 1.32 cfs @ 3.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=54.50' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.00 cfs)

Pond 1P: P-WQ1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

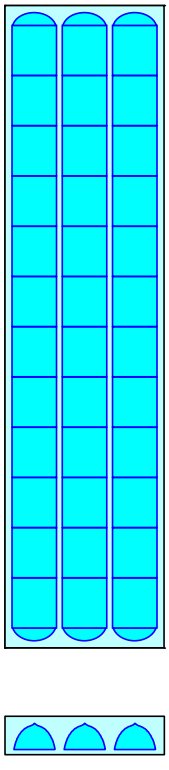
12 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 89.74' Row Length +12.0" End Stone x 2 = 91.74' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

36 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 4,047.7 cf Chamber Storage

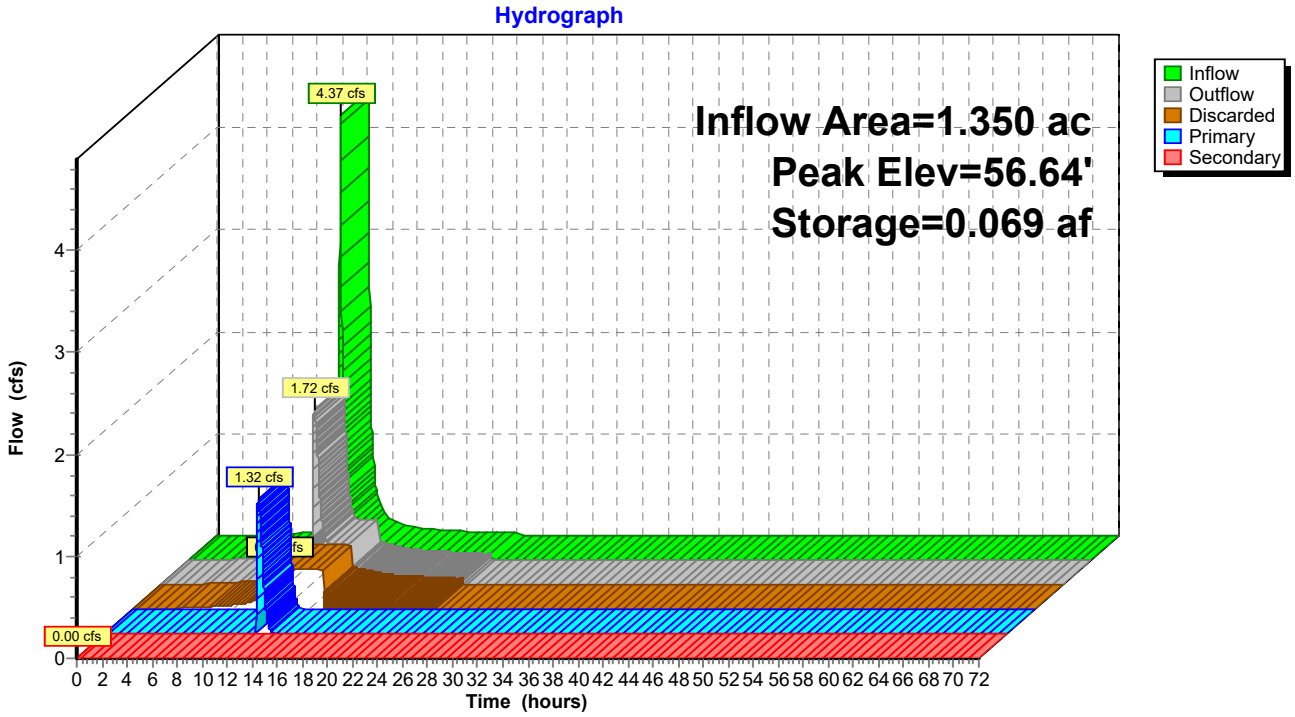
11,479.0 cf Field - 4,047.7 cf Chambers = 7,431.3 cf Stone x 40.0% Voids = 2,972.5 cf Stone Storage

Chamber Storage + Stone Storage = 7,020.2 cf = 0.161 af
Overall Storage Efficiency = 61.2%
Overall System Size = 91.74' x 22.75' x 5.50'

36 Chambers
425.1 cy Field
275.2 cy Stone



Pond 1P: P-WQ1


Hydrograph
Inflow Area=1.350 ac
Peak Elev=56.64'
Storage=0.069 af
Inflow
Outflow
Discarded
Primary
Secondary
4.37 cfs
1.72 cfs
1.32 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 2P: P-WQ2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=451)

Inflow Area = 3.140 ac, 94.59% Impervious, Inflow Depth = 2.38" for 1-Year event
Inflow = 10.41 cfs @ 12.13 hrs, Volume= 0.622 af
Outflow = 4.41 cfs @ 12.25 hrs, Volume= 0.622 af, Atten= 58%, Lag= 7.2 min
Discarded = 0.96 cfs @ 11.62 hrs, Volume= 0.482 af
Primary = 3.46 cfs @ 12.25 hrs, Volume= 0.140 af
Routed to Link 5L : Existing Drainage (Burnham Ave)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 5L : Existing Drainage (Burnham Ave)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 50.30' @ 12.25 hrs Surf.Area= 0.115 ac Storage= 0.160 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.8 min (789.7 - 765.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.25'	0.160 af	**37.08'W x 134.76'L x 5.50'H Field A** 0.631 af Overall - 0.231 af Embedded = 0.400 af x 40.0% Voids
#2A	49.00'	0.231 af	**ADS_StormTech MC-3500 d +Cap**x 90 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 90 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	52.50'	**18.0" Round Culvert** L= 225.0' Ke= 0.500 Inlet / Outlet Invert= 52.50' / 50.25' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Primary	49.50'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.96 cfs @ 11.62 hrs HW=48.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=3.46 cfs @ 12.25 hrs HW=50.30' TW=0.00' (Dynamic Tailwater)
3=Orifice/Grate (Orifice Controls 3.46 cfs @ 3.30 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.25' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 2P: P-WQ2 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

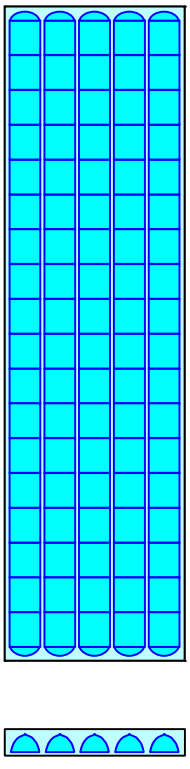
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

90 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 10,044.7 cf Chamber Storage

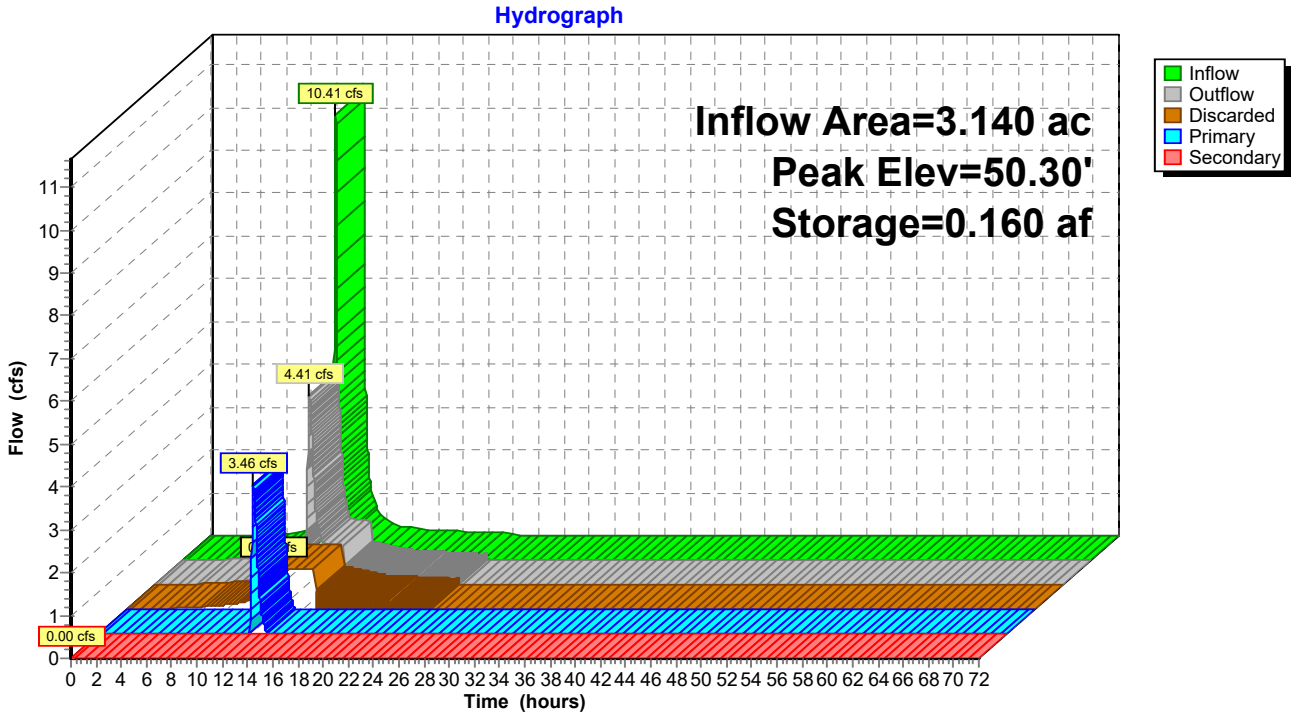
27,485.4 cf Field - 10,044.7 cf Chambers = 17,440.7 cf Stone x 40.0% Voids = 6,976.3 cf Stone Storage

Chamber Storage + Stone Storage = 17,021.0 cf = 0.391 af
Overall Storage Efficiency = 61.9%
Overall System Size = 134.76' x 37.08' x 5.50'

90 Chambers
1,018.0 cy Field
646.0 cy Stone



Pond 2P: P-WQ2

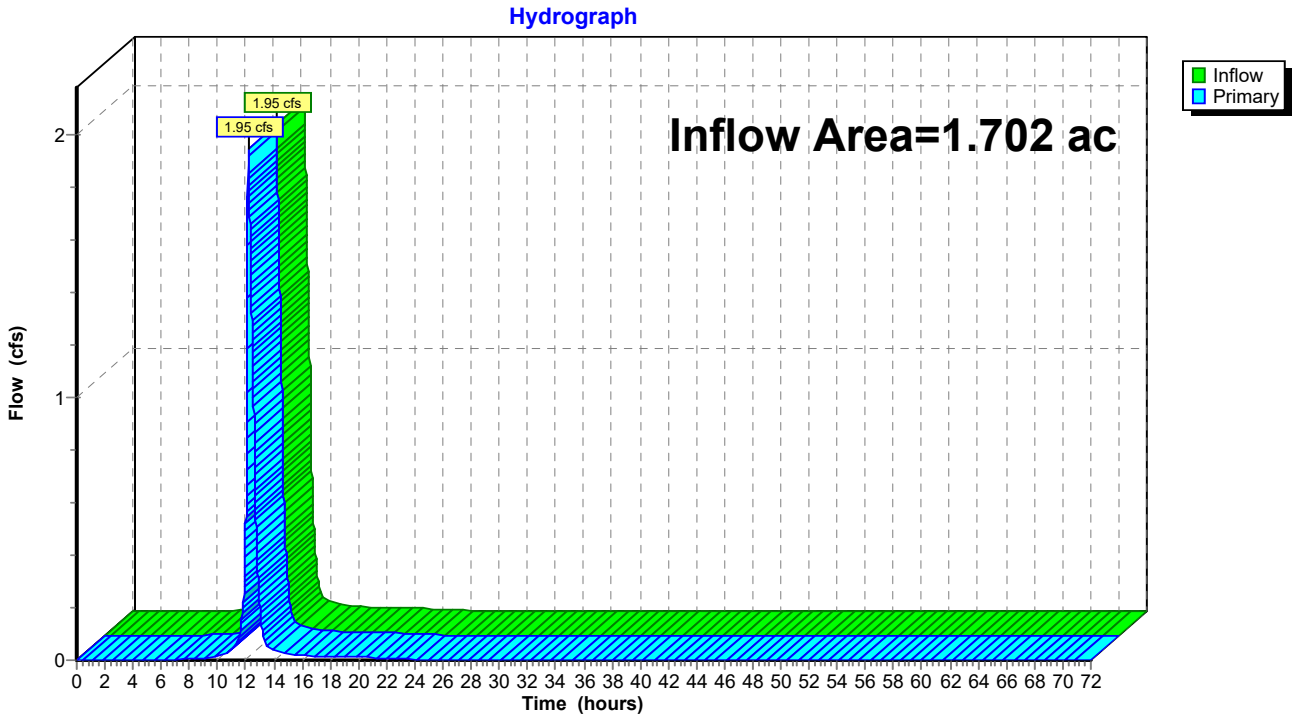

Hydrograph
Inflow Area=3.140 ac
Peak Elev=50.30'
Storage=0.160 af
10.41 cfs
4.41 cfs
3.46 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 3L: Existing Drainage (Carlsbad)

Inflow Area = 1.702 ac, 87.54% Impervious, Inflow Depth = 0.79" for 1-Year event
Inflow = 1.95 cfs @ 12.17 hrs, Volume= 0.112 af
Primary = 1.95 cfs @ 12.17 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3L: Existing Drainage (Carlsbad)

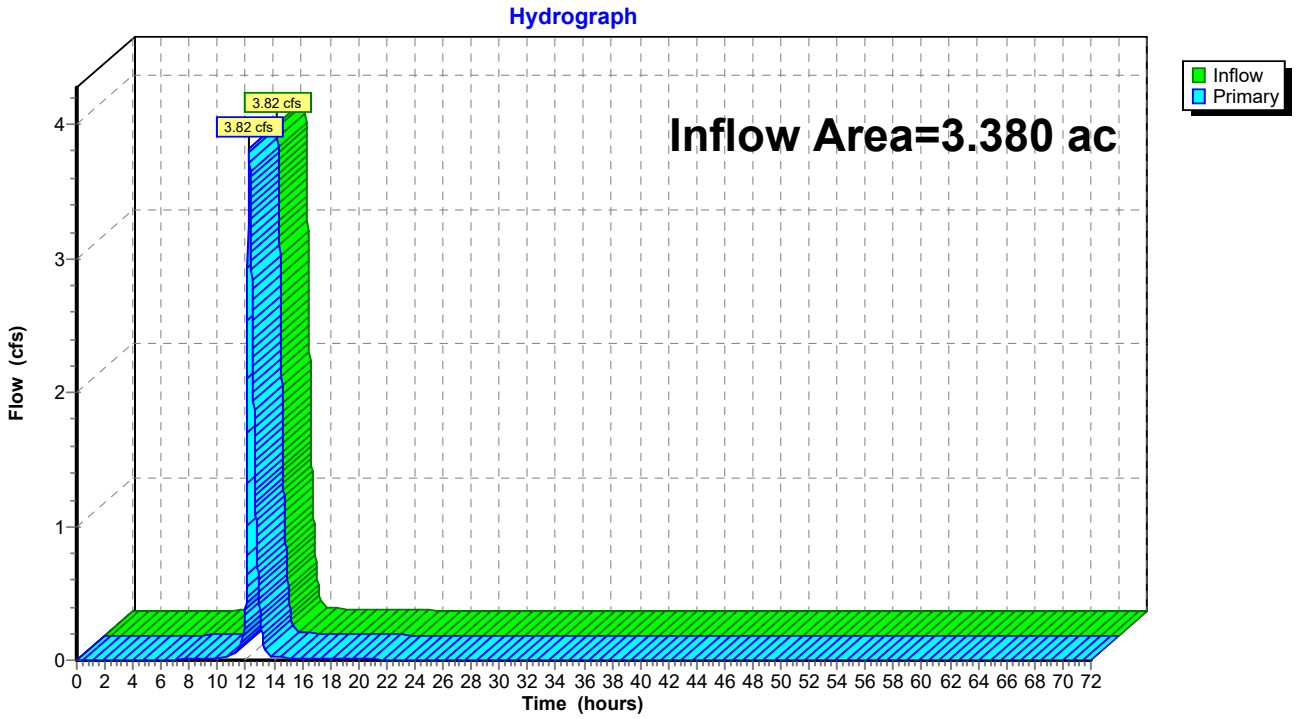


Summary for Link 5L: Existing Drainage (Burnham Ave)

Inflow Area = 3.380 ac, 94.38% Impervious, Inflow Depth = 0.67" for 1-Year event
Inflow = 3.82 cfs @ 12.22 hrs, Volume= 0.187 af
Primary = 3.82 cfs @ 12.22 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 5L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: PR-7 Runoff Area=0.890 ac 92.13% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=97 Runoff=3.54 cfs 0.213 af

Subcatchment2S: PR-6 Runoff Area=1.320 ac 100.00% Impervious Runoff Depth=2.98"
Tc=6.0 min CN=98 Runoff=5.32 cfs 0.328 af

SubcatchmentP1: PR-1 Runoff Area=0.920 ac 100.00% Impervious Runoff Depth=2.98"
Tc=6.0 min CN=98 Runoff=3.71 cfs 0.228 af

SubcatchmentP2: PR-2 Runoff Area=0.430 ac 74.42% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=93 Runoff=1.56 cfs 0.088 af

SubcatchmentP3: PR-4 Runoff Area=0.100 ac 70.00% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=93 Runoff=0.36 cfs 0.020 af

SubcatchmentP4: PR-5 Runoff Area=0.930 ac 89.25% Impervious Runoff Depth=2.76"
Tc=6.0 min CN=96 Runoff=3.63 cfs 0.214 af

SubcatchmentP5: PR-8 Runoff Area=0.240 ac 91.67% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=97 Runoff=0.95 cfs 0.057 af

SubcatchmentP6: PR-3 Runoff Area=0.252 ac 71.43% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=93 Runoff=0.92 cfs 0.052 af

Pond 1P: P-WQ1 Peak Elev=57.03' Storage=0.083 af Inflow=5.27 cfs 0.316 af
Discarded=0.40 cfs 0.230 af Primary=1.77 cfs 0.086 af Secondary=0.00 cfs 0.000 af Outflow=2.17 cfs 0.316 af

Pond 2P: P-WQ2 Peak Elev=50.66' Storage=0.192 af Inflow=12.49 cfs 0.754 af
Discarded=0.96 cfs 0.540 af Primary=4.58 cfs 0.214 af Secondary=0.00 cfs 0.000 af Outflow=5.54 cfs 0.754 af

Link 3L: Existing Drainage (Carlsbad) Inflow=2.68 cfs 0.158 af
Primary=2.68 cfs 0.158 af

Link 5L: Existing Drainage (Burnham Ave) Inflow=5.06 cfs 0.271 af
Primary=5.06 cfs 0.271 af

Total Runoff Area = 5.082 ac Runoff Volume = 1.200 af Average Runoff Depth = 2.83"
7.91% Pervious = 0.402 ac 92.09% Impervious = 4.680 ac

Summary for Subcatchment 1S: PR-7

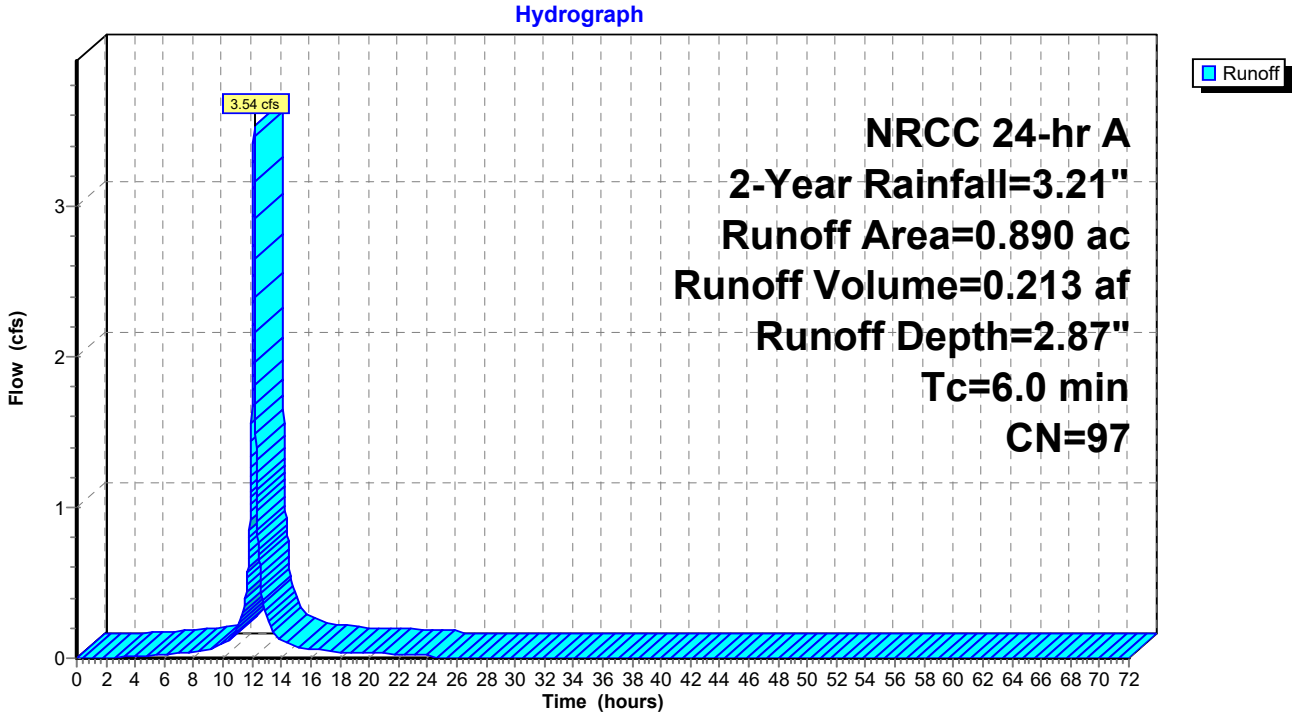
Runoff = 3.54 cfs @ 12.13 hrs, Volume= 0.213 af, Depth= 2.87"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.820	98	Paved parking, HSG A
0.070	80	>75% Grass cover, Good, HSG D
0.890	97	Weighted Average
0.070	80	7.87% Pervious Area
0.820	98	92.13% Impervious Area

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

Subcatchment 1S: PR-7



Summary for Subcatchment 2S: PR-6

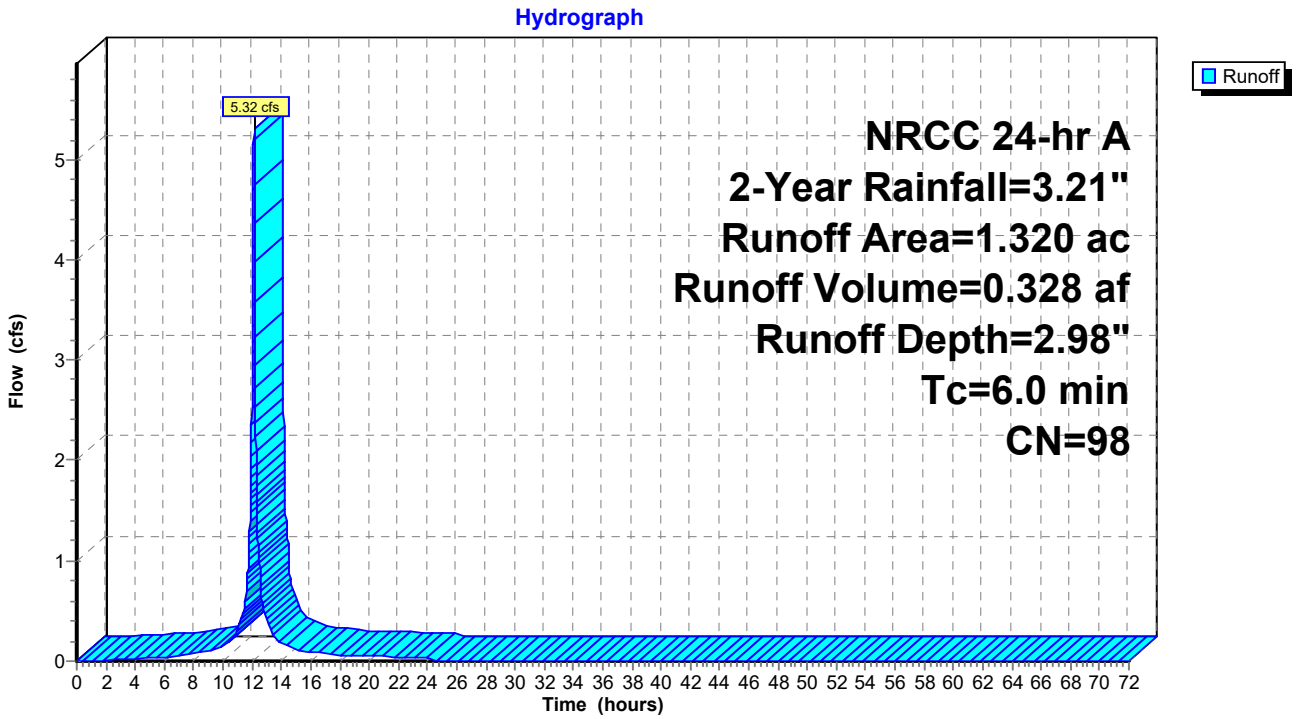
Runoff = 5.32 cfs @ 12.13 hrs, Volume= 0.328 af, Depth= 2.98"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
1.320	98	Unconnected roofs, HSG A
1.320	98	100.00% Impervious Area
1.320		100.00% Unconnected

