STORMWATER ANALYSIS

FOR

OAK STREET LOFTS

AT

9 OAKLAND ST. AMESBURY, MA 01913

<u>**PREPARED ON**</u>

9/18/2025

Revised 5/19/2026

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1. Project Description

1.1. Introduction

9 Oakland Street LLC (The Applicant) is proposing to redevelop three abandoned structures from industrial use to commercial/residential mixed-use, as well as construct a fourth structure to serve a parking garage for the redevelopment. The applicant has retained the services of Millennium Engineering Inc. (MEI) for civil engineering services associated with the redevelopment, including the design of a stormwater management system and the preparation of this report.

The site is 9 Oakland St. in the City of Amesbury Massachusetts. There are two parcels linked to this address, numbered 94 and 95 on Map 53 of the local assessor's maps. The purpose of this report is to explain the design of the proposed development's stormwater management system and document the system's compliance with State and Municipal regulations.

1.2. Existing Conditions

This section will describe the project site in its current state.

1.2.1. Topography & Natural Resources

The site can be described as urban landscape with decades of prior development. Having been built onto the side of a hill, both flat and steep grades are present, with little to no transition between the two, aside from retaining walls. No natural resources such as wetlands or protected habitats are known to exist on the site.

1.2.2. Existing Structures & Use

Three structures exist on the site, all of which are rectangular brick buildings that were originally constructed as industrial mills. The buildings are currently abandoned, and efforts to clean them up so that they can be redeveloped are underway. Volatile Organic Compounds (VOC's) were detected in the soil beneath these buildings, and a monitoring and remediation program has been in place for almost a decade. More information on this can be found online at the Massachusetts Department of Environmental Protection website using the link below, under the Release Tracking Number (RTN) 3-0032360.

https://eeaonline.eea.state.ma.us/portal#!/search/wastesite

1.2.3. Utilities

The site is surrounded by gas, electricity, water, sewer, and storm drain utilities, and service connections for electric, water and sewer have been identified on record plans. It is not known if these connections are still in use.

1.3. Proposed Conditions

This section will describe all proposed changes to the project site.

1.3.1. Alterations to Topography & Natural Resources

In general, the project does not propose significant changes to the grading of the site. The new parking garage will be built into the steepest parts of the site, replacing the sites only patch of woods. The only other topographical changes will be the conversion of some of the sites paved areas to lawns and landscaped areas.

1.3.2. Proposed Structures & Use

As alluded to previously, The Applicant intends to redevelop the site into a mixed use of residential and commercial. New construction will include lawn, landscaped areas, patios, a parking garage, and fresh pavement where the parking lot and sidewalk have deteriorated.

1.3.3. Proposed Utilities

At the time of this report, project proposes the reactivation of electric, water, and sewer services, and the project's stormwater management system will discharge directly to the municipal storm drain system. It is not known if there is a combined sewer overflow downstream of where the proposed sewer and storm drain service lines connect to the municipal main lines.

2. Stormwater Management

2.1. Hydrology

This section will describe the existing hydrologic characteristics of the watershed in which the site is located as relevant to stormwater management.

2.1.1. Rainfall

State and Municipal regulations require use of the latest available rainfall data for the 2-, 10-, 25-, and 100-year, 24-hr rain events. The rainfall depth for each of these events was taken from data published by the Natural Resource Conservation Service (NRCS) based on Atlas-14 Volume 10. Table 1 below summarizes the rainfall depth for each storm.

Table 1: Recurrence & Depth of Design Storms

Recurrence Interval	Rainfall Depth (in.)
2-year	3.24
10-year	5.12
25-year	6.30
100-year	8.11

2.1.2. Soils

Soil Boring Logs recorded between December 2014 and August 2017 by Soil Exploration Corp., and Clean Soils Environmental LTD., were used to determine the composition of the soils at the project site. Copies of these logs have been included with this report as Attachment 2). The logs revealed that the sand and inorganic silt make up the majority of the soil beneath the site, with the former being the more prevalent of the two. For this reason, the stormwater model uses hydrologic soil group A (HSG A) for the whole of the site.

On March 5th, 2026, four additional test pits were dug near the locations of the proposed infiltration chambers, and one infiltration test was conducted in each pit with a double ring infiltrometer. The tests revealed that the soils within the footprint of the chambers beneath the proposed parking lot had an average infiltration rate of 9.25 in/hr, and the soils within the footprint of the chambers beneath the garage have an average infiltration rate of 52.5 in/hr. The test pit and infiltrometer logs are included in Attachment 3. When designing infiltration systems, MADEP guidance allows the use of up to 50% of the average infiltration rate determined by double ring infiltrometer. Therefore, the chambers beneath the garage were designed with an infiltration rate of 25 in/hr. and the chambers beneath the parking lot were designed around a rate of 4 in/hr.

2.1.3. Pre-Development Subcatchments

Under pre-development conditions, the site was modelled as a six subcatchments draining to four different design points. Normally, only 4 subcatchments would have been delineated, however, the additional catchments needed to be broken out in order to quantify the amount of runoff flowing onto abutting lots. Since each design point represents a different structure in the same municipal storm drain network, outflow from each point is routed to the next downstream design point, with a lag time that was calculated based on pipe flow.

Design Point 1 is a catch basin on Oakland St. called out on the plans as CB 2. This basin collects runoff from the parking lot and over half of the roof area of the existing buildings. Runoff collected by CB 2 is discharged to DP3 via the municipal storm drain system.

Design Point 2 measures runoff flowing onto an abutting lot identified as lot 97 by the assessor's maps. This point collects flow from the southerly facing roofs, a patch of woods, and some of the runoff that flows onto the site's easterly abutter, identified as lot 214 by the assessor's maps. It should be noted that runoff flowing onto lot 214 could not be measured by a single design point because there is a high point along the lot line that divides the drainage area, directing runoff toward DP1 and DP2. To properly quantify the flow onto lot 214, the outflow hydrographs for S2A and S2B from the HydroCAD model need to be added together. To make this easier to see, the subcatchment nodes S2A and S2B were duplicated, then routed to a single link node, numbered as L214. The hydrograph of that link node represents all runoff flowing onto lot 214.

Design Point 3 is the drain manhole called out on the plans as DMH 3. This point measures all of the flow from design point 1 and runoff from the perimeter and roof of the building closest to the corner of Oakland and Chestnut Streets. All runoff collected by this point is discharged to the next manhole, DMH 4, which is also Design Point 4.

Design Point 4 is the drain manhole called out on the plans as DMH 4. This manhole collects runoff from the remains of a concrete loading dock along Chestnut St. as well as the discharge from design points 2 and 3. This point is the final destination of all runoff from the site, and it is where the pre- and post-development flow rates will be compared for regulatory compliance.

Of the site's 1.259 acres, 69.9% is covered by impervious surfaces such as pavement, sidewalks, and roofs. This results in a higher peak runoff rate despite the soil's conduciveness to drainage and infiltration. The remainder of the site is covered by lawns, a single patch of woods, and bare earth; the former two of which are in good condition. A visual of the subcatchment boundaries and flow paths are provided in Attachment 3), and a summary of the total area and the amount of impervious surface are provided by Table 2 below.

Table 2: Pre-Development Subcatchment Summary

Subcatchment Number	Receiving Design Point	Impervious Surface (acres)	Total Area (acres)
S1	DP1	0.458	0.458
S2A	DP2	0.053	0.062
S2B	DP2	0.039	0.041

Subcatchment Number	Receiving Design Point	Impervious Surface (acres)	Total Area (acres)
S2C	DP1	0.099	0.404
S3	DP3	0.123	0.123
S4	DP4	0.108	0.171
Total	-	**0.880**	**1.259**

2.1.4. Post-Development Subcatchments

In post-development, the drainage area is further divided into 9 subcatchments that are collected by the same four design points. Table 3 below summarizes the new subcatchments. The location and routing of the four design points are unchanged from their pre-development versions.

Design Point 1 collects treated runoff from the parking lot, and it collects untreated runoff from the lawn along the easterly lot line, and the sidewalk/landscaped area along Oakland St. The area draining to this point was reduced from 0.519 acres to 0.304 acres, and the amount of impervious surface draining to this point is reduced from 0.512 acres to 0.247 acres.

Design Point 2 collects only untreated runoff from the lawns and stone dust path along the perimeter of the buildings as shown on the drainage plan included in Attachment 3). The area contributing to this design point is reduced from 0.446 acres to 0.024 acres, and the impervious surface draining to this point is reduced from 0.145 acres to 0 acres. Just as in pre-development, nodes S214A-1 and S214B-1 were created as duplicates and routed to a single link node to create a single hydrograph modelling flow onto lot 214. In post-development, the peak runoff from all modeled storms, except the 100-yr storm, is reduced to zero. See Table 4 for more information on how the post-development peak discharges compare to those in pre-development.

Design Point 3 collects untreated runoff from the corner of Oakland and Chestnut Streets in addition to all the runoff from Design Point 1. Total contributing area to this point decreases from 0.642 acres to 0.329 acres, and the total impervious surface decreases from 0.634 acres to 0.271 acres.

Finally, Design Point 4 collects treated runoff from the infiltration chamber beneath the garage, and all runoff from Design Points 2 and 3. Being the final design point in the series, the total contributing area of 1.259 acres remains unchanged from pre-development. The total impervious surface across the entire site changes from 0.880 acres to 1.150 acres.

Table 3: Post-Development Subcatchment Summary

Subcatchment Number	Receiving Design Point	Impervious Surface (acres)	Total Area (acres)
S1-1	DP1	0.239	0.284
SAD[1]	N/A	0.008	0.008
STD[1]	N/A	0.009	0.009
S1-2	DP1	0.008	0.013
S2A-1	DP1	0.0	0.007
S2B-1	DP2	0.0	0.003
S2C-1	DP2	0.0	0.022
S3-1	DP3	0.023	0.025
S4-1	DP4	0.022	0.035
S4-2	DP4	0.837	0.837
S4-3	DP4	0.021	0.033
Total	-	**1.150**	**1.259**

2.1.5. Receiving Waters

As alluded to previously, runoff that is not infiltrated naturally or by design is received by a municipal storm drain network. While this is unconfirmed, it is assumed that this storm drain network discharges to nearby Plumbush Creek, located South of the site.

2.2. Compliance with Regulatory Standards

This section will describe how the project's stormwater management system (The System) will comply with the standards established by the Commonwealth of Massachusetts. Municipal standards will be cited where applicable.

2.2.1. Standard 1: Untreated Stormwater

As stated by Standard 1: *"No new stormwater conveyances (e.g. outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."*

Of the 1.150 acres of the site's post-development impervious surface, 1.10 acres (95%), is treated by The System. See Table 5 below for a break-down of which subcatchments do and do not receive treatment for their impervious surfaces.

All runoff from the redeveloped site, whether it is or is not collected and treated by the stormwater management system, is discharged to a municipal storm drain system. Therefore, the redevelopment of this site complies with Standard 1 because the redeveloped site does not have, nor will it create an outfall which discharges untreated stormwater directly to the waters and wetlands of the Commonwealth.

2.2.2. Standard 2: Post-Development Peak Discharge Rates

As stated by Standard 2: *"Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates."*

The System has been designed to prevent the peak discharge rates of the 2-, 10-, 25, and 100-year storms do not exceed their pre-development values. Table 4 below summarizes the peak flow rates under pre- and post-development conditions, as well as the pre- and post-development drainage area. To find out more about how these values were calculated, see Attachment 4).

[1] Subcatchment area not included in total because it was already included in S1-1

Table 4: Pre- and Post-Development Peak Runoff Rates

Design Point	Total Drainage Area (Ac)		Peak Rates of Runoff (cfs)							
			2-Year		10-Year		25-Year		100-Year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP1	0.519	**0.304**	1.57	**0.31**	2.52	**1.13**	3.11	**1.45**	4.01	**1.82**
DP2	0.446	**0.024**	0.12	**0.05**	0.27	**0.09**	0.41	**0.12**	0.87	**0.16**
L214	0.103	**0.010**	0.21	**0.00**	0.35	**0.00**	0.44	**0.00**	0.57	**0.01**
DP3	0.642	**0.329**	1.96	**0.34**	3.13	**1.22**	3.86	**1.57**	4.99	**1.98**
DP4	1.259	**1.259**	2.31	**2.26**	3.90	**3.67**	5.06	**4.41**	6.94	**6.76**

All peak flows under post-development conditions are well below their pre-development values, therefore, this project meets Standard 2 to the maximum extent practicable.

2.2.3. Standard 3: Recharge to Groundwater

As stated by Standard 3: *"Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This condition is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."*

Under normal circumstances, the redevelopment would be required to recharge 0.6 inches multiplied by the difference between the existing and proposed impervious surfaces. However, this cannot be achieved due to the presence of contaminated soils and groundwater on the downgradient property. The applicant's Licensed Site Professional, Simmons Environmental Services, advised that infiltrating stormwater at this site could cause migration or exacerbation of current contamination downgradient of the site. This means that infiltrating stormwater runoff at this site risks spreading that contamination. To prevent this from happening, the applicant is proposing to infiltrate less volume than would normally be required of this redevelopment.

According to Standard 3, MassDEP requires infiltration only to the maximum extent practicable for sites where recharge is proposed at or adjacent to an area classified as contaminated. Given the relatively small area of the site, there is no location on site where the full required recharge volume can be infiltrated. Instead, the applicant is proposing to infiltrate runoff from the courtyard and parking lot that faces Oakland Street using subsurface infiltration chambers beneath that courtyard. Additionally, the applicant has retained Simmons Environmental Services to provide consultation during construction, ensuring that the redevelopment is constructed in accordance with applicable regulations.

Table 5 below compares the recharge volume normally required by Standard 3 to the recharge volume proposed for the redevelopment. Simmons Environmental Services has reviewed the current proposal and has concluded that the proposal is compatible with ongoing monitoring and remediation efforts on site and the existing contamination on adjacent parcels.

Table 5: Required vs. Provided Recharge Volume

Existing Impervious Surface (ft^2)	Proposed Impervious Surface (ft^2)	New Impervious (ft^2)	Required Recharge Volume (ft^3)	Provided Recharge Volume (ft^3)
38,333	50,156	11,823	591	291

2.2.4. Standard 4: Removal of 80% of Total Suspended Solids

Standard 4 states that *"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."*

Most of the redevelopment's impervious surface is comprised of runner membrane roofing that does not require treatment for the removal of TSS. This leaves 12,709ft^2 of impervious surface that must be treated to the maximum extent practicable for the redevelopment to comply with Standard 4. As shown by

Table 6 below, the redevelopment removes 73% of its TSS. This is the maximum extent to which TSS can be practically removed because the remaining untreated impervious surface cannot receive treatment without an unreasonably more intricate system of pipes and treatment structures.

Table 6: Summary of TSS Removed

Treatment Train	Impervious Surface Requiring Treatment (sq-ft)	Depth Required for 80% TSS Reduction (in.)	Volume Required for 80% TSS Reduction (cf)	Volume Provided for TSS Reduction (cf)	TSS Removed (%)	Weighted Average of TSS Removed (%)
Courtyard & Parking Lot	10,418	0.8	695	291	34%	27%
Building Roofs*	0	0.8	0	0	0%	0%
Untreated	2,291	0.8	153	0	0%	0%
Total	**12,709**					**27%**

2.2.5. Standard 5: Land Uses with Higher Potential Pollutant Loads

Standard 5 states that *"For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook."*

No new discharges with higher potential pollutant loads are associated with the proposed use.

Regarding the site's previous industrial use and remediation efforts, the site's Licensed Site Professional at Simmons Environmental Services has reviewed the current proposal and has concluded that the proposal is compatible with ongoing monitoring and remediation efforts on site (which are aimed at addressing VOCs in soils in portions of the site that will not be impacted by stormwater or the proposed infiltration) and the existing contamination on adjacent parcels. Therefore, the redevelopment meets Standard 5 to the maximum extent practicable.

2.2.6. Standard 6: Critical Areas

Standard 6 states that *"Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook."*

The site is not located within Zone II or Interim Wellhead Protection Area of a Public Water Supply, nor will stormwater from the redevelopment be discharged to them. Therefore, Standard 6 is not applicable to this project.

2.2.7. Standard 7: Redevelopment

Standard 7 states that *"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions"*

This project is a redevelopment of an existing site and is therefore subject to this standard. For information on how the redevelopment will meet the modified versions of Standards 1-6, please see their respective sections within this report.

2.2.8. Standard 8: Erosion & Sedimentation Controls

Standard 8 states that *"A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented."*

A plan for controlling erosion and sedimentation during construction will be submitted alongside the civil plans for the project. The plan will be appropriate for the type of work expected for this project; therefore, the redevelopment complies with Standard 8.

2.2.9. Standard 9: Operation & Maintenance Plans

Standard 9 states: *"A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed."*

A long-term operation and maintenance plan has been prepared for The System. Please see Attachment 5) for a copy of the plan. This plan covers all the BMP's associated with The System, thereby proving that the redevelopment complies with Standard 9.

2.2.10. Standard 10: Illicit Discharges to Drainage System

Standard 10 states: *"All illicit discharges to the stormwater management system are prohibited."*

Given that remediation efforts at the site have been completed, and that the infiltration BMPs are well above the water table, no pollutants from the redevelopments previous use will enter The System as illicit discharges. Furthermore, access to the redevelopment's stormwater will be limited to authorized personnel only, thereby reducing the likelihood of illicit discharges to The System to the maximum extent practicable. An Illicit Discharge Compliance Statement shall be submitted by The Applicant to the permitting authority prior to the discharge of any stormwater to post-construction BMPs.

2.2.11. Municipal Standards

The City of Amesbury has additional standards for stormwater infrastructure defined by Section 7.10 of their Subdivision Rules and Regulations. The bulleted list below gives each applicable municipal standard. Beneath each standard, written in bold, is an explanation of how the development was designed to meet the standard.

- No stormwater infrastructure shall impede the flow of natural water courses

  No natural water courses are impeded or otherwise disturbed by the redevelopment.

- Ensure adequate drainage of all low points along streets, and Intercept runoff at intervals reasonably related to the extent and grade of the area being drained

  Area Drains have been specified for all low points and can pass the 25-year peak discharge without causing significant ponding.

- Control erosion

  Adequate provisions for the control of sedimentation and erosion are made by the proposed erosion control plan and the proposed long-term operation and maintenance manual.

- Recharge stormwater with structures that prevent water quality degradation to the maximum extent feasible,

  Structures that prevent water quality degradation have been designed to the extent feasible.

- All Stormwater management systems must conform to the 2016 MS4 permit by:
  - Preventing peak flows from the 25-year and 100-year storms after the development is constructed do not exceed what exists prior to the development

    Peak flows leaving the site post-development are less than or equal to their pre-development values.

  - Using Low Impact Development site planning and strategies unless infeasible

    LID has been incorporated to the extent feasible.

  - Being designed to meet or exceed the requirements of the latest version of the Massachusetts Stormwater Handbook,

Of the Commonwealth's standards, the groundwater recharge standard (standard 3) is the only one that could not be met. This is because downgradient and off of the site are soils that have been contaminated by previous industrial use, and infiltrating the volume required by that standard may spread this contamination further.

- Reducing the pollutant load of both Total Suspended Solids (TSS) and Total Phosphorus (TP) as follows:
  - New developments must reduce TSS by 90% and reduce TP by 60%
  - Redevelopments must reduce TSS by 80% and reduce TP by 50%

    The applicant requests that the Planning Board waive this standard for the same reason the redevelopment cannot meet the recharge standard, that holding and infiltrating the volume required for phosphorus removal carries the risk of disturbing and expanding a known contaminated area.

- Design Calculations are based upon by the latest edition of *TR-55: Urban Hydrology for Small Watersheds* by the USDA, Natural Resource Conservation Service (NRCS), or other methods if approved by the Planning Board in Consultation with the Director of Public Works and the City Engineer

  Design calculations were performed using the HydroCAD Stormwater Modelling System, a software program designed to model stormwater runoff using a variety of different methods, including those defined by TR-55. The TR-55 methods are what was used for this stormwater management system.

- Water velocities in pipes and gutters shall be between three and ten feet per second

  Table 7 below calculates the velocity of each proposed storm sewer pipe when that pipe is flowing full without surcharge. The full-flow velocity of all proposed pipes is within the regulatory limits.

Table 7: Velocity of Proposed Pipes Flowing Full

Pipe Number	Diameter (in.)	Slope (ft/ft)	Manning Number	Flow-Full Area (S.F.)	Hydraulic Radius (ft)	Flushing Velocity (ft/sec)	Flushing Flow (cfs)	Flushing Flow (gpm)
SD-1	12	0.0089	0.013	0.785	0.250	4.28	3.36	1509
SD-2	12	0.0189	0.013	0.785	0.250	6.24	4.90	2199
SD-3	12	0.0089	0.013	0.785	0.250	4.28	3.36	1509
SD-4	6	0.0362	0.014	0.196	0.125	5.05	0.99	445
SD-5	6	0.0109	0.010	0.196	0.125	3.88	0.76	342
SD-6	4	0.0494	0.010	0.087	0.083	6.30	0.55	247

- The developer to prove that existing drains that they are connecting to are adequate to accommodate the drainage flow from their development

Table 8 below was prepared to determine if the existing and proposed storm sewers are of adequate size to carry runoff discharged by the redevelopment. The calculations show that all pipes are adequate for conveying runoff from the redevelopment. Furthermore, the values presented by Table 4 show that this redevelopment positively contributes to the municipal storm drain by reducing the peak flow that is received by that system. However, neither of these calculations account for runoff generated by off-site areas, meaning that it is unknown if the existing storm sewers can convey the combined peak runoff of both the redevelopment, and all other off-site areas served by the storm sewer network.

Table 8: Minimum Diameter for Existing & Proposed Pipes

Storm Sewer Pipe Number	Expected 25-yr Flow, Q (cfs)	Manning Roughness, n	Pipe Slope (ft/ft)	Minimum Diameter (ft)	Minimum Diameter (in)	Specified/ Existing Diameter (in.)
Ex. RCP, Outlet of DMH 4 (slope assumed)	4.41	0.017	0.0050	1.36	17	18
Ex. RCP, Outlet of CB 8	0.12	0.017	0.0811	0.21	3	12
Ex. RCP, Outlet of DMH 3	1.57	0.017	0.0222	0.70	9	18
Ex. RCP, Outlet of CB 6	0.16	0.017	0.0811	0.23	3	12
Ex. RCP, Outlet of DMH 2	1.45	0.017	0.0701	0.55	7	12
Ex. CMP, Outlet of DMH 1	1.45	0.025	0.1391	0.56	7	12
Ex. CMP, Outlet of CB 2	1.45	0.025	0.0501	0.67	9	12
SD-1, Outlet of Detention Chamber	2.76	0.013	0.0089	0.93	12	12
SD-2, Outlet of Infiltration Chambers	1.47	0.013	0.0189	0.64	8	12
SD-3, Outlet of CDS unit	1.77	0.013	0.0089	0.79	10	12
SD-4, Outlet of Area Drain between Garage & Building	0.22	0.014	0.0362	0.28	4	6
SD-5, Outlet of Courtyard Area Drain	0.06	0.010	0.0109	0.19	3	6
SD-6, Outlet of Trench Drain	0.08	0.010	0.0494	0.16	2	4
Roof Drain Collector (Assumes: all runoff drains to one pipe, slope is 0.5%, and material is PVC)	5.36	0.010	0.0050	1.20	15	Pending "For-Construction" M.E.P. plans

- Regarding Catch Basins, Manholes and Piping:
    - All drainpipes have an inside diameter of at least 12 inches, conform to Massachusetts DPW (MADPW) specifications for Class III Reinforced Concrete Pipe, have no less than 36 inches of cover, and shall convey the peak discharge of the 25-year storm

      As shown by Table 8 above, all existing and proposed pipes can convey the 25-yr peak runoff from the redevelopment. The applicant requests waivers from the 12" minimum inside diameter, the class III reinforced pipe, and the

36" minimum cover standards. The minimum diameter waiver is requested because for three of the proposed pipes, 12" is twice the diameter needed to convey the flow that they are expected to carry. Additionally, the pre-fabricated trench drain is not deep enough to be used with a 12" pipe. The Class III RCP waiver is being requested because the smallest size available the meets this standard is 12", which the applicant is already requesting a waiver for. A waiver for the 36" cover standard is being requested because the cover over the existing outlet of CB 2 is less than 36", making it impossible for the drainage system to connect to that catch basin with 36" of cover since the proposed invert into the catch basin must be higher than the existing invert out.

- All catch basins must be placed at every low point on both sides of a road, spaced 250 feet apart on a continuous road, and their outlet pipes shall be directly connected to a manhole, not another catch basin (no catch basin shall be used as a manhole)

  The applicant requests a waiver from this standard because connecting to an existing catch basin will be much quicker and therefore less disruptive to vehicle traffic during construction, because the contractor won't need to close the road for excavations. Connecting to an existing catch basin also means that the contractor won't need to temporarily divert flow to splice a new manhole into an existing drain. This waiver is also being requested to allow for a direct connection to the City's drainpipe instead of providing a new manhole for the outlet of the detention chambers.

- All catch basins and manholes must have a minimum depth of six feet, a minimum inside diameter of four feet, and a minimum sump of 30 inches

  If this standard is applicable to area drains, the applicant requests a waiver from the minimum depth of 6' because that depth is excessive for the areas being drained.

- All grates and manhole covers shall conform to MADPW specifications, cause no hazard to bicycles, and the vanes of any cascade grates shall be perpendicular to the road

  A waiver from this standard is requested because while the grates proposed by the applicant are safe for bicycles, they do not match the cascade or bar grates specified by MADOT. The grates that have been specified were selected because they pass more flow than the standard MADOT cascade grate while remaining bicycle friendly.

ATTACHMENT 1

NRCS WEB SOIL SURVEY REPORT

United States Department of Agriculture

NRCS

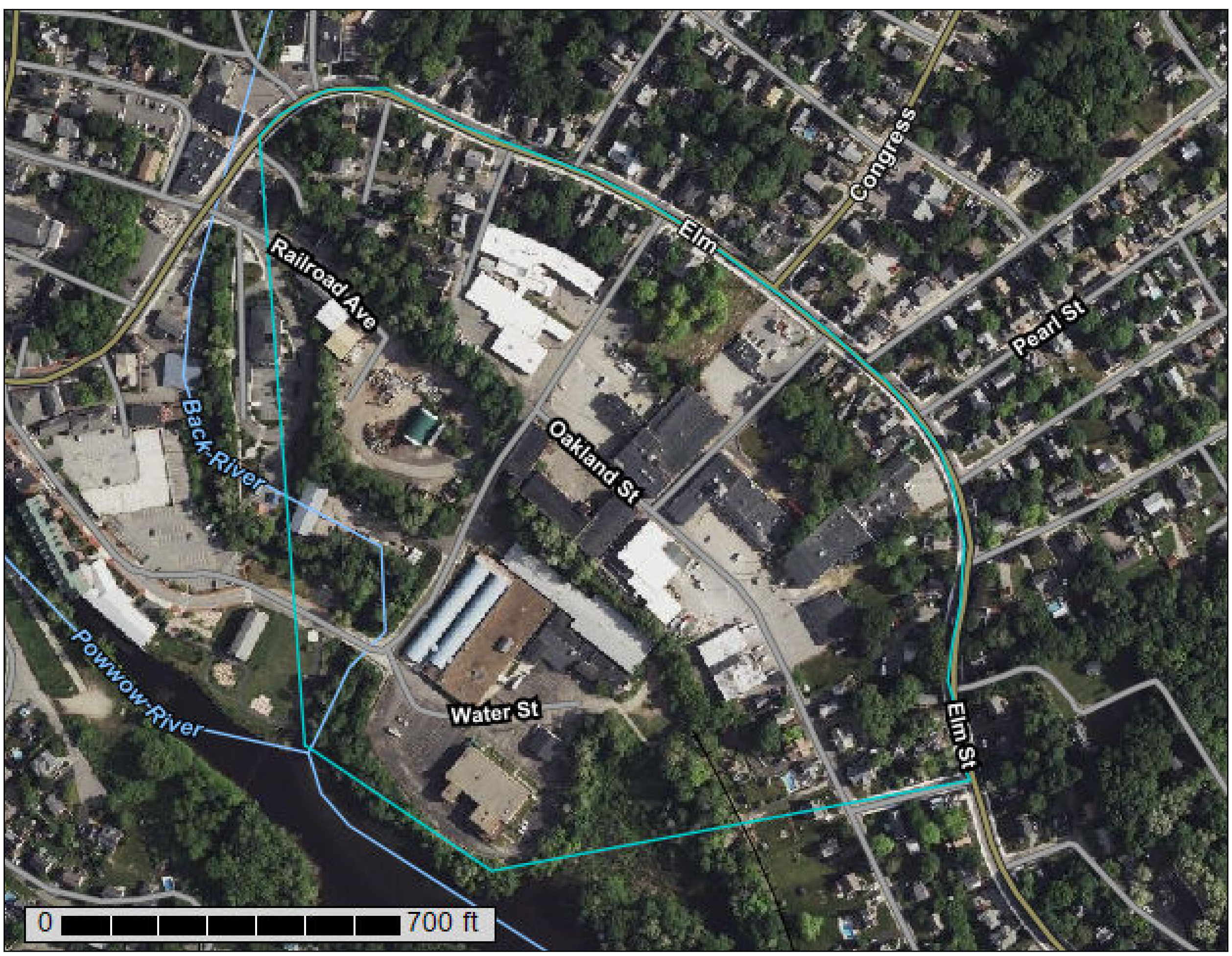
Natural Resources Conservation Service

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

Custom Soil Resource Report for

Essex County, Massachusetts, Northern Part

Area Surrounding 9 Oakland St



September 18, 2025

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	5.4	13.5%
602	Urban land	19.1	48.1%
607	Water, saline	0.5	1.3%
Totals for Area of Interest		**39.8**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Essex County, Massachusetts, Northern Part

12A—Maybid silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: vjhj
Elevation: 0 to 130 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Maybid

Setting

Landform: Depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Soft silty and clayey glaciolacustrine deposits and/or firm silty marine deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 19 inches: silty clay
H3 - 19 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: F144AY020MA - Very Wet Coastal Lake Plain
Hydric soil rating: Yes

Minor Components

Scantic

Percent of map unit: 12 percent
Landform: Depressions

Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs
Hydric soil rating: Yes

230C—Unadilla very fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: vjx1
Elevation: 600 to 1,800 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Unadilla and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Unadilla

Setting

Landform: Lakebeds (relict)
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Soft coarse-silty glaciolacustrine deposits

Typical profile

H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 53 inches: very fine sandy loam
H3 - 53 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: F144AY024NY - Well Drained Eolian Outwash
Hydric soil rating: No

Minor Components

Belgrade
Percent of map unit: 20 percent
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

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

Description of Windsor

Setting
Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile
Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear

Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces

Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

258B—Amostown fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vj2g
Elevation: 0 to 100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Amostown and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amostown

Setting

Landform: Lakebeds, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy glaciofluvial deposits derived from mica schist over hard coarse-loamy glaciolacustrine deposits

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 38 inches: fine sandy loam
H3 - 38 to 60 inches: stratified very fine sand to silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D

Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Pollux

Percent of map unit: 20 percent
Hydric soil rating: No

Walpole variant

Percent of map unit: 10 percent
Landform: Terraces
Hydric soil rating: Yes

602—Urban land

Map Unit Setting

National map unit symbol: vjx3
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Udorthents

Percent of map unit: 10 percent
Hydric soil rating: No

Merrimac

Percent of map unit: 2 percent
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Hydric soil rating: No

Charlton

Percent of map unit: 2 percent
Hydric soil rating: No

Paxton

Percent of map unit: 2 percent
Hydric soil rating: No

607—Water, saline

Map Unit Setting

National map unit symbol: vk29
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water, saline: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Westbrook

Percent of map unit: 5 percent
Landform: Marshes
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

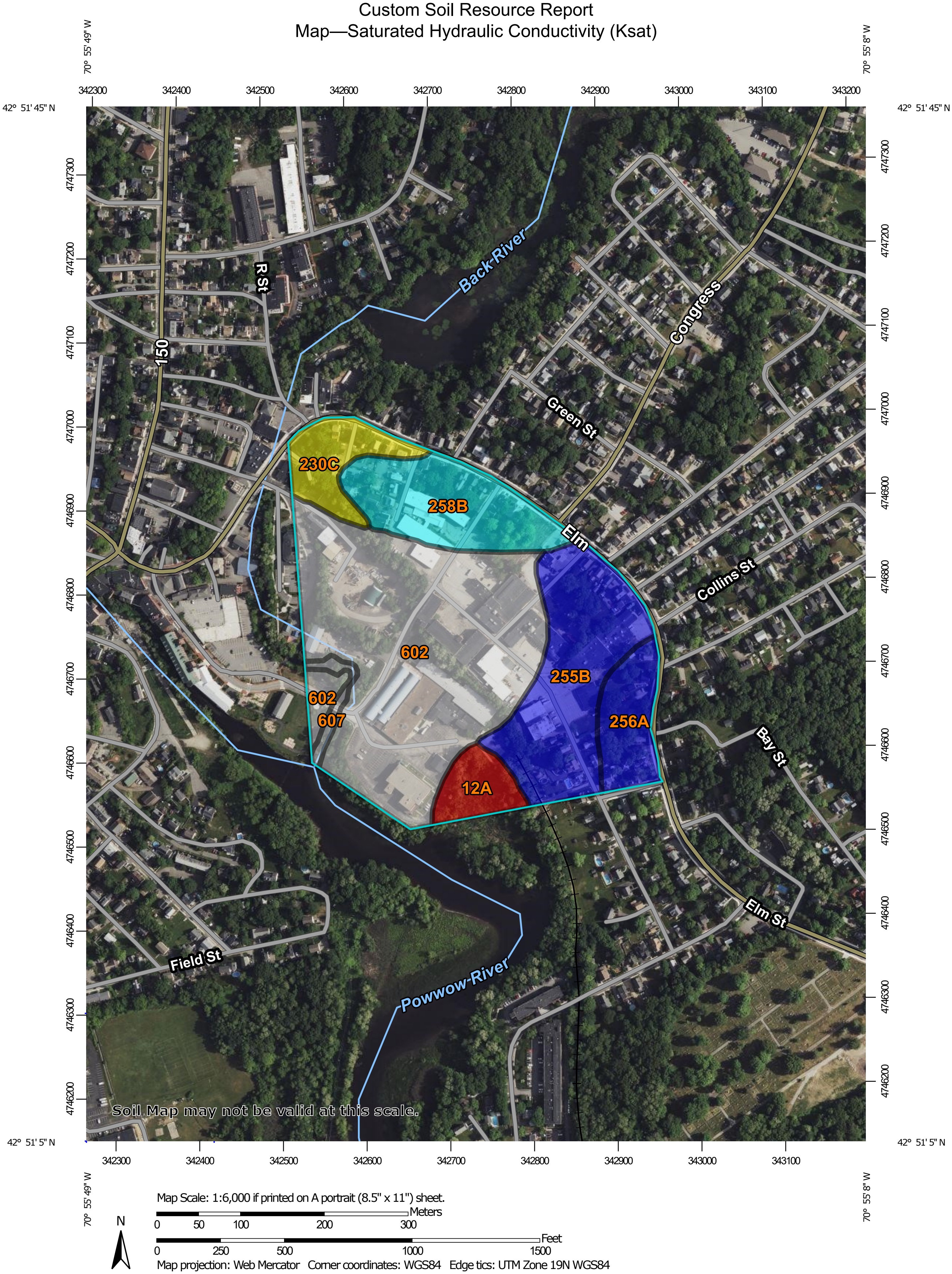
Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 0.9599

> 0.9599 and <= 16.8267

> 16.8267 and <= 18.8583

> 18.8583 and <= 100.0000

Not rated or not available

Soil Rating Lines

<= 0.9599

> 0.9599 and <= 16.8267

> 16.8267 and <= 18.8583

> 18.8583 and <= 100.0000

Not rated or not available

Soil Rating Points

<= 0.9599

> 0.9599 and <= 16.8267

> 16.8267 and <= 18.8583

> 18.8583 and <= 100.0000

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	0.9599	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	16.8267	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	100.0000	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	100.0000	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	18.8583	5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Slowest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 600

Units of Measure: Inches

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Unified Soil Classification (Selected Depth)

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The dominant condition or dominant component representative Unified classification is shown for the user-selected depth range of the soil.

Map—Unified Soil Classification (Selected Depth)

Map Scale: 1:6,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Soil Rating Lines

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Soil Rating Points

- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

MAP INFORMATION

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Table—Unified Soil Classification (Selected Depth)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes		1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes		2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	PT	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	SM	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes		5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Unified Soil Classification (Selected Depth)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Sum)

Top Depth: 0

Bottom Depth: 600

Units of Measure: Inches

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

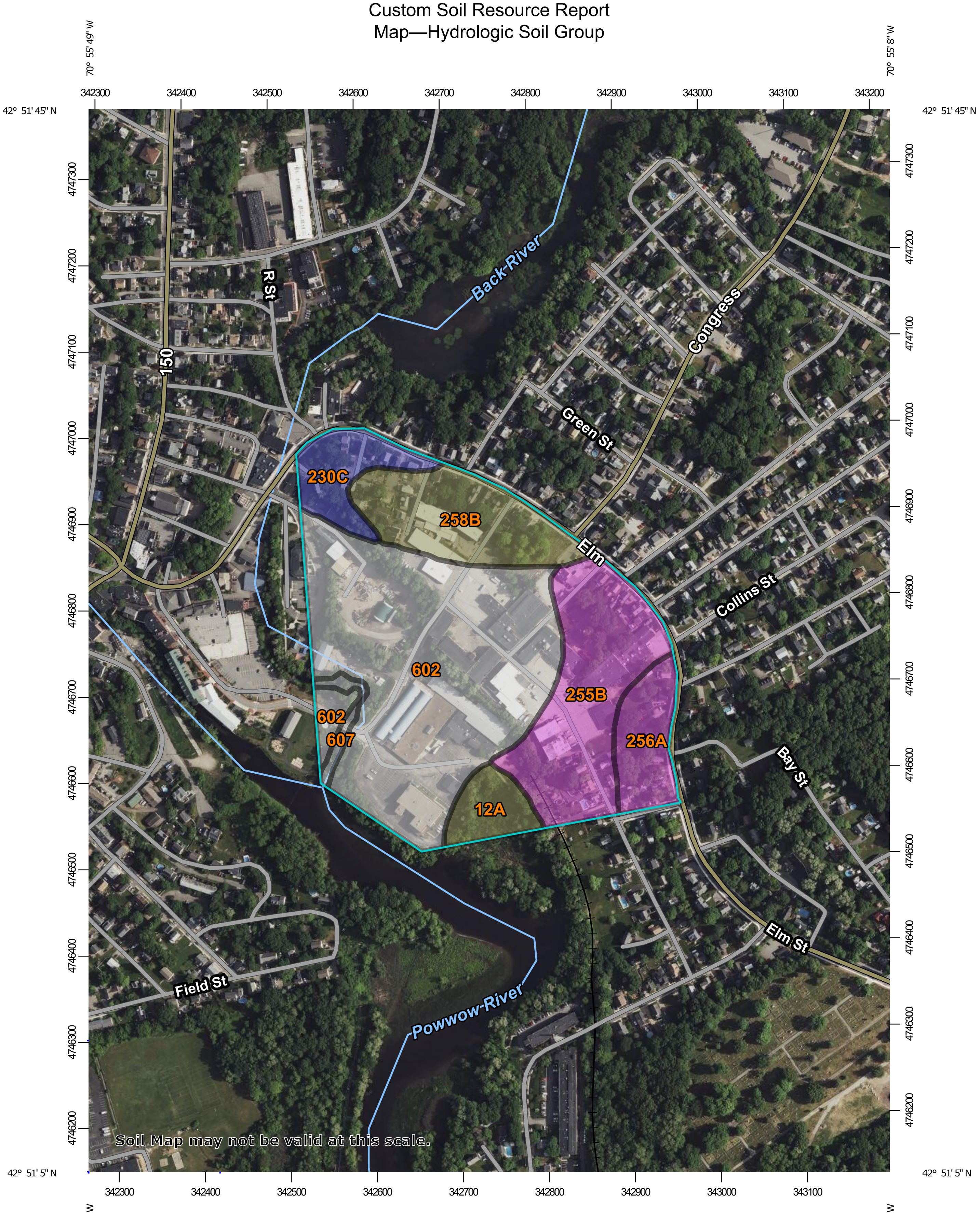
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:6,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

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Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	C/D	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	B	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	C/D	5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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ATTACHMENT 2

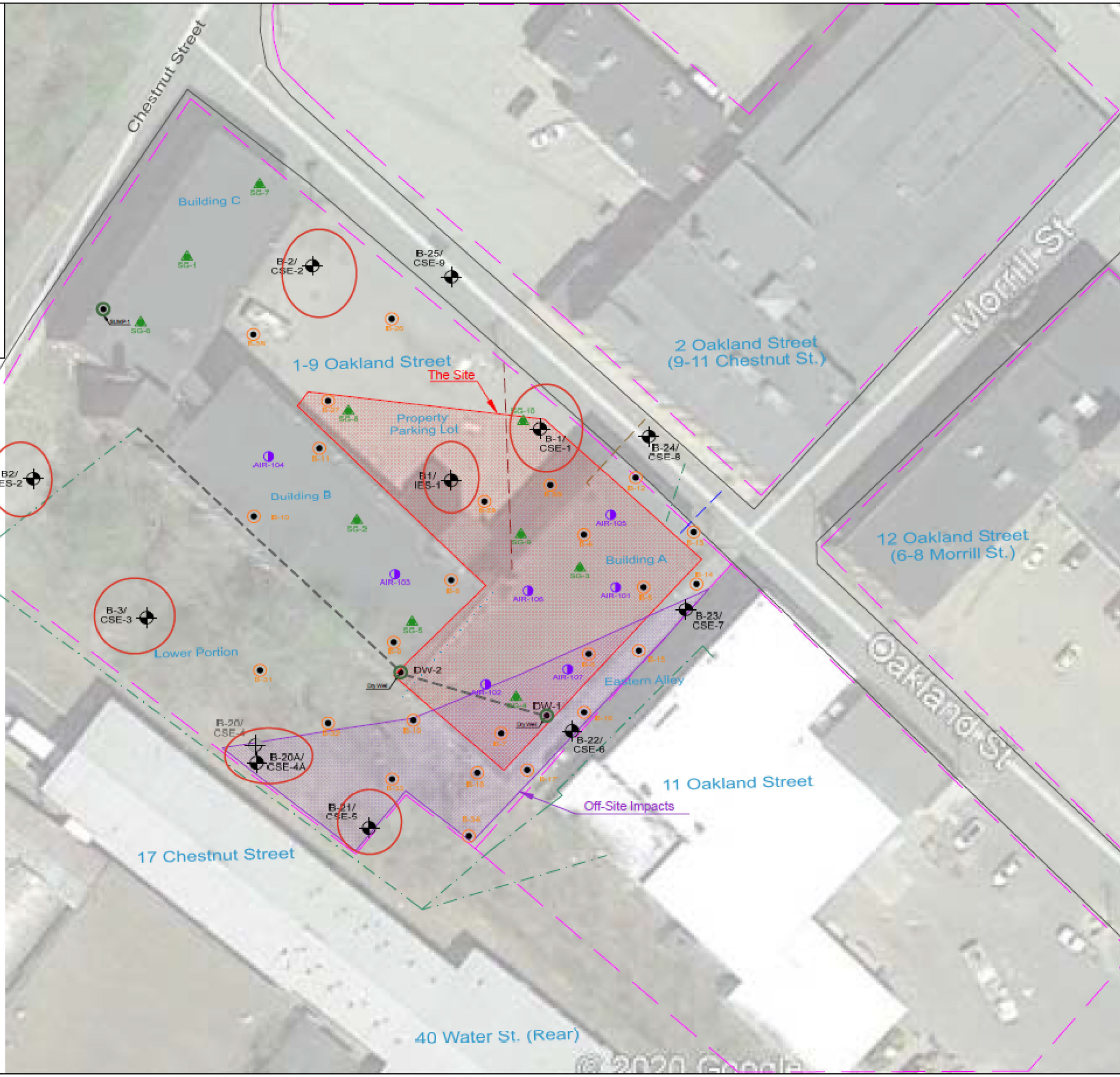
SOIL BORING LOGS AND LOCATIONS BY SOIL EXPLORATION CORP. AND CLEAN SOILS ENVIRONMENTAL, LLC.

LEGEND

B-1/ CSE-1	Soil Boring/Monitoring Well
B-10	Shallow Soil Boring
SG-1	Soil Gas Probe
AIR-101	Indoor Air Sample
	Gas Line
	Water Line
	Sewer Line
	Electric Line
	Parcel Boundary
	Disposal Site Boundary
	Off-Site Impacts

N

1 in = 57.0046 ft



Clean Soils Environmental, Ltd.
33 Estes Street
Ipswich, Massachusetts 01938
(978) 356-1177 Fax: (978) 356-1849
www.cleansoils.com

DATE: 6/14/2022	DRAWN BY: K. McAndrews
PROJECT NUMBER: 2014.52	CHECKED BY: W. Mitchell

SITE MAP

1 – 9 Oakland St, Amesbury, MA
Lat/Long: 42.857164, -70.925222
MassDEP RTN 3-32360

Figure 2

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental
Site: 1 Oakland Street
Amesbury, MA

BORING B-1

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
1		1	12"	0"-2'0"	6-5-5-4	2'0"	Medium dense fine sand, little inorganic silt, little medium to coarse sand
5		2	20"	5'0"-7'0"	4-2-2-3		Loose to medium dense, fine sand and inorganic silt, little medium to coarse sand.
10		3	22"	10'0"-12'0"	6-8-7-8		
15		4	10"	15'0"-17'0"	24-38-31-29	14'0"	
20		5	10"	20'0"-22'0"	11-14-13-15		Very dense to medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
25		6	0"	25'0"-26'0"	52-103		
30		7	12"	30'0"-32'0"	22-28-47-51	30'0"	
35		8	12"	35'0"-36'0"	67-93		Very dense, fine to coarse sand and some inorganic silt.
39							(Continued to Sheet 2)

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

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

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Clean Soils Environmental** **Site: 1 Oakland Street** **Amesbury, MA**	BORING B-1 (continued) PROJECT NO. 14-1246 DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
40		9	12"	40'0"-42'0"	17-18-26-29		
						44'0"	
45							End of boring at 44'0". Water encountered at 36'0". Well set at 43'0".
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace 0 to 10%		CASING	SAMPLE	CORE TYPE
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little 10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some 20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And 35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	Clean Soils Environmental Site: 1 Oakland Street Amesbury, MA	BORING B-2 PROJECT NO. 14-1246 DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
1		1	12"	0"-2'0"	6-7-4-5		Medium dense fine to coarse sand, fine gravel, some inorganic silt.
						3'0"	
5		2	16"	5'0"-7'0"	4-4-5-5		
10		3	22"	10'0"-12'0"	5-6-8-9		Loose to medium dense inorganic silt, clays, fine sand, little medium to coarse sand.
15		4	18"	15'0"-17'0"	6-7-6-10		
20		5	18"	20'0"-22'0"	11-13-15-17	20'0"	
25		6	18"	25'0"-27'0"	25-24-36-39		
30		7	18"	30'0"-32'0"	19-20-26-26		Medium dense to dense to medium dense, fine sand, some inorganic silt, dry to wet.
35		8	18"	35'0"-37'0"	10-10-11-12		
39							(Continued to Sheet 4)

Notes: Hollow Stem Auger Size - 4 1/4"

			CASING	SAMPLE	CORE TYPE
Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace 0 to 10%				
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little 10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some 20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And 35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 4

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Clean Soils Environmental** **Site: 1 Oakland Street** **Amesbury, MA**	BORING B-2 (continued) PROJECT NO. 14-1246 DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
40		9	18"	40'0"-42'0"	8-8-9-14		
						42'0"	
45							End of boring at 42'0". Water encountered at 35'0". Well set at 40'0".
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

				CASING	SAMPLE	CORE TYPE
Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace	0 to 10%				
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little	10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some	20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And	35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 5

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental
Site: 1 Oakland Street
Amesbury, MA

BORING B-3

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 31, 2014
Date Finished: December 31, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	12"	0"-2'0"	4-5-6-10		Medium dense fine to coarse sand, fine gravel, some inorganic silt.
						3'0"	
5		2	16"	5'0"-7'0"	5-6-9-9		
10		3	16"	10'0"-12'0"	5-8-10-9		Medium dense fine sand, little medium sand, little inorganic silt, trace coarse sand.
15		4	18"	15'0"-17'0"	6-7-10-13		
						18'0"	
20		5	6"	20'0"-22'0"	18-25-22-34		Dense, fine to coarse sand, fine to coarse gravel, cobbles, some inorganic silt.
						22'0"	
25							End of boring at 22'0". Water encountered at 13'6". Well set at 20'0".
30							
35							
39							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

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

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 6

Soil Exploration Corp.	Clean Soils Environmental	BORING GP-1
Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	Site: 1 Oakland Street Amesbury, MA	PROJECT NO. 14-1246 DATE: January 5, 2015

Ground Elevation:
Date Started: December 31, 2014
Date Finished: December 31, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
							9" concrete core.
						9"	
1							Fine to coarse sand, fine to coarse gravel, soil gas point installed below concrete slab .
						2'0"	
							End of boring at 2'0".
5							
10							
15							
20							
25							
30							
35							
39							

Notes: Gas Point 1

			CASING	SAMPLE	CORE TYPE
Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace 0 to 10%				
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little 10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some 20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And 35% to 50%	HAMMER FALL (IN)		30"	

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 1 of 8

Project No.	2014.52	Boring No.	**B-4**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM
Lat/Long:	42.857066, -70.924782	Auger Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015
Engineer/Geologist:	Kevin McAndrews		
Boring Location:	Building A Interior		
Drilling Equipment:	Track Mounted Geoprobe		

Monitoring Well No.	**NA**
Completion Depth	8 ft BGS
Rotary Depth	NA
Date Finished	2/23/2015

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1, 2	B-4 (0 - 2')	G	NA	0.5	9:45	Soil Sample "B-4" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3, 4	B-4 (2 - 4')	G	NA	0	9:45	
	4 - 6 ft - fine to medium sands, light brown, dry		5, 6	B-4 (4 - 6')	G	NA	0	9:55	
	6 - 8 ft - fine to medium sands, light brown, dry		7, 8	B-4 (6 - 8')	G	NA	0	9:55	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-5**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1 2	B-5 (0 - 2')	G	NA	1.7	10:20	Soil Sample "B-5" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3 4	B-5 (2 - 4')	G	NA	0.3	10:20	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-5 (4 - 6')	G	NA	0.1	10:30	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-5 (6 - 8')	G	NA	0	10:30	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-5A**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1 2	B-5 (0 - 2')	G	NA	3.2	9:14	
	2 - 4 ft - fine to medium sands, light brown, dry		3 4	B-5 (2 - 4')	G	NA	0.8	9:14	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-5 (4 - 6')	G	NA	0.3	9:19	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-5 (6 - 8')	G	NA	0.3	9:19	Soil Sample "B-5 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page

Project No.	2014.52	Boring No.	**B-6**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1 2	B-6 (0 - 2')	G	NA	6.2	10:50	Soil Sample "B-6" collected for VOCs
	2 - 4 ft - fine to medium sands, staining, light brown, dry		3 4	B-6 (2 - 4')	G	NA	5.3	10:50	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-6 (4 - 6')	G	NA	0.1	10:55	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-6 (6 - 8')	G	NA	0.1	10:55	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES: PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-7**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

SAMPLES — CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1 2	B-7 (0 - 2')	G	NA	2.1	11:20	Soil Sample "B-7" collected for VOCs
	2 - 4 ft - fine to medium sands, staining, light brown, dry		3 4	B-7 (2 - 4')	G	NA	0.3	11:20	
	4 - 6 ft - fine to medium sands, staining, light brown, dry		5 6	B-7 (4 - 6')	G	NA	0.4	11:25	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-7 (6 - 8')	G	NA	0	11:25	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-7A**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to med sands, black staining, light brown, dry		1 2	B-7 (0 - 2')	G	NA	3.9	9:44	
	2 - 4 ft - fine to med sands, black staining, light brown, dry		3 4	B-7 (2 - 4')	G	NA	3.2	9:44	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-7 (4 - 6')	G	NA	2.3	9:48	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-7 (6 - 8')	G	NA	0.3	9:48	Soil Sample "B-7 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-8**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1 2	B-8 (0 - 2')	G	NA	0	12:15	Soil Sample "B-8" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3 4	B-8 (2 - 4')	G	NA	0	12:15	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-8 (4 - 6')	G	NA	0	12:25	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-8 (6 - 8')	G	NA	0	12:25	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page

Project No.	2014.52	Boring No.	**B-9**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

SAMPLES — CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1 2	B-9 (0 - 2')	G	NA	0	12:40	Soil Sample "B-9" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3 4	B-9 (2 - 4')	G	NA	0	12:40	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-9 (4 - 6')	G	NA	0	12:50	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-9 (6 - 8')	G	NA	0	12:50	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES: PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-10**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

SAMPLES | CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1 2	B-10 (0 - 2')	G	NA	0	12:55	Soil Sample "B-10" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3 4	B-10 (2 - 4')	G	NA	0	12:55	
	4 - 6 ft - fine to medium sands, light brown, dry		5 6	B-10 (4 - 6')	G	NA	0	13:05	
	6 - 8 ft - fine to medium sands, light brown, dry		7 8	B-10 (6 - 8')	G	NA	0	13:05	
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-11**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

SAMPLES — CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1, 2	B-11 (0 - 2')	G	NA	0	13:20	Soil Sample "B-11" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3, 4	B-11 (2 - 4')	G	NA	0	13:20	
	4 - 6 ft - fine to medium sands, light brown, dry		5, 6	B-11 (4 - 6')	G	NA	0	13:30	
	6 - 8 ft - fine to medium sands, light brown, dry		7, 8	B-11 (6 - 8')	G	NA	0	13:30	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-12**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, silty sands, light brown, dry		1, 2	B-12 (0 - 2')	G	NA	0.8	12:20	Soil Sample "B-12 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3, 4	B-12 (2 - 4')	G	NA	0.7	12:20	
	4 - 6 ft - fine sands, light brown, dry		5, 6	B-12 (4 - 6')	G	NA	0.8	12:25	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7, 8	B-12 (6 - 8')	G	NA	0.9	12:25	Soil Sample "B-12 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 4 of 12

Project No.	2014.52	Boring No.	**B-13**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, silty sands, light brown, dry		1, 2	B-13 (0 - 2')	G	NA	0.8	12:30	Soil Sample "B-13 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, silts, gravels, light brown, dry		3, 4	B-13 (2 - 4')	G	NA	1	12:30	
	4 - 6 ft - fine sands, silts, gravels, light brown, dry		5, 6	B-13 (4 - 6')	G	NA	0.8	12:35	
	6 - 8 ft - fine sands, silts, gravels, light brown, dry		7, 8	B-13 (6 - 8')	G	NA	1	12:35	Soil Sample "B-13 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-14**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - asphalt, silty sands, light brown, dry		1 2	B-14 (0 - 2')	G	NA	1.4	12:50	Soil Sample "B-14 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3 4	B-14 (2 - 4')	G	NA	0.8	12:50	
	4 - 6 ft - fine sands, silts, gravels, light brown, dry		5 6	B-14 (4 - 6')	G	NA	1.1	12:55	
	6 - 8 ft - fine sands, silty clay, gravels, light brown, dry		7 8	B-14 (6 - 8')	G	NA	1	12:55	Soil Sample "B-14 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9 10 11 12 13 14 15 16 17 18 19 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-15**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - asphalt, silty sands, light brown, dry		1, 2	B-15 (0 - 2')	G	NA	1.1	13:00	Soil Sample "B-15 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3, 4	B-15 (2 - 4')	G	NA	1.7	13:00	
	4 - 6 ft - fine sands, silts, gravels, light brown to orange, dry		5, 6	B-15 (4 - 6')	G	NA	1	13:05	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7, 8	B-15 (6 - 8')	G	NA	0.7	13:05	Soil Sample "B-15 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-16**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

SAMPLES

CSE Personnel: **G - Kevin McAndrews**

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - asphalt, silty sands, dark brown, staining, dry		1, 2	B-16 (0 - 2')	G	NA	1.6	13:10	Soil Sample "B-16 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, med brown, staining, dry		3, 4	B-16 (2 - 4')	G	NA	4.9	13:10	Soil Sample "B-16 (2 - 4')" collected for VOCs
	4 - 6 ft - fine to med sands, minor silt, light brown, dry		5, 6	B-16 (4 - 6')	G	NA	2.4	13:15	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7, 8	B-16 (6 - 8')	G	NA	2.6	13:15	Soil Sample "B-16 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-17**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - asphalt, med to fine sands, dark brown, dry		1, 2	B-17 (0 - 2')	G	NA	0.5	13:20	Soil Sample "B-17 (0 - 2')" collected for VOCs
	2 - 4 ft - silt w/ brick frags, dark brown, dry		3, 4	B-17 (2 - 4')	G	NA	1.4	13:20	
	4 - 6 ft - fine to med sands, med brown, dry		5, 6	B-17 (4 - 6')	G	NA	0.4	13:25	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7, 8	B-17 (6 - 8')	G	NA	0.2	13:25	Soil Sample "B-17 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-18**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Hammer Drill				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - organic loam, dark brown, dry		1, 2	B-18 (0 - 2')	G	NA	0.5	10:45	Soil Sample "B-18 (0 - 2')" collected for VOCs
	2 - 4 ft - fine to med sands, light brown, dry		3, 4	B-18 (2 - 4')	G	NA	0.6	10:50	
	4 - 6 ft - fine to med sands, light brown, dry		5, 6	B-18 (4 - 6')	G	NA	0.4	10:55	
	6 - 8 ft - fine to med sands, light brown, dry		7, 8	B-18 (6 - 8')	G	NA	0.6	11:00	Soil Sample "B-18 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 10 of 12

Project No.	2014.52	Boring No.	**B-19**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Hammer Drill				

CSE Personnel: G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - organic loam, dark brown, dry		1, 2	B-19 (0 - 2')	G	NA	1	11:20	Soil Sample "B-19 (0 - 2')" collected for VOCs
	2 - 4 ft - fine to med sands, light brown, dry		3, 4	B-19 (2 - 4')	G	NA	0.9	11:25	
	4 - 6 ft - fine to med sands, light brown, dry		5, 6	B-19 (4 - 6')	G	NA	1	11:30	
	6 - 8 ft - fine to med sands, light brown, dry		7, 8	B-19 (6 - 8')	G	NA	0.2	11:35	Soil Sample "B-19 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Project No.	2014.52	Boring No.	**B-20**	Monitoring Well No.	**CSE-4**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	20 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 4 ft - fine to coarse sand, minor silt, staining, dark brown, dry		1–4	B-20 (0 - 4')	G	NA	0.3	14:30	
	4 - 8 ft - fine to medium sand, minor silt, staining, med brown, dry		5–8	B-20 (4 - 8')	G	NA	1	14:35	
	8 - 12 ft - fine to medium sand, light brown, moist	▼	9–12	B-20 (8 - 12')	G	NA	0.4	14:40	
	12 - 16 ft - fine to medium sand, med brown, wet		13–16	B-20 (12 - 16')	G	NA	0.5	14:45	
	16 - 20 ft - fine to medium sand, light to med brown, wet		17–20	B-20 (16 - 20')	G	NA	1.7	14:50	Soil Sample "B-20 (16 - 20')" collected for VOCs
	Boring Terminated at 20 ft BGS								

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log

Project No.	2014.52	Boring No.	**B-21**	Monitoring Well No.	**CSE-5**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	20 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 4 ft - fine to coarse sand, minor silt, staining, dark brown, dry		1 2 3 4	B-21 (0 - 4')	G	NA	1.2	15:30	
	4 - 8 ft - fine to medium sand, minor silt, staining, dark brown, dry		5 6 7 8	B-21 (4 - 8')	G	NA	15.8	15:35	
	8 - 12 ft - fine to medium sand, light brown, moist	▼ (10 ft)	9 10 11 12	B-21 (8 - 12')	G	NA	2.4	15:40	
	12 - 16 ft - fine to medium sand, med brown, wet		13 14 15 16	B-21 (12 - 16')	G	NA	1.8	15:45	Soil Sample "B-21 (12 - 16')" collected for VOCs
	16 - 20 ft - fine to medium sand, light to med brown, wet		17 18 19 20	B-21 (16 - 20')	G	NA	1.4	15:50	
	Boring Terminated at 20 ft BGS								

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

TEST BORING LOG

SHEET 1

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Clean Soils Environmental** **Site: 1 Oakland Street** **Amesbury, MA**	BORING B-22 PROJECT NO. 15-0622 DATE: June 10, 2015

Ground Elevation:
Date Started: June 10, 2015
Date Finished: June 10, 2015
Driller: G
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6”	Strata	Visual Identification of Soil and / or Rock Sample
						3”	Asphalt .
1		1	13”	1’0”-3’0”	5-5-6-5	3’0”	Loose to medium dense fine sand, little inorganic silt, little medium to coarse sand, brick frags .
5		2	18”	5’0”-7’0”	1-2-6-8		Loose dense, fine sand and inorganic silt, fine to coarse gravel, cobbles
						9’0”	
10		3	24”	10’0”-12’0”	12-15-24-21		
15		4	18”	15’0”-17’0”	13-18-20-23		
20		5	16”	20’0”-22’0”	14-22-25-26		Medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
25		6	8”	25’0”-27’0”	19-24-27-30		
30		7	16”	30’0”-32’0”	21-25-28-32	30’0”	
35		8	2”	35’0”-37’0”	100/2”		Very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, dry to wet.
39							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace	0 to 10%		CASING	SAMPLE	CORE TYPE
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little	10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some	20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And	35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Clean Soils Environmental** **Site: 1 Oakland Street** **Amesbury, MA**	BORING B-22 (continued) PROJECT NO. 15-0622 DATE: June 10, 2015

Ground Elevation:
Date Started: June 10, 2015
Date Finished: June 10, 2015
Driller: G
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6”	Strata	Visual Identification of Soil and / or Rock Sample
40		9	0”	40’0”-42’0”	21-24-36-41		
						44’0”	
45							End of boring at 44’0”. Water encountered at 36’0”. Well set at 43’0”.
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace 0 to 10%		CASING	SAMPLE	CORE TYPE
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little 10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some 20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And 35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Clean Soils Environmental** **Site: 1 Oakland Street** **Amesbury, MA**	BORING B-23 PROJECT NO. 15-0622 DATE: June 10, 2015

Ground Elevation:	
Date Started:	June 10, 2015
Date Finished:	June 10, 2015
Driller:	G
Soil Engineer/Geologist:	KM

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
1		1	12"	1'0"-3'0"	4-5-5-6	3'0"	Medium dense fine sand, little inorganic silt, little medium to coarse sand
5		2	17"	5'0"-7'0"	8-14-20-22		Medium dense, fine sand and inorganic silt, fine to coarse gravel, cobbles
						9'0"	
10		3	16"	10'0"-12'0"	11-20-22-27		
15		4	15"	15'0"-17'0"	24-24-27-28		Medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
20		5	17"	20'0"-22'0"	23-21-22-22	20'0"	
25		6	9"	25'0"-27'0"	47-75/4"		
30		7	0"	30'0"-32'0"	75/4"		Very dense, fine to coarse sand, inorganic silt, dry to wet.
35		8	0"	35'0"-37'0"	100/3"		
							End of boring at 36'0". Water encountered at 34'0". Well set at 35'0".

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace 0 to 10%		CASING	SAMPLE	CORE TYPE
10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Little 10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff	Some 20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And 35% to 50%	HAMMER FALL (IN)		30"	

CLEAN SOILS ENVIRONMENTAL LTD

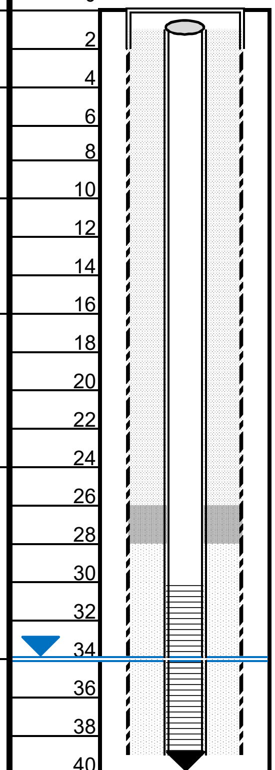
SOIL BORING LOG

ADDRESS:	1 - 9 Oakland St. Amesbury, MA	BORING/WELL ID:	**B-24 / CSE-8**
INSTALLED BY:	Technical Drilling Services	DATE:	7/6/2017
ENGINEER/GEOLOGIST:	Kevin McAndrews	PROJECT #:	2014.52
BORING LOCATION:	Oakland Street Roadway	TOTAL DEPTH: **40'**	WELL DIAMETER: 2"
DRILLING METHOD:	Hollow Stem Auger	WATER TABLE: **34'**	CONSTRUCTION: PVC

DEPTH (ft.)	SAMPLE ID	BLOWS PER 6"	PID (ppm)	LAB	DESCRIPTION
0 - 5'					No Recovery, Utility Clearance
5 - 7'	A	3,4,6,6	0.1		**SM**: fine sands w/ silt, olive gray to light brown, dry
10 - 12'	B	8,10,19,25	0.1		**SM**: fine sands w/ silty interbeds, tan to light brown, dry
15 - 17'	C	5,12,13,15	0		**SM-GM**: fine to crs sand, silty gravels, light to med brown, dry
20 - 22'	D	10,15,16,22	0.1		
25 - 27'	E	23,39,44,120	0.2		**SM-SC**: silty sand with clay interbeds, trace gravel, light to med brown, dry
30 - 32'	F	20,42,55,120	0		
35 - 37'	G	44,40,120	0.2	X	**SM-SC**: silty sand with clay interbeds, trace gravel, light to med brown, wet
					Boring Terminated at 40'

DEPTH BGS (ft): 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

DIAGRAM



WELL CONSTRUCTION

Roadbox: YES

Native Fill/Grout: 0 - 26'

Bentonite Seal: 26 - 28'

PVC Riser: 0 - 30'

Sand Pack: 28 - 40'

Screen: 30 - 40'

Well Cap: @ 40'

Obv. Contam? N

REMARKS: Soils consist mainly of native glacial tills and glaciofluvial deposits
Bedrock refusal not encountered
No significant contamaintion observed

SOIL BORING LOG

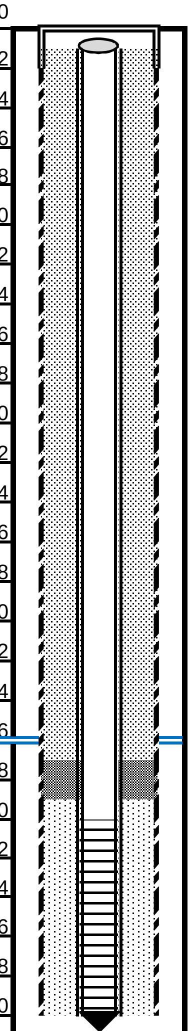
CLEAN SOILS ENVIRONMENTAL LTD

ADDRESS:	1 - 9 Oakland St. Amesbury, MA	BORING/WELL ID:	**B-25 / CSE-9**
INSTALLED BY:	Technical Drilling Services	DATE:	8/28/2017
ENGINEER/GEOLOGIST:	Kevin McAndrews	PROJECT #:	2014.52
BORING LOCATION:	Oakland Street Roadway	TOTAL DEPTH: **50'**	WELL DIAMETER: 2"
DRILLING METHOD:	Hollow Stem Auger	WATER TABLE: **36'**	CONSTRUCTION: PVC

DEPTH (ft.)	SAMPLE ID	BLOWS PER 6"	PID (ppm)	LAB	DESCRIPTION
0 - 5'					No Recovery, Utility Clearance
5 - 7'	A	2,3,4,5	0.1		**ML**: silty, fine sands, trace clay, light to olive gray, dry
10 - 12'	B	2,4,5,6	0.1		
15 - 17'	C	2,4,5,7	0		**ML:** silty, fine sands, trace clay, light brown, dry
20 - 22'	D	3,6,7,10	0		
25 - 27'	E	9,23,10,13	0		**SM**: fine to med sands, light brown, dry
30 - 32'	F	22,26,30,34	0		**GW**: fine to med sand, gravels, light to med brown, dry
35 - 37'	G	20,17,22,27	0		**SM**: fine sand, silt, med brown, moist
40 - 42'	H	10,10,14,16	1.5	**X**	**ML:** silty, fine sands, trace clay, olive gray, moist
45 - 47'	I	9,13,22,17	0.3		
					Boring Terminated at 50'

DEPTH BGS (ft): 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

DIAGRAM



WELL CONSTRUCTION

Roadbox: YES

Native Fill/Grout: 0 - 37'

Bentonite Seal: 37 - 39'

PVC Riser: 0 - 40'

Sand Pack: 39 - 50'

Screen: 40 - 50'

Well Cap: @ 50'

Obv. Contam? N

REMARKS: Soils consist mainly of native glacial tills and glaciofluvial deposits
Bedrock refusal not encountered
No significant contamaintion observed

SOIL SUITABILITY INFILTRATION TEST

DOUBLE RING INFILTROMETER

AMESBURY, MASSACHUSETTS

9 Oakland Street Amesbury, Massachusetts

Double Ring Infiltrometer	Infiltration Test TP26-1	Infiltration Test TP26-2
Depth of test:	48”	48”
Start Time (3”)	0 minutes	0 minutes
Time at 0”	18:40minutes	20:15 minutes
Average rate of infiltration (seconds per inch)	6.22 minutes per inch 9.6 inches per hour	6.75 minutes per inch 8.9inches per hour

SOIL SUITABILITY INFILTRATION TEST

DOUBLE RING INFILTROMETER

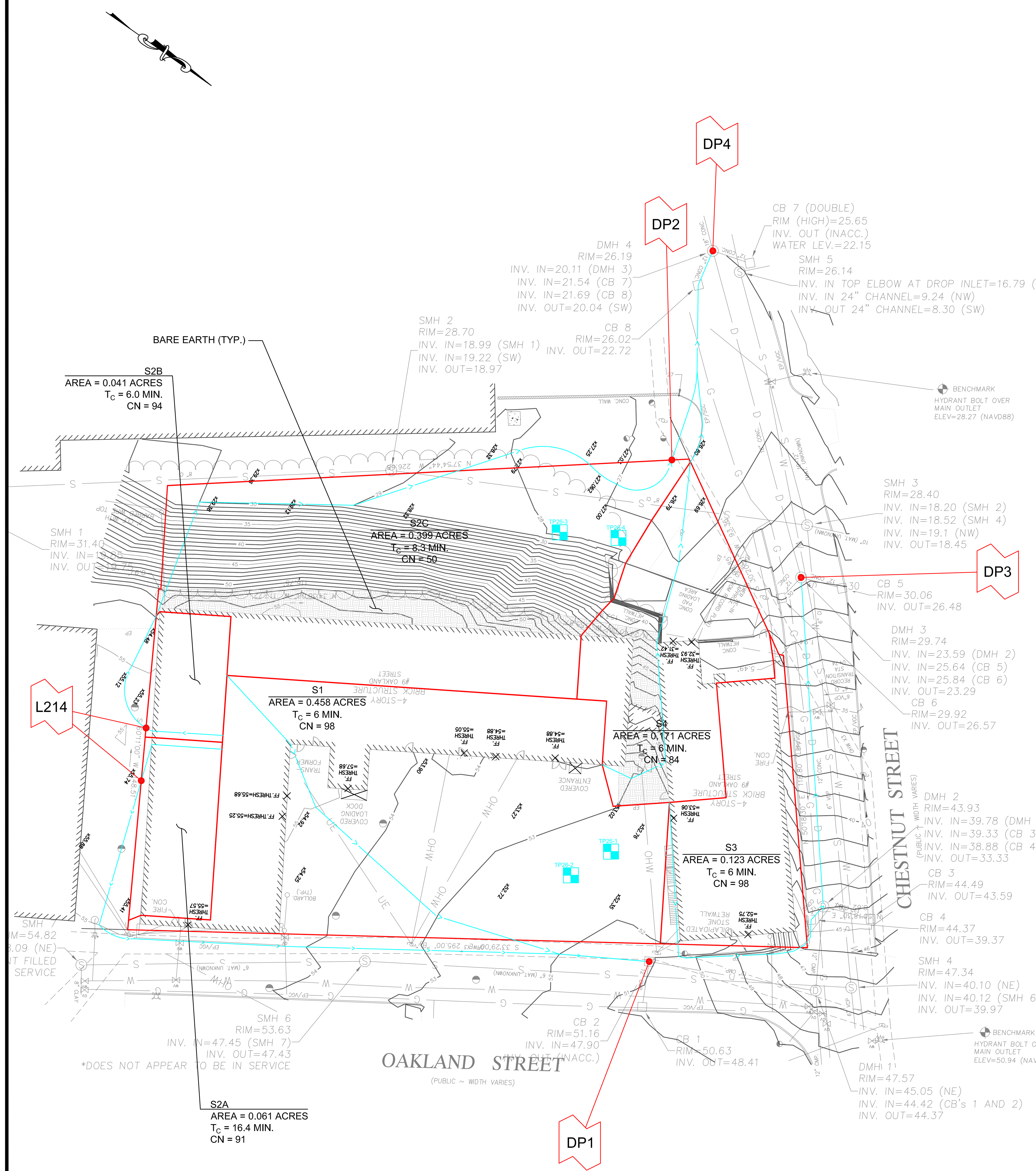
AMESBURY, MASSACHUSETTS

9 Oakland Street, Amesbury, Massachusetts

Double Ring Infiltrometer	Infiltration Test-TP26-3	Infiltration Test-TP26-4
Depth of test:	60”	60”
Start Time (3”)	0 minutes	0 minutes
Time at 0”	3:20 minutes	3:30 minutes
Average rate of infiltration (seconds per inch)	1.11 minutes per inch 54 inches per hour	1.17 minutes per inch 51 inches per hour

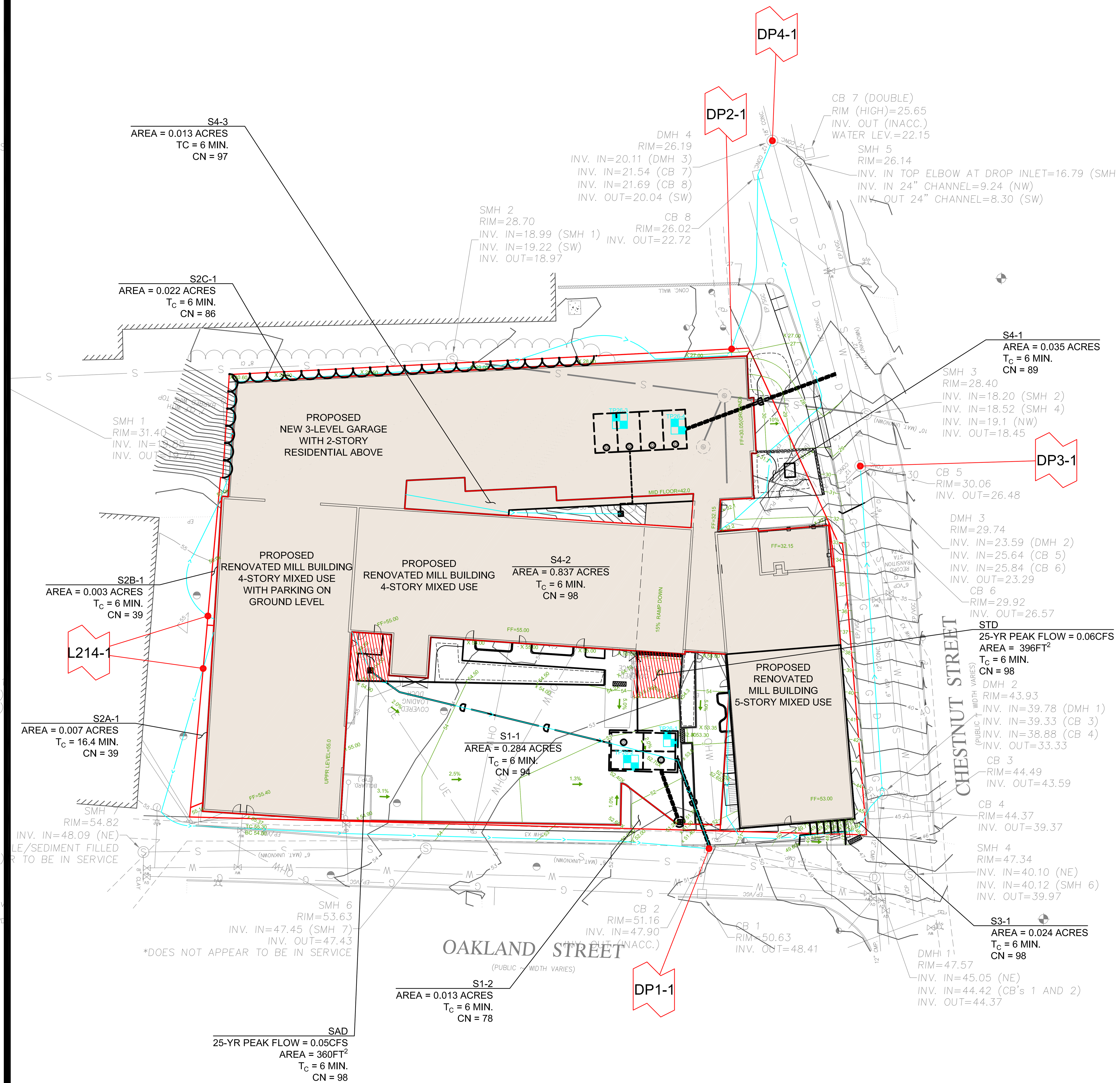
ATTACHMENT 3

PRE- & POST DEVELOPMENT DRAINAGE AREAS



PRE-DEVELOPMENT

1" = 30'



POST-DEVELOPMENT

1" = 30'

NORTH

MEI

MILLENNIUM ENGINEERING, INC.
ENGINEERING AND LAND SURVEYING
62 ELM ST. SALISBURY, MA 01952
(978) 463-8980

OWNER:

9 OAKLAND STREET
AMESBURY LLC
PO BOX 999
DANVILLE NH 03819

PROJECT TEAM

9 OAKLAND ST
OAK STREET LOFTS
4-STORY BUILDING WITH GARAGE
9 OAKLAND STREET
AMESBURY, MA

PROJECT INFO

REV	DESCRIPTION	DATE
2	PEER REVIEW	5/4/2026
1	PEER REVIEW	3/30/2026

COMMONWEALTH OF MASSACHUSETTS
STEPHEN B. SAWYER
CIVIL
No. 00000
REGISTERED
PROFESSIONAL ENGINEER

STAMP:

PRE-, POST-, DRAINAGE PLAN

SHEET NAME:

1 OF 1

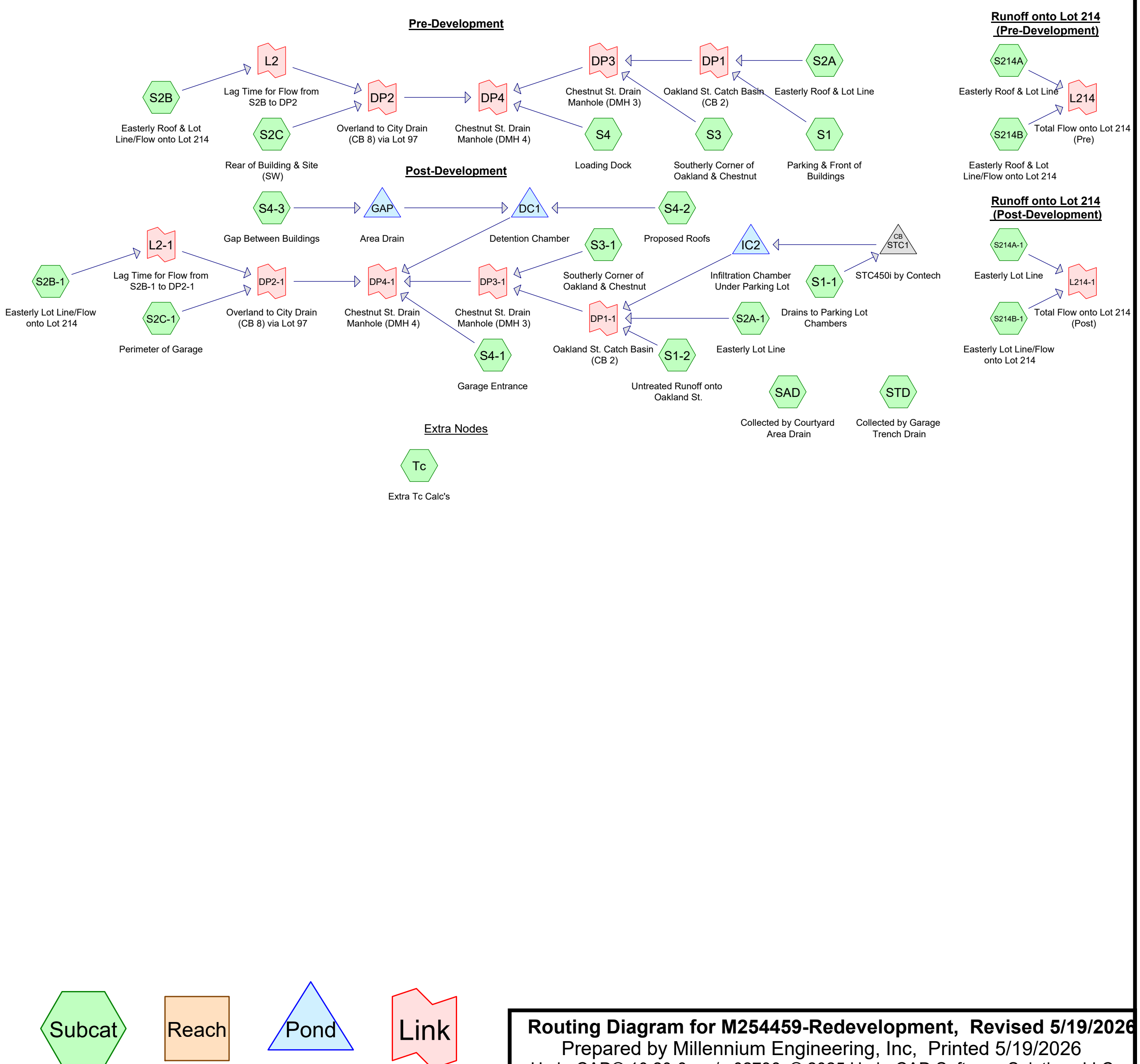
SHT NO:

DR BY: SBS
CHK BY: AM
PROJ NO: M254459
DATE: SEPT. 23, 2025
SCALE: AS NOTED

E:\sdskproj-2025\M254459\DWG\M254459-D rev2 5-4-2026.dwg

ATTACHMENT 4

HYDROCAD HYDROLOGY PRINTOUT



Routing Diagram for M254459-Redevelopment, Revised 5/19/2026
Prepared by Millennium Engineering, Inc, Printed 5/19/2026
HydroCAD® 10.20-8a s/n 02736 © 2025 HydroCAD Software Solutions LLC

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Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 440 MA Amesbury Essex Co
3/27/2026 Revision:
1) Revised per peer review comments.
2) Lag times used by link nodes were computed using the Node named "Extra Tc Calc's"
3/31/2026:
Updated Area of S1-1 and S3-1 to match latest architectural drawings
5/4/2026 Revision:
1) Revised Node CDS1 into STC1
2) Created duplicate nodes and new link nodes to accurately model the flow of runoff onto lot 214.
5/19/2026
1) Added additional subcatchment nodes to verify flow capacity of the courtyard area drain and the grage ramp trench drain.