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

Subcatchment 2S: PR-6



Summary for Subcatchment P1: PR-1

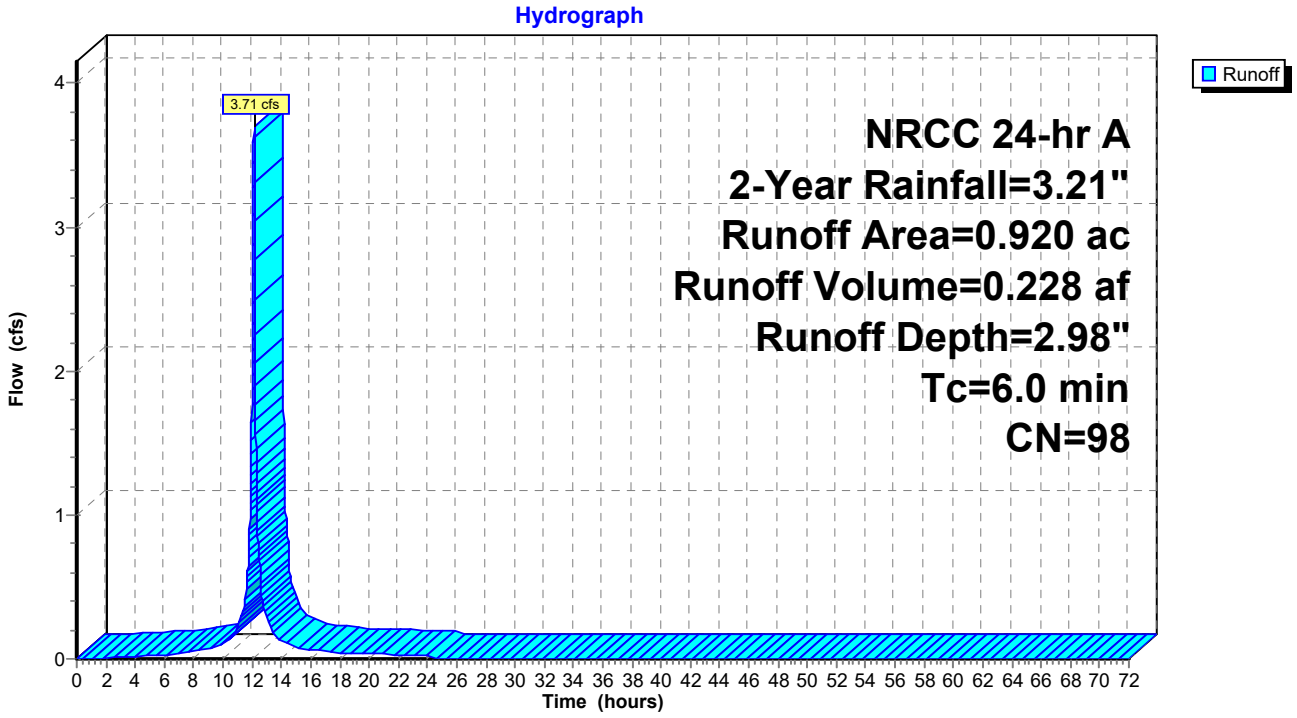
Runoff = 3.71 cfs @ 12.13 hrs, Volume= 0.228 af, Depth= 2.98"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.920	98	Roofs, HSG A
0.920	98	100.00% Impervious Area

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

Subcatchment P1: PR-1



Summary for Subcatchment P2: PR-2

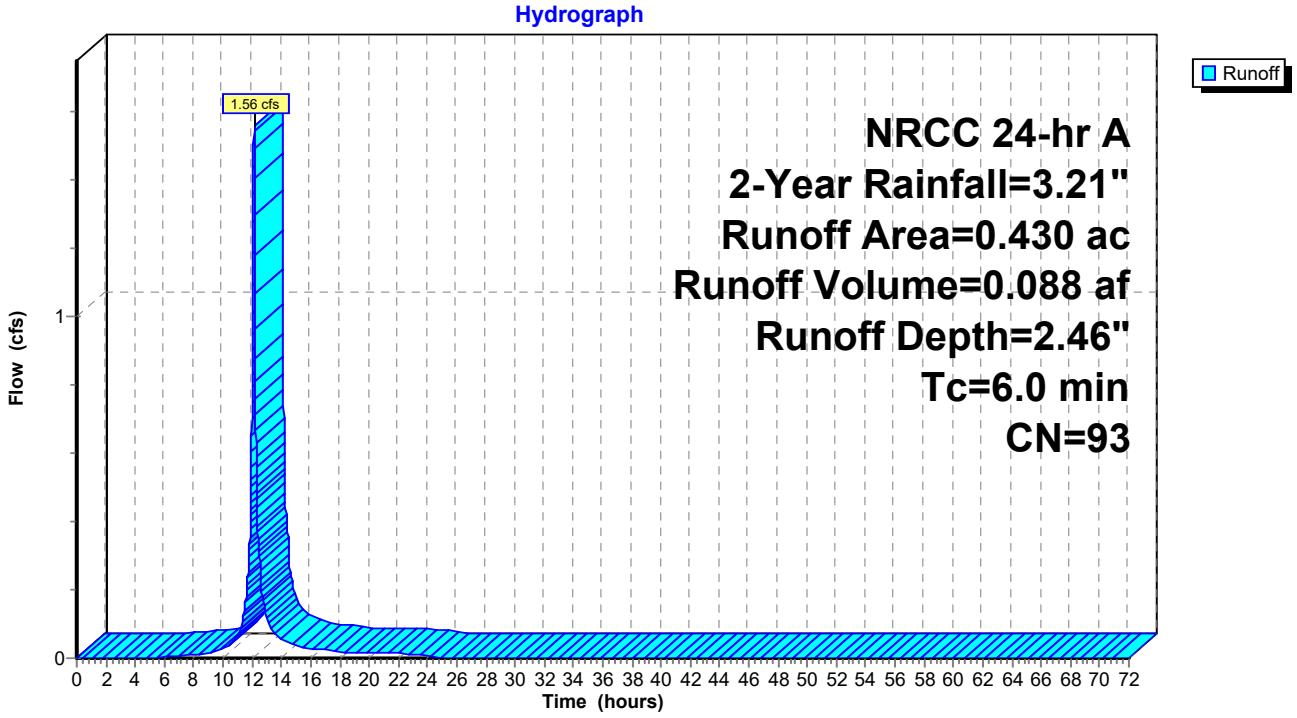
Runoff = 1.56 cfs @ 12.13 hrs, Volume= 0.088 af, Depth= 2.46"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.320	98	Paved parking, HSG D
0.110	80	>75% Grass cover, Good, HSG D
0.430	93	Weighted Average
0.110	80	25.58% Pervious Area
0.320	98	74.42% Impervious Area

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

Subcatchment P2: PR-2



Summary for Subcatchment P3: PR-4

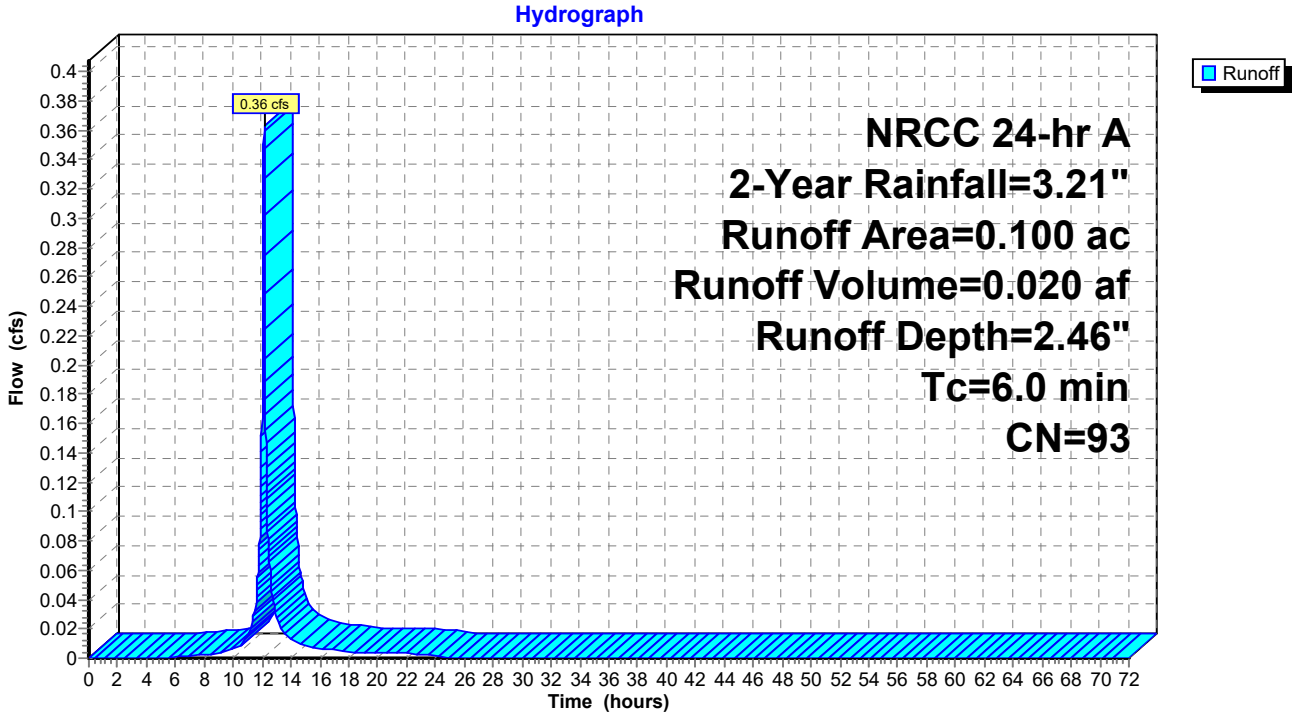
Runoff = 0.36 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 2.46"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.100	93	Weighted Average
0.030	80	30.00% Pervious Area
0.070	98	70.00% Impervious Area

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

Subcatchment P3: PR-4



Summary for Subcatchment P4: PR-5

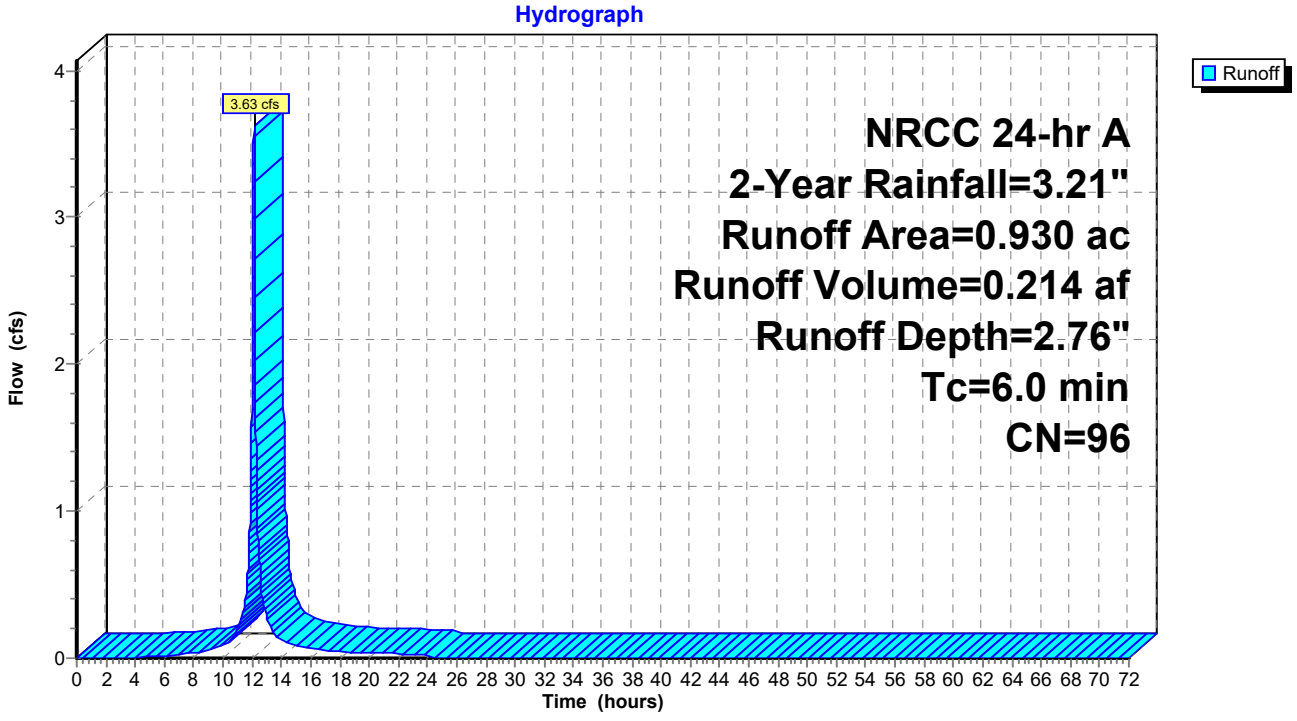
Runoff = 3.63 cfs @ 12.13 hrs, Volume= 0.214 af, Depth= 2.76"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.830	98	Paved parking, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.930	96	Weighted Average
0.100	80	10.75% Pervious Area
0.830	98	89.25% Impervious Area

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

Subcatchment P4: PR-5



Summary for Subcatchment P5: PR-8

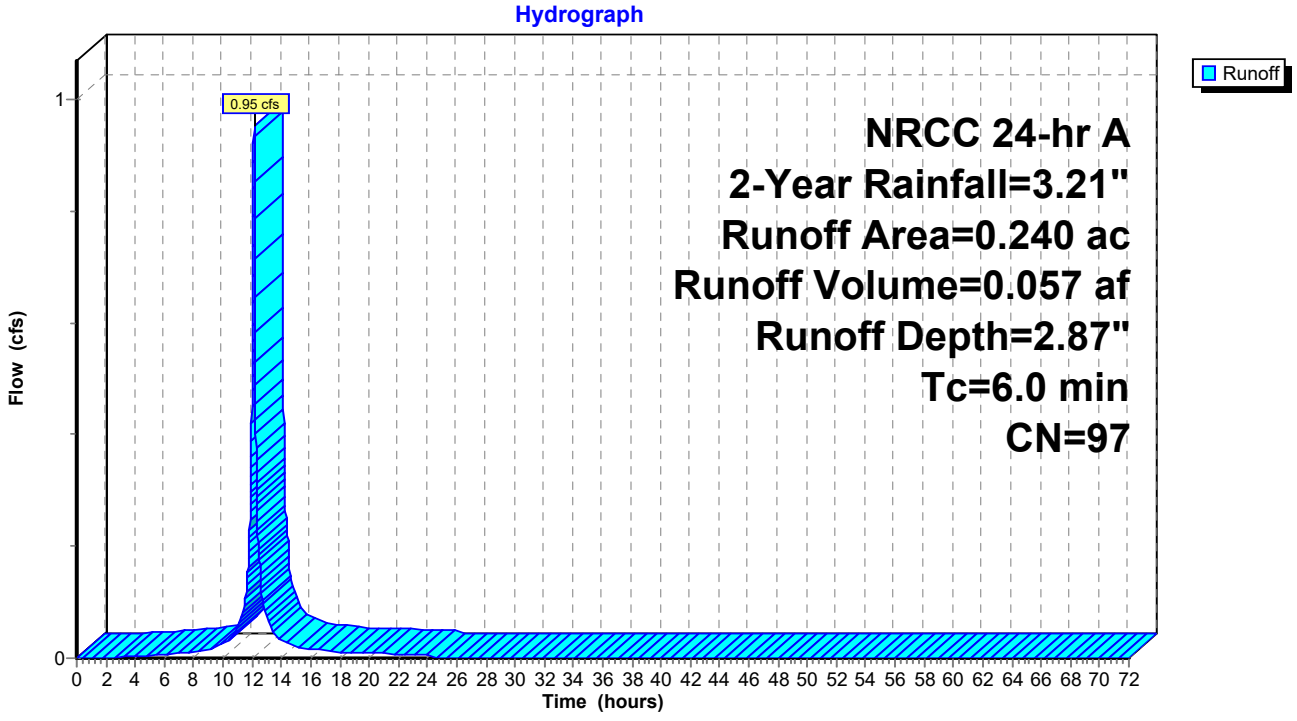
Runoff = 0.95 cfs @ 12.13 hrs, Volume= 0.057 af, Depth= 2.87"
Routed to Link 5L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.220	98	Paved parking, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.240	97	Weighted Average
0.020	80	8.33% Pervious Area
0.220	98	91.67% Impervious Area

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

Subcatchment P5: PR-8



Summary for Subcatchment P6: PR-3

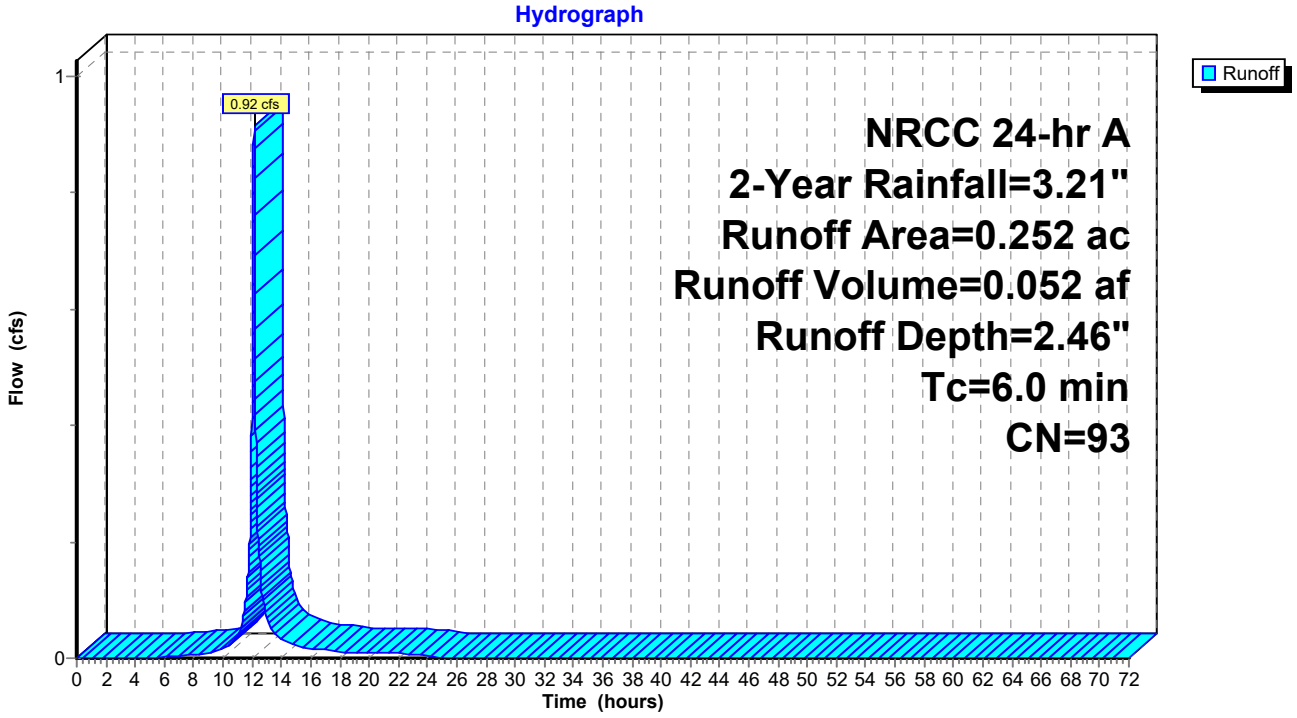
Runoff = 0.92 cfs @ 12.13 hrs, Volume= 0.052 af, Depth= 2.46"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 2-Year Rainfall=3.21"

Area (ac)	CN	Description
0.180	98	Paved parking, HSG D
0.072	80	>75% Grass cover, Good, HSG D
0.252	93	Weighted Average
0.072	80	28.57% Pervious Area
0.180	98	71.43% Impervious Area

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

Subcatchment P6: PR-3



Summary for Pond 1P: P-WQ1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=429)

Inflow Area = 1.350 ac, 91.85% Impervious, Inflow Depth = 2.81" for 2-Year event
Inflow = 5.27 cfs @ 12.13 hrs, Volume= 0.316 af
Outflow = 2.17 cfs @ 12.25 hrs, Volume= 0.316 af, Atten= 59%, Lag= 7.5 min
Discarded = 0.40 cfs @ 11.50 hrs, Volume= 0.230 af
Primary = 1.77 cfs @ 12.25 hrs, Volume= 0.086 af
Routed to Link 3L : Existing Drainage (Carlsbad)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 3L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 57.03' @ 12.25 hrs Surf.Area= 0.048 ac Storage= 0.083 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.9 min (789.9 - 764.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	54.50'	0.068 af	**22.75'W x 91.74'L x 5.50'H Field A** 0.264 af Overall - 0.093 af Embedded = 0.171 af x 40.0% Voids
#2A	55.25'	0.093 af	**ADS_StormTech MC-3500 d +Cap**x 36 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 36 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		0.161 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	55.90'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	59.00'	**12.0" Round Culvert** L= 33.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.67' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.40 cfs @ 11.50 hrs HW=54.56' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=1.77 cfs @ 12.25 hrs HW=57.03' TW=0.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Orifice Controls 1.77 cfs @ 4.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=54.50' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.00 cfs)

Pond 1P: P-WQ1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

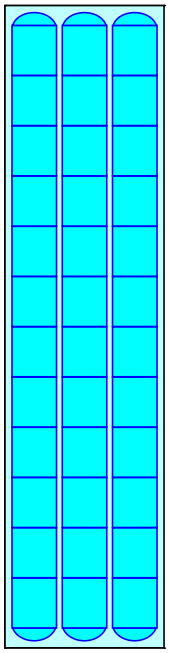
12 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 89.74' Row Length +12.0" End Stone x 2 = 91.74' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

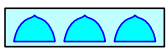
36 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 4,047.7 cf Chamber Storage

11,479.0 cf Field - 4,047.7 cf Chambers = 7,431.3 cf Stone x 40.0% Voids = 2,972.5 cf Stone Storage

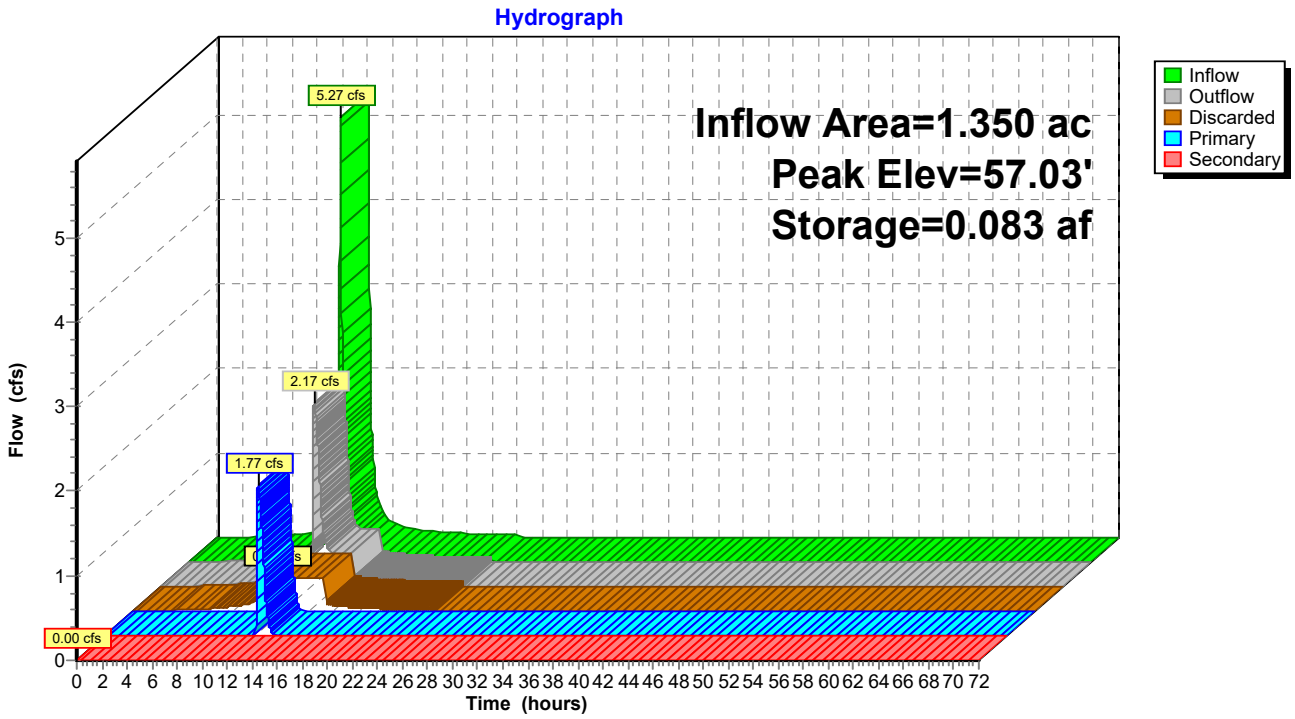
Chamber Storage + Stone Storage = 7,020.2 cf = 0.161 af
Overall Storage Efficiency = 61.2%
Overall System Size = 91.74' x 22.75' x 5.50'

36 Chambers
425.1 cy Field
275.2 cy Stone





Pond 1P: P-WQ1


Hydrograph
Inflow Area=1.350 ac
Peak Elev=57.03'
Storage=0.083 af
Inflow
Outflow
Discarded
Primary
Secondary
5.27 cfs
2.17 cfs
1.77 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 2P: P-WQ2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=439)

Inflow Area = 3.140 ac, 94.59% Impervious, Inflow Depth = 2.88" for 2-Year event
Inflow = 12.49 cfs @ 12.13 hrs, Volume= 0.754 af
Outflow = 5.54 cfs @ 12.24 hrs, Volume= 0.754 af, Atten= 56%, Lag= 6.8 min
Discarded = 0.96 cfs @ 11.49 hrs, Volume= 0.540 af
Primary = 4.58 cfs @ 12.24 hrs, Volume= 0.214 af
Routed to Link 5L : Existing Drainage (Burnham Ave)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 5L : Existing Drainage (Burnham Ave)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 50.66' @ 12.24 hrs Surf.Area= 0.115 ac Storage= 0.192 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.2 min (785.3 - 762.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.25'	0.160 af	**37.08'W x 134.76'L x 5.50'H Field A** 0.631 af Overall - 0.231 af Embedded = 0.400 af x 40.0% Voids
#2A	49.00'	0.231 af	**ADS_StormTech MC-3500 d +Cap**x 90 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 90 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	52.50'	**18.0" Round Culvert** L= 225.0' Ke= 0.500 Inlet / Outlet Invert= 52.50' / 50.25' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Primary	49.50'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.96 cfs @ 11.49 hrs HW=48.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=4.58 cfs @ 12.24 hrs HW=50.66' TW=0.00' (Dynamic Tailwater)
3=Orifice/Grate (Orifice Controls 4.58 cfs @ 4.37 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.25' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 2P: P-WQ2 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

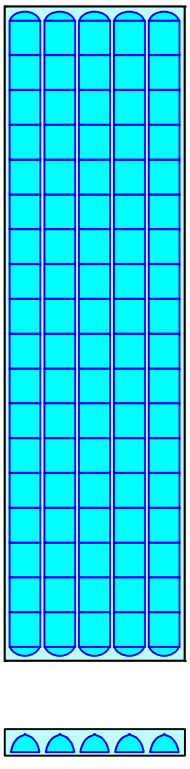
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

90 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 10,044.7 cf Chamber Storage

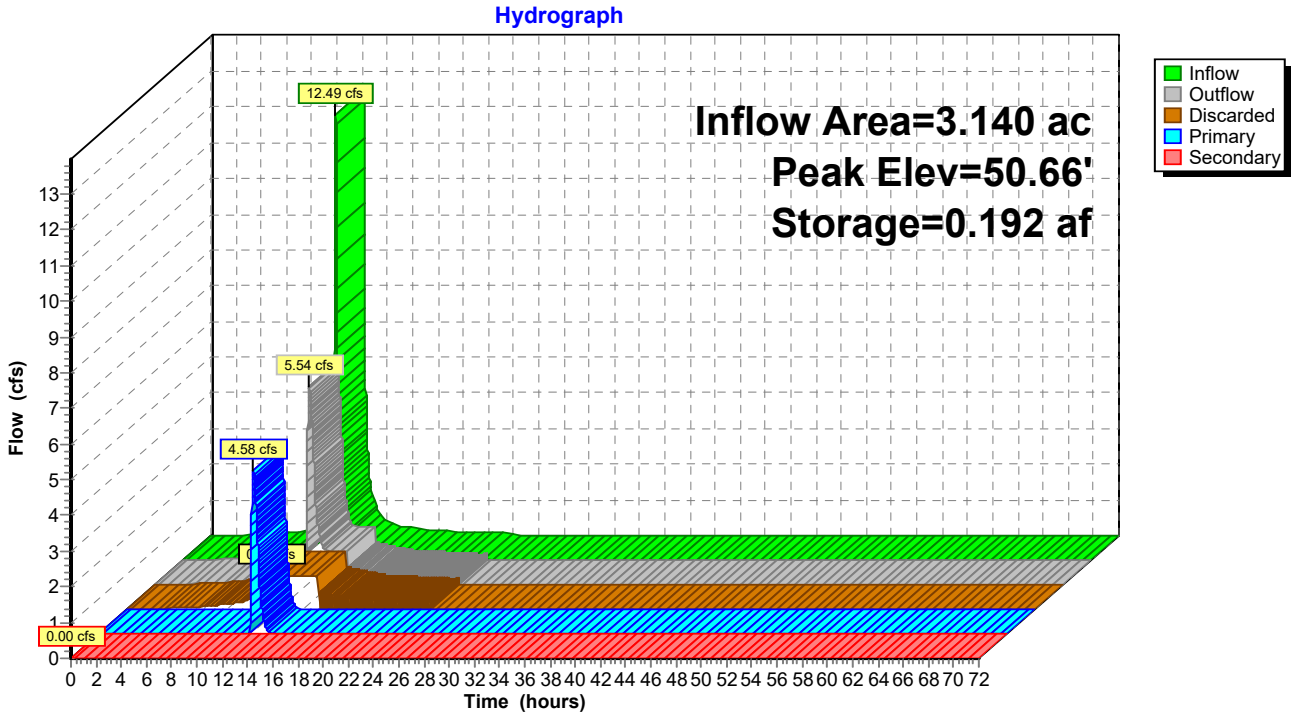
27,485.4 cf Field - 10,044.7 cf Chambers = 17,440.7 cf Stone x 40.0% Voids = 6,976.3 cf Stone Storage

Chamber Storage + Stone Storage = 17,021.0 cf = 0.391 af
Overall Storage Efficiency = 61.9%
Overall System Size = 134.76' x 37.08' x 5.50'

90 Chambers
1,018.0 cy Field
646.0 cy Stone



Pond 2P: P-WQ2

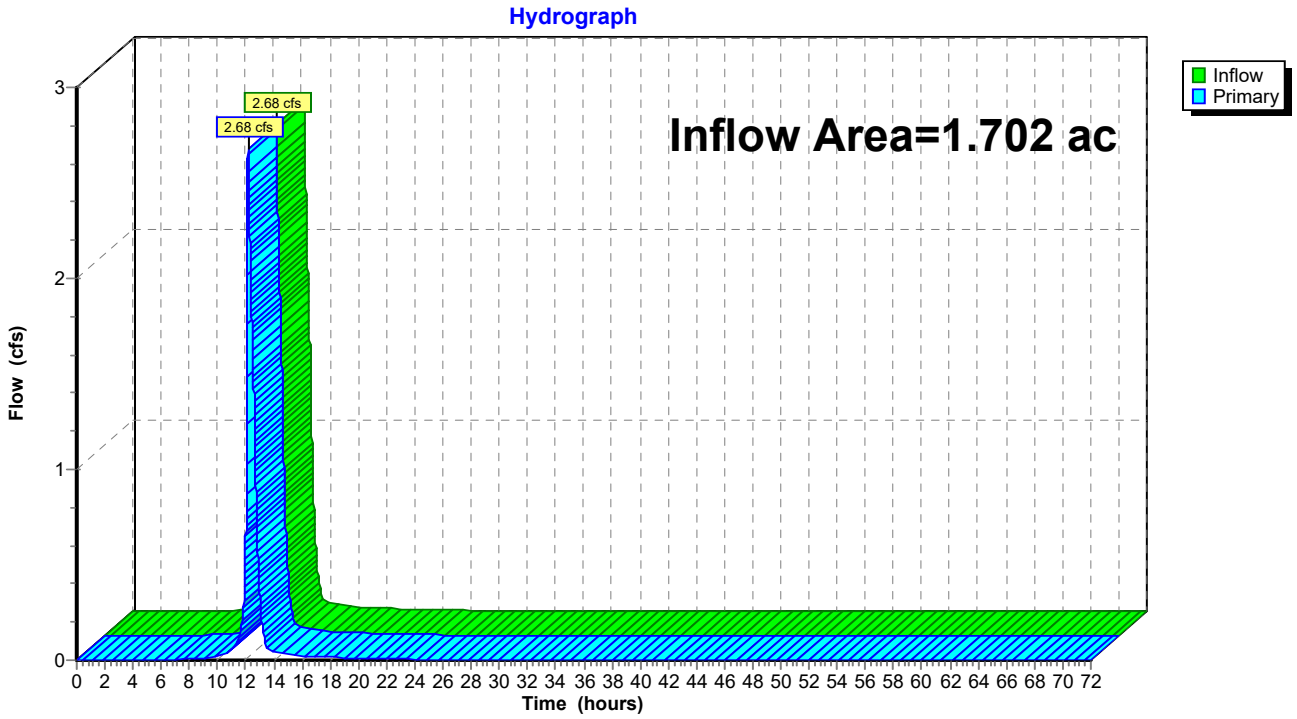

Hydrograph
Inflow Area=3.140 ac
Peak Elev=50.66'
Storage=0.192 af
12.49 cfs
5.54 cfs
4.58 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 3L: Existing Drainage (Carlsbad)

Inflow Area = 1.702 ac, 87.54% Impervious, Inflow Depth = 1.12" for 2-Year event
Inflow = 2.68 cfs @ 12.16 hrs, Volume= 0.158 af
Primary = 2.68 cfs @ 12.16 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3L: Existing Drainage (Carlsbad)

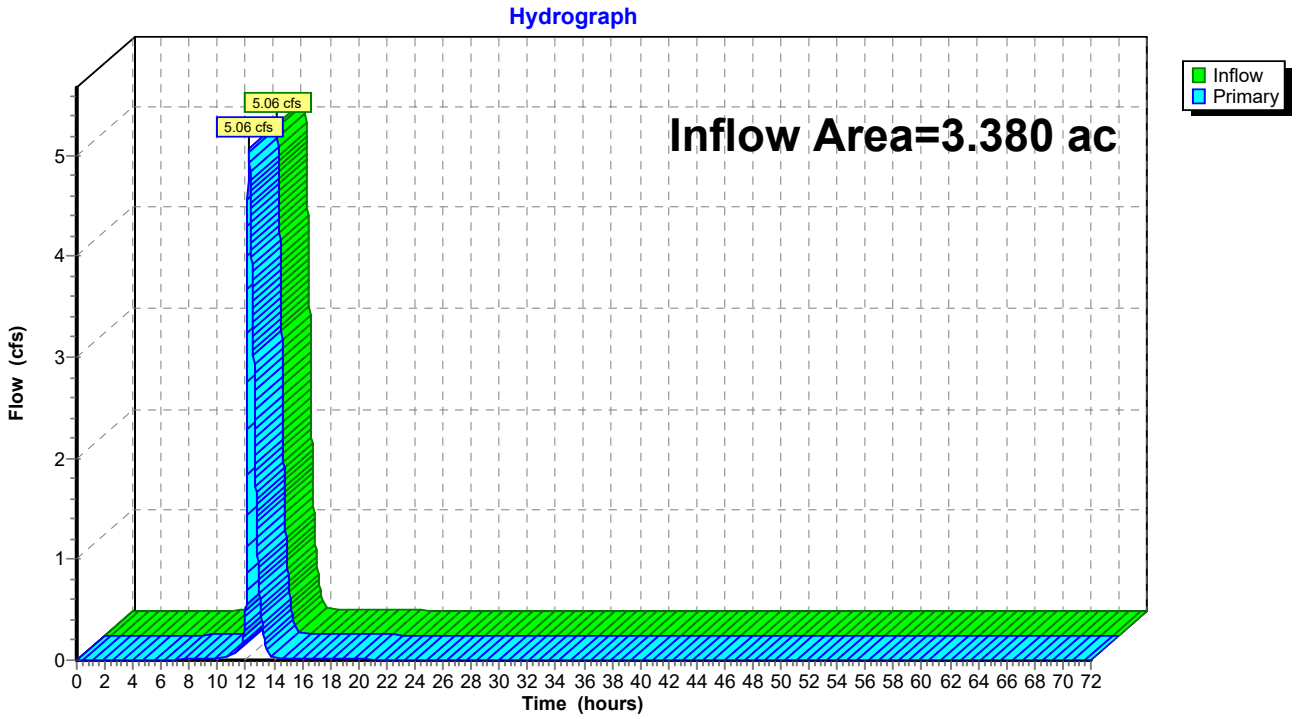


Summary for Link 5L: Existing Drainage (Burnham Ave)

Inflow Area = 3.380 ac, 94.38% Impervious, Inflow Depth = 0.96" for 2-Year event
Inflow = 5.06 cfs @ 12.20 hrs, Volume= 0.271 af
Primary = 5.06 cfs @ 12.20 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 5L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: PR-7 Runoff Area=0.890 ac 92.13% Impervious Runoff Depth=4.39"
Tc=6.0 min CN=97 Runoff=5.29 cfs 0.325 af

Subcatchment2S: PR-6 Runoff Area=1.320 ac 100.00% Impervious Runoff Depth=4.50"
Tc=6.0 min CN=98 Runoff=7.90 cfs 0.495 af

SubcatchmentP1: PR-1 Runoff Area=0.920 ac 100.00% Impervious Runoff Depth=4.50"
Tc=6.0 min CN=98 Runoff=5.51 cfs 0.345 af

SubcatchmentP2: PR-2 Runoff Area=0.430 ac 74.42% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=93 Runoff=2.44 cfs 0.141 af

SubcatchmentP3: PR-4 Runoff Area=0.100 ac 70.00% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=93 Runoff=0.57 cfs 0.033 af

SubcatchmentP4: PR-5 Runoff Area=0.930 ac 89.25% Impervious Runoff Depth=4.27"
Tc=6.0 min CN=96 Runoff=5.48 cfs 0.331 af

SubcatchmentP5: PR-8 Runoff Area=0.240 ac 91.67% Impervious Runoff Depth=4.39"
Tc=6.0 min CN=97 Runoff=1.43 cfs 0.088 af

SubcatchmentP6: PR-3 Runoff Area=0.252 ac 71.43% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=93 Runoff=1.43 cfs 0.083 af

Pond 1P: P-WQ1 Peak Elev=58.43' Storage=0.129 af Inflow=7.94 cfs 0.487 af
Discarded=0.40 cfs 0.297 af Primary=2.86 cfs 0.190 af Secondary=0.00 cfs 0.000 af Outflow=3.26 cfs 0.487 af

Pond 2P: P-WQ2 Peak Elev=51.87' Storage=0.293 af Inflow=18.67 cfs 1.152 af
Discarded=0.96 cfs 0.699 af Primary=7.20 cfs 0.454 af Secondary=0.00 cfs 0.000 af Outflow=8.16 cfs 1.152 af

Link 3L: Existing Drainage (Carlsbad) Inflow=4.40 cfs 0.305 af
Primary=4.40 cfs 0.305 af

Link 5L: Existing Drainage (Burnham Ave) Inflow=7.96 cfs 0.541 af
Primary=7.96 cfs 0.541 af

Total Runoff Area = 5.082 ac Runoff Volume = 1.842 af Average Runoff Depth = 4.35"
7.91% Pervious = 0.402 ac 92.09% Impervious = 4.680 ac

Summary for Subcatchment 1S: PR-7

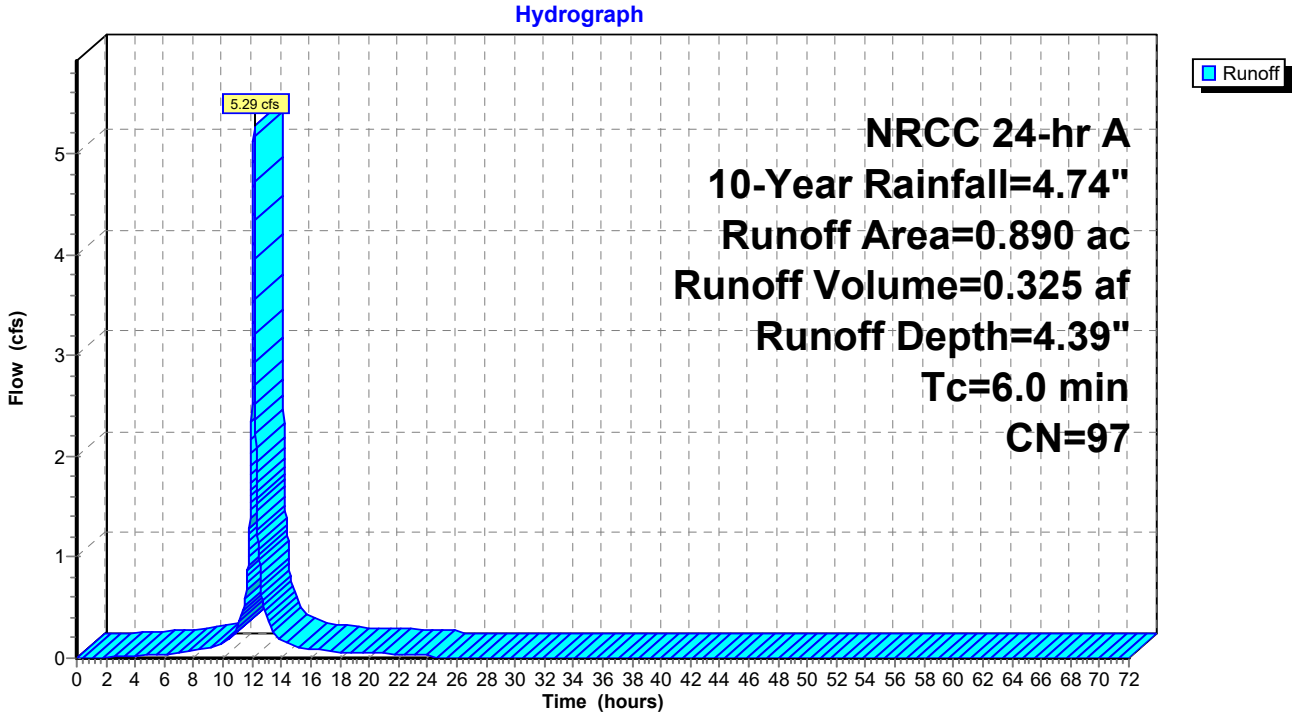
Runoff = 5.29 cfs @ 12.13 hrs, Volume= 0.325 af, Depth= 4.39"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.820	98	Paved parking, HSG A
0.070	80	>75% Grass cover, Good, HSG D
0.890	97	Weighted Average
0.070	80	7.87% Pervious Area
0.820	98	92.13% Impervious Area

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

Subcatchment 1S: PR-7



Summary for Subcatchment 2S: PR-6

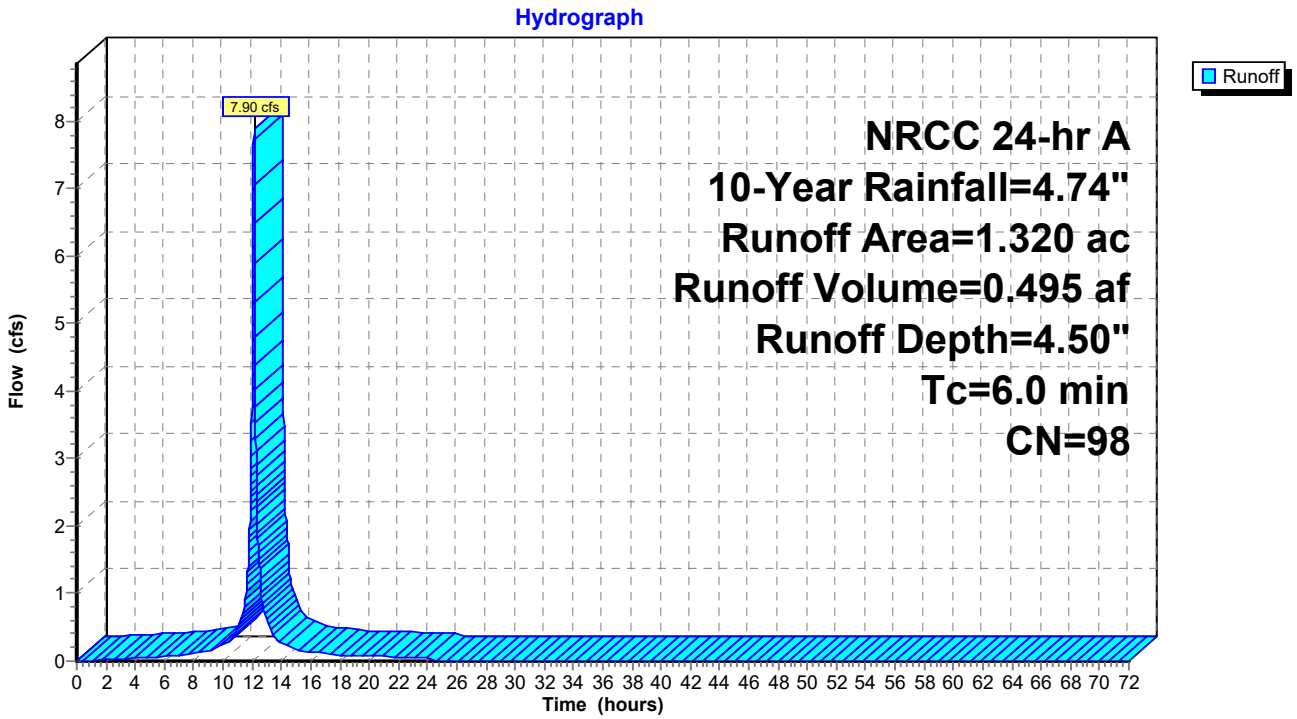
Runoff = 7.90 cfs @ 12.13 hrs, Volume= 0.495 af, Depth= 4.50"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
1.320	98	Unconnected roofs, HSG A
1.320	98	100.00% Impervious Area
1.320		100.00% Unconnected

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

Subcatchment 2S: PR-6



Summary for Subcatchment P1: PR-1

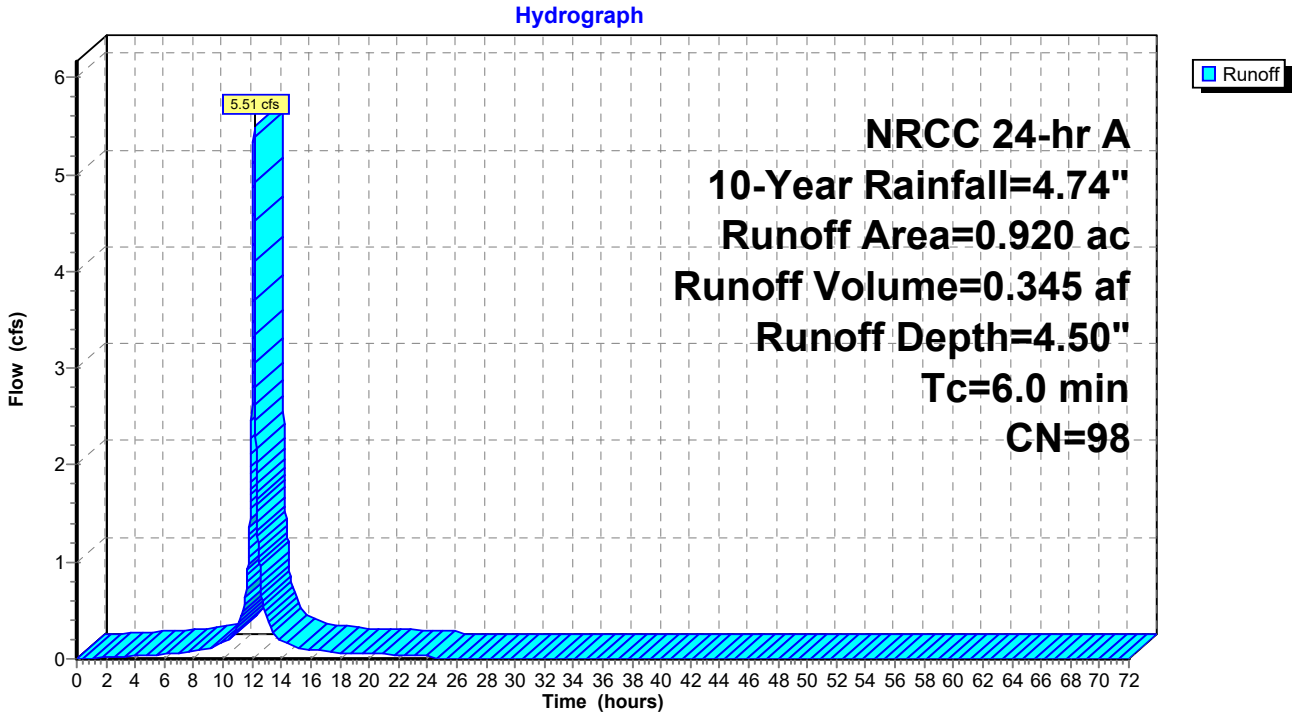
Runoff = 5.51 cfs @ 12.13 hrs, Volume= 0.345 af, Depth= 4.50"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.920	98	Roofs, HSG A
0.920	98	100.00% Impervious Area