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.24	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	5.12	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	6.30	2
4	100-Year	NOAA10 24-hr	D	Default	24.00	1	8.11	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.130	39	>75% Grass cover, Good, HSG A (S1-1, S1-2, S214A, S214A-1, S214B, S214B-1, S2A, S2A-1, S2B, S2B-1, S2C, S2C-1, S3, S4, S4-1)
0.075	77	Fallow, bare soil, HSG A (S2C, S4)
0.059	96	Gravel surface, HSG A (S1-1, S2C-1, S3-1, S4-1, S4-3)
0.679	98	Paved parking, HSG A (S1, S1-1, S1-2, S2C, S3, S3-1, S4, S4-1, SAD, STD)
1.168	98	Roofs, HSG A (S1, S3, S4, S4-2)
0.304	98	Unconnected roofs, HSG A (S214A, S214B, S2A, S2B, S2C, S4-3)
0.234	30	Woods, Good, HSG A (S2C, S4)
2.649	**88**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	Tc	0.00	0.00	70.0	0.0501	0.025	0.00	12.00	0.00	Extra Tc Calc's
2	Tc	0.00	0.00	33.0	0.1391	0.025	0.00	12.00	0.00	Extra Tc Calc's
3	Tc	0.00	0.00	139.0	0.0701	0.017	0.00	12.00	0.00	Extra Tc Calc's
4	Tc	0.00	0.00	9.0	0.0811	0.017	0.00	12.00	0.00	Extra Tc Calc's
5	Tc	0.00	0.00	143.0	0.0222	0.017	0.00	18.00	0.00	Extra Tc Calc's
6	DC1	23.01	22.66	69.4	0.0050	0.013	0.00	12.00	0.00	Detention Chamber
7	GAP	26.00	25.00	22.5	0.0444	0.014	0.00	6.00	0.00	Area Drain
8	GAP	50.43	50.43	5.2	0.0000	0.014	0.00	6.00	0.00	Area Drain
9	GAP	50.50	50.43	3.5	0.0200	0.014	0.00	6.00	0.00	Area Drain
10	IC2	49.00	48.00	53.0	0.0189	0.013	0.00	12.00	0.00	Infiltration Chamber Under Parking Lot
11	STC1	48.90	48.70	22.5	0.0089	0.013	0.00	12.00	0.00	STC450i by Contech

Time span=0.00-30.00 hrs, dt=0.015 hrs, 2001 points x 2
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 S1: Parking & Front of Buildings Runoff Area=19,942 sf 100.00% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=1.50 cfs 0.115 af

Subcatchment S1-1: Drains to Parking Lot Chambers Runoff Area=12,372 sf 87.12% Impervious Runoff Depth=2.58"
Tc=6.0 min CN=94 Runoff=0.86 cfs 0.061 af

Subcatchment S1-2: Untreated Runoff onto Oakland St. Runoff Area=556 sf 65.65% Impervious Runoff Depth=1.30"
Tc=6.0 min CN=78 Runoff=0.02 cfs 0.001 af

Subcatchment S214A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=2.30"
Tc=6.0 min CN=91 Runoff=0.17 cfs 0.012 af

Subcatchment S214A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=2.58"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.13 cfs 0.009 af

Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=2.30"
Flow Length=324' Tc=16.4 min CN=91 Runoff=0.12 cfs 0.012 af

Subcatchment S2A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=324' Tc=16.4 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=2.58"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.13 cfs 0.009 af

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2C: Rear of Building & Site (SW) Runoff Area=17,617 sf 24.44% Impervious Runoff Depth=0.06"
Flow Length=256' Tc=8.3 min UI Adjusted CN=46 Runoff=0.00 cfs 0.002 af

Subcatchment S2C-1: Perimeter of Garage Runoff Area=947 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=279' Tc=6.0 min CN=86 Runoff=0.05 cfs 0.003 af

Subcatchment S3: Southerly Corner of Oakland & Chestnut Runoff Area=5,360 sf 99.74% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=0.40 cfs 0.031 af

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut Runoff Area=1,067 sf 97.94% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment S4: Loading Dock Runoff Area=7,458 sf 63.19% Impervious Runoff Depth=1.57"
Tc=6.0 min CN=82 Runoff=0.34 cfs 0.022 af

Subcatchment S4-1: Garage Entrance Runoff Area=1,510 sf 63.31% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=89 Runoff=0.09 cfs 0.006 af

Subcatchment S4-2: Proposed Roofs Runoff Area=36,464 sf 100.00% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=2.73 cfs 0.210 af

Subcatchment S4-3: Gap Between Buildings Runoff Area=1,495 sf 62.61% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=97 Runoff=0.11 cfs 0.008 af

Subcatchment SAD: Collected by Courtyard Area Drain Runoff Area=360 sf 100.00% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.002 af

Subcatchment STD: Collected by Garage Trench Drain Runoff Area=396 sf 100.00% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.002 af

Subcatchment Tc: Extra Tc Calc's
Runoff=0.00 cfs 0.000 af

Pond DC1: Detention Chamber Peak Elev=24.91' Storage=1,034 cf Inflow=2.84 cfs 0.218 af
Outflow=1.63 cfs 0.218 af

Pond GAP: Area Drain Peak Elev=54.52' Storage=5 cf Inflow=0.11 cfs 0.008 af
Outflow=0.11 cfs 0.008 af

Pond IC2: Infiltration Chamber Under Parking Lot Peak Elev=49.49' Storage=504 cf Inflow=0.86 cfs 0.061 af
Discarded=0.07 cfs 0.049 af Primary=0.48 cfs 0.012 af Outflow=0.55 cfs 0.061 af

Pond STC1: STC450i by Contech Peak Elev=51.30' Inflow=0.86 cfs 0.061 af
Outflow=0.86 cfs 0.061 af

Link DP1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=1.57 cfs 0.126 af
Primary=1.56 cfs 0.126 af

Link DP1-1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=0.49 cfs 0.013 af
Primary=0.49 cfs 0.013 af

Link DP2: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.12 cfs 0.011 af
Primary=0.12 cfs 0.011 af

Link DP2-1: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.05 cfs 0.003 af
Primary=0.05 cfs 0.003 af

Link DP3: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=1.96 cfs 0.157 af
Primary=1.95 cfs 0.157 af

Link DP3-1: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=0.54 cfs 0.019 af
Primary=0.54 cfs 0.019 af

Link DP4: Chestnut St. Drain Manhole (DMH 4) Inflow=2.31 cfs 0.191 af
Primary=2.31 cfs 0.191 af

Link DP4-1: Chestnut St. Drain Manhole (DMH 4) Inflow=2.26 cfs 0.247 af
Primary=2.26 cfs 0.247 af

Link L2: Lag Time for Flow from S2B to DP2 delayed by 14.6 min Inflow=0.13 cfs 0.009 af
Primary=0.12 cfs 0.009 af

Link L2-1: Lag Time for Flow from S2B-1 to DP2-1 delayed by 12.3 min Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L214: Total Flow onto Lot 214 (Pre) Inflow=0.30 cfs 0.021 af
Primary=0.30 cfs 0.021 af

Link L214-1: Total Flow onto Lot 214 (Post) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.649 ac Runoff Volume = 0.512 af Average Runoff Depth = 2.32"
18.81% Pervious = 0.498 ac 81.19% Impervious = 2.151 ac

Summary for Subcatchment S1: Parking & Front of Buildings

"Paved Parking" includes building roofs.

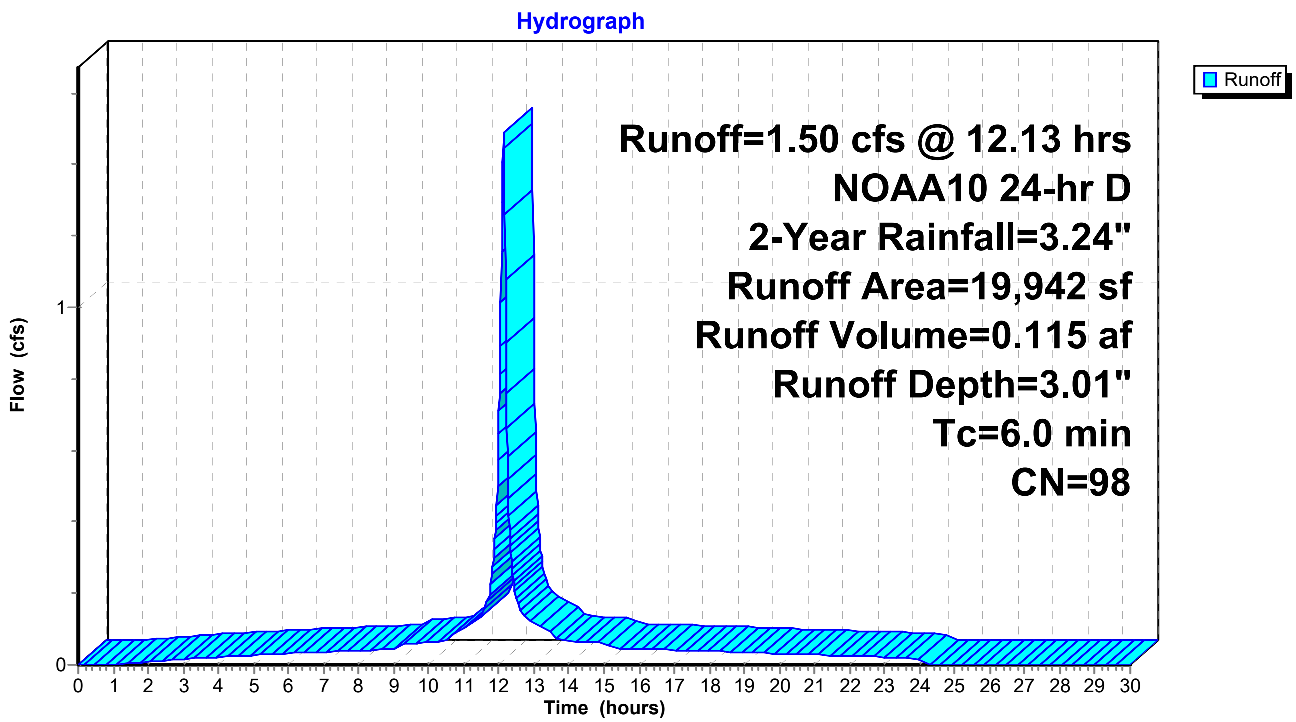
Runoff = 1.50 cfs @ 12.13 hrs, Volume= 0.115 af, Depth= 3.01"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
12,479	98	Paved parking, HSG A
7,463	98	Roofs, HSG A
19,942	98	Weighted Average
19,942		100.00% Impervious Area

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

Subcatchment S1: Parking & Front of Buildings



Summary for Subcatchment S1-1: Drains to Parking Lot Chambers

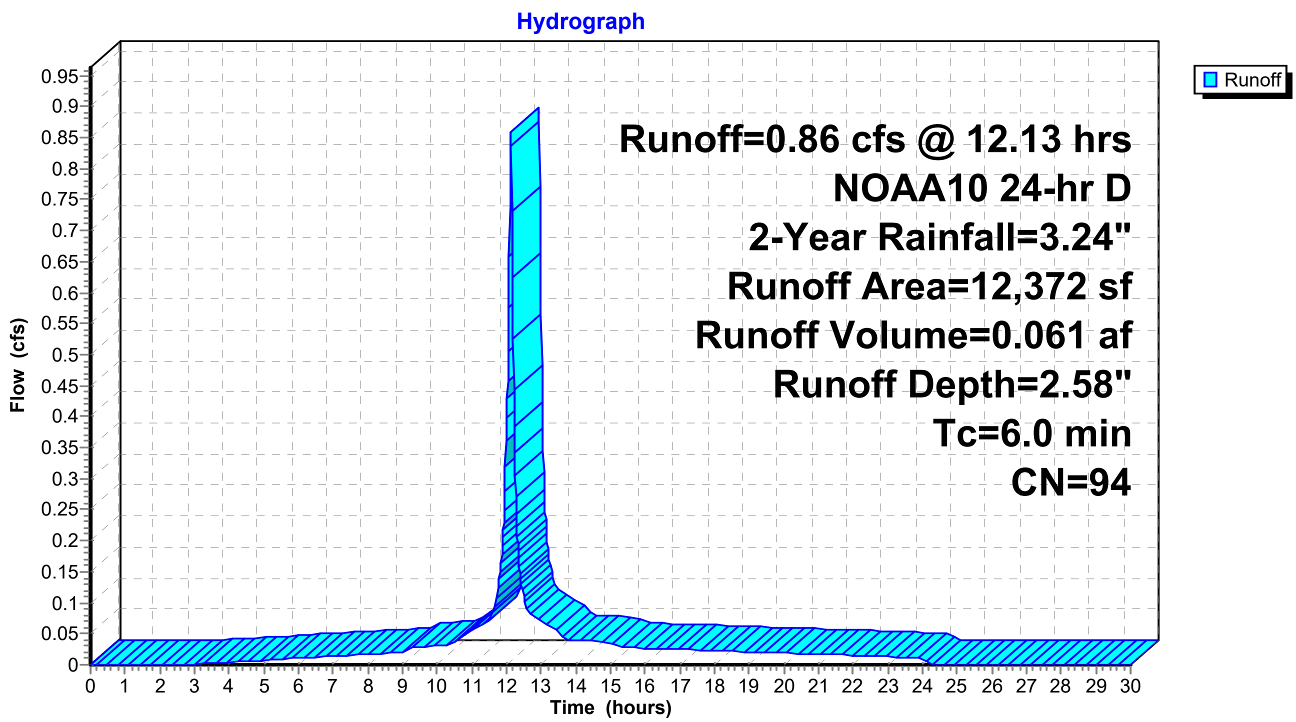
Runoff = 0.86 cfs @ 12.13 hrs, Volume= 0.061 af, Depth= 2.58"
Routed to Pond STC1 : STC450i by Contech

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
717	39	>75% Grass cover, Good, HSG A
876	96	Gravel surface, HSG A
10,779	98	Paved parking, HSG A
12,372	94	Weighted Average
1,593		12.88% Pervious Area
10,779		87.12% Impervious Area

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

Subcatchment S1-1: Drains to Parking Lot Chambers



Summary for Subcatchment S1-2: Untreated Runoff onto Oakland St.

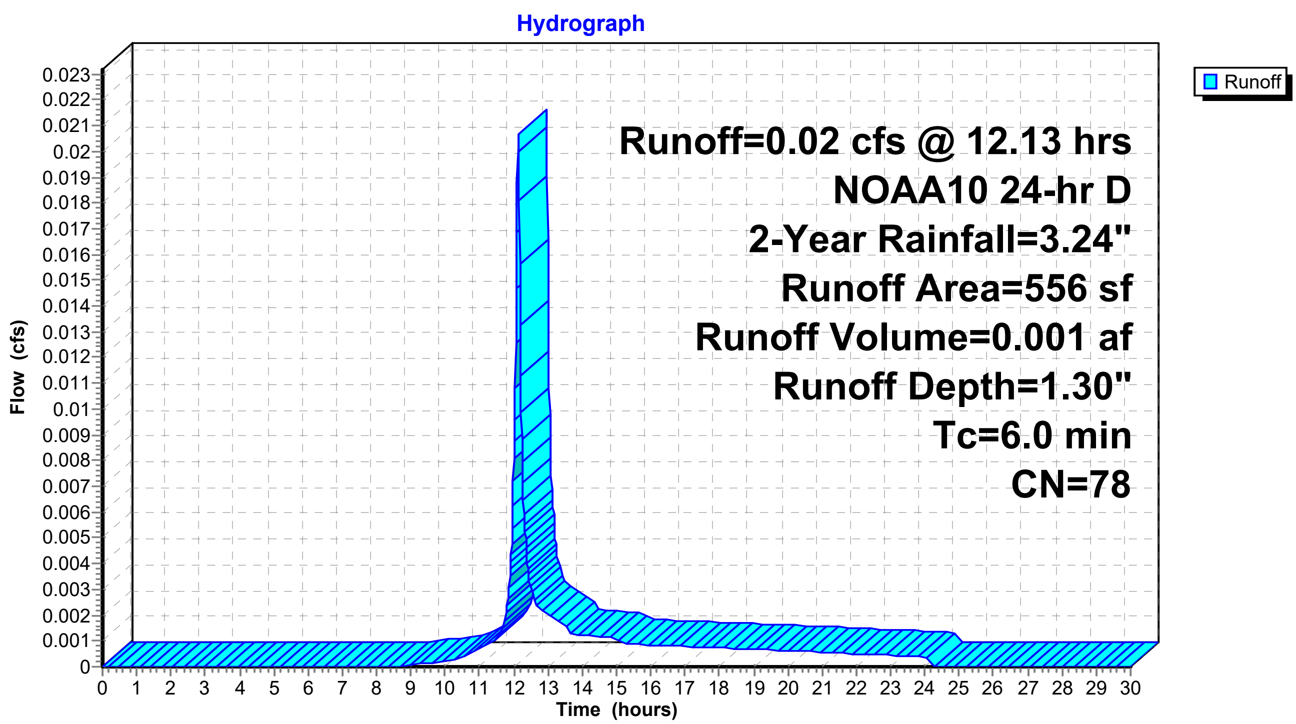
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 1.30"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
191	39	>75% Grass cover, Good, HSG A
365	98	Paved parking, HSG A
556	78	Weighted Average
191		34.35% Pervious Area
365		65.65% Impervious Area

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

Subcatchment S1-2: Untreated Runoff onto Oakland St.



Summary for Subcatchment S214A: Easterly Roof & Lot Line

"Paved Parking" includes building roofs.

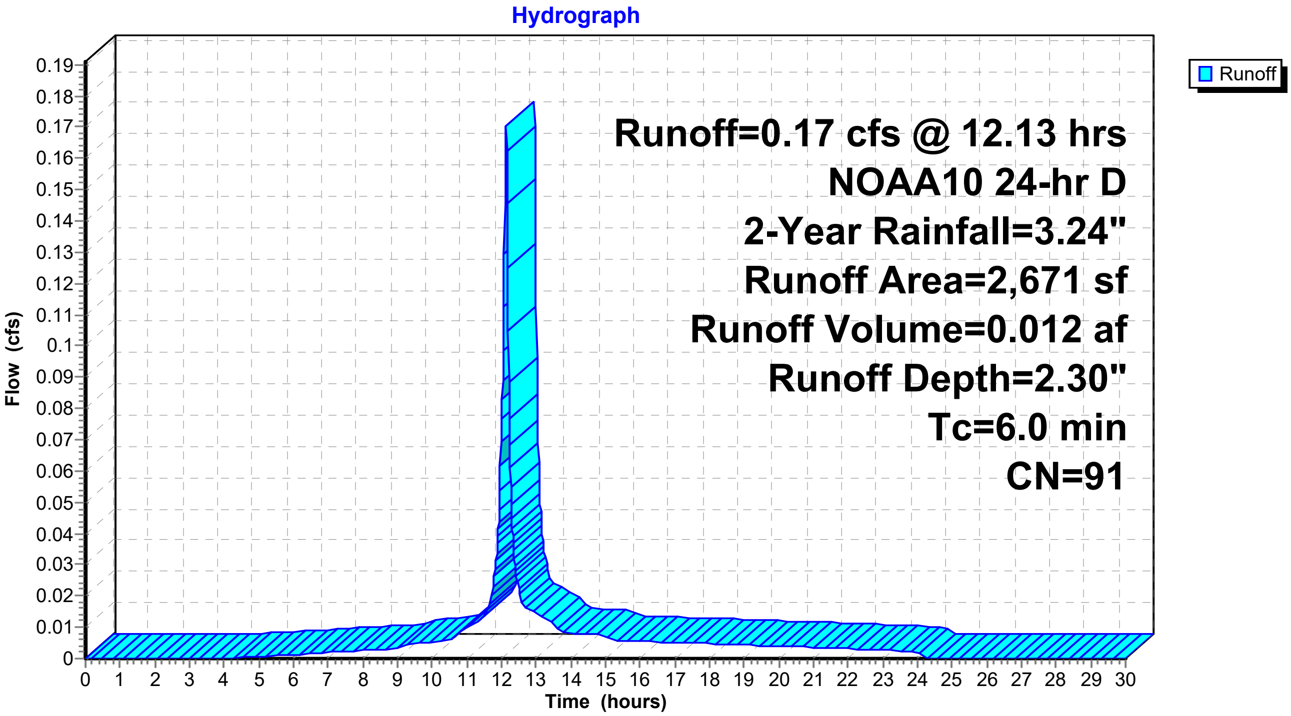
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 2.30"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

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

Subcatchment S214A: Easterly Roof & Lot Line



Summary for Subcatchment S214A-1: Easterly Lot Line

"Paved Parking" includes building roofs.

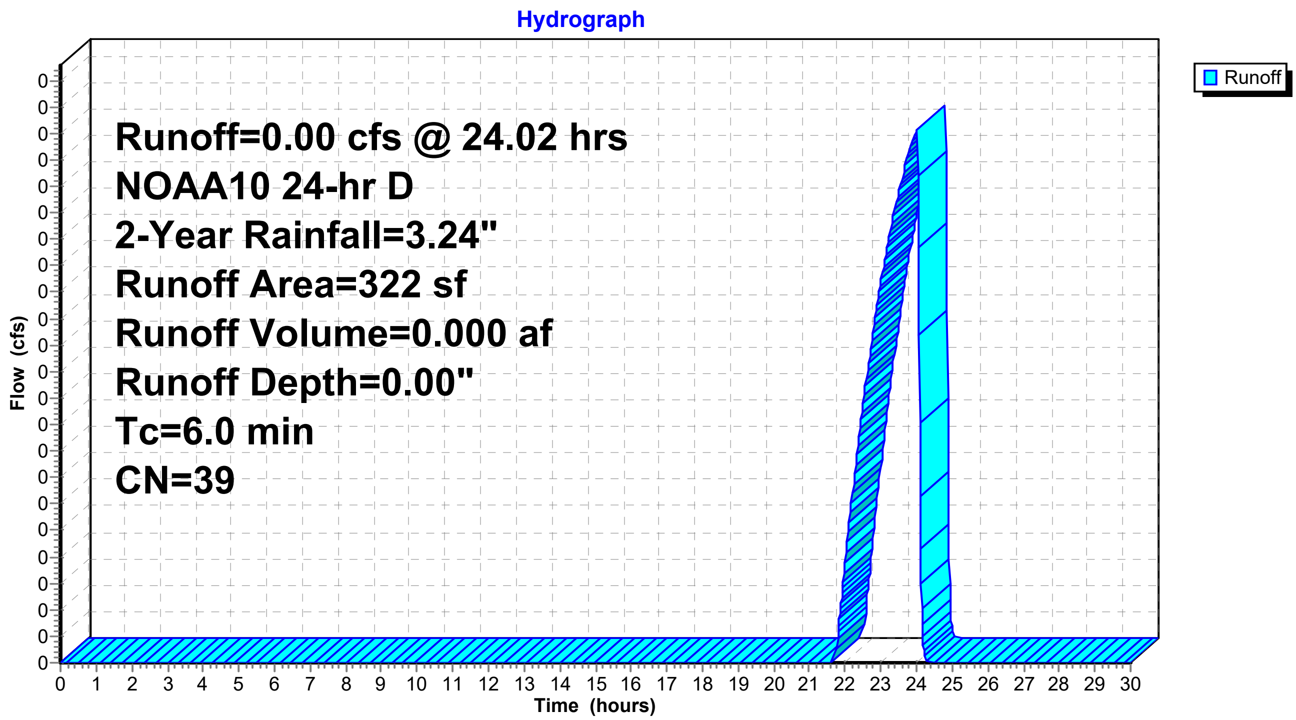
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

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

Subcatchment S214A-1: Easterly Lot Line



Summary for Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

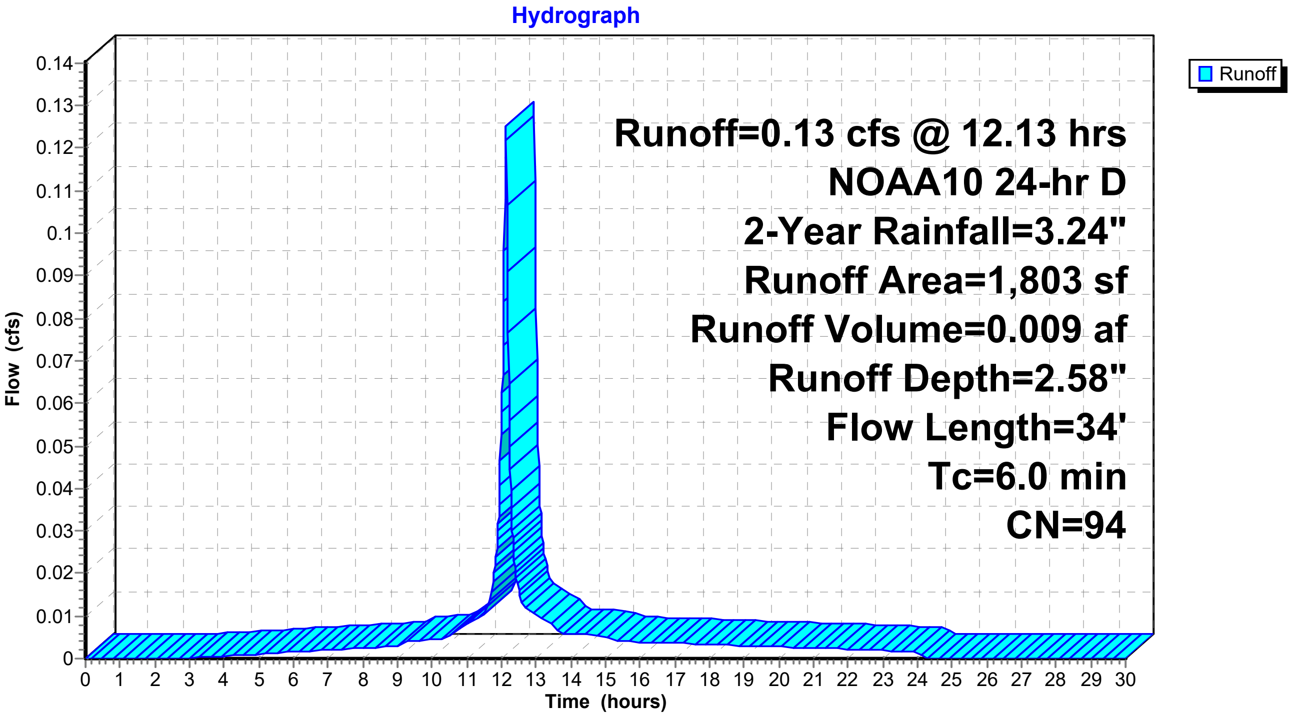
Runoff = 0.13 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 2.58"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214



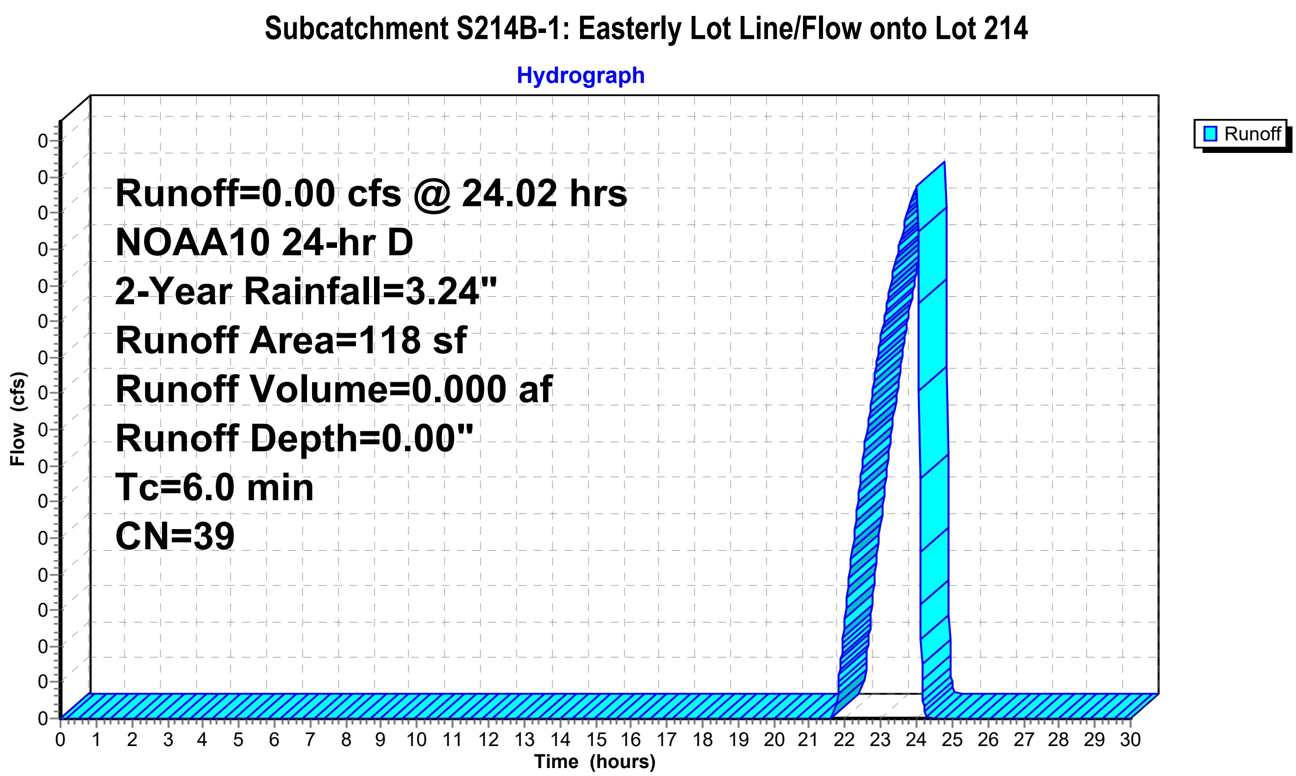
Summary for Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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



Summary for Subcatchment S2A: Easterly Roof & Lot Line

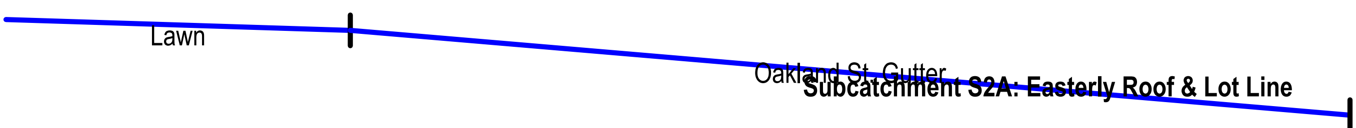
"Paved Parking" includes building roofs.

Runoff = 0.12 cfs @ 12.24 hrs, Volume= 0.012 af, Depth= 2.30"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

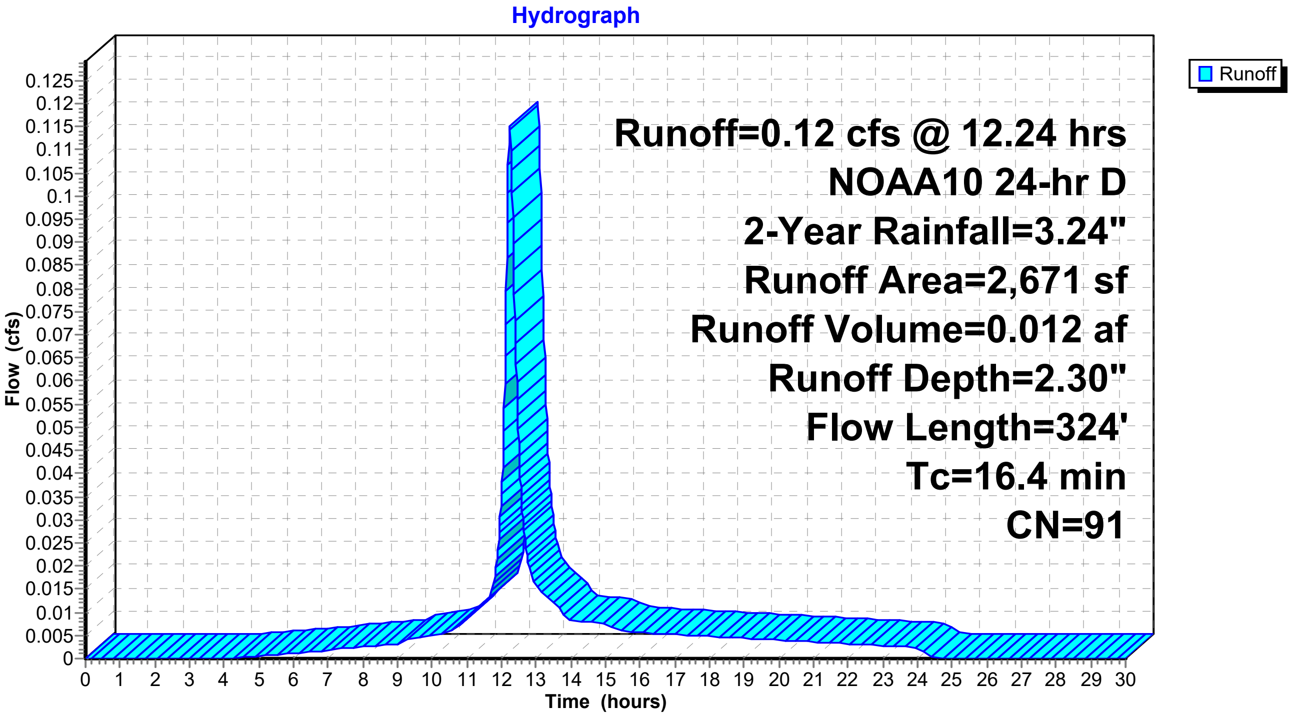
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter** Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A: Easterly Roof & Lot Line



Summary for Subcatchment S2A-1: Easterly Lot Line

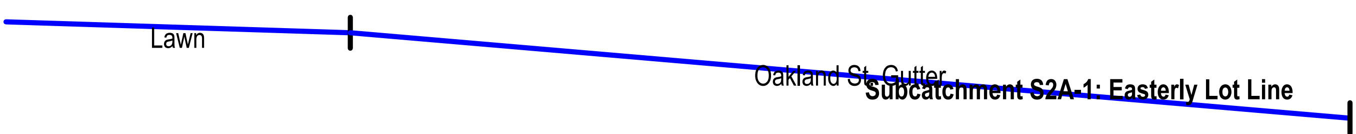
"Paved Parking" includes building roofs.

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

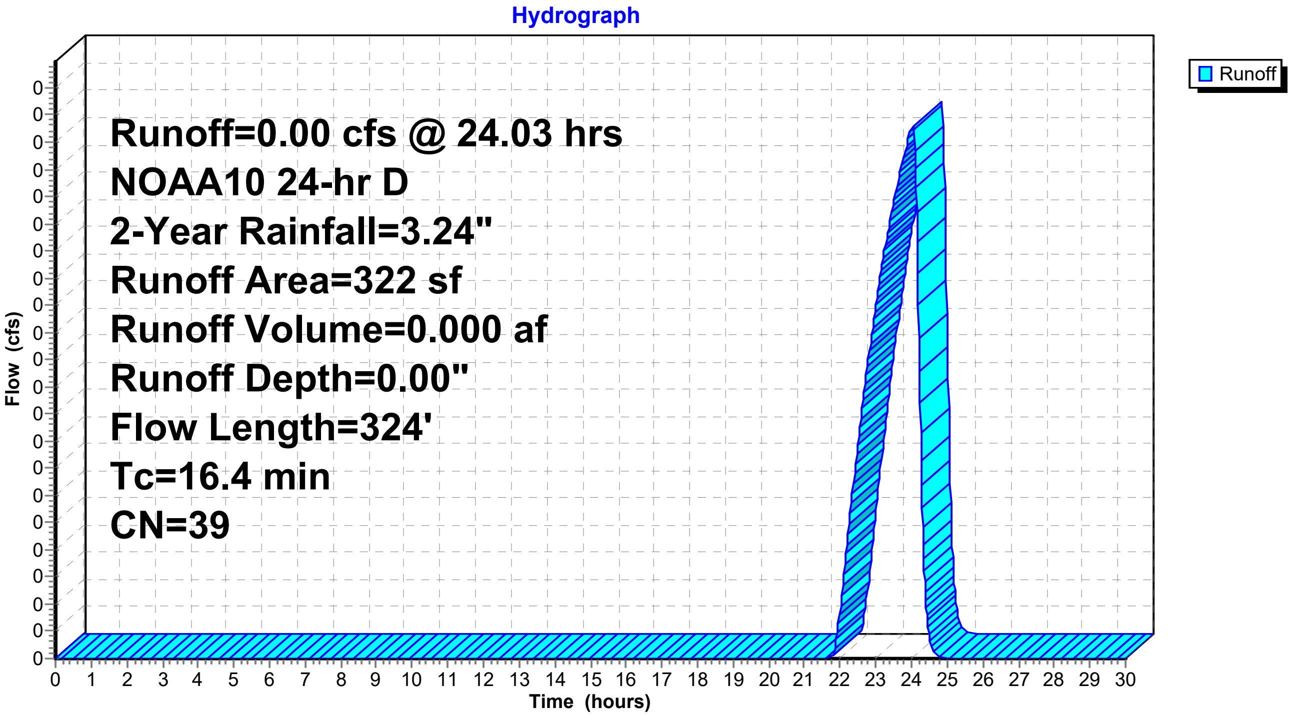
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter** Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A-1: Easterly Lot Line



Summary for Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

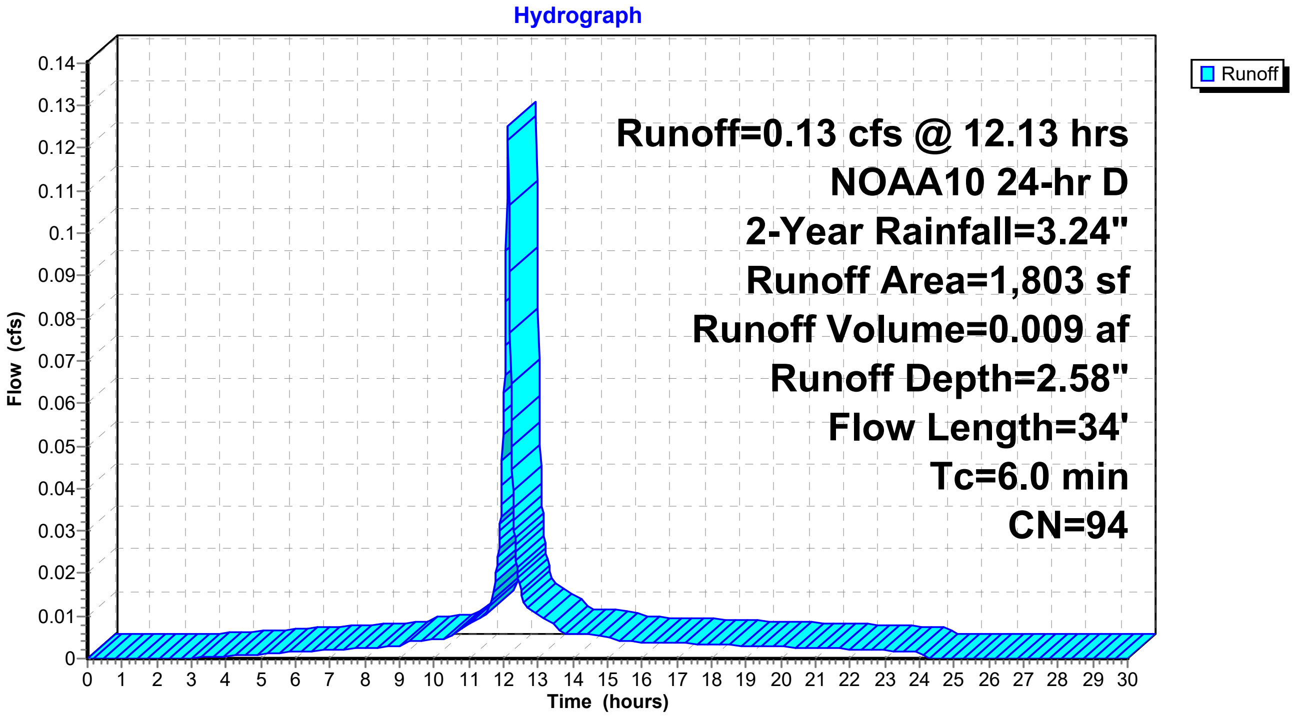
Runoff = 0.13 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 2.58"
Routed to Link L2 : Lag Time for Flow from S2B to DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214



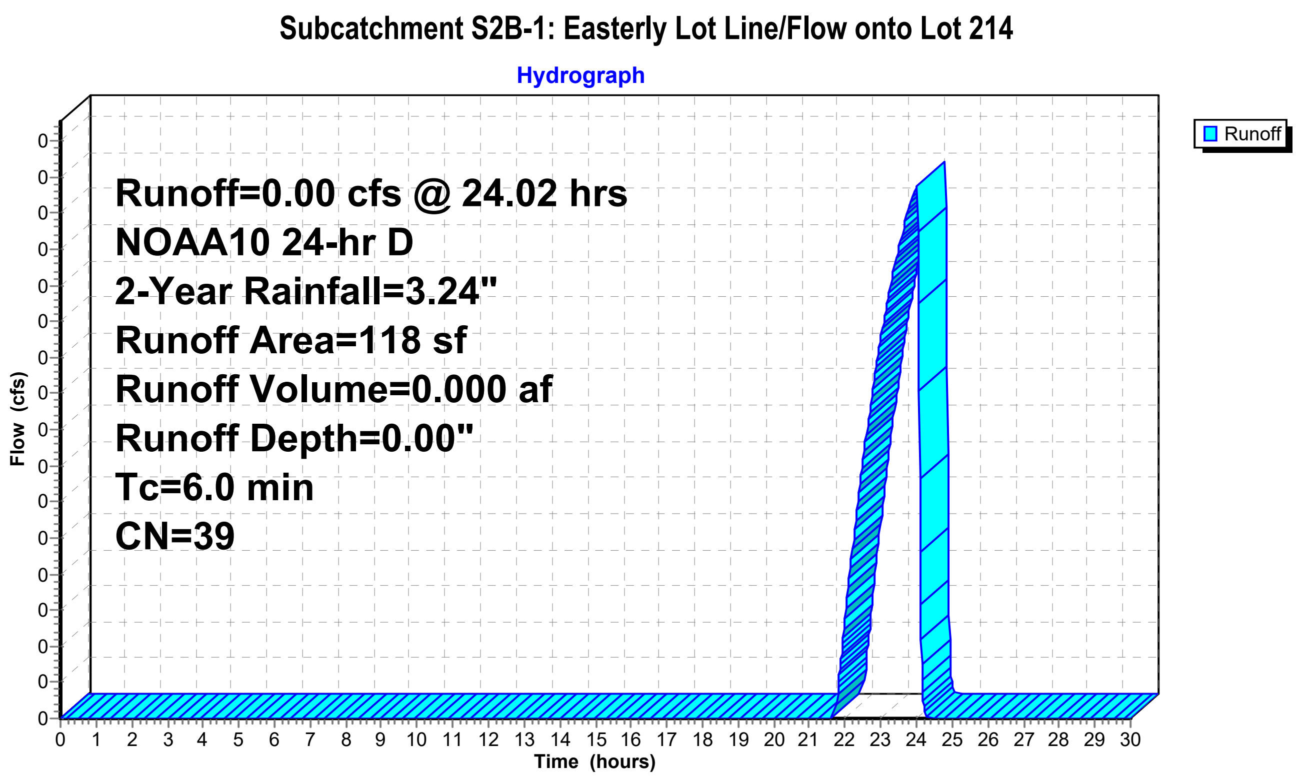
Summary for Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link L2-1 : Lag Time for Flow from S2B-1 to DP2-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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



Summary for Subcatchment S2C: Rear of Building & Site (SW)

"Paved Parking" includes building roofs.

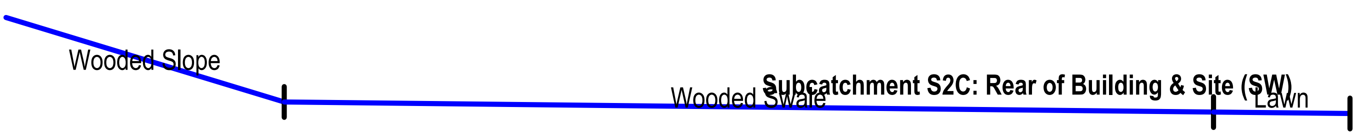
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.00 cfs @ 19.64 hrs, Volume= 0.002 af, Depth= 0.06"
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

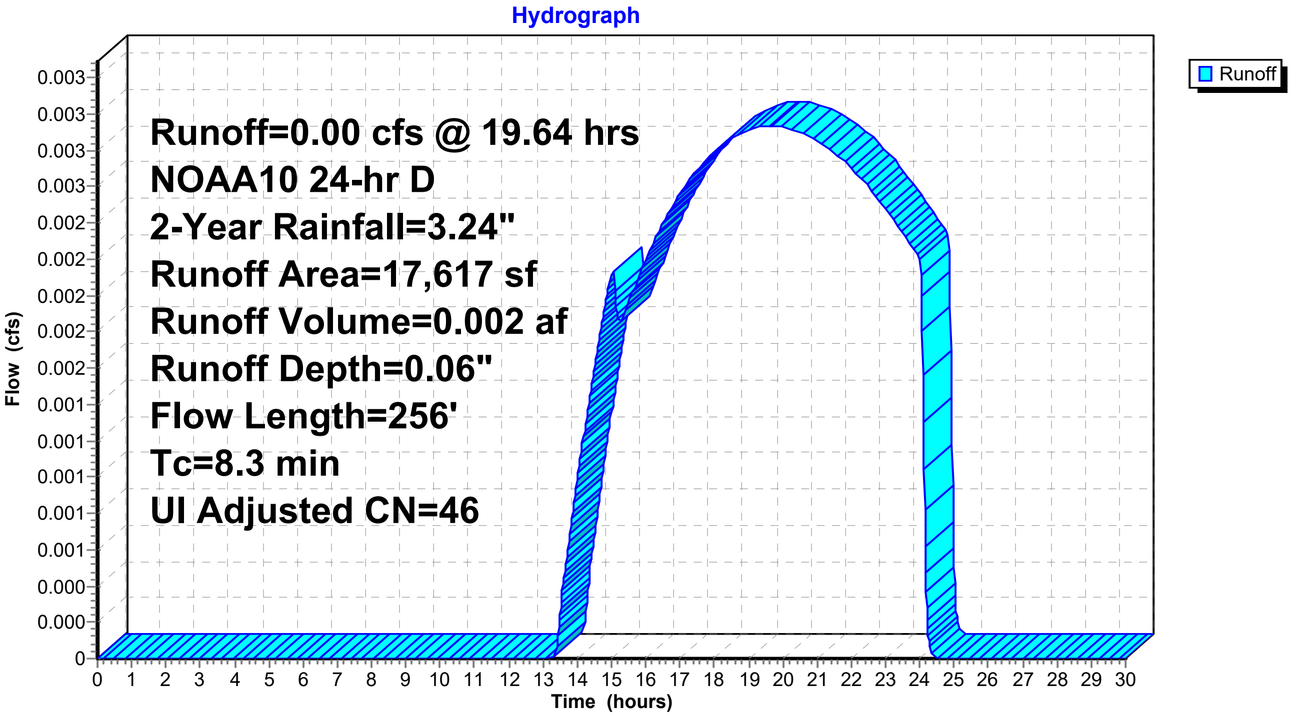
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Adj	Description
1,157	39		>75% Grass cover, Good, HSG A
80	98		Paved parking, HSG A
4,226	98		Unconnected roofs, HSG A
2,147	77		Fallow, bare soil, HSG A
10,007	30		Woods, Good, HSG A
17,617	53	46	Weighted Average, UI Adjusted
13,311			75.56% Pervious Area
4,306			24.44% Impervious Area
4,226			98.14% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	53	0.4720	0.24		**Sheet Flow, Wooded Slope** Woods: Light underbrush n= 0.400 P2= 3.24"
4.5	177	0.0169	0.65		**Shallow Concentrated Flow, Wooded Swale** Woodland Kv= 5.0 fps
0.2	26	0.0169	1.95		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
8.3	256	Total			



Subcatchment S2C: Rear of Building & Site (SW)



Summary for Subcatchment S2C-1: Perimeter of Garage

"Paved Parking" includes building roofs.

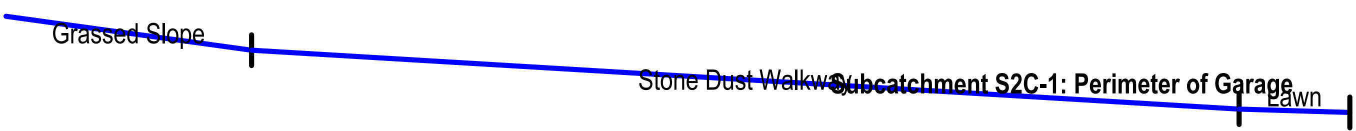
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 1.87"
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

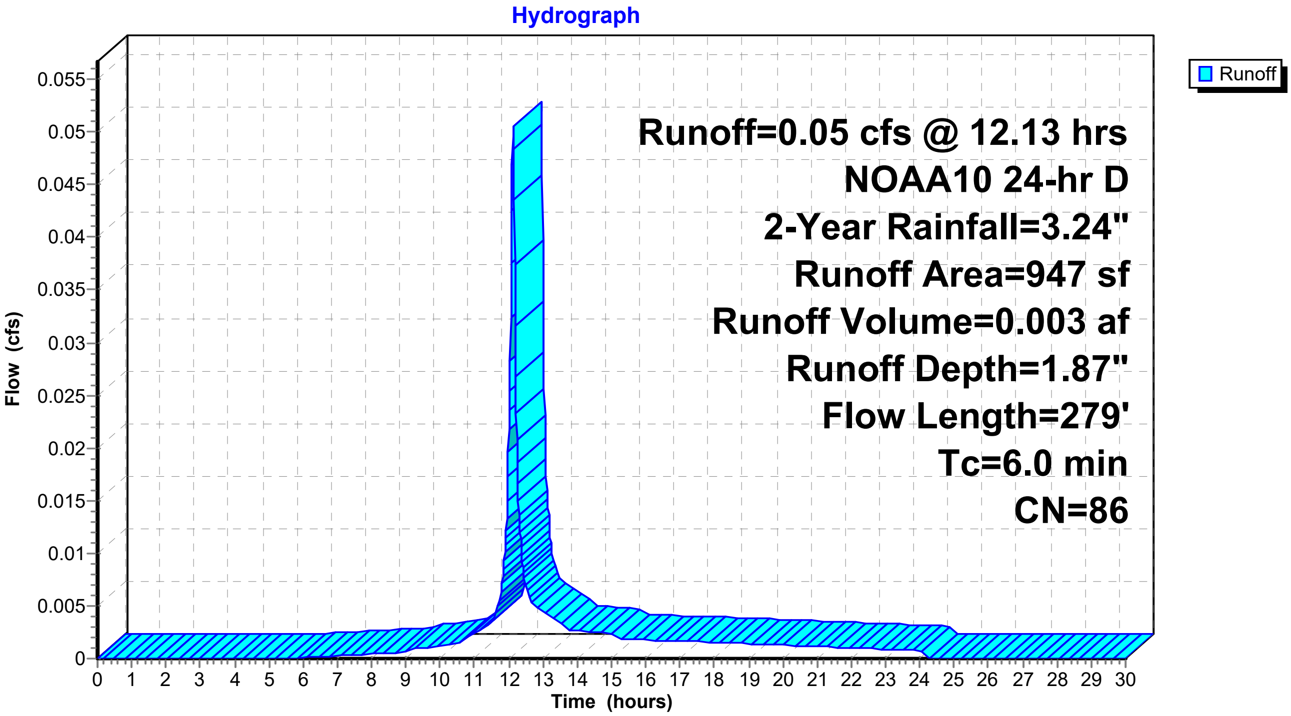
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
167	39	>75% Grass cover, Good, HSG A
780	96	Gravel surface, HSG A
947	86	Weighted Average
947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	51	0.0451	0.21		**Sheet Flow, Grassed Slope** Grass: Short n= 0.150 P2= 3.24"
1.5	205	0.0195	2.25		**Shallow Concentrated Flow, Stone Dust Walkway** Unpaved Kv= 16.1 fps
0.3	23	0.0098	1.48		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
5.9	279	Total, Increased to minimum Tc = 6.0 min			



Subcatchment S2C-1: Perimeter of Garage



Summary for Subcatchment S3: Southerly Corner of Oakland & Chestnut

"Paved Parking" includes building roofs.

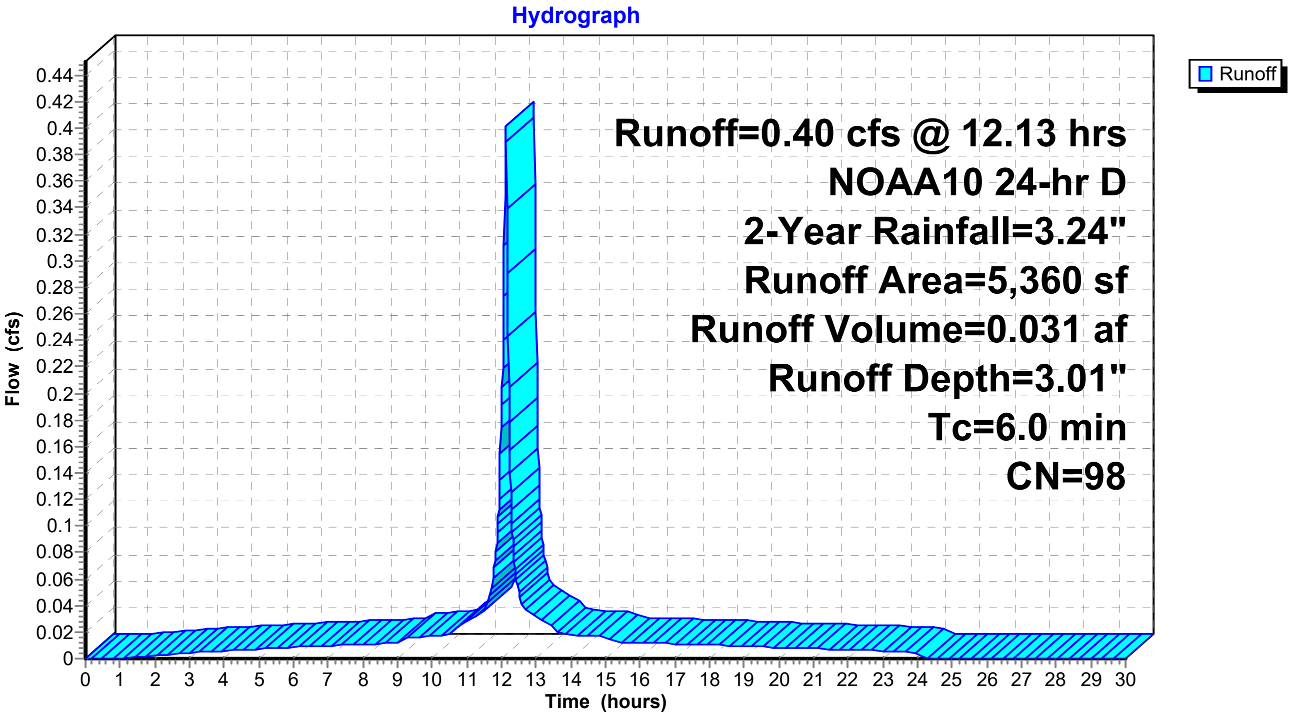
Runoff = 0.40 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 3.01"
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
14	39	>75% Grass cover, Good, HSG A
1,053	98	Paved parking, HSG A
4,293	98	Roofs, HSG A
5,360	98	Weighted Average
14		0.26% Pervious Area
5,346		99.74% Impervious Area

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

Subcatchment S3: Southerly Corner of Oakland & Chestnut



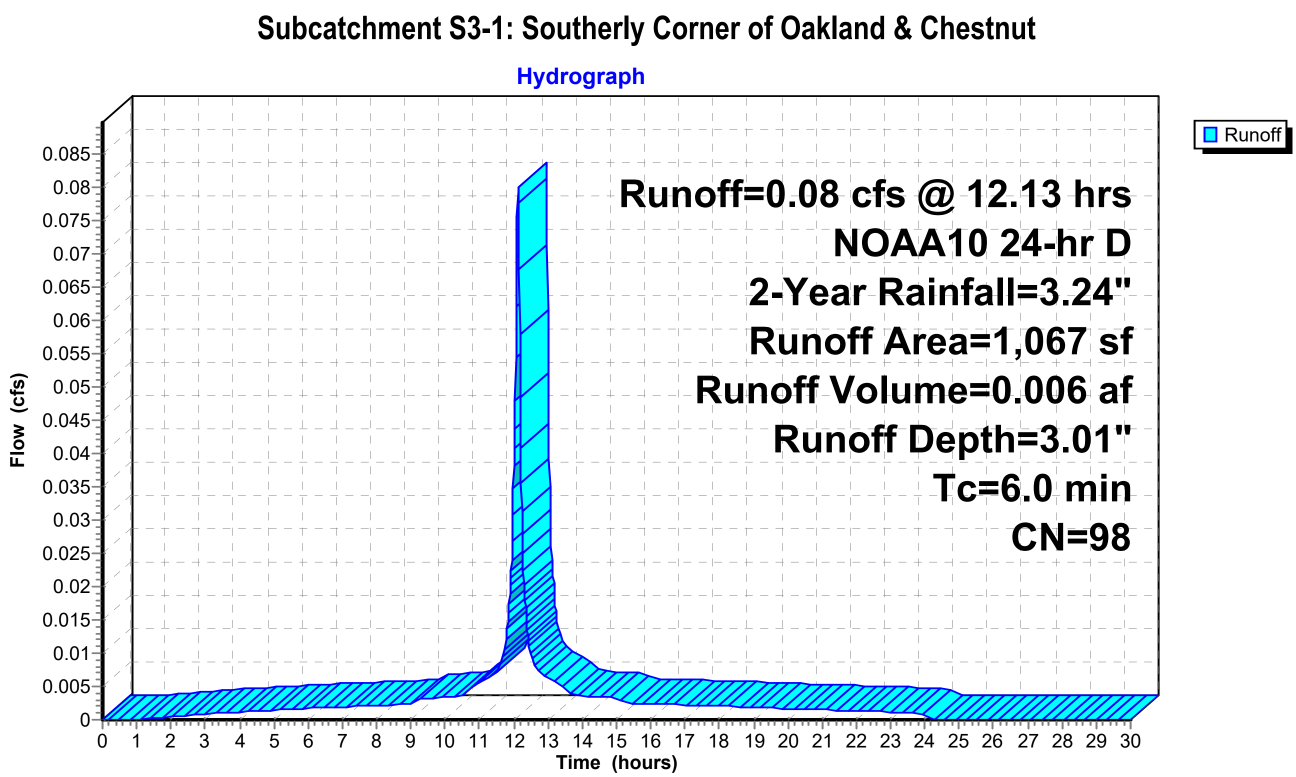
Summary for Subcatchment S3-1: Southerly Corner of Oakland & Chestnut

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 3.01"
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
22	96	Gravel surface, HSG A
1,045	98	Paved parking, HSG A
1,067	98	Weighted Average
22		2.06% Pervious Area
1,045		97.94% Impervious Area

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



Summary for Subcatchment S4: Loading Dock

"Paved Parking" includes building roofs.

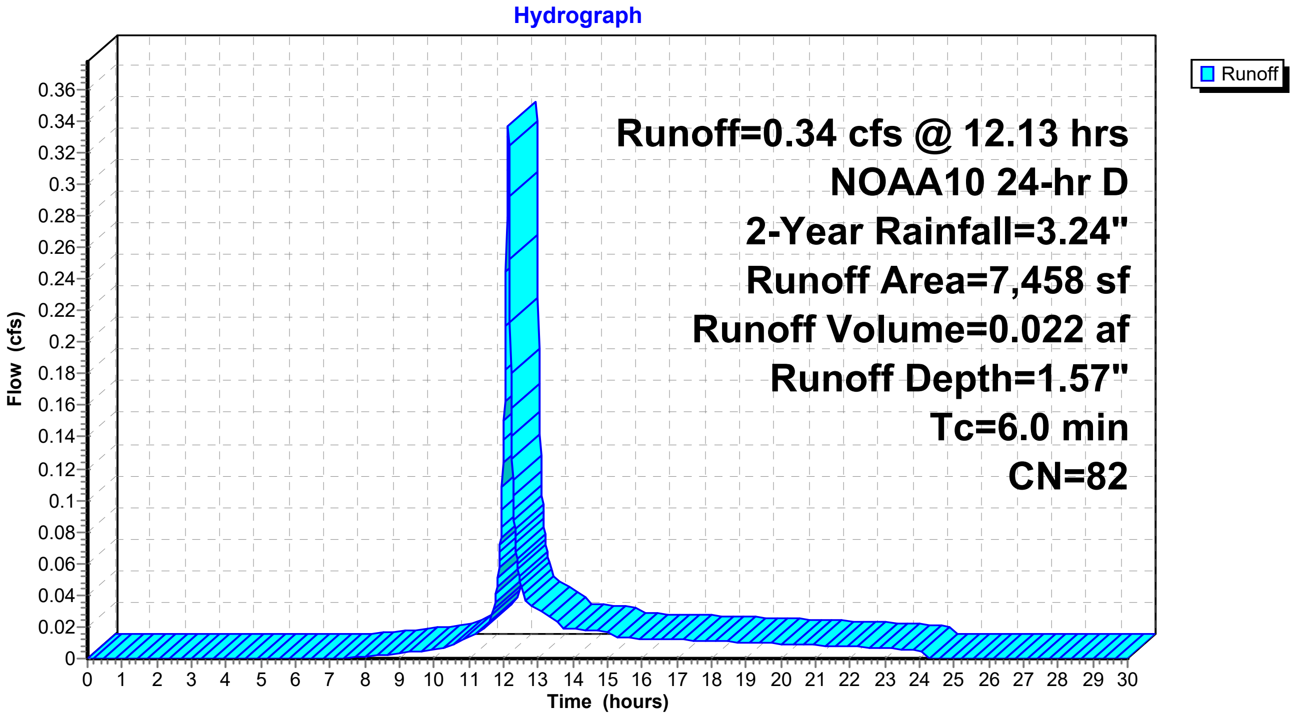
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.022 af, Depth= 1.57"
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
1,421	39	>75% Grass cover, Good, HSG A
2,055	98	Paved parking, HSG A
2,658	98	Roofs, HSG A
1,122	77	Fallow, bare soil, HSG A
202	30	Woods, Good, HSG A
7,458	82	Weighted Average
2,745		36.81% Pervious Area
4,713		63.19% Impervious Area

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

Subcatchment S4: Loading Dock



Summary for Subcatchment S4-1: Garage Entrance

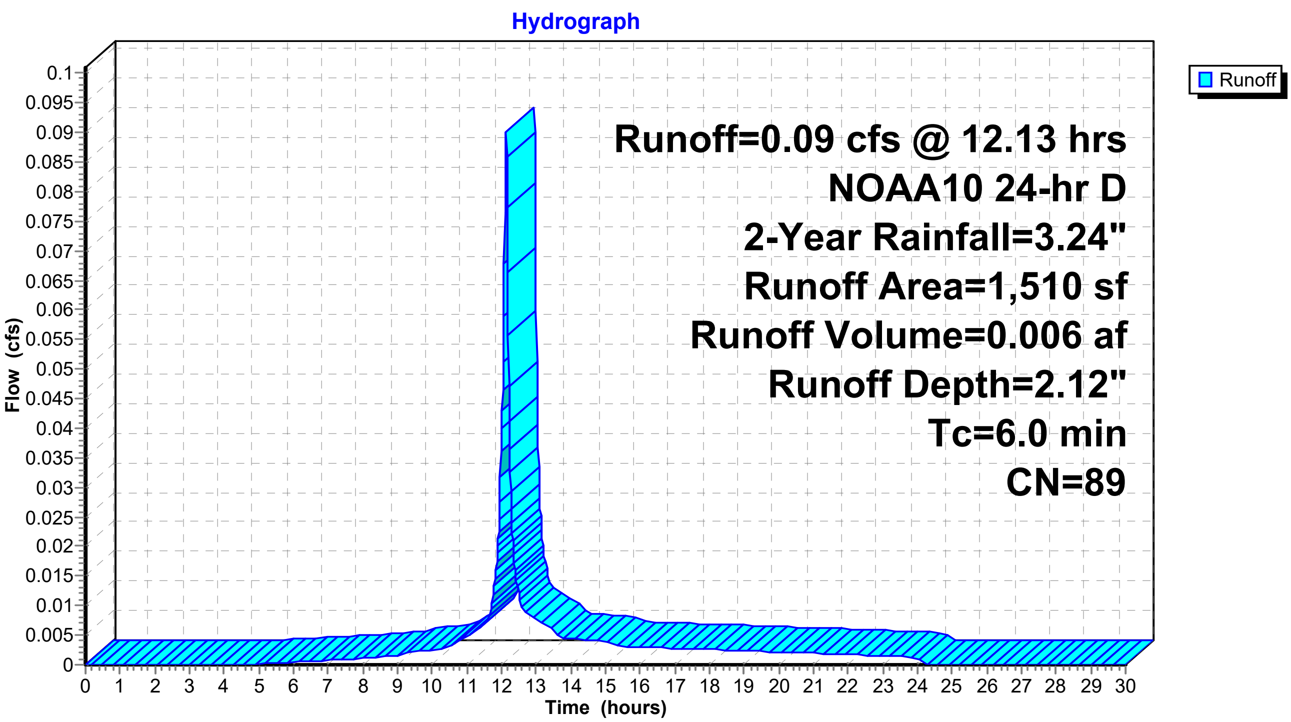
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 2.12"
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
231	39	>75% Grass cover, Good, HSG A
323	96	Gravel surface, HSG A
956	98	Paved parking, HSG A
1,510	89	Weighted Average
554		36.69% Pervious Area
956		63.31% Impervious Area

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

Subcatchment S4-1: Garage Entrance



Summary for Subcatchment S4-2: Proposed Roofs

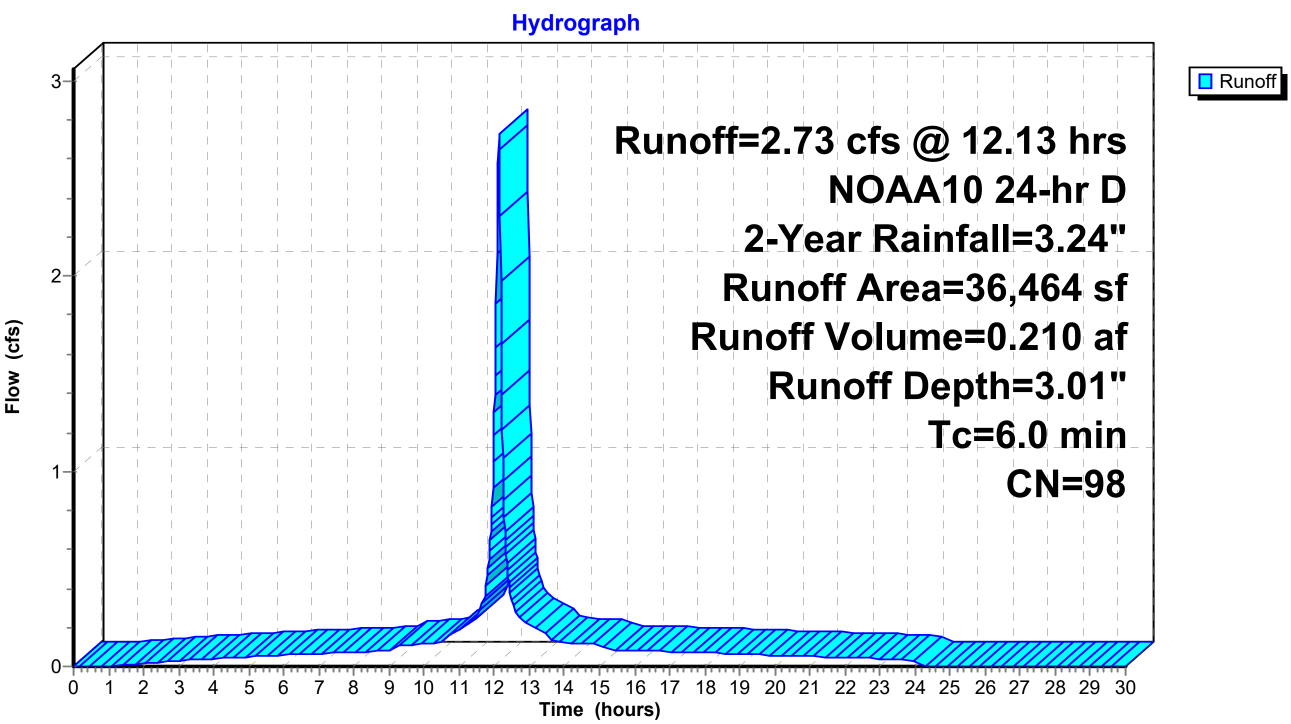
Runoff = 2.73 cfs @ 12.13 hrs, Volume= 0.210 af, Depth= 3.01"
Routed to Pond DC1 : Detention Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
36,464	98	Roofs, HSG A
36,464		100.00% Impervious Area

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

Subcatchment S4-2: Proposed Roofs



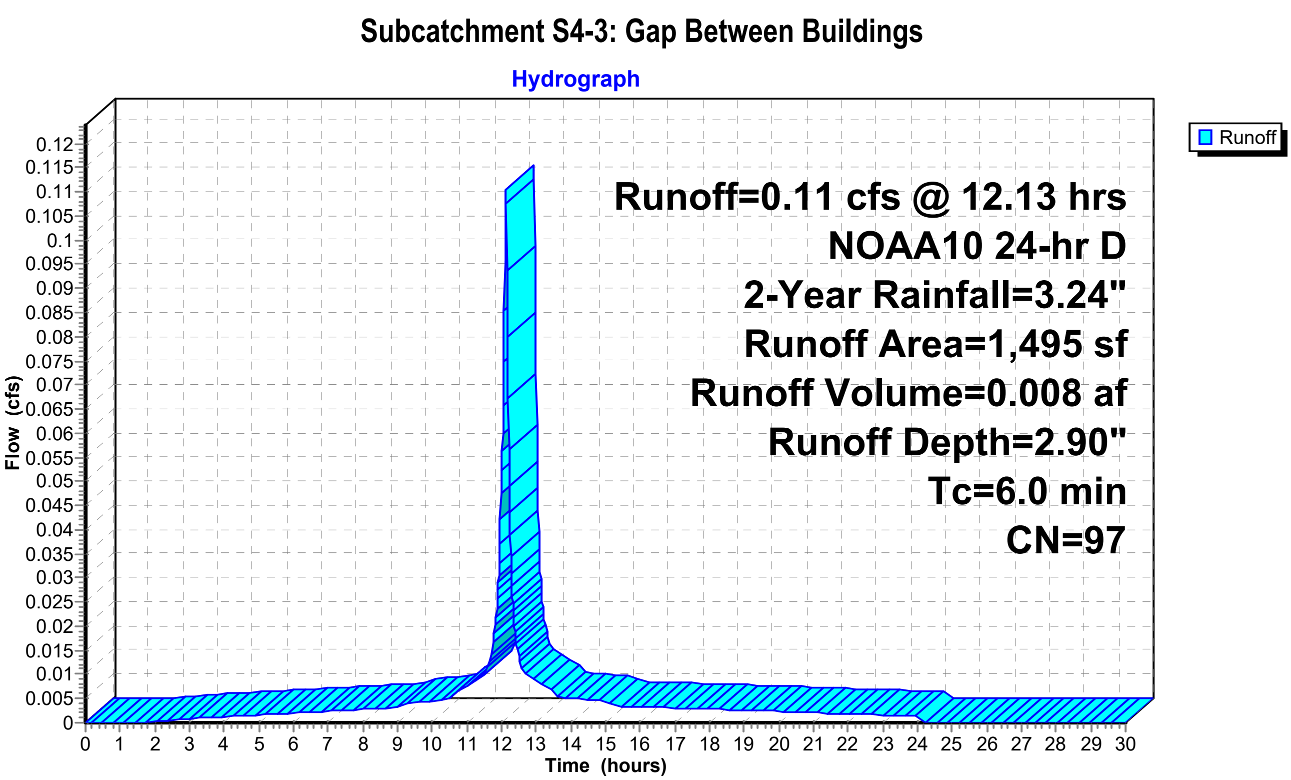
Summary for Subcatchment S4-3: Gap Between Buildings

Runoff = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 2.90"
Routed to Pond GAP : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
559	96	Gravel surface, HSG A
936	98	Unconnected roofs, HSG A
1,495	97	Weighted Average
559		37.39% Pervious Area
936		62.61% Impervious Area
936		100.00% Unconnected

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



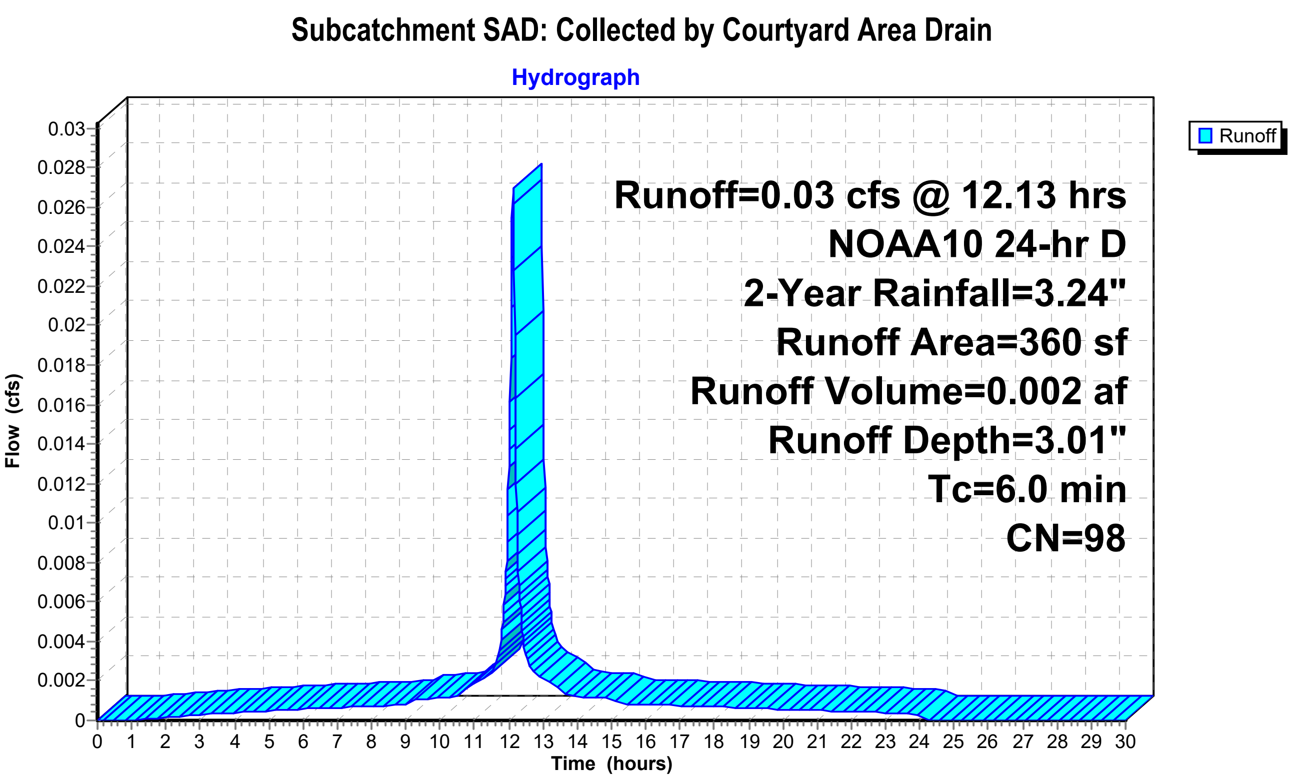
Summary for Subcatchment SAD: Collected by Courtyard Area Drain

Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
360	98	Paved parking, HSG A
360		100.00% Impervious Area

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



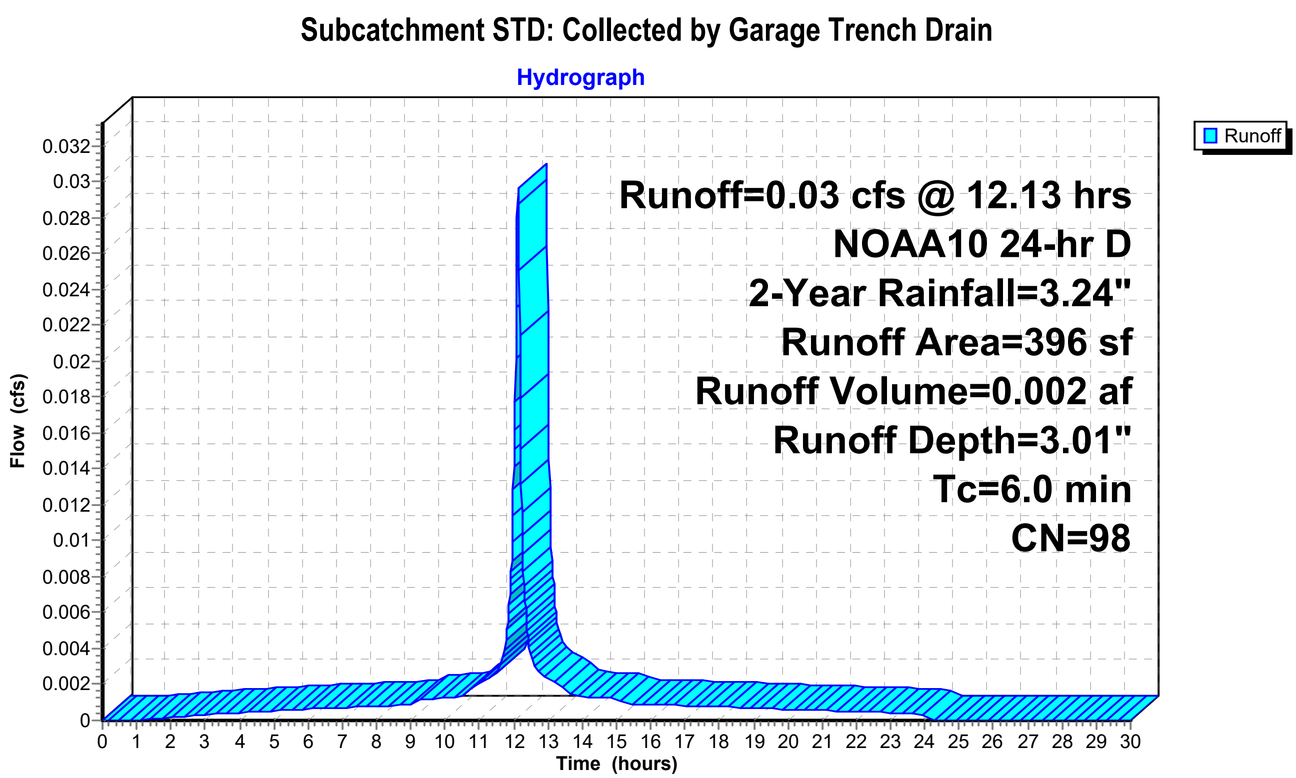
Summary for Subcatchment STD: Collected by Garage Trench Drain

Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
396	98	Paved parking, HSG A
396		100.00% Impervious Area

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



Summary for Subcatchment Tc: Extra Tc Calc's

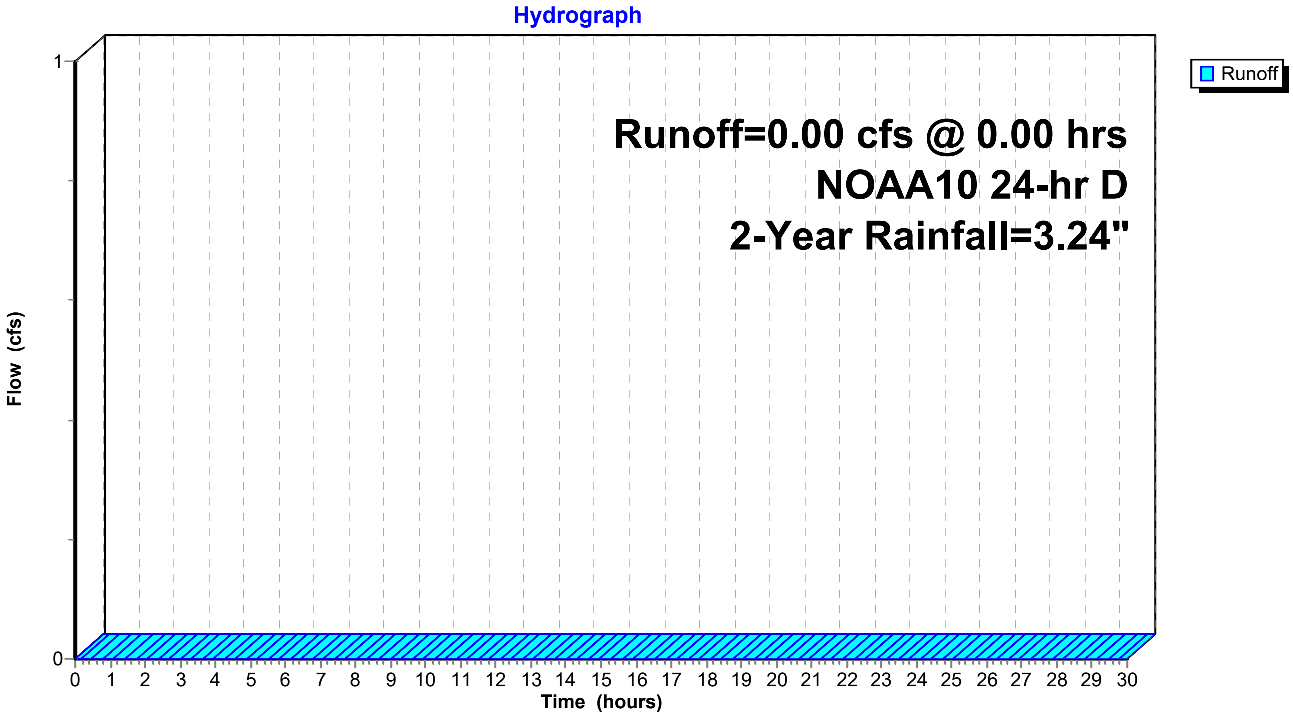
[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	70	0.0501	5.28	4.15	**Pipe Channel, CB 2 to DMH 1** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.1	33	0.1391	8.80	6.91	**Pipe Channel, DMH 1 to DMH 2** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.3	139	0.0701	9.18	7.21	**Pipe Channel, DMH 2 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
6.3	55	0.0182	0.15		**Sheet Flow, Lawn (L2 to DP2)** Grass: Short n= 0.150 P2= 3.24"
0.3	27	0.0079	1.33		**Shallow Concentrated Flow, Lawn (DP2 to CB 8)** Grassed Waterway Kv= 15.0 fps
0.4	47	0.0079	1.80		**Shallow Concentrated Flow, Chestnut St. Gutter (DP2 to CB 8)** Paved Kv= 20.3 fps
0.0	9	0.0811	9.88	7.76	**Pipe Channel, CB 8 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
0.4	143	0.0222	6.77	11.97	**Pipe Channel, DMH 3 to DMH 4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.017 Concrete sewer w/manholes & inlets
8.0	523	Total			

Subcatchment Tc: Extra Tc Calc's



Summary for Pond DC1: Detention Chamber

Chamber ceiling = 28.93

Inflow Area = 0.871 ac, 98.53% Impervious, Inflow Depth = 3.00" for 2-Year event
Inflow = 2.84 cfs @ 12.13 hrs, Volume= 0.218 af
Outflow = 1.63 cfs @ 12.20 hrs, Volume= 0.218 af, Atten= 43%, Lag= 4.3 min
Primary = 1.63 cfs @ 12.20 hrs, Volume= 0.218 af
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

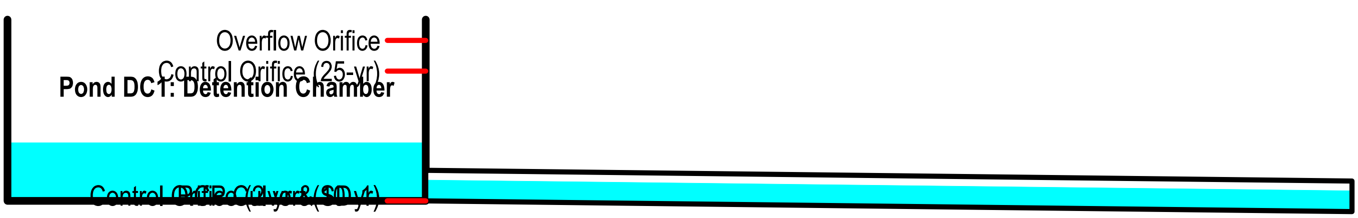
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 24.91' @ 12.20 hrs Surf.Area= 543 sf Storage= 1,034 cf

Plug-Flow detention time= 16.5 min calculated for 0.218 af (100% of inflow)
Center-of-Mass det. time= 16.2 min (777.2 - 760.9)

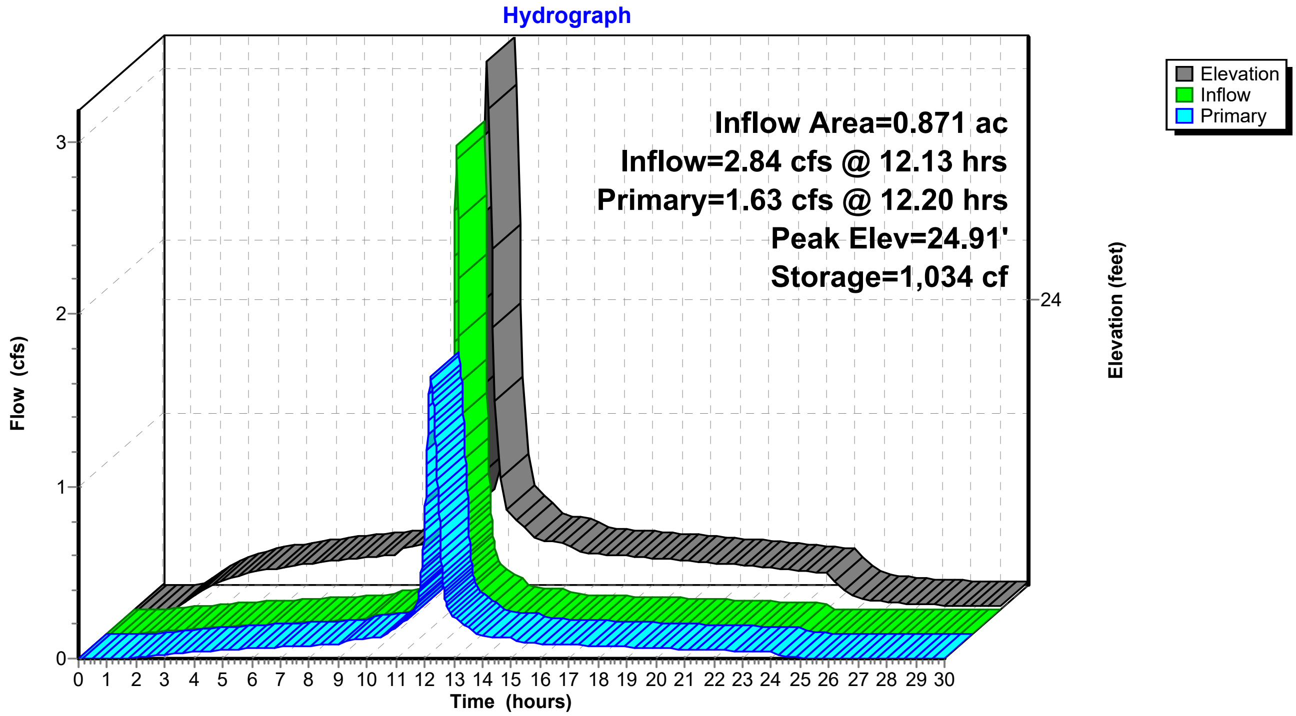
Volume	Invert	Avail.Storage	Storage Description
#1	23.01'	3,217 cf	**8.67'W x 15.67'L x 5.92'H Shea Fire Cistern Bank** x 4

Device	Routing	Invert	Outlet Devices
#1	Primary	23.01'	**12.00" Round RCP Culvert (SD-1)** L= 69.4' Ke= 1.800 Inlet / Outlet Invert= 23.01' / 22.66' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	23.01'	**7.00" Vert. Control Orifice (2-yr & 10-yr)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.25'	**4.00" Vert. Control Orifice (25-yr) X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	28.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.63 cfs @ 12.20 hrs HW=24.91' TW=0.00' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-1)** (Passes 1.63 cfs of 2.40 cfs potential flow)
  ├─**2=Control Orifice (2-yr & 10-yr)** (Orifice Controls 1.63 cfs @ 6.11 fps)
  ├─**3=Control Orifice (25-yr)** (Controls 0.00 cfs)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)



Pond DC1: Detention Chamber



Stage-Area-Storage for Pond DC1: Detention Chamber

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
23.01	0	25.61	1,413	28.21	2,826
23.06	27	25.66	1,440	28.26	2,853
23.11	54	25.71	1,467	28.31	2,880
23.16	82	25.76	1,494	28.36	2,907
23.21	109	25.81	1,522	28.41	2,935
23.26	136	25.86	1,549	28.46	2,962
23.31	163	25.91	1,576	28.51	2,989
23.36	190	25.96	1,603	28.56	3,016
23.41	217	26.01	1,630	28.61	3,043
23.46	245	26.06	1,657	28.66	3,070
23.51	272	26.11	1,685	28.71	3,098
23.56	299	26.16	1,712	28.76	3,125
23.61	326	26.21	1,739	28.81	3,152
23.66	353	26.26	1,766	28.86	3,179
23.71	380	26.31	1,793	28.91	**3,206**
23.76	408	26.36	1,821		
23.81	435	26.41	1,848		
23.86	462	26.46	1,875		
23.91	489	26.51	1,902		
23.96	516	26.56	1,929		
24.01	543	26.61	1,956		
24.06	571	26.66	1,984		
24.11	598	26.71	2,011		
24.16	625	26.76	2,038		
24.21	652	26.81	2,065		
24.26	679	26.86	2,092		
24.31	706	26.91	2,119		
24.36	734	26.96	2,147		
24.41	761	27.01	2,174		
24.46	788	27.06	2,201		
24.51	815	27.11	2,228		
24.56	842	27.16	2,255		
24.61	869	27.21	2,282		
24.66	897	27.26	2,310		
24.71	924	27.31	2,337		
24.76	951	27.36	2,364		
24.81	978	27.41	2,391		
24.86	1,005	27.46	2,418		
24.91	1,033	27.51	2,445		
24.96	1,060	27.56	2,473		
25.01	1,087	27.61	2,500		
25.06	1,114	27.66	2,527		
25.11	1,141	27.71	2,554		
25.16	1,168	27.76	2,581		
25.21	1,196	27.81	2,608		
25.26	1,223	27.86	2,636		
25.31	1,250	27.91	2,663		
25.36	1,277	27.96	2,690		
25.41	1,304	28.01	2,717		
25.46	1,331	28.06	2,744		
25.51	1,359	28.11	2,772		
25.56	1,386	28.16	2,799		

Summary for Pond GAP: Area Drain

Flood elevation set at finished floor of level 2.
Loss coefficient of 0.9 for short radius 90-degree fittings between pipes.

Inflow Area = 0.034 ac, 62.61% Impervious, Inflow Depth = 2.90" for 2-Year event
Inflow = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af
Outflow = 0.11 cfs @ 12.14 hrs, Volume= 0.008 af, Atten= 1%, Lag= 0.5 min
Primary = 0.11 cfs @ 12.14 hrs, Volume= 0.008 af
Routed to Pond DC1 : Detention Chamber

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 54.52' @ 12.14 hrs Storage= 5 cf
Flood Elev= 55.00' Storage= 112 cf

Plug-Flow detention time= 1.9 min calculated for 0.008 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (774.3 - 772.4)

Volume	Invert	Avail.Storage	Storage Description
#1	54.50'	2,068 cf	**Open Area (Prismatic)** Listed below -Impervious

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.50	559	0.0	0	0
55.00	559	40.0	112	112
58.50	559	100.0	1,957	2,068

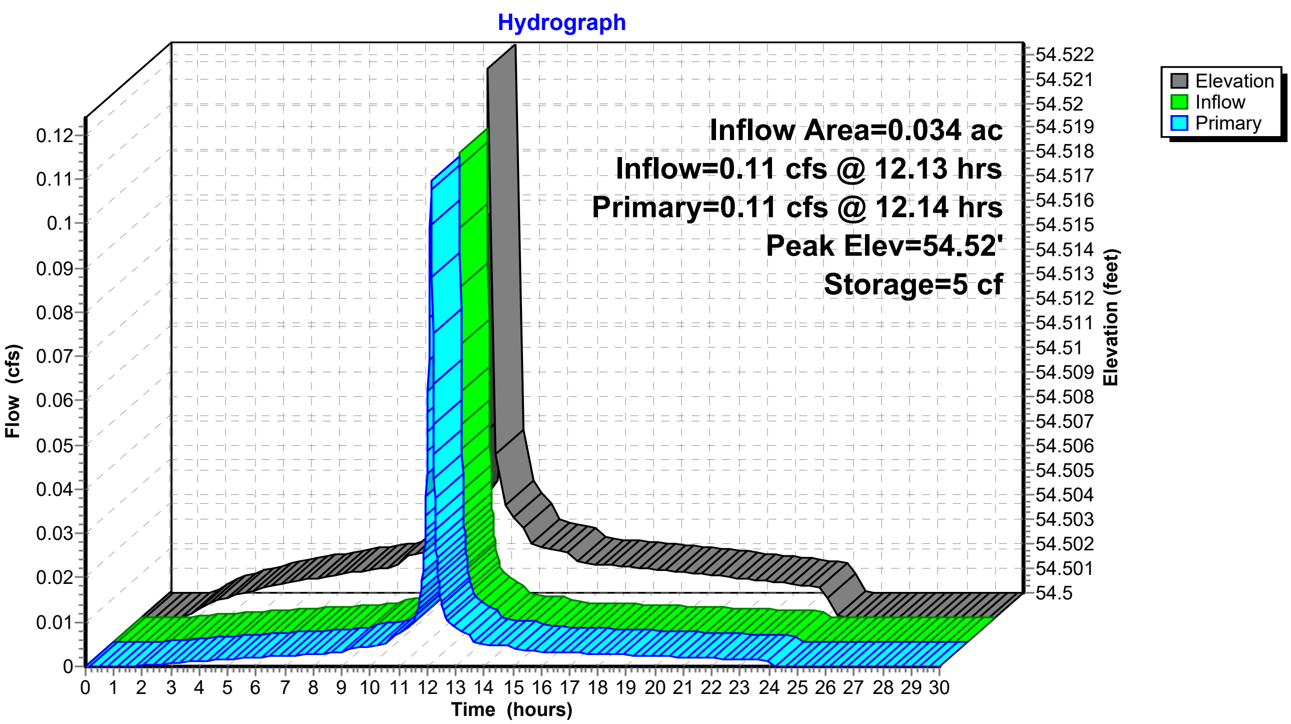
Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 22.5' Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.00' S= 0.0444 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#2	Device 1	50.43'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 5.2' Ke= 0.900 Inlet / Outlet Invert= 50.43' / 50.43' S= 0.0000 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#3	Device 2	50.50'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 3.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.50' / 50.43' S= 0.0200 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#4	Device 3	54.50'	**2.25" x 5.40" Horiz. Neenah R-6672-F Grate X 8.00 columns** X 4 rows C= 0.600 in 30.00" x 30.00" Grate (43% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 12.14 hrs HW=54.52' TW=24.61' (Dynamic Tailwater)
└─**1=Ductile Iron Drain Pipe (SD-4)** (Passes 0.11 cfs of 3.97 cfs potential flow)
  └─**2=Ductile Iron Drain Pipe (SD-4)** (Passes 0.11 cfs of 1.46 cfs potential flow)
    └─**3=Ductile Iron Drain Pipe (SD-4)** (Passes 0.11 cfs of 1.84 cfs potential flow)
      └─**4=Neenah R-6672-F Grate** (Weir Controls 0.11 cfs @ 0.49 fps)

Neenah R-6672-F Grate
Ductile Iron Drain Pipe (SD-4)
Pond GAP: Area Drain

Ductile Iron Drain Pipe (SD-4)

Pond GAP: Area Drain



Stage-Area-Storage for Pond GAP: Area Drain

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
54.50	0	55.54	414	56.58	995	57.62	1,576
54.52	4	55.56	425	56.60	1,006	57.64	1,588
54.54	9	55.58	436	56.62	1,017	57.66	1,599
54.56	13	55.60	447	56.64	1,029	57.68	1,610
54.58	18	55.62	458	56.66	1,040	57.70	1,621
54.60	22	55.64	470	56.68	1,051	57.72	1,632
54.62	27	55.66	481	56.70	1,062	57.74	1,643
54.64	31	55.68	492	56.72	1,073	57.76	1,655
54.66	36	55.70	503	56.74	1,084	57.78	1,666
54.68	40	55.72	514	56.76	1,096	57.80	1,677
54.70	45	55.74	525	56.78	1,107	57.82	1,688
54.72	49	55.76	537	56.80	1,118	57.84	1,699
54.74	54	55.78	548	56.82	1,129	57.86	1,711
54.76	58	55.80	559	56.84	1,140	57.88	1,722
54.78	63	55.82	570	56.86	1,152	57.90	1,733
54.80	67	55.84	581	56.88	1,163	57.92	1,744
54.82	72	55.86	593	56.90	1,174	57.94	1,755
54.84	76	55.88	604	56.92	1,185	57.96	1,766
54.86	80	55.90	615	56.94	1,196	57.98	1,778
54.88	85	55.92	626	56.96	1,207	58.00	1,789
54.90	89	55.94	637	56.98	1,219	58.02	1,800
54.92	94	55.96	648	57.00	1,230	58.04	1,811
54.94	98	55.98	660	57.02	1,241	58.06	1,822
54.96	103	56.00	671	57.04	1,252	58.08	1,834
54.98	107	56.02	682	57.06	1,263	58.10	1,845
55.00	112	56.04	693	57.08	1,275	58.12	1,856
55.02	123	56.06	704	57.10	1,286	58.14	1,867
55.04	134	56.08	716	57.12	1,297	58.16	1,878
55.06	145	56.10	727	57.14	1,308	58.18	1,889
55.08	157	56.12	738	57.16	1,319	58.20	1,901
55.10	168	56.14	749	57.18	1,330	58.22	1,912
55.12	179	56.16	760	57.20	1,342	58.24	1,923
55.14	190	56.18	771	57.22	1,353	58.26	1,934
55.16	201	56.20	783	57.24	1,364	58.28	1,945
55.18	212	56.22	794	57.26	1,375	58.30	1,956
55.20	224	56.24	805	57.28	1,386	58.32	1,968
55.22	235	56.26	816	57.30	1,397	58.34	1,979
55.24	246	56.28	827	57.32	1,409	58.36	1,990
55.26	257	56.30	838	57.34	1,420	58.38	2,001
55.28	268	56.32	850	57.36	1,431	58.40	2,012
55.30	279	56.34	861	57.38	1,442	58.42	2,024
55.32	291	56.36	872	57.40	1,453	58.44	2,035
55.34	302	56.38	883	57.42	1,465	58.46	2,046
55.36	313	56.40	894	57.44	1,476	58.48	2,057
55.38	324	56.42	906	57.46	1,487	58.50	**2,068**
55.40	335	56.44	917	57.48	1,498		
55.42	347	56.46	928	57.50	1,509		
55.44	358	56.48	939	57.52	1,520		
55.46	369	56.50	950	57.54	1,532		
55.48	380	56.52	961	57.56	1,543		
55.50	391	56.54	973	57.58	1,554		
55.52	402	56.56	984	57.60	1,565		

Summary for Pond IC2: Infiltration Chamber Under Parking Lot

Chamber ceiling = 50.58

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 2.58" for 2-Year event
Inflow = 0.86 cfs @ 12.13 hrs, Volume= 0.061 af
Outflow = 0.55 cfs @ 12.19 hrs, Volume= 0.061 af, Atten= 36%, Lag= 3.8 min
Discarded = 0.07 cfs @ 12.19 hrs, Volume= 0.049 af
Primary = 0.48 cfs @ 12.19 hrs, Volume= 0.012 af
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 49.49' @ 12.19 hrs Surf.Area= 540 sf Storage= 504 cf

Plug-Flow detention time= 29.1 min calculated for 0.061 af (100% of inflow)
Center-of-Mass det. time= 29.1 min (829.0 - 799.9)

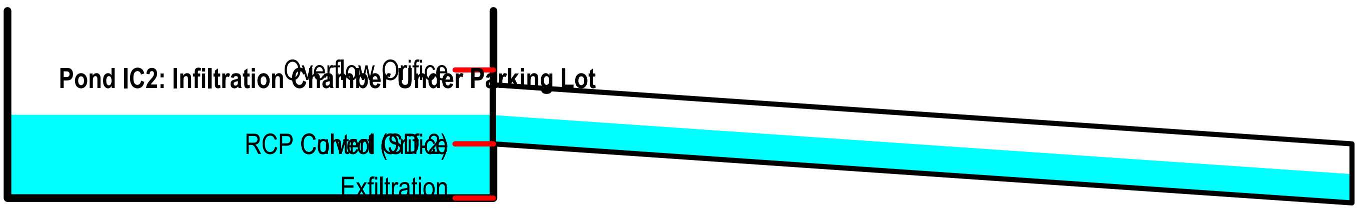
Volume	Invert	Avail.Storage	Storage Description
#1A	48.08'	206 cf	**18.00'W x 30.00'L x 3.17'H Field A** 1,712 cf Overall - 1,196 cf Embedded = 516 cf x 40.0% Voids
#2A	48.58'	800 cf	**Shea Leaching Chamber 8x14x2.7** x 4 Inside #1 Inside= 84.0"W x 24.0"H => 15.38 sf x 13.00'L = 200.0 cf Outside= 96.0"W x 32.0"H => 21.36 sf x 14.00'L = 299.0 cf 4 Chambers in 2 Rows
		1,006 cf	Total Available Storage

Storage Group A created with Chamber Wizard

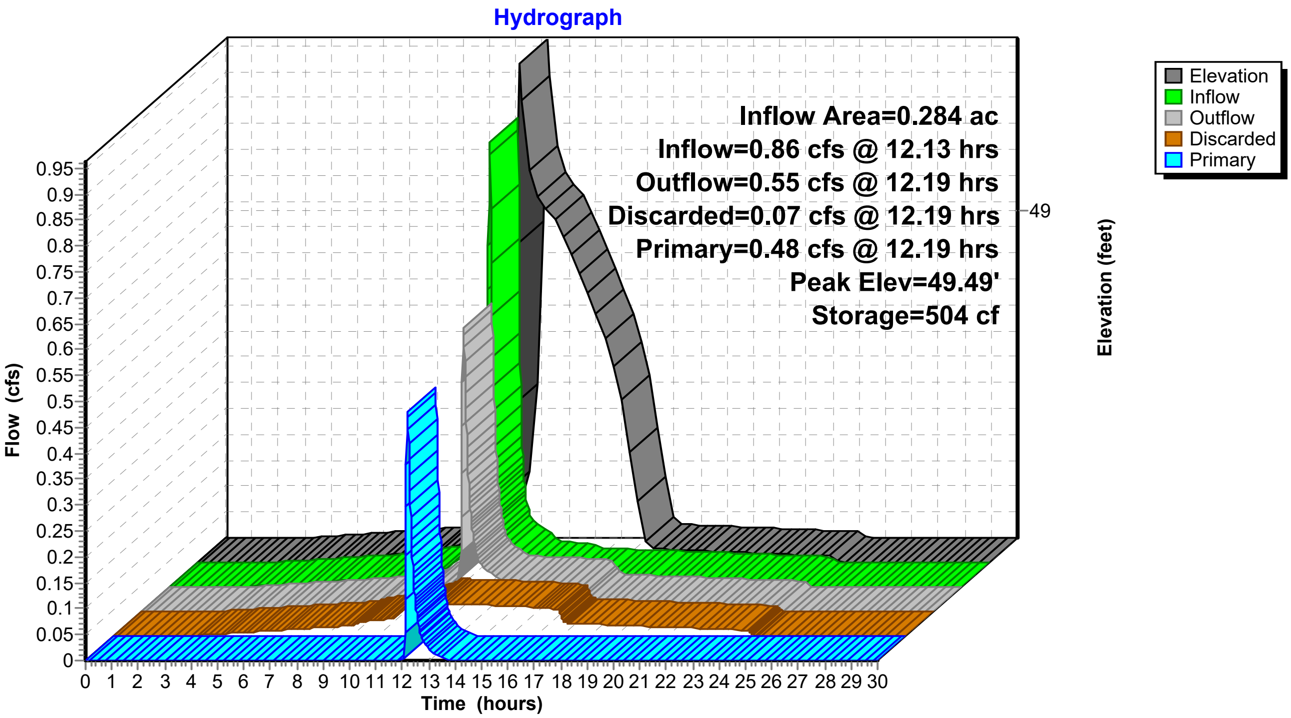
Device	Routing	Invert	Outlet Devices
#1	Discarded	48.08'	**4.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 17.50' Phase-In= 0.08'
#2	Primary	49.00'	**12.00" Round RCP Culvert (SD-2)** L= 53.0' Ke= 1.800 Inlet / Outlet Invert= 49.00' / 48.00' S= 0.0189 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	49.00'	**9.00" Vert. Control Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	50.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.19 hrs HW=49.49' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.48 cfs @ 12.19 hrs HW=49.49' TW=0.00' (Dynamic Tailwater)
└─**2=RCP Culvert (SD-2)** (Inlet Controls 0.48 cfs @ 1.27 fps)
  ├─**3=Control Orifice** (Passes 0.48 cfs of 0.72 cfs potential flow)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)



Pond IC2: Infiltration Chamber Under Parking Lot



Stage-Area-Storage for Pond IC2: Infiltration Chamber Under Parking Lot

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
48.08	0	49.12	344	50.16	798	51.20	1,004
48.10	4	49.14	353	50.18	807	51.22	1,005
48.12	9	49.16	361	50.20	816	51.24	**1,006**
48.14	13	49.18	370	50.22	824		
48.16	17	49.20	379	50.24	833		
48.18	22	49.22	388	50.26	842		
48.20	26	49.24	396	50.28	851		
48.22	30	49.26	405	50.30	859		
48.24	35	49.28	414	50.32	868		
48.26	39	49.30	422	50.34	877		
48.28	43	49.32	431	50.36	886		
48.30	48	49.34	440	50.38	894		
48.32	52	49.36	449	50.40	903		
48.34	56	49.38	457	50.42	912		
48.36	60	49.40	466	50.44	920		
48.38	65	49.42	475	50.46	929		
48.40	69	49.44	484	50.48	938		
48.42	73	49.46	492	50.50	947		
48.44	78	49.48	501	50.52	955		
48.46	82	49.50	510	50.54	964		
48.48	86	49.52	519	50.56	973		
48.50	91	49.54	527	50.58	982		
48.52	95	49.56	536	50.60	982		
48.54	99	49.58	545	50.62	983		
48.56	104	49.60	554	50.64	984		
48.58	108	49.62	562	50.66	985		
48.60	117	49.64	571	50.68	985		
48.62	125	49.66	580	50.70	986		
48.64	134	49.68	588	50.72	987		
48.66	143	49.70	597	50.74	987		
48.68	152	49.72	606	50.76	988		
48.70	160	49.74	615	50.78	989		
48.72	169	49.76	623	50.80	990		
48.74	178	49.78	632	50.82	990		
48.76	187	49.80	641	50.84	991		
48.78	195	49.82	650	50.86	992		
48.80	204	49.84	658	50.88	993		
48.82	213	49.86	667	50.90	993		
48.84	222	49.88	676	50.92	994		
48.86	230	49.90	685	50.94	995		
48.88	239	49.92	693	50.96	996		
48.90	248	49.94	702	50.98	996		
48.92	257	49.96	711	51.00	997		
48.94	265	49.98	720	51.02	998		
48.96	274	50.00	728	51.04	999		
48.98	283	50.02	737	51.06	999		
49.00	291	50.04	746	51.08	1,000		
49.02	300	50.06	754	51.10	1,001		
49.04	309	50.08	763	51.12	1,001		
49.06	318	50.10	772	51.14	1,002		
49.08	326	50.12	781	51.16	1,003		
49.10	335	50.14	789	51.18	1,004		

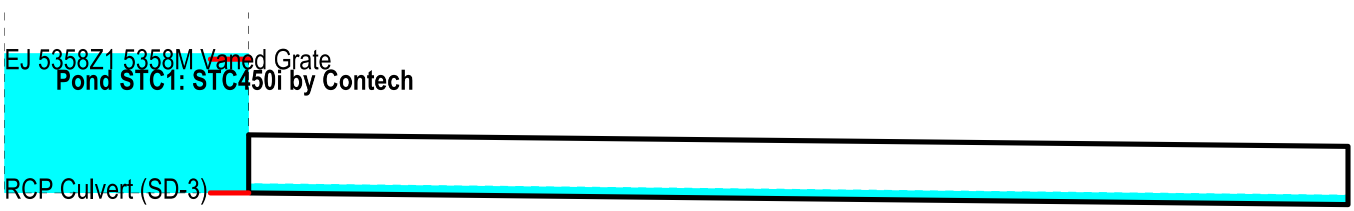
Summary for Pond STC1: STC450i by Contech

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 2.58" for 2-Year event
Inflow = 0.86 cfs @ 12.13 hrs, Volume= 0.061 af
Outflow = 0.86 cfs @ 12.13 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.13 hrs, Volume= 0.061 af
Routed to Pond IC2 : Infiltration Chamber Under Parking Lot

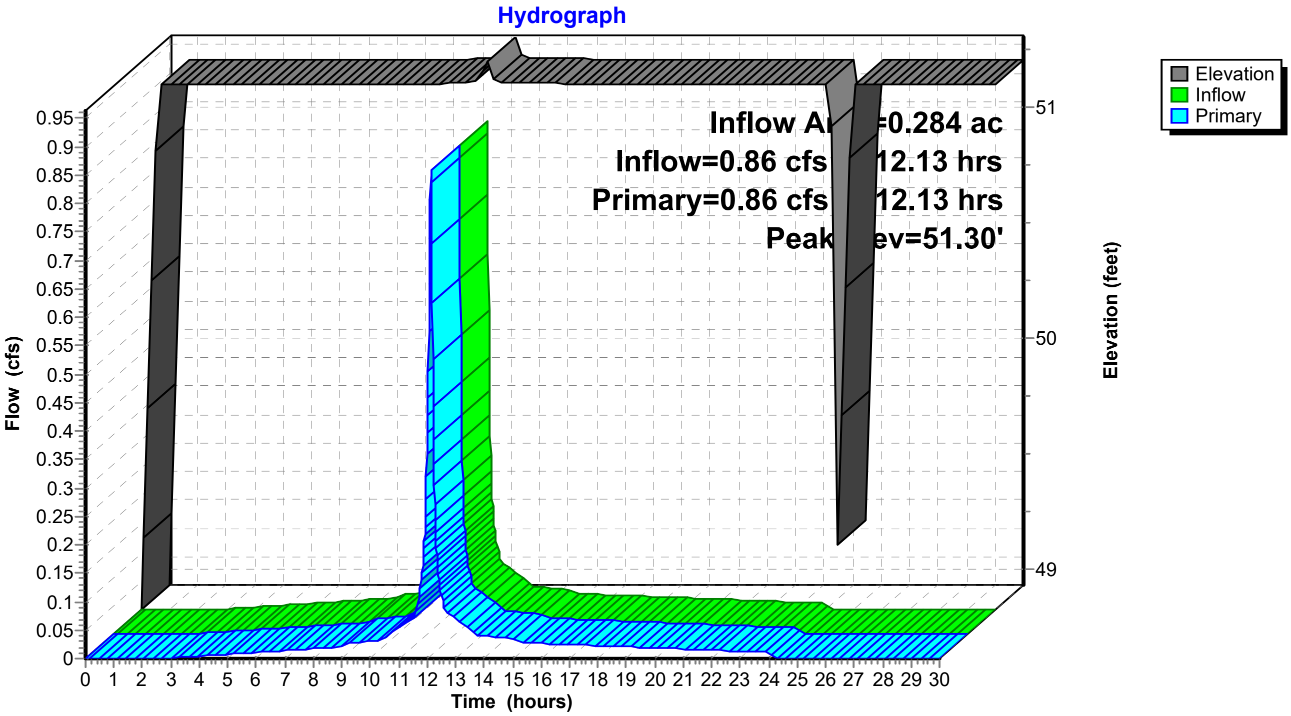
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 51.30' @ 12.13 hrs
Flood Elev= 52.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	48.90'	**12.00" Round RCP Culvert (SD-3)** L= 22.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.90' / 48.70' S= 0.0089 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	51.20'	**EJ 5358Z1 5358M Vaned Grate** Head (feet) 0.00 0.08 0.17 0.25 Disch. (cfs) 0.000 0.600 1.800 3.300

Primary OutFlow Max=0.85 cfs @ 12.13 hrs HW=51.30' TW=49.35' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-3)** (Passes 0.85 cfs of 5.21 cfs potential flow)
  └─**2=EJ 5358Z1 5358M Vaned Grate** (Custom Controls 0.85 cfs)



Pond STC1: STC450i by Contech



Stage-Area-Storage for Pond STC1: STC450i by Contech

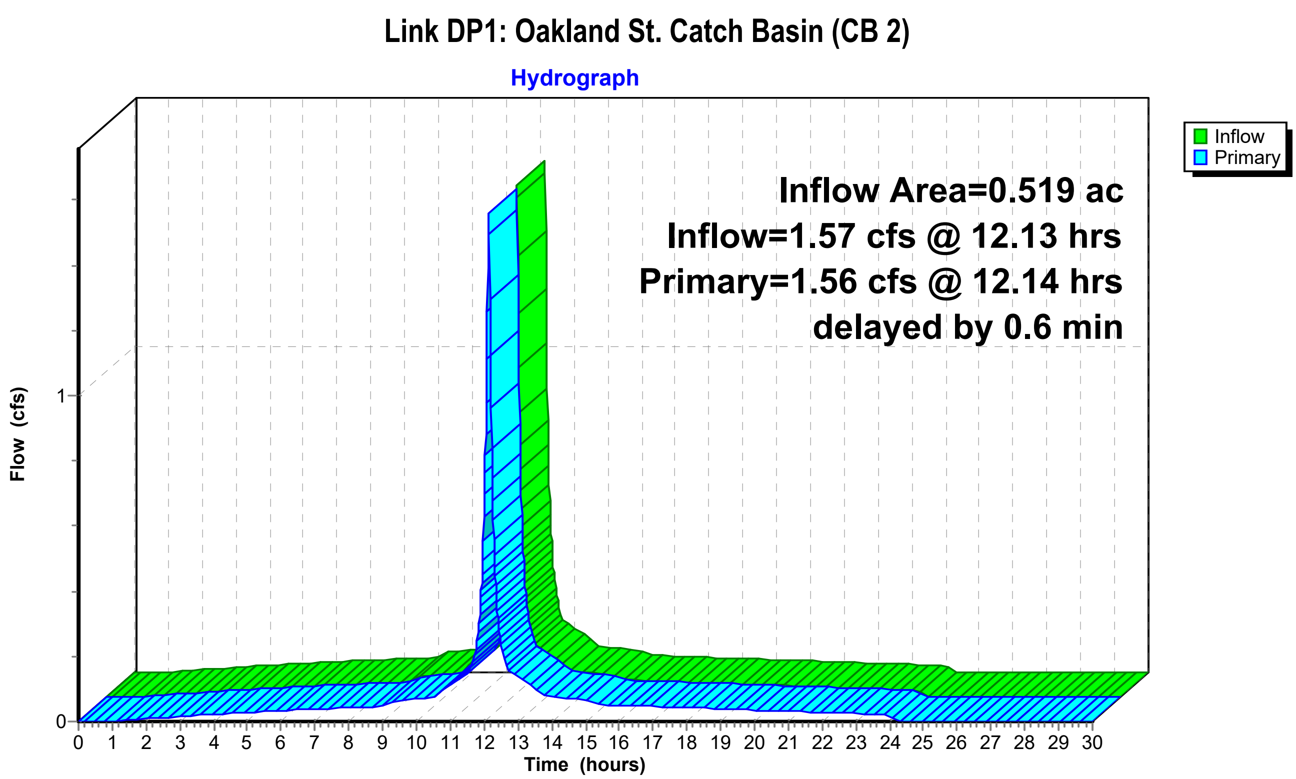
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
48.90	**0.000**	49.94	0.000	50.98	0.000
48.92	0.000	49.96	0.000	51.00	0.000
48.94	0.000	49.98	0.000	51.02	0.000
48.96	0.000	50.00	0.000	51.04	0.000
48.98	0.000	50.02	0.000	51.06	0.000
49.00	0.000	50.04	0.000	51.08	0.000
49.02	0.000	50.06	0.000	51.10	0.000
49.04	0.000	50.08	0.000	51.12	0.000
49.06	0.000	50.10	0.000	51.14	0.000
49.08	0.000	50.12	0.000	51.16	0.000
49.10	0.000	50.14	0.000	51.18	0.000
49.12	0.000	50.16	0.000	51.20	0.000
49.14	0.000	50.18	0.000	51.22	0.000
49.16	0.000	50.20	0.000	51.24	0.000
49.18	0.000	50.22	0.000	51.26	0.000
49.20	0.000	50.24	0.000	51.28	0.000
49.22	0.000	50.26	0.000	51.30	0.000
49.24	0.000	50.28	0.000	51.32	0.000
49.26	0.000	50.30	0.000	51.34	0.000
49.28	0.000	50.32	0.000	51.36	0.000
49.30	0.000	50.34	0.000	51.38	0.000
49.32	0.000	50.36	0.000	51.40	0.000
49.34	0.000	50.38	0.000	51.42	0.000
49.36	0.000	50.40	0.000	51.44	0.000
49.38	0.000	50.42	0.000	51.46	0.000
49.40	0.000	50.44	0.000	51.48	0.000
49.42	0.000	50.46	0.000	51.50	0.000
49.44	0.000	50.48	0.000	51.52	0.000
49.46	0.000	50.50	0.000	51.54	0.000
49.48	0.000	50.52	0.000	51.56	0.000
49.50	0.000	50.54	0.000	51.58	0.000
49.52	0.000	50.56	0.000	51.60	0.000
49.54	0.000	50.58	0.000	51.62	0.000
49.56	0.000	50.60	0.000	51.64	0.000
49.58	0.000	50.62	0.000	51.66	0.000
49.60	0.000	50.64	0.000	51.68	0.000
49.62	0.000	50.66	0.000	51.70	0.000
49.64	0.000	50.68	0.000	51.72	0.000
49.66	0.000	50.70	0.000	51.74	0.000
49.68	0.000	50.72	0.000	51.76	0.000
49.70	0.000	50.74	0.000	51.78	0.000
49.72	0.000	50.76	0.000	51.80	0.000
49.74	0.000	50.78	0.000	51.82	0.000
49.76	0.000	50.80	0.000	51.84	0.000
49.78	0.000	50.82	0.000	51.86	0.000
49.80	0.000	50.84	0.000	51.88	0.000
49.82	0.000	50.86	0.000	51.90	0.000
49.84	0.000	50.88	0.000	51.92	0.000
49.86	0.000	50.90	0.000	51.94	0.000
49.88	0.000	50.92	0.000	51.96	0.000
49.90	0.000	50.94	0.000	51.98	0.000
49.92	0.000	50.96	0.000	52.00	0.000

Summary for Link DP1: Oakland St. Catch Basin (CB 2)

Lag time for this node is the sum of lines 1-3 of the Tc calculations in the Extra Tc Calc's Node

Inflow Area = 0.519 ac, 98.58% Impervious, Inflow Depth = 2.92" for 2-Year event
Inflow = 1.57 cfs @ 12.13 hrs, Volume= 0.126 af
Primary = 1.56 cfs @ 12.14 hrs, Volume= 0.126 af, Atten= 1%, Lag= 0.6 min
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

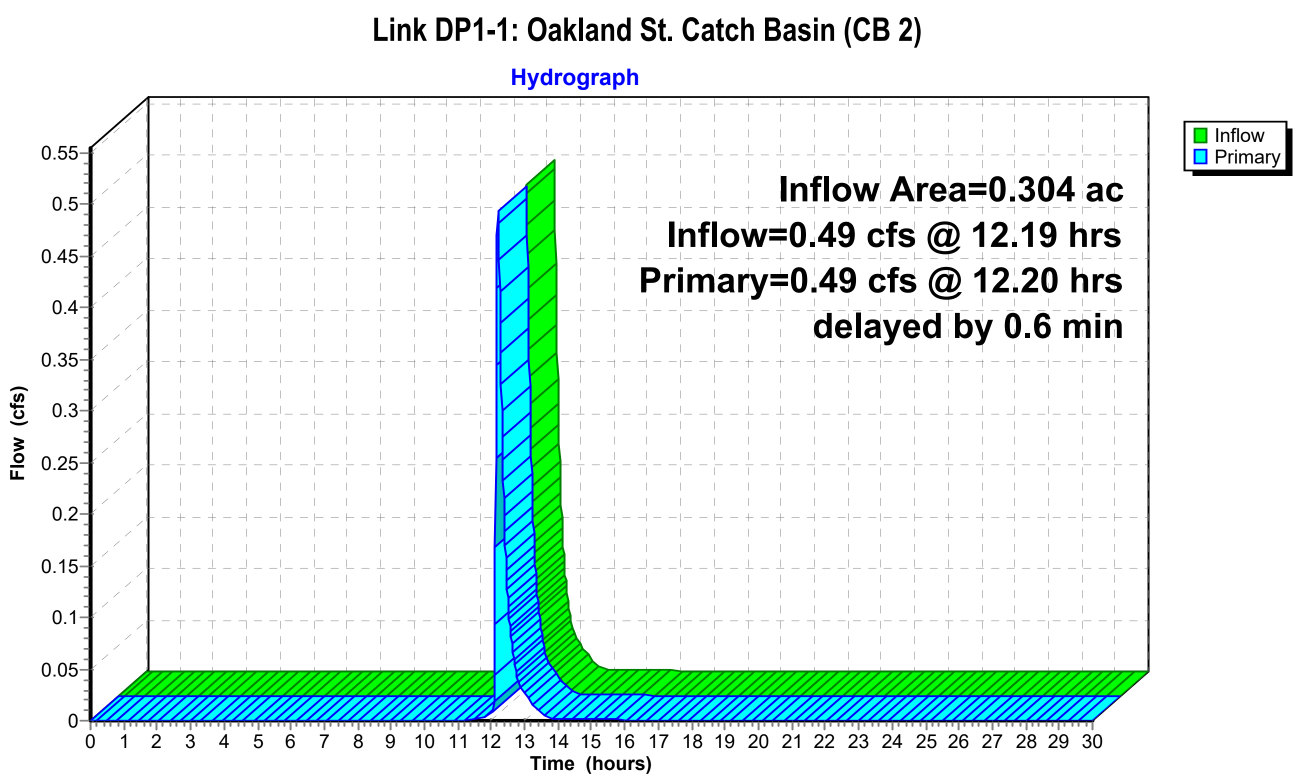
Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP1-1: Oakland St. Catch Basin (CB 2)

Inflow Area = 0.304 ac, 84.11% Impervious, Inflow Depth = 0.53" for 2-Year event
Inflow = 0.49 cfs @ 12.19 hrs, Volume= 0.013 af
Primary = 0.49 cfs @ 12.20 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.6 min
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

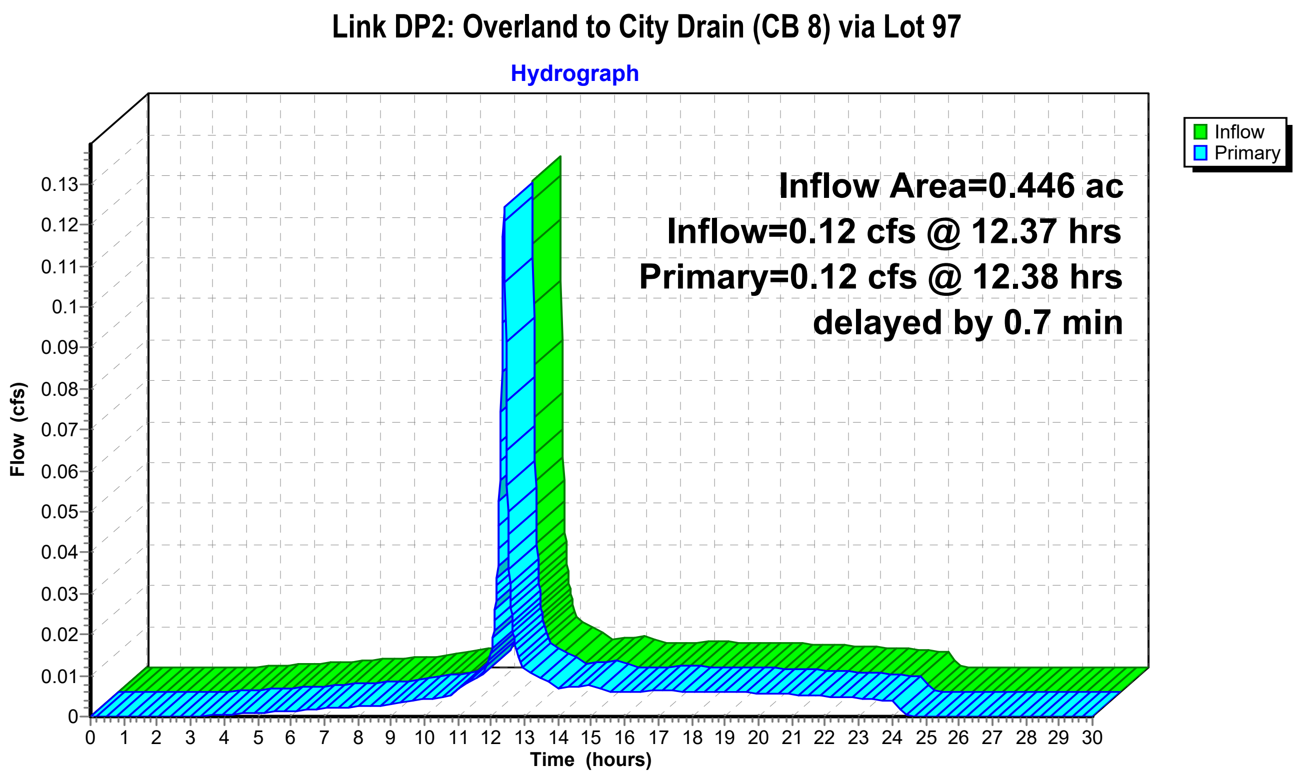


Summary for Link DP2: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.446 ac, 30.85% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 0.12 cfs @ 12.37 hrs, Volume= 0.011 af
Primary = 0.12 cfs @ 12.38 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.7 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

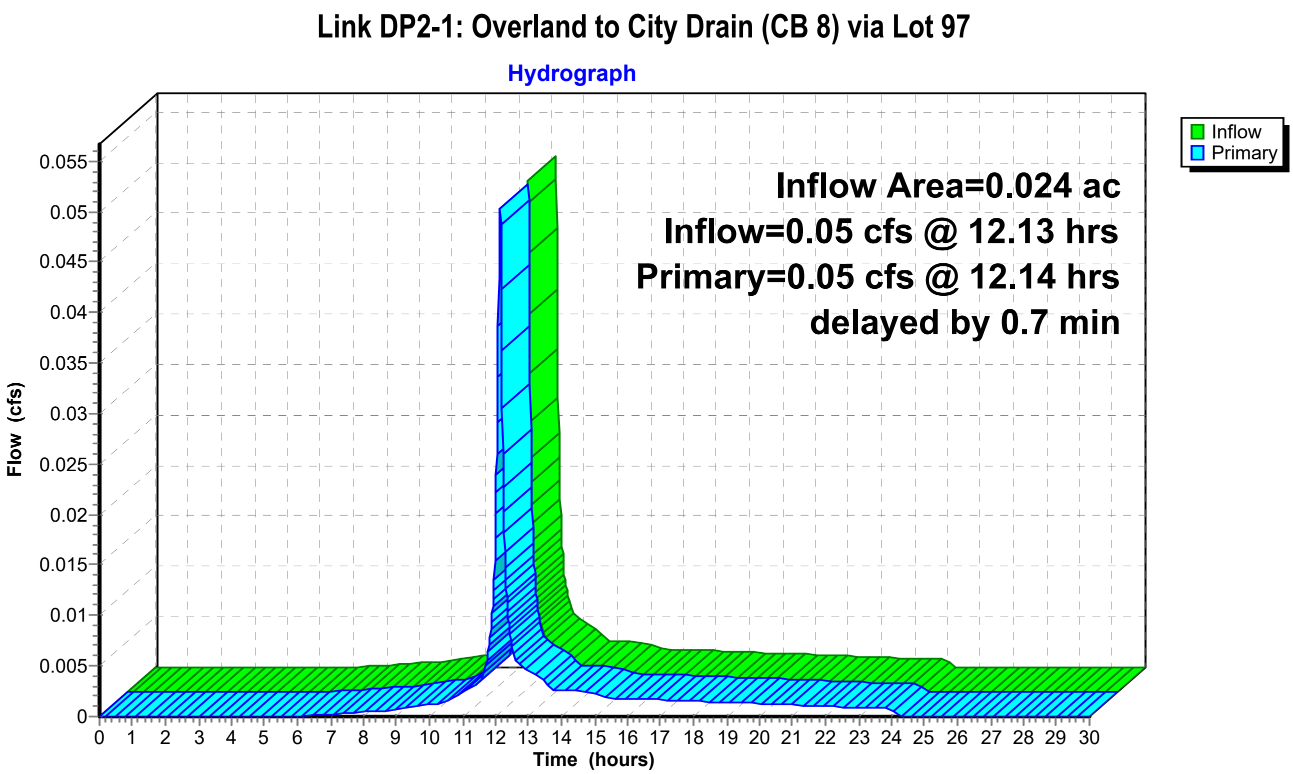


Summary for Link DP2-1: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.024 ac, 0.00% Impervious, Inflow Depth = 1.66" for 2-Year event
Inflow = 0.05 cfs @ 12.13 hrs, Volume= 0.003 af
Primary = 0.05 cfs @ 12.14 hrs, Volume= 0.003 af, Atten= 1%, Lag= 0.7 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

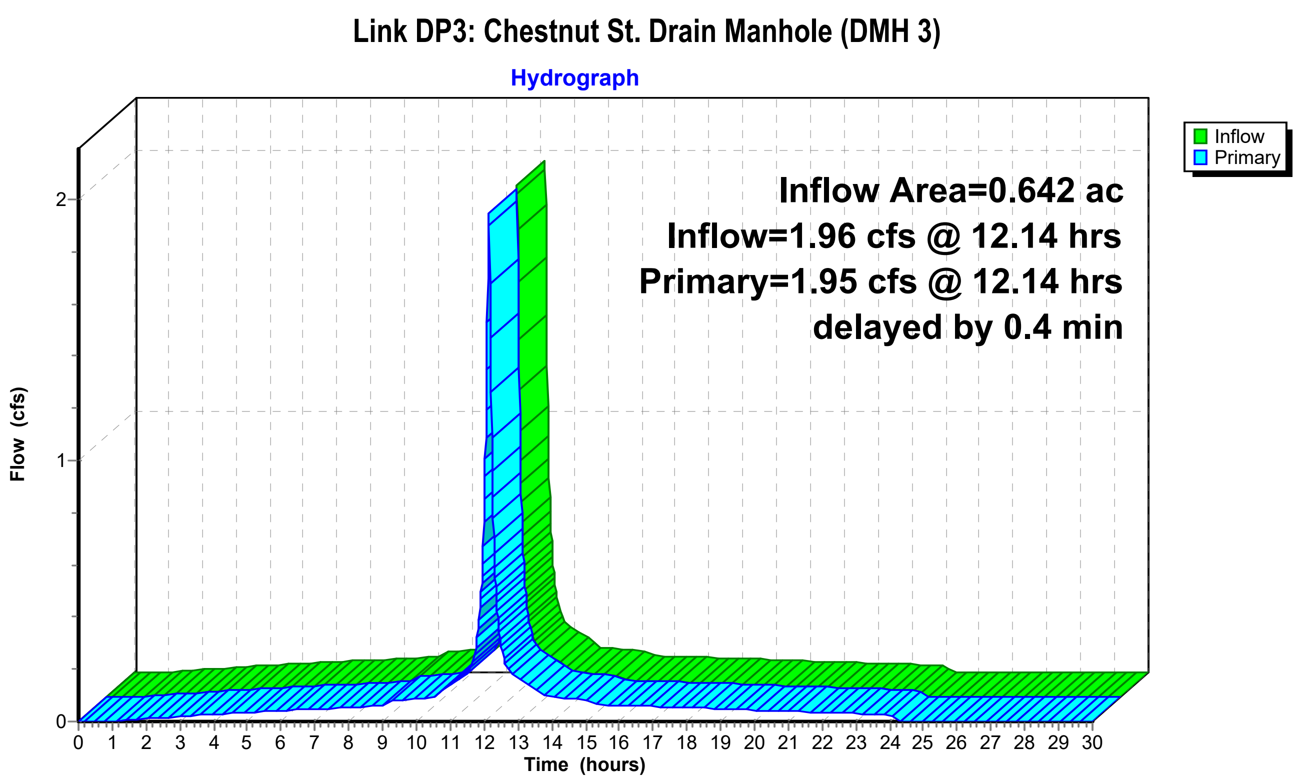


Summary for Link DP3: Chestnut St. Drain Manhole (DMH 3)

Lag time for this node was computed using line 8 of the Tc Calculations of the Extra Tc Calc's node.

Inflow Area = 0.642 ac, 98.80% Impervious, Inflow Depth = 2.94" for 2-Year event
Inflow = 1.96 cfs @ 12.14 hrs, Volume= 0.157 af
Primary = 1.95 cfs @ 12.14 hrs, Volume= 0.157 af, Atten= 1%, Lag= 0.4 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

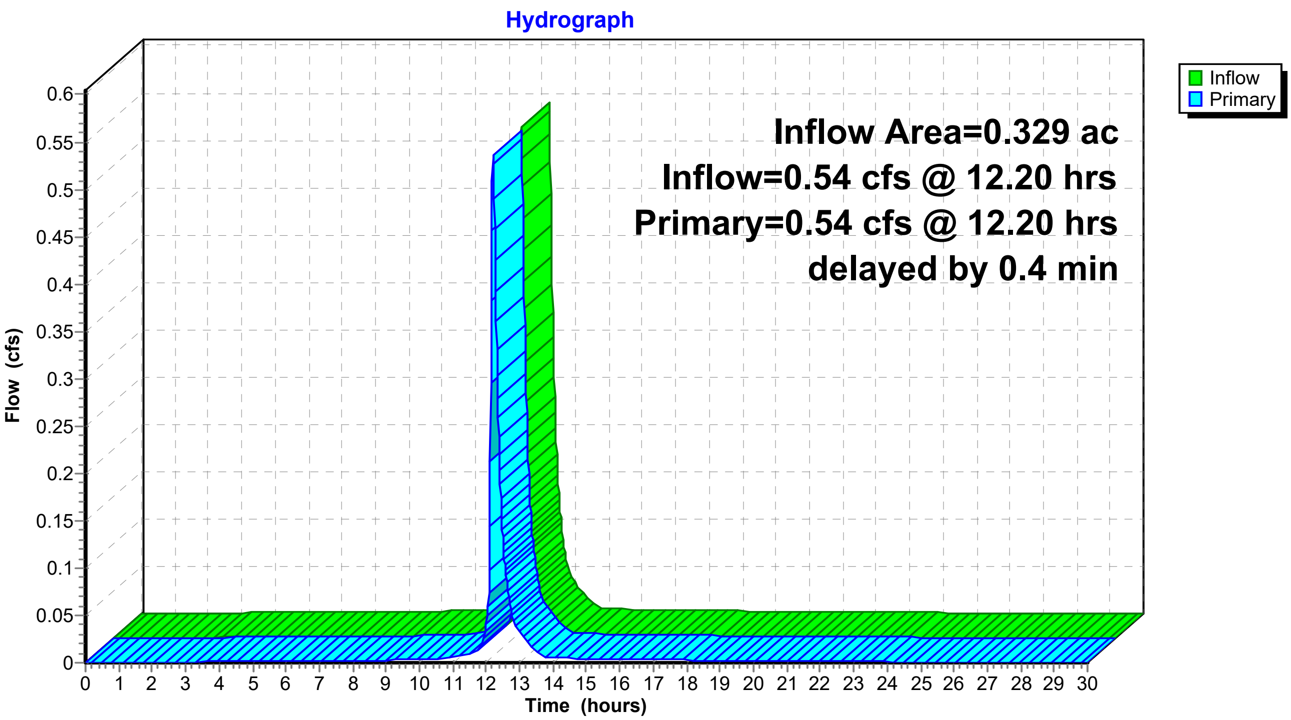


Summary for Link DP3-1: Chestnut St. Drain Manhole (DMH 3)

Inflow Area = 0.329 ac, 85.14% Impervious, Inflow Depth = 0.71" for 2-Year event
Inflow = 0.54 cfs @ 12.20 hrs, Volume= 0.019 af
Primary = 0.54 cfs @ 12.20 hrs, Volume= 0.019 af, Atten= 1%, Lag= 0.4 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

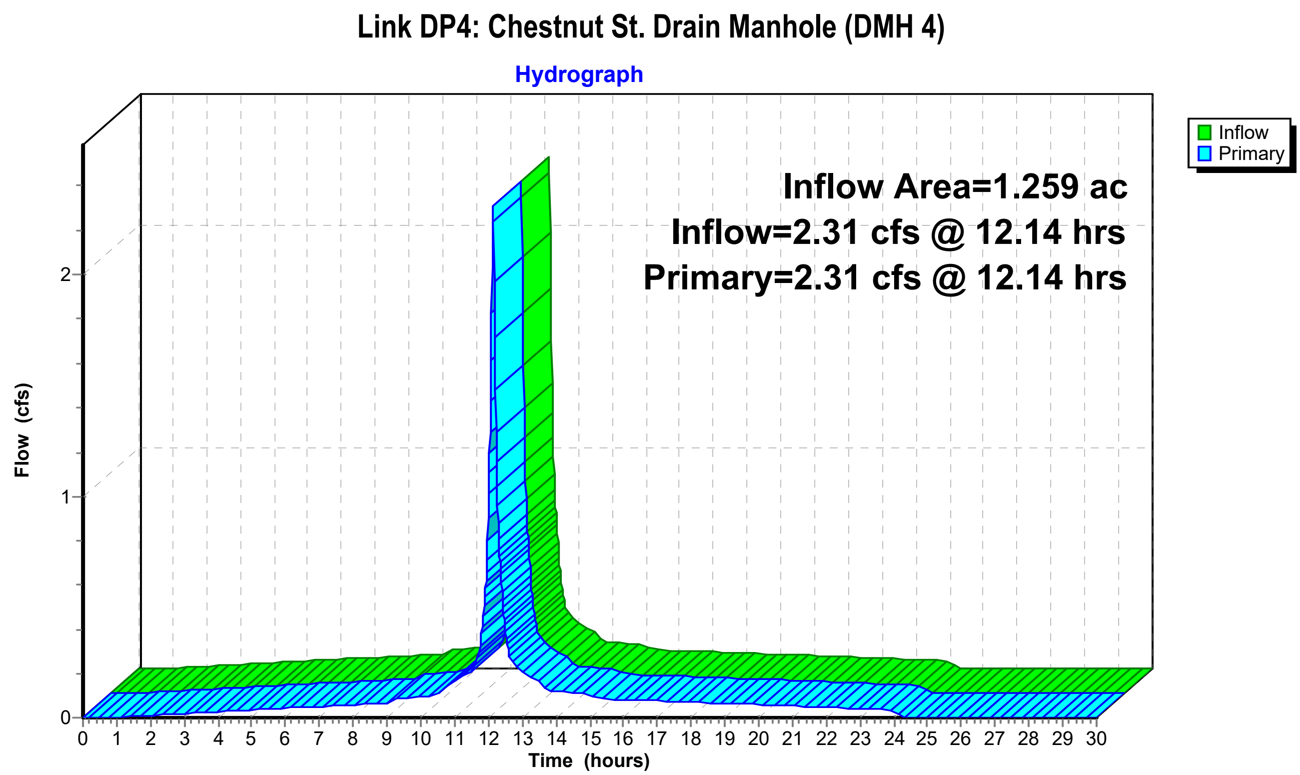
Link DP3-1: Chestnut St. Drain Manhole (DMH 3)



Summary for Link DP4: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 69.90% Impervious, Inflow Depth = 1.82" for 2-Year event
Inflow = 2.31 cfs @ 12.14 hrs, Volume= 0.191 af
Primary = 2.31 cfs @ 12.14 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min

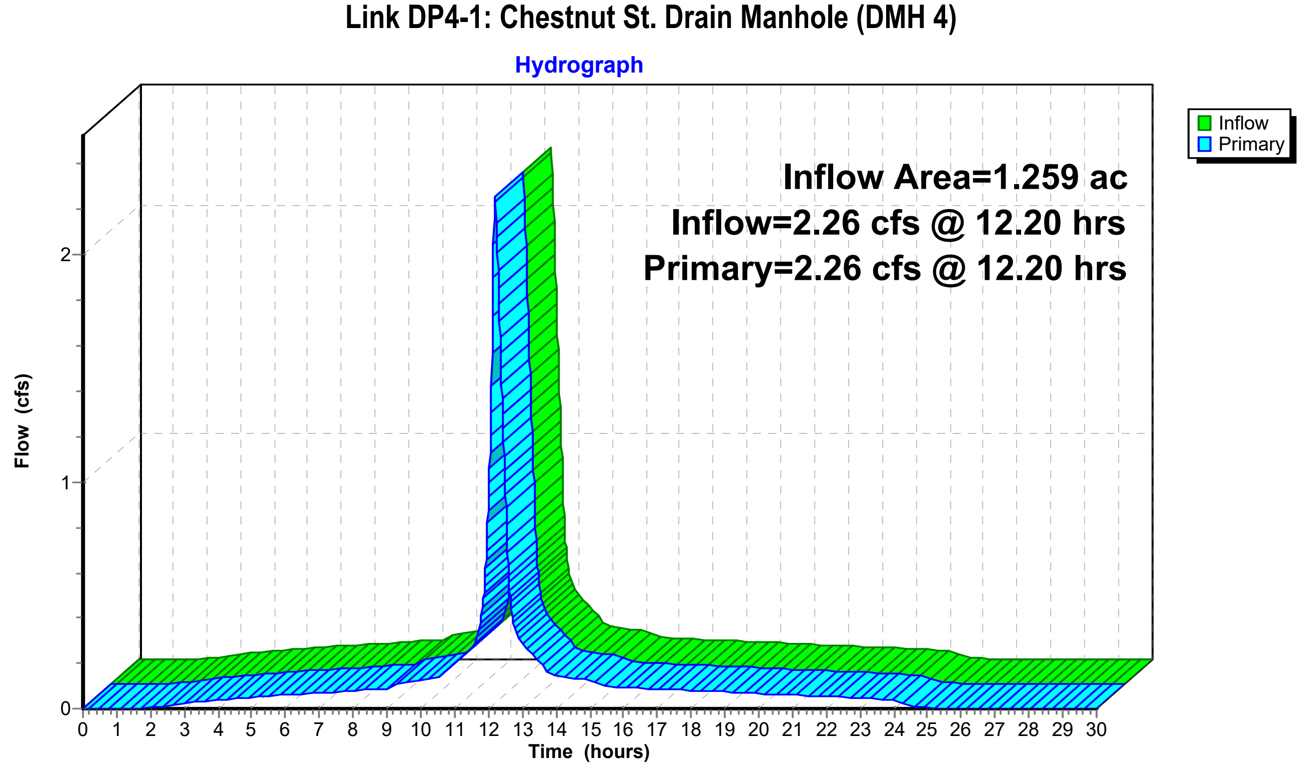
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP4-1: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 92.15% Impervious, Inflow Depth = 2.35" for 2-Year event
Inflow = 2.26 cfs @ 12.20 hrs, Volume= 0.247 af
Primary = 2.26 cfs @ 12.20 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

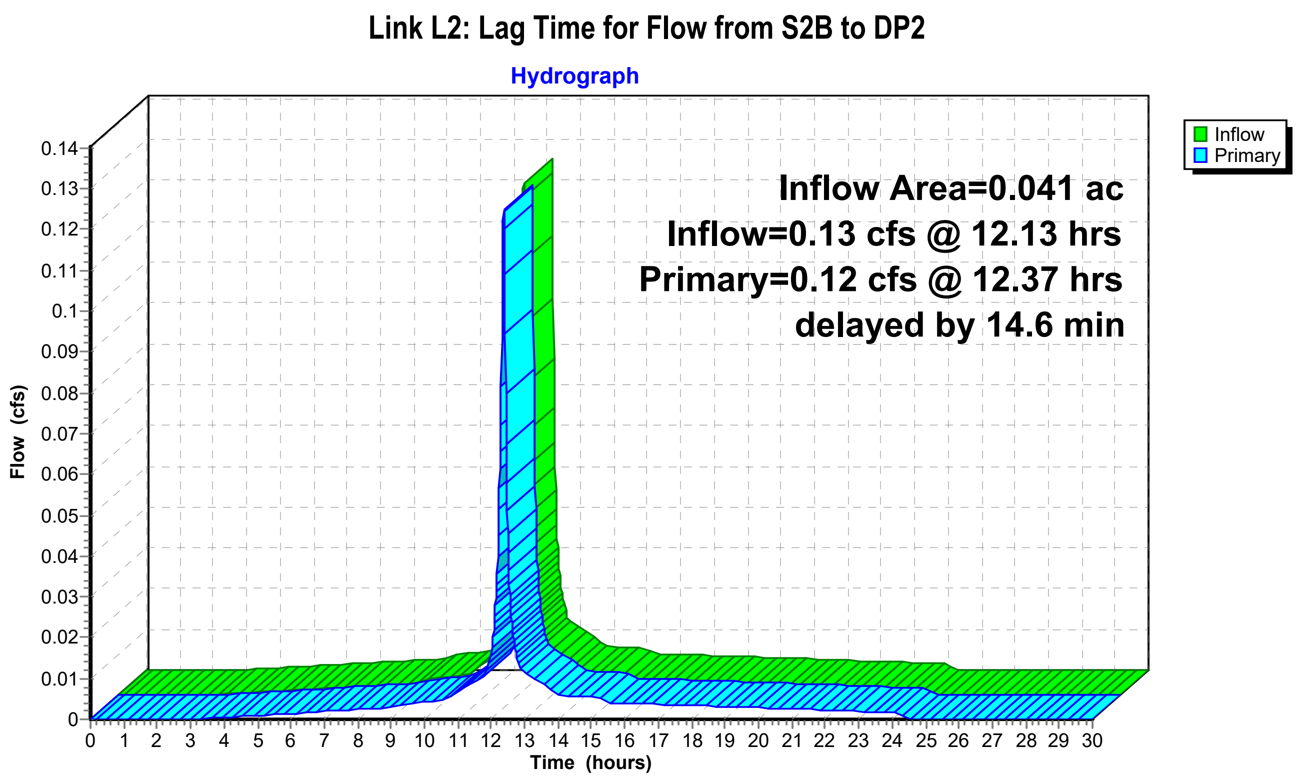


Summary for Link L2: Lag Time for Flow from S2B to DP2

Lag time for this node is the sum of the Tc of Node S2C and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.041 ac, 93.46% Impervious, Inflow Depth = 2.58" for 2-Year event
Inflow = 0.13 cfs @ 12.13 hrs, Volume= 0.009 af
Primary = 0.12 cfs @ 12.37 hrs, Volume= 0.009 af, Atten= 0%, Lag= 14.6 min
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 14.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



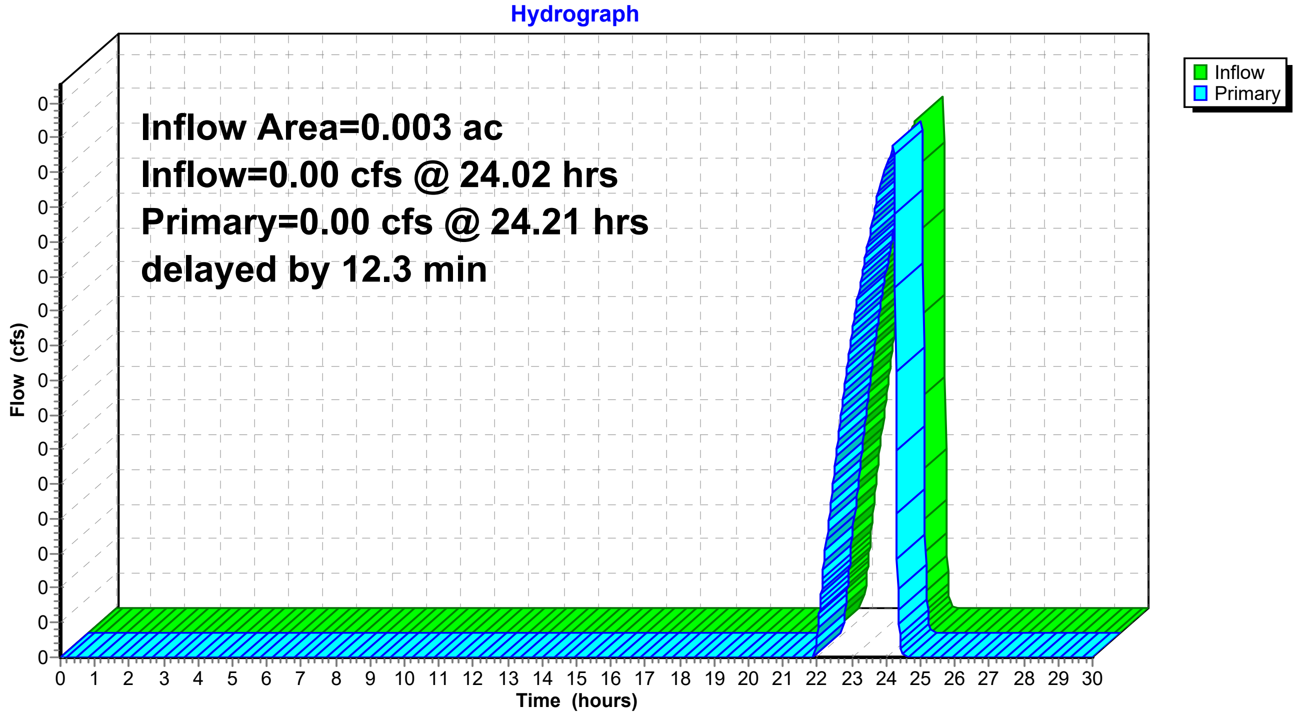
Summary for Link L2-1: Lag Time for Flow from S2B-1 to DP2-1

Lag time for this node is the sum of the Tc of Node S2C-1 and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.003 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.21 hrs, Volume= 0.000 af, Atten= 0%, Lag= 11.5 min
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 12.3 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

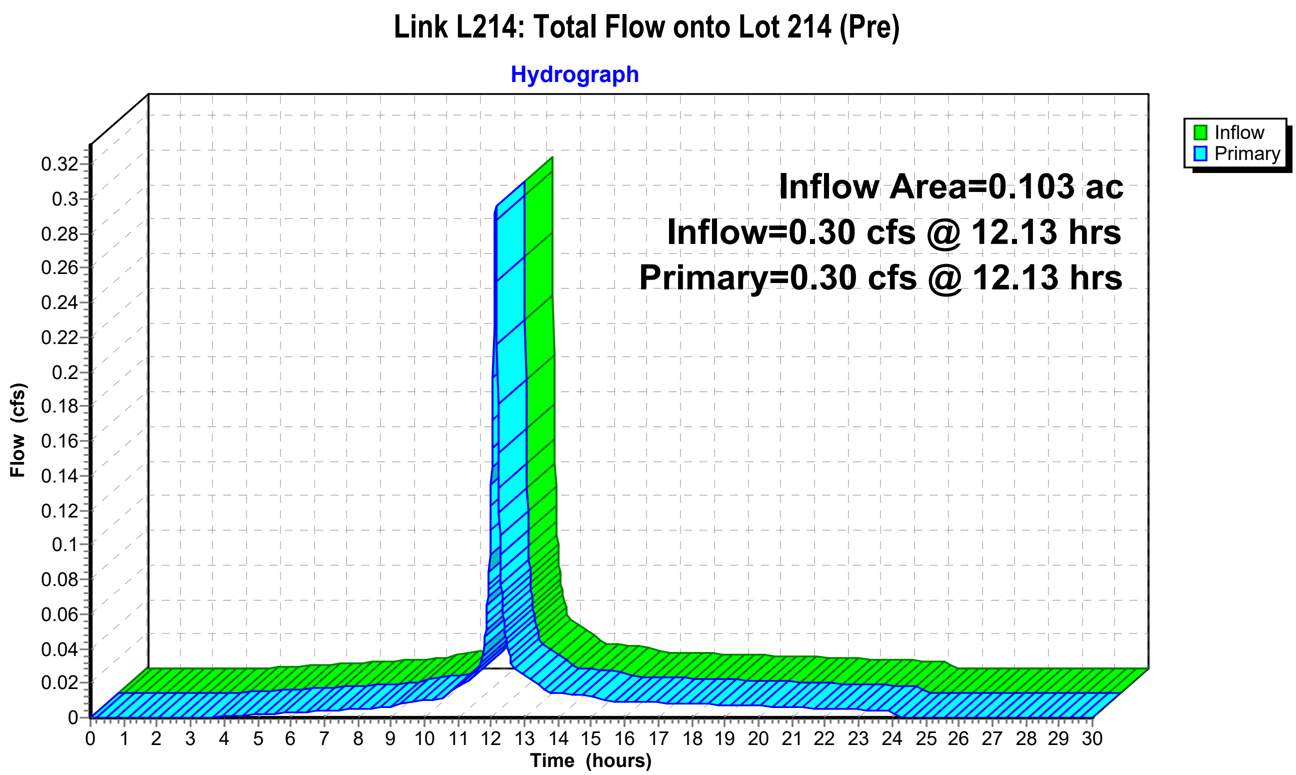
Link L2-1: Lag Time for Flow from S2B-1 to DP2-1



Summary for Link L214: Total Flow onto Lot 214 (Pre)

Inflow Area = 0.103 ac, 90.17% Impervious, Inflow Depth = 2.41" for 2-Year event
Inflow = 0.30 cfs @ 12.13 hrs, Volume= 0.021 af
Primary = 0.30 cfs @ 12.13 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

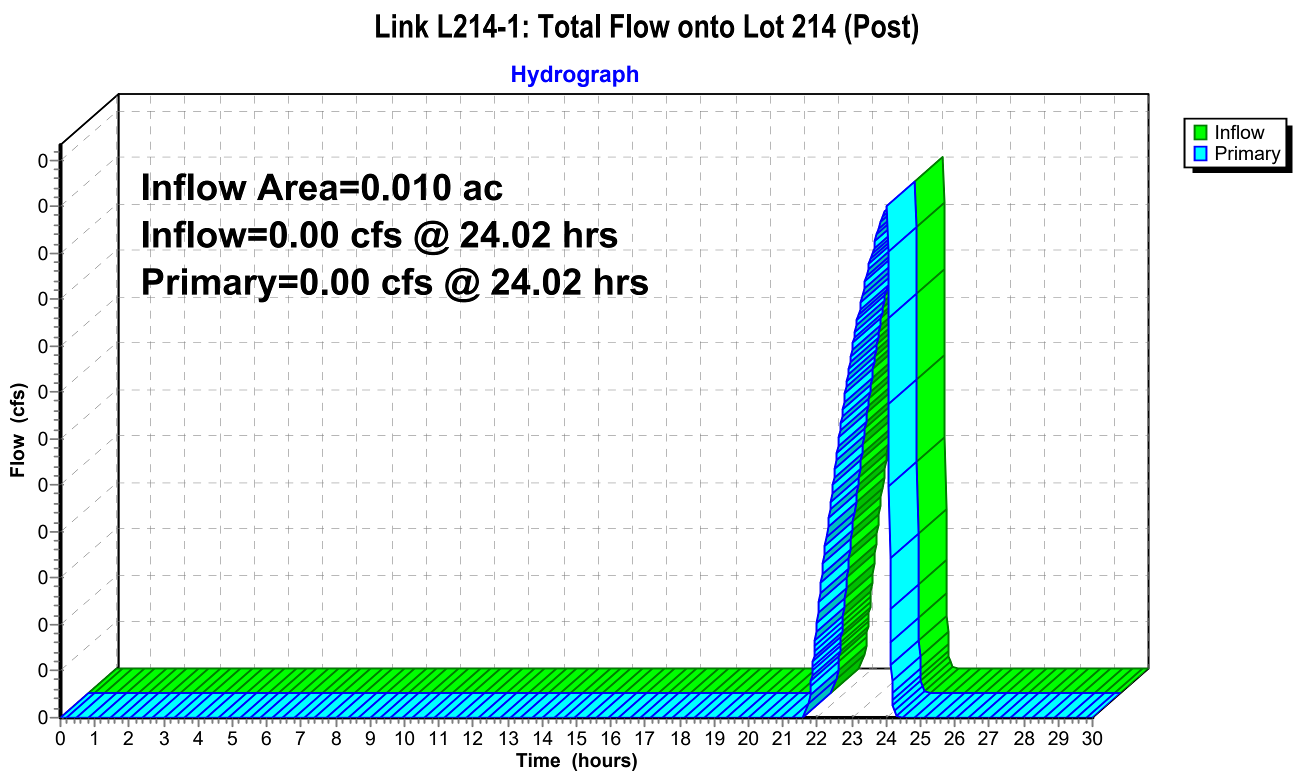
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214-1: Total Flow onto Lot 214 (Post)

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Time span=0.00-30.00 hrs, dt=0.015 hrs, 2001 points x 2
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 S1: Parking & Front of Buildings Runoff Area=19,942 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=2.38 cfs 0.186 af

Subcatchment S1-1: Drains to Parking Lot Chambers Runoff Area=12,372 sf 87.12% Impervious Runoff Depth=4.43"
Tc=6.0 min CN=94 Runoff=1.42 cfs 0.105 af

Subcatchment S1-2: Untreated Runoff onto Oakland St. Runoff Area=556 sf 65.65% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=78 Runoff=0.04 cfs 0.003 af

Subcatchment S214A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=91 Runoff=0.29 cfs 0.021 af

Subcatchment S214A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.22"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=4.43"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.21 cfs 0.015 af

Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.22"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=4.10"
Flow Length=324' Tc=16.4 min CN=91 Runoff=0.20 cfs 0.021 af

Subcatchment S2A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.22"
Flow Length=324' Tc=16.4 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=4.43"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.21 cfs 0.015 af

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.22"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2C: Rear of Building & Site (SW) Runoff Area=17,617 sf 24.44% Impervious Runoff Depth=0.53"
Flow Length=256' Tc=8.3 min UI Adjusted CN=46 Runoff=0.11 cfs 0.018 af

Subcatchment S2C-1: Perimeter of Garage Runoff Area=947 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=279' Tc=6.0 min CN=86 Runoff=0.09 cfs 0.006 af

Subcatchment S3: Southerly Corner of Oakland & Chestnut Runoff Area=5,360 sf 99.74% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=0.64 cfs 0.050 af

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut Runoff Area=1,067 sf 97.94% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.010 af

Subcatchment S4: Loading Dock Runoff Area=7,458 sf 63.19% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=82 Runoff=0.67 cfs 0.045 af

Subcatchment S4-1: Garage Entrance Runoff Area=1,510 sf 63.31% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=89 Runoff=0.16 cfs 0.011 af

Subcatchment S4-2: Proposed Roofs Runoff Area=36,464 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=4.35 cfs 0.341 af

Subcatchment S4-3: Gap Between Buildings Runoff Area=1,495 sf 62.61% Impervious Runoff Depth=4.77"
Tc=6.0 min CN=97 Runoff=0.18 cfs 0.014 af

Subcatchment SAD: Collected by Courtyard Area Drain Runoff Area=360 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment STD: Collected by Garage Trench Drain Runoff Area=396 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment Tc: Extra Tc Calc's
Runoff=0.00 cfs 0.000 af

Pond DC1: Detention Chamber Peak Elev=26.38' Storage=1,834 cf Inflow=4.53 cfs 0.354 af
Outflow=2.26 cfs 0.354 af

Pond GAP: Area Drain Peak Elev=54.53' Storage=7 cf Inflow=0.18 cfs 0.014 af
Outflow=0.18 cfs 0.014 af

Pond IC2: Infiltration Chamber Under Parking Lot Peak Elev=49.81' Storage=646 cf Inflow=1.42 cfs 0.105 af
Discarded=0.07 cfs 0.071 af Primary=1.12 cfs 0.034 af Outflow=1.19 cfs 0.105 af

Pond STC1: STC450i by Contech Peak Elev=51.34' Inflow=1.42 cfs 0.105 af
Outflow=1.42 cfs 0.105 af

Link DP1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=2.52 cfs 0.207 af
Primary=2.50 cfs 0.207 af

Link DP1-1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=1.16 cfs 0.037 af
Primary=1.16 cfs 0.037 af

Link DP2: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.27 cfs 0.033 af
Primary=0.26 cfs 0.033 af

Link DP2-1: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.09 cfs 0.007 af
Primary=0.09 cfs 0.007 af

Link DP3: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=3.13 cfs 0.257 af
Primary=3.11 cfs 0.257 af

Link DP3-1: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=1.26 cfs 0.047 af
Primary=1.25 cfs 0.047 af

Link DP4: Chestnut St. Drain Manhole (DMH 4) Inflow=3.90 cfs 0.336 af
Primary=3.90 cfs 0.336 af

Link DP4-1: Chestnut St. Drain Manhole (DMH 4) Inflow=3.67 cfs 0.419 af
Primary=3.67 cfs 0.419 af

Link L2: Lag Time for Flow from S2B to DP2 delayed by 14.6 min Inflow=0.21 cfs 0.015 af
Primary=0.21 cfs 0.015 af

Link L2-1: Lag Time for Flow from S2B-1 to DP2-1 delayed by 12.3 min Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L214: Total Flow onto Lot 214 (Pre) Inflow=0.50 cfs 0.036 af
Primary=0.50 cfs 0.036 af

Link L214-1: Total Flow onto Lot 214 (Post) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.649 ac Runoff Volume = 0.869 af Average Runoff Depth = 3.94"
18.81% Pervious = 0.498 ac 81.19% Impervious = 2.151 ac

Summary for Subcatchment S1: Parking & Front of Buildings

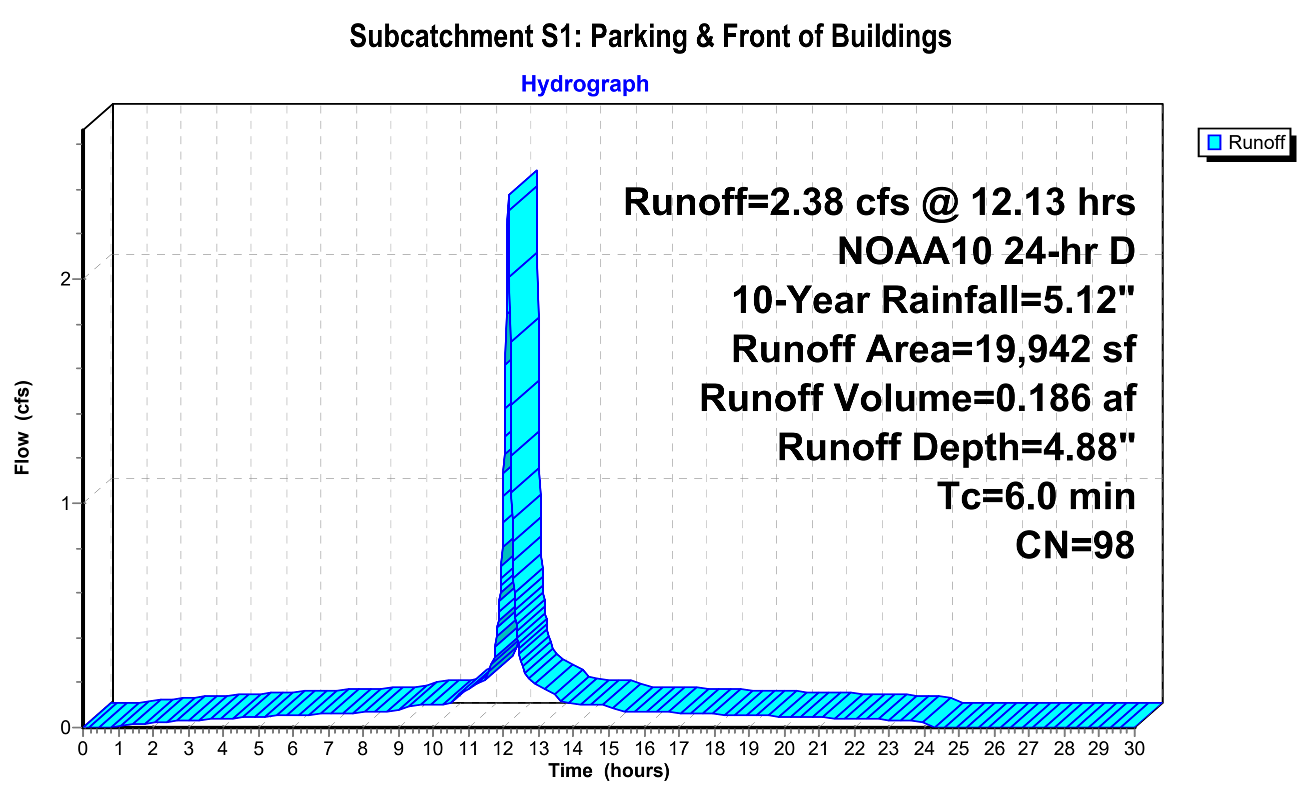
"Paved Parking" includes building roofs.