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

Subcatchment P1: PR-1



Summary for Subcatchment P2: PR-2

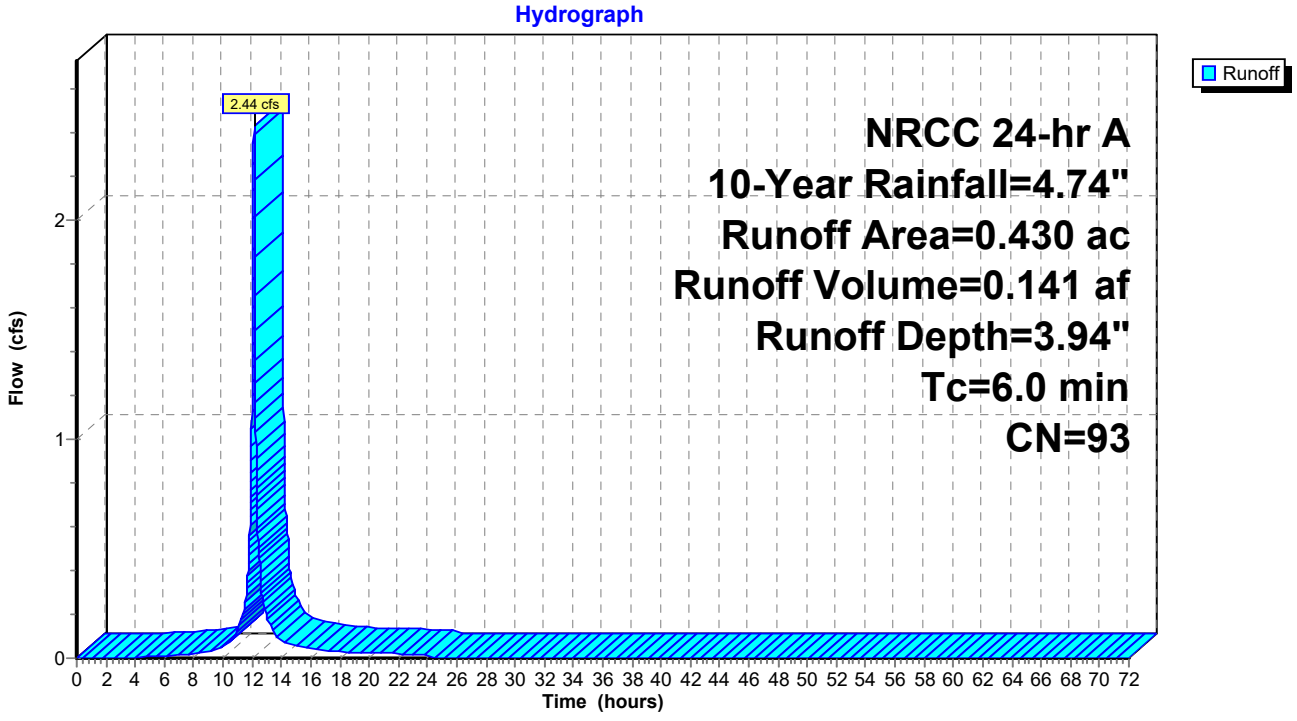
Runoff = 2.44 cfs @ 12.13 hrs, Volume= 0.141 af, Depth= 3.94"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.320	98	Paved parking, HSG D
0.110	80	>75% Grass cover, Good, HSG D
0.430	93	Weighted Average
0.110	80	25.58% Pervious Area
0.320	98	74.42% Impervious Area

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

Subcatchment P2: PR-2



Summary for Subcatchment P3: PR-4

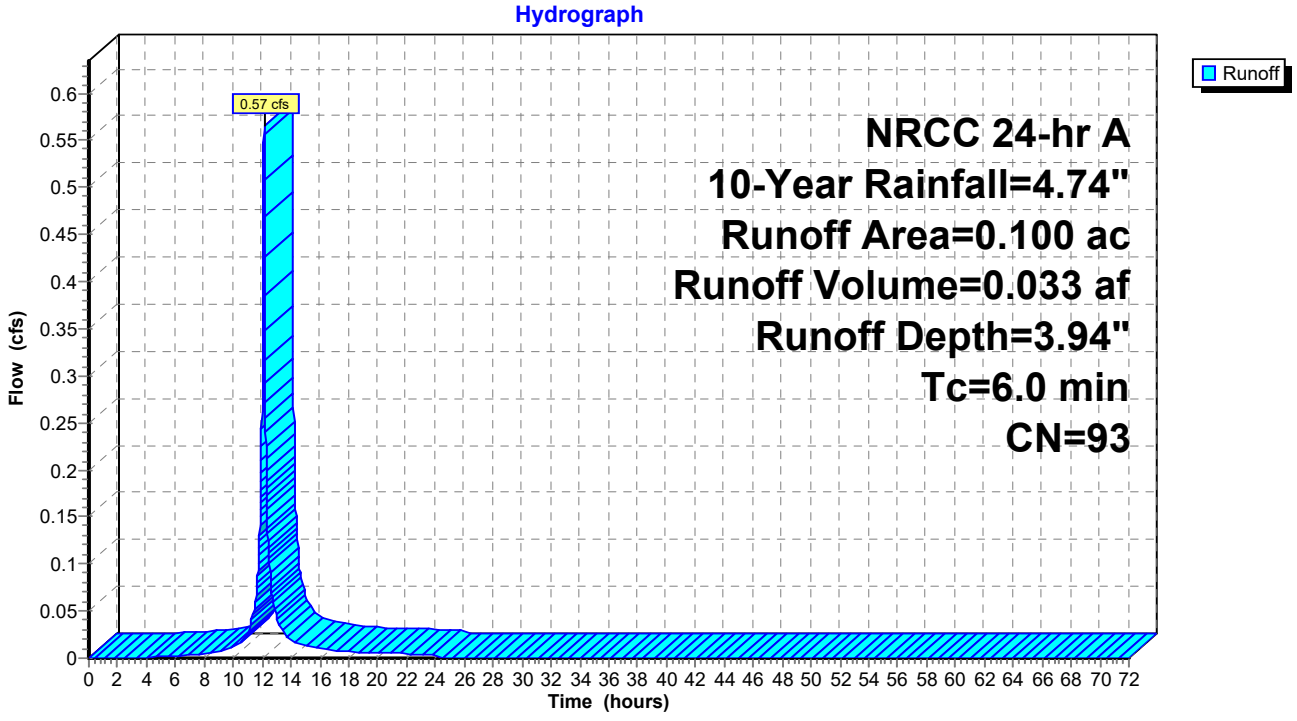
Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.033 af, Depth= 3.94"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.100	93	Weighted Average
0.030	80	30.00% Pervious Area
0.070	98	70.00% Impervious Area

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

Subcatchment P3: PR-4



Summary for Subcatchment P4: PR-5

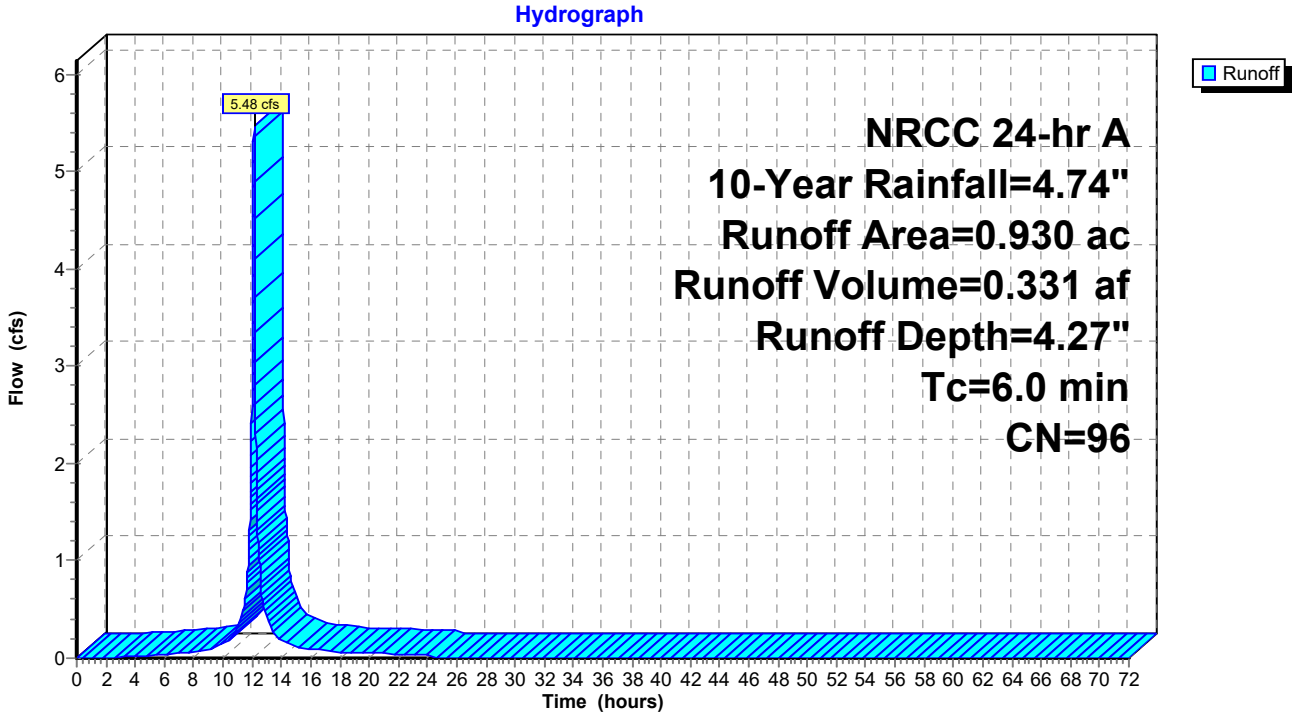
Runoff = 5.48 cfs @ 12.13 hrs, Volume= 0.331 af, Depth= 4.27"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.830	98	Paved parking, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.930	96	Weighted Average
0.100	80	10.75% Pervious Area
0.830	98	89.25% Impervious Area

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

Subcatchment P4: PR-5



Summary for Subcatchment P5: PR-8

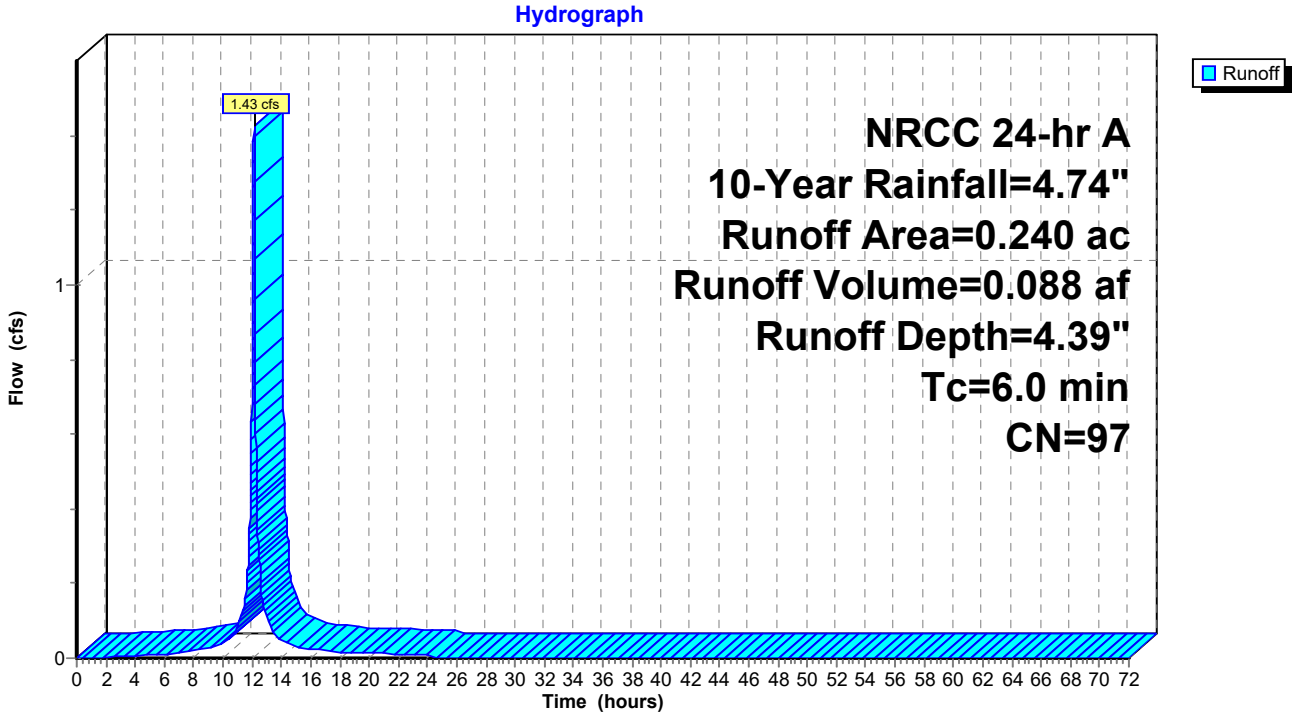
Runoff = 1.43 cfs @ 12.13 hrs, Volume= 0.088 af, Depth= 4.39"
Routed to Link 5L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.220	98	Paved parking, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.240	97	Weighted Average
0.020	80	8.33% Pervious Area
0.220	98	91.67% Impervious Area

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

Subcatchment P5: PR-8



Summary for Subcatchment P6: PR-3

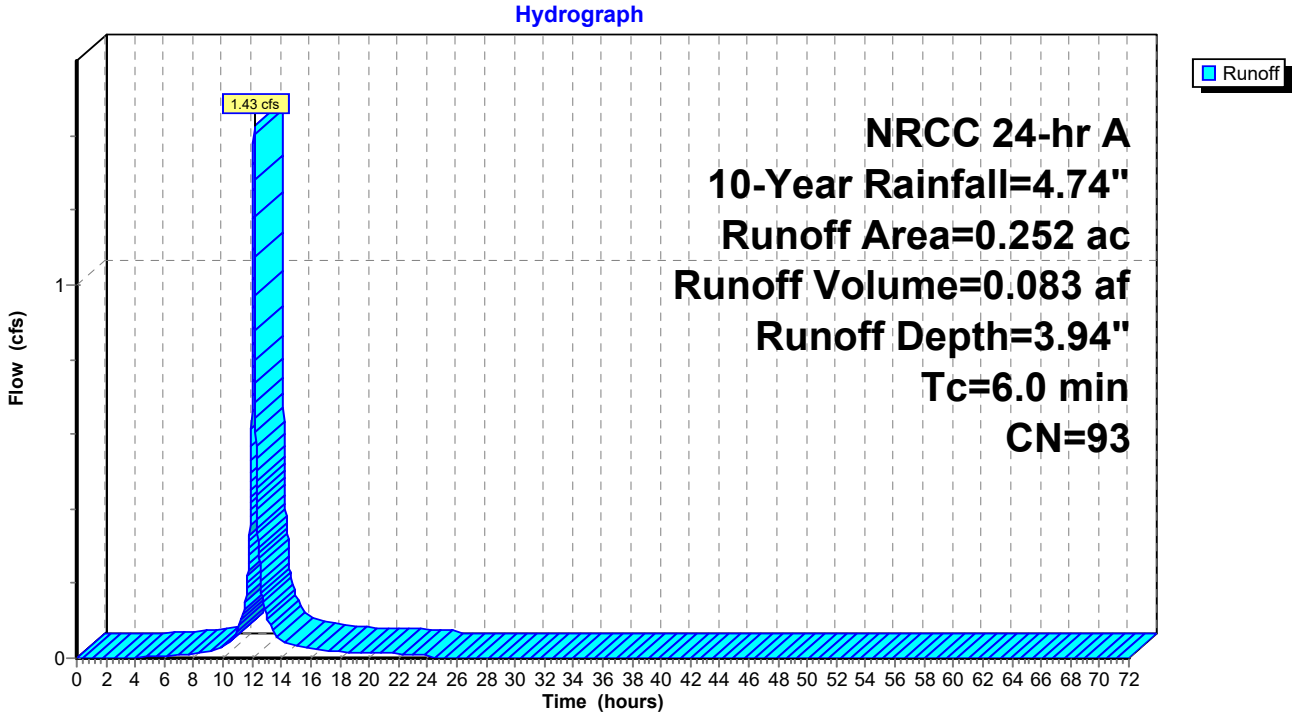
Runoff = 1.43 cfs @ 12.13 hrs, Volume= 0.083 af, Depth= 3.94"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 10-Year Rainfall=4.74"

Area (ac)	CN	Description
0.180	98	Paved parking, HSG D
0.072	80	>75% Grass cover, Good, HSG D
0.252	93	Weighted Average
0.072	80	28.57% Pervious Area
0.180	98	71.43% Impervious Area

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

Subcatchment P6: PR-3



Summary for Pond 1P: P-WQ1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=393)

Inflow Area = 1.350 ac, 91.85% Impervious, Inflow Depth = 4.32" for 10-Year event
Inflow = 7.94 cfs @ 12.13 hrs, Volume= 0.487 af
Outflow = 3.26 cfs @ 12.25 hrs, Volume= 0.487 af, Atten= 59%, Lag= 7.5 min
Discarded = 0.40 cfs @ 11.13 hrs, Volume= 0.297 af
Primary = 2.86 cfs @ 12.25 hrs, Volume= 0.190 af
Routed to Link 3L : Existing Drainage (Carlsbad)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 3L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 58.43' @ 12.25 hrs Surf.Area= 0.048 ac Storage= 0.129 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.8 min (782.2 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	54.50'	0.068 af	**22.75'W x 91.74'L x 5.50'H Field A** 0.264 af Overall - 0.093 af Embedded = 0.171 af x 40.0% Voids
#2A	55.25'	0.093 af	**ADS_StormTech MC-3500 d +Cap**x 36 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 36 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		0.161 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	55.90'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	59.00'	**12.0" Round Culvert** L= 33.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.67' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.40 cfs @ 11.13 hrs HW=54.56' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=2.86 cfs @ 12.25 hrs HW=58.43' TW=0.00' (Dynamic Tailwater)
2=Orifice/Grate (Orifice Controls 2.86 cfs @ 7.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=54.50' TW=0.00' (Dynamic Tailwater)
3=Culvert (Controls 0.00 cfs)

Pond 1P: P-WQ1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

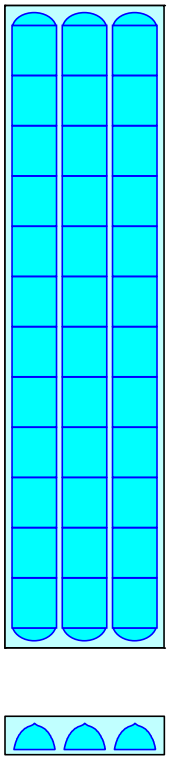
12 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 89.74' Row Length +12.0" End Stone x 2 = 91.74' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

36 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 4,047.7 cf Chamber Storage

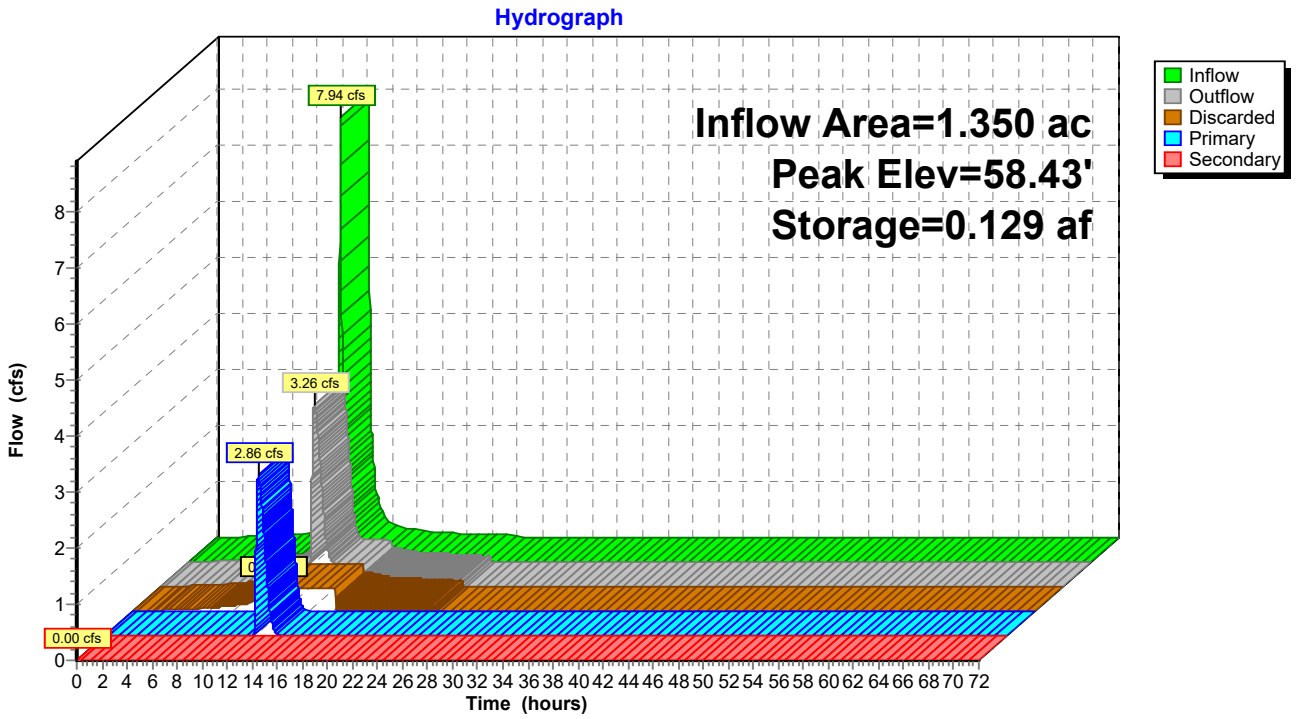
11,479.0 cf Field - 4,047.7 cf Chambers = 7,431.3 cf Stone x 40.0% Voids = 2,972.5 cf Stone Storage

Chamber Storage + Stone Storage = 7,020.2 cf = 0.161 af
Overall Storage Efficiency = 61.2%
Overall System Size = 91.74' x 22.75' x 5.50'

36 Chambers
425.1 cy Field
275.2 cy Stone



Pond 1P: P-WQ1


Hydrograph
Inflow Area=1.350 ac
Peak Elev=58.43'
Storage=0.129 af
7.94 cfs
3.26 cfs
2.86 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond 2P: P-WQ2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=406)

Inflow Area = 3.140 ac, 94.59% Impervious, Inflow Depth = 4.40" for 10-Year event
Inflow = 18.67 cfs @ 12.13 hrs, Volume= 1.152 af
Outflow = 8.16 cfs @ 12.24 hrs, Volume= 1.152 af, Atten= 56%, Lag= 6.9 min
Discarded = 0.96 cfs @ 11.13 hrs, Volume= 0.699 af
Primary = 7.20 cfs @ 12.24 hrs, Volume= 0.454 af
Routed to Link 5L : Existing Drainage (Burnham Ave)
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 5L : Existing Drainage (Burnham Ave)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 51.87' @ 12.24 hrs Surf.Area= 0.115 ac Storage= 0.293 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.1 min (777.3 - 754.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.25'	0.160 af	**37.08'W x 134.76'L x 5.50'H Field A** 0.631 af Overall - 0.231 af Embedded = 0.400 af x 40.0% Voids
#2A	49.00'	0.231 af	**ADS_StormTech MC-3500 d +Cap**x 90 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 90 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	52.50'	**18.0" Round Culvert** L= 225.0' Ke= 0.500 Inlet / Outlet Invert= 52.50' / 50.25' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Primary	49.50'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.96 cfs @ 11.13 hrs HW=48.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=7.20 cfs @ 12.24 hrs HW=51.87' TW=0.00' (Dynamic Tailwater)
3=Orifice/Grate (Orifice Controls 7.20 cfs @ 6.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.25' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 2P: P-WQ2 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

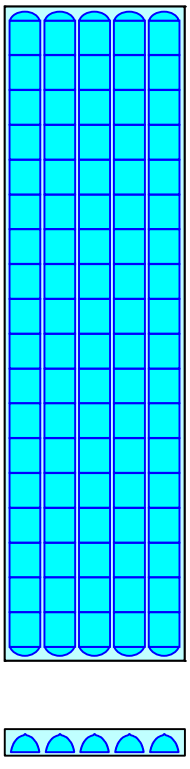
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

90 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 10,044.7 cf Chamber Storage

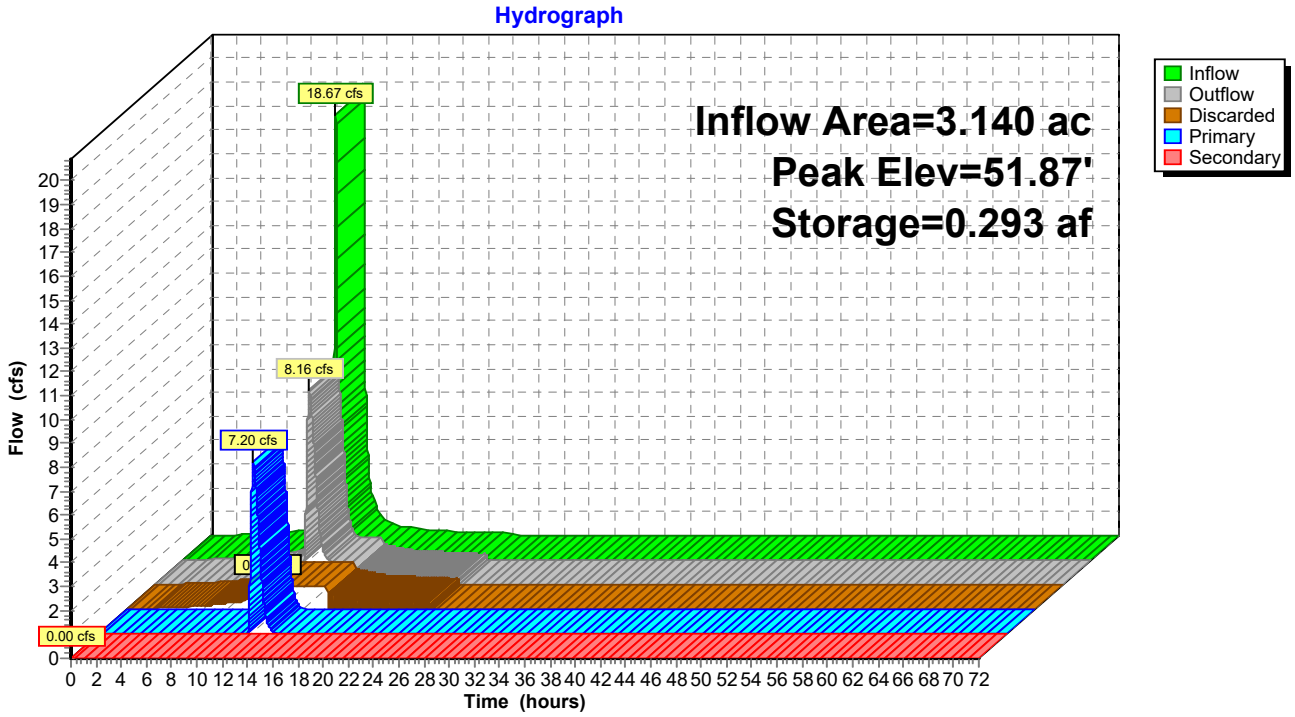
27,485.4 cf Field - 10,044.7 cf Chambers = 17,440.7 cf Stone x 40.0% Voids = 6,976.3 cf Stone Storage

Chamber Storage + Stone Storage = 17,021.0 cf = 0.391 af
Overall Storage Efficiency = 61.9%
Overall System Size = 134.76' x 37.08' x 5.50'

90 Chambers
1,018.0 cy Field
646.0 cy Stone



Pond 2P: P-WQ2

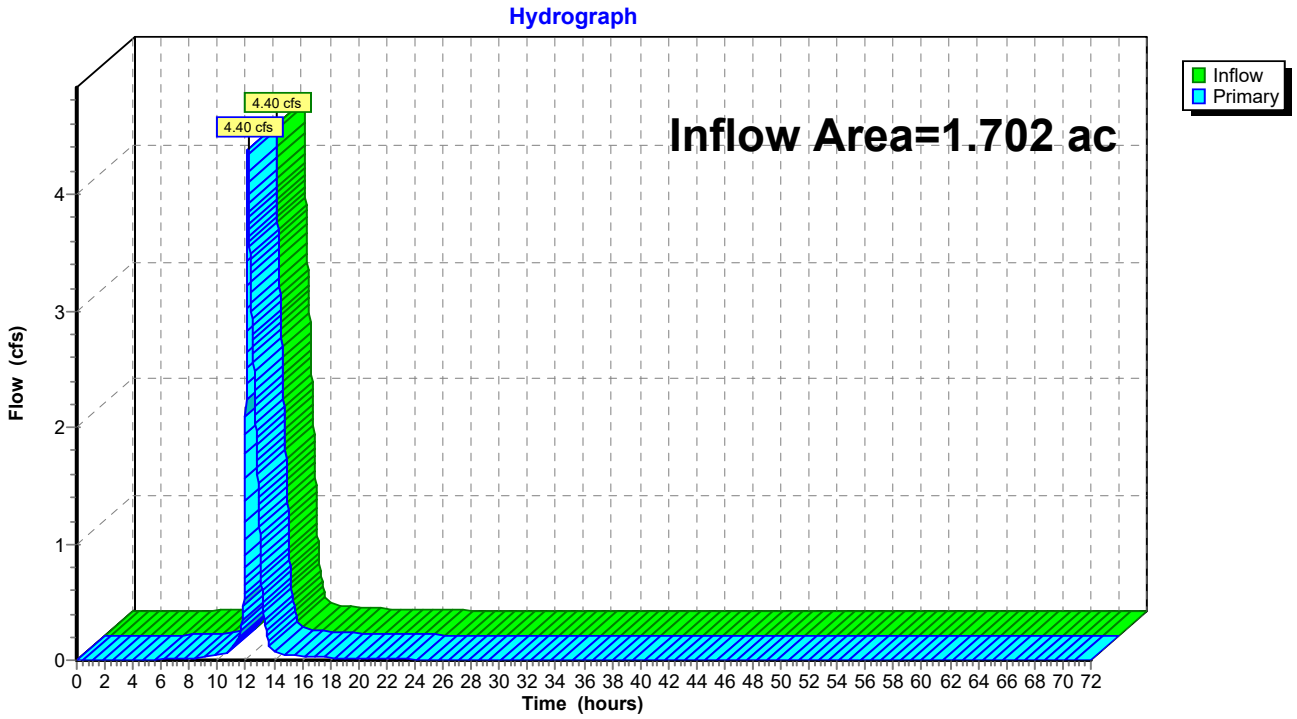

Hydrograph
Inflow Area=3.140 ac
Peak Elev=51.87'
Storage=0.293 af
18.67 cfs
8.16 cfs
7.20 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 3L: Existing Drainage (Carlsbad)

Inflow Area = 1.702 ac, 87.54% Impervious, Inflow Depth = 2.15" for 10-Year event
Inflow = 4.40 cfs @ 12.15 hrs, Volume= 0.305 af
Primary = 4.40 cfs @ 12.15 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3L: Existing Drainage (Carlsbad)

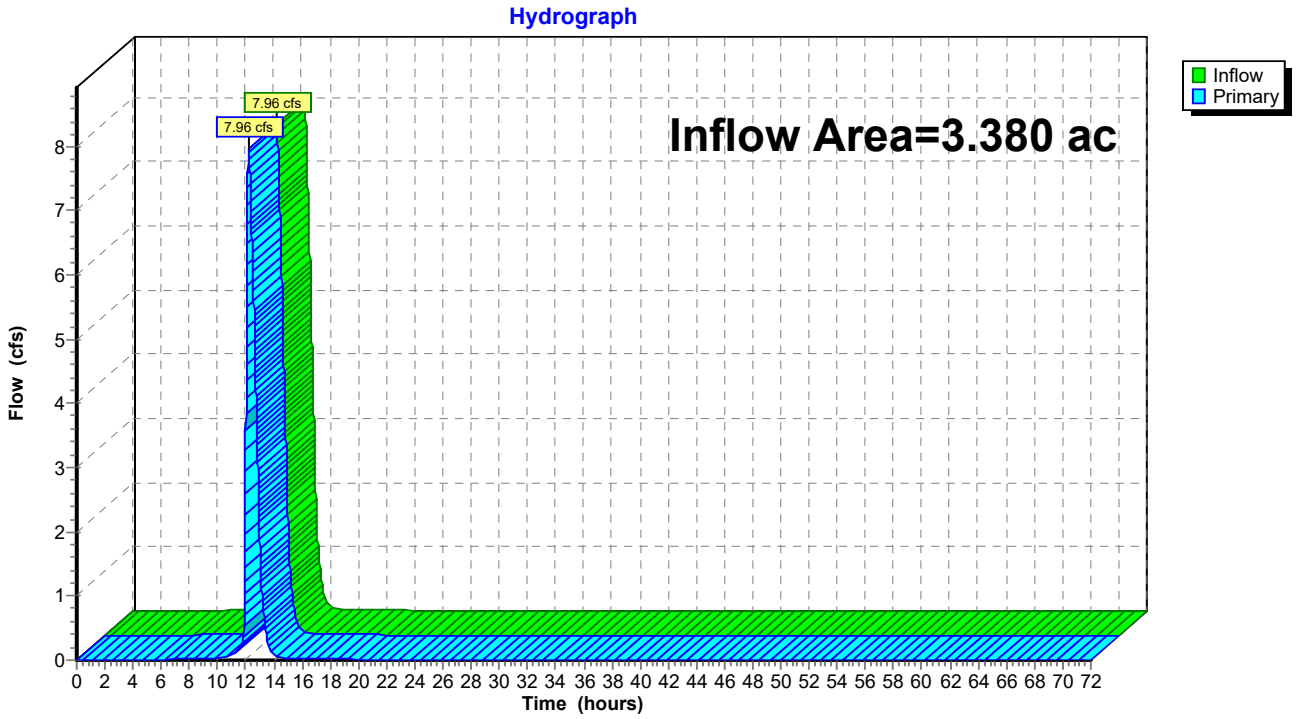


Summary for Link 5L: Existing Drainage (Burnham Ave)

Inflow Area = 3.380 ac, 94.38% Impervious, Inflow Depth = 1.92" for 10-Year event
Inflow = 7.96 cfs @ 12.19 hrs, Volume= 0.541 af
Primary = 7.96 cfs @ 12.19 hrs, Volume= 0.541 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 5L: Existing Drainage (Burnham Ave)



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: PR-7 Runoff Area=0.890 ac 92.13% Impervious Runoff Depth=5.57"
Tc=6.0 min CN=97 Runoff=6.65 cfs 0.413 af

Subcatchment2S: PR-6 Runoff Area=1.320 ac 100.00% Impervious Runoff Depth=5.69"
Tc=6.0 min CN=98 Runoff=9.91 cfs 0.626 af

SubcatchmentP1: PR-1 Runoff Area=0.920 ac 100.00% Impervious Runoff Depth=5.69"
Tc=6.0 min CN=98 Runoff=6.90 cfs 0.436 af

SubcatchmentP2: PR-2 Runoff Area=0.430 ac 74.42% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=93 Runoff=3.11 cfs 0.183 af

SubcatchmentP3: PR-4 Runoff Area=0.100 ac 70.00% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=93 Runoff=0.72 cfs 0.043 af

SubcatchmentP4: PR-5 Runoff Area=0.930 ac 89.25% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=96 Runoff=6.90 cfs 0.423 af

SubcatchmentP5: PR-8 Runoff Area=0.240 ac 91.67% Impervious Runoff Depth=5.57"
Tc=6.0 min CN=97 Runoff=1.79 cfs 0.111 af

SubcatchmentP6: PR-3 Runoff Area=0.252 ac 71.43% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=93 Runoff=1.82 cfs 0.107 af

Pond 1P: P-WQ1 Peak Elev=59.74' Storage=0.156 af Inflow=10.01 cfs 0.620 af
Discarded=0.40 cfs 0.344 af Primary=3.58 cfs 0.261 af Secondary=1.69 cfs 0.015 af Outflow=5.67 cfs 0.620 af

Pond 2P: P-WQ2 Peak Elev=53.12' Storage=0.362 af Inflow=23.46 cfs 1.463 af
Discarded=0.96 cfs 0.809 af Primary=9.14 cfs 0.638 af Secondary=1.83 cfs 0.015 af Outflow=11.93 cfs 1.463 af

Link 3L: Existing Drainage (Carlsbad) Inflow=6.82 cfs 0.426 af
Primary=6.82 cfs 0.426 af

Link 5L: Existing Drainage (Burnham Ave) Inflow=11.90 cfs 0.765 af
Primary=11.90 cfs 0.765 af

Total Runoff Area = 5.082 ac Runoff Volume = 2.344 af Average Runoff Depth = 5.53"
7.91% Pervious = 0.402 ac 92.09% Impervious = 4.680 ac

Summary for Subcatchment 1S: PR-7

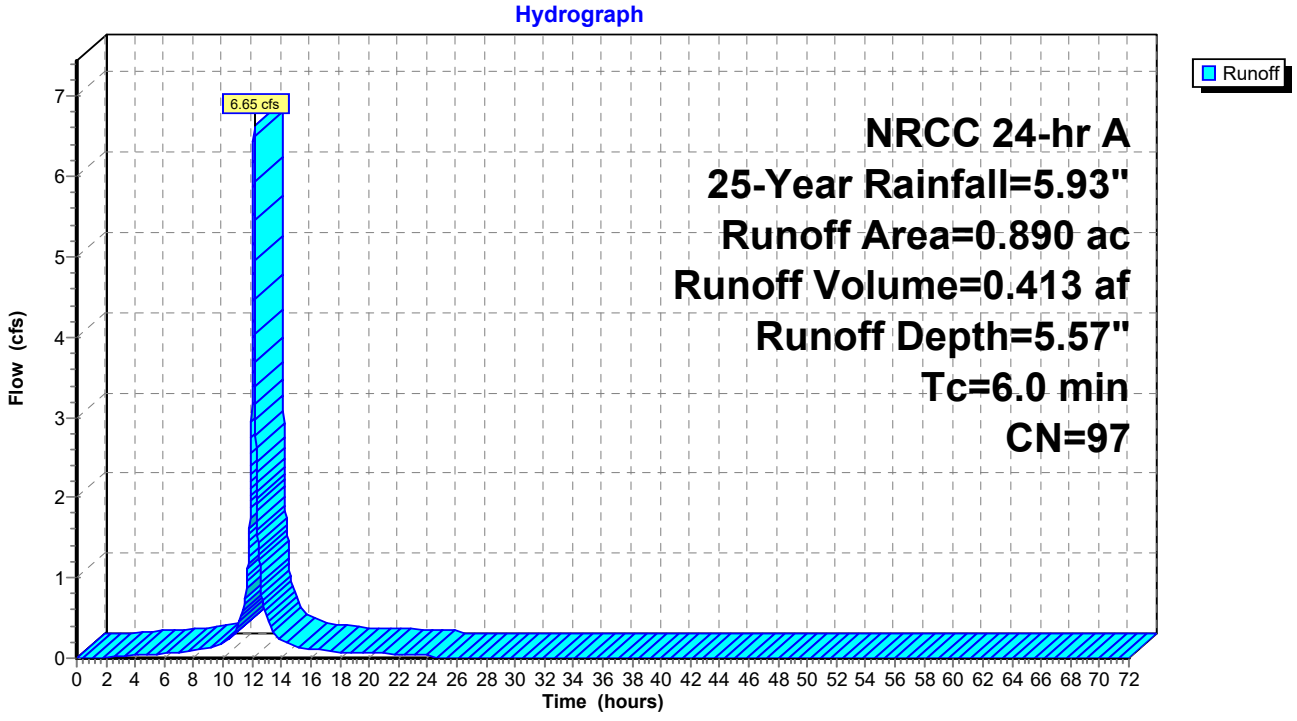
Runoff = 6.65 cfs @ 12.13 hrs, Volume= 0.413 af, Depth= 5.57"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.820	98	Paved parking, HSG A
0.070	80	>75% Grass cover, Good, HSG D
0.890	97	Weighted Average
0.070	80	7.87% Pervious Area
0.820	98	92.13% Impervious Area

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

Subcatchment 1S: PR-7



Summary for Subcatchment 2S: PR-6

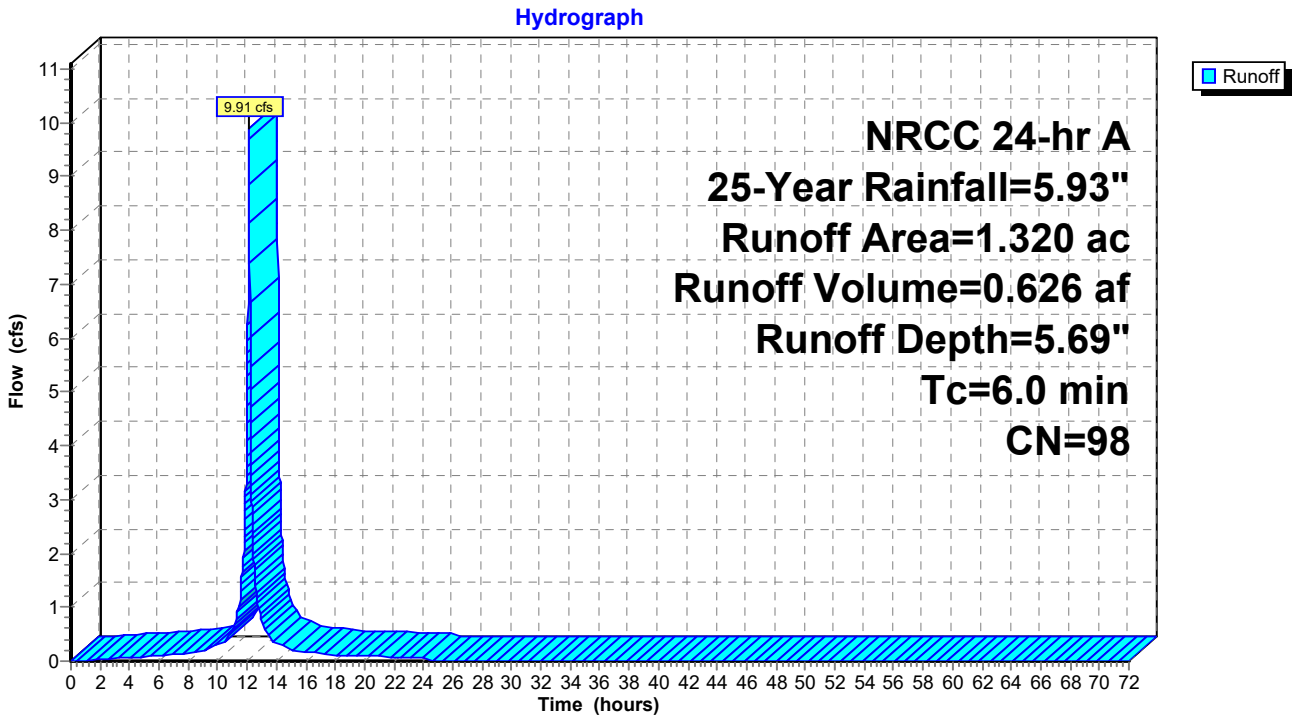
Runoff = 9.91 cfs @ 12.13 hrs, Volume= 0.626 af, Depth= 5.69"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
1.320	98	Unconnected roofs, HSG A
1.320	98	100.00% Impervious Area
1.320		100.00% Unconnected

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

Subcatchment 2S: PR-6



Summary for Subcatchment P1: PR-1

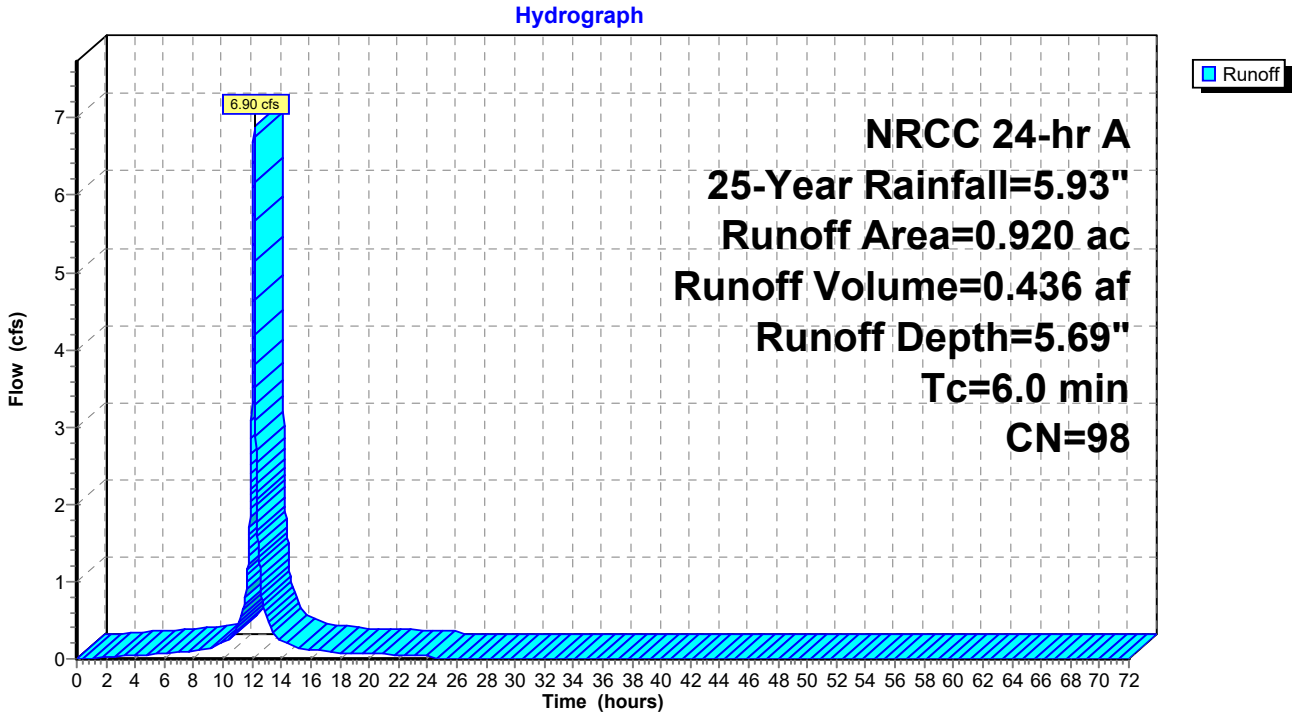
Runoff = 6.90 cfs @ 12.13 hrs, Volume= 0.436 af, Depth= 5.69"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.920	98	Roofs, HSG A
0.920	98	100.00% Impervious Area