Runoff = 2.38 cfs @ 12.13 hrs, Volume= 0.186 af, Depth= 4.88"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
12,479	98	Paved parking, HSG A
7,463	98	Roofs, HSG A
19,942	98	Weighted Average
19,942		100.00% Impervious Area

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



Summary for Subcatchment S1-1: Drains to Parking Lot Chambers

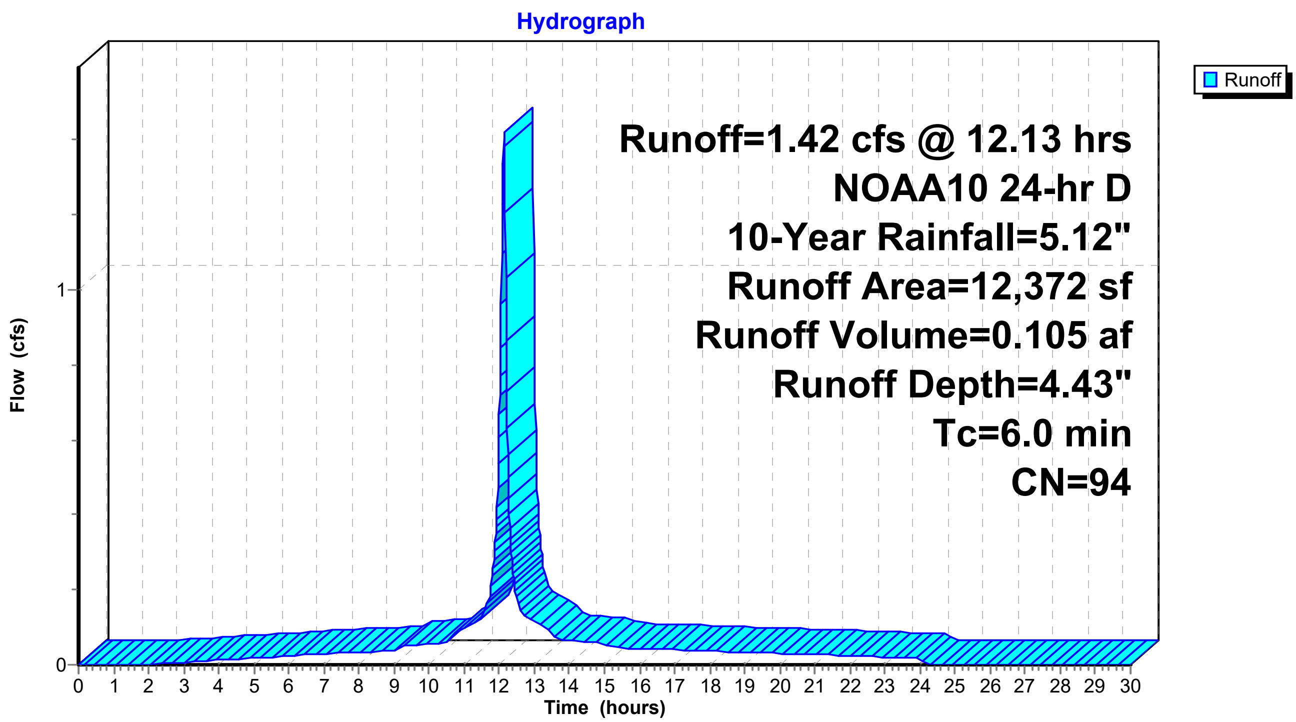
Runoff = 1.42 cfs @ 12.13 hrs, Volume= 0.105 af, Depth= 4.43"
Routed to Pond STC1 : STC450i by Contech

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
717	39	>75% Grass cover, Good, HSG A
876	96	Gravel surface, HSG A
10,779	98	Paved parking, HSG A
12,372	94	Weighted Average
1,593		12.88% Pervious Area
10,779		87.12% Impervious Area

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

Subcatchment S1-1: Drains to Parking Lot Chambers



Summary for Subcatchment S1-2: Untreated Runoff onto Oakland St.

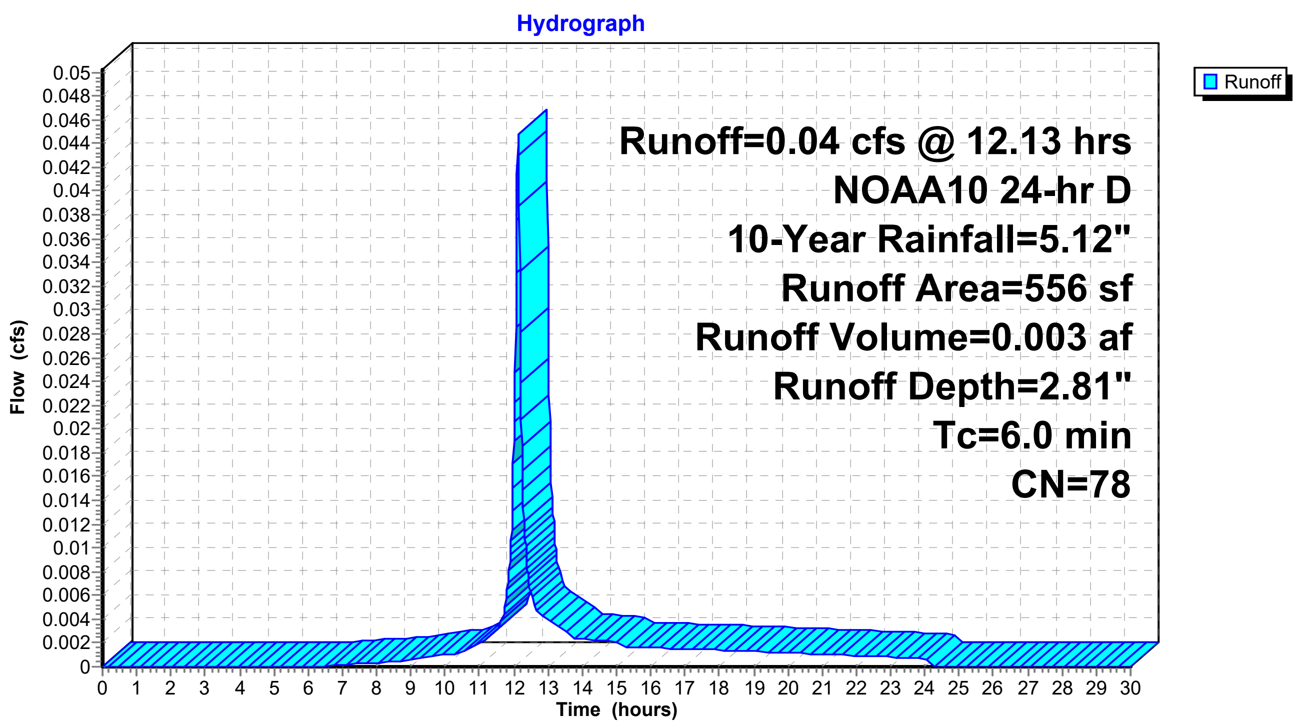
Runoff = 0.04 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 2.81"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
191	39	>75% Grass cover, Good, HSG A
365	98	Paved parking, HSG A
556	78	Weighted Average
191		34.35% Pervious Area
365		65.65% Impervious Area

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

Subcatchment S1-2: Untreated Runoff onto Oakland St.



Summary for Subcatchment S214A: Easterly Roof & Lot Line

"Paved Parking" includes building roofs.

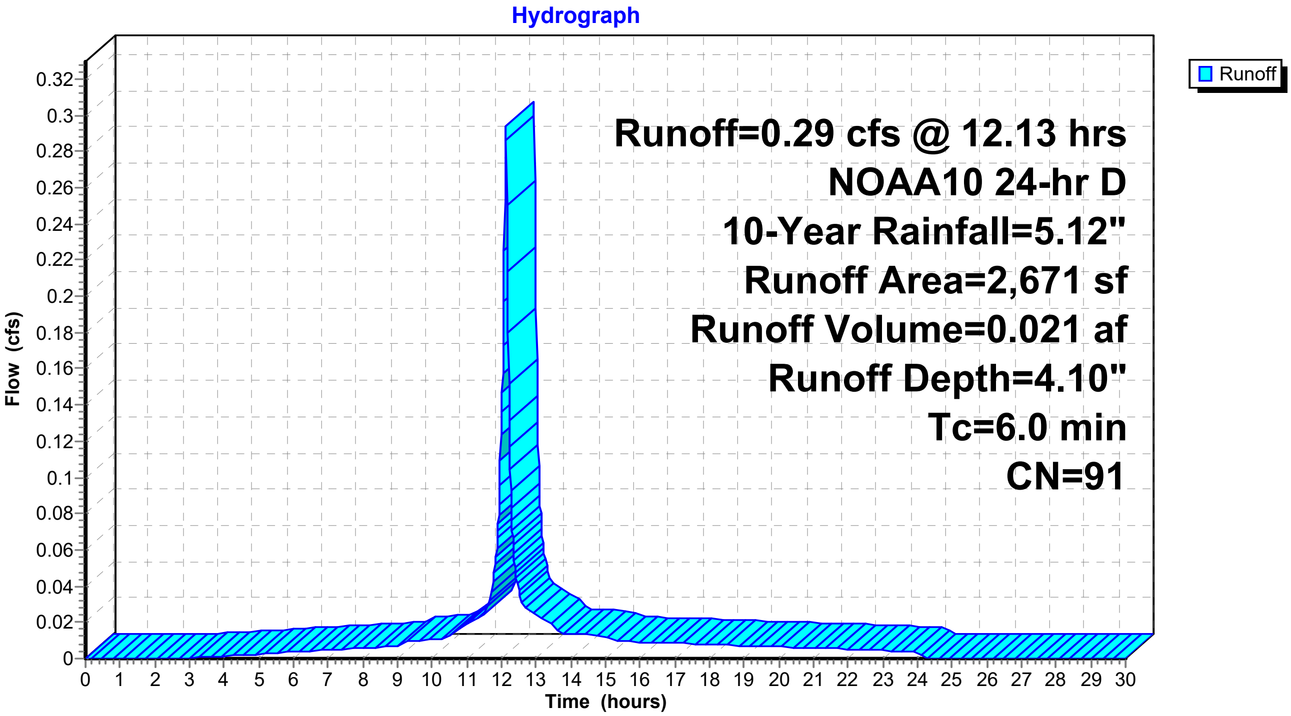
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.021 af, Depth= 4.10"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

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

Subcatchment S214A: Easterly Roof & Lot Line



Summary for Subcatchment S214A-1: Easterly Lot Line

"Paved Parking" includes building roofs.

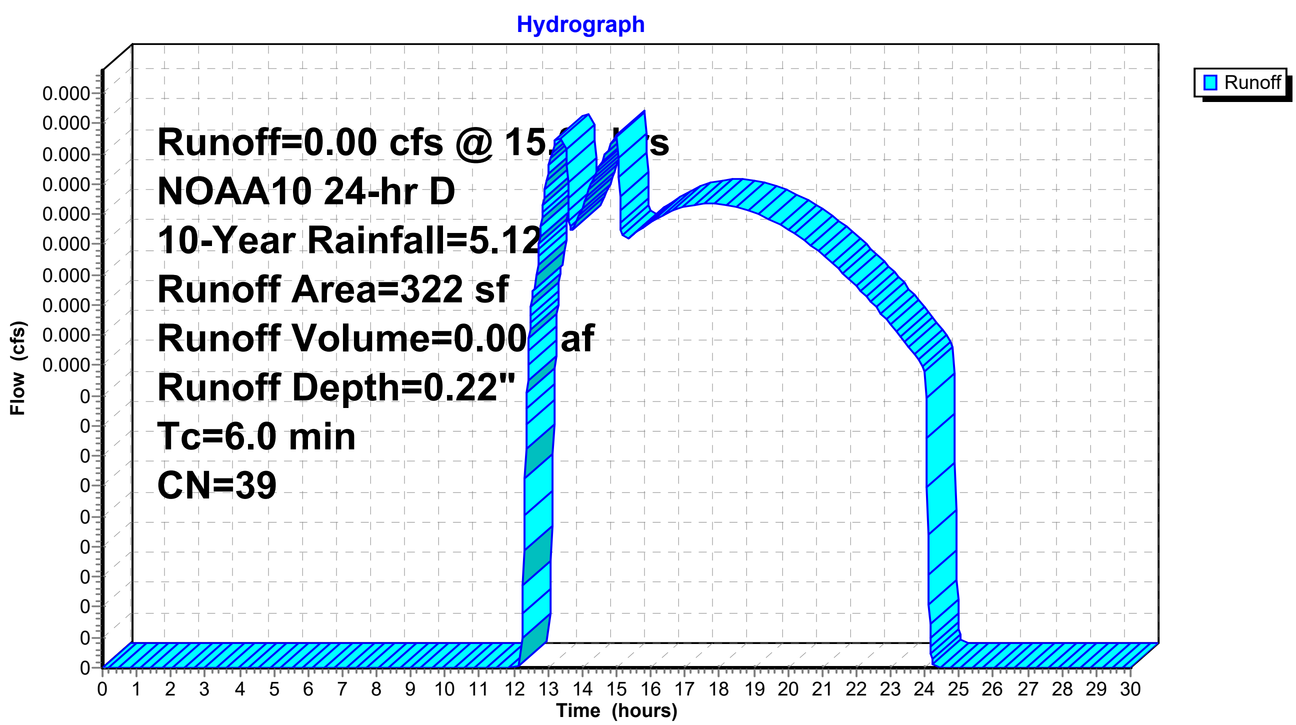
Runoff = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af, Depth= 0.22"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

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

Subcatchment S214A-1: Easterly Lot Line



Summary for Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

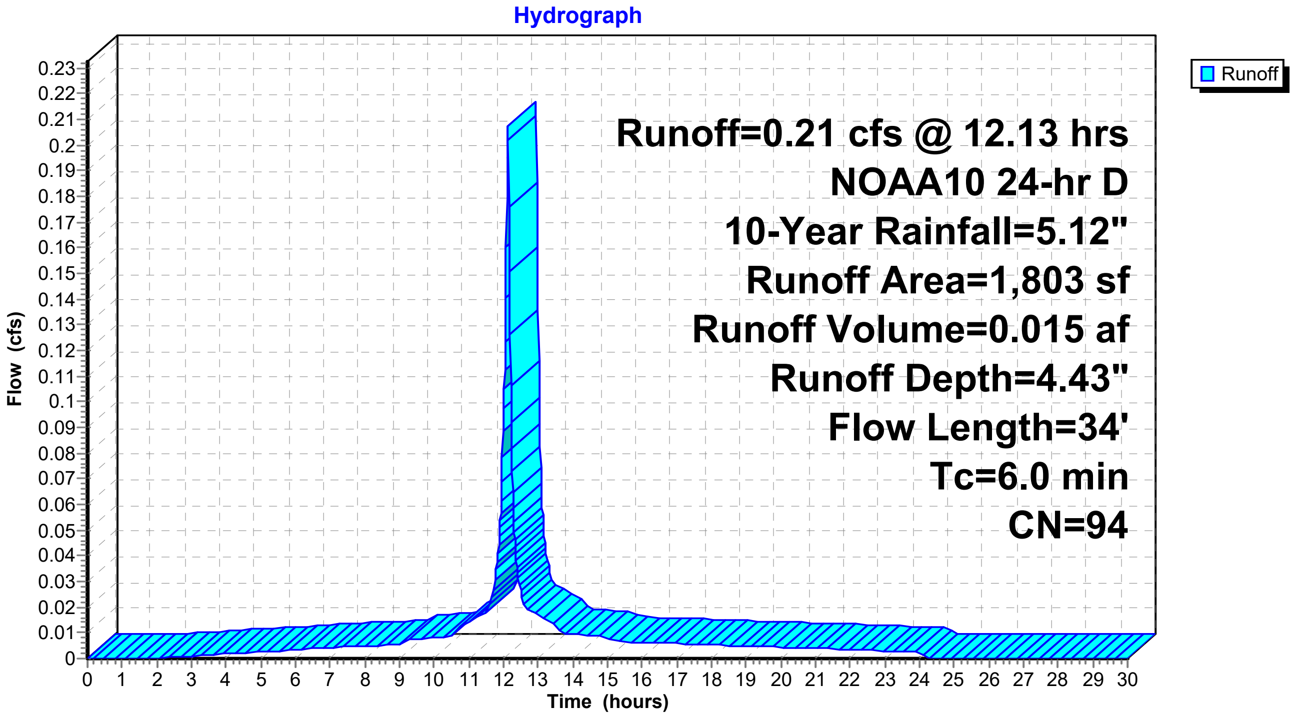
Runoff = 0.21 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 4.43"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214



Summary for Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214

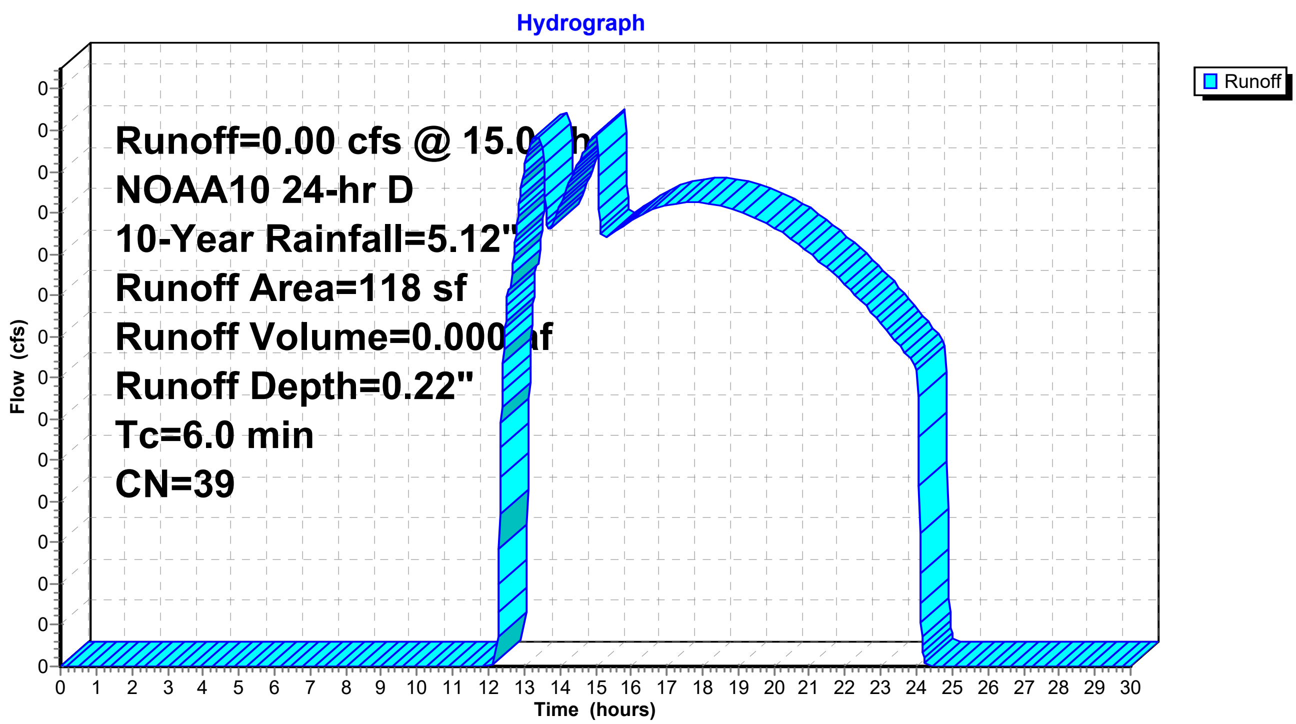
Runoff = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af, Depth= 0.22"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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

Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214



Summary for Subcatchment S2A: Easterly Roof & Lot Line

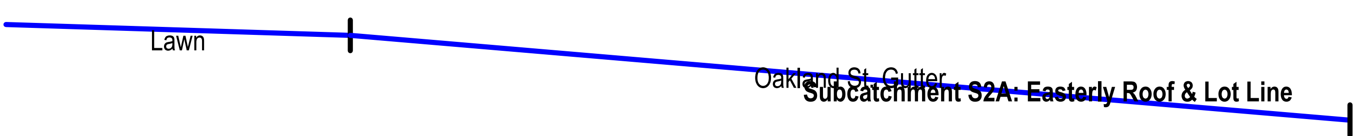
"Paved Parking" includes building roofs.

Runoff = 0.20 cfs @ 12.24 hrs, Volume= 0.021 af, Depth= 4.10"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

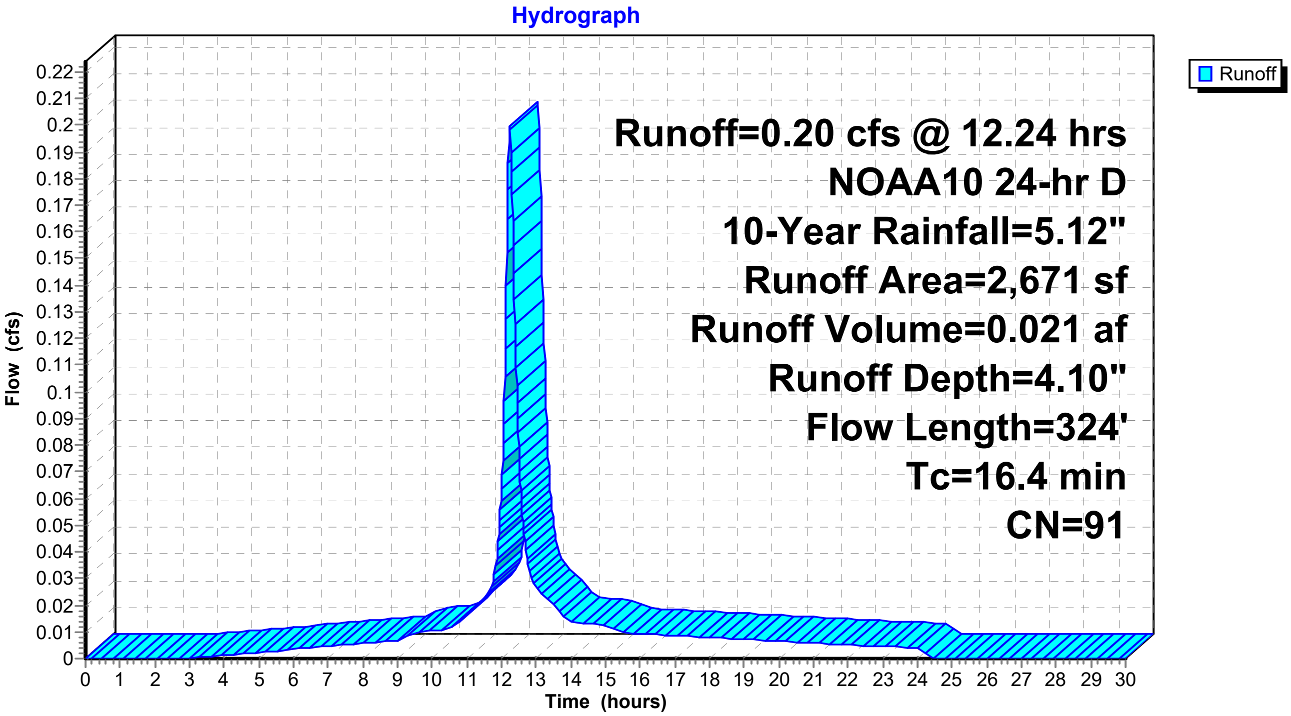
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter** Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A: Easterly Roof & Lot Line



Summary for Subcatchment S2A-1: Easterly Lot Line

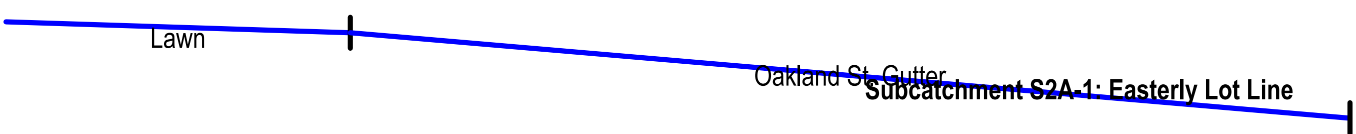
"Paved Parking" includes building roofs.

Runoff = 0.00 cfs @ 13.50 hrs, Volume= 0.000 af, Depth= 0.22"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

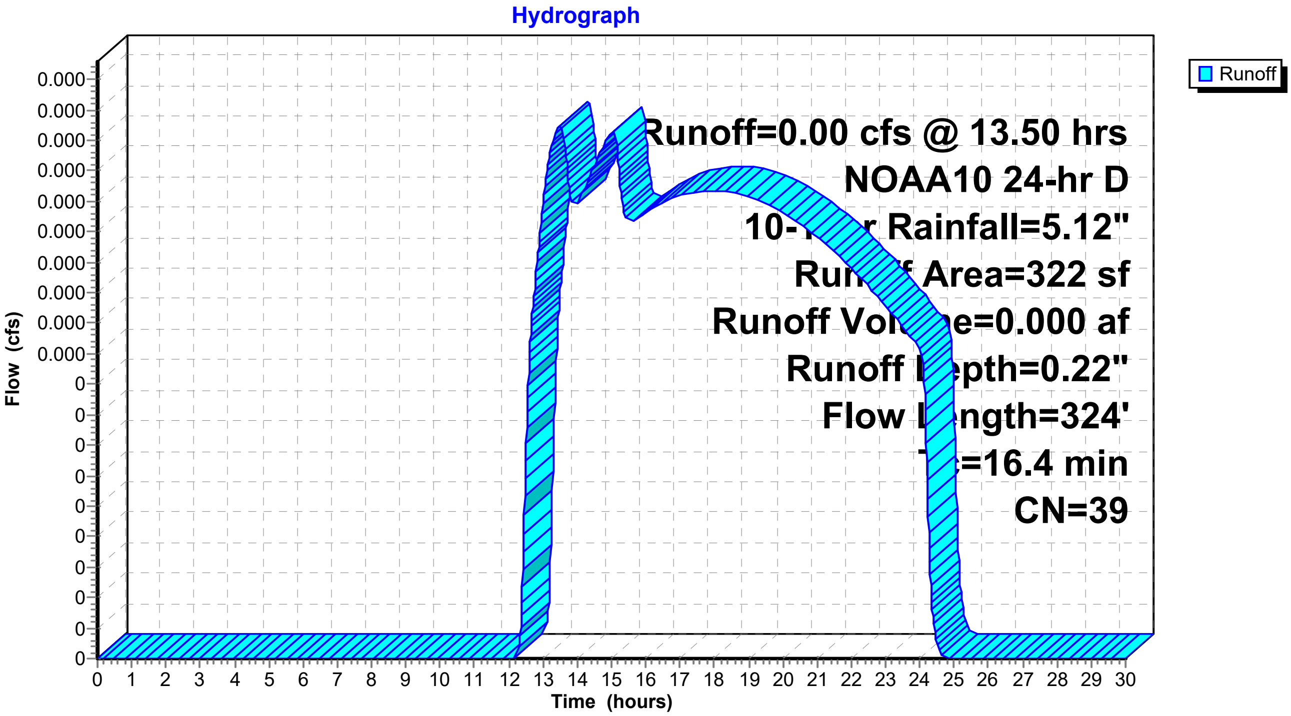
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn**
					Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter**
					Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A-1: Easterly Lot Line



Summary for Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

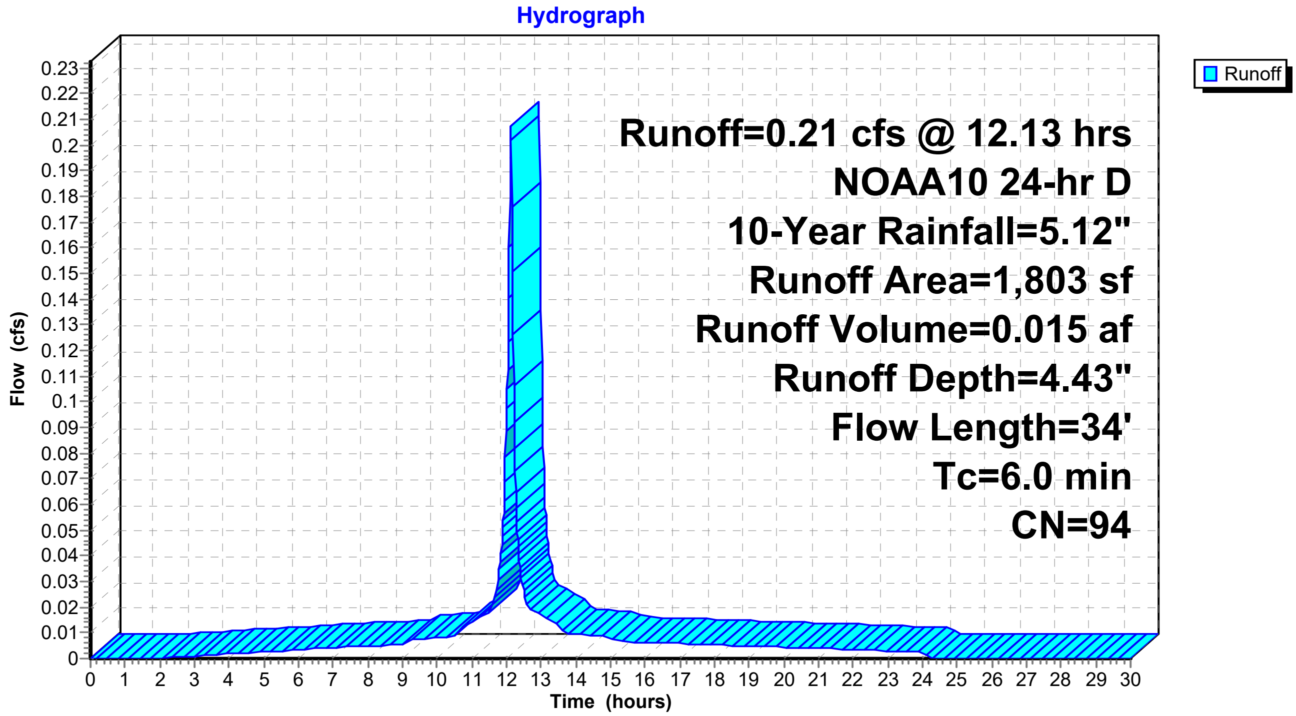
Runoff = 0.21 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 4.43"
Routed to Link L2 : Lag Time for Flow from S2B to DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214



Summary for Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214

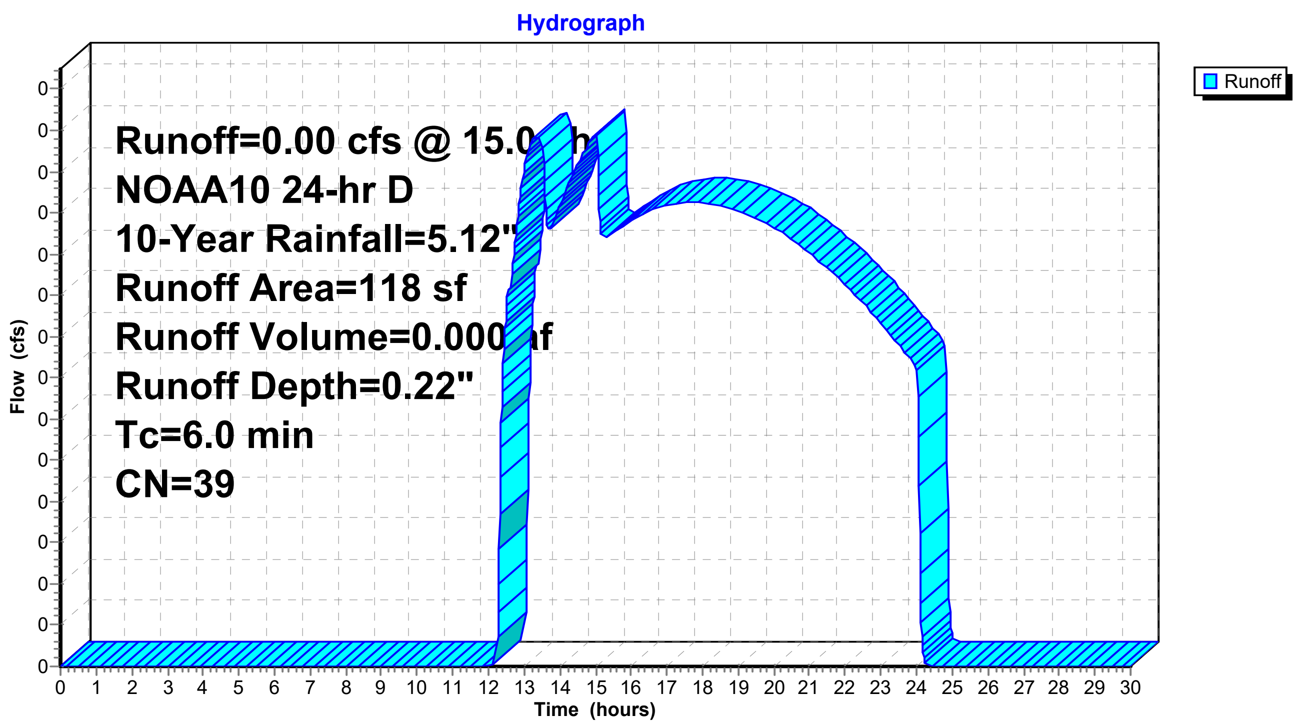
Runoff = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af, Depth= 0.22"
Routed to Link L2-1 : Lag Time for Flow from S2B-1 to DP2-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214



Summary for Subcatchment S2C: Rear of Building & Site (SW)

"Paved Parking" includes building roofs.

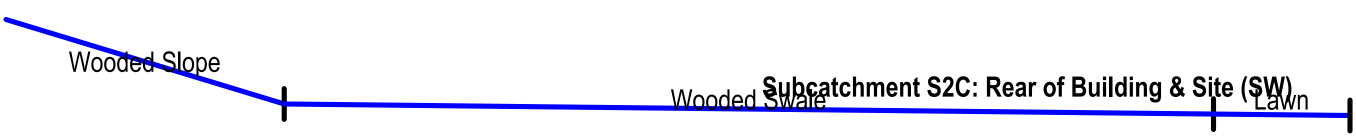
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.11 cfs @ 12.19 hrs, Volume= 0.018 af, Depth= 0.53"
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

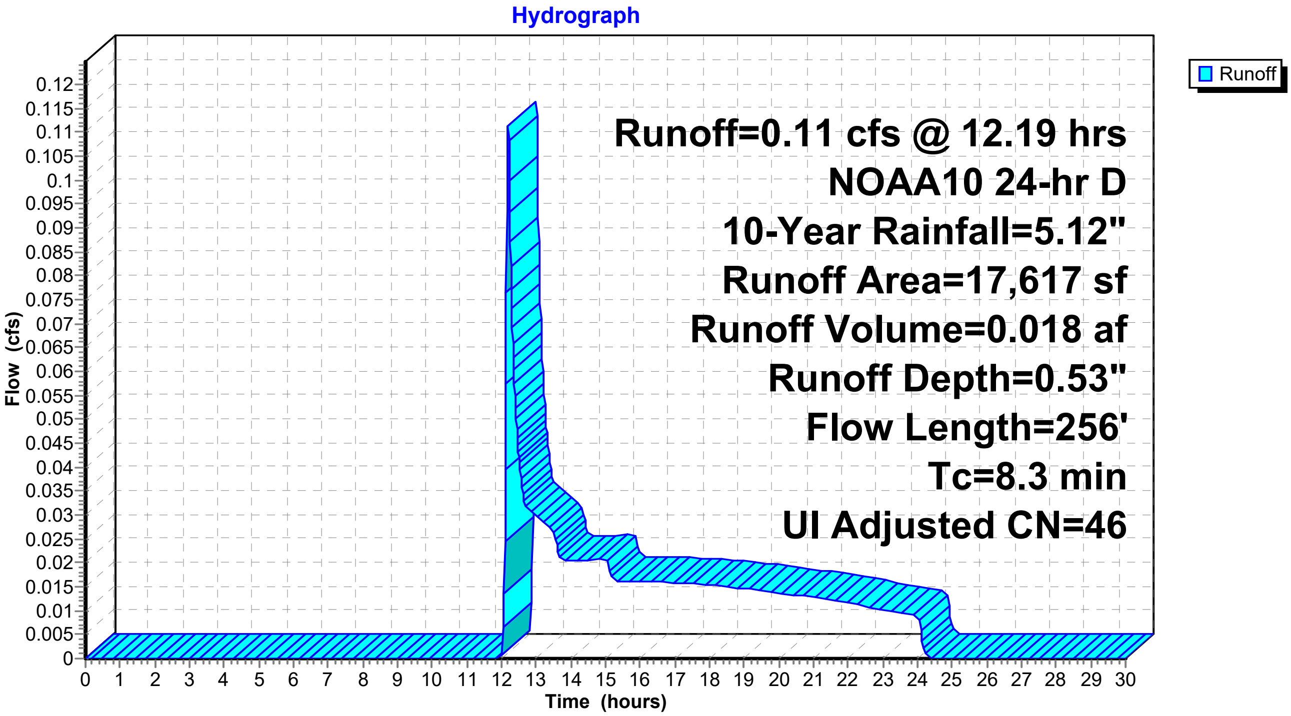
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Adj	Description
1,157	39		>75% Grass cover, Good, HSG A
80	98		Paved parking, HSG A
4,226	98		Unconnected roofs, HSG A
2,147	77		Fallow, bare soil, HSG A
10,007	30		Woods, Good, HSG A
17,617	53	46	Weighted Average, UI Adjusted
13,311			75.56% Pervious Area
4,306			24.44% Impervious Area
4,226			98.14% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	53	0.4720	0.24		**Sheet Flow, Wooded Slope** Woods: Light underbrush n= 0.400 P2= 3.24"
4.5	177	0.0169	0.65		**Shallow Concentrated Flow, Wooded Swale** Woodland Kv= 5.0 fps
0.2	26	0.0169	1.95		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
8.3	256	Total			



Subcatchment S2C: Rear of Building & Site (SW)



Summary for Subcatchment S2C-1: Perimeter of Garage

"Paved Parking" includes building roofs.

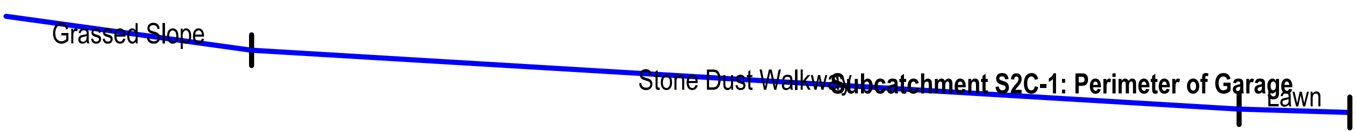
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 3.58"
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

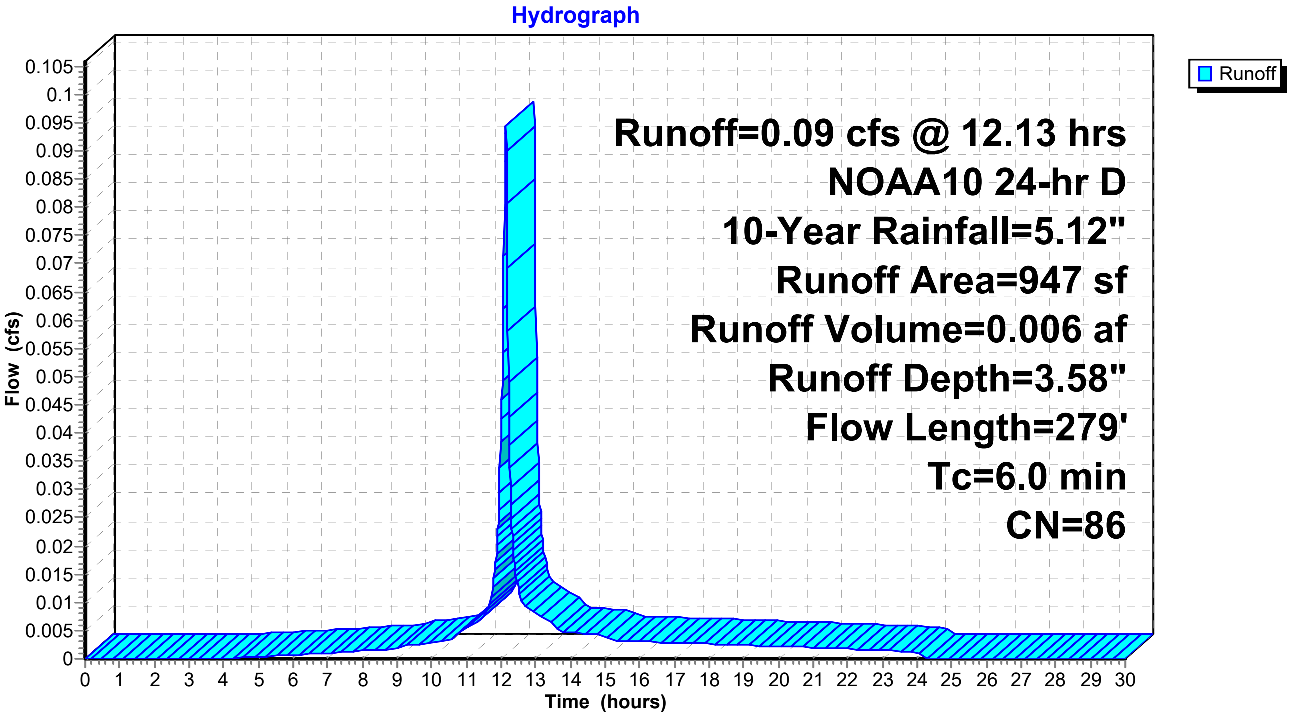
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
167	39	>75% Grass cover, Good, HSG A
780	96	Gravel surface, HSG A
947	86	Weighted Average
947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	51	0.0451	0.21		**Sheet Flow, Grassed Slope**
					Grass: Short n= 0.150 P2= 3.24"
1.5	205	0.0195	2.25		**Shallow Concentrated Flow, Stone Dust Walkway**
					Unpaved Kv= 16.1 fps
0.3	23	0.0098	1.48		**Shallow Concentrated Flow, Lawn**
					Grassed Waterway Kv= 15.0 fps
5.9	279	Total, Increased to minimum Tc = 6.0 min			



Subcatchment S2C-1: Perimeter of Garage



Summary for Subcatchment S3: Southerly Corner of Oakland & Chestnut

"Paved Parking" includes building roofs.

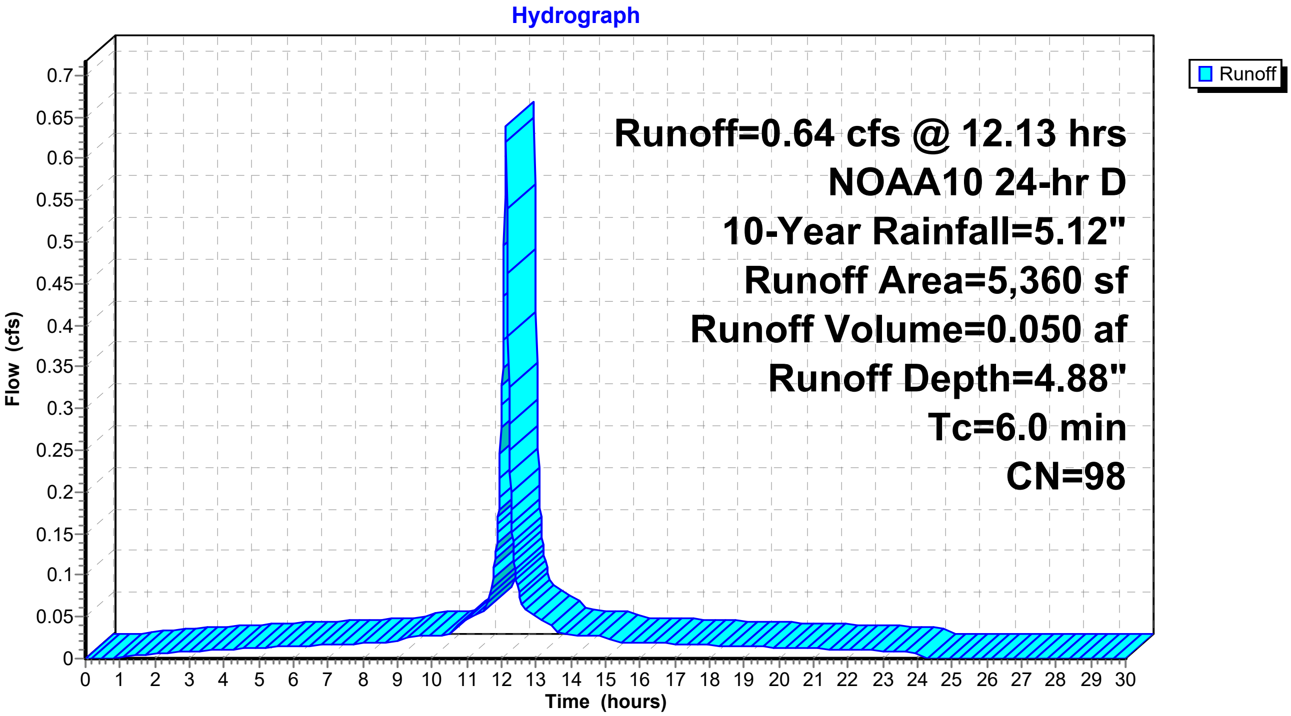
Runoff = 0.64 cfs @ 12.13 hrs, Volume= 0.050 af, Depth= 4.88"
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
14	39	>75% Grass cover, Good, HSG A
1,053	98	Paved parking, HSG A
4,293	98	Roofs, HSG A
5,360	98	Weighted Average
14		0.26% Pervious Area
5,346		99.74% Impervious Area

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

Subcatchment S3: Southerly Corner of Oakland & Chestnut



Summary for Subcatchment S3-1: Southerly Corner of Oakland & Chestnut

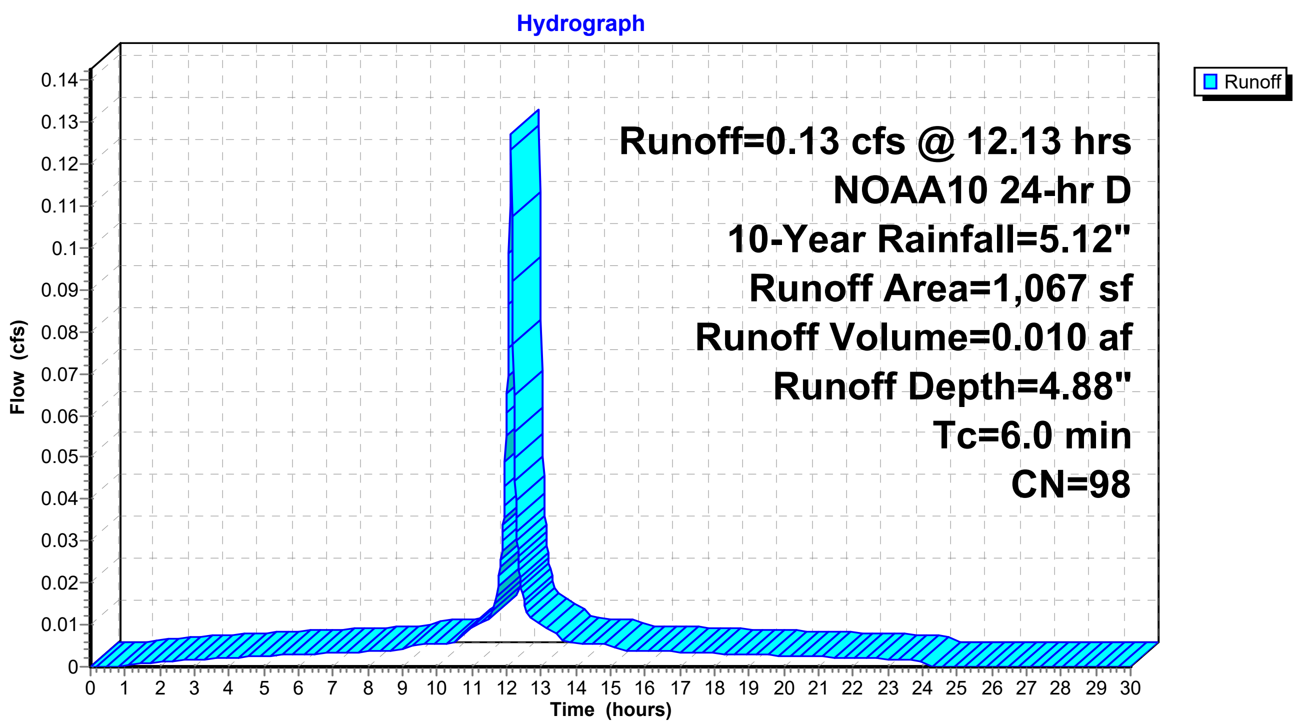
Runoff = 0.13 cfs @ 12.13 hrs, Volume= 0.010 af, Depth= 4.88"
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
22	96	Gravel surface, HSG A
1,045	98	Paved parking, HSG A
1,067	98	Weighted Average
22		2.06% Pervious Area
1,045		97.94% Impervious Area

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

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut



Summary for Subcatchment S4: Loading Dock

"Paved Parking" includes building roofs.

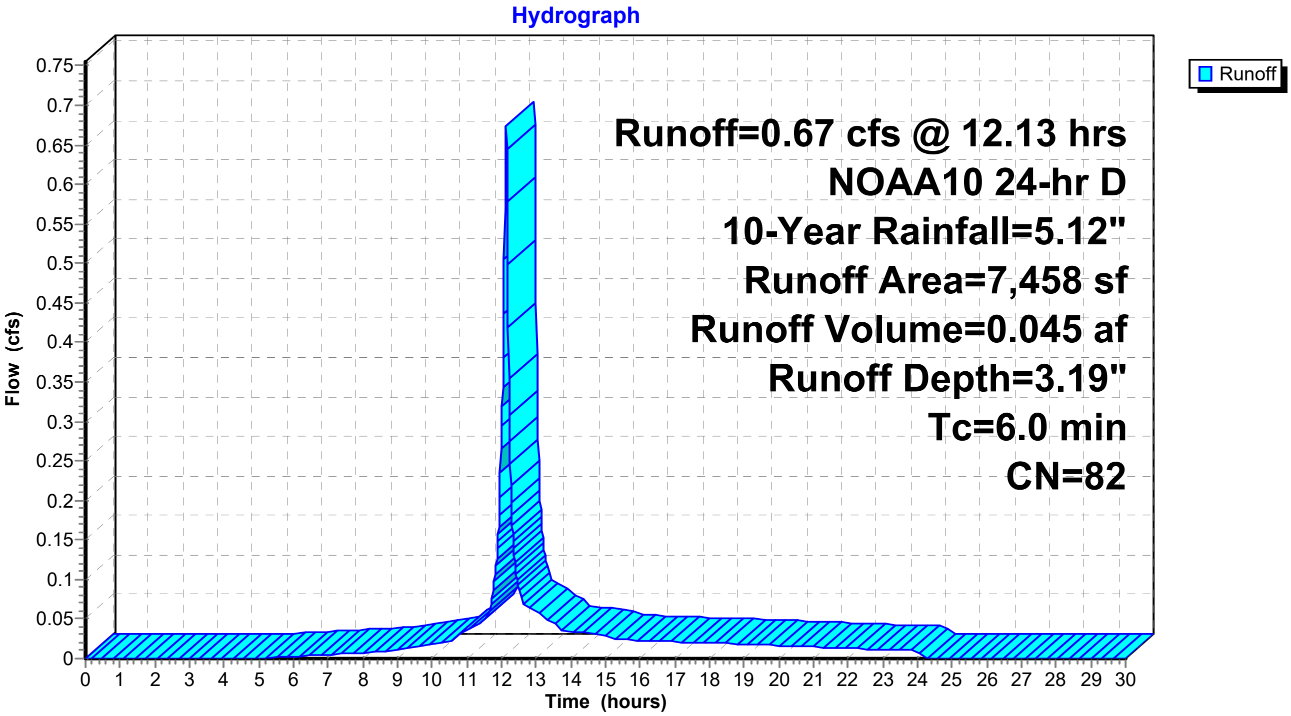
Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.045 af, Depth= 3.19"
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
1,421	39	>75% Grass cover, Good, HSG A
2,055	98	Paved parking, HSG A
2,658	98	Roofs, HSG A
1,122	77	Fallow, bare soil, HSG A
202	30	Woods, Good, HSG A
7,458	82	Weighted Average
2,745		36.81% Pervious Area
4,713		63.19% Impervious Area

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

Subcatchment S4: Loading Dock



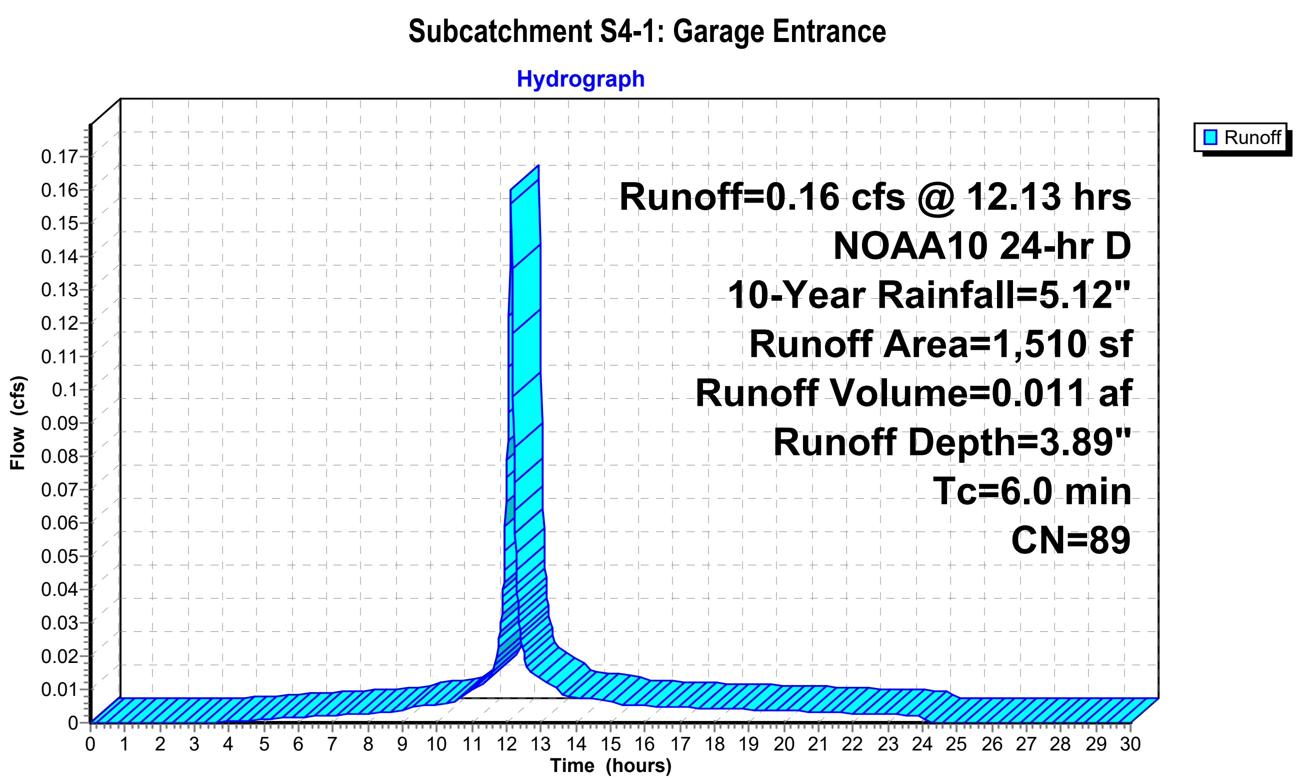
Summary for Subcatchment S4-1: Garage Entrance

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.011 af, Depth= 3.89"
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
231	39	>75% Grass cover, Good, HSG A
323	96	Gravel surface, HSG A
956	98	Paved parking, HSG A
1,510	89	Weighted Average
554		36.69% Pervious Area
956		63.31% Impervious Area

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



Summary for Subcatchment S4-2: Proposed Roofs

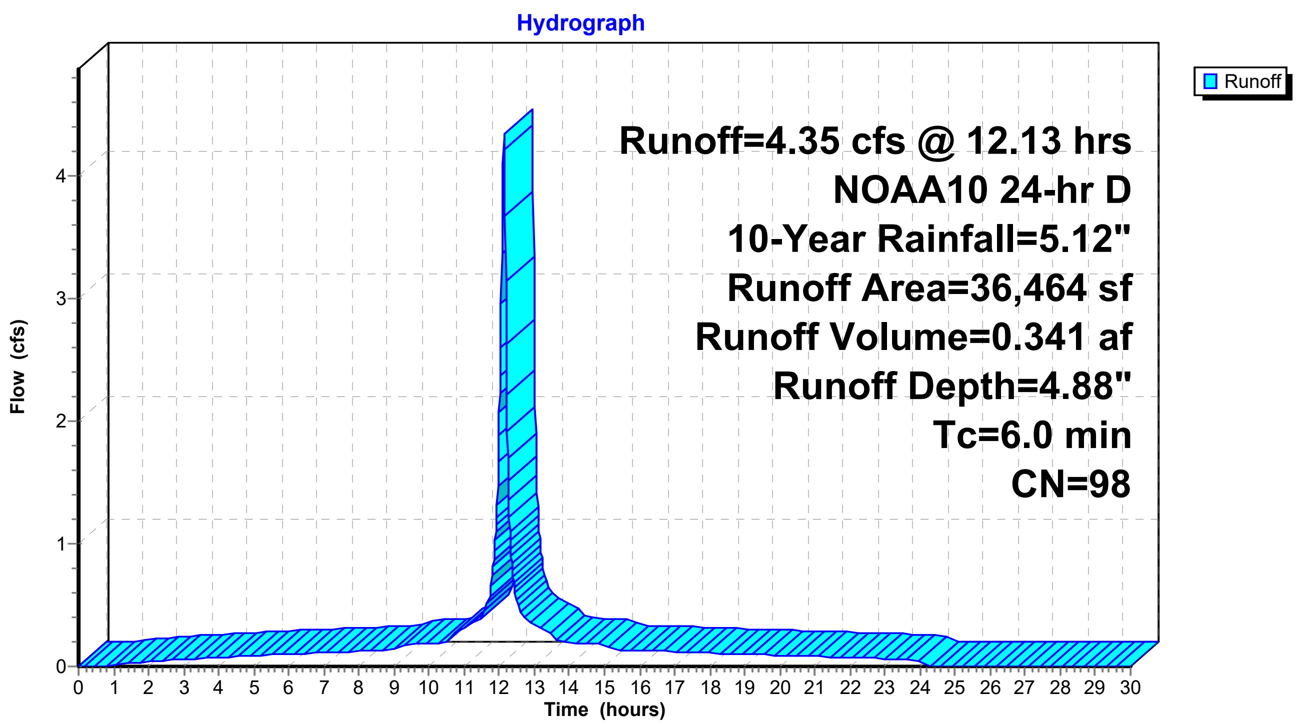
Runoff = 4.35 cfs @ 12.13 hrs, Volume= 0.341 af, Depth= 4.88"
Routed to Pond DC1 : Detention Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
36,464	98	Roofs, HSG A
36,464		100.00% Impervious Area

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

Subcatchment S4-2: Proposed Roofs



Summary for Subcatchment S4-3: Gap Between Buildings

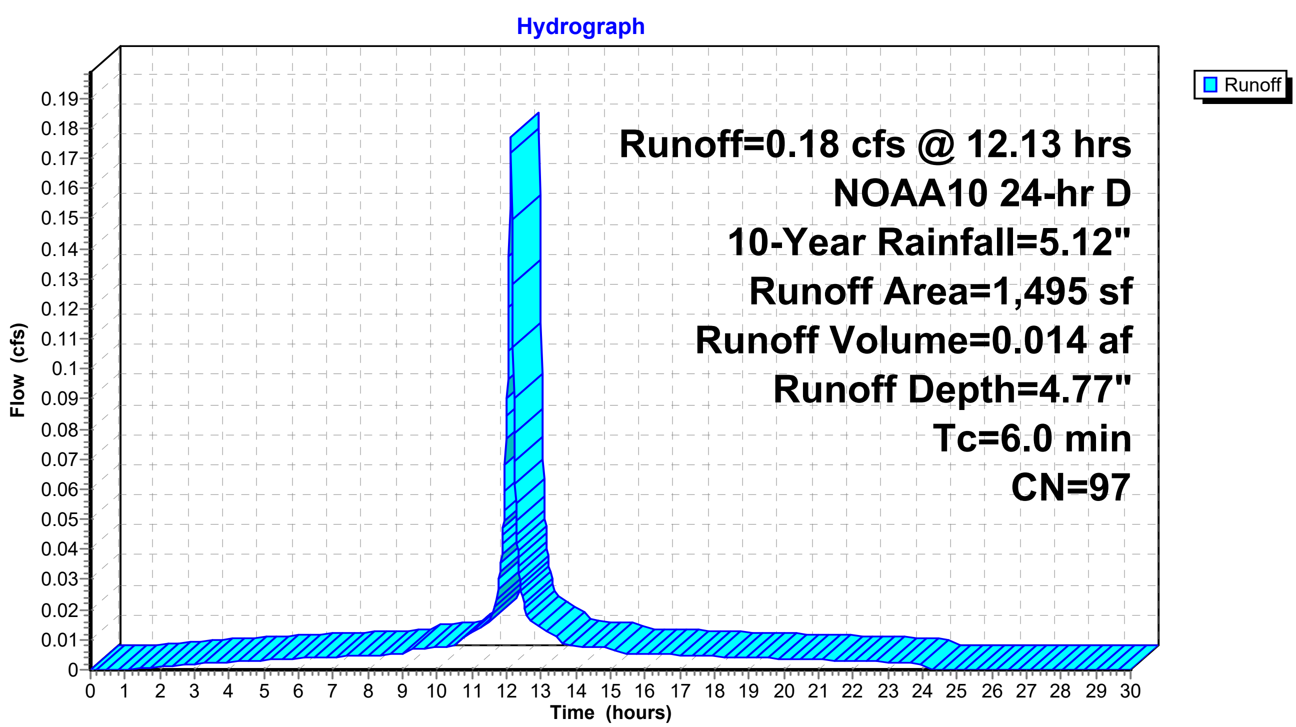
Runoff = 0.18 cfs @ 12.13 hrs, Volume= 0.014 af, Depth= 4.77"
Routed to Pond GAP : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
559	96	Gravel surface, HSG A
936	98	Unconnected roofs, HSG A
1,495	97	Weighted Average
559		37.39% Pervious Area
936		62.61% Impervious Area
936		100.00% Unconnected

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

Subcatchment S4-3: Gap Between Buildings



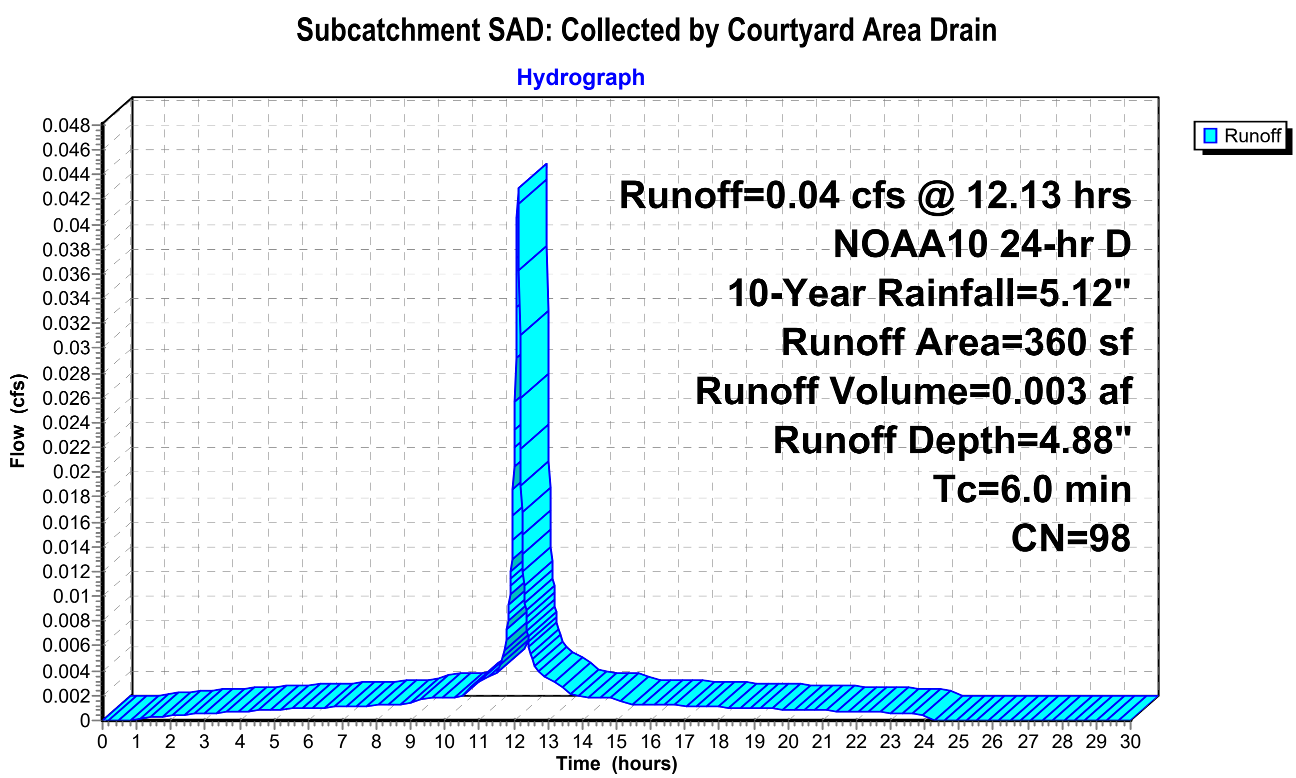
Summary for Subcatchment SAD: Collected by Courtyard Area Drain

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
360	98	Paved parking, HSG A
360		100.00% Impervious Area

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



Summary for Subcatchment STD: Collected by Garage Trench Drain

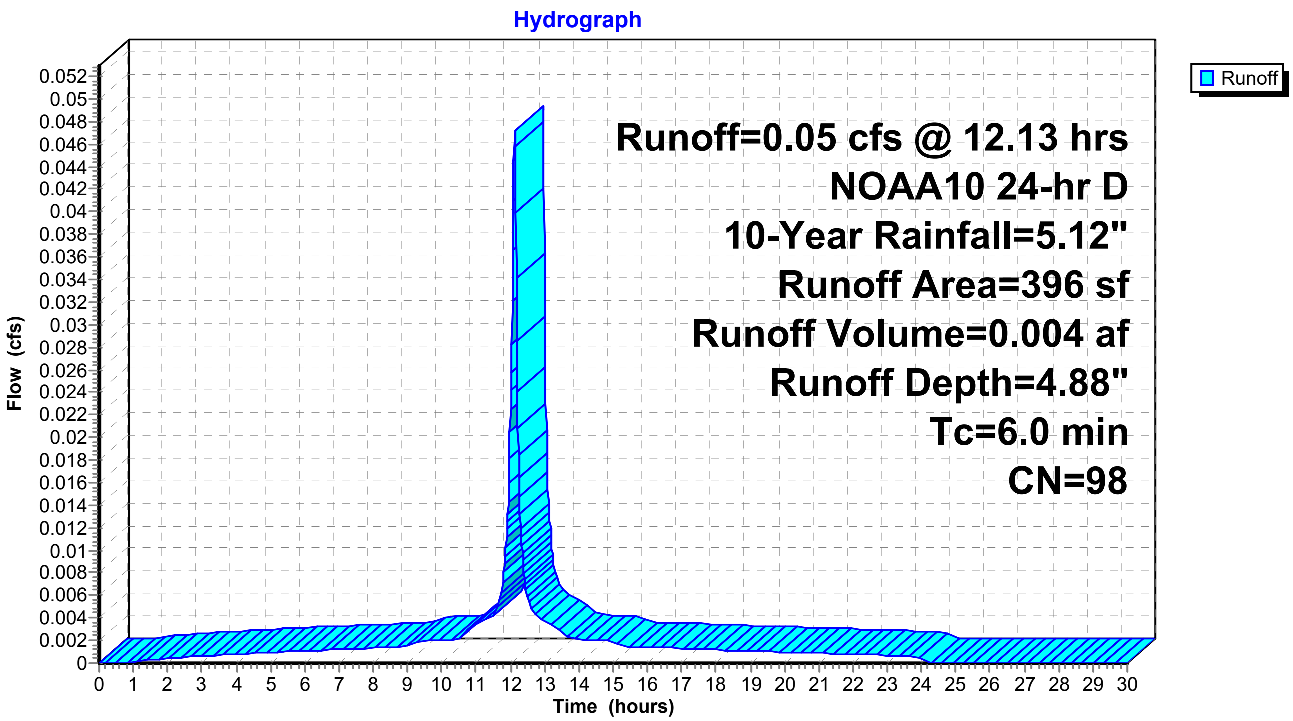
Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
396	98	Paved parking, HSG A
396		100.00% Impervious Area

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

Subcatchment STD: Collected by Garage Trench Drain



Summary for Subcatchment Tc: Extra Tc Calc's

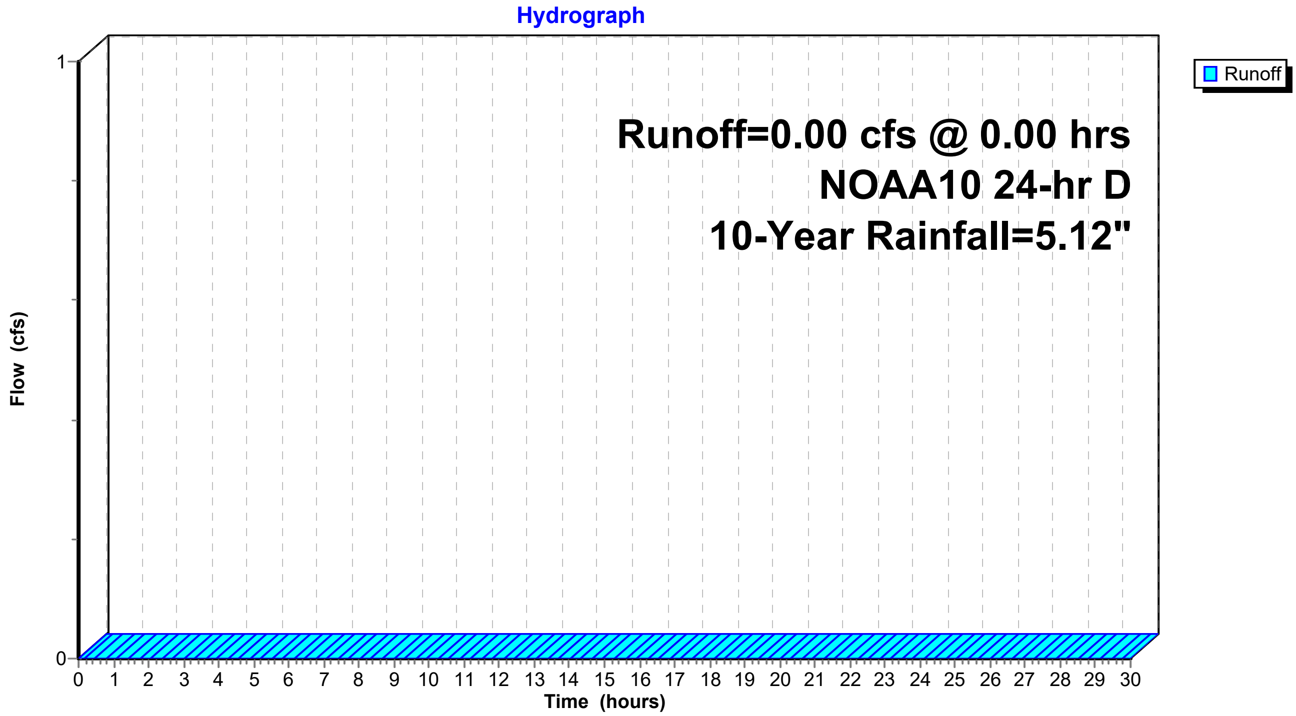
[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	70	0.0501	5.28	4.15	**Pipe Channel, CB 2 to DMH 1**
					12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.025 Corrugated metal
0.1	33	0.1391	8.80	6.91	**Pipe Channel, DMH 1 to DMH 2**
					12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.025 Corrugated metal
0.3	139	0.0701	9.18	7.21	**Pipe Channel, DMH 2 to DMH 3**
					12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.017 Concrete sewer w/manholes & inlets
6.3	55	0.0182	0.15		**Sheet Flow, Lawn (L2 to DP2)**
					Grass: Short n= 0.150 P2= 3.24"
0.3	27	0.0079	1.33		**Shallow Concentrated Flow, Lawn (DP2 to CB 8)**
					Grassed Waterway Kv= 15.0 fps
0.4	47	0.0079	1.80		**Shallow Concentrated Flow, Chestnut St. Gutter (DP2 to CB 8)**
					Paved Kv= 20.3 fps
0.0	9	0.0811	9.88	7.76	**Pipe Channel, CB 8 to DMH 3**
					12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.017 Concrete sewer w/manholes & inlets
0.4	143	0.0222	6.77	11.97	**Pipe Channel, DMH 3 to DMH 4**
					18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38'
					n= 0.017 Concrete sewer w/manholes & inlets
8.0	523	Total			