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

Subcatchment P1: PR-1



Summary for Subcatchment P2: PR-2

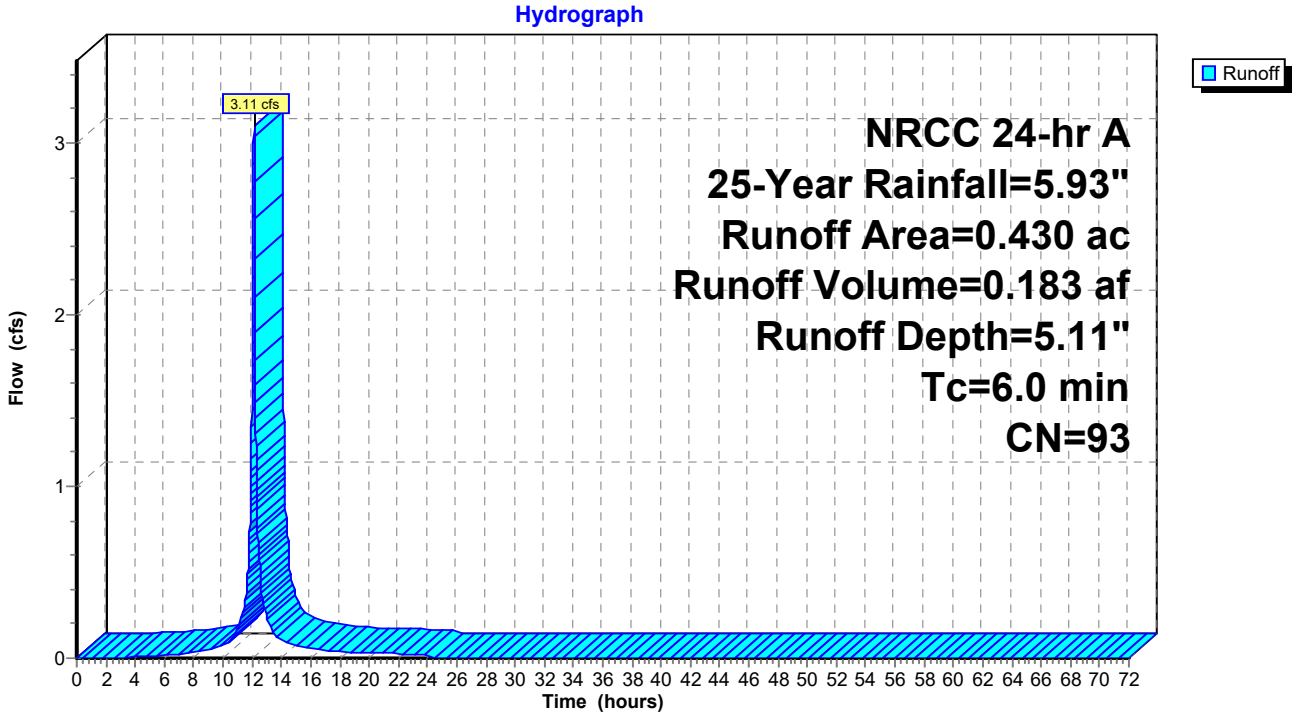
Runoff = 3.11 cfs @ 12.13 hrs, Volume= 0.183 af, Depth= 5.11"
Routed to Pond 1P : P-WQ1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.320	98	Paved parking, HSG D
0.110	80	>75% Grass cover, Good, HSG D
0.430	93	Weighted Average
0.110	80	25.58% Pervious Area
0.320	98	74.42% Impervious Area

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

Subcatchment P2: PR-2



Summary for Subcatchment P3: PR-4

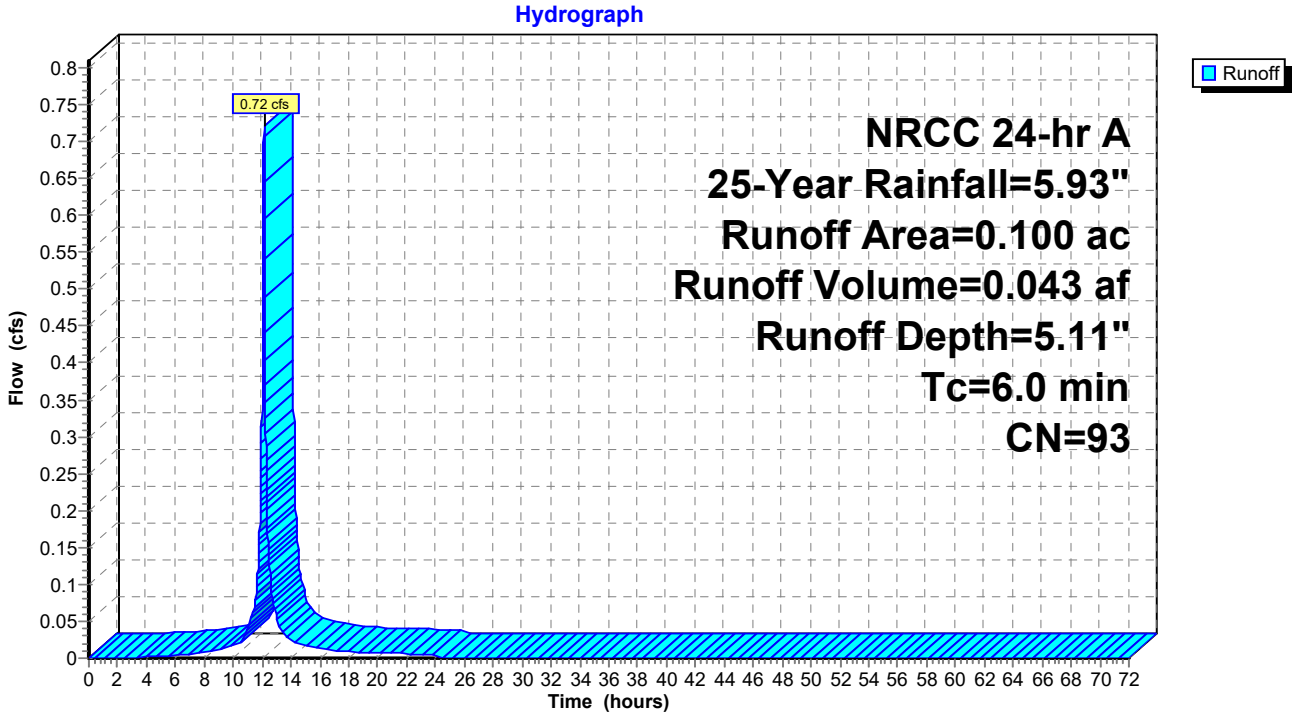
Runoff = 0.72 cfs @ 12.13 hrs, Volume= 0.043 af, Depth= 5.11"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.070	98	Paved parking, HSG D
0.030	80	>75% Grass cover, Good, HSG D
0.100	93	Weighted Average
0.030	80	30.00% Pervious Area
0.070	98	70.00% Impervious Area

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

Subcatchment P3: PR-4



Summary for Subcatchment P4: PR-5

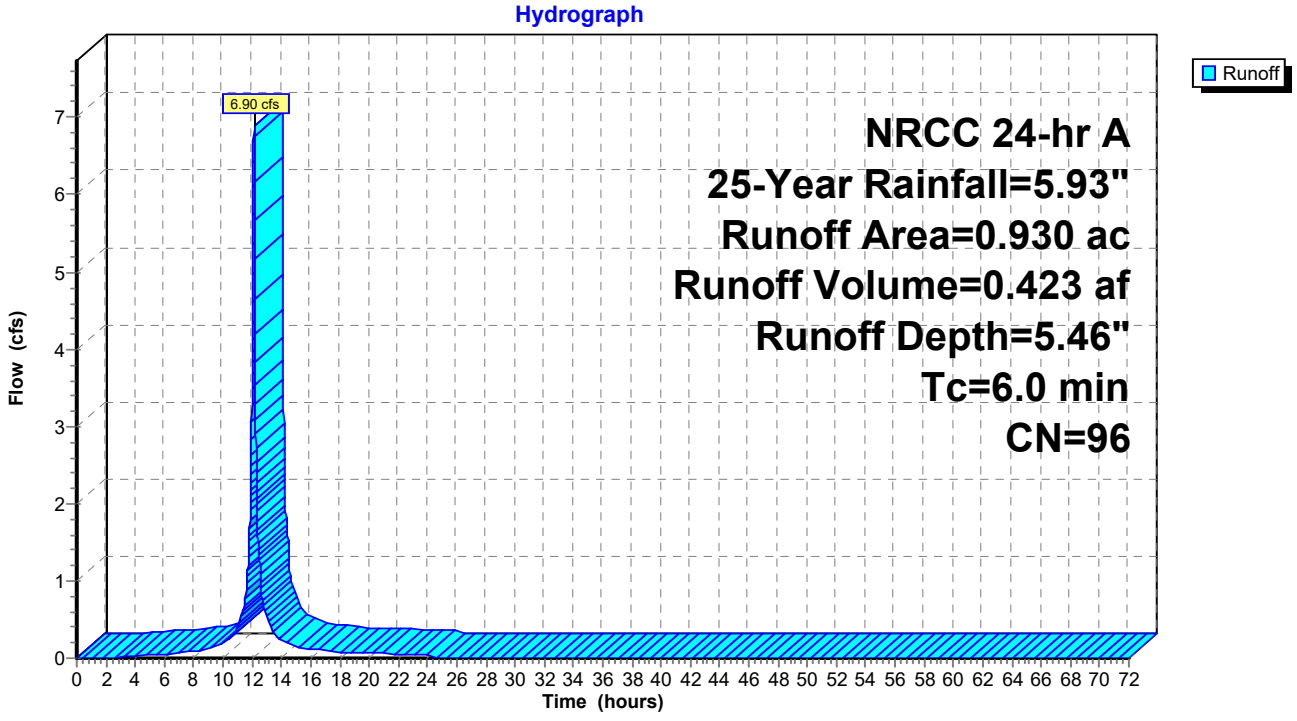
Runoff = 6.90 cfs @ 12.13 hrs, Volume= 0.423 af, Depth= 5.46"
Routed to Pond 2P : P-WQ2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.830	98	Paved parking, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.930	96	Weighted Average
0.100	80	10.75% Pervious Area
0.830	98	89.25% Impervious Area

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

Subcatchment P4: PR-5



Summary for Subcatchment P5: PR-8

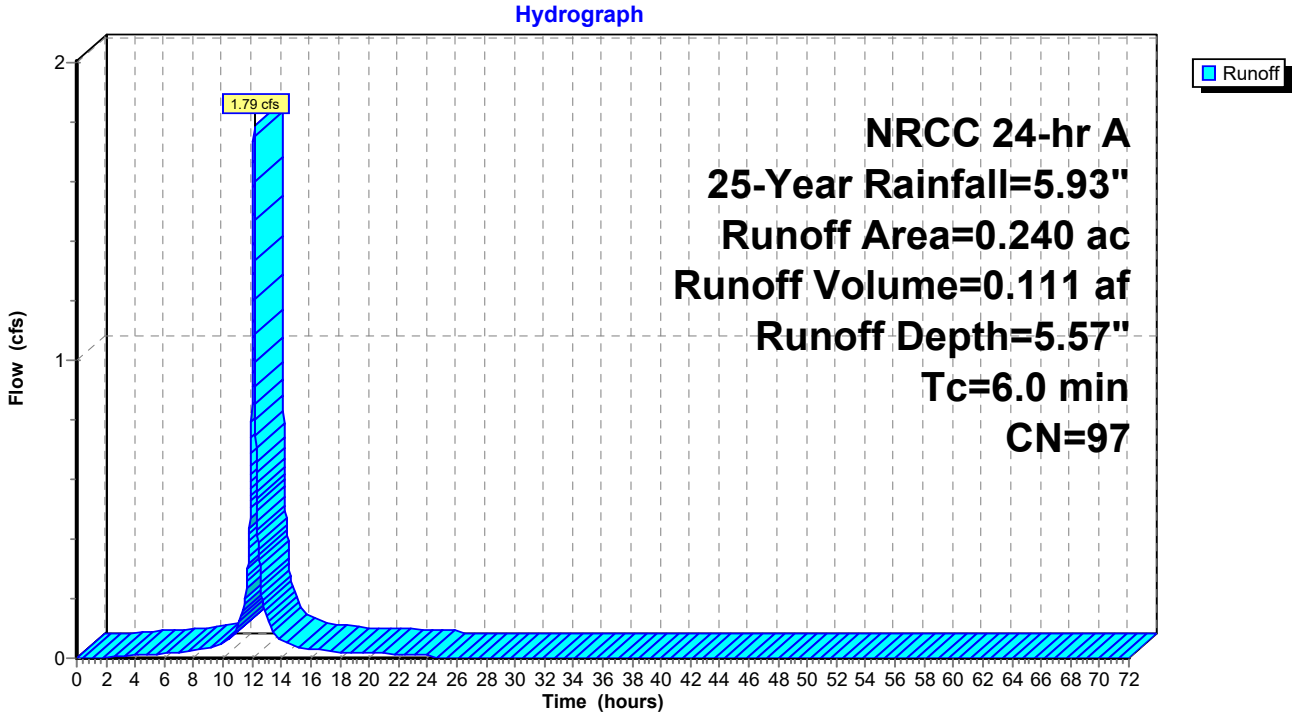
Runoff = 1.79 cfs @ 12.13 hrs, Volume= 0.111 af, Depth= 5.57"
Routed to Link 5L : Existing Drainage (Burnham Ave)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.220	98	Paved parking, HSG D
0.020	80	>75% Grass cover, Good, HSG D
0.240	97	Weighted Average
0.020	80	8.33% Pervious Area
0.220	98	91.67% Impervious Area

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

Subcatchment P5: PR-8



Summary for Subcatchment P6: PR-3

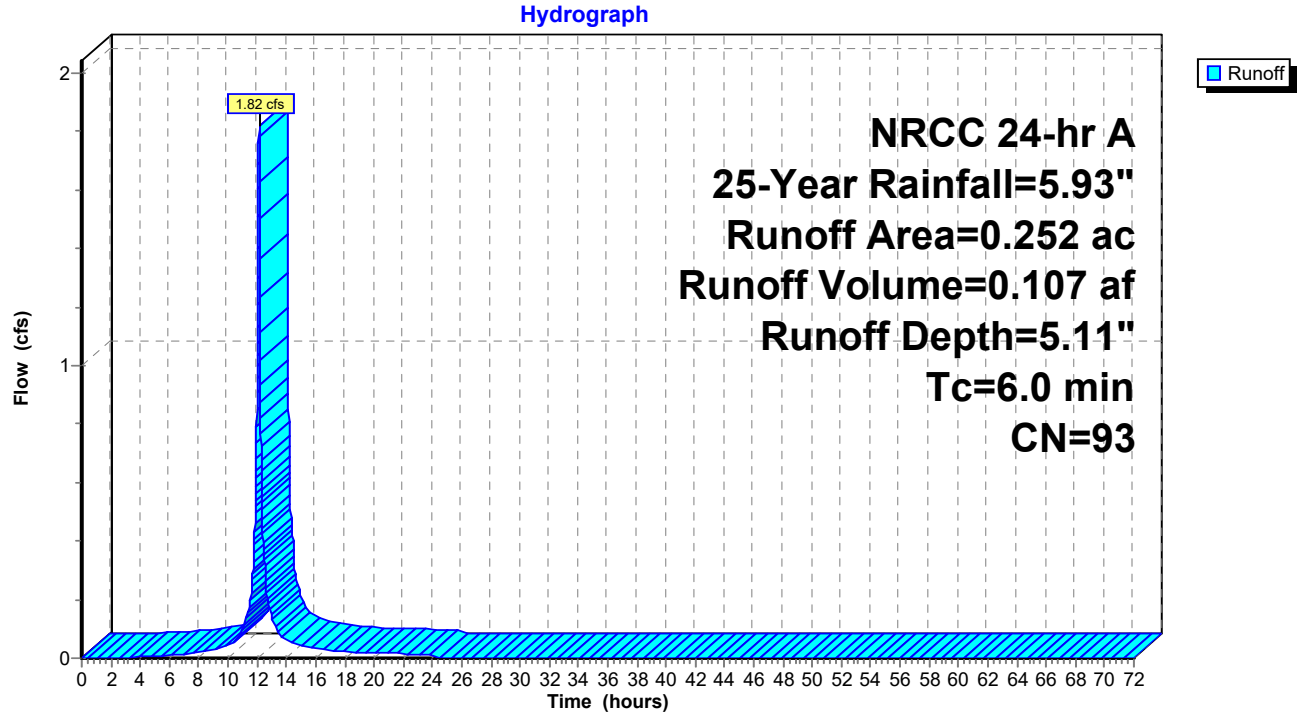
Runoff = 1.82 cfs @ 12.13 hrs, Volume= 0.107 af, Depth= 5.11"
Routed to Link 3L : Existing Drainage (Carlsbad)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr A 25-Year Rainfall=5.93"

Area (ac)	CN	Description
0.180	98	Paved parking, HSG D
0.072	80	>75% Grass cover, Good, HSG D
0.252	93	Weighted Average
0.072	80	28.57% Pervious Area
0.180	98	71.43% Impervious Area

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

Subcatchment P6: PR-3



Summary for Pond 1P: P-WQ1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=364)

Inflow Area = 1.350 ac, 91.85% Impervious, Inflow Depth = 5.51" for 25-Year event
Inflow = 10.01 cfs @ 12.13 hrs, Volume= 0.620 af
Outflow = 5.67 cfs @ 12.21 hrs, Volume= 0.620 af, Atten= 43%, Lag= 4.8 min
Discarded = 0.40 cfs @ 10.88 hrs, Volume= 0.344 af
Primary = 3.58 cfs @ 12.21 hrs, Volume= 0.261 af
Routed to Link 3L : Existing Drainage (Carlsbad)
Secondary = 1.69 cfs @ 12.21 hrs, Volume= 0.015 af
Routed to Link 3L : Existing Drainage (Carlsbad)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 59.74' @ 12.21 hrs Surf.Area= 0.048 ac Storage= 0.156 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.4 min (777.9 - 752.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	54.50'	0.068 af	**22.75'W x 91.74'L x 5.50'H Field A** 0.264 af Overall - 0.093 af Embedded = 0.171 af x 40.0% Voids
#2A	55.25'	0.093 af	**ADS_StormTech MC-3500 d +Cap**x 36 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 36 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
		0.161 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	55.90'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	59.00'	**12.0" Round Culvert** L= 33.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.67' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.40 cfs @ 10.88 hrs HW=54.56' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=3.58 cfs @ 12.21 hrs HW=59.74' TW=0.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Orifice Controls 3.58 cfs @ 9.12 fps)

Secondary OutFlow Max=1.68 cfs @ 12.21 hrs HW=59.74' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Barrel Controls 1.68 cfs @ 3.78 fps)

Pond 1P: P-WQ1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

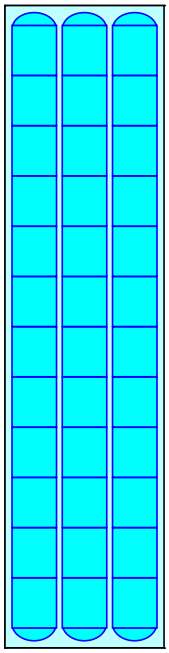
12 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 89.74' Row Length +12.0" End Stone x 2 = 91.74' Base Length
3 Rows x 77.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 22.75' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

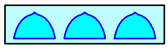
36 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 3 Rows = 4,047.7 cf Chamber Storage

11,479.0 cf Field - 4,047.7 cf Chambers = 7,431.3 cf Stone x 40.0% Voids = 2,972.5 cf Stone Storage

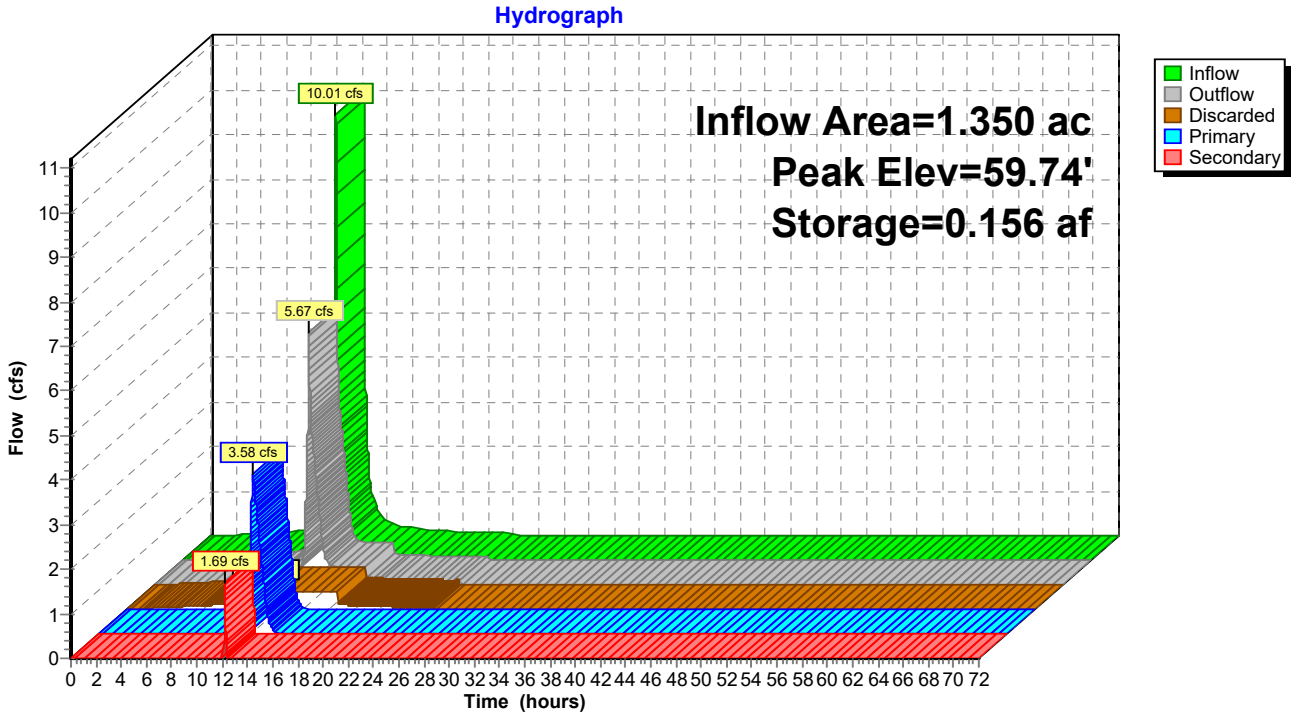
Chamber Storage + Stone Storage = 7,020.2 cf = 0.161 af
Overall Storage Efficiency = 61.2%
Overall System Size = 91.74' x 22.75' x 5.50'

36 Chambers
425.1 cy Field
275.2 cy Stone





Pond 1P: P-WQ1


Hydrograph
Inflow Area=1.350 ac
Peak Elev=59.74'
Storage=0.156 af
10.01 cfs
5.67 cfs
3.58 cfs
1.69 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond 2P: P-WQ2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=379)

Inflow Area = 3.140 ac, 94.59% Impervious, Inflow Depth = 5.59" for 25-Year event
Inflow = 23.46 cfs @ 12.13 hrs, Volume= 1.463 af
Outflow = 11.93 cfs @ 12.22 hrs, Volume= 1.463 af, Atten= 49%, Lag= 5.6 min
Discarded = 0.96 cfs @ 10.88 hrs, Volume= 0.809 af
Primary = 9.14 cfs @ 12.22 hrs, Volume= 0.638 af
Routed to Link 5L : Existing Drainage (Burnham Ave)
Secondary = 1.83 cfs @ 12.22 hrs, Volume= 0.015 af
Routed to Link 5L : Existing Drainage (Burnham Ave)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 53.12' @ 12.22 hrs Surf.Area= 0.115 ac Storage= 0.362 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.2 min (773.4 - 750.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.25'	0.160 af	**37.08'W x 134.76'L x 5.50'H Field A** 0.631 af Overall - 0.231 af Embedded = 0.400 af x 40.0% Voids
#2A	49.00'	0.231 af	**ADS_StormTech MC-3500 d +Cap**x 90 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 90 Chambers in 5 Rows Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	52.50'	**18.0" Round Culvert** L= 225.0' Ke= 0.500 Inlet / Outlet Invert= 52.50' / 50.25' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Primary	49.50'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.96 cfs @ 10.88 hrs HW=48.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=9.14 cfs @ 12.22 hrs HW=53.12' TW=0.00' (Dynamic Tailwater)
3=Orifice/Grate (Orifice Controls 9.14 cfs @ 8.72 fps)

Secondary OutFlow Max=1.83 cfs @ 12.22 hrs HW=53.12' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 1.83 cfs @ 2.67 fps)

Pond 2P: P-WQ2 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

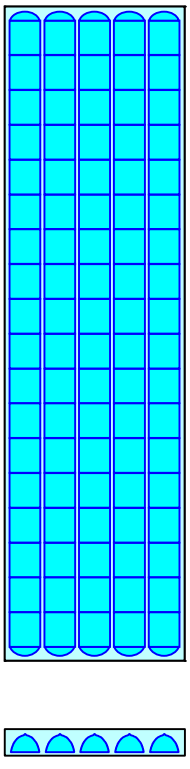
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

90 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 10,044.7 cf Chamber Storage

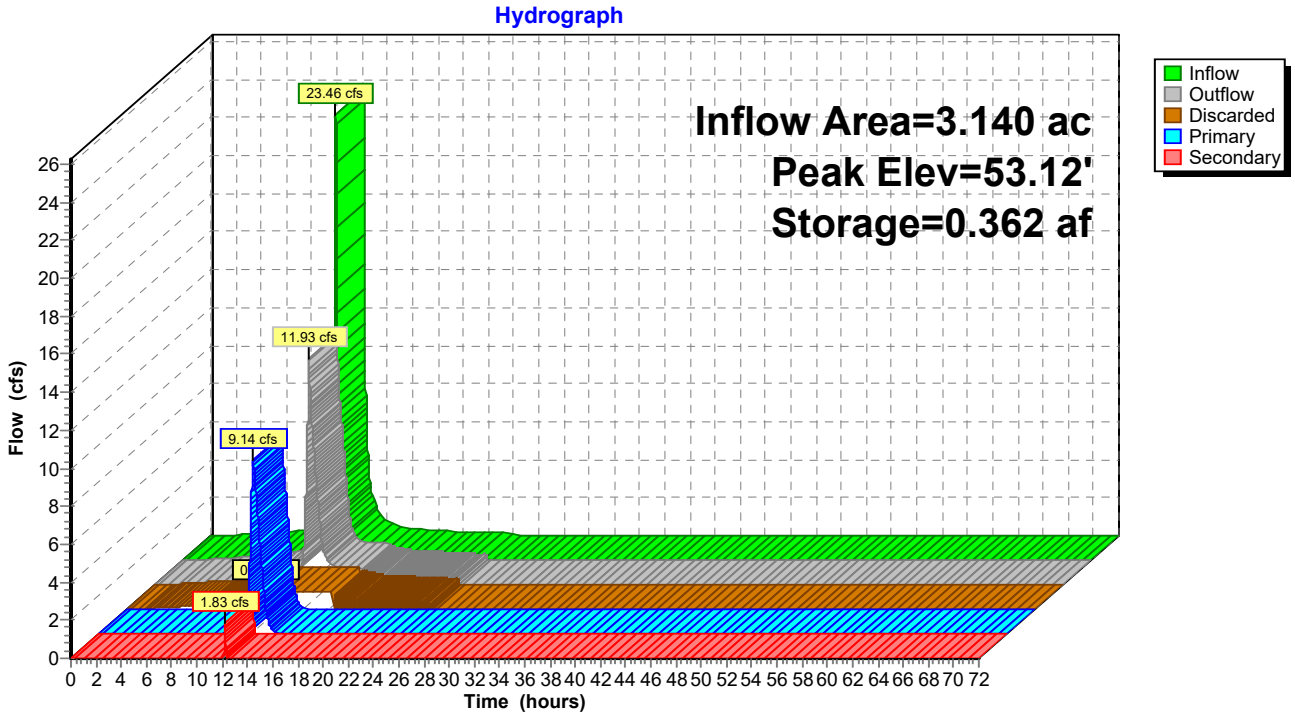
27,485.4 cf Field - 10,044.7 cf Chambers = 17,440.7 cf Stone x 40.0% Voids = 6,976.3 cf Stone Storage

Chamber Storage + Stone Storage = 17,021.0 cf = 0.391 af
Overall Storage Efficiency = 61.9%
Overall System Size = 134.76' x 37.08' x 5.50'

90 Chambers
1,018.0 cy Field
646.0 cy Stone



Pond 2P: P-WQ2

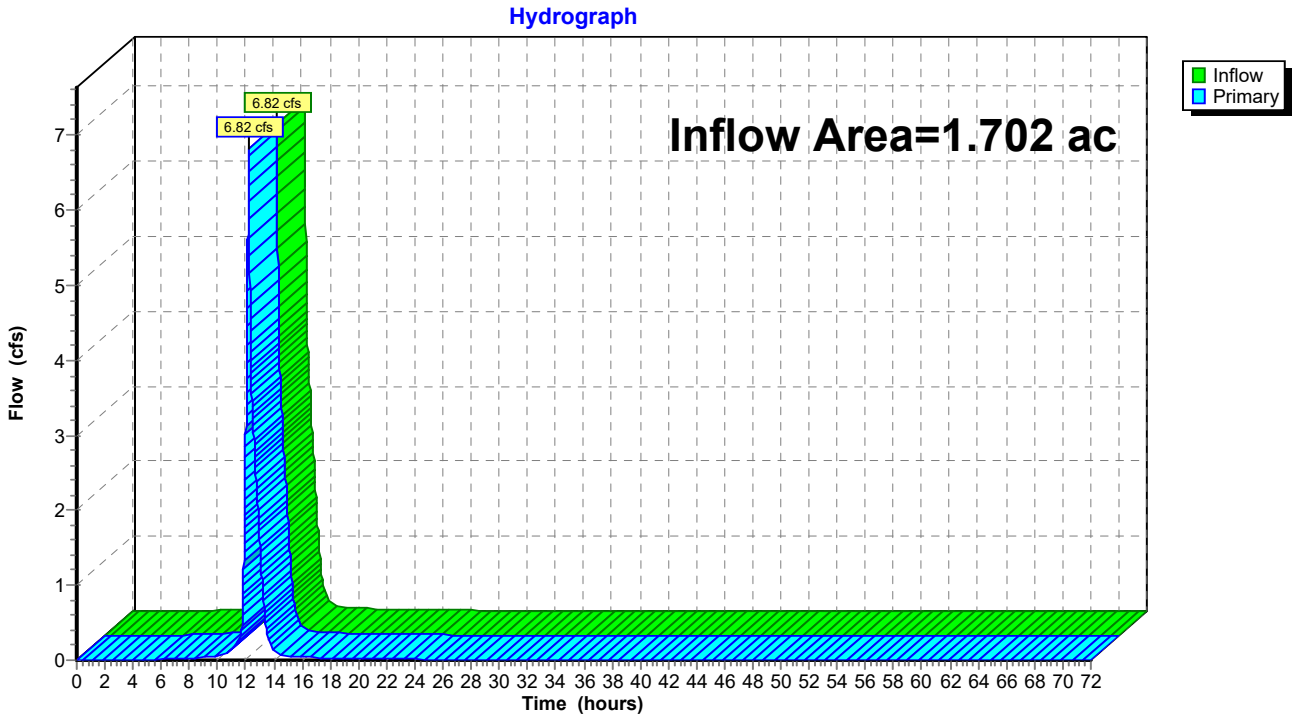

Hydrograph
Inflow Area=3.140 ac
Peak Elev=53.12'
Storage=0.362 af
23.46 cfs
11.93 cfs
9.14 cfs
1.83 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 3L: Existing Drainage (Carlsbad)

Inflow Area = 1.702 ac, 87.54% Impervious, Inflow Depth = 3.00" for 25-Year event
Inflow = 6.82 cfs @ 12.19 hrs, Volume= 0.426 af
Primary = 6.82 cfs @ 12.19 hrs, Volume= 0.426 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3L: Existing Drainage (Carlsbad)

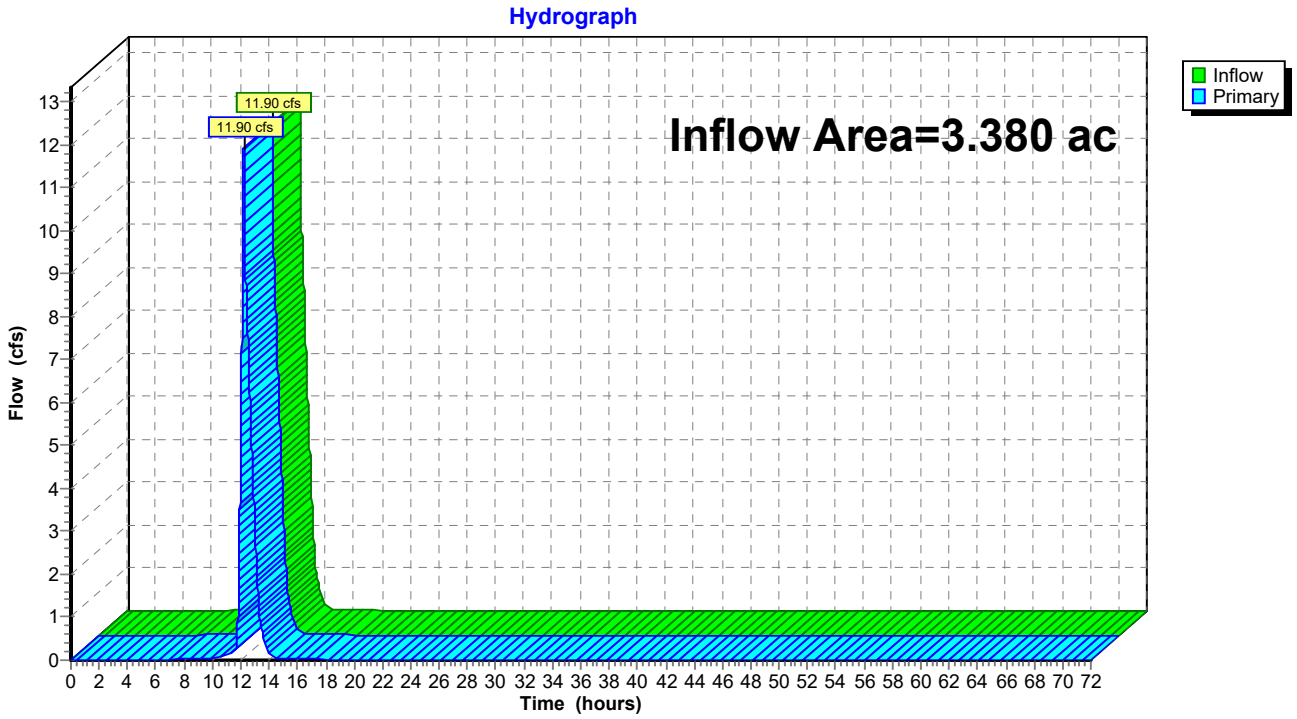


Summary for Link 5L: Existing Drainage (Burnham Ave)

Inflow Area = 3.380 ac, 94.38% Impervious, Inflow Depth = 2.72" for 25-Year event
Inflow = 11.90 cfs @ 12.21 hrs, Volume= 0.765 af
Primary = 11.90 cfs @ 12.21 hrs, Volume= 0.765 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 5L: Existing Drainage (Burnham Ave)



- **Land Use with Higher Potential For Pollutant Loading Certification Letter**

July 13, 2023

Permit Application Center (PAC)

Rhode Island Department of Environmental Management

235 Promenade Street

Providence, Rhode Island 02908-5767

To Whom it May Concern,

Please accept this letter as certification by Taco, Inc. that the proposed Taco Manufacturing and Warehouse Facility, to be located at 35 Carlsbad Street in Cranston, Rhode Island, will not include any Land Uses with Higher Potential Pollutant Loading (LUHPPLs), as defined by the Rhode Island Stormwater Design and Installation Standards Manual.

Sincerely,

Jon Giampietro

Executive Vice President Operation

Taco Comfort Solutions, Inc.

APPENDIX E: STORMWATER CALCULATIONS

- **Proposed Water Quality Volume Calculations**
- **Proposed Groundwater Recharge Calculations**
- **Spectacle Pond Total Phosphorus Calculations**
- **UNHSC Infiltration Trench Performance Curve**
- **Hydraflow Report**

Proposed Water Quality Volume Calculations

Woodard & Curran

33 Broad Street, 7th Floor
Providence, Rhode Island, 02903
Tel: 800.985.7897 Fax: 401.273.5087

CLIENT:	Taco Comfort Solutions, Inc.			
PROJECT:	New Industrial Manufacturing and Warehousing Facility for Taco Comfort Solutions, Inc.			
DESIGNED BY:	GRB		DATE:	7/25/2023
CHECKED BY:	KM		DATE:	7/26/2023
PROJECT NO.	234511.00	SHEET NO.	1	

Standard #3: Water Quality Volume Calculations

TREATMENT AREA REQUIREMENTS

		Area (SF)	Area (ac)	% Required to Treat	Required Treatment Area (SF)
New Impervious (Proposed - Existing Impervious)		78762.35	1.81 AC	100%	78762.35
Previously Treated Impervious (EX-1 - Ex-1 Impervious)		27060	0.62 AC	100%	27060
Disturbed & Previously Untreated Impervious (EX-2 + EX-3 Impervious)		93997.3	2.16 AC	50%	46998.65
Total Required Impervious Treatment Area	Site-Wide	-	-	-	152821
Total Provided Impervious Treatment Area	North Chambers	53939.2	1.24 AC	100%	188140.2
	South Chambers	134201	3.08 AC	100%	

WQV_R =	15282.1	Cubic Feet
WQV_P =	18814.02	Cubic Feet

$WQV_P \geq WQV_R$, Therefore Standard 3 has been met

Proposed Groundwater Recharge Calculations

Woodard & Curran

33 Broad Street, 7th Floor
Providence, Rhode Island, 02903
Tel: 800.985.7897 Fax: 401.273.5087

CLIENT:	Taco Comfort Solutions, Inc.			
PROJECT:	New Industrial Manufacturing and Warehousing Facility for Taco Comfort Solutions, Inc.			
DESIGNED BY:	GRB		DATE:	7/25/2023
CHECKED BY:	KM		DATE:	7/26/2023
PROJECT NO.	234511.00	SHEET NO.	1	

Standard #2: Groundwater Volume Calculations

ReV = (1")(F)(I)/12

Recharge Factor	Impervious Area (ac)	Required Re_V (ac-ft)	Provided Re_V (ac-ft)	Provided Re_V (cu ft)
0.6	4.65	0.233	0.335	14593

Required Re_V =	**0.2325**	**Acre-Feet**
Proposed Re_V =	**0.335**	**Acre-Feet**

Provided Re_V ≥ Required Re_V, Therefore Standard 2 has been met

Spectacle Pond Total Phosphorus Calculations

Woodard & Curran

33 Broad Street, 7th Floor
Providence, Rhode Island, 02903
Tel: 800.985.7897 Fax: 401.273.5087

CLIENT:	Taco Comfort Solutions, Inc.		
PROJECT:	New Industrial Manufacturing and Warehousing Facility For Taco Comfort Solutions, Inc.		
DESIGNED BY:	GRB	DATE:	7/25/2023
CHECKED BY:	KM	DATE:	7/26/2023
PROJECT NO.	234511.00	SHEET NO.	1

Spectacle Pond Existing Pollutant Loading Calculations

Watershed EX-1, EX-2 and EX-3	
Watershed Area	**5.05 AC**
Pervious	**2.25 AC**
Impervious	**2.80 AC**

Pollutant of Concern		TP
Rainfall Depth (in/year)	**P**	49
Rainfall Correction Factor	**Pj**	0.9
Runoff Coefficient (Rv=0.05+0.009*I%)	**Rv**	0.55
Mean Concentration of the Pollutant (Commercial) (mg/L)	**C**	0.2
Contributing Drainage Area (ac)	**A**	5.05
Pollutant Export Load (lbs/year)	**L**	**5.54**

UNHSC Infiltration Trench Performance Curve

Woodard & Curran

33 Broad Street, 7th Floor
Providence, Rhode Island, 02903
Tel: 800.985.7897 Fax: 401.273.5087

CLIENT:	Taco Comfort Solutions, Inc.		
PROJECT:	New Industrial Manufacturing and Warehousing Facility for Taco Comfort Solutions, Inc.		
DESIGNED BY:	GRB	DATE:	7/25/2023
CHECKED BY:	KM	DATE:	7/26/2023
PROJECT NO.	234511.00	SHEET NO.	1

WATER QUALITY GOAL 1: TREATMENT AREA REQUIREMENTS

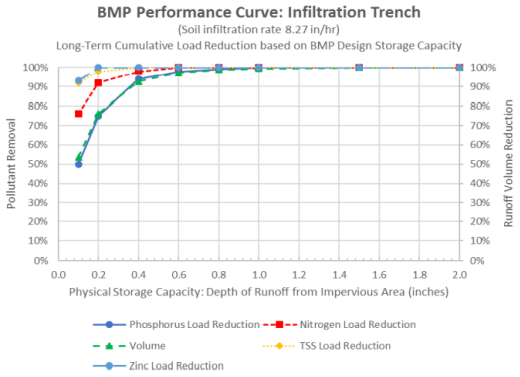
		Area (SF)	Area (ac)	% Required to Treat	Required Treatment Area (SF)
New Impervious (Proposed - Existing Impervious)		78,762	1.81	100%	78,762
Previously Treated Impervious		27,060	0.62	100%	27,060
Disturbed Impervious		93,997	2.16	50%	46,999
Total Required Impervious Treatment Area	**Site-Wide**	-	-	-	**152,821**
Total Provided Impervious Treatment Area	**Infiltration Chambers**	188,140	4.32	100%	**188,140**

Total proposed impervious treatment area > total required impervious treatment area; therefore, this water quality goal has been met.

WATER QUALITY GOAL 2: POLLUTANT REMOVAL REQUIREMENTS

Per Section 3.2.3 of the RISDISM, structural BMPs are required to achieve the following minimum average pollutant removal efficiencies: 85% removal of TSS, 60% removal of pathogens, 30% removal of TP for discharges to freshwater systems, and 30% removal of TN for discharges to saltwater/tidal systems.

Using subsurface infiltration chambers, the following reduction efficiencies are achievable: 100% TSS, 90% bacteria (RISDISM), 100% TP, and 100% TN using UNHSC BMP Performance Data. These exceed the requirements.



Infiltration Rate (in/hr)	Depth of Runoff from Impervious Area (inches)	Cumulative Load Reduction				
		TSS	Phosphorus	Nitrogen	Zinc	Runoff Volume
1.02	0.1	44%	27%	61%	72%	26%
	0.2	70%	47%	78%	94%	45%
	0.4	93%	73%	92%	99%	68%
	0.6	99%	86%	97%	100%	81%
	0.8	100%	92%	98%	100%	88%
	1.0	100%	96%	99%	100%	92%
	1.5	100%	99%	100%	100%	97%
	2.0	100%	100%	100%	100%	98%
2.41	0.1	50%	33%	65%	81%	34%
	0.2	77%	55%	83%	98%	55%
	0.4	97%	81%	95%	100%	78%
	0.6	100%	91%	98%	100%	88%
	0.8	100%	96%	99%	100%	93%
	1.0	100%	98%	100%	100%	96%
	1.5	100%	100%	100%	100%	99%
	2.0	100%	100%	100%	100%	100%
8.27	0.1	92%	50%	76%	93%	54%
	0.2	98%	75%	92%	100%	76%
	0.4	100%	94%	98%	100%	93%
	0.6	100%	98%	100%	100%	97%
	0.8	100%	99%	100%	100%	99%
	1.0	100%	100%	100%	100%	100%
	1.5	100%	100%	100%	100%	100%
	2.0	100%	100%	100%	100%	100%

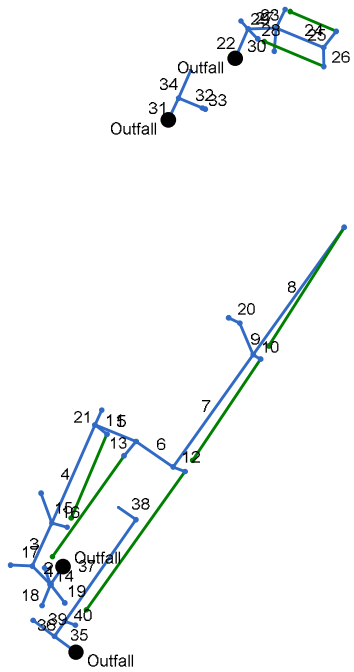
WATER QUALITY GOAL 3: REQUIRED WATER QUALITY VOLUME (WQV_R)

WQV_R = Water quality volume required = 1.2-inch * Treatment Area — 15,282 CF

WQV_P = 18,814 CF

Hydraflow Report

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



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	32.000	125.001	MH	0.00	0.00	0.00	0.0	50.00	1.00	50.32	24	Cir	0.012	1.00	56.25	Pipe - (11)
2	1	38.000	100.323	MH	0.00	0.00	0.00	0.0	50.32	1.00	50.70	24	Cir	0.012	0.94	56.68	Pipe - (12)
3	2	69.621	68.882	MH	0.00	0.00	0.00	0.0	50.70	1.01	51.40	24	Cir	0.012	0.99	57.95	Pipe - (13)
4	3	157.466	-0.546	MH	0.00	0.00	0.00	0.0	51.40	1.00	52.97	24	Cir	0.012	1.00	63.70	Pipe - (14)
5	4	65.030	88.205	MH	0.00	0.00	0.00	0.0	52.98	0.98	53.62	24	Cir	0.012	1.00	63.10	Pipe - (15)
6	5	66.000	12.842	MH	0.00	0.00	0.00	0.0	53.62	1.02	54.29	24	Cir	0.012	1.00	57.85	Pipe - (16)
7	6	202.846	-89.314	MH	0.00	0.00	0.00	0.0	54.79	1.00	56.82	18	Cir	0.012	1.00	61.20	Pipe - (17)
8	7	230.000	0.041	Grate	0.00	0.28	0.94	6.0	57.32	1.00	59.62	12	Cir	0.012	1.00	63.50	Pipe - (18)
9	7	50.445	-58.453	Grate	0.00	0.27	0.98	6.0	56.82	0.99	57.32	18	Cir	0.012	1.07	61.72	Pipe - (19)
10	7	12.616	86.281	Grate	0.00	0.17	0.98	6.0	57.32	1.03	57.45	12	Cir	0.012	1.00	61.06	Pipe - (46)
11	4	22.355	103.828	Grate	0.00	0.06	0.98	6.0	56.75	1.07	56.99	12	Cir	0.012	1.00	63.40	Pipe - (22)
12	6	18.835	-13.721	Grate	0.00	0.17	0.98	6.0	54.29	1.01	54.48	12	Cir	0.012	1.00	57.57	Pipe - (20)
13	5	27.463	108.073	Grate	0.00	0.04	0.98	6.0	54.62	1.02	54.90	12	Cir	0.012	1.00	62.25	Pipe - (21)
14	1	25.934	124.839	Grate	0.00	0.24	0.92	6.0	53.75	1.04	54.02	12	Cir	0.012	1.00	56.30	Pipe - (32)
15	3	46.583	-44.064	Grate	0.00	0.12	0.96	6.0	52.40	1.01	52.87	12	Cir	0.012	1.00	58.80	Pipe - (34)
16	3	23.489	81.545	Grate	0.00	0.11	0.98	6.0	52.40	1.06	52.65	12	Cir	0.012	1.00	57.75	Pipe - (23)
17	2	32.089	-42.824	Grate	0.00	0.06	0.98	6.0	51.70	1.06	52.04	12	Cir	0.012	1.00	56.50	Pipe - (24)
18	1	33.629	-13.232	Grate	0.00	0.10	0.98	6.0	51.32	1.04	51.67	12	Cir	0.012	1.00	55.80	Pipe - (25)
19	1	34.305	-72.514	Grate	0.00	0.21	0.98	6.0	51.32	1.02	51.67	12	Cir	0.012	1.00	55.50	Pipe - (26)
20	9	18.020	-41.536	Grate	0.00	0.75	0.98	6.0	57.49	1.17	57.70	10	Cir	0.012	1.00	62.00	
21	4	24.164	1.015	Grate	0.00	0.57	0.98	6.0	53.64	1.49	54.00	8	Cir	0.012	1.00	65.00	
22	End	47.352	-66.298	MH	0.00	0.00	0.00	0.0	55.25	0.53	55.50	18	Cir	0.012	1.00	62.80	Pipe - (36)
23	22	41.096	64.770	MH	0.00	0.00	0.00	0.0	57.10	2.00	57.92	18	Cir	0.012	1.00	63.82	Pipe - (37)

Project File: 0234511.00 HydraFlow.stm

Number of lines: 40

Date: 7/28/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	23	75.207	23.886	MH	0.00	0.00	0.00	0.0	57.92	1.50	59.05	12	Cir	0.012	0.97	64.79	Pipe - (47)
25	24	30.211	-74.680	Grate	0.00	0.10	0.89	6.0	59.05	1.49	59.50	12	Cir	0.012	1.00	64.57	Pipe - (49)
26	24	28.000	67.176	Grate	0.00	0.06	0.98	6.0	59.05	1.61	59.50	12	Cir	0.012	1.00	64.56	Pipe - (48)
27	23	30.541	-62.890	Grate	0.00	0.11	0.94	6.0	57.92	1.02	58.23	12	Cir	0.012	1.00	63.33	Pipe - (37) (1)
28	22	20.301	112.300	Grate	0.00	0.10	0.98	6.0	57.10	0.99	57.30	12	Cir	0.012	1.00	63.00	Pipe - (38)
29	22	15.722	-66.104	Curb	0.00	0.05	0.89	6.0	57.10	1.02	57.26	12	Cir	0.012	1.00	62.35	Pipe - (50)
30	23	34.000	96.144	Grate	0.00	0.92	0.98	6.0	57.92	0.88	58.22	15	Cir	0.012	1.00	63.00	
31	End	35.249	-64.926	MH	0.00	0.00	0.00	0.0	54.65	0.43	54.80	12	Cir	0.012	1.00	61.12	Pipe - (41)
32	31	37.865	87.264	MH	0.00	0.00	0.00	0.0	54.90	2.51	55.85	12	Cir	0.012	0.15	61.45	Pipe - (39)
33	32	4.526	-0.629	MH	3.09	0.00	0.00	0.0	55.85	1.10	55.90	12	Cir	0.012	1.00	59.78	Pipe - (51)
34	31	43.549	-1.249	MH	1.50	0.00	0.00	0.0	54.80	0.46	55.00	12	Cir	0.012	1.00	60.95	Pipe - (40)
35	End	39.182	-143.353	MH	0.00	0.00	0.00	0.0	47.27	1.80	47.98	30	Cir	0.012	1.00	53.39	Pipe - (27)
36	35	26.798	88.370	MH	0.00	0.00	0.00	0.0	48.33	0.41	48.44	24	Cir	0.012	0.97	52.61	Pipe - (6)
37	36	182.274	-0.215	MH	0.00	0.00	0.00	0.0	49.85	0.27	50.35	24	Cir	0.012	1.00	56.15	Pipe - (6) (1)
38	37	31.387	-89.356	None	7.65	0.00	0.00	0.0	50.35	0.48	50.50	18	Cir	0.012	1.00	53.11	Pipe - (7)
39	35	39.094	0.104	MH	0.01	0.00	0.00	0.0	47.98	1.79	48.68	30	Cir	0.012	1.00	54.20	Pipe - (28)
40	36	16.261	75.145	Grate	0.00	0.21	0.98	6.0	48.44	0.98	48.60	12	Cir	0.012	1.00	52.32	Pipe - (8)