Subcatchment Tc: Extra Tc Calc's



Summary for Pond DC1: Detention Chamber

Chamber ceiling = 28.93

Inflow Area = 0.871 ac, 98.53% Impervious, Inflow Depth = 4.88" for 10-Year event
Inflow = 4.53 cfs @ 12.13 hrs, Volume= 0.354 af
Outflow = 2.26 cfs @ 12.21 hrs, Volume= 0.354 af, Atten= 50%, Lag= 5.1 min
Primary = 2.26 cfs @ 12.21 hrs, Volume= 0.354 af
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

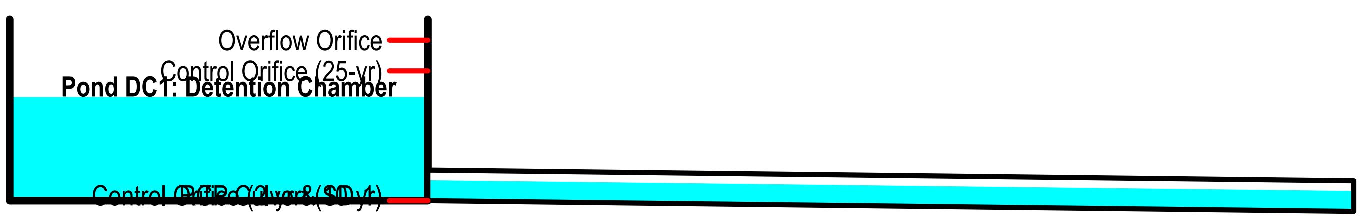
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 26.38' @ 12.21 hrs Surf.Area= 543 sf Storage= 1,834 cf

Plug-Flow detention time= 14.4 min calculated for 0.354 af (100% of inflow)
Center-of-Mass det. time= 14.2 min (764.7 - 750.6)

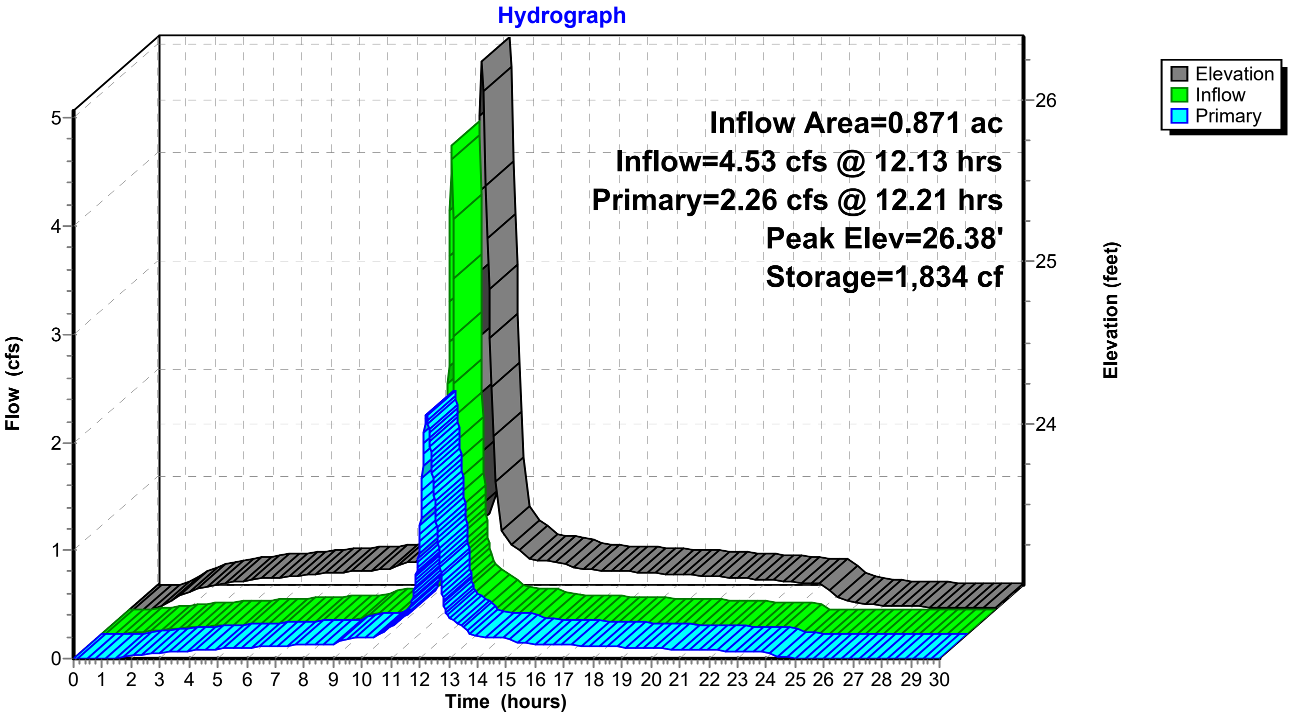
Volume	Invert	Avail.Storage	Storage Description
#1	23.01'	3,217 cf	**8.67'W x 15.67'L x 5.92'H Shea Fire Cistern Bank** x 4

Device	Routing	Invert	Outlet Devices
#1	Primary	23.01'	**12.00" Round RCP Culvert (SD-1)** L= 69.4' Ke= 1.800 Inlet / Outlet Invert= 23.01' / 22.66' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	23.01'	**7.00" Vert. Control Orifice (2-yr & 10-yr)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.25'	**4.00" Vert. Control Orifice (25-yr) X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	28.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.26 cfs @ 12.21 hrs HW=26.38' TW=0.00' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-1)** (Passes 2.26 cfs of 3.43 cfs potential flow)
  ├─**2=Control Orifice (2-yr & 10-yr)** (Orifice Controls 2.26 cfs @ 8.45 fps)
  ├─**3=Control Orifice (25-yr)** (Controls 0.00 cfs)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)



Pond DC1: Detention Chamber



Stage-Area-Storage for Pond DC1: Detention Chamber

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
23.01	0	25.61	1,413	28.21	2,826
23.06	27	25.66	1,440	28.26	2,853
23.11	54	25.71	1,467	28.31	2,880
23.16	82	25.76	1,494	28.36	2,907
23.21	109	25.81	1,522	28.41	2,935
23.26	136	25.86	1,549	28.46	2,962
23.31	163	25.91	1,576	28.51	2,989
23.36	190	25.96	1,603	28.56	3,016
23.41	217	26.01	1,630	28.61	3,043
23.46	245	26.06	1,657	28.66	3,070
23.51	272	26.11	1,685	28.71	3,098
23.56	299	26.16	1,712	28.76	3,125
23.61	326	26.21	1,739	28.81	3,152
23.66	353	26.26	1,766	28.86	3,179
23.71	380	26.31	1,793	28.91	**3,206**
23.76	408	26.36	1,821		
23.81	435	26.41	1,848		
23.86	462	26.46	1,875		
23.91	489	26.51	1,902		
23.96	516	26.56	1,929		
24.01	543	26.61	1,956		
24.06	571	26.66	1,984		
24.11	598	26.71	2,011		
24.16	625	26.76	2,038		
24.21	652	26.81	2,065		
24.26	679	26.86	2,092		
24.31	706	26.91	2,119		
24.36	734	26.96	2,147		
24.41	761	27.01	2,174		
24.46	788	27.06	2,201		
24.51	815	27.11	2,228		
24.56	842	27.16	2,255		
24.61	869	27.21	2,282		
24.66	897	27.26	2,310		
24.71	924	27.31	2,337		
24.76	951	27.36	2,364		
24.81	978	27.41	2,391		
24.86	1,005	27.46	2,418		
24.91	1,033	27.51	2,445		
24.96	1,060	27.56	2,473		
25.01	1,087	27.61	2,500		
25.06	1,114	27.66	2,527		
25.11	1,141	27.71	2,554		
25.16	1,168	27.76	2,581		
25.21	1,196	27.81	2,608		
25.26	1,223	27.86	2,636		
25.31	1,250	27.91	2,663		
25.36	1,277	27.96	2,690		
25.41	1,304	28.01	2,717		
25.46	1,331	28.06	2,744		
25.51	1,359	28.11	2,772		
25.56	1,386	28.16	2,799		