Project File: 0234511.00 HydraFlow.stm | Number of lines: 40 | Date: 7/28/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	DMH-4	Manhole	56.25	Cir	6.00	6.00	24	Cir	50.32	24 12 12 12	Cir Cir Cir Cir	50.32 53.75 51.32 51.32
2	DMH-5	Manhole	56.68	Cir	4.00	4.00	24	Cir	50.70	24 12	Cir Cir	50.70 51.70
3	DMH-6	Manhole	57.95	Cir	4.00	4.00	24	Cir	51.40	24 12 12	Cir Cir Cir	51.40 52.40 52.40
4	DMH-7	Manhole	63.70	Cir	4.00	4.00	24	Cir	52.97	24 12 8	Cir Cir Cir	52.98 56.75 53.64
5	DMH-8	Manhole	63.10	Cir	4.00	4.00	24	Cir	53.62	24 12	Cir Cir	53.62 54.62
6	DMH-9	Manhole	57.85	Cir	4.00	4.00	24	Cir	54.29	18 12	Cir Cir	54.79 54.29
7	DMH-10	Manhole	61.20	Cir	4.00	4.00	18	Cir	56.82	12 18 12	Cir Cir Cir	57.32 56.82 57.32
8	CB-13	Grate	63.50	Cir	4.00	4.00	12	Cir	59.62			
9	TRENCH DRAIN	Grate	61.72	Cir	4.00	4.00	18	Cir	57.32	10	Cir	57.49
10	CB-12	Grate	61.06	Cir	4.00	4.00	12	Cir	57.45			
11	CB-9	Grate	63.40	Cir	4.00	4.00	12	Cir	56.99			
12	CB-11	Grate	57.57	Cir	4.00	4.00	12	Cir	54.48			
13	CB-10	Grate	62.25	Cir	4.00	4.00	12	Cir	54.90			
14	CB-5	Grate	56.30	Cir	4.00	4.00	12	Cir	54.02			
15	CB-8	Grate	58.80	Cir	4.00	4.00	12	Cir	52.87			
16	CB-7	Grate	57.75	Cir	4.00	4.00	12	Cir	52.65			
17	CB-6	Grate	56.50	Cir	4.00	4.00	12	Cir	52.04			

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
18	CB-4	Grate	55.80	Cir	4.00	4.00	12	Cir	51.67			
19	CB-3	Grate	55.50	Cir	4.00	4.00	12	Cir	51.67			
20		Grate	62.00	Cir	4.00	4.00	10	Cir	57.70			
21		Grate	65.00	Cir	4.00	4.00	8	Cir	54.00			
22	DMH-12	Manhole	62.80	Cir	4.00	4.00	18	Cir	55.50	18 12 12	Cir Cir Cir	57.10 57.10 57.10
23	DMH-13	Manhole	63.82	Cir	4.00	4.00	18	Cir	57.92	12 12 15	Cir Cir Cir	57.92 57.92 57.92
24	DMH-14	Manhole	64.79	Cir	4.00	4.00	12	Cir	59.05	12 12	Cir Cir	59.05 59.05
25	CB-17	Grate	64.57	Cir	4.00	4.00	12	Cir	59.50			
26	CB-18	Grate	64.56	Cir	4.00	4.00	12	Cir	59.50			
27	CB-16	Grate	63.33	Cir	4.00	4.00	12	Cir	58.23			
28	CB-15	Grate	63.00	Cir	4.00	4.00	12	Cir	57.30			
29	CB-14	Curb-	62.35	Cir	4.00	4.00	12	Cir	57.26			
30		Grate	63.00	Cir	4.00	4.00	15	Cir	58.22			
31	DMH-11	Manhole	61.12	Cir	4.00	4.00	12	Cir	54.80	12 12	Cir Cir	54.90 54.80
32	OUTLET CONTROL STRUC	Manhole	61.45	Cir	4.00	4.00	12	Cir	55.85	12	Cir	55.85
33	STORMTECH CHAMBERS	Manhole	59.78	Cir	4.00	4.00	12	Cir	55.90			
34	EX CB-1	Manhole	60.95	Rect	4.00	4.00	12	Cir	55.00			
35	DMH-1	Manhole	53.39	Cir	4.00	4.00	30	Cir	47.98	24 30	Cir Cir	48.33 47.98
36	DMH-2	Manhole	52.61	Cir	4.00	4.00	24	Cir	48.44	24 12	Cir Cir	49.85 48.44

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
37	OUTLET CONTROL STRUC	Manhole	56.15	Cir	4.00	4.00	24	Cir	50.35	18	Cir	50.35
38	INFILTRATION SYSTEM-1	None	53.11	n/a	n/a	n/a	18	Cir	50.50			
39	EX DMH-2	Manhole	54.20	Cir	4.00	4.00	30	Cir	48.68			
40	CB-1	Grate	52.32	Cir	4.00	4.00	12	Cir	48.60			

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	Pipe - (11)	User																		0.00
2	Pipe - (12)	User																		0.00
3	Pipe - (13)	User																		0.00
4	Pipe - (14)	User																		0.00
5	Pipe - (15)	User																		0.00
6	Pipe - (16)	User																		0.00
7	Pipe - (17)	User																		0.00
8	Pipe - (18)	User																		6.00
9	Pipe - (19)	User																		6.00
10	Pipe - (46)	User																		6.00
11	Pipe - (22)	User																		6.00
12	Pipe - (20)	User																		6.00
13	Pipe - (21)	User																		6.00
14	Pipe - (32)	User																		6.00
15	Pipe - (34)	User																		6.00
16	Pipe - (23)	User																		6.00
17	Pipe - (24)	User																		6.00
18	Pipe - (25)	User																		6.00
19	Pipe - (26)	User																		6.00
20		User																		6.00
21		User																		6.00
22	Pipe - (36)	User																		0.00
23	Pipe - (37)	User																		0.00
24	Pipe - (47)	User																		0.00

Project File: 0234511.00 HydraFlow.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 40 | Date: 7/28/2023

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
25	Pipe - (49)	User																		6.00
26	Pipe - (48)	User																		6.00
27	Pipe - (37) (1)	User																		6.00
28	Pipe - (38)	User																		6.00
29	Pipe - (50)	User																		6.00
30		User																		6.00
31	Pipe - (41)	User																		0.00
32	Pipe - (39)	User																		0.00
33	Pipe - (51)	User																		0.00
34	Pipe - (40)	User																		0.00
35	Pipe - (27)	User																		0.00
36	Pipe - (6)	User																		0.00
37	Pipe - (6) (1)	User																		0.00
38	Pipe - (7)	User																		0.00
39	Pipe - (28)	User																		0.00
40	Pipe - (8)	User																		6.00

Project File: 0234511.00 HydraFlow.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 40 | Date: 7/28/2023

APPENDIX F: STORMWATER CHECKLIST

- **Stormwater Checklist**
- **RIDEM Pre-Application Meeting Minutes**

- **Stormwater Checklist**

APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY

PROJECT NAME **New Industrial Manufacturing and Warehousing Facility For Taco Comfort Solutions, Inc.**	**(RIDEM USE ONLY)** **STW/WQC File #:**
TOWN **Cranston, RI**	**Date Received:**
BRIEF PROJECT DESCRIPTION: Construction of a new industrial manufacturing and warehousing facility for Taco Comfort Solutions, Inc. with associated parking and utility upgrades.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] submit four separately bound documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to Suggestions to Promote Brevity**.**

Note**: All stormwater construction projects must create a Stormwater Management Plan (SMP). However, not every element listed below is required per the RIDEM Stormwater Rules and the RIPDES Construction General Permit (CGP). This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ Residential	☒ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☐ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ Other (specify):				

SITE INFORMATION

☒ Vicinity Map

INITIAL DISCHARGE LOCATION(S): The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)

☐ **Groundwater**	☒ **Surface Water**	☒ **MS4**
☐ GAA	☐ Isolated Wetland	☐ RIDOT
☐ GA	☒ Named Waterbody **Spectacle Pond**	☐ RIDOT Alteration Permit is Approved
☐ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☒ Town
		☐ Other (specify):

ULTIMATE RECEIVING WATERBODY LOCATION(S): Include pertinent information that applies to both WQ_v and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

☐ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Spectacle Pond	☐ Coldwater	☐ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0006017L-07	☐ 4th order stream of pond 50 acres or more		
☒ TMDL for: Total Phosphorus, Dissolved Oxygen	☐ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☒ 303(d) list – Impairment(s) for: Chloropyll, Total Phosphorus, Dissolved Oxygen	☐ Contributes to shellfishing grounds		

[1] Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date: 5/2/2023	☒ Minutes Attached
☐ Municipal Master Plan Approval	Approval Date:	☐ Minutes Attached
☐ Subdivision Suitability Required	Approval #:	
☐ Previous Enforcement Action has been taken on the property	Enforcement #:	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☐ Delineated from FEMA Maps	
NOTE: Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional	
☐ Calculated by Professional Engineer	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):
	Amount of Cut (CY):
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway	
☐ Floodplain storage capacity is impacted	
☒ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION
☐ CRMC Assent required
☐ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
☐ Sea level rise mitigation has been designed into this project

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:			
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)			
	☐ Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations))		**RIDEM CONTACT:**
	☐ Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials)		
	☒ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities		**SITE ID#**: SR-07-0121
		☐ CERCLIS/Superfund (NPL)	
		☐ State Hazardous Waste Site (SHWS)	
		☒ Environmental Land Usage Restriction (ELUR)	
		☐ Leaking Underground Storage Tank (LUST)	
		☐ Closed Landfill	
Note: If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSMM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration**.**			
2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:			
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php		
	☐ Auto Fueling Facility (e.g., gas station)		
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

	☐ Road Salt Storage and Loading Areas (exposed to rainwater)	
	☐ Outdoor Storage and Loading/Unloading of Hazardous Substances	
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☐ The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C)	Activities: Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain:	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☒ Pre Construction Impervious Area		
	☐ Total Pre-Construction Impervious Area (**TIA**) **2.80 AC**	
	☐ Total Site Area (**TSA**) **5.05 AC**	
	☐ Jurisdictional Wetlands (**JW**)	
	☐ Conservation Land (**CL**)	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) **5.05 AC**	
	☐ (**TIA**) / (**SS**) = **0.55**	☒ (**TIA**) / (**SS**) >**0.4**?
☒ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)
This section may be deleted if not required.

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
☐	☐	Your waiver request has been explained in the Narrative, if applicable.
☐	☒	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☐	☐	If "Yes," has approval for infiltration by the OLRSMM Site Project Manager, per Part 1, Minimum Standard 8, been requested?

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2) (Add or Subtract Rows as Necessary)					
Design Point	**Impervious Area Treated (sq ft)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)** **Portion of Re_v directed to a QPA (cu ft)**	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
DP-1: Spectacle Pond	202,554	10,149	0	10,149	14,593
TOTALS:	202,554	10,149	0	10,149	14,593

Notes:

1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Appendix E

WATER QUALITY – MINIMUM STANDARD 3		
YES	**NO**	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☒	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☒	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☐	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☒	☐	Does this project propose an increase of impervious cover to a receiving water body with impairments? If "Yes," please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water. The proposed impervious cover is treated using a combination of deep sump, hooded catch basins and subsurface infiltration chambers with isolator rows. A total phosphorus pollutant loading calculation can be found in Appendix E showing a reduction in pollutant loading under post-construction conditions.
☒	☐	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
☒	☐	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☒	☐	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer.
☒	☐	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe: Spectacle Pond has a TMDL for total phosphorus, chlorophyll, and dissolved oxygen. The UNH Stormwater Center Performance Curve was used to calculate Phosphorus removal efficiency for the proposed infiltration chamber systems. The proposed infiltration chamber systems result in a net decrease of total phosphorus, the calculations are shown in Appendix E.

TABLE 3-1: Summary of Water Quality (see RICR 8.9)

Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-1: Spectacle Pond RI0006017L-07	202,554	15,282	0	15,282	18,814
TOTALS:	202,554	15,282	0	15,282	18,814

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Water Quality volume calculations are in Appendix E.

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	**NO**	
☐	☒	Is this standard waived? If "Yes," please indicate one or more of the reasons below:
		☐ The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. ☐ The project is a small facility with impervious cover of less than or equal to 1 acre. ☐ The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). (Note: LID design strategies can greatly reduce the peak discharge rate).
☐	☒	Conveyance and natural channel protection for the site have been met. If "No,' explain why: The proposed project is classified as a redevelopment project under RISDISM as the existing project site has more than 40% impervious cover. Therefore; only Standards 2-3 and 7-11 must be met.

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1:					
DP-2:					
DP-3:					
DP-4:					
TOTALS:					

Note: The Channel Protection Volume Standard must be met in each waterbody ID.	
☐ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).
☐ YES ☐ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.
☐ Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).	

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters.
		☐	A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
☒	☐	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☐	RIDOT
		☒	Other (specify): City of Cranston
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.			
		Indicate below which model was used for your analysis. ☐ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☐	☒	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If "No," please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.): The project is classified as a redevelopment, therefore it is not required to demonstrate that flow from the 100-year storm event can be conveyed through the proposed BMPs.	
☐	☒	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☐	☒	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☐	☒	Are the off-site areas shown on the subwatershed maps?	
☐	☒	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☐	☐	Calculate the following:	
		☒	Area of disturbance within the sub-watershed (areas): 4.88 acres
		☒	Impervious cover (%): 92%
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☐	☒	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**25-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1A: Carlsbad Street (Cranston MS4)	1.25	0.34	3.45	1.94	6.44	4.39	8.71	6.81
DP-1B: Burnham Avenue (Cranston MS4)	3.47	0.32	9.54	3.82	17.65	7.96	22.32	11.90
TOTALS:	4.72	0.66	12.99	5.76	24.09	12.35	31.03	18.71

** Utilize modified curve number method or split pervious /impervious method in HydroCAD.

Note: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	**Name of report/document, page numbers, appendices, etc.**
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Appendix C of the Taco Comfort Solutions Stormwater Report
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Appendix D of the Taco Comfort Solutions Stormwater Report
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Appendix D of the Taco Comfort Solutions Stormwater Report
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Appendix D of the Taco Comfort Solutions Stormwater Report

Table 5-2 Summary of Best Management Practices											
BMP ID	**DP #**	**BMP Type** (e.g., bioretention, tree filter)	**BMP Functions**					**Bypass Type**	**Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4**		
			Pre-Treatment (Y/N/ NA)	Re_v (ac-ft)	WQ_v (Cu-Ft)	CP_v (Y/N / NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes /No	Technical Justification (Design Report page number)	Distance Provided
1	1	Subsurface Infiltration Chambers	Y	.097	5,394	N/A	N/A	N/A	Yes	C-300	
2	1	Subsurface Infiltration Chambers	Y	.238	13,420	N/A	N/A	N/A	Yes	C-301	
		TOTALS:		0.335	18,814						

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**						
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
1	1	Subsurface Infiltration Chambers	10 (62')		Not encountered	54.50'	N/A	A	8.27
1	2	Subsurface Infiltration Chambers	4 (56')		45.5'	49.25'	3.75'	A	8.27
		TOTALS:							

* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☐	☐	☒	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
☐	☐	☒	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☒	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, "Acceptable BMPs for Use at LUHPPLs." Please list BMPs:
☐	☐	☒	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☒	☐	☐	Have you provided a **separately-bound** document based upon the SESC Template? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).	
			If "No," include a document with your submittal that addresses the following elements of an SESC Plan:	
			☐	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☐	Provide Natural Buffers and Maintain Existing Vegetation
			☐	Minimize Area of Disturbance
			☐	Minimize the Disturbance of Steep Slopes
			☐	Preserve Topsoil
			☐	Stabilize Soils
			☐	Protect Storm Drain Inlets
			☐	Protect Storm Drain Outlets
			☐	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☐	Establish Perimeter Controls and Sediment Barriers
			☐	Divert or Manage Run-On from Up-Gradient Areas
			☐	Properly Design Constructed Stormwater Conveyance Channels
			☐	Retain Sediment On-Site
			☐	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☐	Apply Construction Activity Pollution Prevention Control Measures
			☐	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☐	Qualified SESC Plan Preparer's Information and Certification
			☐	Operator's Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
			☐	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☐	☒	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them:

☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		
☐	☒	Designated snow stockpile locations?
☐	☒	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☐	☒	Regular sweeping? Please describe:
☐	☒	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☒	☐		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☒	☐		Mapped seasonal high-water-table test pit locations
☒	☐		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☐	☒		Mapped bedrock outcrops adjacent to any infiltration BMP
☐	☒		Soils were logged by a:
		☐	DEM-licensed Class IV soil evaluator Name:
		☐	RI-registered P.E. Name

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (acres)**	**Existing Impervious (acres)**	**Proposed Impervious (acres)**
DP-1: Direct	Spectacle Pond RI0006017L-07	5.04	2.88	4.67
TOTALS:		5.04	2.88	4.67

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	**NO**	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☐	☒	Location and field-verified boundaries of resource protection areas such as: ► freshwater and coastal wetlands, including lakes and ponds ► coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs) **N/A**
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☒	☐	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: ► Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2; ► Design water surface elevations (applicable storms); ► Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ► Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ► Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain; ► Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☒	☐	Mapping of any OLRSMM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ► Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ► Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.); ► Cross sections of roadways, with edge details such as curbs and sidewalks; ► Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

- **RIDEM Pre-Application Meeting Minutes**

33 Broad Street
Floor 7
Providence, RI 02903
www.woodardcurran.com

T 800.985.7897
F 401.273.5087

MEETING MEMORANDUM

PROJECT:	Taco	
MEETING DATE:	May 2, 2023	
LOCATION:	via Microsoft Teams	
PREPARED BY:	Caitlin Glass	Woodard & Curran
ATTENDEES:	James Wilusz	RIDEM *(sitting in for Joe Antonio)*
	Nick Pisani	RIDEM
	Ashley Blauvelt	RIDEM
	Bob Kelliher	Thermo-Mechanical
	Jan Greenwood	Woodard & Curran
	Eric Axelrod	Woodard & Curran
	Greg Betsold	Woodard & Curran
	Michelle MacDonald	Woodard & Curran

The following meeting minutes have been interpreted to the best of the writer's understanding with respect to topics discussed. Additions and/or corrections are invited and requested prior to Wednesday, 5/17/2023, after which the minutes will be accepted by all attendees as a matter of record.

Meeting Goals:

- ***Introduce project to RIDEM.***
- ***Confirm agreement with stormwater management scheme and design methodology, particularly infiltration of stormwater and pretreatment requirements.***
- ***Obtain guidance on recommended permit application contents to facilitate approval.***

1. INTRODUCTIONS

2. PROJECT DESCRIPTION

- Woodard & Curran gave an overview of the project, which is located at 35 Carlsbad Street in Cranston.
- 98,000 SF building for manufacturing, testing laboratory, and warehouse.
- Site current use is partially for parking and partially vacant. It was formerly occupied by an industrial building. There are fill soils on site to a depth ranging from about 2' to 10' below the existing ground surface.
- Site is comprised of two lots: Plat 7, Lots 3141 and 3744. Lot 3741 has an Environmental Land Use Restriction (ELUR). An environmental cap was installed per RIDEM in 2015 over a portion of Lot 3741. An infiltration basin was also constructed on that lot.
- Lots will be merged as part of the project.
- The proposed building will be entirely located on the ELUR parcel.
- Earthwork summary - proposed cuts beneath building and fills in southern parking lot.

3. ENVIRONMENTAL REQUIREMENTS

- Summary of previous environmental investigations and constituents found in soils at concentrations above the Industrial/Commercial Direct Exposure Criteria (I/C DEC). Benzo(a)pyrene in the range of 3.0 mg/kg.
- Currently, lot 3741 has an ELUR restricting the use of the lot to Industrial/Commercial and soils exhibiting concentrations of benzo(a)pyrene above the industrial/commercial direct exposure criteria are currently underneath engineered barriers that are managed under the recorded ELUR.
- The project is proposing to shift excess material from the northern lot (lot 3741) onto the adjacent southern lot, and to expand the ELUR to encompass both lots.
- The proposed building and pavement sections will, as necessary, be used as engineered barriers, and any landscape areas will also have engineered caps, with 1' of clean material over geotextile fabric.
- RIDEM indicated that the I/C DEC is proposed to be increased to 5.7 mg/kg sometime soon. If this becomes promulgated there will not be a need to utilize engineered barrier to restrict access to the underlying soils as this proposed standard is higher than the concentrations of benzo(a)pyrene reported on the property.
- RIDEM indicated the site will need to be restricted to Industrial/Commercial use as there remain concentrations of compounds above residential direct exposure criteria.
- RIDEM asked if Benzo(a)pyrene was the only compound found to be above the I/C DEC, and W&C confirmed it was.
- RIDEM asked if there were any other compounds that were above the residential direct exposure criteria as that may affect ability to infiltrate stormwater. W&C recalled that there were other PAHs and the metal beryllium, but would confirm. W&C followed up with an email to Ashley on 5/2/23 indicating that this was correct, and that the sampling included volatile organic compounds, herbicides, PAHs, PP13 metals and total petroleum hydrocarbons.
- RIDEM confirmed stormwater infiltration on both lots could be acceptable based on whether other compounds are present above the residential direct exposure criteria.

4. STORMWATER SUMMARY

- The proposed stormwater management system will be designed to meet the recharge, water quality treatment, and peak rate standards.
- Peak flows will not exceed pre-development peak flows for a 25-year storm.
- Proposed underground infiltration in two locations, anticipated to be StormTech chambers. The bottom of the infiltration systems will be in natural sandy soils, beneath existing fill, therefore RIDEM confirmed an extra sand layer is not required.
- RIDEM advised including a note on the standard detail for the infiltration systems that if fill is found in the field extending below the bottom of the system in some spots, that the existing fill should be removed and replaced with sand.
- Calculations for infiltration rates are based on Rawls rate of 8.27 in/hour for sandy soils. RIDEM confirmed this rate was acceptable based on medium sandy soils.

- Taco Operations confirmed that no hazardous substances are proposed for use or as a waste, therefore, no LUHPPLS on the Site.
- Currently, RIDEM accepts StormTech isolator rows in conjunction with deep sump hooded catch basins to meet the pre-treatment requirements for infiltration. RIDEM is currently working on a letter to send to the manufacturer to provide an application for the isolator row. RIDEM indicated the letter should be sent to the manufacturer in the next few days, and then the manufacturer will have 90 days to submit an application for RIDEM Technology Review Committee for approval. If this project is submitted prior to the 90 days, the isolator row will be grandfathered in and accepted for pre-treatment. If the project is submitted after the 90 days, approval will be dependent upon the manufacturer submitting an application and RIDEM approving it.
- Based on the amount of existing impervious area on site, which exceeds 40%, the site will be considered a redevelopment project.
- The drainage that leaves the site will connect to the City's MS4 system.

5. SUMMARY DISCUSSION

- RIDEM confirmed that the Water Quality Certification and RIPDES CGP and Registration for Infiltration (UIC) can be combined into one application.
- RIDEM provided the following recommendations for permit application contents:
    - Documentation from Ashley's group at RIDEM signing off that it's acceptable to infiltrate on the site
    - Statement from the Owner/Applicant that no LUHPPL's are present on site
    - 1.2" storm for water quality
    - Summary of 1-, 10-, and 100-year storm events
    - If a redevelopment project, don't need to provide peak flow mitigation for the 100-year storm event
    - Provide full size drawings for the pre- and post-development drainage plans
    - Show test pits on the plan that are in the area of the proposed BMPs
- Project schedule and review periods
    - Woodard & Curran indicated they are aiming to submit the application in July
    - RIDEM indicated typically their review time is 30-45 days

APPENDIX G: SOIL EROSION AND SEDIMENTATION CONTROL PLAN (BOUND SEPARATELY)

APPENDIX H: STORMWATER MANAGEMENT SYSTEM O&M PLAN (BOUND SEPARATELY)

Woodard & Curran

woodardcurran.com