Summary for Pond GAP: Area Drain

Flood elevation set at finished floor of level 2.
Loss coefficient of 0.9 for short radius 90-degree fittings between pipes.

```
Inflow Area =     0.034 ac, 62.61% Impervious, Inflow Depth =  4.77"   for 10-Year event
Inflow      =     0.18 cfs @  12.13 hrs, Volume=        0.014 af
Outflow     =     0.18 cfs @  12.14 hrs, Volume=        0.014 af, Atten= 1%, Lag= 0.4 min
Primary     =     0.18 cfs @  12.14 hrs, Volume=        0.014 af
   Routed to Pond DC1 : Detention Chamber
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 54.53' @ 12.14 hrs Storage= 7 cf
Flood Elev= 55.00' Storage= 112 cf

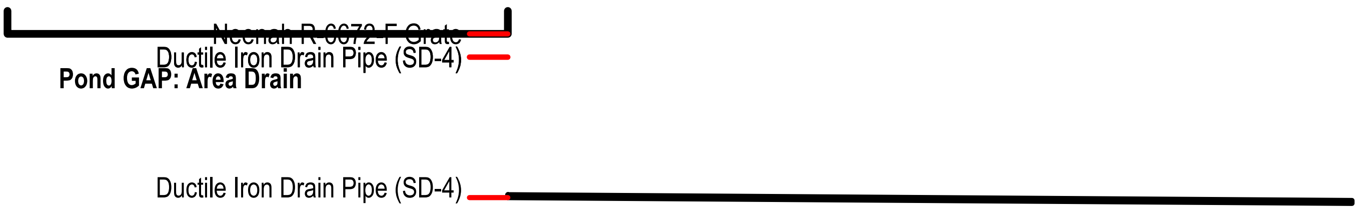
Plug-Flow detention time= 1.7 min calculated for 0.014 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (761.0 - 759.3)

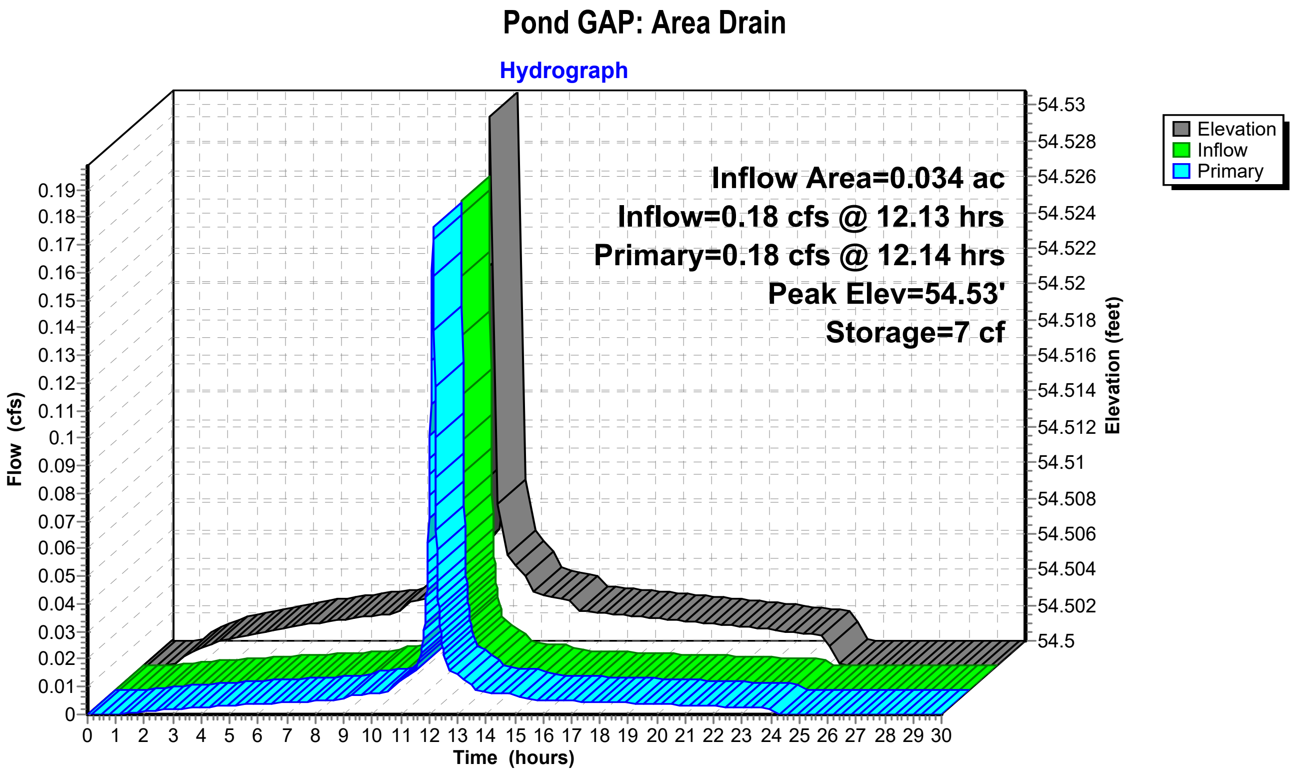
Volume	Invert	Avail.Storage	Storage Description
#1	54.50'	2,068 cf	**Open Area (Prismatic)** Listed below -Impervious

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.50	559	0.0	0	0
55.00	559	40.0	112	112
58.50	559	100.0	1,957	2,068

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 22.5' Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.00' S= 0.0444 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#2	Device 1	50.43'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 5.2' Ke= 0.900 Inlet / Outlet Invert= 50.43' / 50.43' S= 0.0000 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#3	Device 2	50.50'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 3.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.50' / 50.43' S= 0.0200 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#4	Device 3	54.50'	**2.25" x 5.40" Horiz. Neenah R-6672-F Grate X 8.00 columns** X 4 rows C= 0.600 in 30.00" x 30.00" Grate (43% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 12.14 hrs HW=54.53' TW=25.72' (Dynamic Tailwater)
└─**1=Ductile Iron Drain Pipe (SD-4)** (Passes 0.18 cfs of 3.97 cfs potential flow)
  └─**2=Ductile Iron Drain Pipe (SD-4)** (Passes 0.18 cfs of 1.46 cfs potential flow)
    └─**3=Ductile Iron Drain Pipe (SD-4)** (Passes 0.18 cfs of 1.84 cfs potential flow)
      └─**4=Neenah R-6672-F Grate** (Weir Controls 0.18 cfs @ 0.57 fps)


Neenah R-6672-F Grate
Ductile Iron Drain Pipe (SD-4)
Pond GAP: Area Drain
Ductile Iron Drain Pipe (SD-4)


Pond GAP: Area Drain
Hydrograph
Elevation
Inflow
Primary
Inflow Area=0.034 ac
Inflow=0.18 cfs @ 12.13 hrs
Primary=0.18 cfs @ 12.14 hrs
Peak Elev=54.53'
Storage=7 cf
Flow (cfs)
Elevation (feet)
Time (hours)

Stage-Area-Storage for Pond GAP: Area Drain

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
54.50	0	55.54	414	56.58	995	57.62	1,576
54.52	4	55.56	425	56.60	1,006	57.64	1,588
54.54	9	55.58	436	56.62	1,017	57.66	1,599
54.56	13	55.60	447	56.64	1,029	57.68	1,610
54.58	18	55.62	458	56.66	1,040	57.70	1,621
54.60	22	55.64	470	56.68	1,051	57.72	1,632
54.62	27	55.66	481	56.70	1,062	57.74	1,643
54.64	31	55.68	492	56.72	1,073	57.76	1,655
54.66	36	55.70	503	56.74	1,084	57.78	1,666
54.68	40	55.72	514	56.76	1,096	57.80	1,677
54.70	45	55.74	525	56.78	1,107	57.82	1,688
54.72	49	55.76	537	56.80	1,118	57.84	1,699
54.74	54	55.78	548	56.82	1,129	57.86	1,711
54.76	58	55.80	559	56.84	1,140	57.88	1,722
54.78	63	55.82	570	56.86	1,152	57.90	1,733
54.80	67	55.84	581	56.88	1,163	57.92	1,744
54.82	72	55.86	593	56.90	1,174	57.94	1,755
54.84	76	55.88	604	56.92	1,185	57.96	1,766
54.86	80	55.90	615	56.94	1,196	57.98	1,778
54.88	85	55.92	626	56.96	1,207	58.00	1,789
54.90	89	55.94	637	56.98	1,219	58.02	1,800
54.92	94	55.96	648	57.00	1,230	58.04	1,811
54.94	98	55.98	660	57.02	1,241	58.06	1,822
54.96	103	56.00	671	57.04	1,252	58.08	1,834
54.98	107	56.02	682	57.06	1,263	58.10	1,845
55.00	112	56.04	693	57.08	1,275	58.12	1,856
55.02	123	56.06	704	57.10	1,286	58.14	1,867
55.04	134	56.08	716	57.12	1,297	58.16	1,878
55.06	145	56.10	727	57.14	1,308	58.18	1,889
55.08	157	56.12	738	57.16	1,319	58.20	1,901
55.10	168	56.14	749	57.18	1,330	58.22	1,912
55.12	179	56.16	760	57.20	1,342	58.24	1,923
55.14	190	56.18	771	57.22	1,353	58.26	1,934
55.16	201	56.20	783	57.24	1,364	58.28	1,945
55.18	212	56.22	794	57.26	1,375	58.30	1,956
55.20	224	56.24	805	57.28	1,386	58.32	1,968
55.22	235	56.26	816	57.30	1,397	58.34	1,979
55.24	246	56.28	827	57.32	1,409	58.36	1,990
55.26	257	56.30	838	57.34	1,420	58.38	2,001
55.28	268	56.32	850	57.36	1,431	58.40	2,012
55.30	279	56.34	861	57.38	1,442	58.42	2,024
55.32	291	56.36	872	57.40	1,453	58.44	2,035
55.34	302	56.38	883	57.42	1,465	58.46	2,046
55.36	313	56.40	894	57.44	1,476	58.48	2,057
55.38	324	56.42	906	57.46	1,487	58.50	**2,068**
55.40	335	56.44	917	57.48	1,498		
55.42	347	56.46	928	57.50	1,509		
55.44	358	56.48	939	57.52	1,520		
55.46	369	56.50	950	57.54	1,532		
55.48	380	56.52	961	57.56	1,543		
55.50	391	56.54	973	57.58	1,554		
55.52	402	56.56	984	57.60	1,565		

Summary for Pond IC2: Infiltration Chamber Under Parking Lot

Chamber ceiling = 50.58

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 4.43" for 10-Year event
Inflow = 1.42 cfs @ 12.13 hrs, Volume= 0.105 af
Outflow = 1.19 cfs @ 12.17 hrs, Volume= 0.105 af, Atten= 16%, Lag= 2.2 min
Discarded = 0.07 cfs @ 12.17 hrs, Volume= 0.071 af
Primary = 1.12 cfs @ 12.17 hrs, Volume= 0.034 af
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 49.81' @ 12.17 hrs Surf.Area= 540 sf Storage= 646 cf

Plug-Flow detention time= 29.6 min calculated for 0.105 af (100% of inflow)
Center-of-Mass det. time= 29.5 min (811.1 - 781.5)

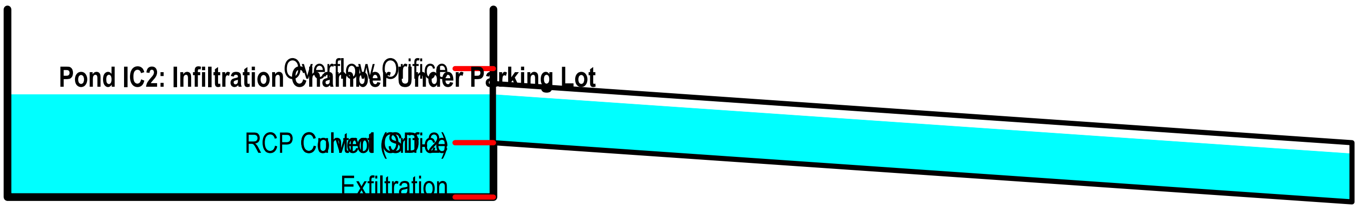
Volume	Invert	Avail.Storage	Storage Description
#1A	48.08'	206 cf	**18.00'W x 30.00'L x 3.17'H Field A** 1,712 cf Overall - 1,196 cf Embedded = 516 cf x 40.0% Voids
#2A	48.58'	800 cf	**Shea Leaching Chamber 8x14x2.7** x 4 Inside #1 Inside= 84.0"W x 24.0"H => 15.38 sf x 13.00'L = 200.0 cf Outside= 96.0"W x 32.0"H => 21.36 sf x 14.00'L = 299.0 cf 4 Chambers in 2 Rows
		1,006 cf	Total Available Storage

Storage Group A created with Chamber Wizard

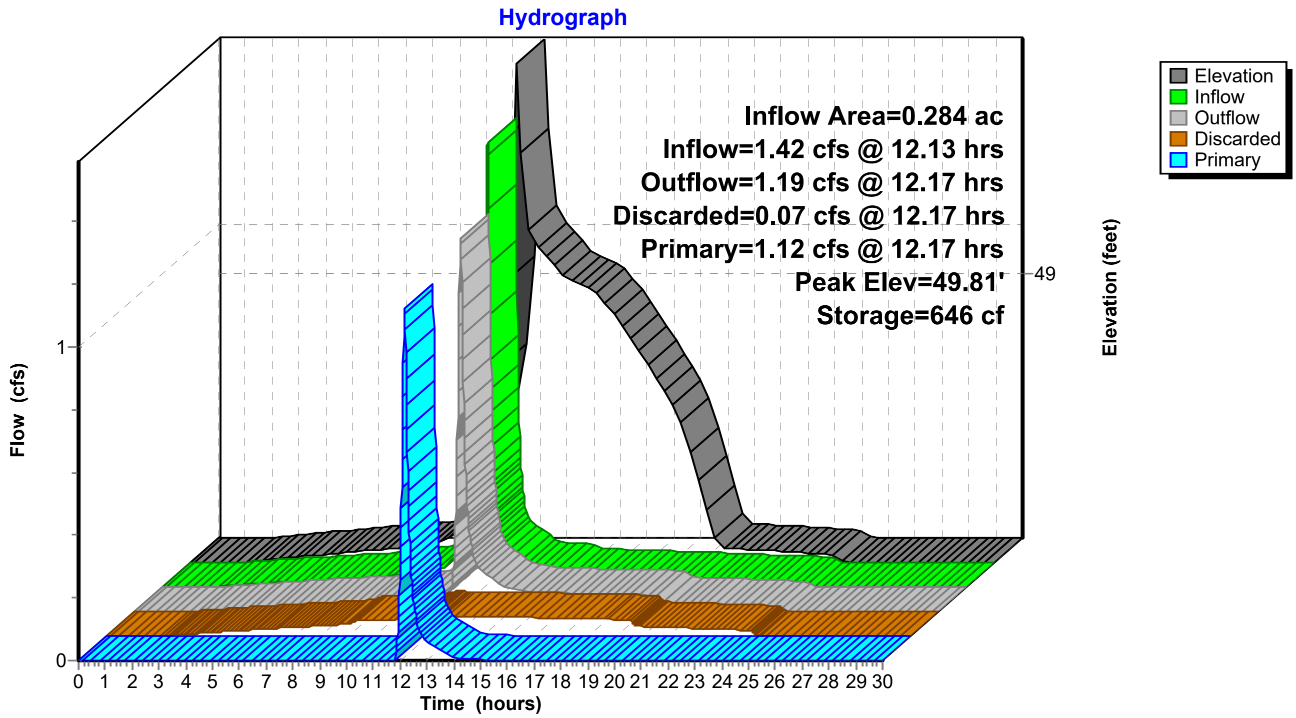
Device	Routing	Invert	Outlet Devices
#1	Discarded	48.08'	**4.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 17.50' Phase-In= 0.08'
#2	Primary	49.00'	**12.00" Round RCP Culvert (SD-2)** L= 53.0' Ke= 1.800 Inlet / Outlet Invert= 49.00' / 48.00' S= 0.0189 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	49.00'	**9.00" Vert. Control Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	50.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.17 hrs HW=49.81' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.12 cfs @ 12.17 hrs HW=49.81' TW=0.00' (Dynamic Tailwater)
└─**2=RCP Culvert (SD-2)** (Inlet Controls 1.12 cfs @ 1.64 fps)
  ├─**3=Control Orifice** (Passes 1.12 cfs of 1.41 cfs potential flow)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)



Pond IC2: Infiltration Chamber Under Parking Lot



Stage-Area-Storage for Pond IC2: Infiltration Chamber Under Parking Lot

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
48.08	0	49.12	344	50.16	798	51.20	1,004
48.10	4	49.14	353	50.18	807	51.22	1,005
48.12	9	49.16	361	50.20	816	51.24	**1,006**
48.14	13	49.18	370	50.22	824		
48.16	17	49.20	379	50.24	833		
48.18	22	49.22	388	50.26	842		
48.20	26	49.24	396	50.28	851		
48.22	30	49.26	405	50.30	859		
48.24	35	49.28	414	50.32	868		
48.26	39	49.30	422	50.34	877		
48.28	43	49.32	431	50.36	886		
48.30	48	49.34	440	50.38	894		
48.32	52	49.36	449	50.40	903		
48.34	56	49.38	457	50.42	912		
48.36	60	49.40	466	50.44	920		
48.38	65	49.42	475	50.46	929		
48.40	69	49.44	484	50.48	938		
48.42	73	49.46	492	50.50	947		
48.44	78	49.48	501	50.52	955		
48.46	82	49.50	510	50.54	964		
48.48	86	49.52	519	50.56	973		
48.50	91	49.54	527	50.58	982		
48.52	95	49.56	536	50.60	982		
48.54	99	49.58	545	50.62	983		
48.56	104	49.60	554	50.64	984		
48.58	108	49.62	562	50.66	985		
48.60	117	49.64	571	50.68	985		
48.62	125	49.66	580	50.70	986		
48.64	134	49.68	588	50.72	987		
48.66	143	49.70	597	50.74	987		
48.68	152	49.72	606	50.76	988		
48.70	160	49.74	615	50.78	989		
48.72	169	49.76	623	50.80	990		
48.74	178	49.78	632	50.82	990		
48.76	187	49.80	641	50.84	991		
48.78	195	49.82	650	50.86	992		
48.80	204	49.84	658	50.88	993		
48.82	213	49.86	667	50.90	993		
48.84	222	49.88	676	50.92	994		
48.86	230	49.90	685	50.94	995		
48.88	239	49.92	693	50.96	996		
48.90	248	49.94	702	50.98	996		
48.92	257	49.96	711	51.00	997		
48.94	265	49.98	720	51.02	998		
48.96	274	50.00	728	51.04	999		
48.98	283	50.02	737	51.06	999		
49.00	291	50.04	746	51.08	1,000		
49.02	300	50.06	754	51.10	1,001		
49.04	309	50.08	763	51.12	1,001		
49.06	318	50.10	772	51.14	1,002		
49.08	326	50.12	781	51.16	1,003		
49.10	335	50.14	789	51.18	1,004		

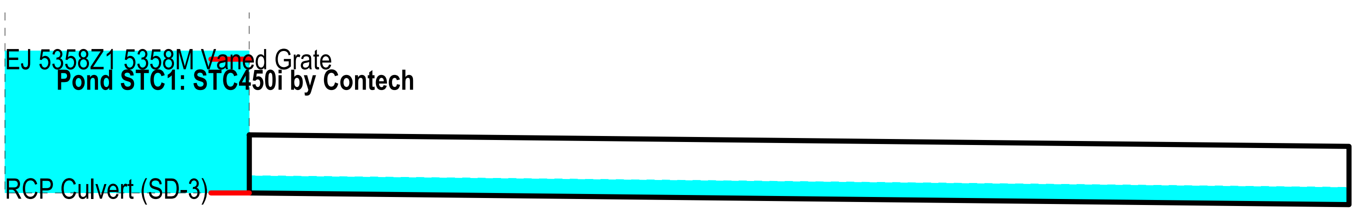
Summary for Pond STC1: STC450i by Contech

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 4.43" for 10-Year event
Inflow = 1.42 cfs @ 12.13 hrs, Volume= 0.105 af
Outflow = 1.42 cfs @ 12.13 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min
Primary = 1.42 cfs @ 12.13 hrs, Volume= 0.105 af
Routed to Pond IC2 : Infiltration Chamber Under Parking Lot

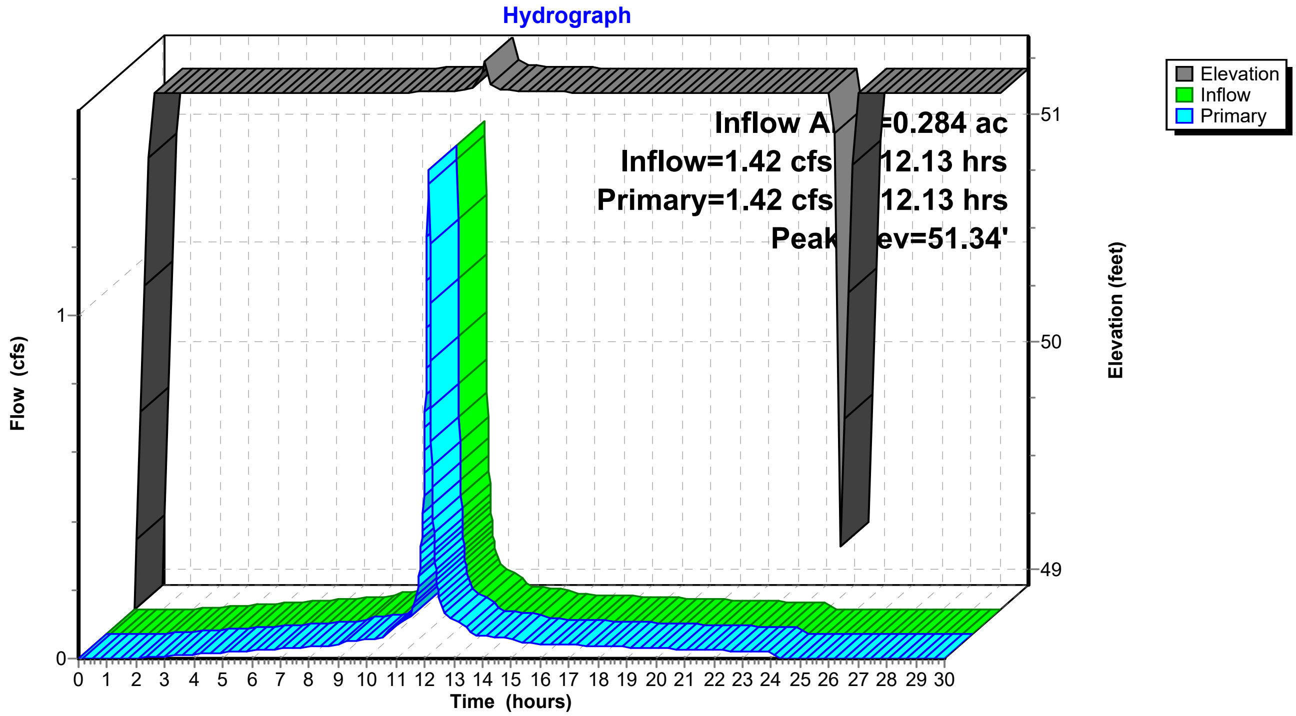
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 51.34' @ 12.13 hrs
Flood Elev= 52.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	48.90'	**12.00" Round RCP Culvert (SD-3)** L= 22.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.90' / 48.70' S= 0.0089 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	51.20'	**EJ 5358Z1 5358M Vaned Grate** Head (feet) 0.00 0.08 0.17 0.25 Disch. (cfs) 0.000 0.600 1.800 3.300

Primary OutFlow Max=1.41 cfs @ 12.13 hrs HW=51.34' TW=49.75' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-3)** (Passes 1.41 cfs of 4.77 cfs potential flow)
  └─**2=EJ 5358Z1 5358M Vaned Grate** (Custom Controls 1.41 cfs)



Pond STC1: STC450i by Contech



Stage-Area-Storage for Pond STC1: STC450i by Contech

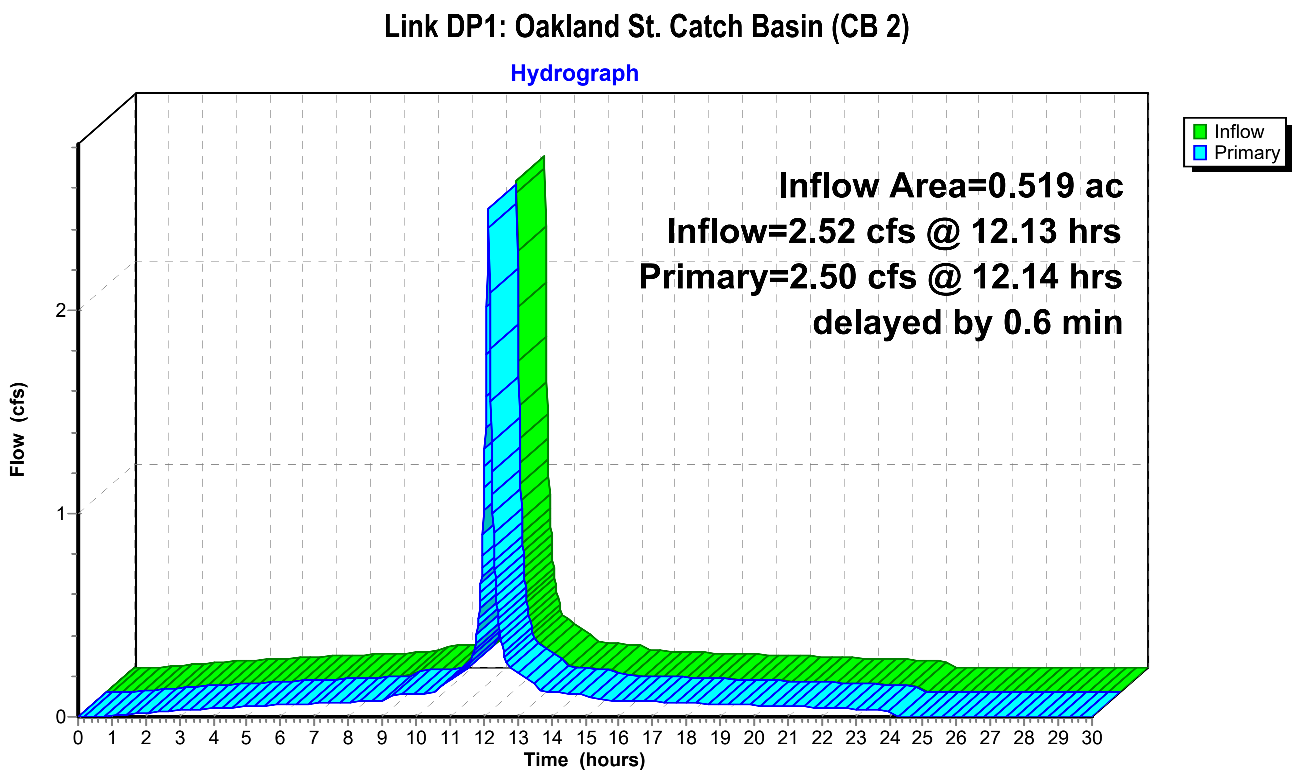
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
48.90	**0.000**	49.94	0.000	50.98	0.000
48.92	0.000	49.96	0.000	51.00	0.000
48.94	0.000	49.98	0.000	51.02	0.000
48.96	0.000	50.00	0.000	51.04	0.000
48.98	0.000	50.02	0.000	51.06	0.000
49.00	0.000	50.04	0.000	51.08	0.000
49.02	0.000	50.06	0.000	51.10	0.000
49.04	0.000	50.08	0.000	51.12	0.000
49.06	0.000	50.10	0.000	51.14	0.000
49.08	0.000	50.12	0.000	51.16	0.000
49.10	0.000	50.14	0.000	51.18	0.000
49.12	0.000	50.16	0.000	51.20	0.000
49.14	0.000	50.18	0.000	51.22	0.000
49.16	0.000	50.20	0.000	51.24	0.000
49.18	0.000	50.22	0.000	51.26	0.000
49.20	0.000	50.24	0.000	51.28	0.000
49.22	0.000	50.26	0.000	51.30	0.000
49.24	0.000	50.28	0.000	51.32	0.000
49.26	0.000	50.30	0.000	51.34	0.000
49.28	0.000	50.32	0.000	51.36	0.000
49.30	0.000	50.34	0.000	51.38	0.000
49.32	0.000	50.36	0.000	51.40	0.000
49.34	0.000	50.38	0.000	51.42	0.000
49.36	0.000	50.40	0.000	51.44	0.000
49.38	0.000	50.42	0.000	51.46	0.000
49.40	0.000	50.44	0.000	51.48	0.000
49.42	0.000	50.46	0.000	51.50	0.000
49.44	0.000	50.48	0.000	51.52	0.000
49.46	0.000	50.50	0.000	51.54	0.000
49.48	0.000	50.52	0.000	51.56	0.000
49.50	0.000	50.54	0.000	51.58	0.000
49.52	0.000	50.56	0.000	51.60	0.000
49.54	0.000	50.58	0.000	51.62	0.000
49.56	0.000	50.60	0.000	51.64	0.000
49.58	0.000	50.62	0.000	51.66	0.000
49.60	0.000	50.64	0.000	51.68	0.000
49.62	0.000	50.66	0.000	51.70	0.000
49.64	0.000	50.68	0.000	51.72	0.000
49.66	0.000	50.70	0.000	51.74	0.000
49.68	0.000	50.72	0.000	51.76	0.000
49.70	0.000	50.74	0.000	51.78	0.000
49.72	0.000	50.76	0.000	51.80	0.000
49.74	0.000	50.78	0.000	51.82	0.000
49.76	0.000	50.80	0.000	51.84	0.000
49.78	0.000	50.82	0.000	51.86	0.000
49.80	0.000	50.84	0.000	51.88	0.000
49.82	0.000	50.86	0.000	51.90	0.000
49.84	0.000	50.88	0.000	51.92	0.000
49.86	0.000	50.90	0.000	51.94	0.000
49.88	0.000	50.92	0.000	51.96	0.000
49.90	0.000	50.94	0.000	51.98	0.000
49.92	0.000	50.96	0.000	52.00	0.000

Summary for Link DP1: Oakland St. Catch Basin (CB 2)

Lag time for this node is the sum of lines 1-3 of the Tc calculations in the Extra Tc Calc's Node

Inflow Area = 0.519 ac, 98.58% Impervious, Inflow Depth = 4.79" for 10-Year event
Inflow = 2.52 cfs @ 12.13 hrs, Volume= 0.207 af
Primary = 2.50 cfs @ 12.14 hrs, Volume= 0.207 af, Atten= 1%, Lag= 0.6 min
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

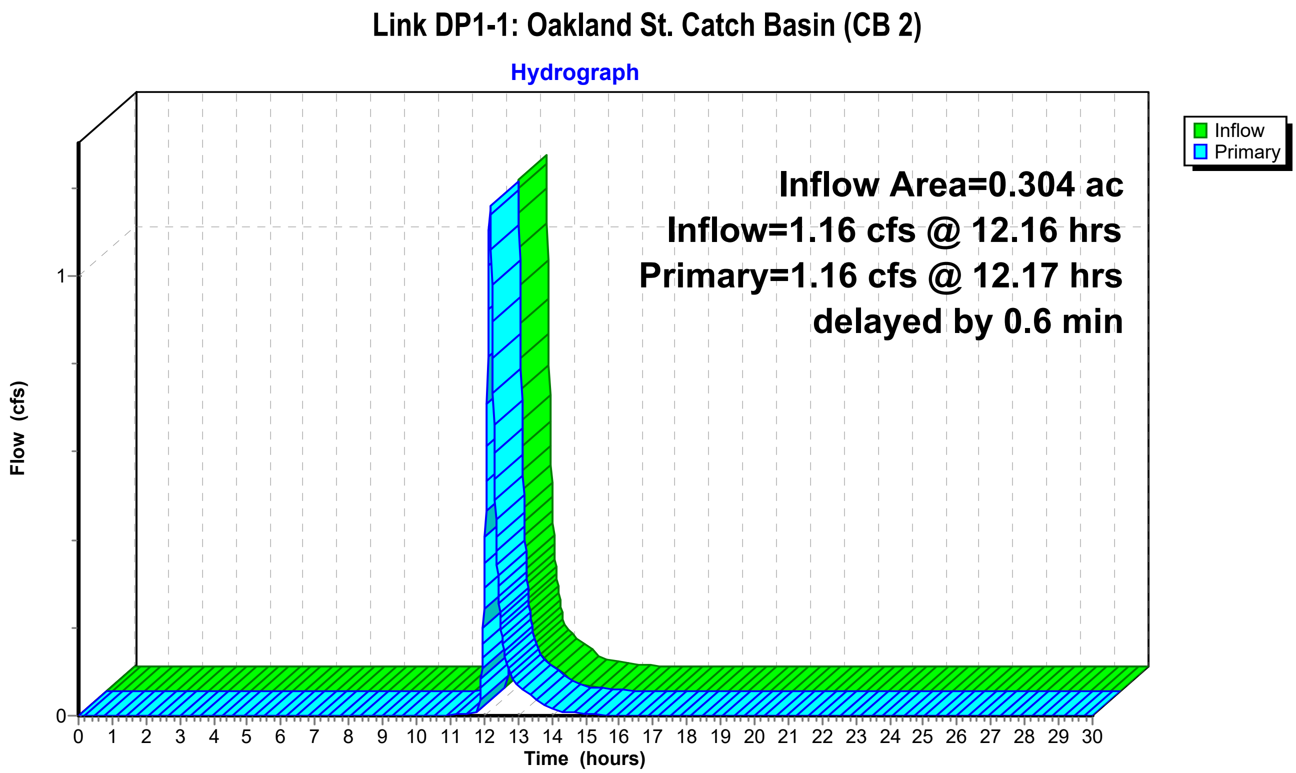
Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP1-1: Oakland St. Catch Basin (CB 2)

Inflow Area = 0.304 ac, 84.11% Impervious, Inflow Depth = 1.46" for 10-Year event
Inflow = 1.16 cfs @ 12.16 hrs, Volume= 0.037 af
Primary = 1.16 cfs @ 12.17 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.6 min
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

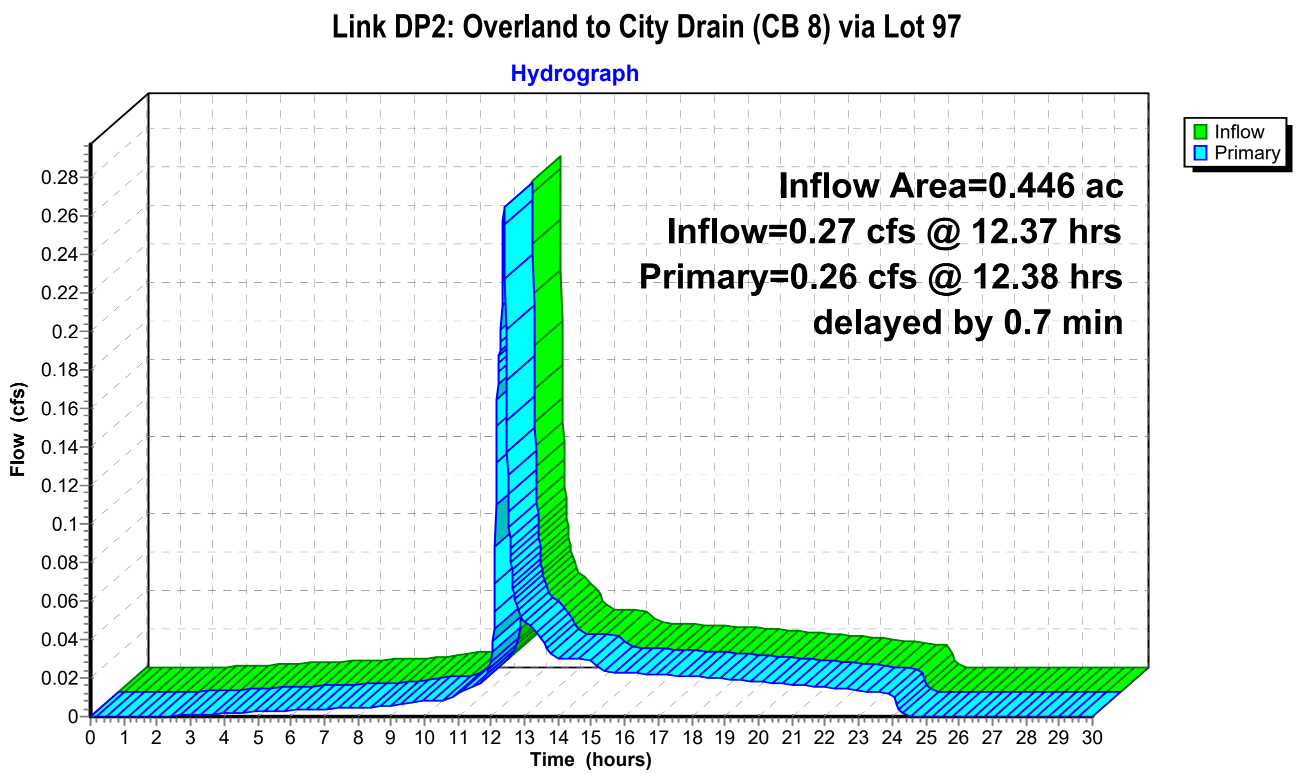


Summary for Link DP2: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.446 ac, 30.85% Impervious, Inflow Depth = 0.89" for 10-Year event
Inflow = 0.27 cfs @ 12.37 hrs, Volume= 0.033 af
Primary = 0.26 cfs @ 12.38 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.7 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

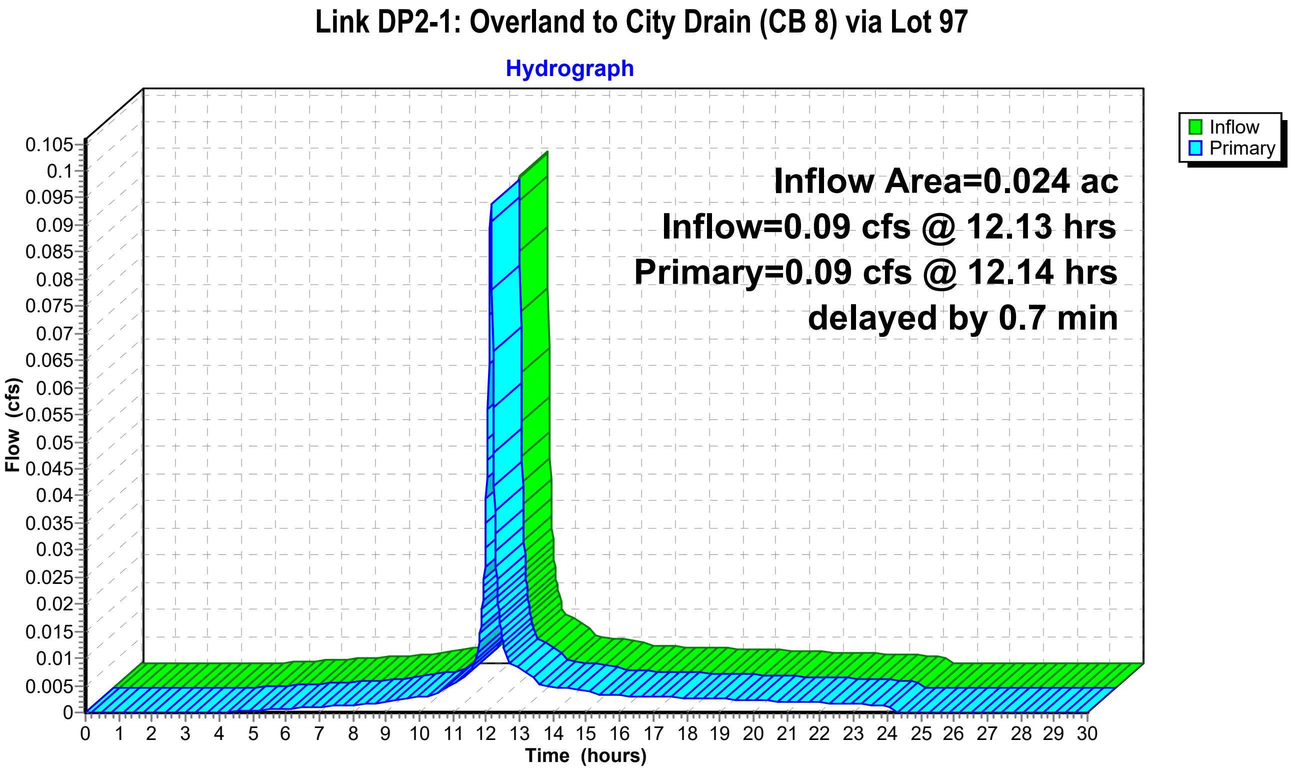


Summary for Link DP2-1: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.024 ac, 0.00% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 0.09 cfs @ 12.13 hrs, Volume= 0.007 af
Primary = 0.09 cfs @ 12.14 hrs, Volume= 0.007 af, Atten= 1%, Lag= 0.7 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



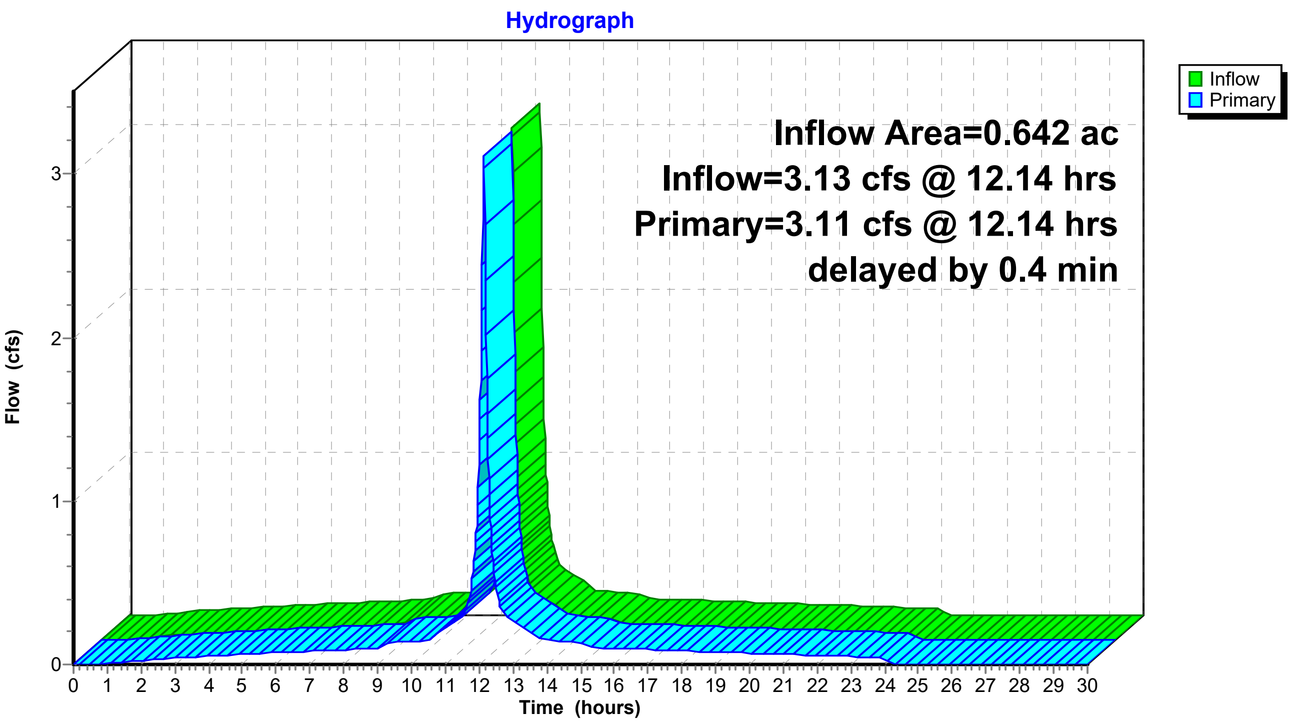
Summary for Link DP3: Chestnut St. Drain Manhole (DMH 3)

Lag time for this node was computed using line 8 of the Tc Calculations of the Extra Tc Calc's node.

Inflow Area = 0.642 ac, 98.80% Impervious, Inflow Depth = 4.81" for 10-Year event
Inflow = 3.13 cfs @ 12.14 hrs, Volume= 0.257 af
Primary = 3.11 cfs @ 12.14 hrs, Volume= 0.257 af, Atten= 1%, Lag= 0.4 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

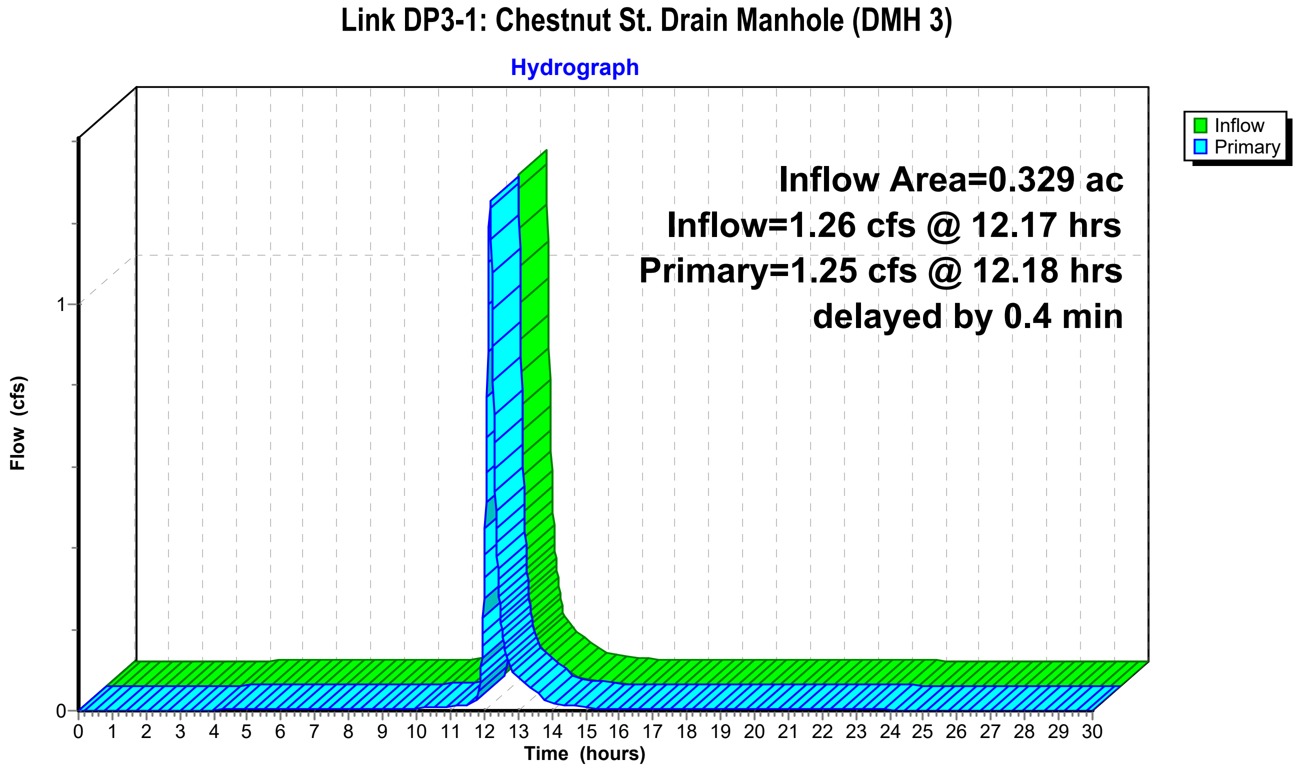
Link DP3: Chestnut St. Drain Manhole (DMH 3)



Summary for Link DP3-1: Chestnut St. Drain Manhole (DMH 3)

Inflow Area = 0.329 ac, 85.14% Impervious, Inflow Depth = 1.72" for 10-Year event
Inflow = 1.26 cfs @ 12.17 hrs, Volume= 0.047 af
Primary = 1.25 cfs @ 12.18 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.4 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

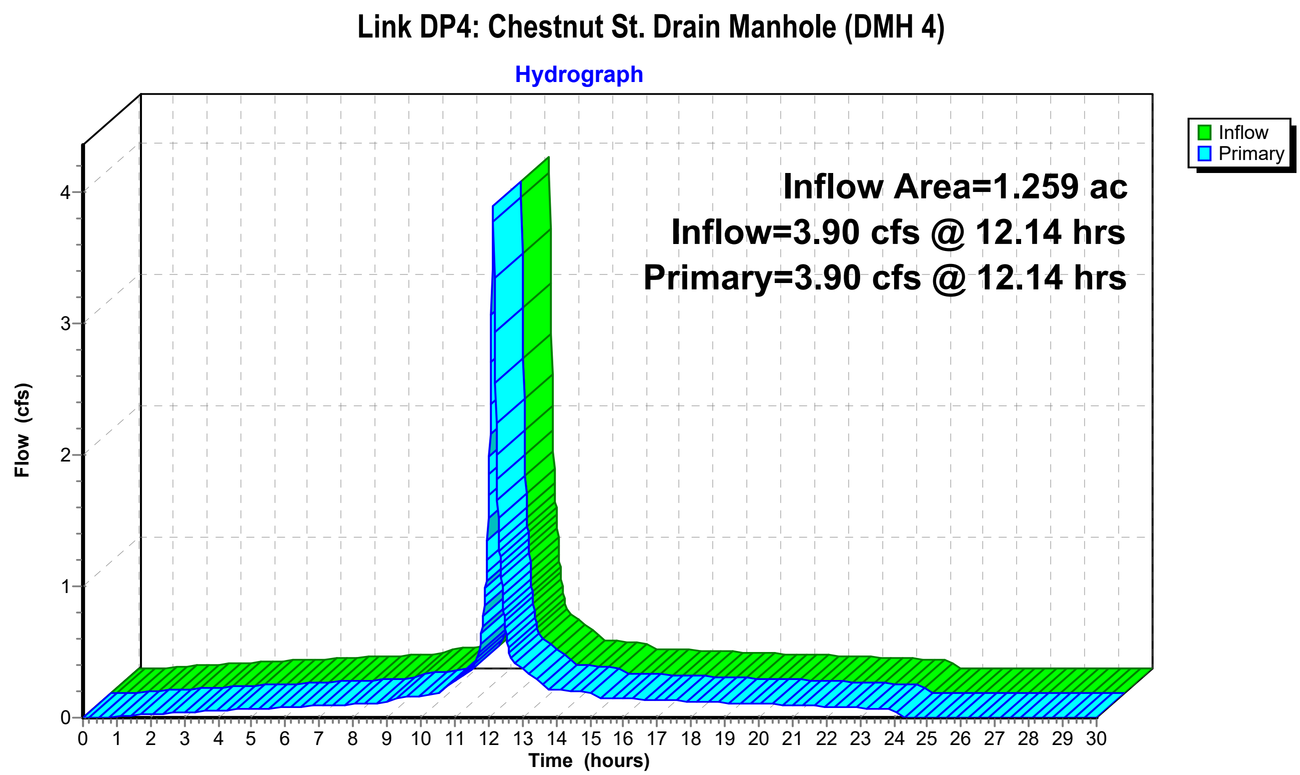
Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP4: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 69.90% Impervious, Inflow Depth = 3.20" for 10-Year event
Inflow = 3.90 cfs @ 12.14 hrs, Volume= 0.336 af
Primary = 3.90 cfs @ 12.14 hrs, Volume= 0.336 af, Atten= 0%, Lag= 0.0 min

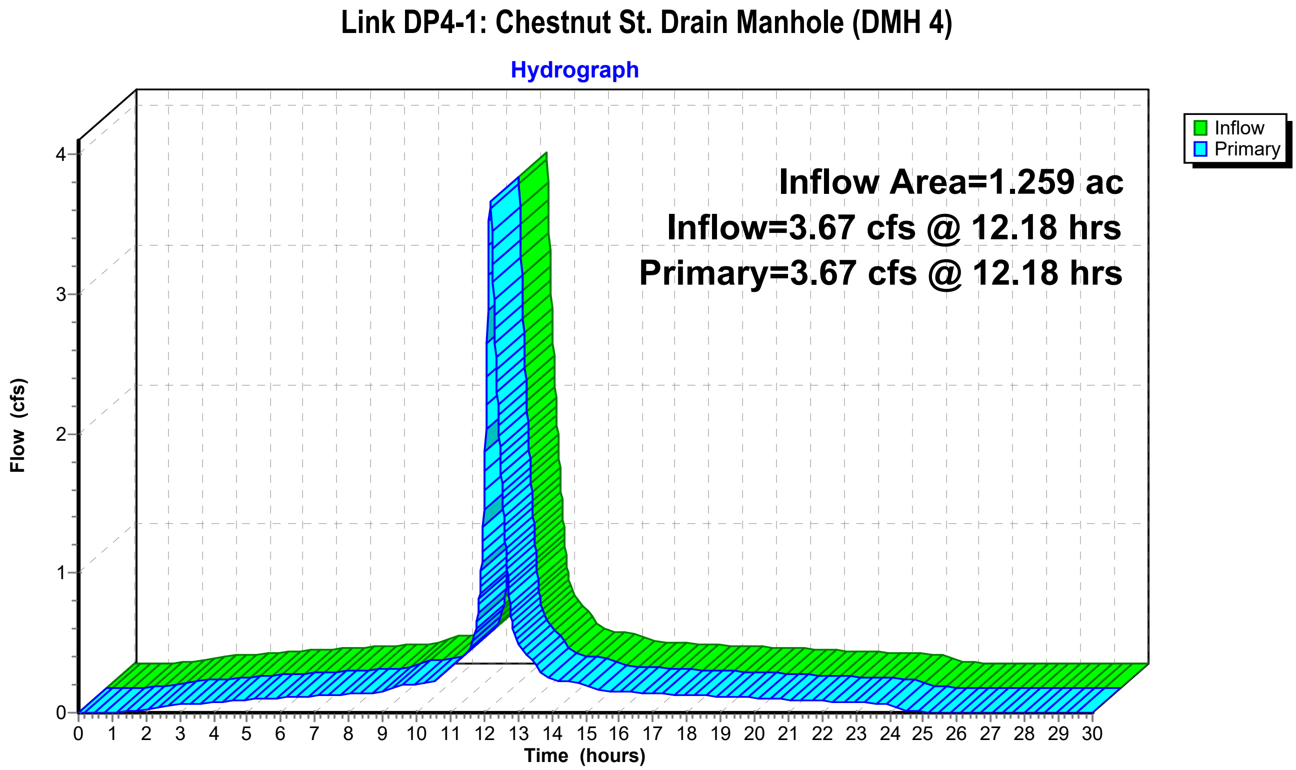
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP4-1: Chestnut St. Drain Manhole (DMH 4)

Inflow Area =	1.259 ac,	92.15% Impervious,	Inflow Depth = 3.99"	for 10-Year event
Inflow =	3.67 cfs @	12.18 hrs, Volume=	0.419 af	
Primary =	3.67 cfs @	12.18 hrs, Volume=	0.419 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

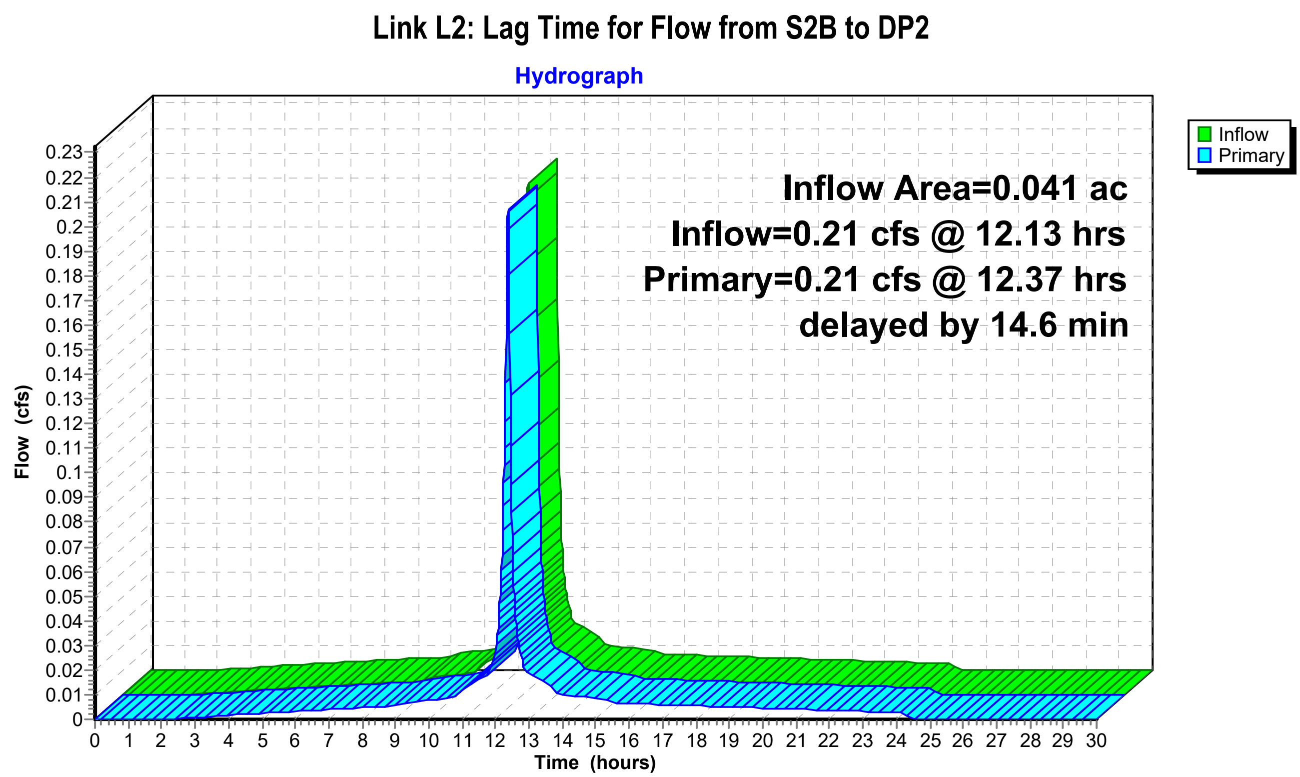


Summary for Link L2: Lag Time for Flow from S2B to DP2

Lag time for this node is the sum of the Tc of Node S2C and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.041 ac, 93.46% Impervious, Inflow Depth = 4.43" for 10-Year event
Inflow = 0.21 cfs @ 12.13 hrs, Volume= 0.015 af
Primary = 0.21 cfs @ 12.37 hrs, Volume= 0.015 af, Atten= 0%, Lag= 14.6 min
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 14.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

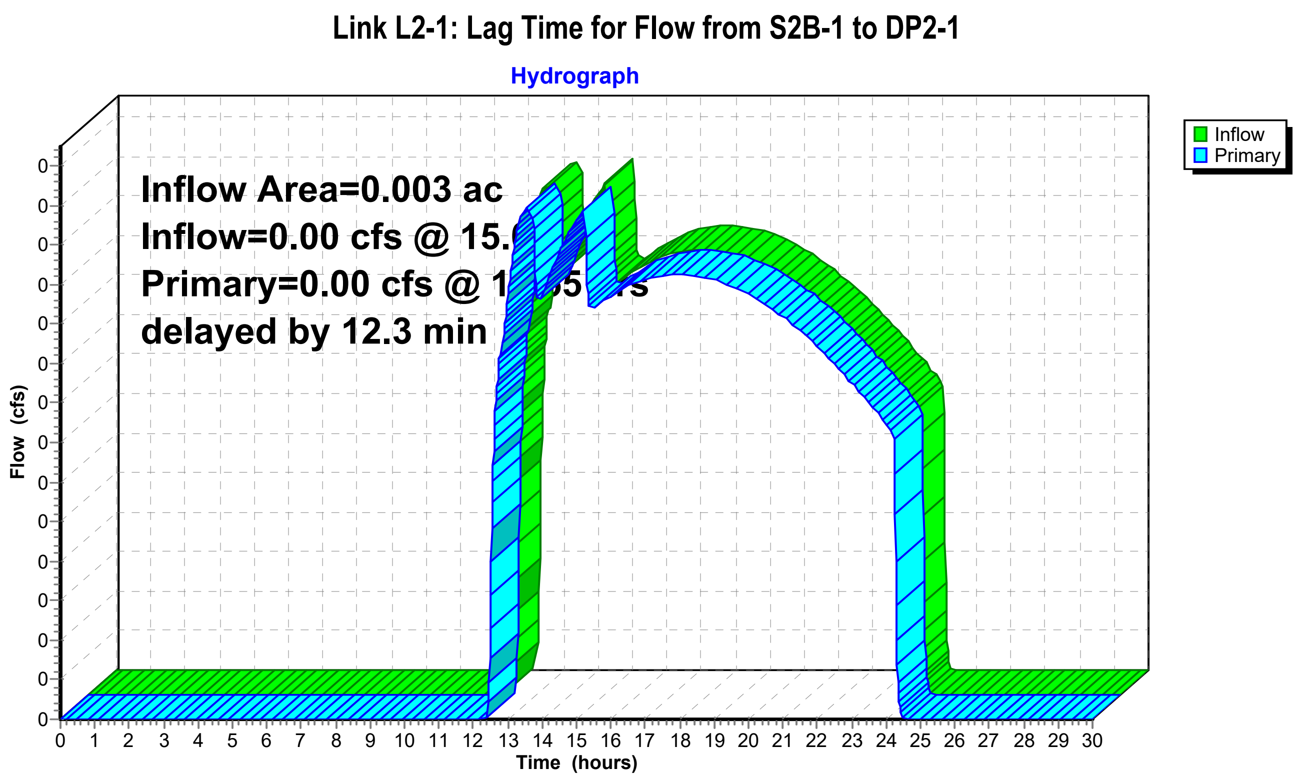


Summary for Link L2-1: Lag Time for Flow from S2B-1 to DP2-1

Lag time for this node is the sum of the Tc of Node S2C-1 and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.003 ac, 0.00% Impervious, Inflow Depth = 0.22" for 10-Year event
Inflow = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 13.55 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

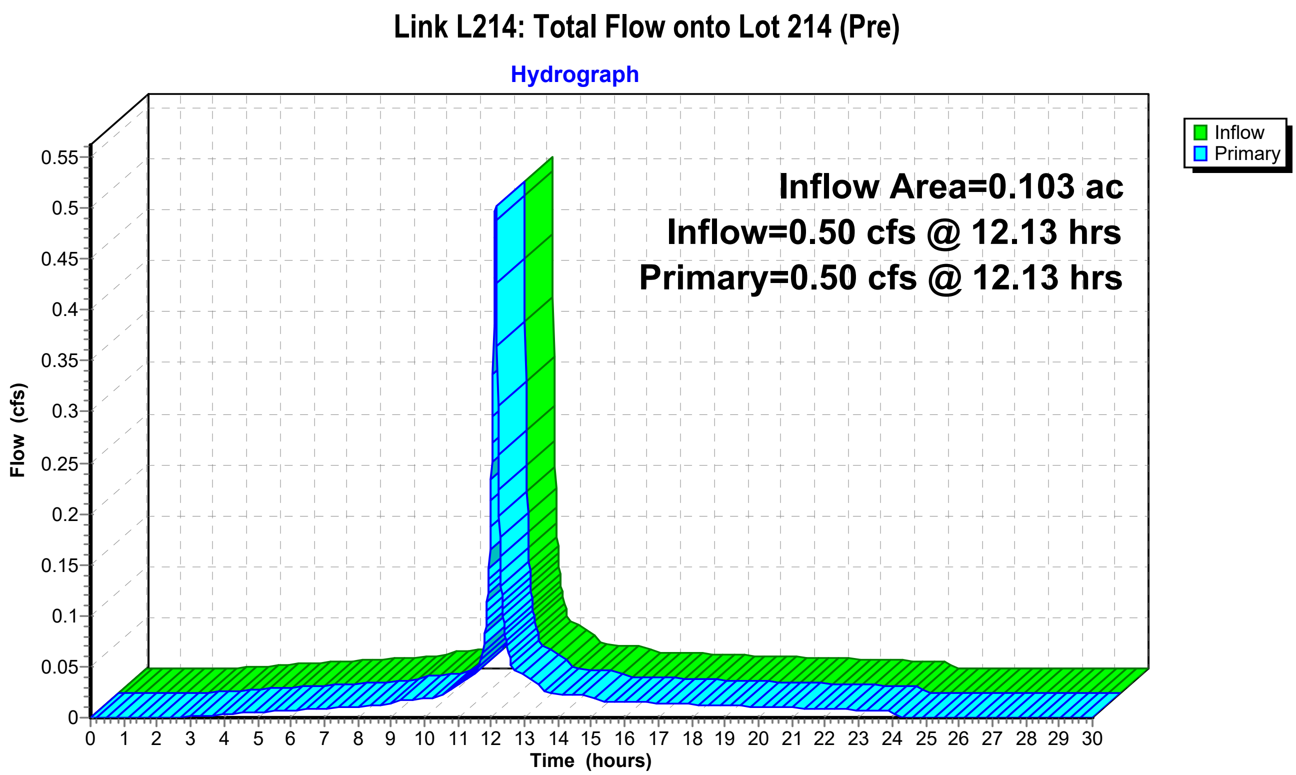
Primary outflow = Inflow delayed by 12.3 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214: Total Flow onto Lot 214 (Pre)

Inflow Area = 0.103 ac, 90.17% Impervious, Inflow Depth = 4.23" for 10-Year event
Inflow = 0.50 cfs @ 12.13 hrs, Volume= 0.036 af
Primary = 0.50 cfs @ 12.13 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

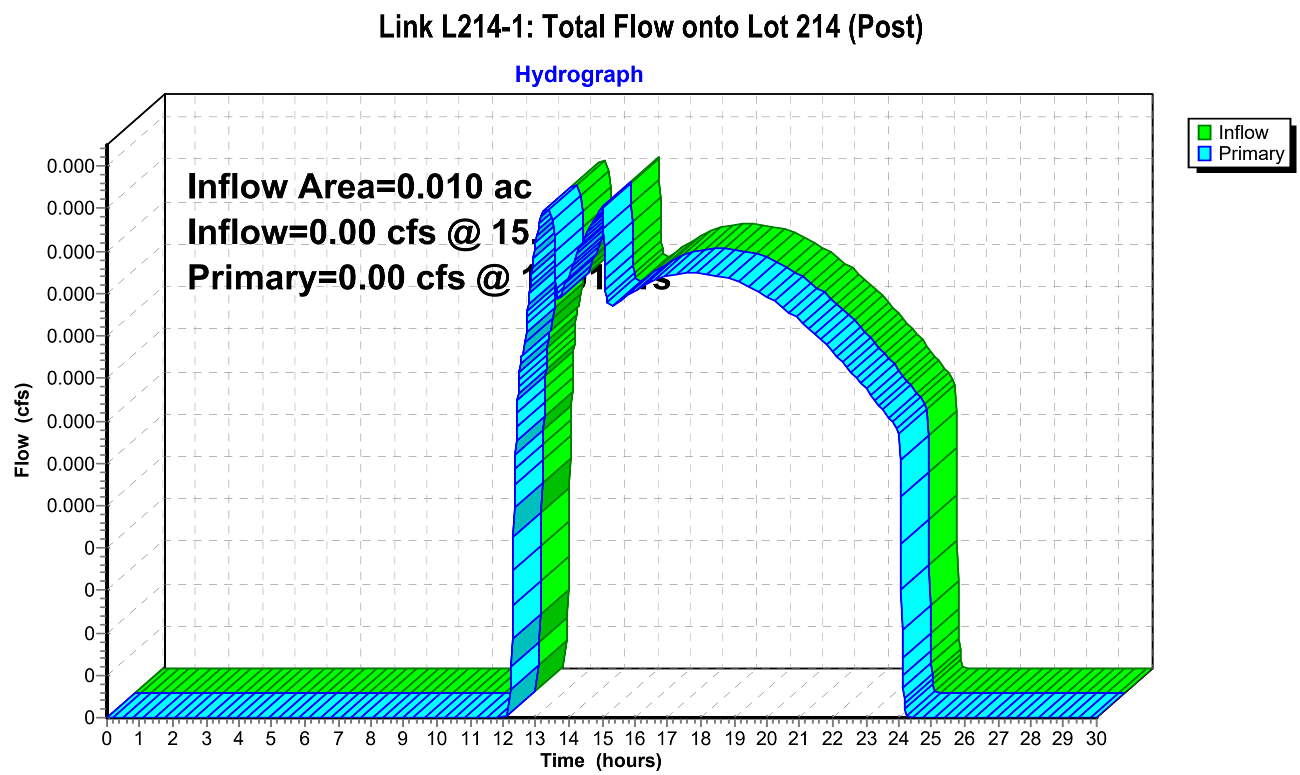
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214-1: Total Flow onto Lot 214 (Post)

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 0.22" for 10-Year event
Inflow = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 15.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Time span=0.00-30.00 hrs, dt=0.015 hrs, 2001 points x 2
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 S1: Parking & Front of Buildings Runoff Area=19,942 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=2.93 cfs 0.231 af

Subcatchment S1-1: Drains to Parking Lot Chambers Runoff Area=12,372 sf 87.12% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=94 Runoff=1.77 cfs 0.132 af

Subcatchment S1-2: Untreated Runoff onto Oakland St. Runoff Area=556 sf 65.65% Impervious Runoff Depth=3.85"
Tc=6.0 min CN=78 Runoff=0.06 cfs 0.004 af

Subcatchment S214A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=91 Runoff=0.37 cfs 0.027 af

Subcatchment S214A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=5.59"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.26 cfs 0.019 af

Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=5.25"
Flow Length=324' Tc=16.4 min CN=91 Runoff=0.25 cfs 0.027 af

Subcatchment S2A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=0.53"
Flow Length=324' Tc=16.4 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=5.59"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.26 cfs 0.019 af

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2C: Rear of Building & Site (SW) Runoff Area=17,617 sf 24.44% Impervious Runoff Depth=1.00"
Flow Length=256' Tc=8.3 min UI Adjusted CN=46 Runoff=0.34 cfs 0.034 af

Subcatchment S2C-1: Perimeter of Garage Runoff Area=947 sf 0.00% Impervious Runoff Depth=4.70"
Flow Length=279' Tc=6.0 min CN=86 Runoff=0.12 cfs 0.009 af

Subcatchment S3: Southerly Corner of Oakland & Chestnut Runoff Area=5,360 sf 99.74% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=0.79 cfs 0.062 af

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut Runoff Area=1,067 sf 97.94% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=0.16 cfs 0.012 af

Subcatchment S4: Loading Dock Runoff Area=7,458 sf 63.19% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=82 Runoff=0.89 cfs 0.061 af

Subcatchment S4-1: Garage Entrance Runoff Area=1,510 sf 63.31% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=89 Runoff=0.20 cfs 0.015 af

Subcatchment S4-2: Proposed Roofs Runoff Area=36,464 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=5.36 cfs 0.423 af

Subcatchment S4-3: Gap Between Buildings Runoff Area=1,495 sf 62.61% Impervious Runoff Depth=5.94"
Tc=6.0 min CN=97 Runoff=0.22 cfs 0.017 af

Subcatchment SAD: Collected by Courtyard Area Drain Runoff Area=360 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment STD: Collected by Garage Trench Drain Runoff Area=396 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment Tc: Extra Tc Calc's
Runoff=0.00 cfs 0.000 af

Pond DC1: Detention Chamber Peak Elev=27.38' Storage=2,376 cf Inflow=5.58 cfs 0.440 af
Outflow=2.76 cfs 0.440 af

Pond GAP: Area Drain Peak Elev=54.54' Storage=8 cf Inflow=0.22 cfs 0.017 af
Outflow=0.22 cfs 0.017 af

Pond IC2: Infiltration Chamber Under Parking Lot Peak Elev=49.97' Storage=716 cf Inflow=1.77 cfs 0.132 af
Discarded=0.07 cfs 0.082 af Primary=1.40 cfs 0.050 af Outflow=1.47 cfs 0.132 af

Pond STC1: STC450i by Contech Peak Elev=51.37' Inflow=1.77 cfs 0.132 af
Outflow=1.77 cfs 0.132 af

Link DP1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=3.11 cfs 0.258 af
Primary=3.08 cfs 0.258 af

Link DP1-1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=1.45 cfs 0.055 af
Primary=1.45 cfs 0.055 af

Link DP2: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.41 cfs 0.053 af
Primary=0.41 cfs 0.053 af

Link DP2-1: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.12 cfs 0.009 af
Primary=0.12 cfs 0.009 af

Link DP3: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=3.86 cfs 0.320 af
Primary=3.84 cfs 0.320 af

Link DP3-1: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=1.57 cfs 0.067 af
Primary=1.57 cfs 0.067 af

Link DP4: Chestnut St. Drain Manhole (DMH 4) Inflow=5.06 cfs 0.434 af
Primary=5.06 cfs 0.434 af

Link DP4-1: Chestnut St. Drain Manhole (DMH 4) Inflow=4.40 cfs 0.530 af
Primary=4.40 cfs 0.530 af

Link L2: Lag Time for Flow from S2B to DP2 delayed by 14.6 min Inflow=0.26 cfs 0.019 af
Primary=0.26 cfs 0.019 af

Link L2-1: Lag Time for Flow from S2B-1 to DP2-1 delayed by 12.3 min Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L214: Total Flow onto Lot 214 (Pre) Inflow=0.63 cfs 0.046 af
Primary=0.63 cfs 0.046 af

Link L214-1: Total Flow onto Lot 214 (Post) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 2.649 ac Runoff Volume = 1.101 af Average Runoff Depth = 4.99"
18.81% Pervious = 0.498 ac 81.19% Impervious = 2.151 ac

Summary for Subcatchment S1: Parking & Front of Buildings

"Paved Parking" includes building roofs.

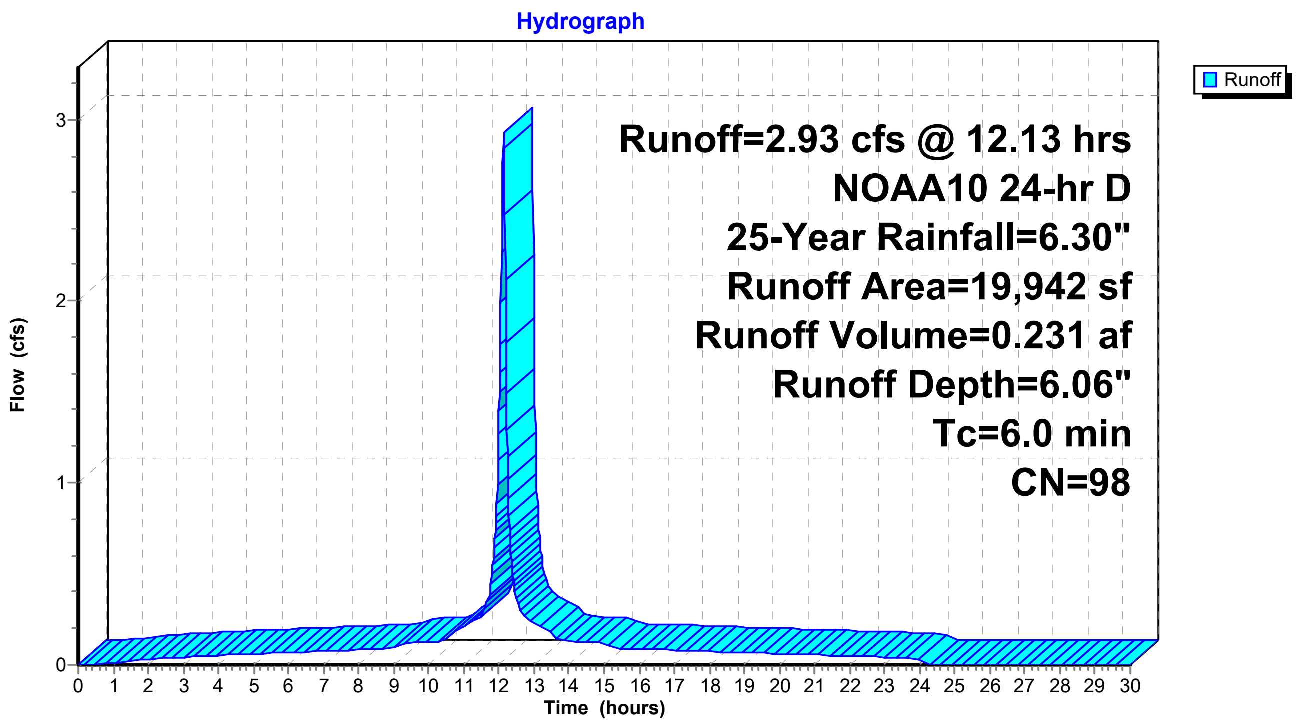
Runoff = 2.93 cfs @ 12.13 hrs, Volume= 0.231 af, Depth= 6.06"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
12,479	98	Paved parking, HSG A
7,463	98	Roofs, HSG A
19,942	98	Weighted Average
19,942		100.00% Impervious Area

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

Subcatchment S1: Parking & Front of Buildings



Summary for Subcatchment S1-1: Drains to Parking Lot Chambers

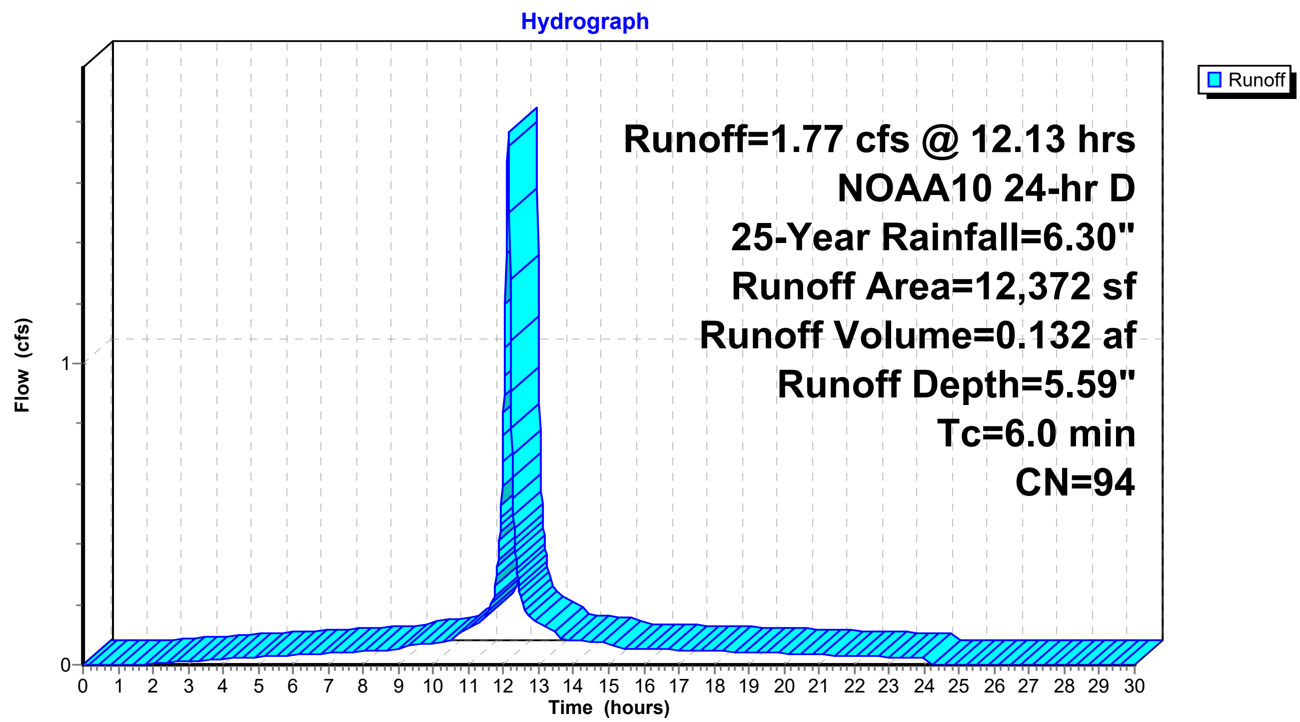
Runoff = 1.77 cfs @ 12.13 hrs, Volume= 0.132 af, Depth= 5.59"
Routed to Pond STC1 : STC450i by Contech

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
717	39	>75% Grass cover, Good, HSG A
876	96	Gravel surface, HSG A
10,779	98	Paved parking, HSG A
12,372	94	Weighted Average
1,593		12.88% Pervious Area
10,779		87.12% Impervious Area

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

Subcatchment S1-1: Drains to Parking Lot Chambers



Summary for Subcatchment S1-2: Untreated Runoff onto Oakland St.

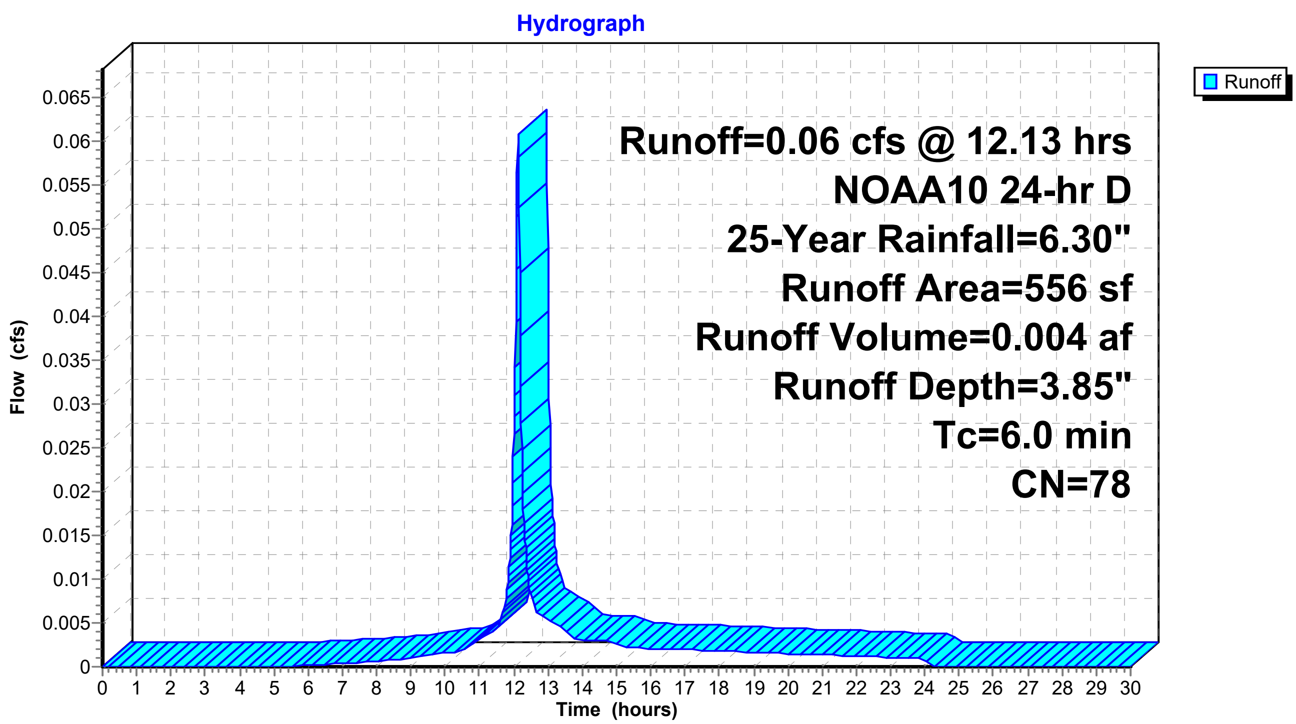
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 3.85"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
191	39	>75% Grass cover, Good, HSG A
365	98	Paved parking, HSG A
556	78	Weighted Average
191		34.35% Pervious Area
365		65.65% Impervious Area

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

Subcatchment S1-2: Untreated Runoff onto Oakland St.



Summary for Subcatchment S214A: Easterly Roof & Lot Line

"Paved Parking" includes building roofs.

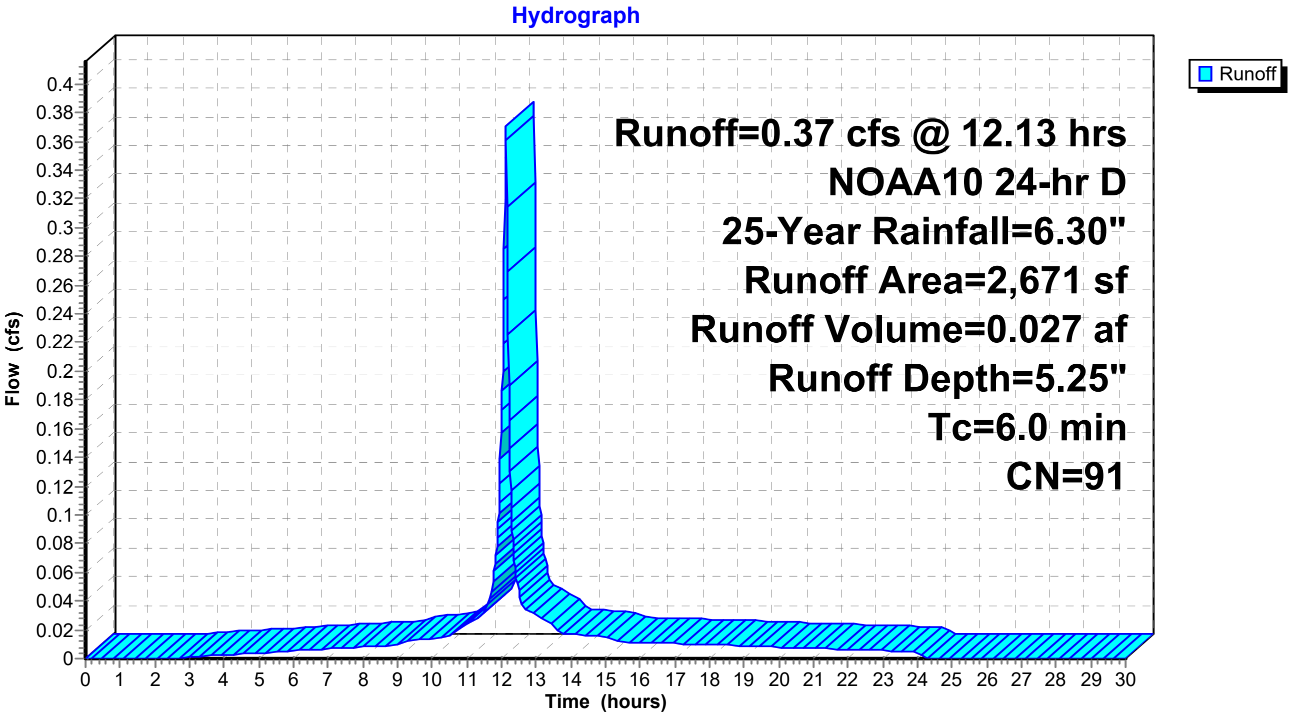
Runoff = 0.37 cfs @ 12.13 hrs, Volume= 0.027 af, Depth= 5.25"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

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

Subcatchment S214A: Easterly Roof & Lot Line



Summary for Subcatchment S214A-1: Easterly Lot Line

"Paved Parking" includes building roofs.

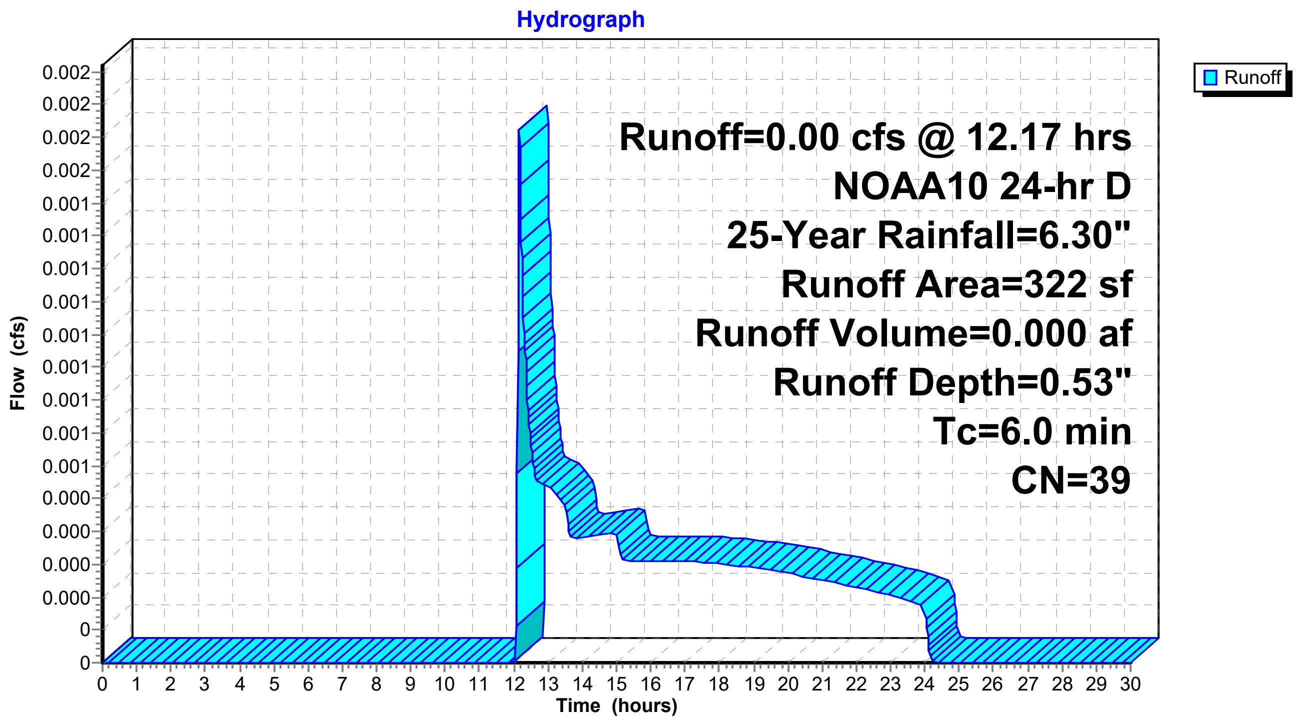
Runoff = 0.00 cfs @ 12.17 hrs, Volume= 0.000 af, Depth= 0.53"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

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

Subcatchment S214A-1: Easterly Lot Line



Summary for Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

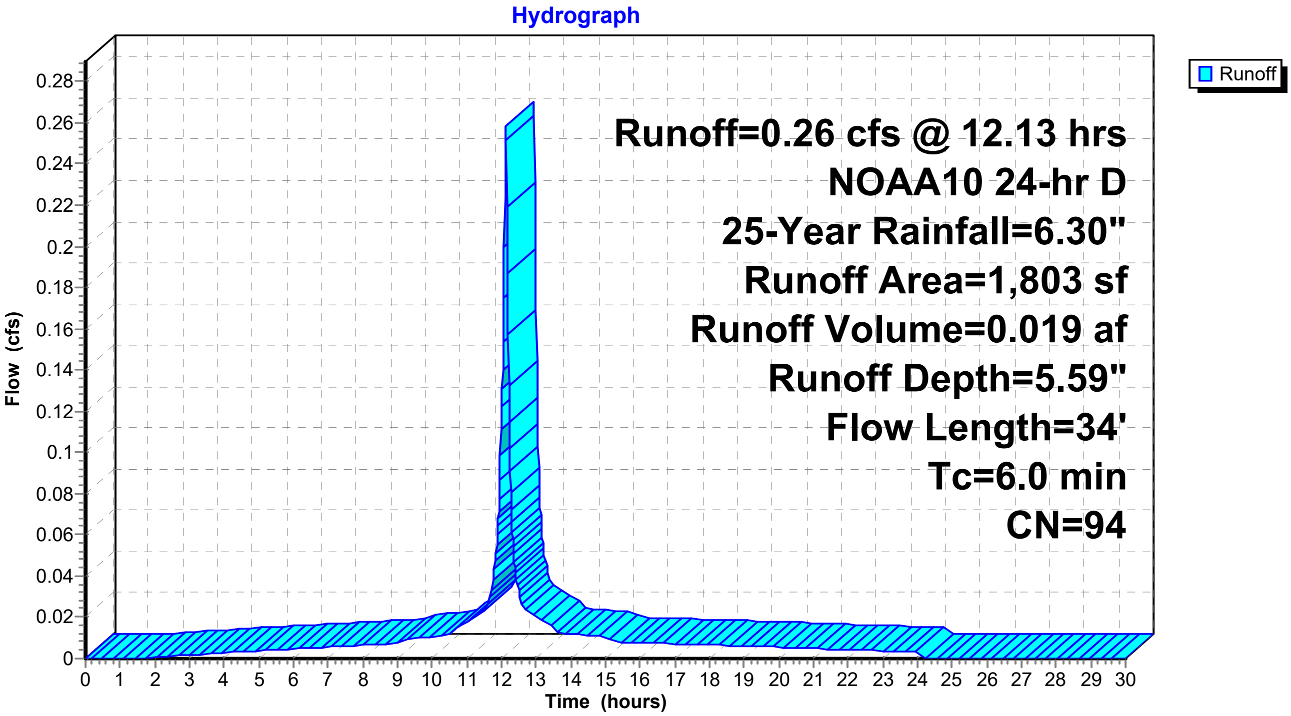
Runoff = 0.26 cfs @ 12.13 hrs, Volume= 0.019 af, Depth= 5.59"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214



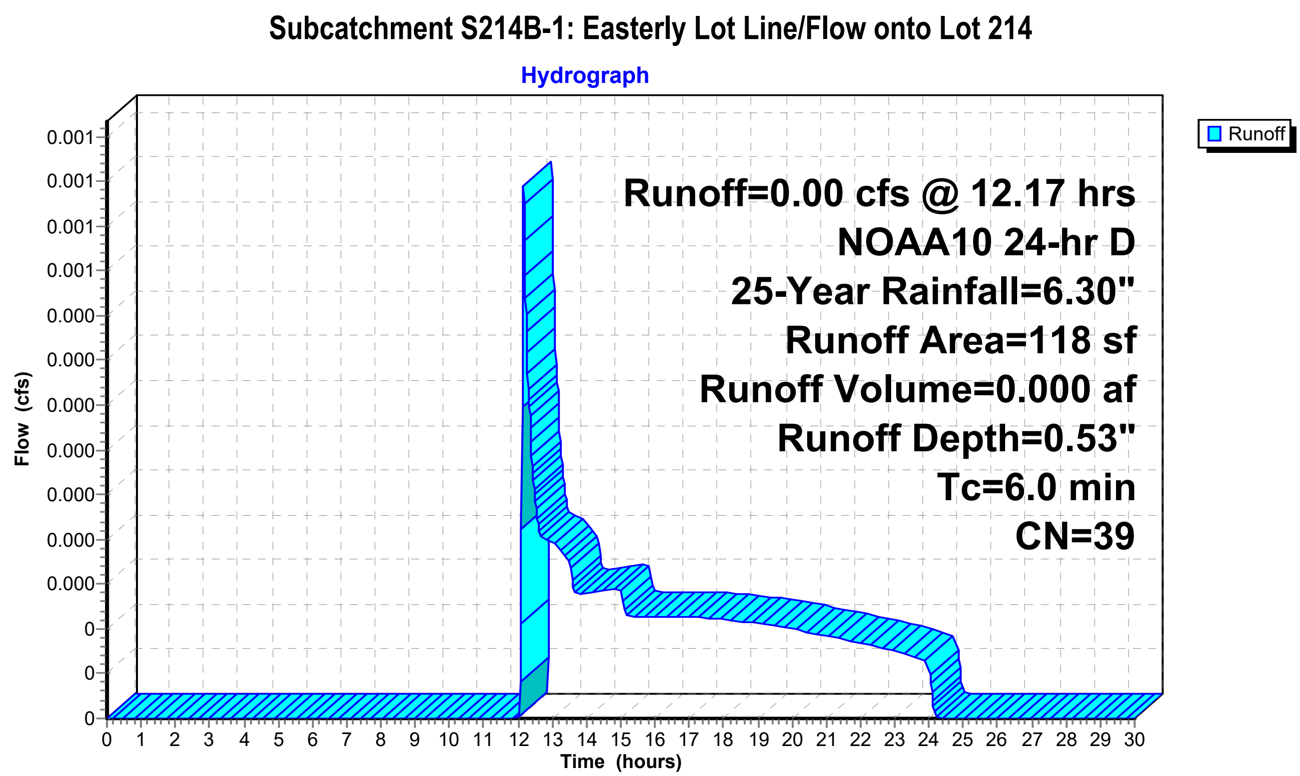
Summary for Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214

Runoff = 0.00 cfs @ 12.17 hrs, Volume= 0.000 af, Depth= 0.53"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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



Summary for Subcatchment S2A: Easterly Roof & Lot Line

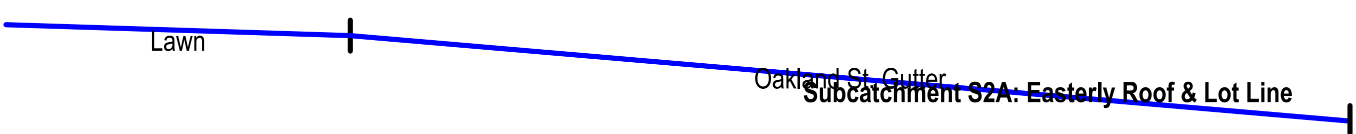
"Paved Parking" includes building roofs.

Runoff = 0.25 cfs @ 12.24 hrs, Volume= 0.027 af, Depth= 5.25"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

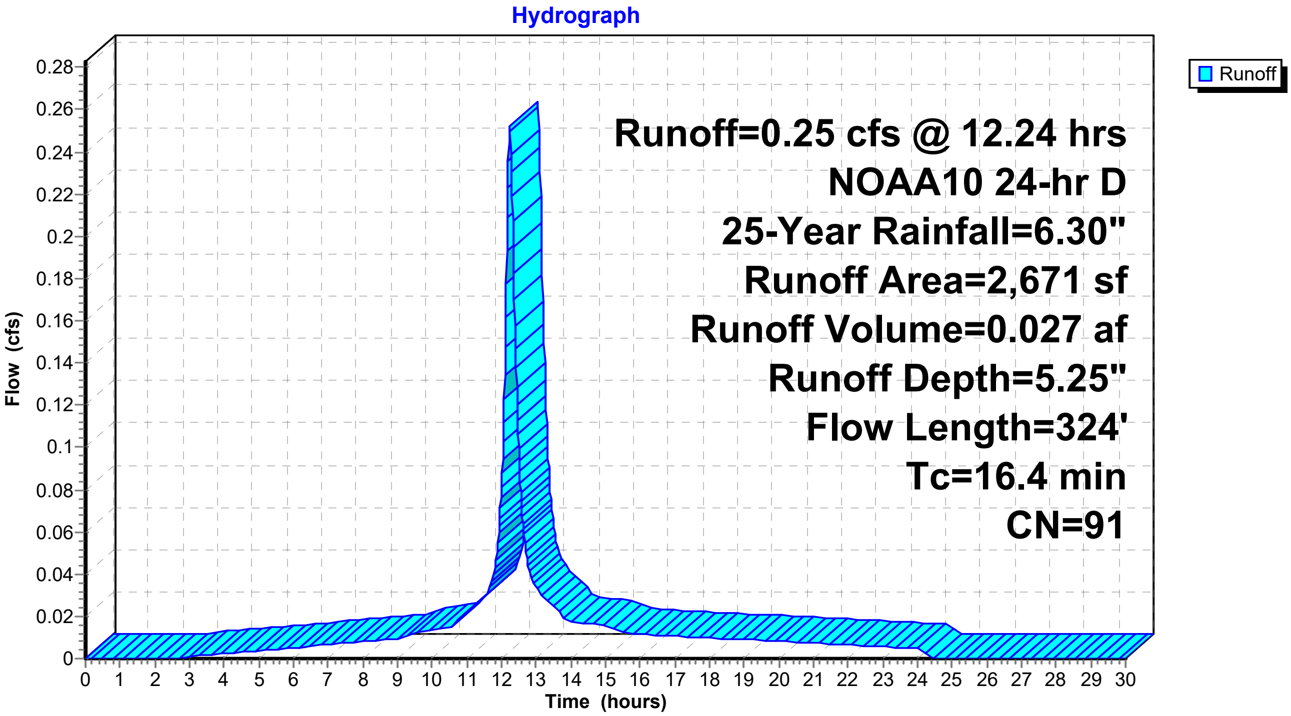
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn**
					Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter**
					Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A: Easterly Roof & Lot Line



Summary for Subcatchment S2A-1: Easterly Lot Line

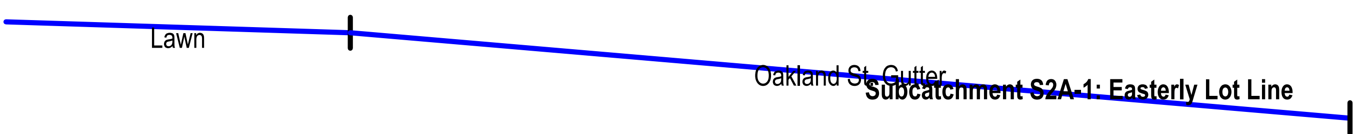
"Paved Parking" includes building roofs.

Runoff = 0.00 cfs @ 12.36 hrs, Volume= 0.000 af, Depth= 0.53"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

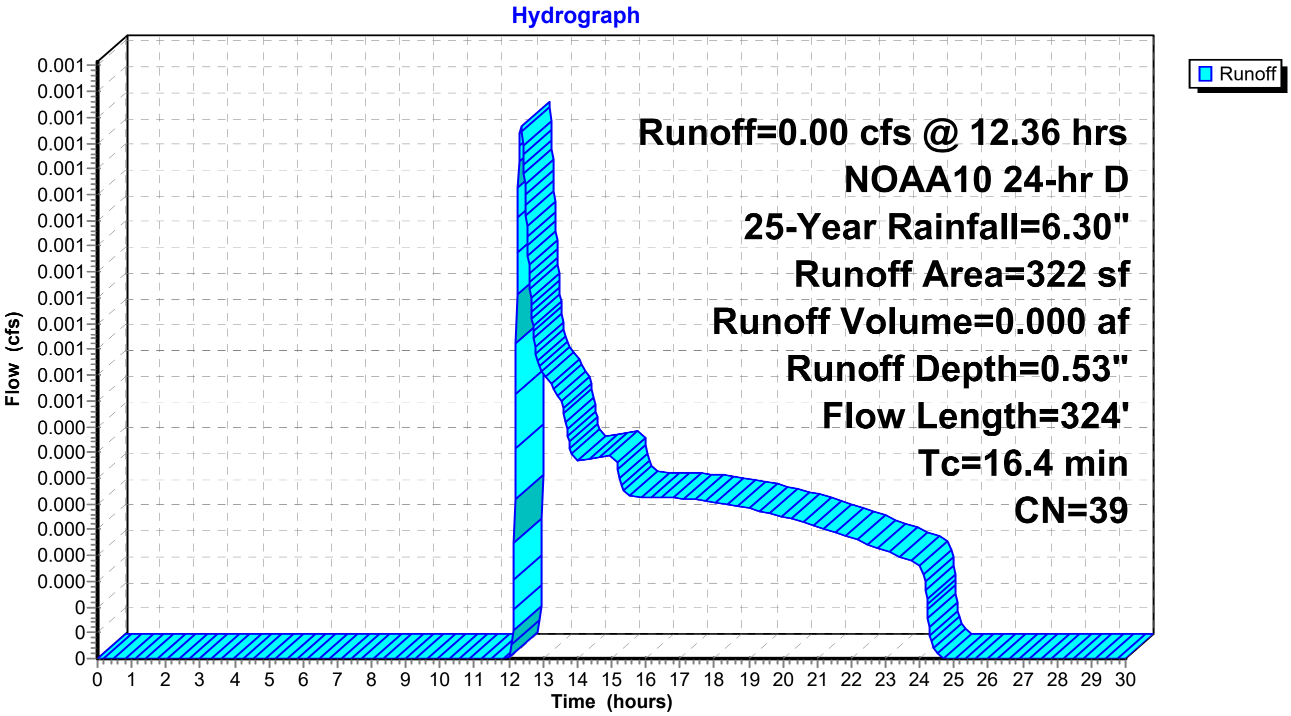
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn**
					Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter**
					Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A-1: Easterly Lot Line



Summary for Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

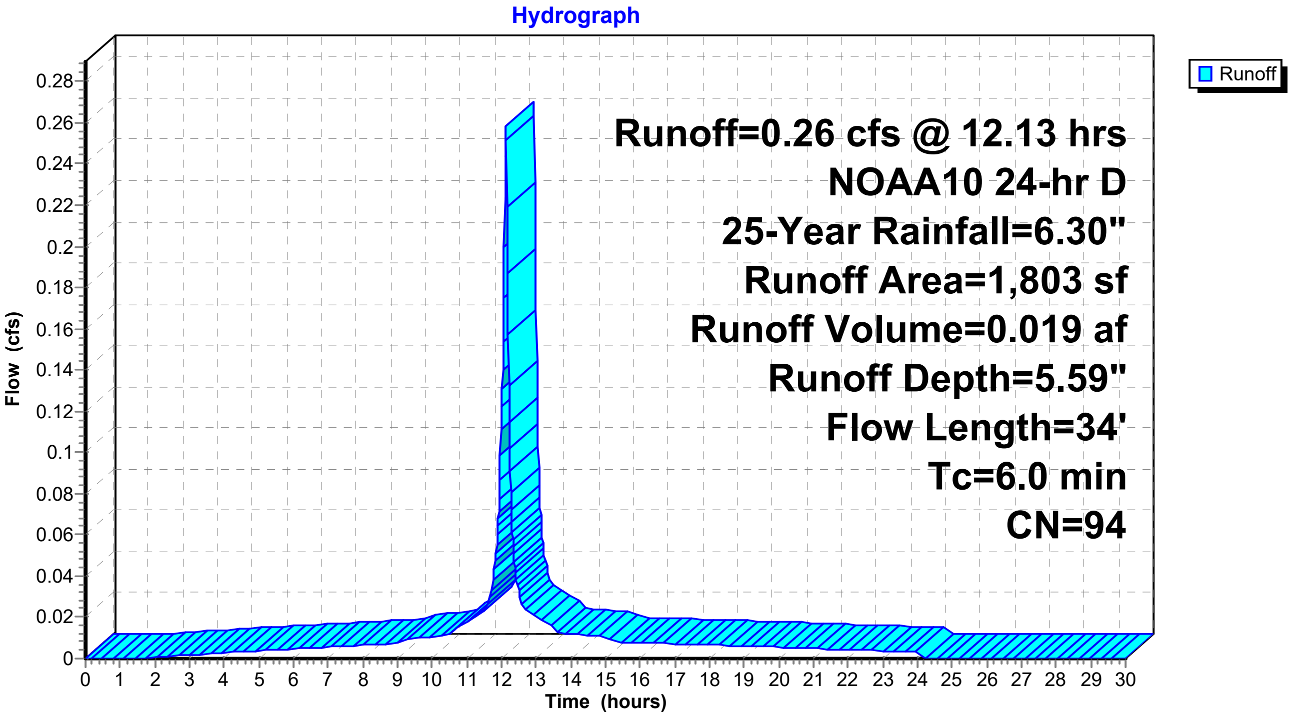
Runoff = 0.26 cfs @ 12.13 hrs, Volume= 0.019 af, Depth= 5.59"
Routed to Link L2 : Lag Time for Flow from S2B to DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214



Summary for Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214

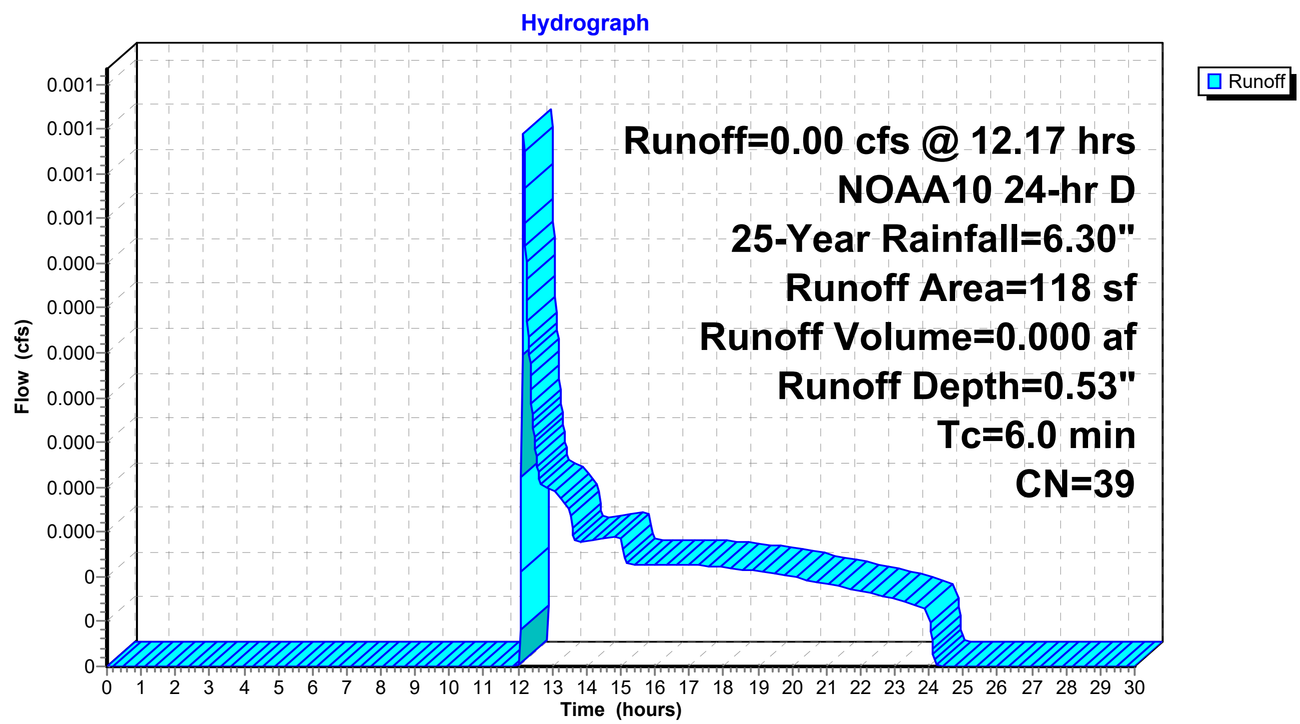
Runoff = 0.00 cfs @ 12.17 hrs, Volume= 0.000 af, Depth= 0.53"
Routed to Link L2-1 : Lag Time for Flow from S2B-1 to DP2-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214



Summary for Subcatchment S2C: Rear of Building & Site (SW)

"Paved Parking" includes building roofs.

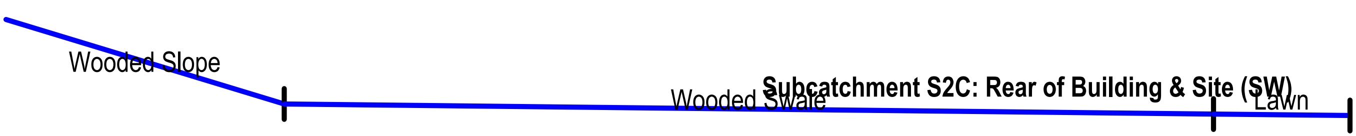
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.34 cfs @ 12.17 hrs, Volume= 0.034 af, Depth= 1.00"
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

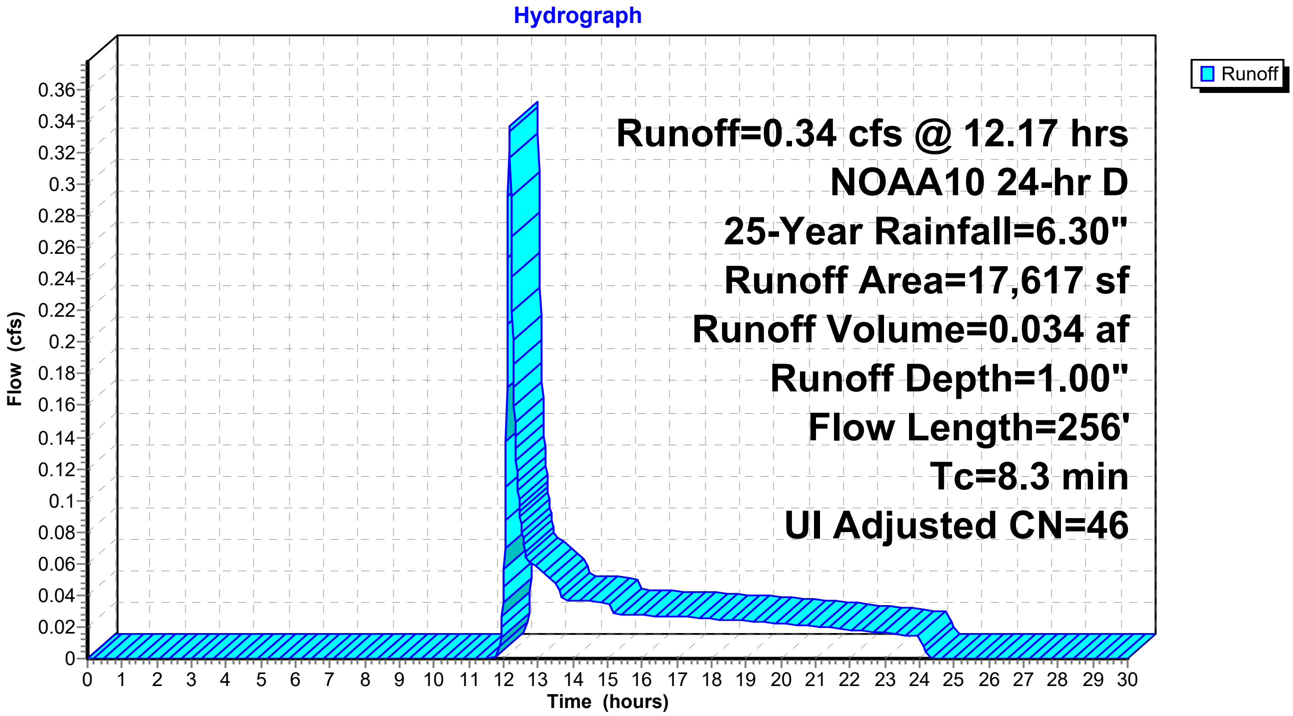
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Adj	Description
1,157	39		>75% Grass cover, Good, HSG A
80	98		Paved parking, HSG A
4,226	98		Unconnected roofs, HSG A
2,147	77		Fallow, bare soil, HSG A
10,007	30		Woods, Good, HSG A
17,617	53	46	Weighted Average, UI Adjusted
13,311			75.56% Pervious Area
4,306			24.44% Impervious Area
4,226			98.14% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	53	0.4720	0.24		**Sheet Flow, Wooded Slope** Woods: Light underbrush n= 0.400 P2= 3.24"
4.5	177	0.0169	0.65		**Shallow Concentrated Flow, Wooded Swale** Woodland Kv= 5.0 fps
0.2	26	0.0169	1.95		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
8.3	256	Total			



Subcatchment S2C: Rear of Building & Site (SW)



Summary for Subcatchment S2C-1: Perimeter of Garage

"Paved Parking" includes building roofs.

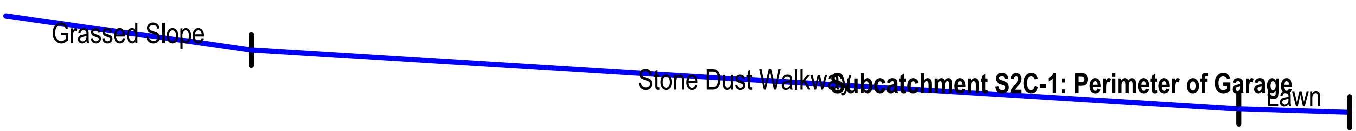
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.12 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 4.70"
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

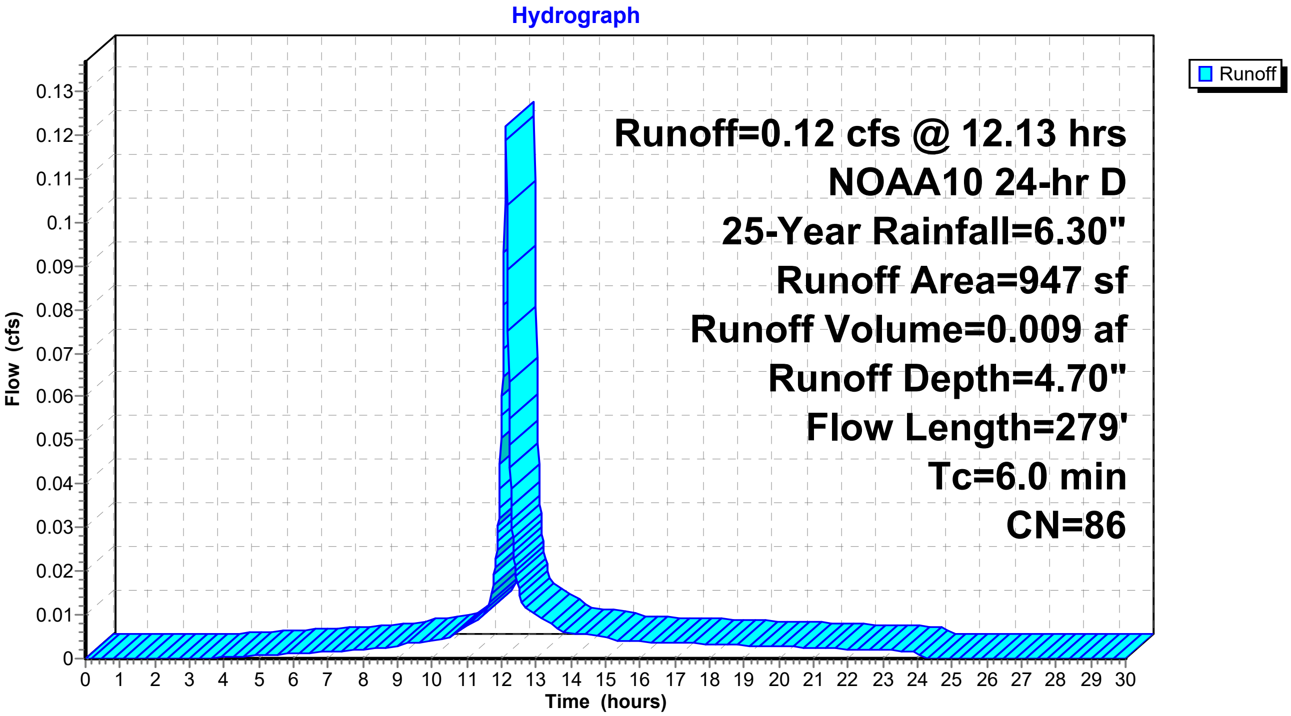
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
167	39	>75% Grass cover, Good, HSG A
780	96	Gravel surface, HSG A
947	86	Weighted Average
947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	51	0.0451	0.21		**Sheet Flow, Grassed Slope**
					Grass: Short n= 0.150 P2= 3.24"
1.5	205	0.0195	2.25		**Shallow Concentrated Flow, Stone Dust Walkway**
					Unpaved Kv= 16.1 fps
0.3	23	0.0098	1.48		**Shallow Concentrated Flow, Lawn**
					Grassed Waterway Kv= 15.0 fps
5.9	279	Total, Increased to minimum Tc = 6.0 min			



Subcatchment S2C-1: Perimeter of Garage



Summary for Subcatchment S3: Southerly Corner of Oakland & Chestnut

"Paved Parking" includes building roofs.

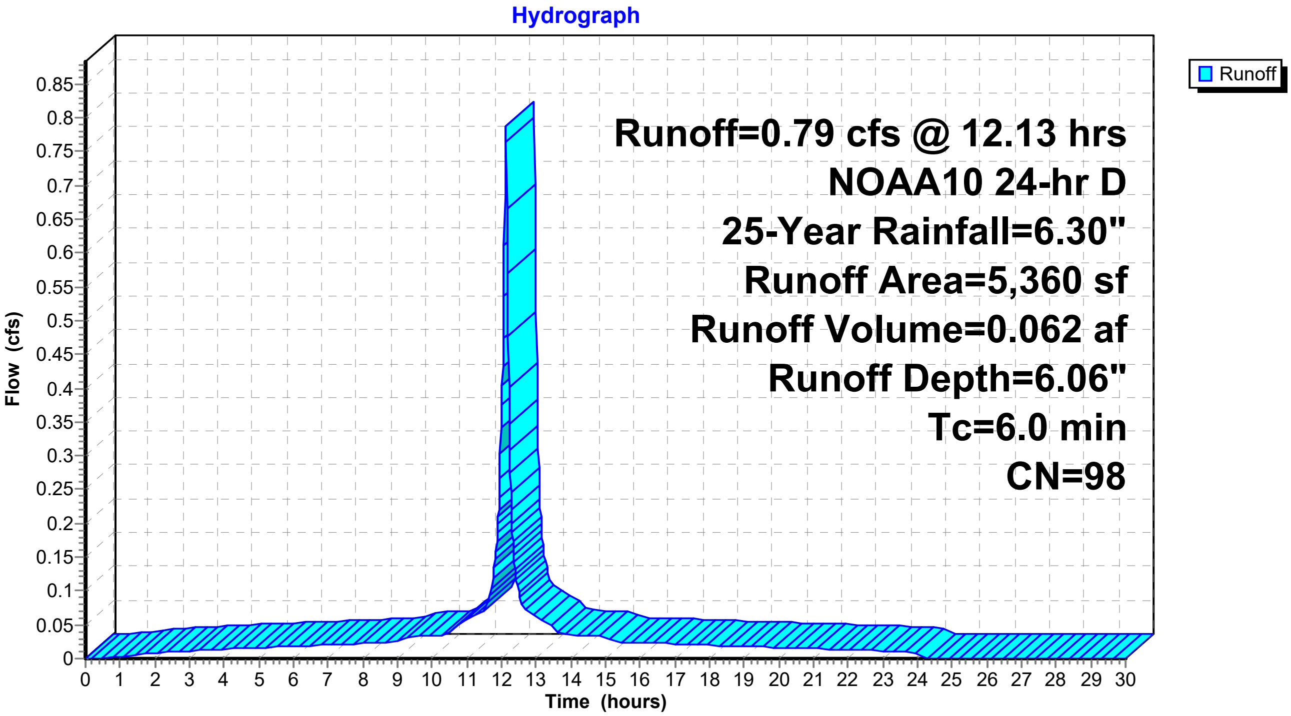
Runoff = 0.79 cfs @ 12.13 hrs, Volume= 0.062 af, Depth= 6.06"
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
14	39	>75% Grass cover, Good, HSG A
1,053	98	Paved parking, HSG A
4,293	98	Roofs, HSG A
5,360	98	Weighted Average
14		0.26% Pervious Area
5,346		99.74% Impervious Area

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

Subcatchment S3: Southerly Corner of Oakland & Chestnut



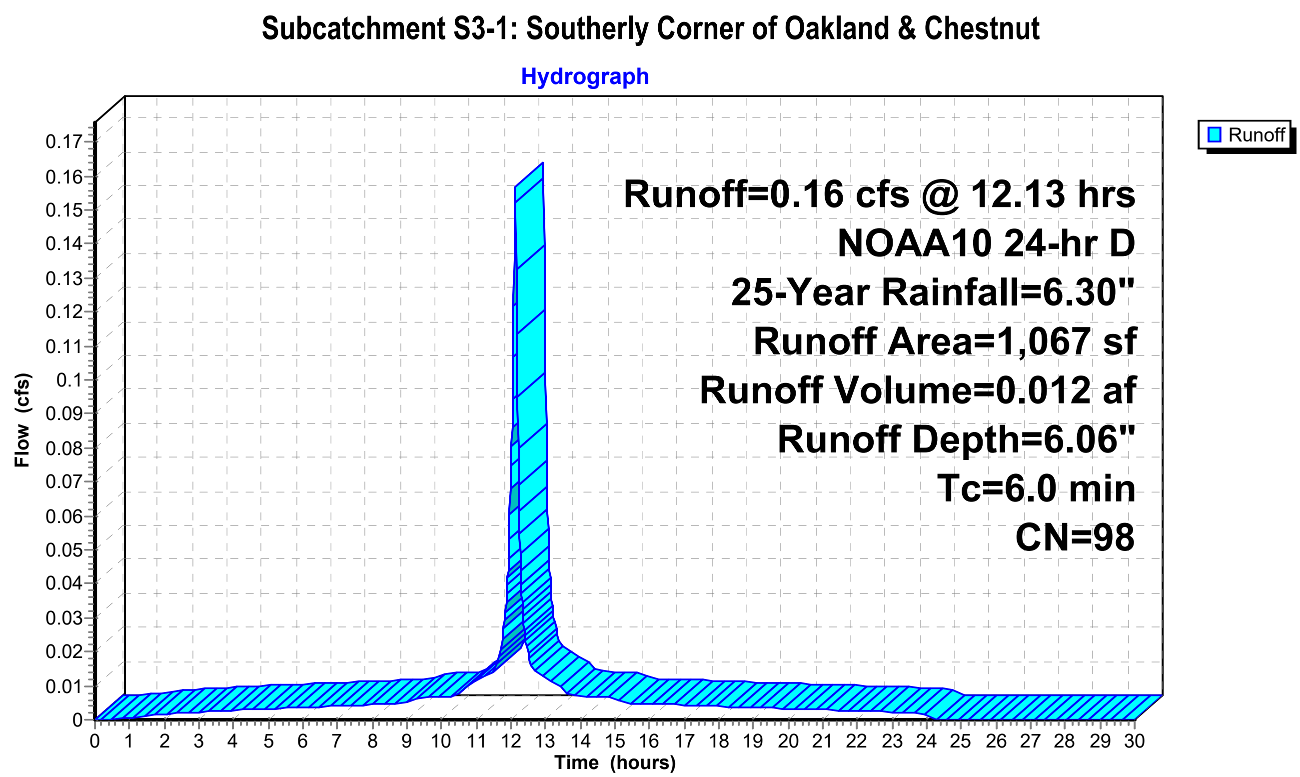
Summary for Subcatchment S3-1: Southerly Corner of Oakland & Chestnut

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 6.06"
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
22	96	Gravel surface, HSG A
1,045	98	Paved parking, HSG A
1,067	98	Weighted Average
22		2.06% Pervious Area
1,045		97.94% Impervious Area

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



Summary for Subcatchment S4: Loading Dock

"Paved Parking" includes building roofs.

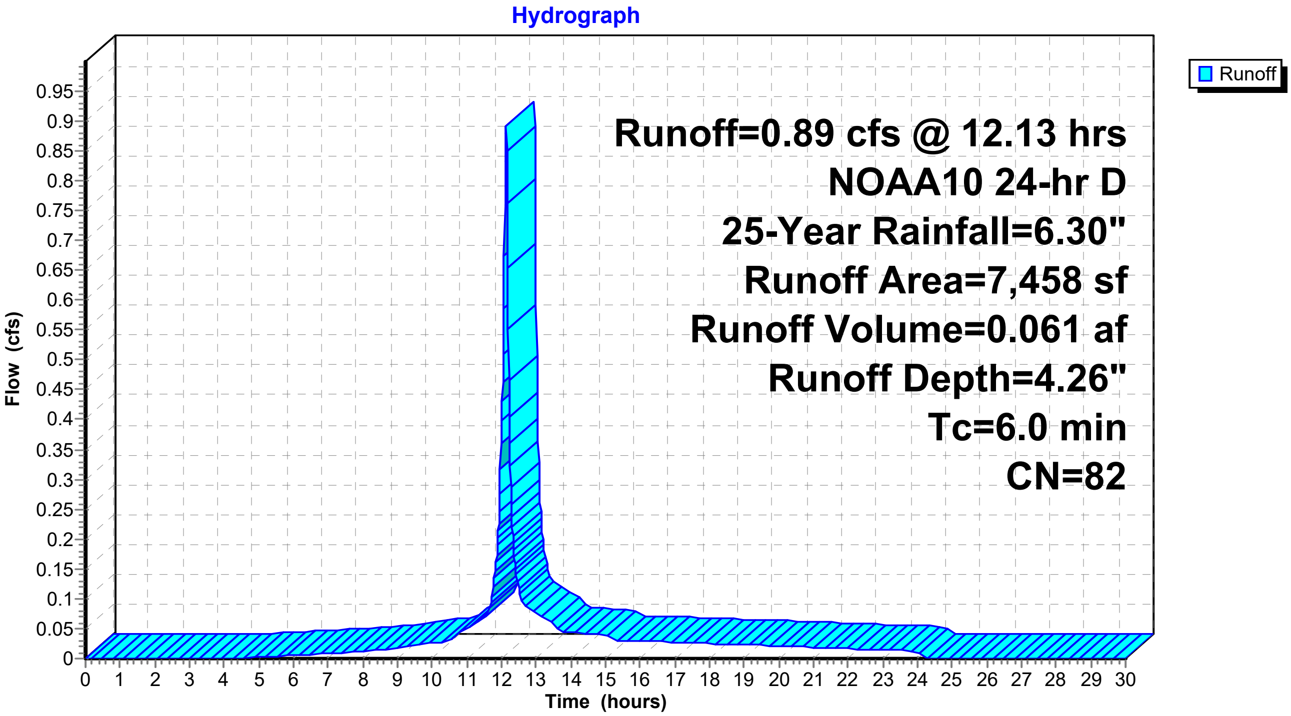
Runoff = 0.89 cfs @ 12.13 hrs, Volume= 0.061 af, Depth= 4.26"
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
1,421	39	>75% Grass cover, Good, HSG A
2,055	98	Paved parking, HSG A
2,658	98	Roofs, HSG A
1,122	77	Fallow, bare soil, HSG A
202	30	Woods, Good, HSG A
7,458	82	Weighted Average
2,745		36.81% Pervious Area
4,713		63.19% Impervious Area

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

Subcatchment S4: Loading Dock



Summary for Subcatchment S4-1: Garage Entrance

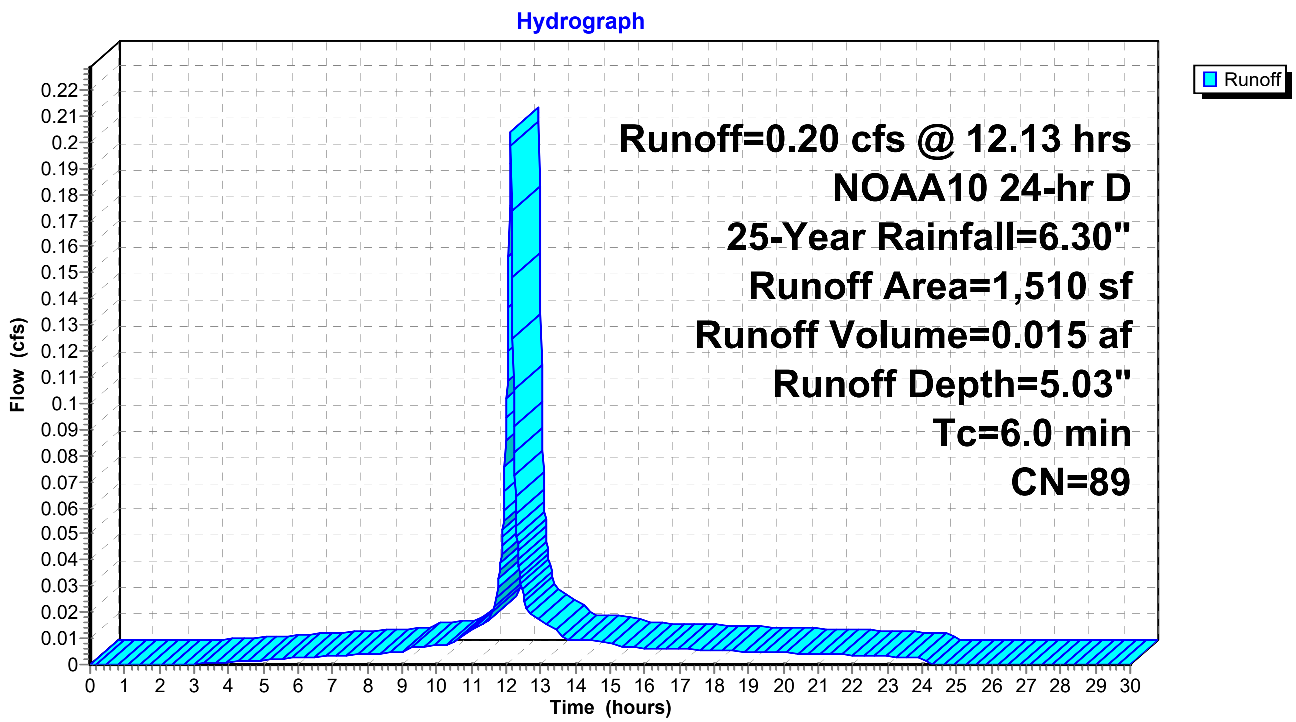
Runoff = 0.20 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 5.03"
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
231	39	>75% Grass cover, Good, HSG A
323	96	Gravel surface, HSG A
956	98	Paved parking, HSG A
1,510	89	Weighted Average
554		36.69% Pervious Area
956		63.31% Impervious Area

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

Subcatchment S4-1: Garage Entrance



Summary for Subcatchment S4-2: Proposed Roofs

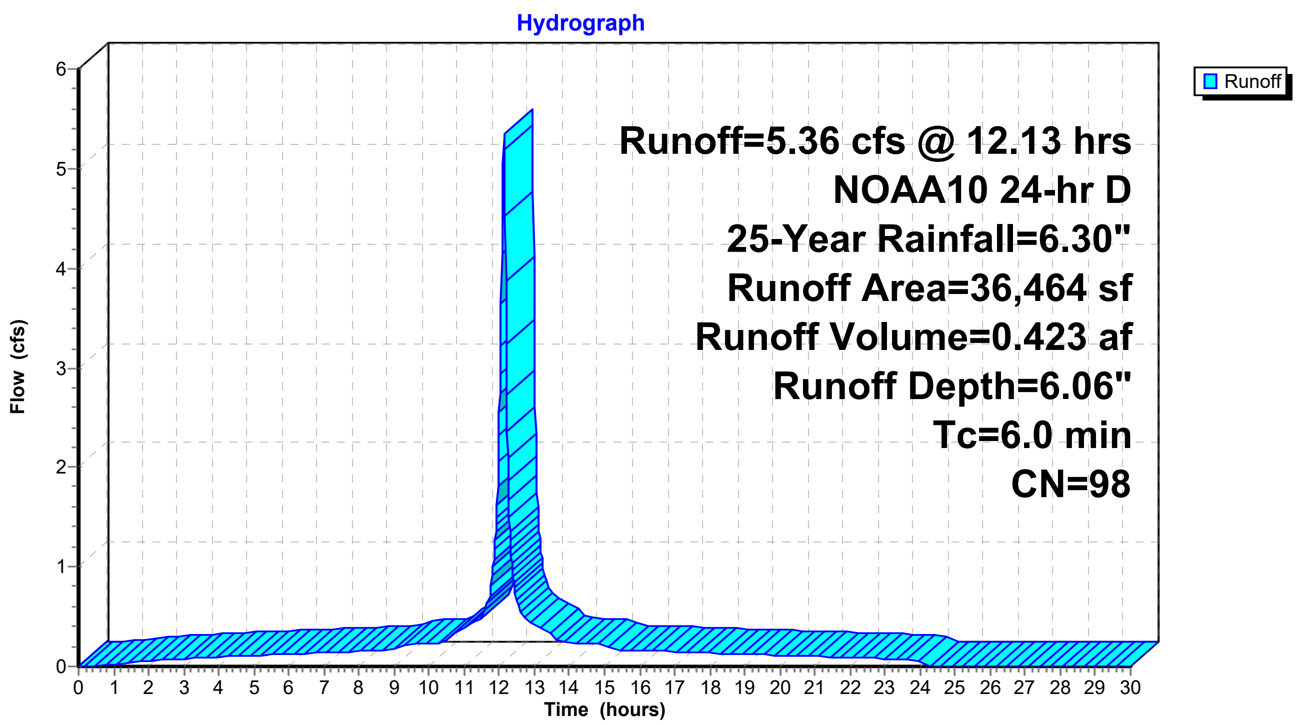
Runoff = 5.36 cfs @ 12.13 hrs, Volume= 0.423 af, Depth= 6.06"
Routed to Pond DC1 : Detention Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
36,464	98	Roofs, HSG A
36,464		100.00% Impervious Area

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

Subcatchment S4-2: Proposed Roofs



Summary for Subcatchment S4-3: Gap Between Buildings

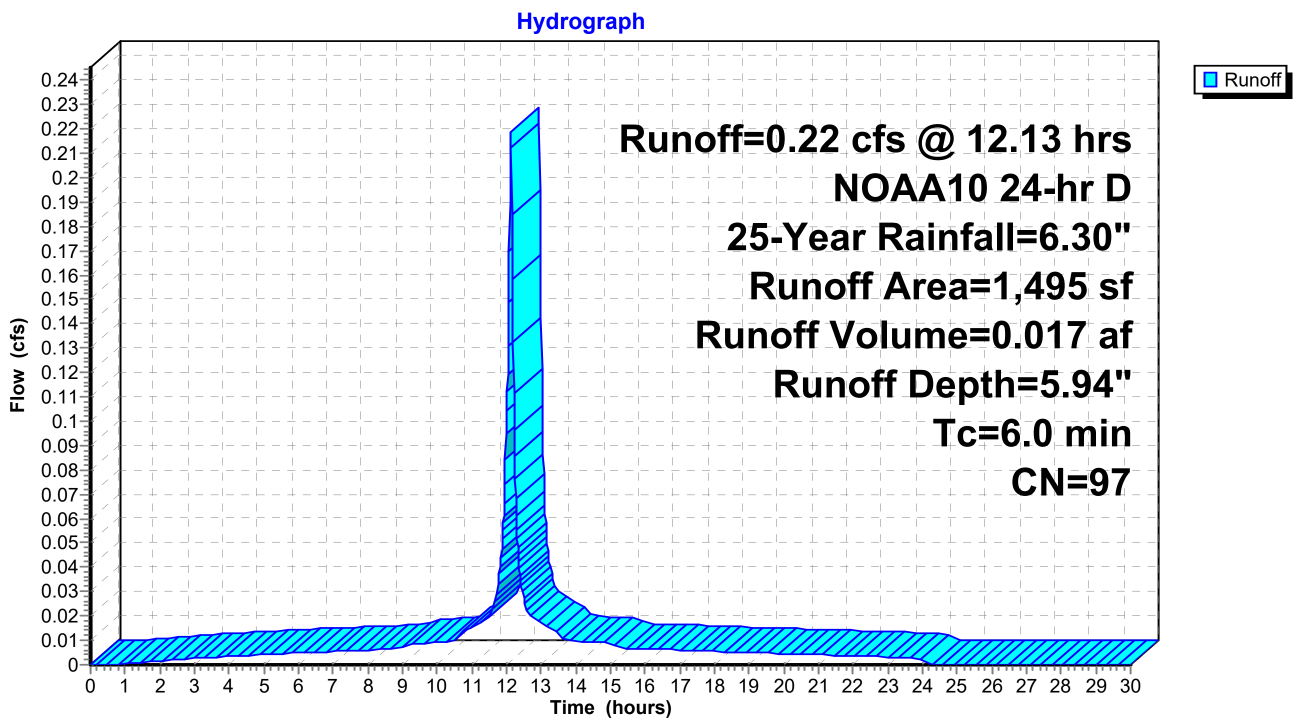
Runoff = 0.22 cfs @ 12.13 hrs, Volume= 0.017 af, Depth= 5.94"
Routed to Pond GAP : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
559	96	Gravel surface, HSG A
936	98	Unconnected roofs, HSG A
1,495	97	Weighted Average
559		37.39% Pervious Area
936		62.61% Impervious Area
936		100.00% Unconnected

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

Subcatchment S4-3: Gap Between Buildings



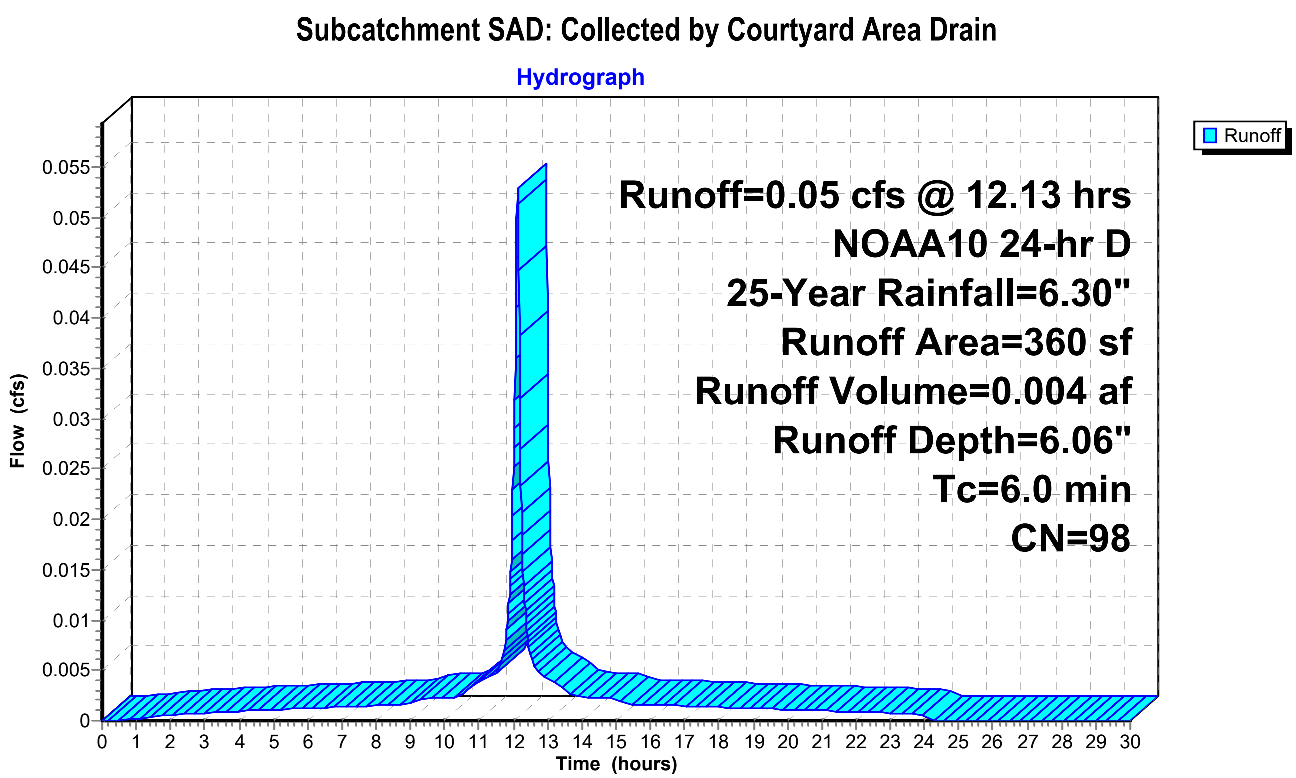
Summary for Subcatchment SAD: Collected by Courtyard Area Drain

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
360	98	Paved parking, HSG A
360		100.00% Impervious Area

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



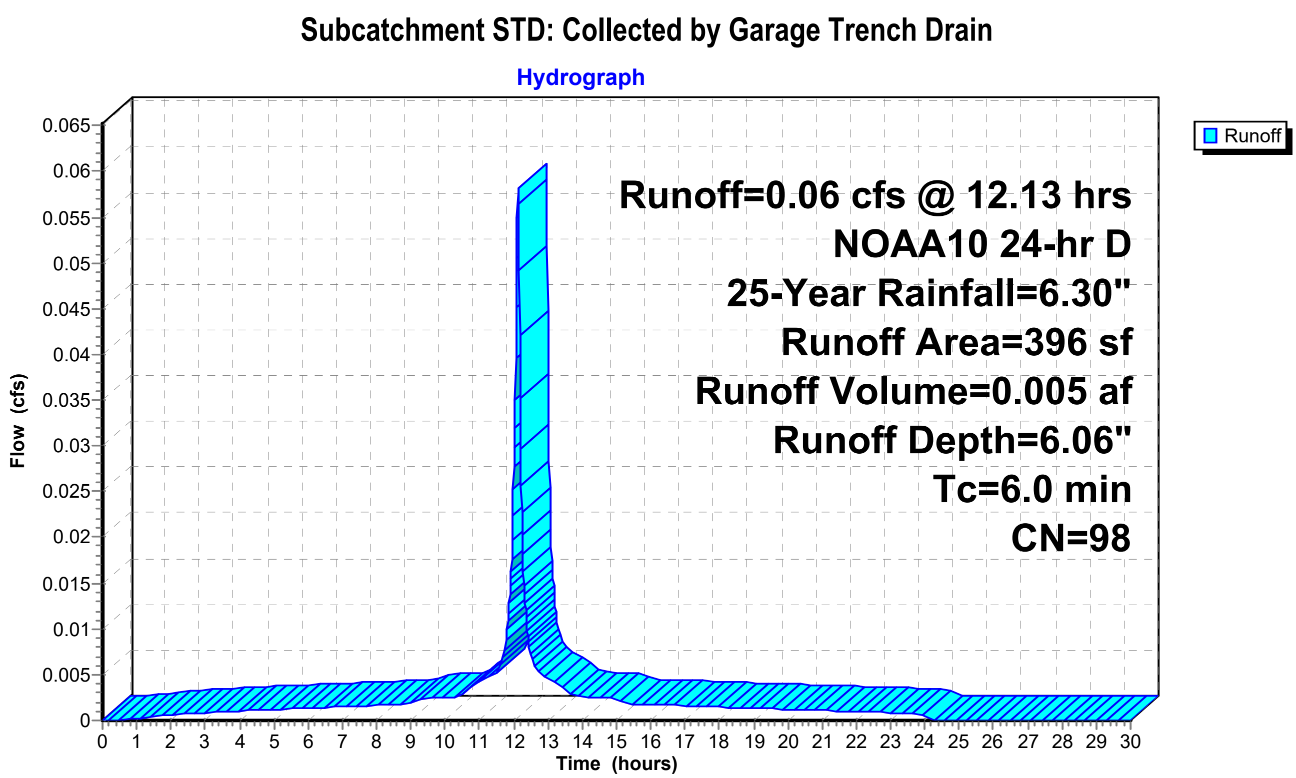
Summary for Subcatchment STD: Collected by Garage Trench Drain

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
396	98	Paved parking, HSG A
396		100.00% Impervious Area

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



Summary for Subcatchment Tc: Extra Tc Calc's

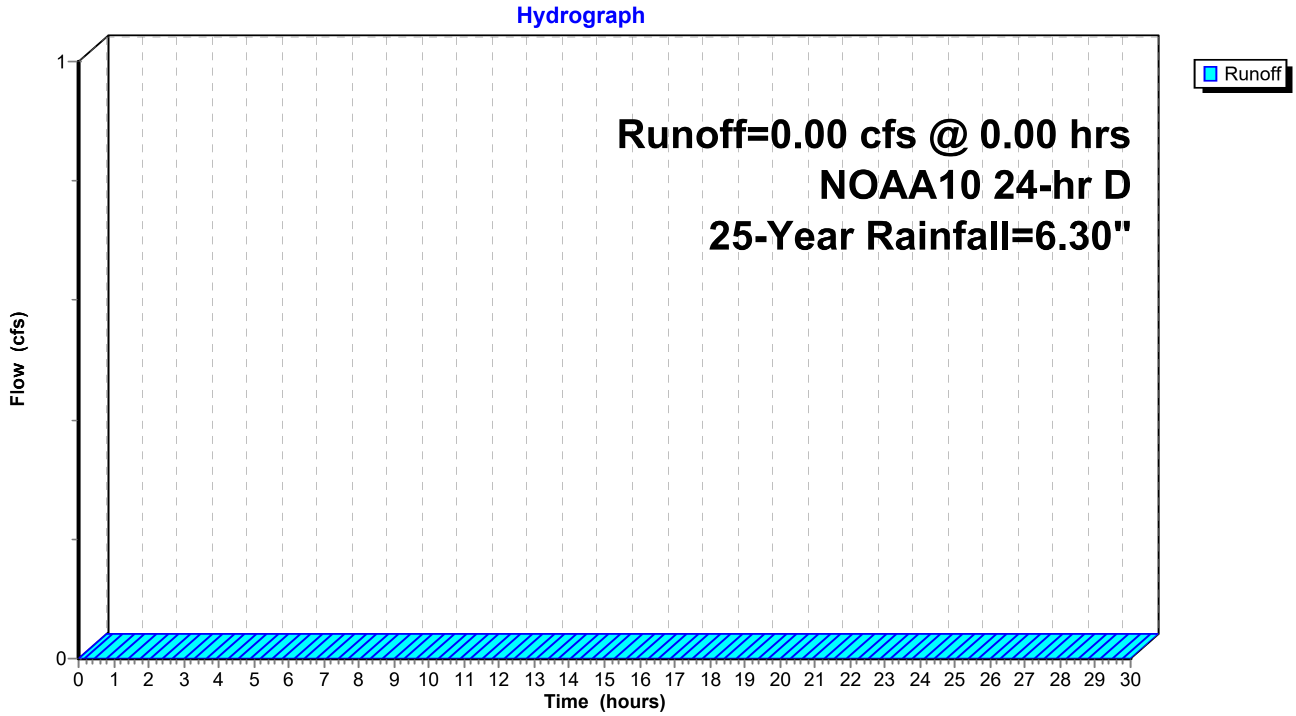
[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	70	0.0501	5.28	4.15	**Pipe Channel, CB 2 to DMH 1** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.1	33	0.1391	8.80	6.91	**Pipe Channel, DMH 1 to DMH 2** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.3	139	0.0701	9.18	7.21	**Pipe Channel, DMH 2 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
6.3	55	0.0182	0.15		**Sheet Flow, Lawn (L2 to DP2)** Grass: Short n= 0.150 P2= 3.24"
0.3	27	0.0079	1.33		**Shallow Concentrated Flow, Lawn (DP2 to CB 8)** Grassed Waterway Kv= 15.0 fps
0.4	47	0.0079	1.80		**Shallow Concentrated Flow, Chestnut St. Gutter (DP2 to CB 8)** Paved Kv= 20.3 fps
0.0	9	0.0811	9.88	7.76	**Pipe Channel, CB 8 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
0.4	143	0.0222	6.77	11.97	**Pipe Channel, DMH 3 to DMH 4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.017 Concrete sewer w/manholes & inlets
8.0	523	Total			

Subcatchment Tc: Extra Tc Calc's



Summary for Pond DC1: Detention Chamber

Chamber ceiling = 28.93

Inflow Area = 0.871 ac, 98.53% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 5.58 cfs @ 12.13 hrs, Volume= 0.440 af
Outflow = 2.76 cfs @ 12.22 hrs, Volume= 0.440 af, Atten= 51%, Lag= 5.2 min
Primary = 2.76 cfs @ 12.22 hrs, Volume= 0.440 af
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

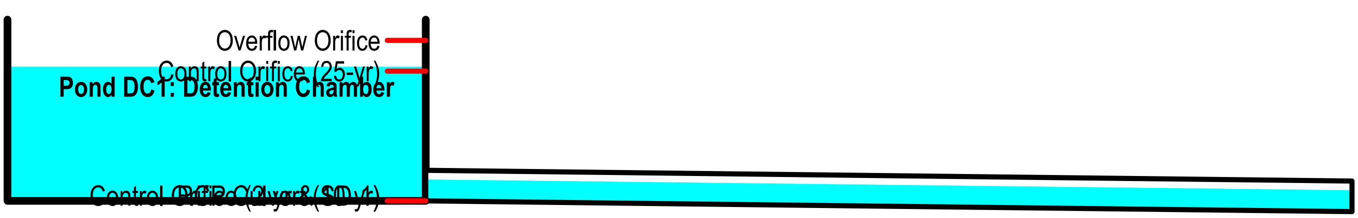
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 27.38' @ 12.22 hrs Surf.Area= 543 sf Storage= 2,376 cf

Plug-Flow detention time= 13.8 min calculated for 0.440 af (100% of inflow)
Center-of-Mass det. time= 13.5 min (760.3 - 746.8)

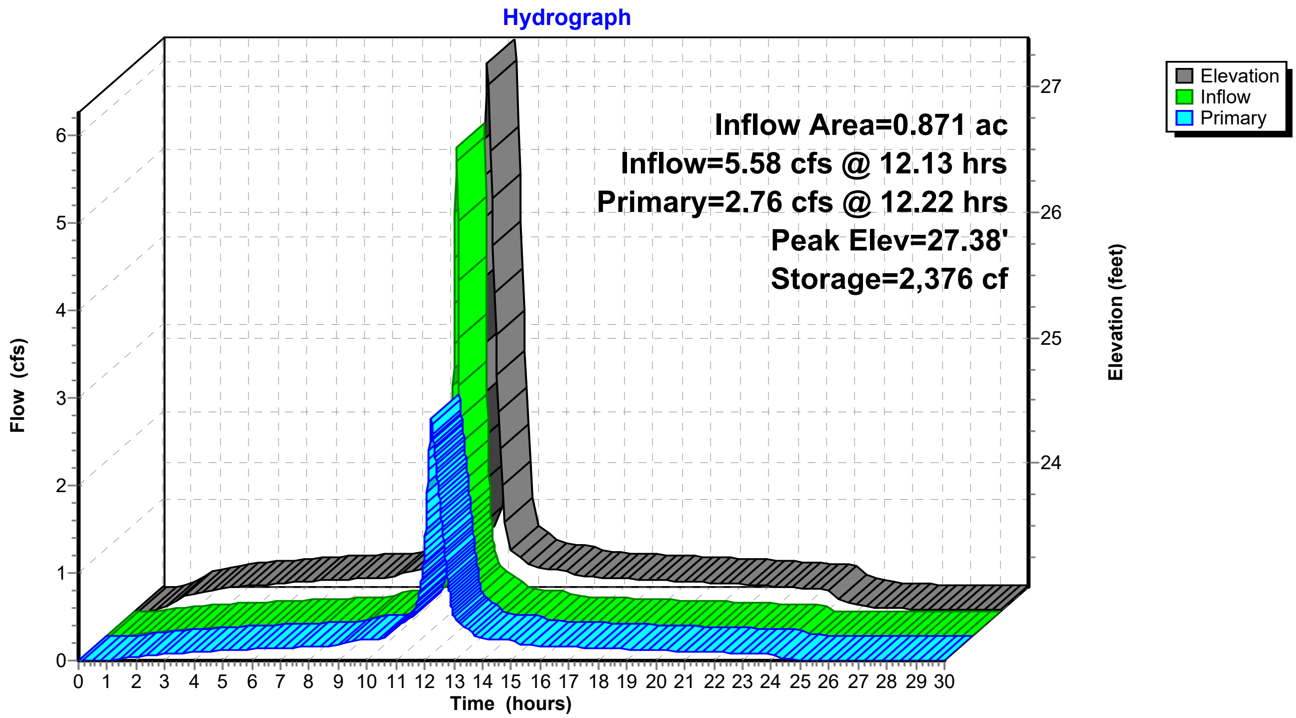
Volume	Invert	Avail.Storage	Storage Description
#1	23.01'	3,217 cf	**8.67'W x 15.67'L x 5.92'H Shea Fire Cistern Bank** x 4

Device	Routing	Invert	Outlet Devices
#1	Primary	23.01'	**12.00" Round RCP Culvert (SD-1)** L= 69.4' Ke= 1.800 Inlet / Outlet Invert= 23.01' / 22.66' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	23.01'	**7.00" Vert. Control Orifice (2-yr & 10-yr)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.25'	**4.00" Vert. Control Orifice (25-yr) X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	28.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.74 cfs @ 12.22 hrs HW=27.38' TW=0.00' (Dynamic Tailwater)
1=RCP Culvert (SD-1) (Passes 2.74 cfs of 3.98 cfs potential flow)
2=Control Orifice (2-yr & 10-yr) (Orifice Controls 2.60 cfs @ 9.72 fps)
3=Control Orifice (25-yr) (Orifice Controls 0.15 cfs @ 1.21 fps)
4=Overflow Orifice (Controls 0.00 cfs)



Pond DC1: Detention Chamber



Stage-Area-Storage for Pond DC1: Detention Chamber

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
23.01	0	25.61	1,413	28.21	2,826
23.06	27	25.66	1,440	28.26	2,853
23.11	54	25.71	1,467	28.31	2,880
23.16	82	25.76	1,494	28.36	2,907
23.21	109	25.81	1,522	28.41	2,935
23.26	136	25.86	1,549	28.46	2,962
23.31	163	25.91	1,576	28.51	2,989
23.36	190	25.96	1,603	28.56	3,016
23.41	217	26.01	1,630	28.61	3,043
23.46	245	26.06	1,657	28.66	3,070
23.51	272	26.11	1,685	28.71	3,098
23.56	299	26.16	1,712	28.76	3,125
23.61	326	26.21	1,739	28.81	3,152
23.66	353	26.26	1,766	28.86	3,179
23.71	380	26.31	1,793	28.91	**3,206**
23.76	408	26.36	1,821		
23.81	435	26.41	1,848		
23.86	462	26.46	1,875		
23.91	489	26.51	1,902		
23.96	516	26.56	1,929		
24.01	543	26.61	1,956		
24.06	571	26.66	1,984		
24.11	598	26.71	2,011		
24.16	625	26.76	2,038		
24.21	652	26.81	2,065		
24.26	679	26.86	2,092		
24.31	706	26.91	2,119		
24.36	734	26.96	2,147		
24.41	761	27.01	2,174		
24.46	788	27.06	2,201		
24.51	815	27.11	2,228		
24.56	842	27.16	2,255		
24.61	869	27.21	2,282		
24.66	897	27.26	2,310		
24.71	924	27.31	2,337		
24.76	951	27.36	2,364		
24.81	978	27.41	2,391		
24.86	1,005	27.46	2,418		
24.91	1,033	27.51	2,445		
24.96	1,060	27.56	2,473		
25.01	1,087	27.61	2,500		
25.06	1,114	27.66	2,527		
25.11	1,141	27.71	2,554		
25.16	1,168	27.76	2,581		
25.21	1,196	27.81	2,608		
25.26	1,223	27.86	2,636		
25.31	1,250	27.91	2,663		
25.36	1,277	27.96	2,690		
25.41	1,304	28.01	2,717		
25.46	1,331	28.06	2,744		
25.51	1,359	28.11	2,772		
25.56	1,386	28.16	2,799		

Summary for Pond GAP: Area Drain

Flood elevation set at finished floor of level 2.
Loss coefficient of 0.9 for short radius 90-degree fittings between pipes.

Inflow Area = 0.034 ac, 62.61% Impervious, Inflow Depth = 5.94" for 25-Year event
Inflow = 0.22 cfs @ 12.13 hrs, Volume= 0.017 af
Outflow = 0.22 cfs @ 12.13 hrs, Volume= 0.017 af, Atten= 1%, Lag= 0.4 min
Primary = 0.22 cfs @ 12.13 hrs, Volume= 0.017 af
Routed to Pond DC1 : Detention Chamber

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 54.54' @ 12.13 hrs Storage= 8 cf
Flood Elev= 55.00' Storage= 112 cf

Plug-Flow detention time= 1.5 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (756.0 - 754.5)

Volume	Invert	Avail.Storage	Storage Description
#1	54.50'	2,068 cf	**Open Area (Prismatic)** Listed below -Impervious

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.50	559	0.0	0	0
55.00	559	40.0	112	112
58.50	559	100.0	1,957	2,068

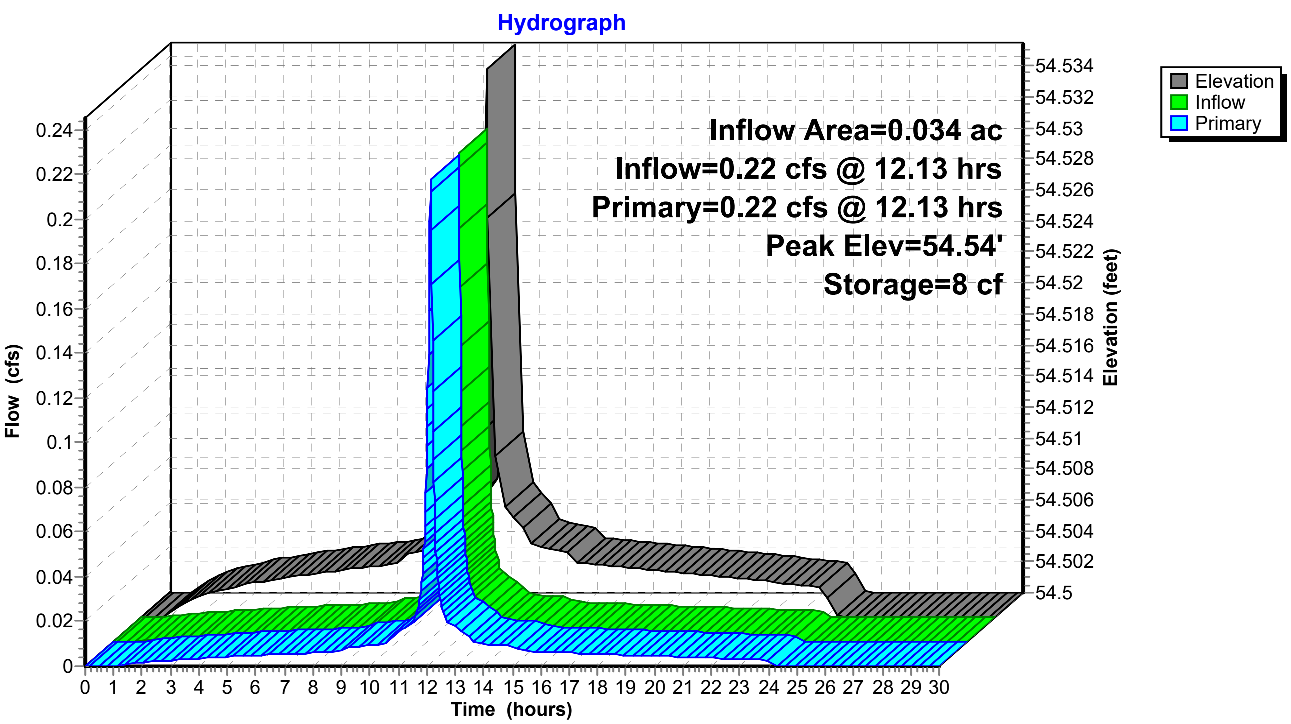
Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 22.5' Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.00' S= 0.0444 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#2	Device 1	50.43'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 5.2' Ke= 0.900 Inlet / Outlet Invert= 50.43' / 50.43' S= 0.0000 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#3	Device 2	50.50'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 3.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.50' / 50.43' S= 0.0200 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#4	Device 3	54.50'	**2.25" x 5.40" Horiz. Neenah R-6672-F Grate X 8.00 columns** X 4 rows C= 0.600 in 30.00" x 30.00" Grate (43% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.22 cfs @ 12.13 hrs HW=54.54' TW=26.48' (Dynamic Tailwater)
└─**1=Ductile Iron Drain Pipe (SD-4)** (Passes 0.22 cfs of 3.95 cfs potential flow)
  └─**2=Ductile Iron Drain Pipe (SD-4)** (Passes 0.22 cfs of 1.47 cfs potential flow)
    └─**3=Ductile Iron Drain Pipe (SD-4)** (Passes 0.22 cfs of 1.84 cfs potential flow)
      └─**4=Neenah R-6672-F Grate** (Weir Controls 0.22 cfs @ 0.62 fps)

Neenah R-6672-F Grate
Ductile Iron Drain Pipe (SD-4)
Pond GAP: Area Drain

Ductile Iron Drain Pipe (SD-4)

Pond GAP: Area Drain



Stage-Area-Storage for Pond GAP: Area Drain

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
54.50	0	55.54	414	56.58	995	57.62	1,576
54.52	4	55.56	425	56.60	1,006	57.64	1,588
54.54	9	55.58	436	56.62	1,017	57.66	1,599
54.56	13	55.60	447	56.64	1,029	57.68	1,610
54.58	18	55.62	458	56.66	1,040	57.70	1,621
54.60	22	55.64	470	56.68	1,051	57.72	1,632
54.62	27	55.66	481	56.70	1,062	57.74	1,643
54.64	31	55.68	492	56.72	1,073	57.76	1,655
54.66	36	55.70	503	56.74	1,084	57.78	1,666
54.68	40	55.72	514	56.76	1,096	57.80	1,677
54.70	45	55.74	525	56.78	1,107	57.82	1,688
54.72	49	55.76	537	56.80	1,118	57.84	1,699
54.74	54	55.78	548	56.82	1,129	57.86	1,711
54.76	58	55.80	559	56.84	1,140	57.88	1,722
54.78	63	55.82	570	56.86	1,152	57.90	1,733
54.80	67	55.84	581	56.88	1,163	57.92	1,744
54.82	72	55.86	593	56.90	1,174	57.94	1,755
54.84	76	55.88	604	56.92	1,185	57.96	1,766
54.86	80	55.90	615	56.94	1,196	57.98	1,778
54.88	85	55.92	626	56.96	1,207	58.00	1,789
54.90	89	55.94	637	56.98	1,219	58.02	1,800
54.92	94	55.96	648	57.00	1,230	58.04	1,811
54.94	98	55.98	660	57.02	1,241	58.06	1,822
54.96	103	56.00	671	57.04	1,252	58.08	1,834
54.98	107	56.02	682	57.06	1,263	58.10	1,845
55.00	112	56.04	693	57.08	1,275	58.12	1,856
55.02	123	56.06	704	57.10	1,286	58.14	1,867
55.04	134	56.08	716	57.12	1,297	58.16	1,878
55.06	145	56.10	727	57.14	1,308	58.18	1,889
55.08	157	56.12	738	57.16	1,319	58.20	1,901
55.10	168	56.14	749	57.18	1,330	58.22	1,912
55.12	179	56.16	760	57.20	1,342	58.24	1,923
55.14	190	56.18	771	57.22	1,353	58.26	1,934
55.16	201	56.20	783	57.24	1,364	58.28	1,945
55.18	212	56.22	794	57.26	1,375	58.30	1,956
55.20	224	56.24	805	57.28	1,386	58.32	1,968
55.22	235	56.26	816	57.30	1,397	58.34	1,979
55.24	246	56.28	827	57.32	1,409	58.36	1,990
55.26	257	56.30	838	57.34	1,420	58.38	2,001
55.28	268	56.32	850	57.36	1,431	58.40	2,012
55.30	279	56.34	861	57.38	1,442	58.42	2,024
55.32	291	56.36	872	57.40	1,453	58.44	2,035
55.34	302	56.38	883	57.42	1,465	58.46	2,046
55.36	313	56.40	894	57.44	1,476	58.48	2,057
55.38	324	56.42	906	57.46	1,487	58.50	**2,068**
55.40	335	56.44	917	57.48	1,498		
55.42	347	56.46	928	57.50	1,509		
55.44	358	56.48	939	57.52	1,520		
55.46	369	56.50	950	57.54	1,532		
55.48	380	56.52	961	57.56	1,543		
55.50	391	56.54	973	57.58	1,554		
55.52	402	56.56	984	57.60	1,565		

Summary for Pond IC2: Infiltration Chamber Under Parking Lot

Chamber ceiling = 50.58

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 5.59" for 25-Year event
Inflow = 1.77 cfs @ 12.13 hrs, Volume= 0.132 af
Outflow = 1.47 cfs @ 12.17 hrs, Volume= 0.132 af, Atten= 17%, Lag= 2.3 min
Discarded = 0.07 cfs @ 12.17 hrs, Volume= 0.082 af
Primary = 1.40 cfs @ 12.17 hrs, Volume= 0.050 af
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 49.97' @ 12.17 hrs Surf.Area= 540 sf Storage= 716 cf

Plug-Flow detention time= 31.3 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 31.3 min (805.6 - 774.3)

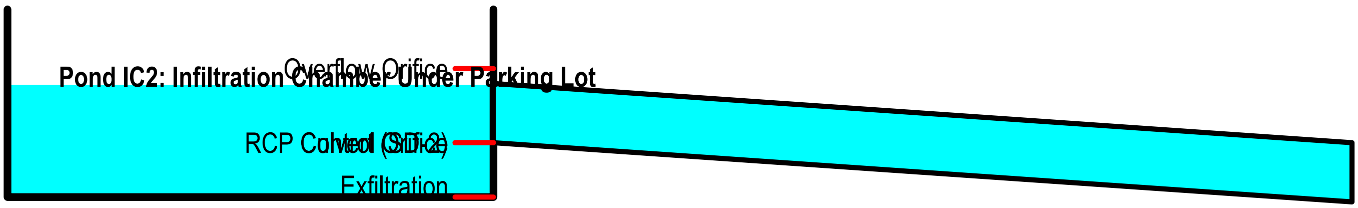
Volume	Invert	Avail.Storage	Storage Description
#1A	48.08'	206 cf	**18.00'W x 30.00'L x 3.17'H Field A** 1,712 cf Overall - 1,196 cf Embedded = 516 cf x 40.0% Voids
#2A	48.58'	800 cf	**Shea Leaching Chamber 8x14x2.7** x 4 Inside #1 Inside= 84.0"W x 24.0"H => 15.38 sf x 13.00'L = 200.0 cf Outside= 96.0"W x 32.0"H => 21.36 sf x 14.00'L = 299.0 cf 4 Chambers in 2 Rows
		1,006 cf	Total Available Storage

Storage Group A created with Chamber Wizard

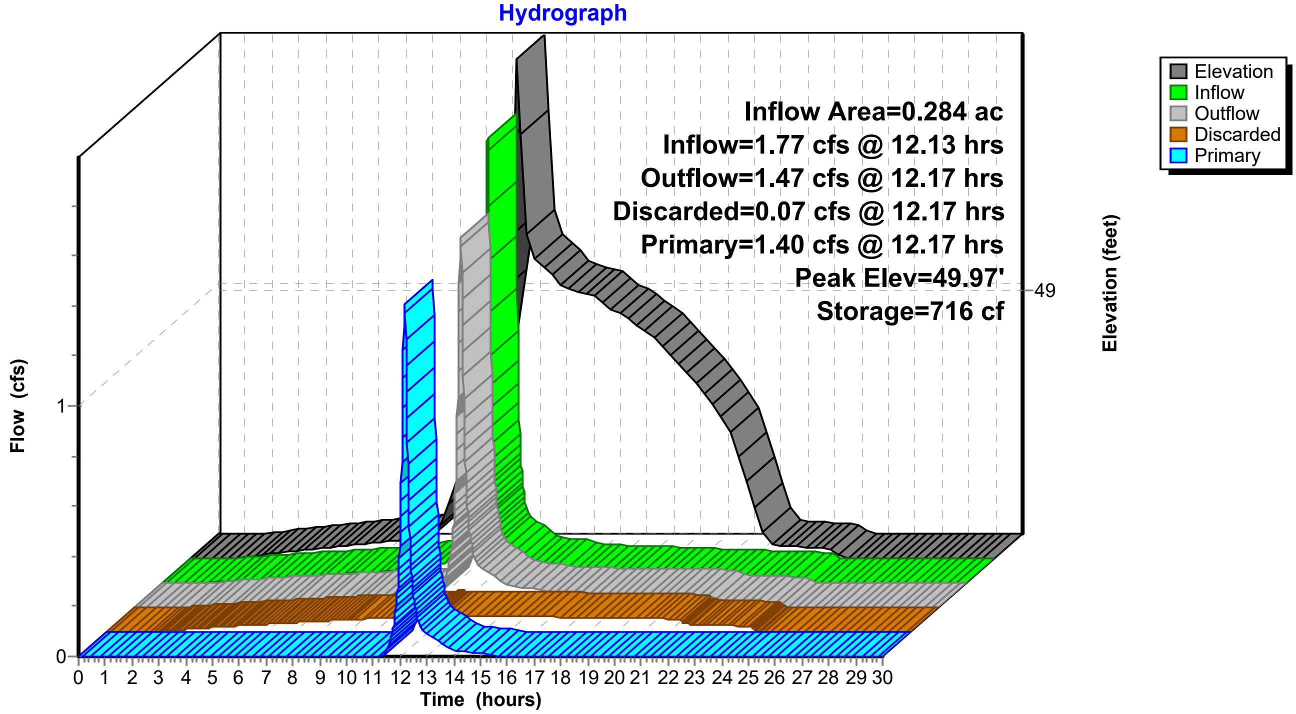
Device	Routing	Invert	Outlet Devices
#1	Discarded	48.08'	**4.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 17.50' Phase-In= 0.08'
#2	Primary	49.00'	**12.00" Round RCP Culvert (SD-2)** L= 53.0' Ke= 1.800 Inlet / Outlet Invert= 49.00' / 48.00' S= 0.0189 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	49.00'	**9.00" Vert. Control Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	50.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.17 hrs HW=49.97' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.40 cfs @ 12.17 hrs HW=49.97' TW=0.00' (Dynamic Tailwater)
└─**2=RCP Culvert (SD-2)** (Inlet Controls 1.40 cfs @ 1.80 fps)
  ├─**3=Control Orifice** (Passes 1.40 cfs of 1.64 cfs potential flow)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)



Pond IC2: Infiltration Chamber Under Parking Lot



Stage-Area-Storage for Pond IC2: Infiltration Chamber Under Parking Lot

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
48.08	0	49.12	344	50.16	798	51.20	1,004
48.10	4	49.14	353	50.18	807	51.22	1,005
48.12	9	49.16	361	50.20	816	51.24	**1,006**
48.14	13	49.18	370	50.22	824		
48.16	17	49.20	379	50.24	833		
48.18	22	49.22	388	50.26	842		
48.20	26	49.24	396	50.28	851		
48.22	30	49.26	405	50.30	859		
48.24	35	49.28	414	50.32	868		
48.26	39	49.30	422	50.34	877		
48.28	43	49.32	431	50.36	886		
48.30	48	49.34	440	50.38	894		
48.32	52	49.36	449	50.40	903		
48.34	56	49.38	457	50.42	912		
48.36	60	49.40	466	50.44	920		
48.38	65	49.42	475	50.46	929		
48.40	69	49.44	484	50.48	938		
48.42	73	49.46	492	50.50	947		
48.44	78	49.48	501	50.52	955		
48.46	82	49.50	510	50.54	964		
48.48	86	49.52	519	50.56	973		
48.50	91	49.54	527	50.58	982		
48.52	95	49.56	536	50.60	982		
48.54	99	49.58	545	50.62	983		
48.56	104	49.60	554	50.64	984		
48.58	108	49.62	562	50.66	985		
48.60	117	49.64	571	50.68	985		
48.62	125	49.66	580	50.70	986		
48.64	134	49.68	588	50.72	987		
48.66	143	49.70	597	50.74	987		
48.68	152	49.72	606	50.76	988		
48.70	160	49.74	615	50.78	989		
48.72	169	49.76	623	50.80	990		
48.74	178	49.78	632	50.82	990		
48.76	187	49.80	641	50.84	991		
48.78	195	49.82	650	50.86	992		
48.80	204	49.84	658	50.88	993		
48.82	213	49.86	667	50.90	993		
48.84	222	49.88	676	50.92	994		
48.86	230	49.90	685	50.94	995		
48.88	239	49.92	693	50.96	996		
48.90	248	49.94	702	50.98	996		
48.92	257	49.96	711	51.00	997		
48.94	265	49.98	720	51.02	998		
48.96	274	50.00	728	51.04	999		
48.98	283	50.02	737	51.06	999		
49.00	291	50.04	746	51.08	1,000		
49.02	300	50.06	754	51.10	1,001		
49.04	309	50.08	763	51.12	1,001		
49.06	318	50.10	772	51.14	1,002		
49.08	326	50.12	781	51.16	1,003		
49.10	335	50.14	789	51.18	1,004		

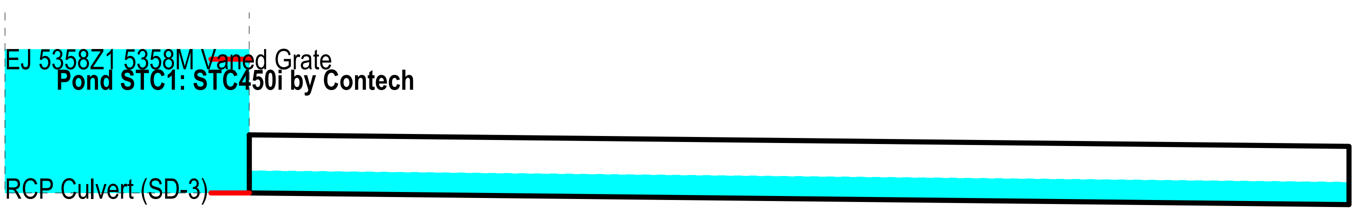
Summary for Pond STC1: STC450i by Contech

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 5.59" for 25-Year event
Inflow = 1.77 cfs @ 12.13 hrs, Volume= 0.132 af
Outflow = 1.77 cfs @ 12.13 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min
Primary = 1.77 cfs @ 12.13 hrs, Volume= 0.132 af
Routed to Pond IC2 : Infiltration Chamber Under Parking Lot

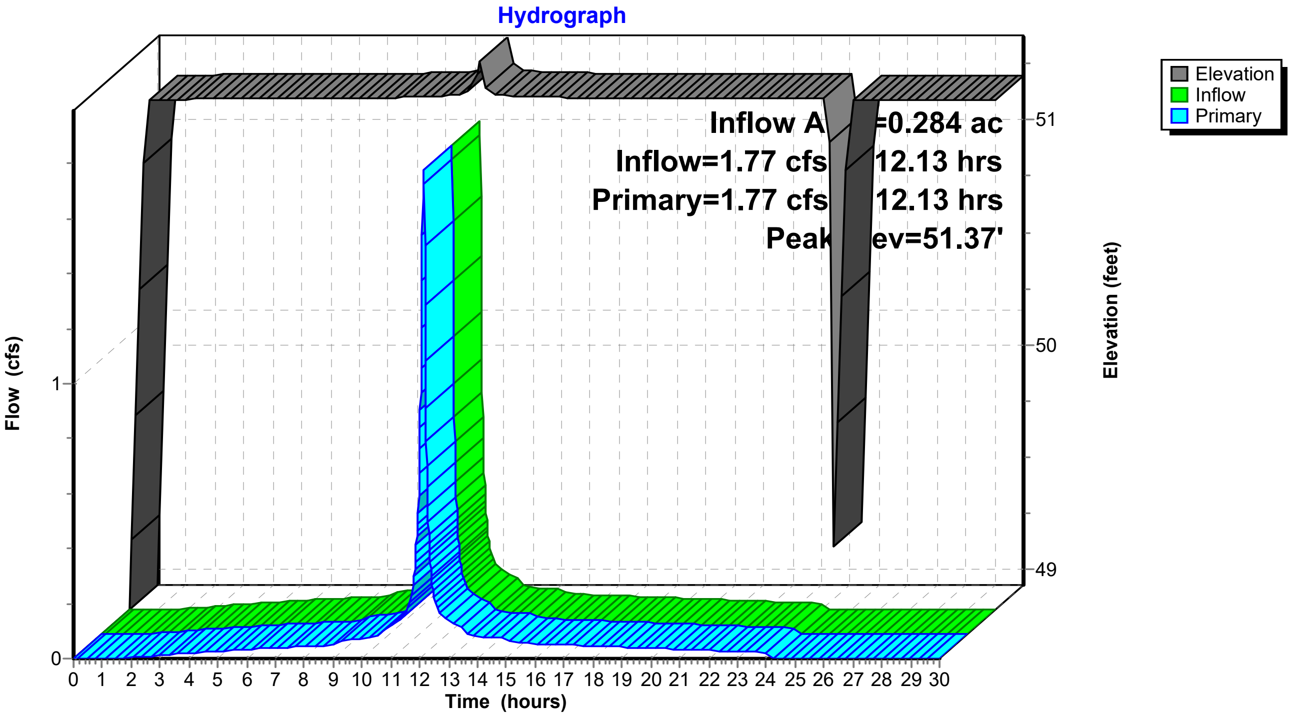
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 51.37' @ 12.13 hrs
Flood Elev= 52.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	48.90'	**12.00" Round RCP Culvert (SD-3)** L= 22.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.90' / 48.70' S= 0.0089 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	51.20'	**EJ 5358Z1 5358M Vaned Grate** Head (feet) 0.00 0.08 0.17 0.25 Disch. (cfs) 0.000 0.600 1.800 3.300

Primary OutFlow Max=1.76 cfs @ 12.13 hrs HW=51.37' TW=49.90' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-3)** (Passes 1.76 cfs of 4.59 cfs potential flow)
└─**2=EJ 5358Z1 5358M Vaned Grate** (Custom Controls 1.76 cfs)



Pond STC1: STC450i by Contech



Stage-Area-Storage for Pond STC1: STC450i by Contech

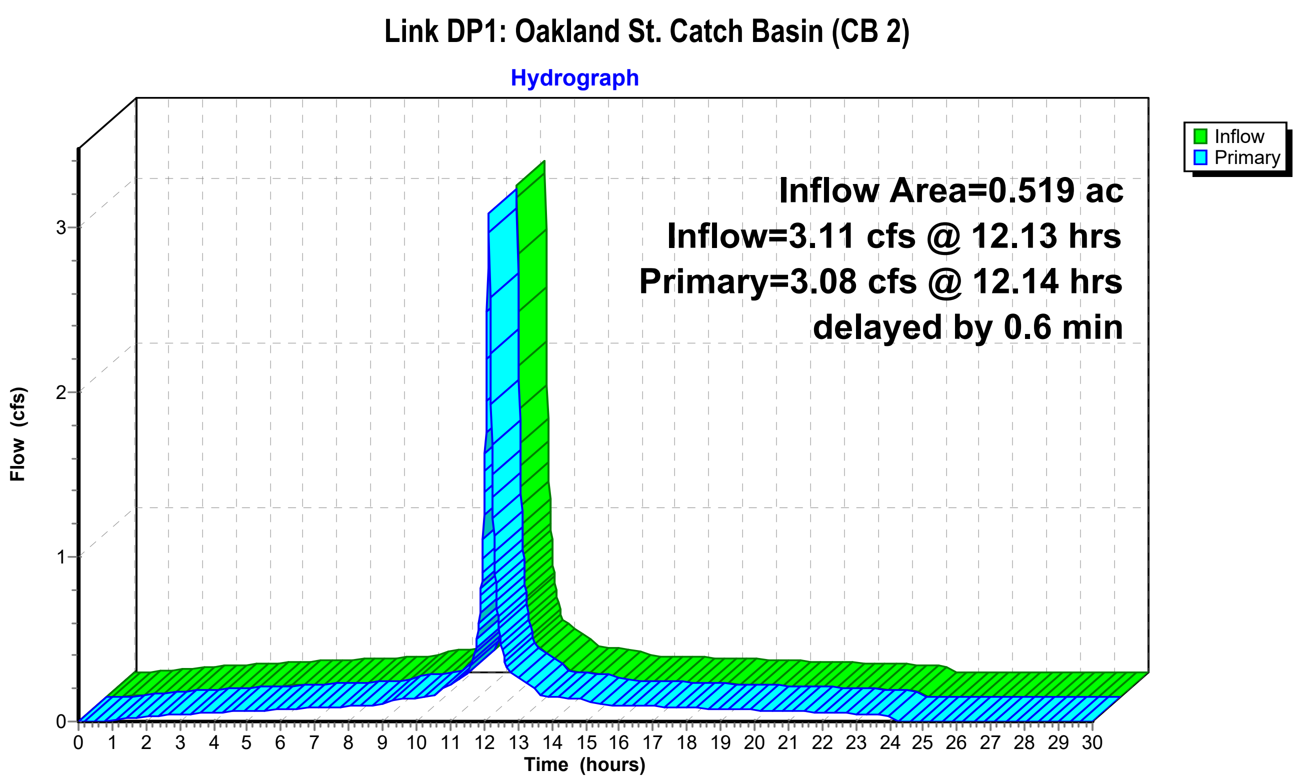
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
48.90	**0.000**	49.94	0.000	50.98	0.000
48.92	0.000	49.96	0.000	51.00	0.000
48.94	0.000	49.98	0.000	51.02	0.000
48.96	0.000	50.00	0.000	51.04	0.000
48.98	0.000	50.02	0.000	51.06	0.000
49.00	0.000	50.04	0.000	51.08	0.000
49.02	0.000	50.06	0.000	51.10	0.000
49.04	0.000	50.08	0.000	51.12	0.000
49.06	0.000	50.10	0.000	51.14	0.000
49.08	0.000	50.12	0.000	51.16	0.000
49.10	0.000	50.14	0.000	51.18	0.000
49.12	0.000	50.16	0.000	51.20	0.000
49.14	0.000	50.18	0.000	51.22	0.000
49.16	0.000	50.20	0.000	51.24	0.000
49.18	0.000	50.22	0.000	51.26	0.000
49.20	0.000	50.24	0.000	51.28	0.000
49.22	0.000	50.26	0.000	51.30	0.000
49.24	0.000	50.28	0.000	51.32	0.000
49.26	0.000	50.30	0.000	51.34	0.000
49.28	0.000	50.32	0.000	51.36	0.000
49.30	0.000	50.34	0.000	51.38	0.000
49.32	0.000	50.36	0.000	51.40	0.000
49.34	0.000	50.38	0.000	51.42	0.000
49.36	0.000	50.40	0.000	51.44	0.000
49.38	0.000	50.42	0.000	51.46	0.000
49.40	0.000	50.44	0.000	51.48	0.000
49.42	0.000	50.46	0.000	51.50	0.000
49.44	0.000	50.48	0.000	51.52	0.000
49.46	0.000	50.50	0.000	51.54	0.000
49.48	0.000	50.52	0.000	51.56	0.000
49.50	0.000	50.54	0.000	51.58	0.000
49.52	0.000	50.56	0.000	51.60	0.000
49.54	0.000	50.58	0.000	51.62	0.000
49.56	0.000	50.60	0.000	51.64	0.000
49.58	0.000	50.62	0.000	51.66	0.000
49.60	0.000	50.64	0.000	51.68	0.000
49.62	0.000	50.66	0.000	51.70	0.000
49.64	0.000	50.68	0.000	51.72	0.000
49.66	0.000	50.70	0.000	51.74	0.000
49.68	0.000	50.72	0.000	51.76	0.000
49.70	0.000	50.74	0.000	51.78	0.000
49.72	0.000	50.76	0.000	51.80	0.000
49.74	0.000	50.78	0.000	51.82	0.000
49.76	0.000	50.80	0.000	51.84	0.000
49.78	0.000	50.82	0.000	51.86	0.000
49.80	0.000	50.84	0.000	51.88	0.000
49.82	0.000	50.86	0.000	51.90	0.000
49.84	0.000	50.88	0.000	51.92	0.000
49.86	0.000	50.90	0.000	51.94	0.000
49.88	0.000	50.92	0.000	51.96	0.000
49.90	0.000	50.94	0.000	51.98	0.000
49.92	0.000	50.96	0.000	52.00	0.000

Summary for Link DP1: Oakland St. Catch Basin (CB 2)

Lag time for this node is the sum of lines 1-3 of the Tc calculations in the Extra Tc Calc's Node

Inflow Area = 0.519 ac, 98.58% Impervious, Inflow Depth = 5.97" for 25-Year event
Inflow = 3.11 cfs @ 12.13 hrs, Volume= 0.258 af
Primary = 3.08 cfs @ 12.14 hrs, Volume= 0.258 af, Atten= 1%, Lag= 0.6 min
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

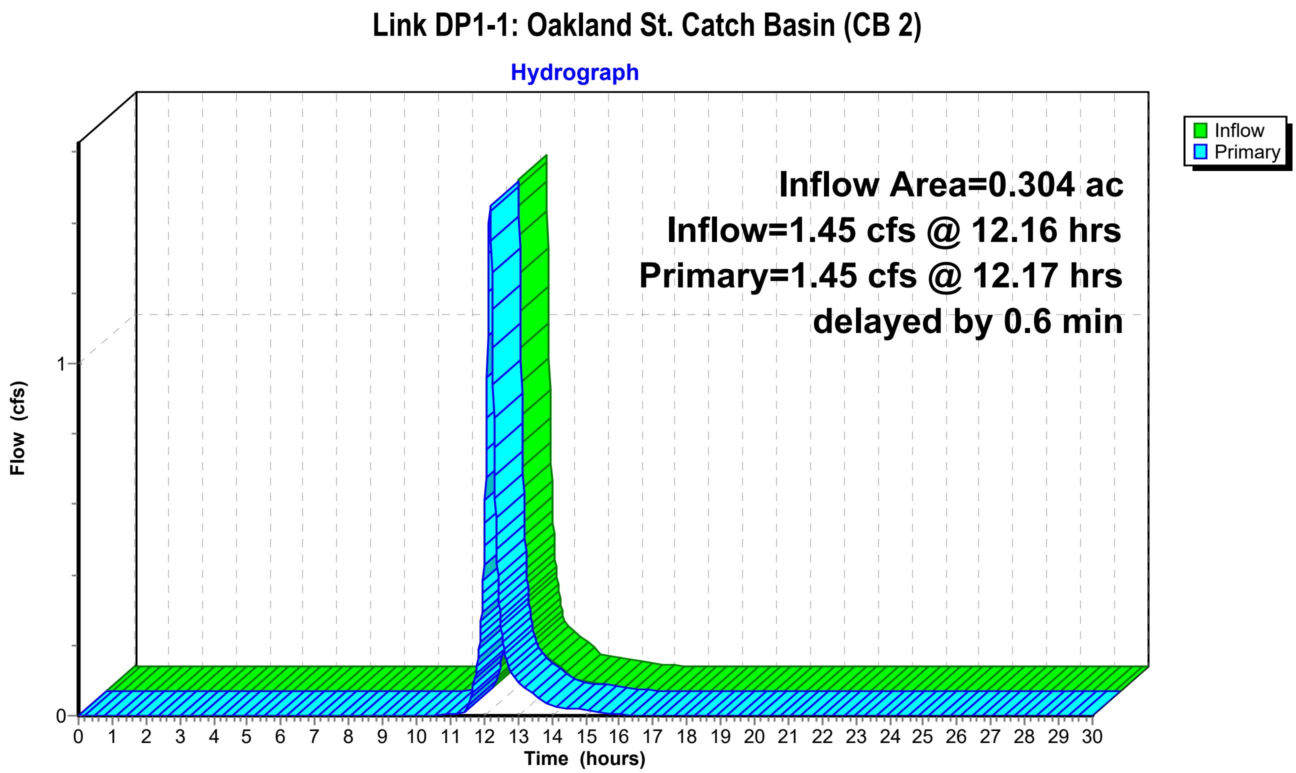
Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP1-1: Oakland St. Catch Basin (CB 2)

Inflow Area = 0.304 ac, 84.11% Impervious, Inflow Depth = 2.17" for 25-Year event
Inflow = 1.45 cfs @ 12.16 hrs, Volume= 0.055 af
Primary = 1.45 cfs @ 12.17 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.6 min
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

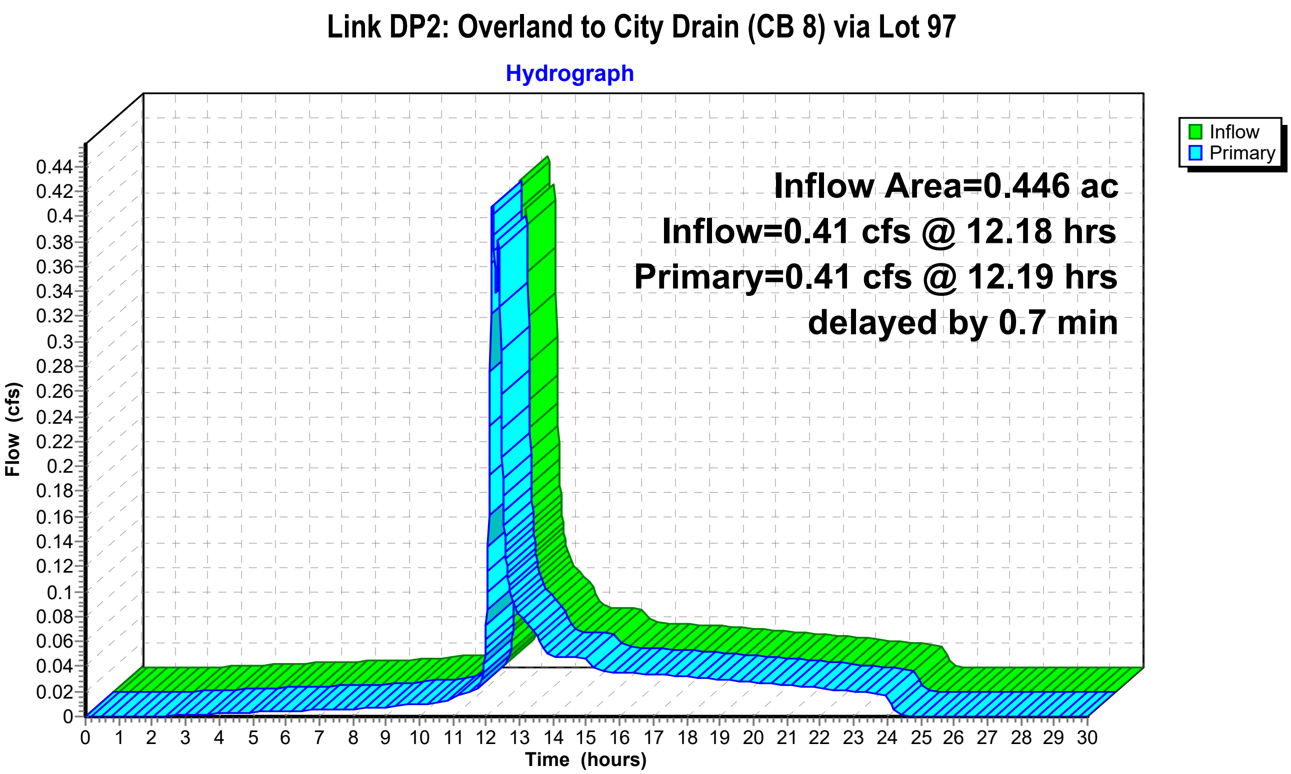


Summary for Link DP2: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.446 ac, 30.85% Impervious, Inflow Depth = 1.42" for 25-Year event
Inflow = 0.41 cfs @ 12.18 hrs, Volume= 0.053 af
Primary = 0.41 cfs @ 12.19 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.7 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

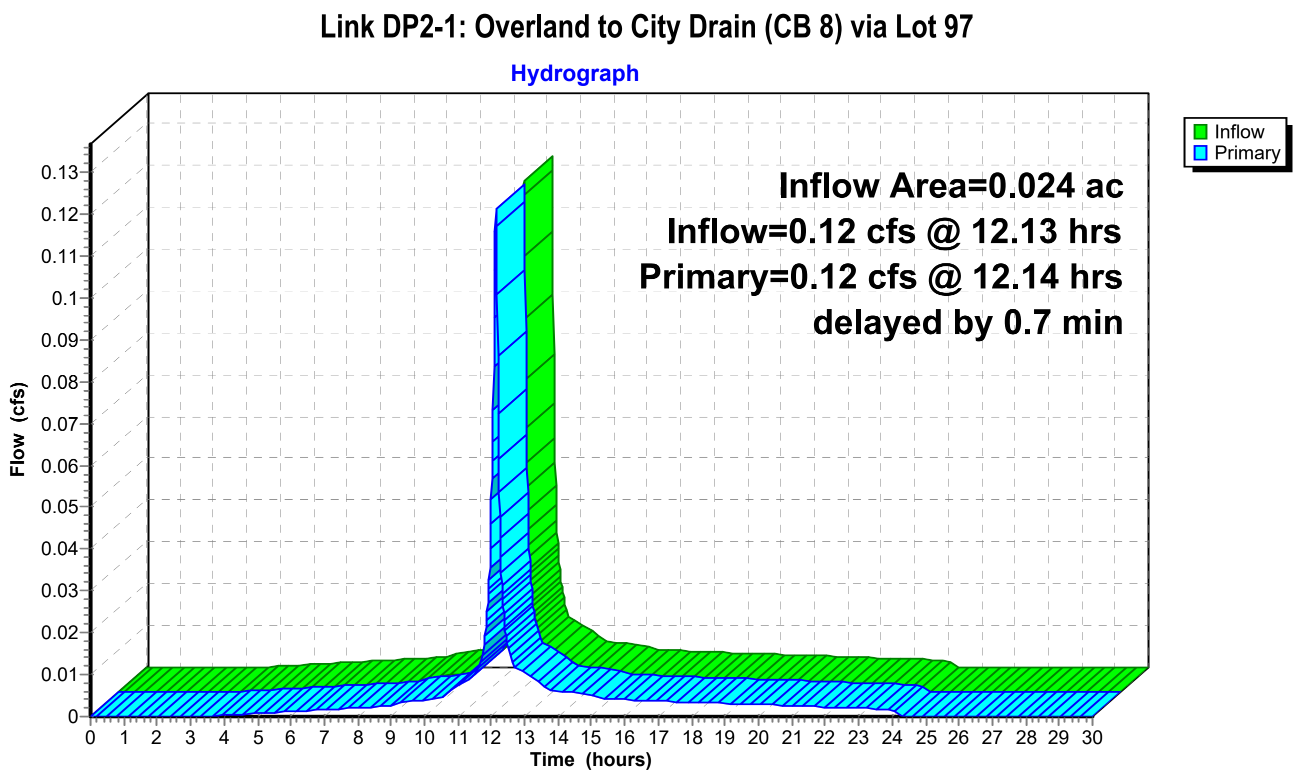


Summary for Link DP2-1: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.024 ac, 0.00% Impervious, Inflow Depth = 4.23" for 25-Year event
Inflow = 0.12 cfs @ 12.13 hrs, Volume= 0.009 af
Primary = 0.12 cfs @ 12.14 hrs, Volume= 0.009 af, Atten= 1%, Lag= 0.7 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

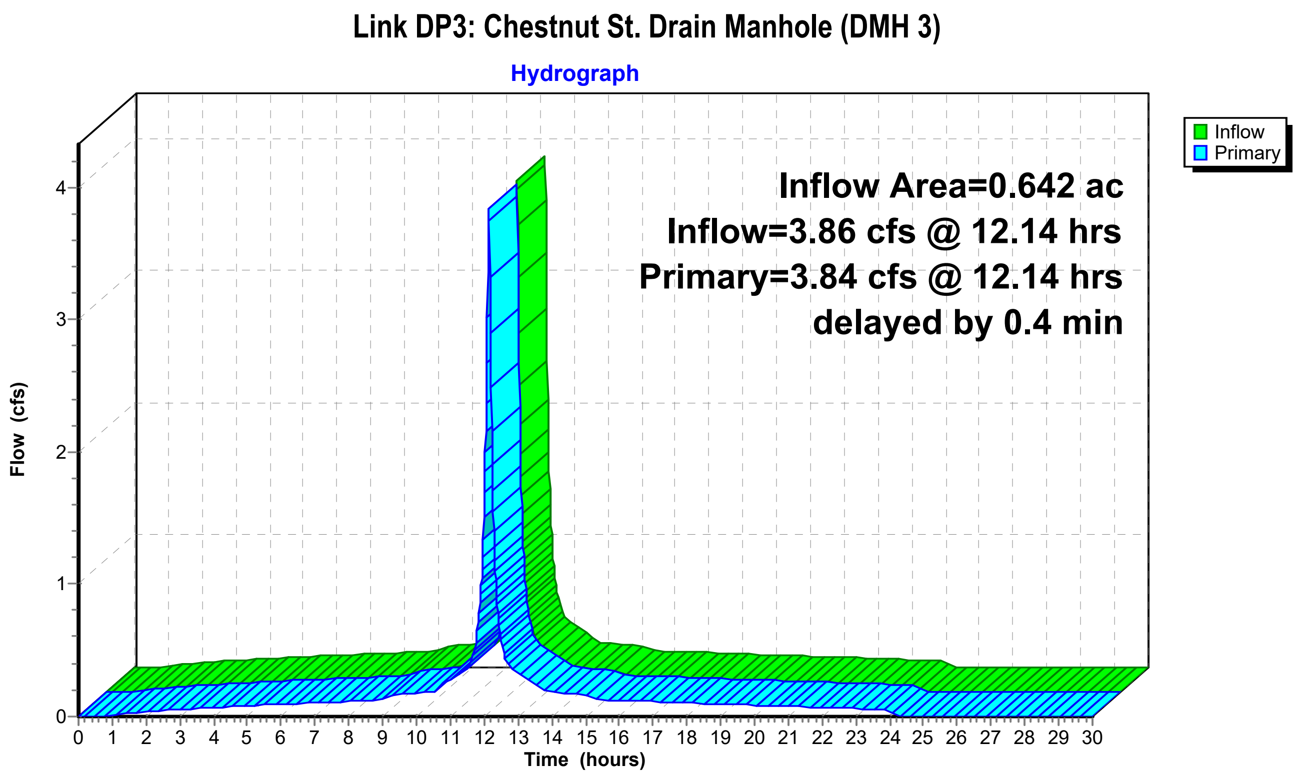


Summary for Link DP3: Chestnut St. Drain Manhole (DMH 3)

Lag time for this node was computed using line 8 of the Tc Calculations of the Extra Tc Calc's node.

Inflow Area = 0.642 ac, 98.80% Impervious, Inflow Depth = 5.98" for 25-Year event
Inflow = 3.86 cfs @ 12.14 hrs, Volume= 0.320 af
Primary = 3.84 cfs @ 12.14 hrs, Volume= 0.320 af, Atten= 1%, Lag= 0.4 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

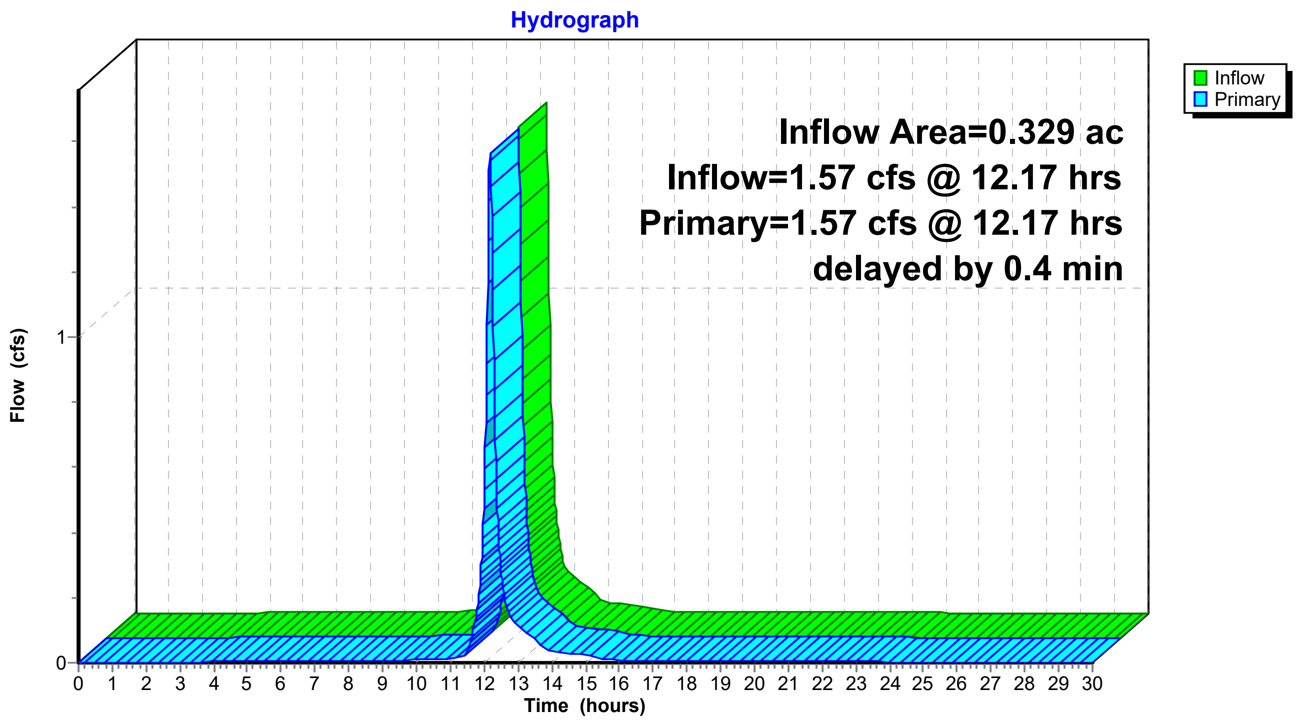


Summary for Link DP3-1: Chestnut St. Drain Manhole (DMH 3)

Inflow Area = 0.329 ac, 85.14% Impervious, Inflow Depth = 2.46" for 25-Year event
Inflow = 1.57 cfs @ 12.17 hrs, Volume= 0.067 af
Primary = 1.57 cfs @ 12.17 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.4 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

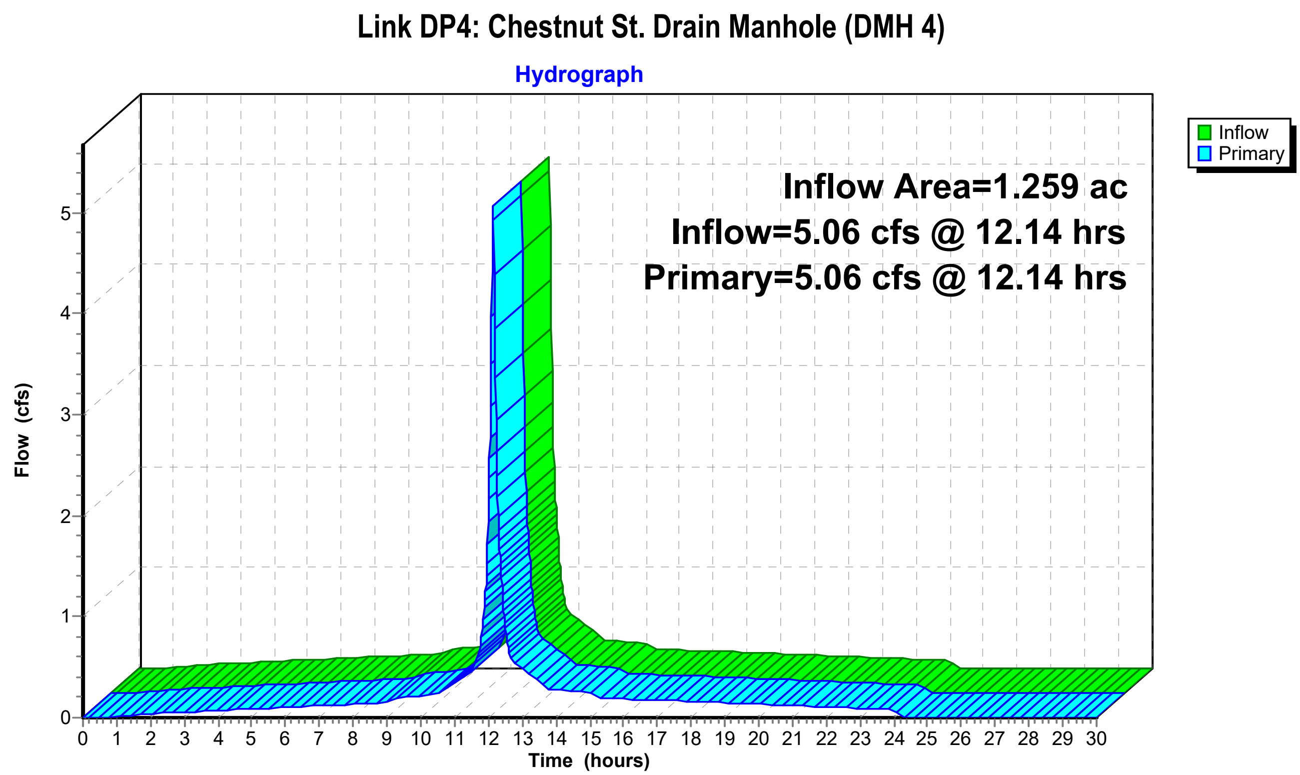
Link DP3-1: Chestnut St. Drain Manhole (DMH 3)



Summary for Link DP4: Chestnut St. Drain Manhole (DMH 4)

Inflow Area =	1.259 ac, 69.90% Impervious, Inflow Depth = 4.14" for 25-Year event			
Inflow =	5.06 cfs @	12.14 hrs, Volume=	0.434 af	
Primary =	5.06 cfs @	12.14 hrs, Volume=	0.434 af, Atten= 0%, Lag= 0.0 min	

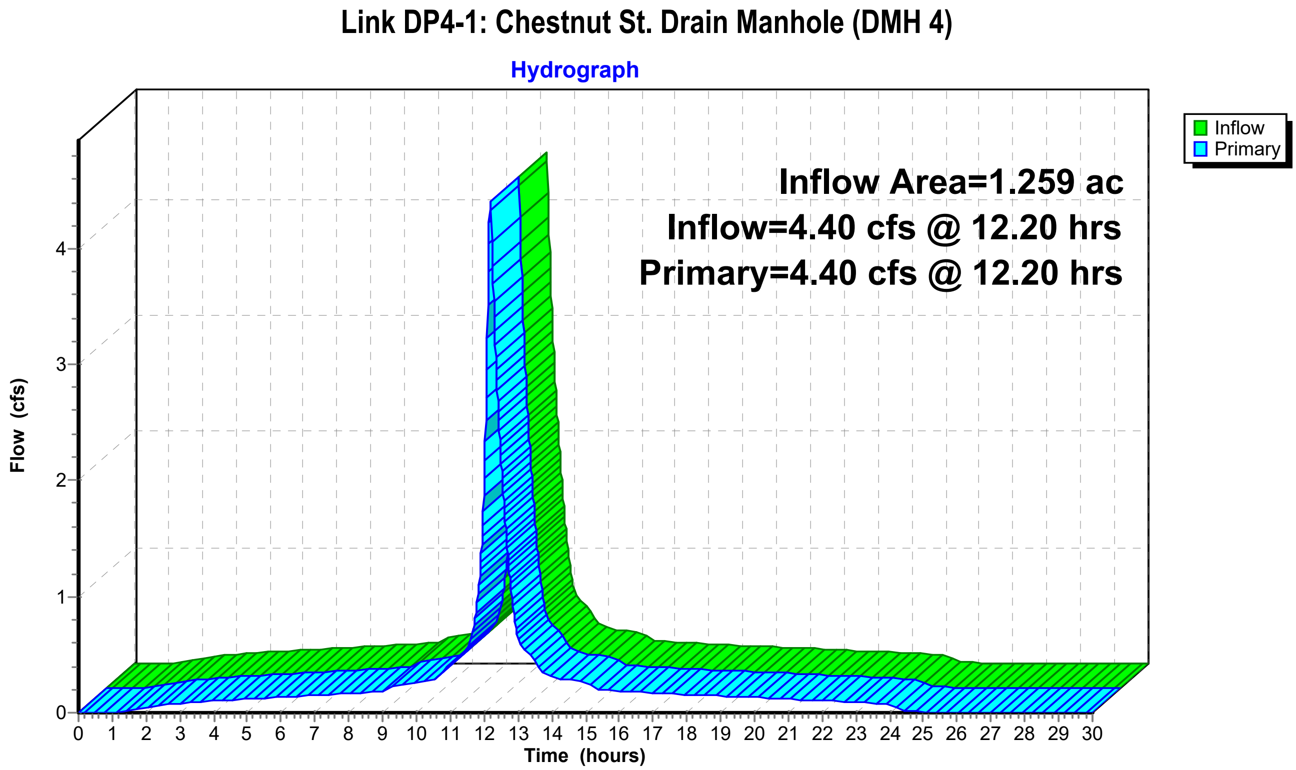
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP4-1: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 92.15% Impervious, Inflow Depth = 5.05" for 25-Year event
Inflow = 4.40 cfs @ 12.20 hrs, Volume= 0.530 af
Primary = 4.40 cfs @ 12.20 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

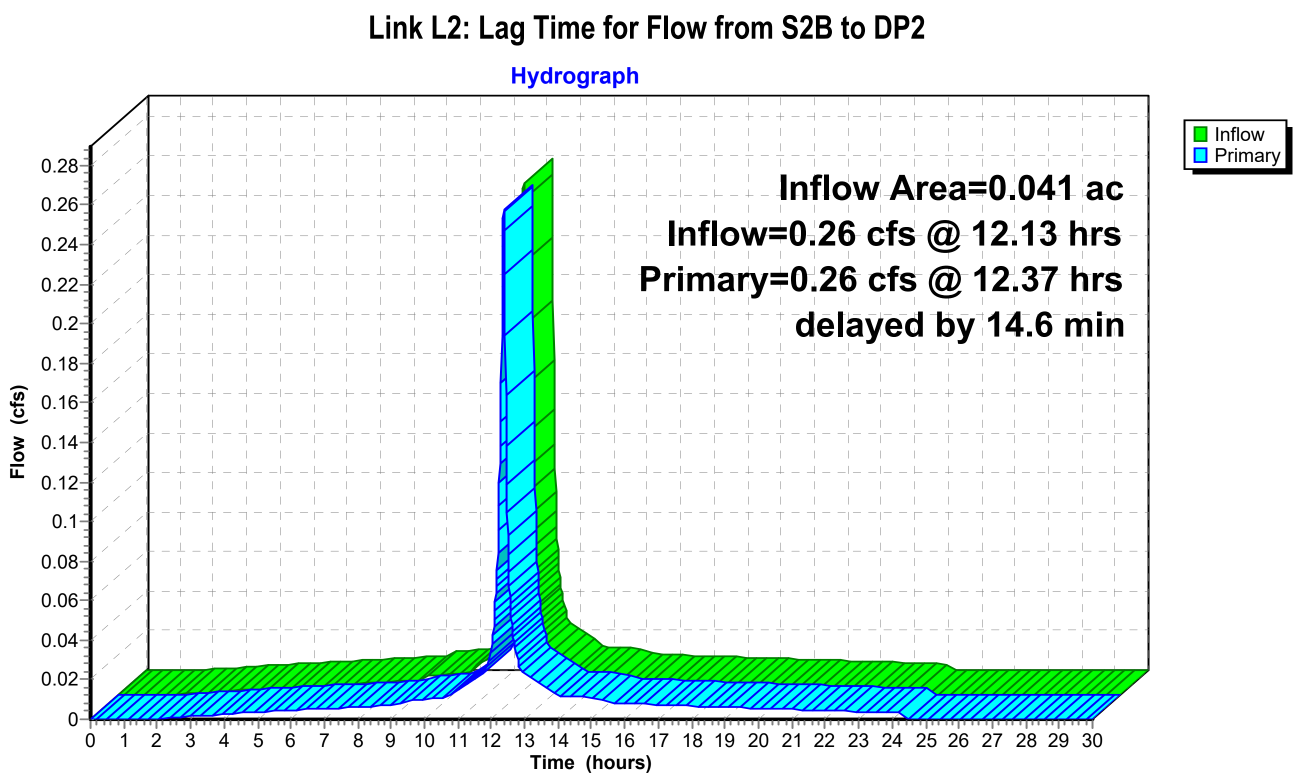


Summary for Link L2: Lag Time for Flow from S2B to DP2

Lag time for this node is the sum of the Tc of Node S2C and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.041 ac, 93.46% Impervious, Inflow Depth = 5.59" for 25-Year event
Inflow = 0.26 cfs @ 12.13 hrs, Volume= 0.019 af
Primary = 0.26 cfs @ 12.37 hrs, Volume= 0.019 af, Atten= 0%, Lag= 14.6 min
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 14.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

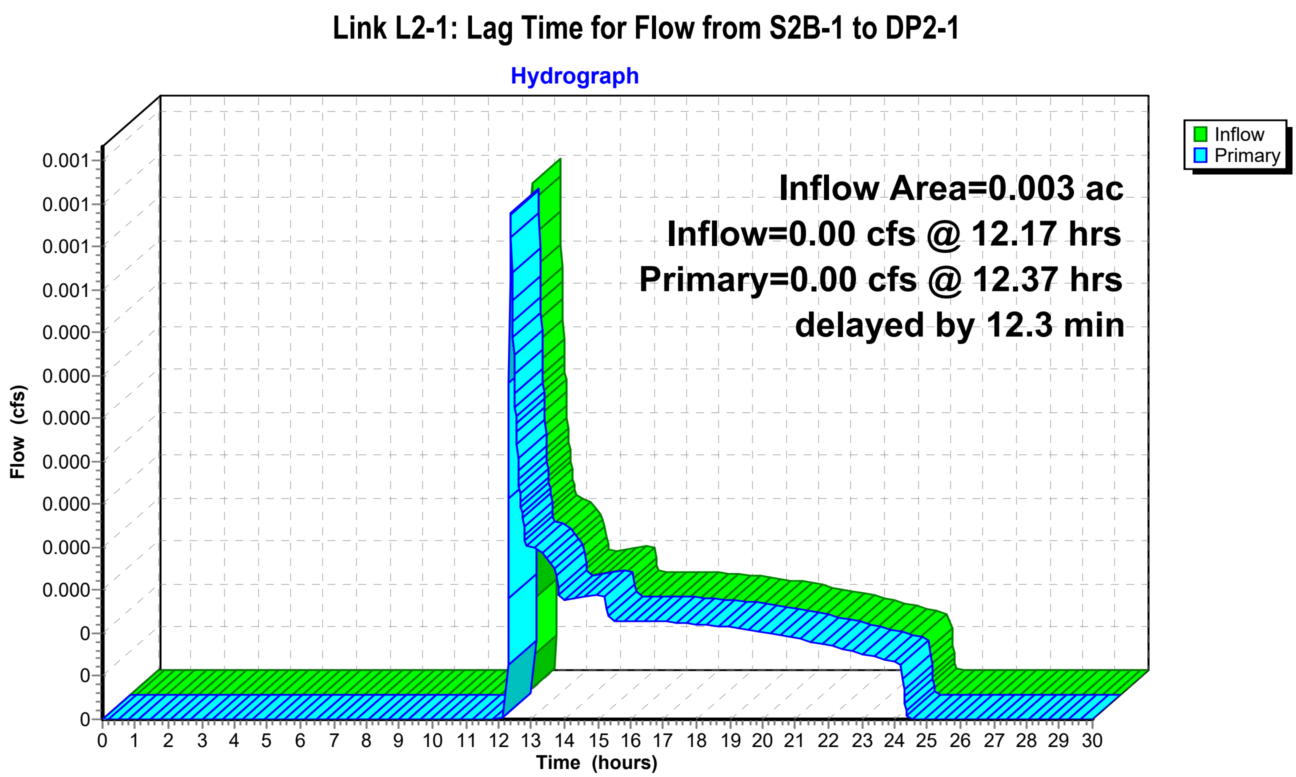


Summary for Link L2-1: Lag Time for Flow from S2B-1 to DP2-1

Lag time for this node is the sum of the Tc of Node S2C-1 and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.003 ac, 0.00% Impervious, Inflow Depth = 0.53" for 25-Year event
Inflow = 0.00 cfs @ 12.17 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.37 hrs, Volume= 0.000 af, Atten= 1%, Lag= 12.3 min
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

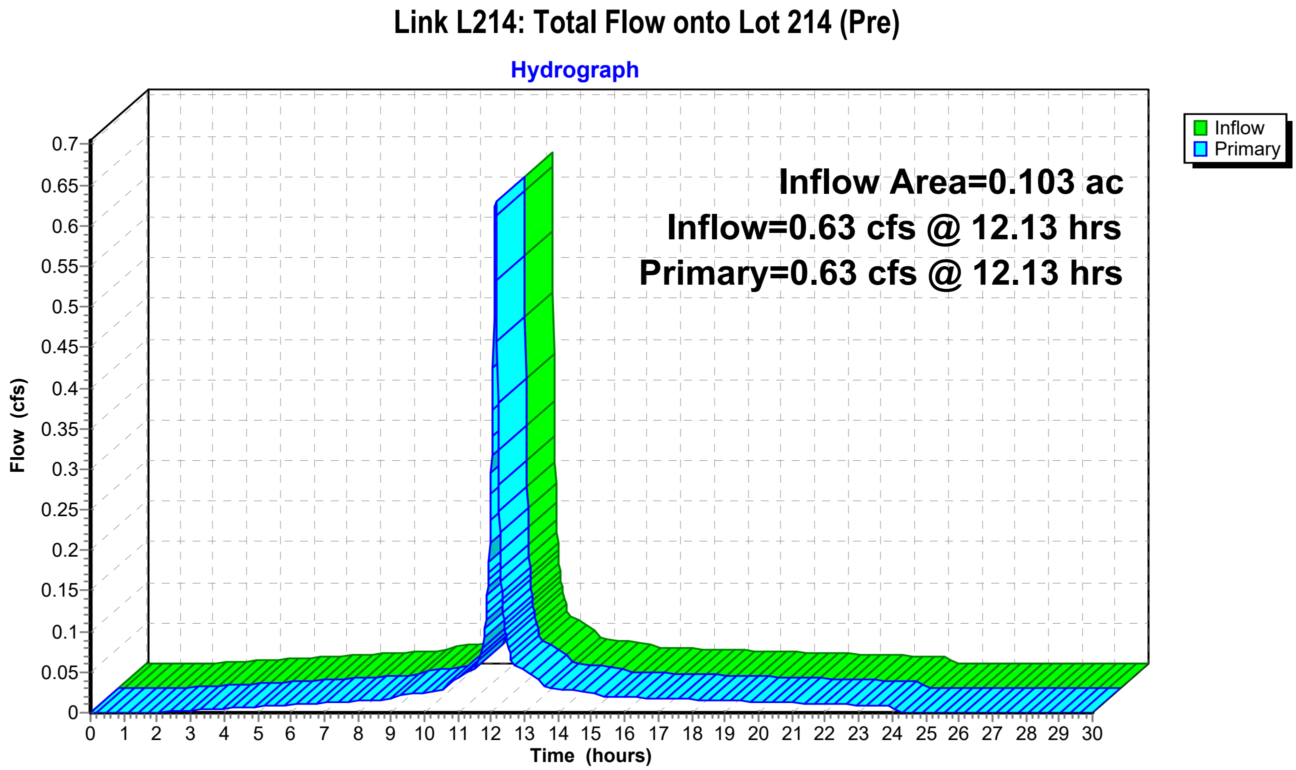
Primary outflow = Inflow delayed by 12.3 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214: Total Flow onto Lot 214 (Pre)

Inflow Area = 0.103 ac, 90.17% Impervious, Inflow Depth = 5.39" for 25-Year event
Inflow = 0.63 cfs @ 12.13 hrs, Volume= 0.046 af
Primary = 0.63 cfs @ 12.13 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

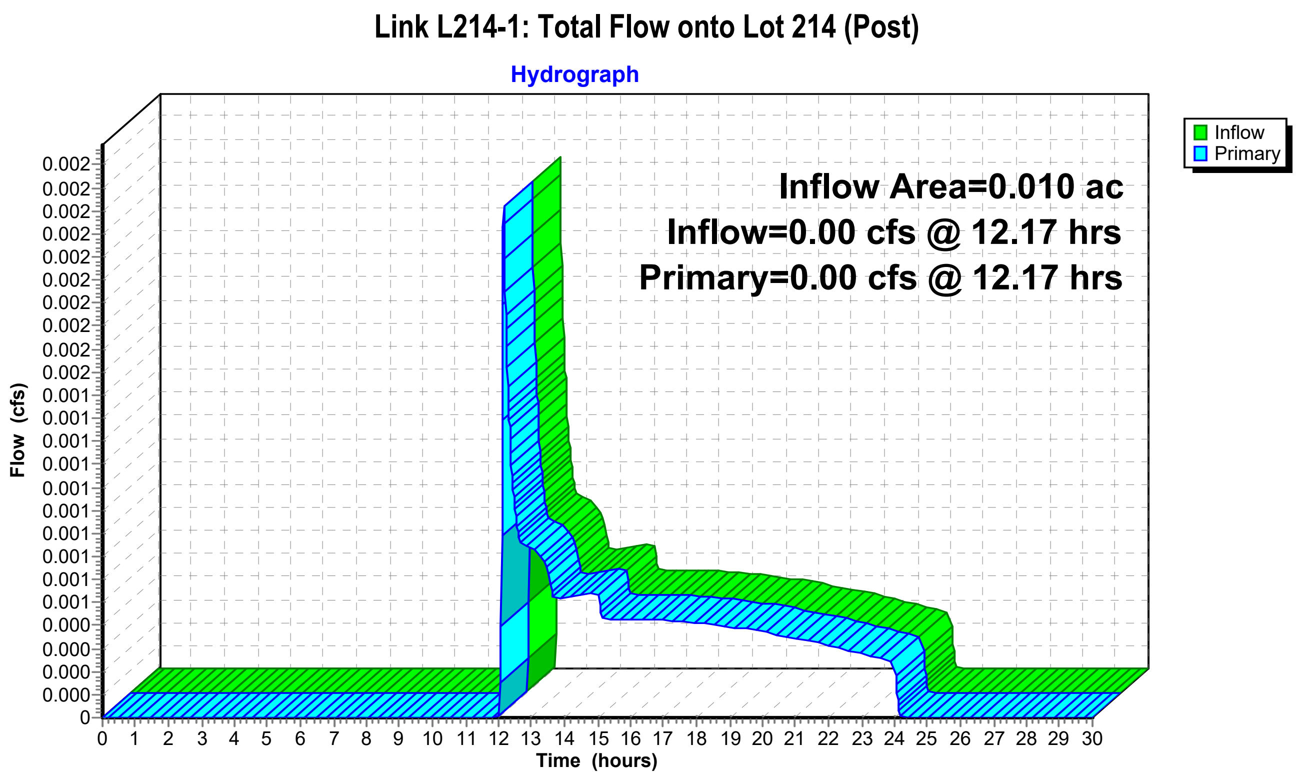
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214-1: Total Flow onto Lot 214 (Post)

Inflow Area =	0.010 ac,	0.00% Impervious, Inflow Depth = 0.53"	for 25-Year event
Inflow =	0.00 cfs @	12.17 hrs, Volume=	0.000 af
Primary =	0.00 cfs @	12.17 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Time span=0.00-30.00 hrs, dt=0.015 hrs, 2001 points x 2
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 S1: Parking & Front of Buildings Runoff Area=19,942 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=3.78 cfs 0.300 af

Subcatchment S1-1: Drains to Parking Lot Chambers Runoff Area=12,372 sf 87.12% Impervious Runoff Depth=7.39"
Tc=6.0 min CN=94 Runoff=2.31 cfs 0.175 af

Subcatchment S1-2: Untreated Runoff onto Oakland St. Runoff Area=556 sf 65.65% Impervious Runoff Depth=5.49"
Tc=6.0 min CN=78 Runoff=0.09 cfs 0.006 af

Subcatchment S214A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=7.03"
Tc=6.0 min CN=91 Runoff=0.49 cfs 0.036 af

Subcatchment S214A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.001 af

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=7.39"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.34 cfs 0.025 af

Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2A: Easterly Roof & Lot Line Runoff Area=2,671 sf 87.94% Impervious Runoff Depth=7.03"
Flow Length=324' Tc=16.4 min CN=91 Runoff=0.33 cfs 0.036 af

Subcatchment S2A-1: Easterly Lot Line Runoff Area=322 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=324' Tc=16.4 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214 Runoff Area=1,803 sf 93.46% Impervious Runoff Depth=7.39"
Flow Length=34' Tc=6.0 min CN=94 Runoff=0.34 cfs 0.025 af

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214 Runoff Area=118 sf 0.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment S2C: Rear of Building & Site (SW) Runoff Area=17,617 sf 24.44% Impervious Runoff Depth=1.90"
Flow Length=256' Tc=8.3 min UI Adjusted CN=46 Runoff=0.78 cfs 0.064 af

Subcatchment S2C-1: Perimeter of Garage Runoff Area=947 sf 0.00% Impervious Runoff Depth=6.44"
Flow Length=279' Tc=6.0 min CN=86 Runoff=0.16 cfs 0.012 af

Subcatchment S3: Southerly Corner of Oakland & Chestnut Runoff Area=5,360 sf 99.74% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=1.02 cfs 0.081 af

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut Runoff Area=1,067 sf 97.94% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=0.20 cfs 0.016 af

Subcatchment S4: Loading Dock Runoff Area=7,458 sf 63.19% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=82 Runoff=1.23 cfs 0.085 af

Subcatchment S4-1: Garage Entrance Runoff Area=1,510 sf 63.31% Impervious Runoff Depth=6.79"
Tc=6.0 min CN=89 Runoff=0.27 cfs 0.020 af

Subcatchment S4-2: Proposed Roofs Runoff Area=36,464 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=6.92 cfs 0.549 af

Subcatchment S4-3: Gap Between Buildings Runoff Area=1,495 sf 62.61% Impervious Runoff Depth=7.75"
Tc=6.0 min CN=97 Runoff=0.28 cfs 0.022 af

Subcatchment SAD: Collected by Courtyard Area Drain Runoff Area=360 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.005 af

Subcatchment STD: Collected by Garage Trench Drain Runoff Area=396 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment Tc: Extra Tc Calc's
Runoff=0.00 cfs 0.000 af

Pond DC1: Detention Chamber Peak Elev=28.38' Storage=2,916 cf Inflow=7.20 cfs 0.571 af
Outflow=4.47 cfs 0.571 af

Pond GAP: Area Drain Peak Elev=54.54' Storage=9 cf Inflow=0.28 cfs 0.022 af
Outflow=0.28 cfs 0.022 af

Pond IC2: Infiltration Chamber Under Parking Lot Peak Elev=50.25' Storage=837 cf Inflow=2.31 cfs 0.175 af
Discarded=0.07 cfs 0.096 af Primary=1.75 cfs 0.079 af Outflow=1.83 cfs 0.175 af

Pond STC1: STC450i by Contech Peak Elev=51.40' Inflow=2.31 cfs 0.175 af
Outflow=2.31 cfs 0.175 af

Link DP1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=4.01 cfs 0.336 af
Primary=3.98 cfs 0.336 af

Link DP1-1: Oakland St. Catch Basin (CB 2) delayed by 0.6 min Inflow=1.83 cfs 0.086 af
Primary=1.82 cfs 0.086 af

Link DP2: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.87 cfs 0.089 af
Primary=0.87 cfs 0.089 af

Link DP2-1: Overland to City Drain (CB 8) via Lot 97 delayed by 0.7 min Inflow=0.16 cfs 0.012 af
Primary=0.16 cfs 0.012 af

Link DP3: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=4.99 cfs 0.417 af
Primary=4.96 cfs 0.417 af

Link DP3-1: Chestnut St. Drain Manhole (DMH 3) delayed by 0.4 min Inflow=1.98 cfs 0.102 af
Primary=1.97 cfs 0.102 af

Link DP4: Chestnut St. Drain Manhole (DMH 4) Inflow=6.94 cfs 0.591 af
Primary=6.94 cfs 0.591 af

Link DP4-1: Chestnut St. Drain Manhole (DMH 4) Inflow=6.76 cfs 0.704 af
Primary=6.76 cfs 0.704 af

Link L2: Lag Time for Flow from S2B to DP2 delayed by 14.6 min Inflow=0.34 cfs 0.025 af
Primary=0.33 cfs 0.025 af

Link L2-1: Lag Time for Flow from S2B-1 to DP2-1 delayed by 12.3 min Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L214: Total Flow onto Lot 214 (Pre) Inflow=0.82 cfs 0.061 af
Primary=0.82 cfs 0.061 af

Link L214-1: Total Flow onto Lot 214 (Post) Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

Total Runoff Area = 2.649 ac Runoff Volume = 1.466 af Average Runoff Depth = 6.64"
18.81% Pervious = 0.498 ac 81.19% Impervious = 2.151 ac

Summary for Subcatchment S1: Parking & Front of Buildings

"Paved Parking" includes building roofs.

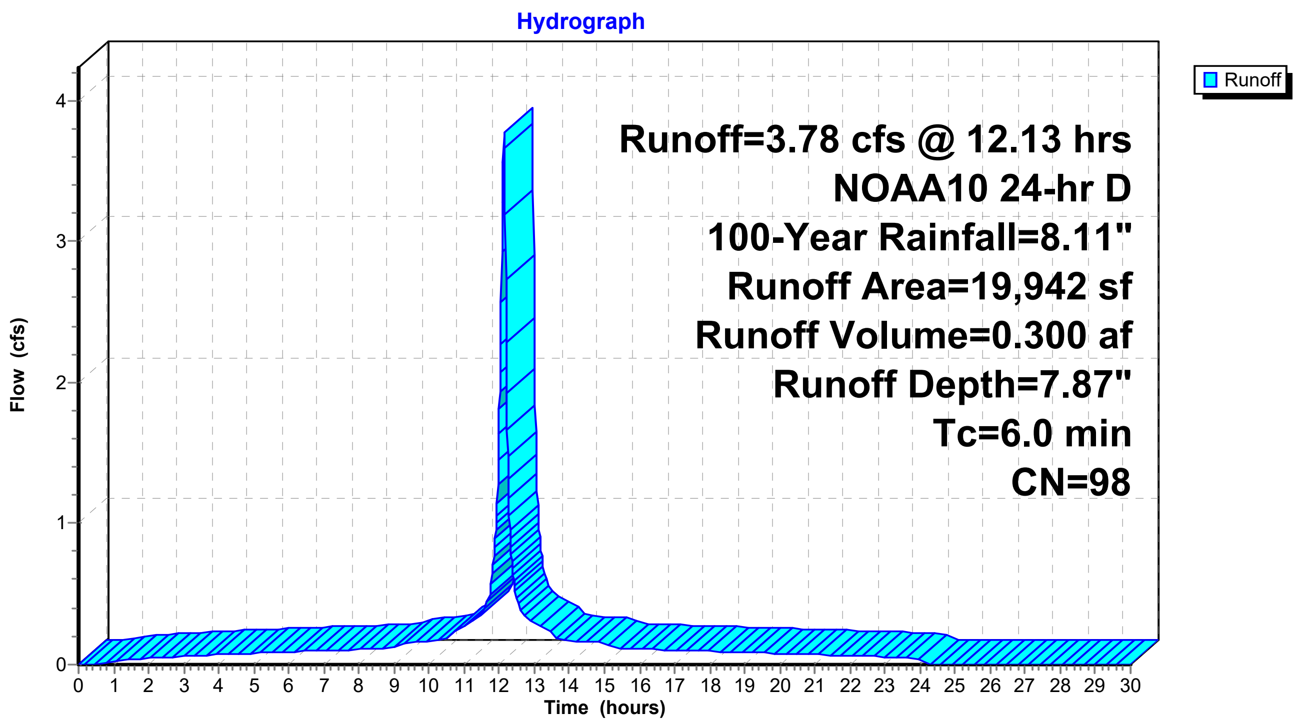
Runoff = 3.78 cfs @ 12.13 hrs, Volume= 0.300 af, Depth= 7.87"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
12,479	98	Paved parking, HSG A
7,463	98	Roofs, HSG A
19,942	98	Weighted Average
19,942		100.00% Impervious Area

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

Subcatchment S1: Parking & Front of Buildings



Summary for Subcatchment S1-1: Drains to Parking Lot Chambers

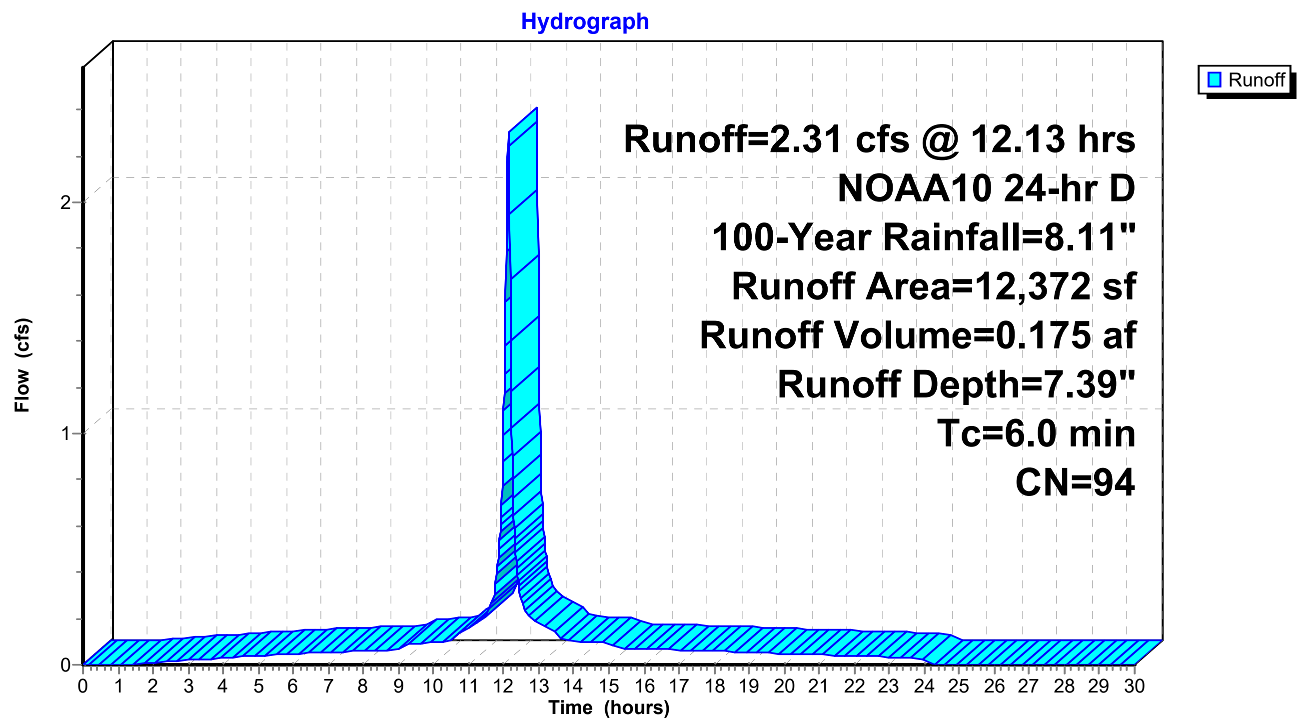
Runoff = 2.31 cfs @ 12.13 hrs, Volume= 0.175 af, Depth= 7.39"
Routed to Pond STC1 : STC450i by Contech

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
717	39	>75% Grass cover, Good, HSG A
876	96	Gravel surface, HSG A
10,779	98	Paved parking, HSG A
12,372	94	Weighted Average
1,593		12.88% Pervious Area
10,779		87.12% Impervious Area

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

Subcatchment S1-1: Drains to Parking Lot Chambers



Summary for Subcatchment S1-2: Untreated Runoff onto Oakland St.

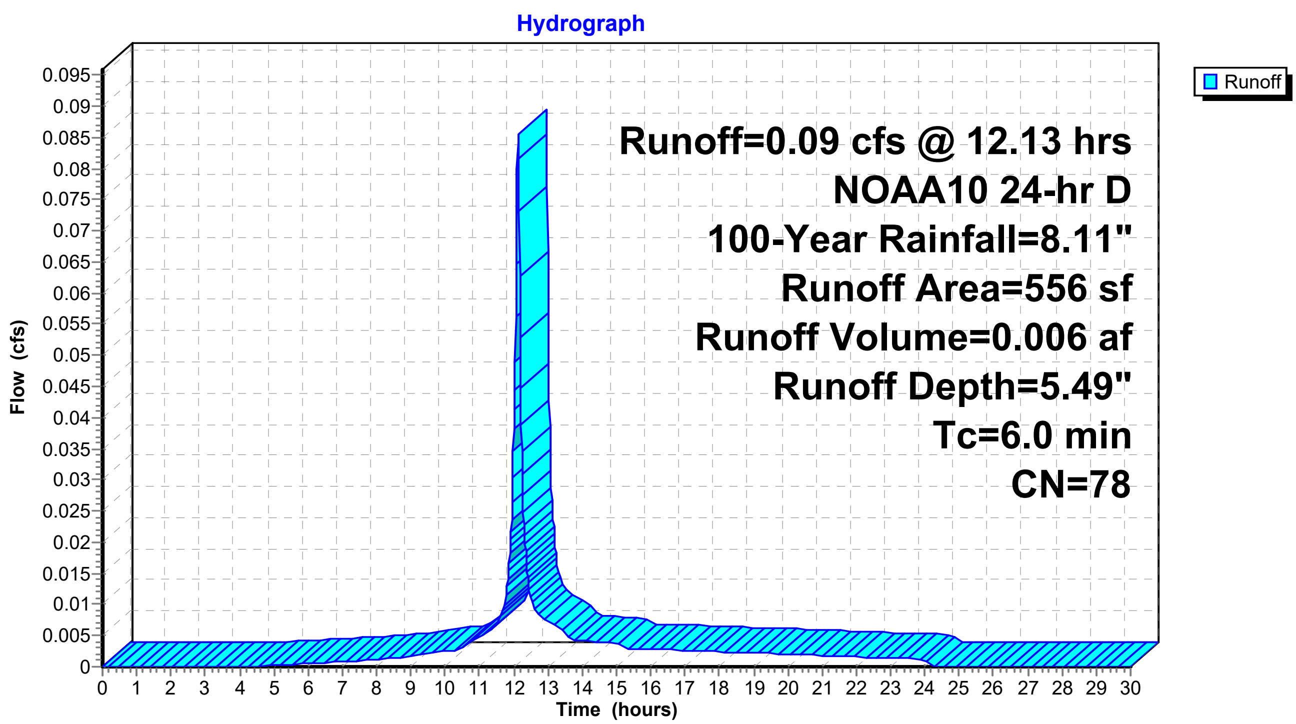
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 5.49"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
191	39	>75% Grass cover, Good, HSG A
365	98	Paved parking, HSG A
556	78	Weighted Average
191		34.35% Pervious Area
365		65.65% Impervious Area

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

Subcatchment S1-2: Untreated Runoff onto Oakland St.



Summary for Subcatchment S214A: Easterly Roof & Lot Line

"Paved Parking" includes building roofs.

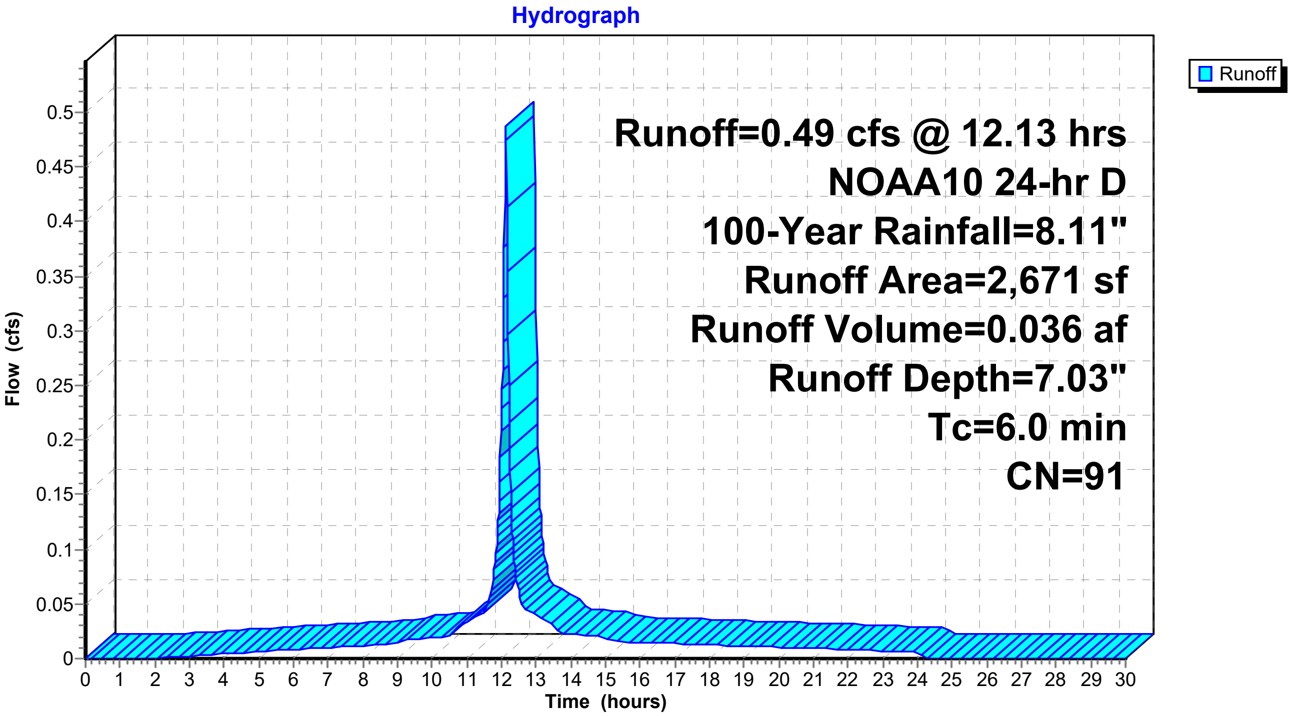
Runoff = 0.49 cfs @ 12.13 hrs, Volume= 0.036 af, Depth= 7.03"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

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

Subcatchment S214A: Easterly Roof & Lot Line



Summary for Subcatchment S214A-1: Easterly Lot Line

"Paved Parking" includes building roofs.

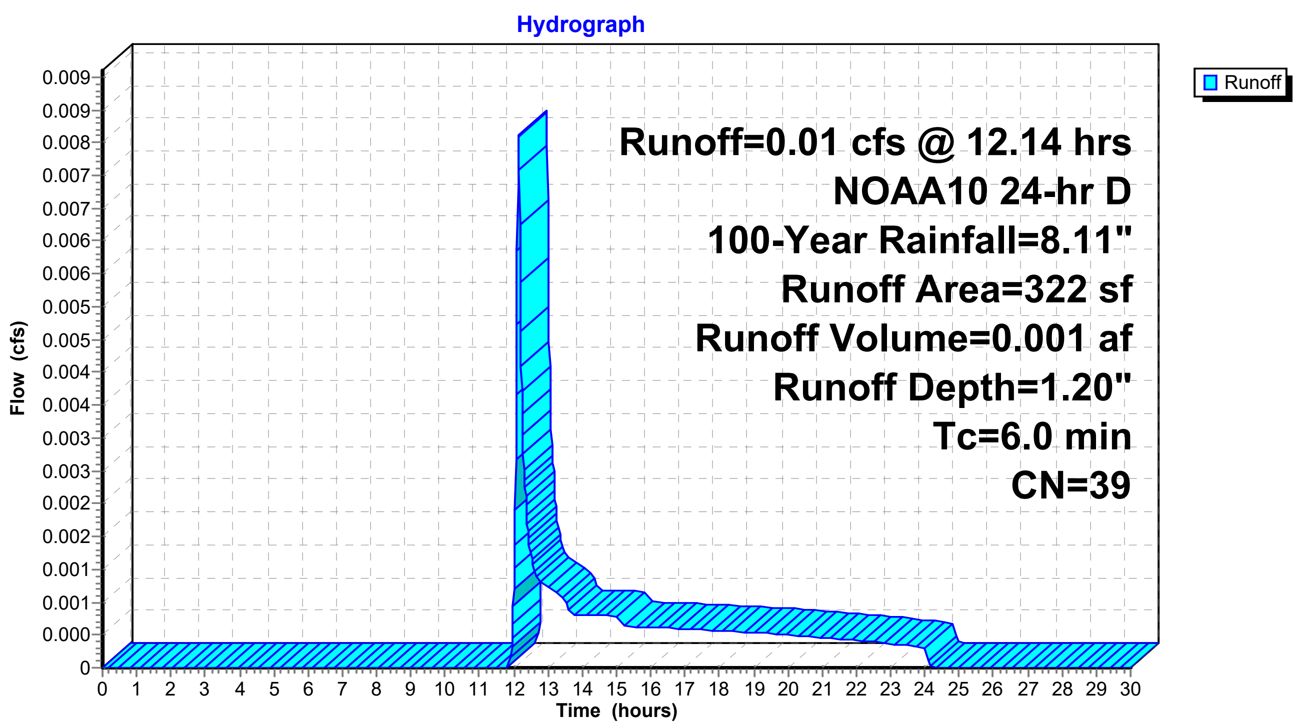
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 1.20"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

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

Subcatchment S214A-1: Easterly Lot Line



Summary for Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

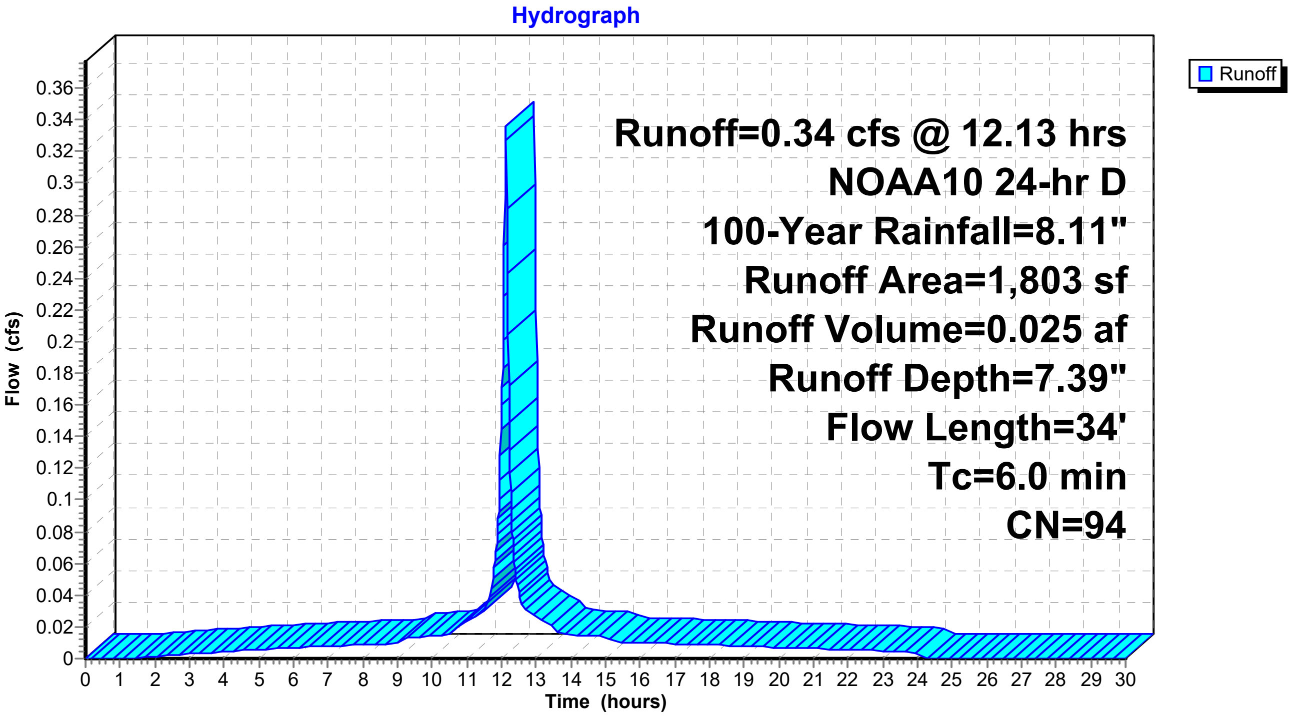
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 7.39"
Routed to Link L214 : Total Flow onto Lot 214 (Pre)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S214B: Easterly Roof & Lot Line/Flow onto Lot 214



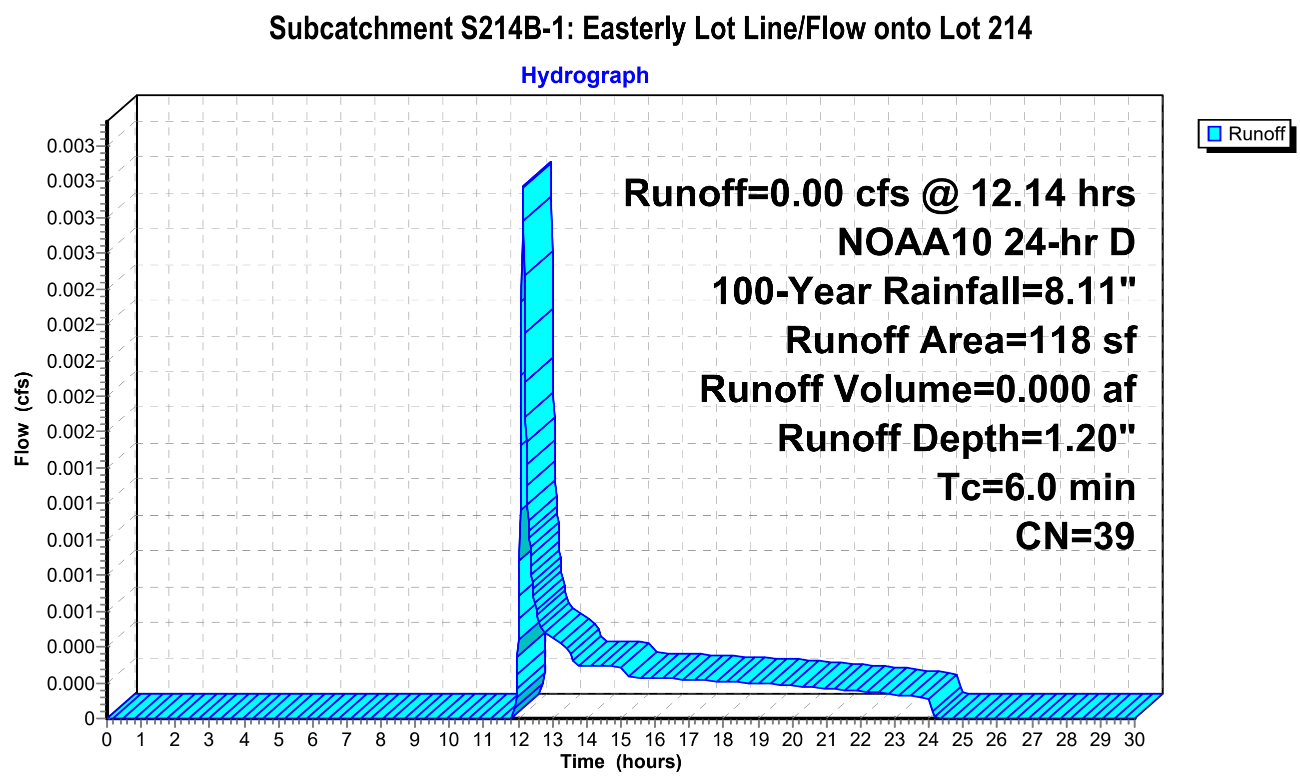
Summary for Subcatchment S214B-1: Easterly Lot Line/Flow onto Lot 214

Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 1.20"
Routed to Link L214-1 : Total Flow onto Lot 214 (Post)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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



Summary for Subcatchment S2A: Easterly Roof & Lot Line

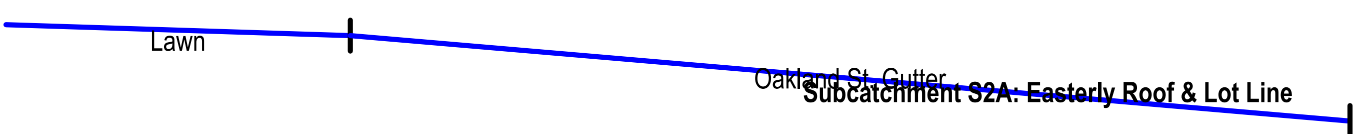
"Paved Parking" includes building roofs.

Runoff = 0.33 cfs @ 12.24 hrs, Volume= 0.036 af, Depth= 7.03"
Routed to Link DP1 : Oakland St. Catch Basin (CB 2)

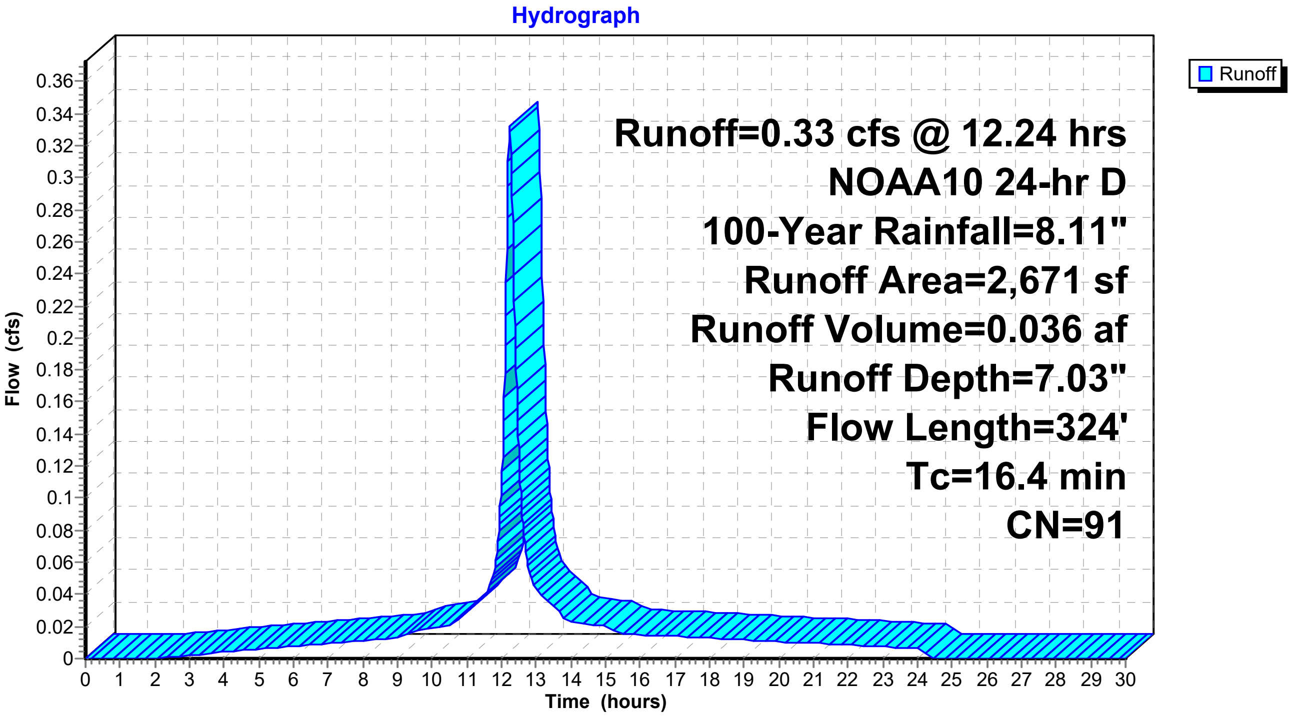
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
2,349	98	Unconnected roofs, HSG A
2,671	91	Weighted Average
322		12.06% Pervious Area
2,349		87.94% Impervious Area
2,349		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter** Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A: Easterly Roof & Lot Line



Summary for Subcatchment S2A-1: Easterly Lot Line

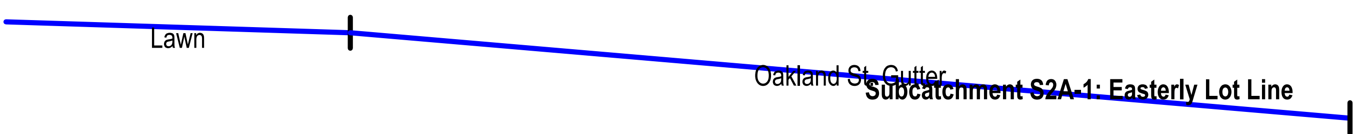
"Paved Parking" includes building roofs.

Runoff = 0.00 cfs @ 12.28 hrs, Volume= 0.001 af, Depth= 1.20"
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

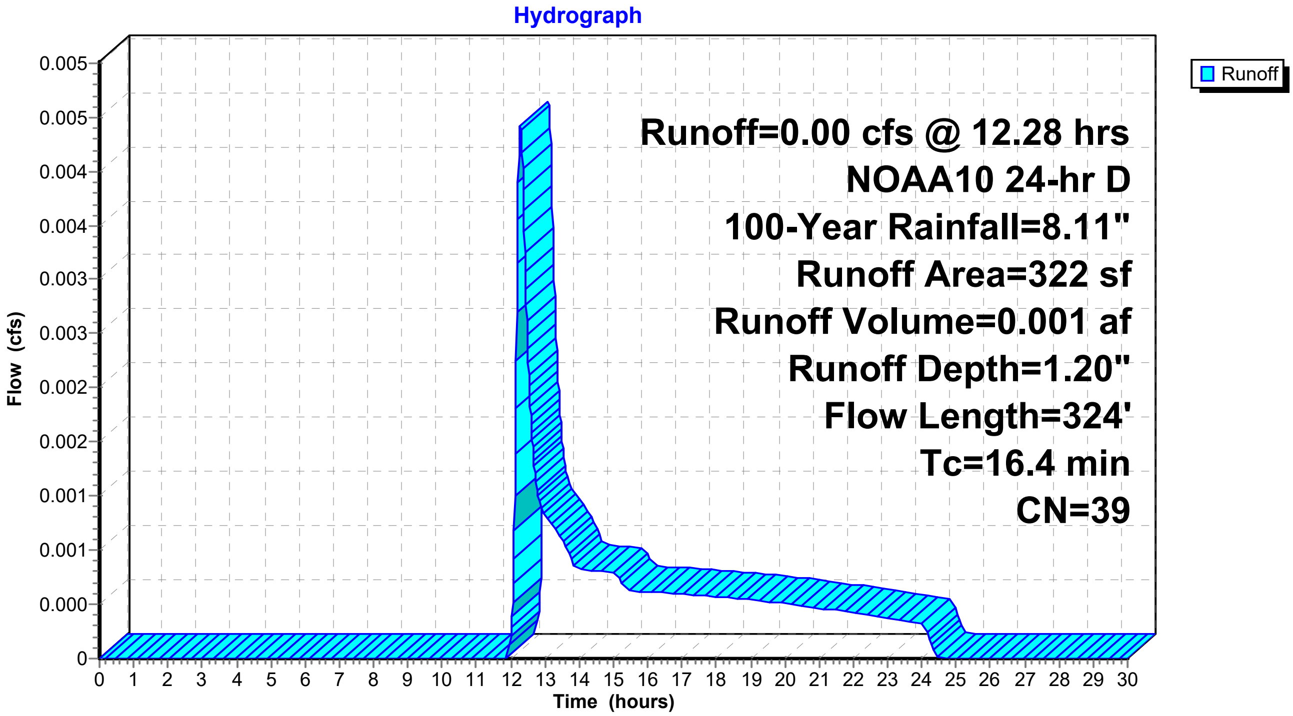
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
322	39	>75% Grass cover, Good, HSG A
322		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	83	0.0059	0.10		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.24"
2.7	241	0.0159	1.51		**Sheet Flow, Oakland St. Gutter** Smooth surfaces n= 0.011 P2= 3.24"
16.4	324	Total			



Subcatchment S2A-1: Easterly Lot Line



Summary for Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214

"Paved Parking" includes building roofs.

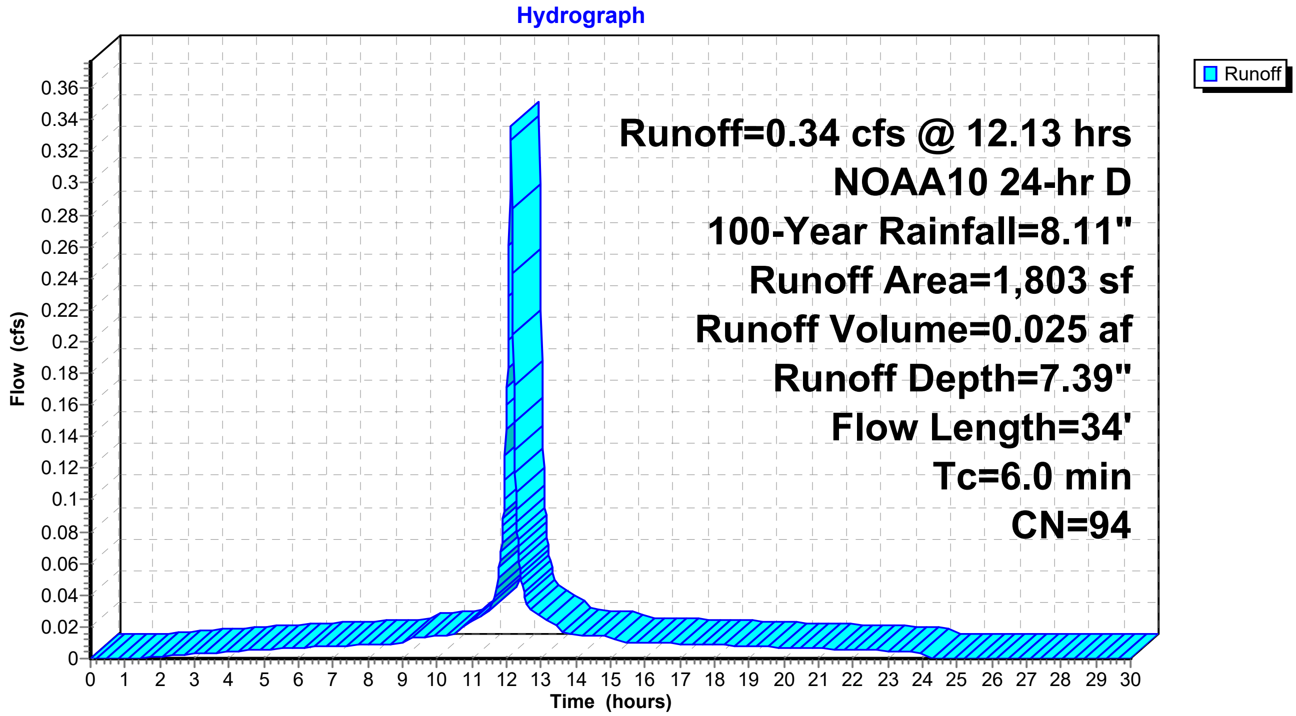
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 7.39"
Routed to Link L2 : Lag Time for Flow from S2B to DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
1,685	98	Unconnected roofs, HSG A
1,803	94	Weighted Average
118		6.54% Pervious Area
1,685		93.46% Impervious Area
1,685		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	34		0.09		**Direct Entry, Assumed Minimum**

Subcatchment S2B: Easterly Roof & Lot Line/Flow onto Lot 214



Summary for Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214

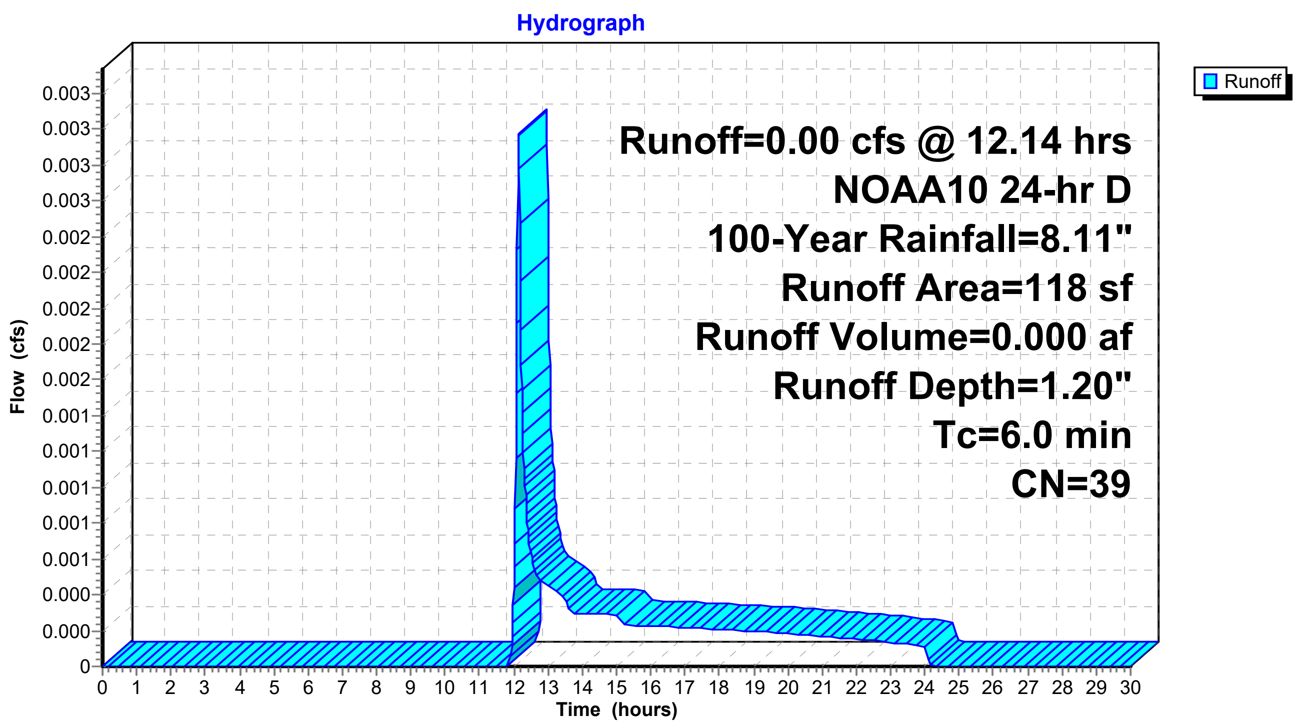
Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 1.20"
Routed to Link L2-1 : Lag Time for Flow from S2B-1 to DP2-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
118	39	>75% Grass cover, Good, HSG A
118		100.00% Pervious Area

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

Subcatchment S2B-1: Easterly Lot Line/Flow onto Lot 214



Summary for Subcatchment S2C: Rear of Building & Site (SW)

"Paved Parking" includes building roofs.

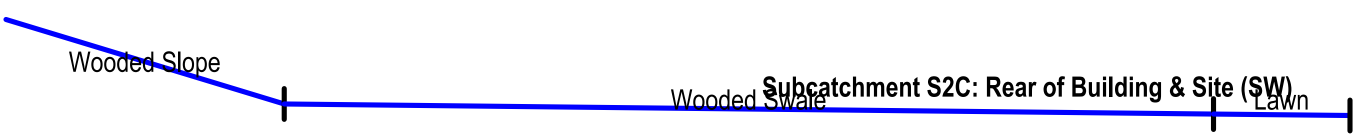
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.78 cfs @ 12.16 hrs, Volume= 0.064 af, Depth= 1.90"
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

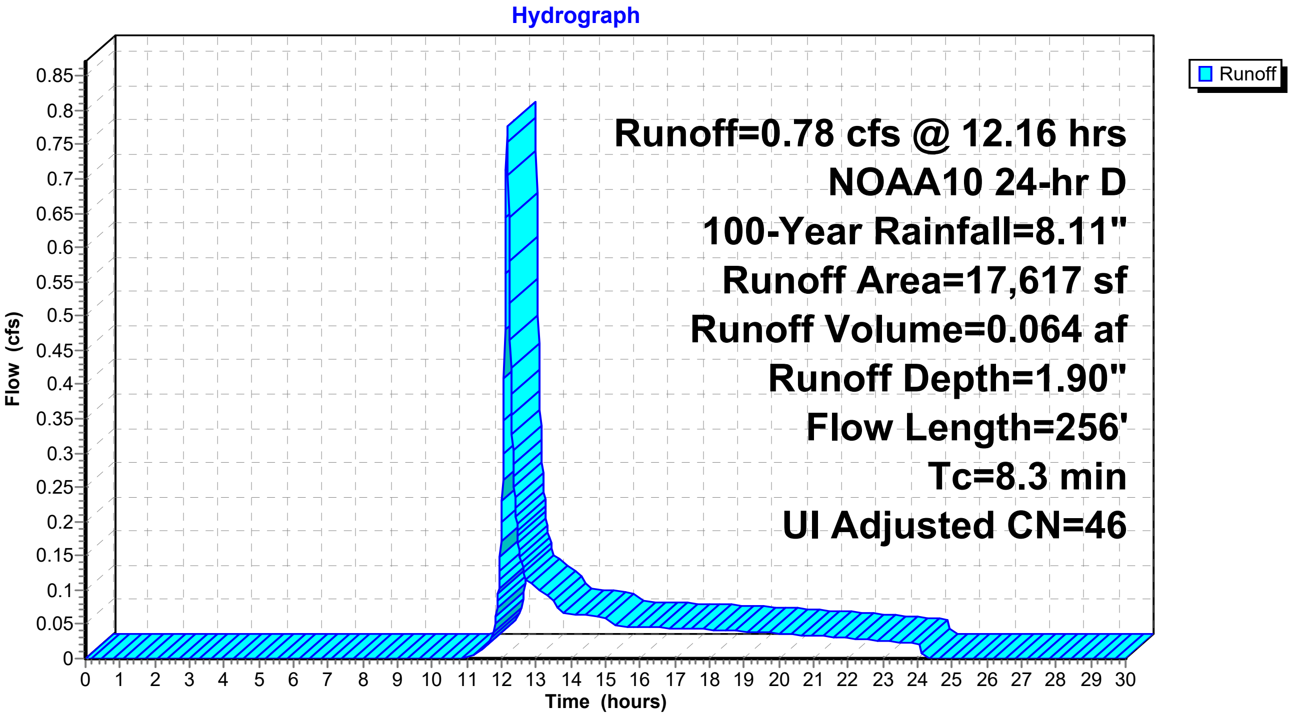
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Adj	Description
1,157	39		>75% Grass cover, Good, HSG A
80	98		Paved parking, HSG A
4,226	98		Unconnected roofs, HSG A
2,147	77		Fallow, bare soil, HSG A
10,007	30		Woods, Good, HSG A
17,617	53	46	Weighted Average, UI Adjusted
13,311			75.56% Pervious Area
4,306			24.44% Impervious Area
4,226			98.14% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	53	0.4720	0.24		**Sheet Flow, Wooded Slope** Woods: Light underbrush n= 0.400 P2= 3.24"
4.5	177	0.0169	0.65		**Shallow Concentrated Flow, Wooded Swale** Woodland Kv= 5.0 fps
0.2	26	0.0169	1.95		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
8.3	256	Total			



Subcatchment S2C: Rear of Building & Site (SW)



Summary for Subcatchment S2C-1: Perimeter of Garage

"Paved Parking" includes building roofs.

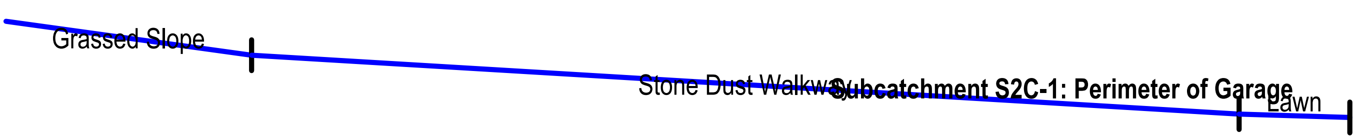
Runoff from this node travels over an abutting lot, 34 Water Street, then returns to the project locus before it is discharged to DP3.

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 6.44"
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

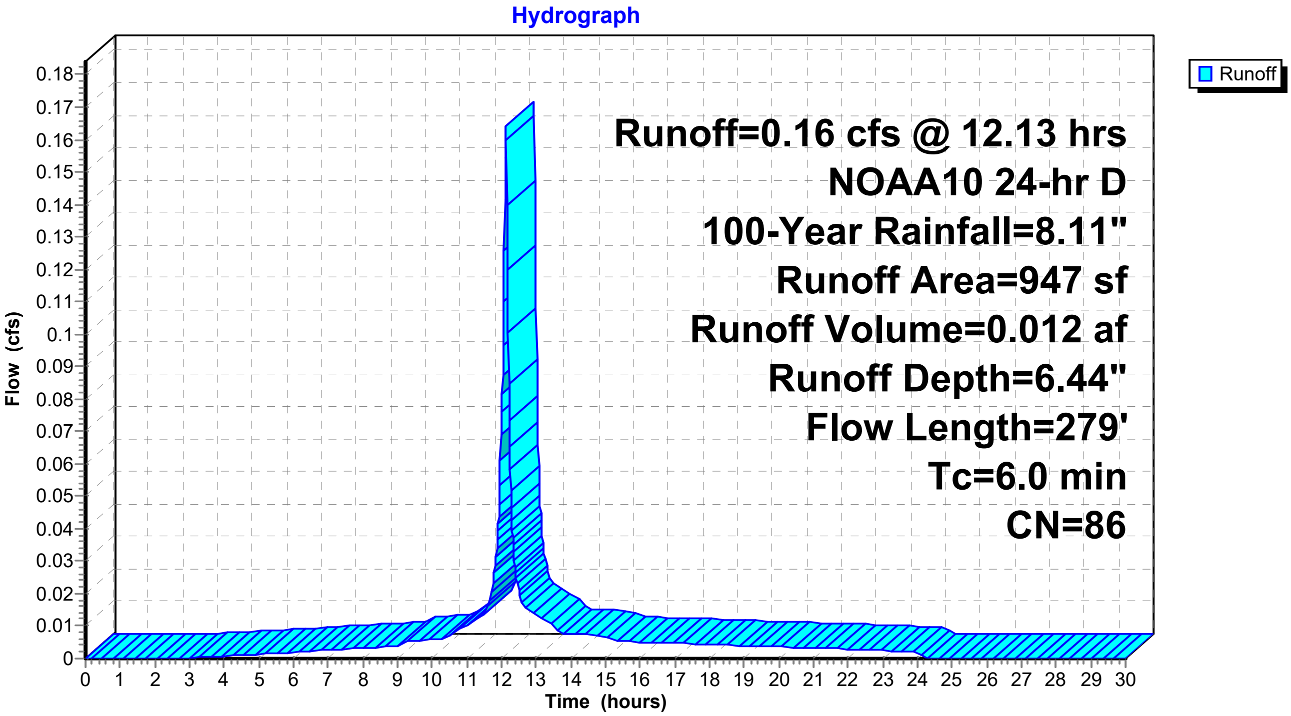
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
167	39	>75% Grass cover, Good, HSG A
780	96	Gravel surface, HSG A
947	86	Weighted Average
947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	51	0.0451	0.21		**Sheet Flow, Grassed Slope** Grass: Short n= 0.150 P2= 3.24"
1.5	205	0.0195	2.25		**Shallow Concentrated Flow, Stone Dust Walkway** Unpaved Kv= 16.1 fps
0.3	23	0.0098	1.48		**Shallow Concentrated Flow, Lawn** Grassed Waterway Kv= 15.0 fps
5.9	279	Total, Increased to minimum Tc = 6.0 min			



Subcatchment S2C-1: Perimeter of Garage



Summary for Subcatchment S3: Southerly Corner of Oakland & Chestnut

"Paved Parking" includes building roofs.

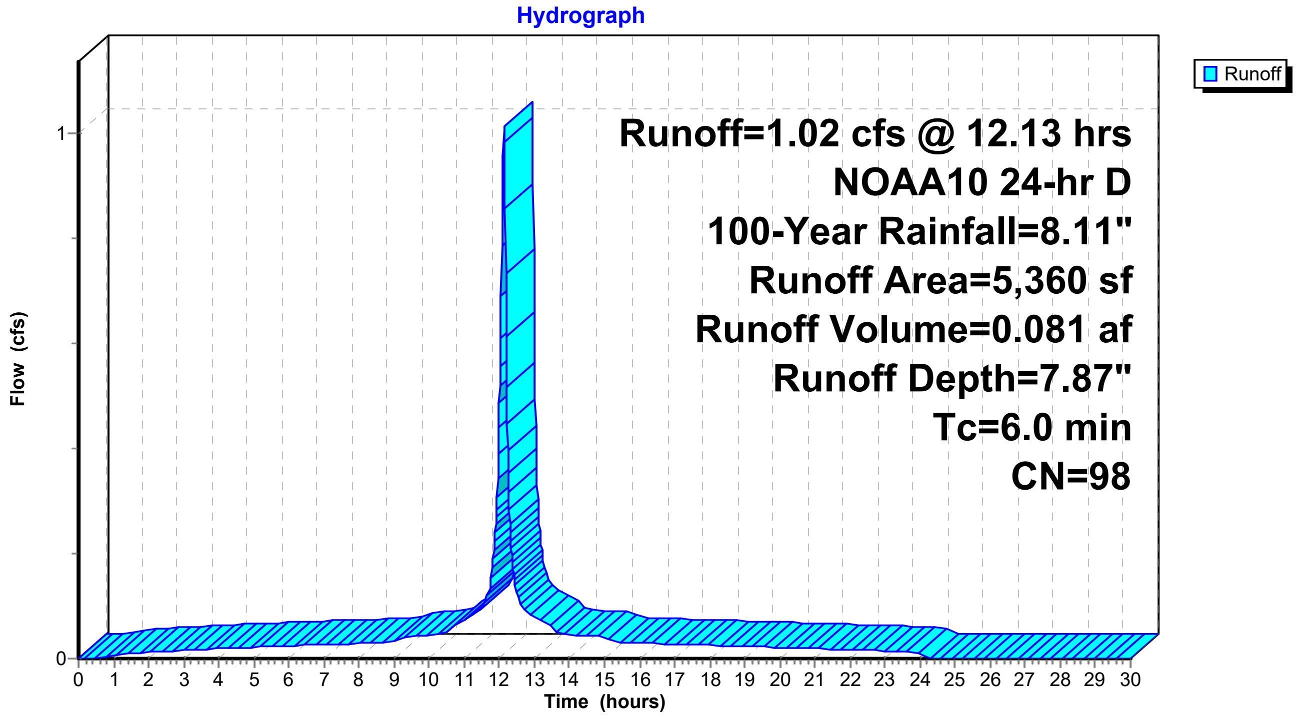
Runoff = 1.02 cfs @ 12.13 hrs, Volume= 0.081 af, Depth= 7.87"
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
14	39	>75% Grass cover, Good, HSG A
1,053	98	Paved parking, HSG A
4,293	98	Roofs, HSG A
5,360	98	Weighted Average
14		0.26% Pervious Area
5,346		99.74% Impervious Area

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

Subcatchment S3: Southerly Corner of Oakland & Chestnut



Summary for Subcatchment S3-1: Southerly Corner of Oakland & Chestnut

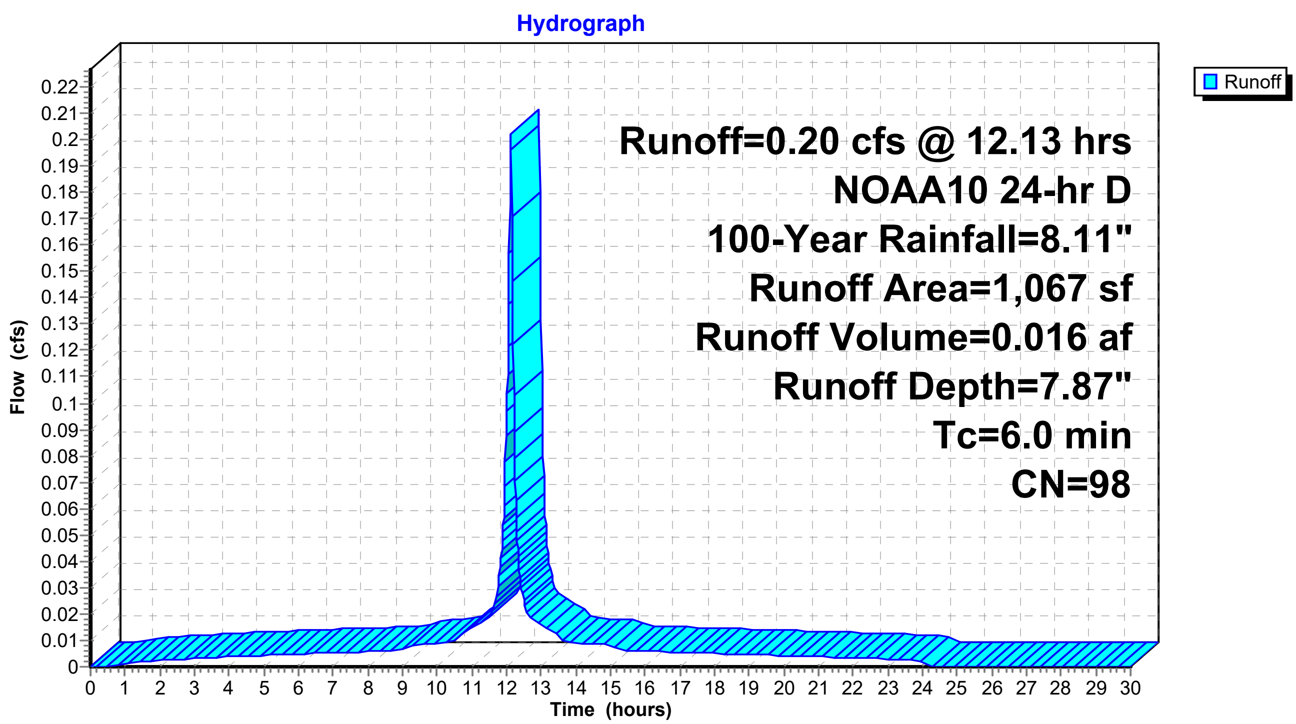
Runoff = 0.20 cfs @ 12.13 hrs, Volume= 0.016 af, Depth= 7.87"
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
22	96	Gravel surface, HSG A
1,045	98	Paved parking, HSG A
1,067	98	Weighted Average
22		2.06% Pervious Area
1,045		97.94% Impervious Area

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

Subcatchment S3-1: Southerly Corner of Oakland & Chestnut



Summary for Subcatchment S4: Loading Dock

"Paved Parking" includes building roofs.

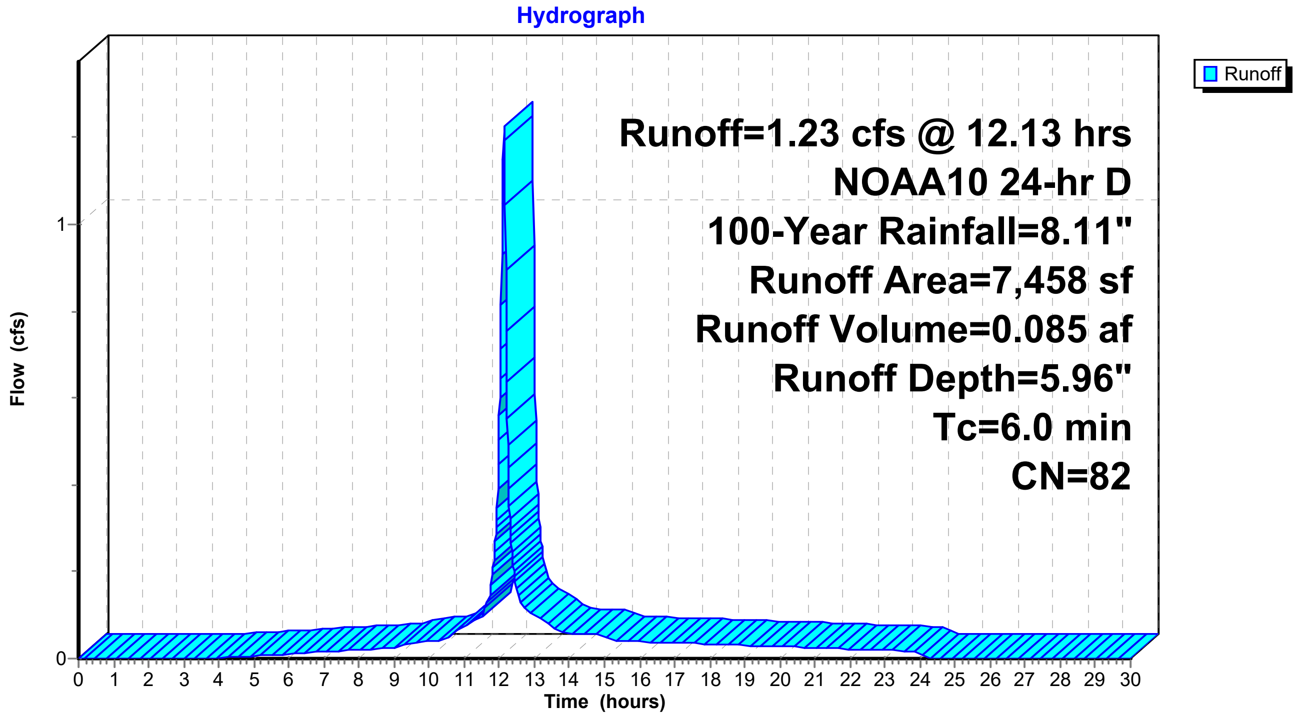
Runoff = 1.23 cfs @ 12.13 hrs, Volume= 0.085 af, Depth= 5.96"
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
1,421	39	>75% Grass cover, Good, HSG A
2,055	98	Paved parking, HSG A
2,658	98	Roofs, HSG A
1,122	77	Fallow, bare soil, HSG A
202	30	Woods, Good, HSG A
7,458	82	Weighted Average
2,745		36.81% Pervious Area
4,713		63.19% Impervious Area

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

Subcatchment S4: Loading Dock



Summary for Subcatchment S4-1: Garage Entrance

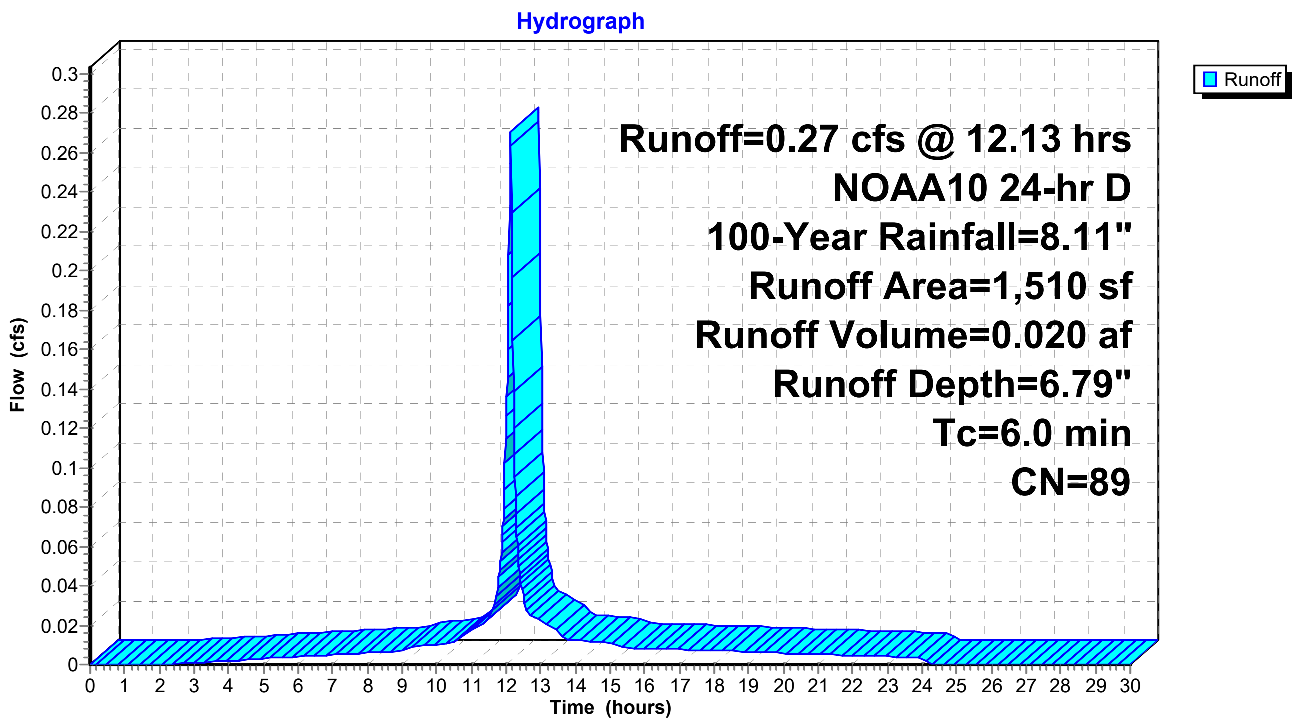
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 6.79"
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
231	39	>75% Grass cover, Good, HSG A
323	96	Gravel surface, HSG A
956	98	Paved parking, HSG A
1,510	89	Weighted Average
554		36.69% Pervious Area
956		63.31% Impervious Area

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

Subcatchment S4-1: Garage Entrance



Summary for Subcatchment S4-2: Proposed Roofs

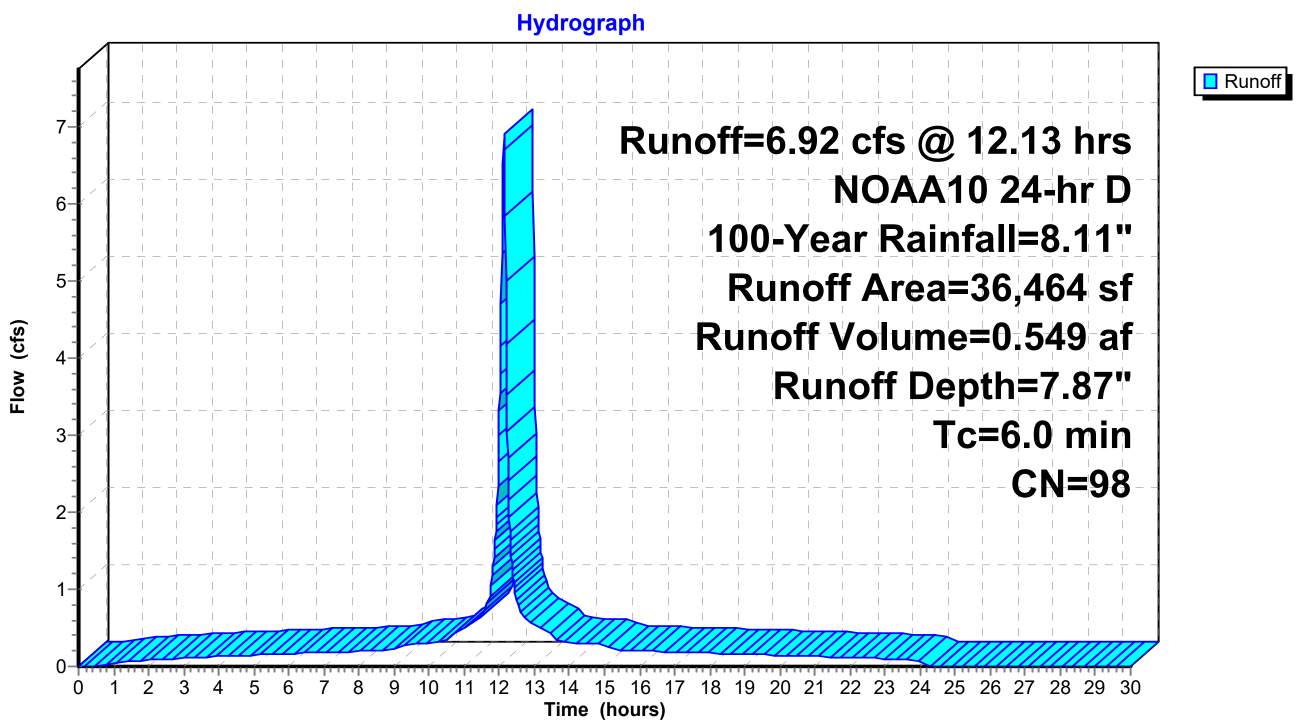
Runoff = 6.92 cfs @ 12.13 hrs, Volume= 0.549 af, Depth= 7.87"
Routed to Pond DC1 : Detention Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
36,464	98	Roofs, HSG A
36,464		100.00% Impervious Area

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

Subcatchment S4-2: Proposed Roofs



Summary for Subcatchment S4-3: Gap Between Buildings

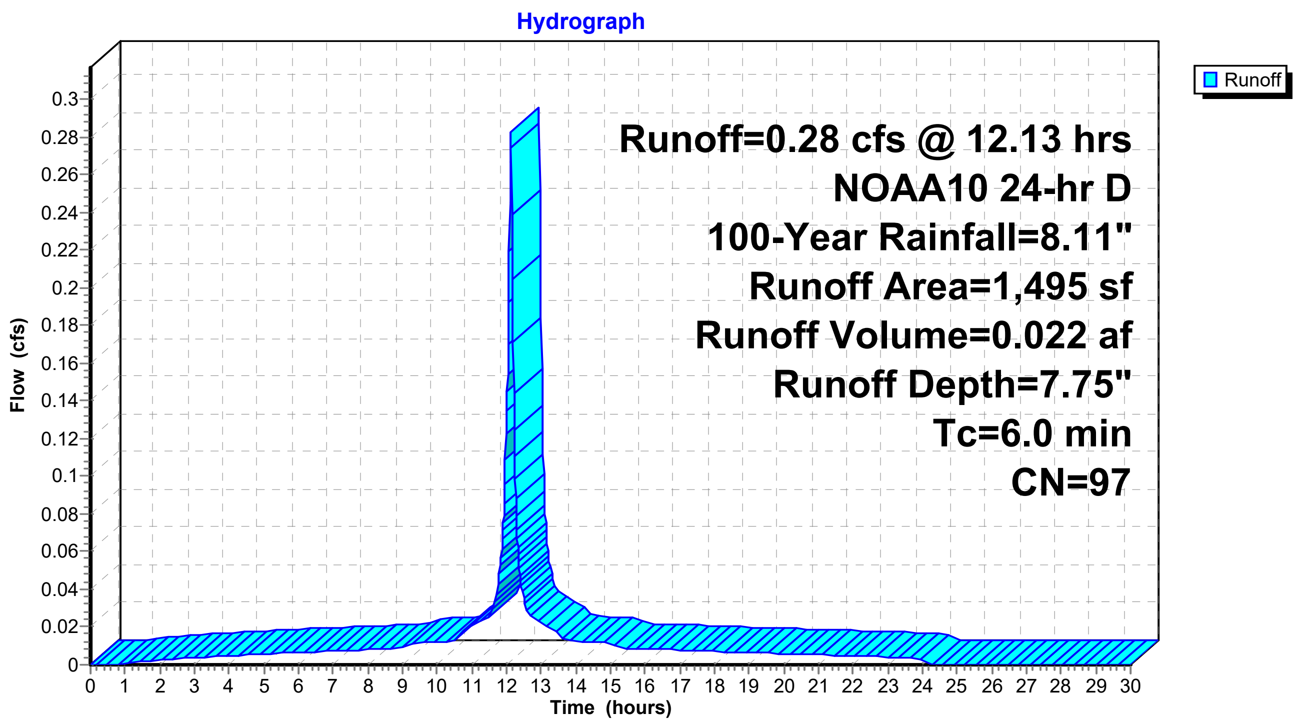
Runoff = 0.28 cfs @ 12.13 hrs, Volume= 0.022 af, Depth= 7.75"
Routed to Pond GAP : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
559	96	Gravel surface, HSG A
936	98	Unconnected roofs, HSG A
1,495	97	Weighted Average
559		37.39% Pervious Area
936		62.61% Impervious Area
936		100.00% Unconnected

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

Subcatchment S4-3: Gap Between Buildings



Summary for Subcatchment SAD: Collected by Courtyard Area Drain

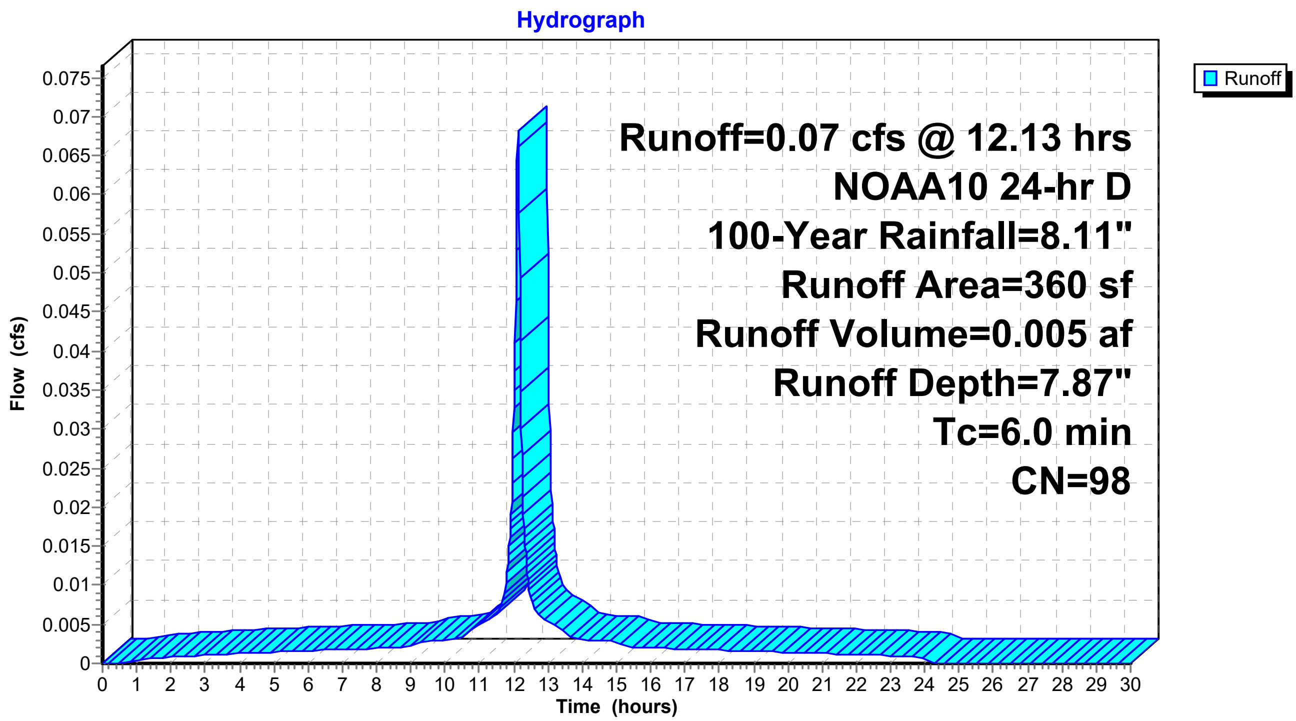
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
360	98	Paved parking, HSG A
360		100.00% Impervious Area

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

Subcatchment SAD: Collected by Courtyard Area Drain



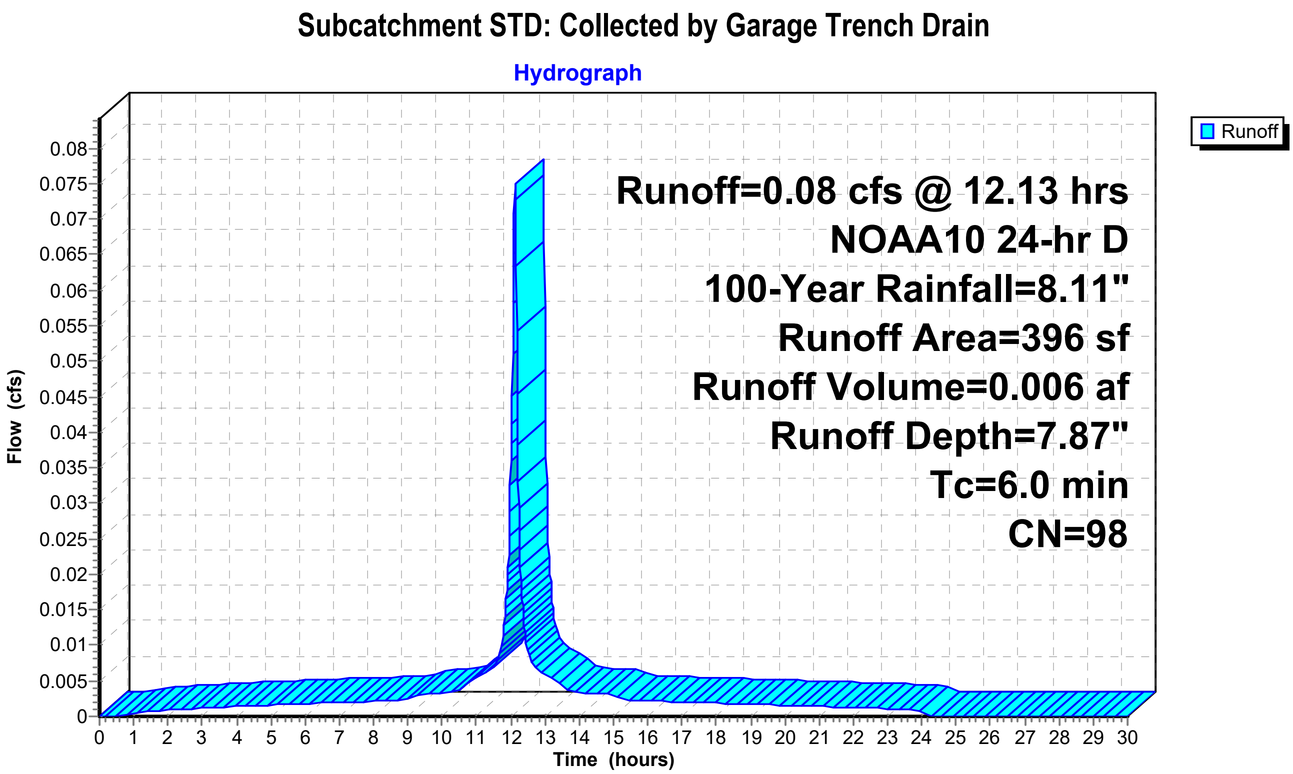
Summary for Subcatchment STD: Collected by Garage Trench Drain

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
396	98	Paved parking, HSG A
396		100.00% Impervious Area

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



Summary for Subcatchment Tc: Extra Tc Calc's

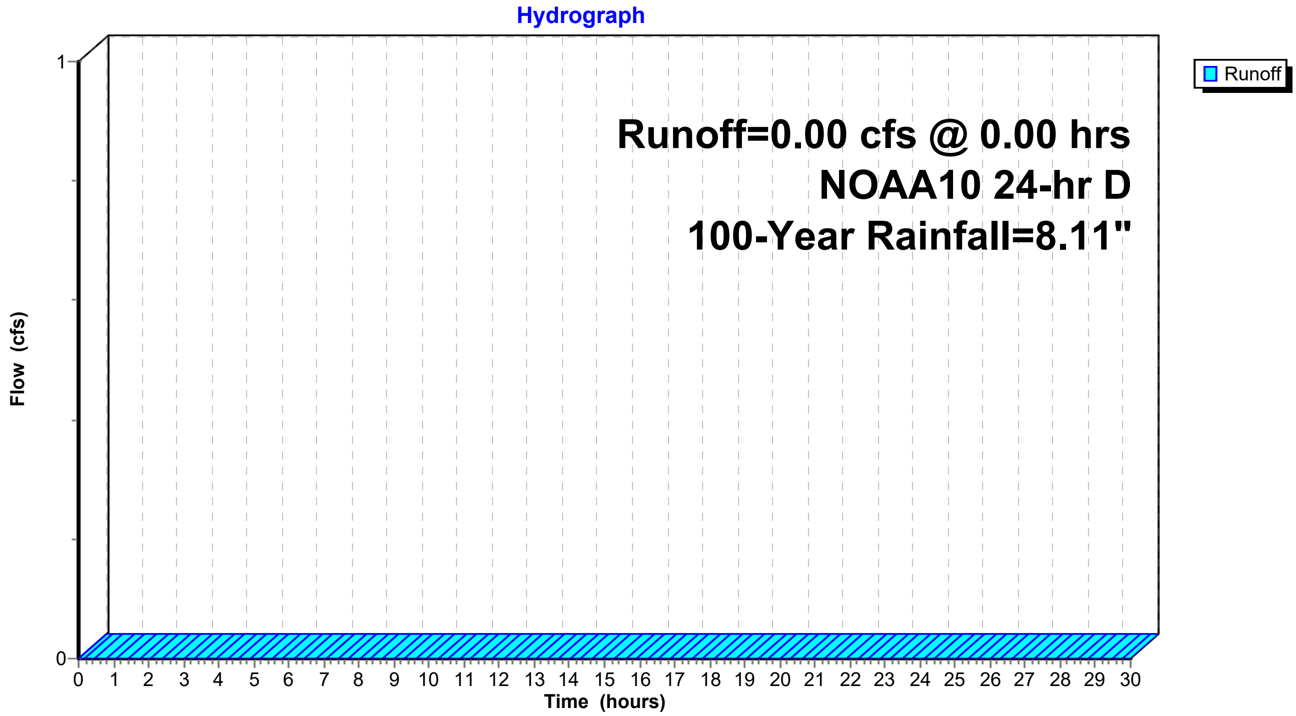
[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	70	0.0501	5.28	4.15	**Pipe Channel, CB 2 to DMH 1** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.1	33	0.1391	8.80	6.91	**Pipe Channel, DMH 1 to DMH 2** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
0.3	139	0.0701	9.18	7.21	**Pipe Channel, DMH 2 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
6.3	55	0.0182	0.15		**Sheet Flow, Lawn (L2 to DP2)** Grass: Short n= 0.150 P2= 3.24"
0.3	27	0.0079	1.33		**Shallow Concentrated Flow, Lawn (DP2 to CB 8)** Grassed Waterway Kv= 15.0 fps
0.4	47	0.0079	1.80		**Shallow Concentrated Flow, Chestnut St. Gutter (DP2 to CB 8)** Paved Kv= 20.3 fps
0.0	9	0.0811	9.88	7.76	**Pipe Channel, CB 8 to DMH 3** 12.00" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.017 Concrete sewer w/manholes & inlets
0.4	143	0.0222	6.77	11.97	**Pipe Channel, DMH 3 to DMH 4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.017 Concrete sewer w/manholes & inlets
8.0	523	Total			

Subcatchment Tc: Extra Tc Calc's



Summary for Pond DC1: Detention Chamber

Chamber ceiling = 28.93

Inflow Area = 0.871 ac, 98.53% Impervious, Inflow Depth = 7.87" for 100-Year event
Inflow = 7.20 cfs @ 12.13 hrs, Volume= 0.571 af
Outflow = 4.47 cfs @ 12.19 hrs, Volume= 0.571 af, Atten= 38%, Lag= 3.9 min
Primary = 4.47 cfs @ 12.19 hrs, Volume= 0.571 af
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

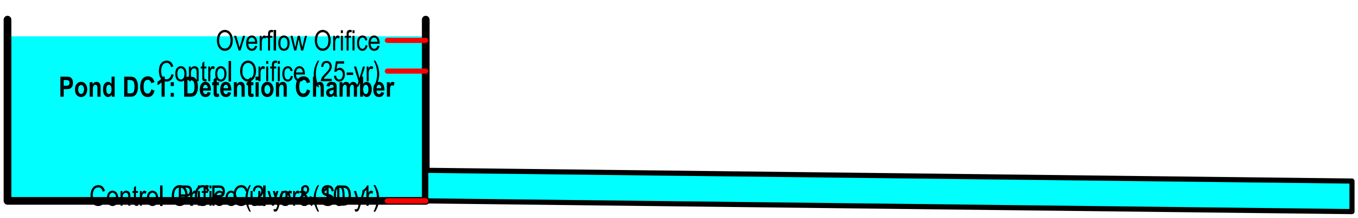
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 28.38' @ 12.19 hrs Surf.Area= 543 sf Storage= 2,916 cf

Plug-Flow detention time= 12.6 min calculated for 0.571 af (100% of inflow)
Center-of-Mass det. time= 12.4 min (755.3 - 742.9)

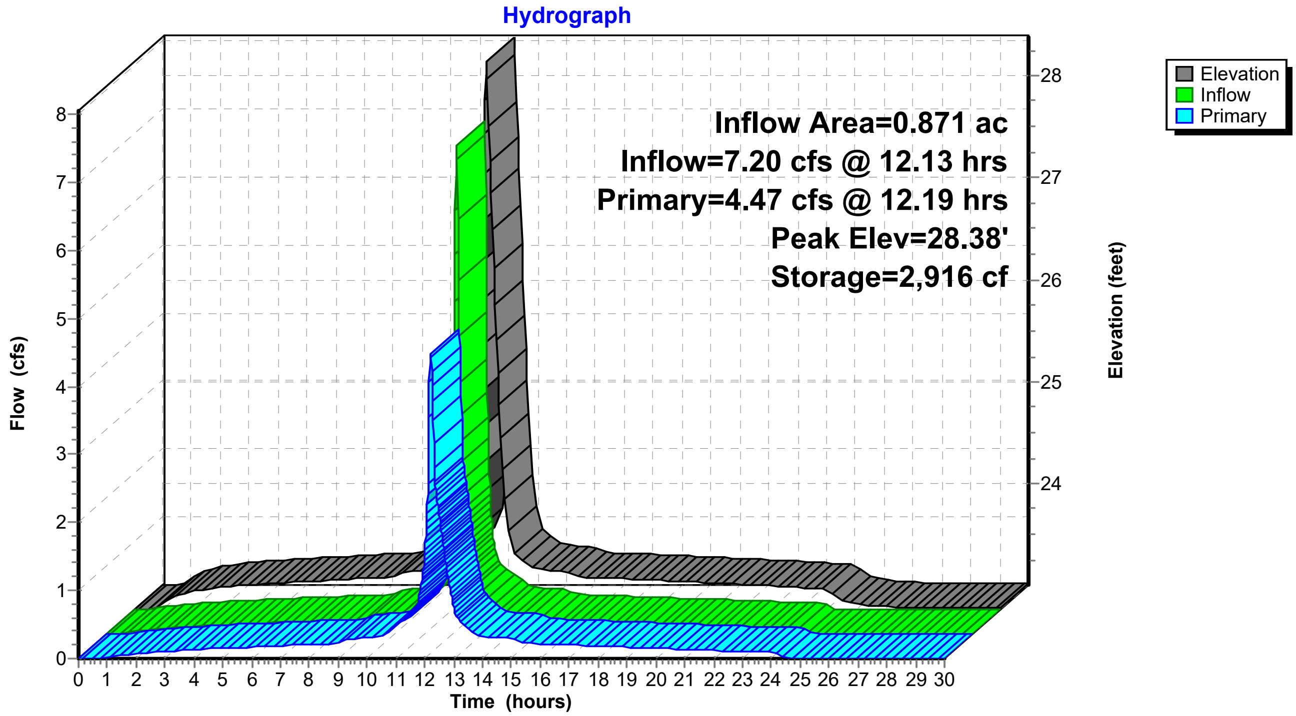
Volume	Invert	Avail.Storage	Storage Description
#1	23.01'	3,217 cf	**8.67'W x 15.67'L x 5.92'H Shea Fire Cistern Bank** x 4

Device	Routing	Invert	Outlet Devices
#1	Primary	23.01'	**12.00" Round RCP Culvert (SD-1)** L= 69.4' Ke= 1.800 Inlet / Outlet Invert= 23.01' / 22.66' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	23.01'	**7.00" Vert. Control Orifice (2-yr & 10-yr)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.25'	**4.00" Vert. Control Orifice (25-yr) X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	28.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Primary OutFlow Max=4.47 cfs @ 12.19 hrs HW=28.37' TW=0.00' (Dynamic Tailwater)
1=RCP Culvert (SD-1) (Inlet Controls 4.47 cfs @ 5.69 fps)
2=Control Orifice (2-yr & 10-yr) (Passes < 2.90 cfs potential flow)
3=Control Orifice (25-yr) (Passes < 1.64 cfs potential flow)
4=Overflow Orifice (Passes < 0.44 cfs potential flow)



Pond DC1: Detention Chamber



Stage-Area-Storage for Pond DC1: Detention Chamber

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
23.01	0	25.61	1,413	28.21	2,826
23.06	27	25.66	1,440	28.26	2,853
23.11	54	25.71	1,467	28.31	2,880
23.16	82	25.76	1,494	28.36	2,907
23.21	109	25.81	1,522	28.41	2,935
23.26	136	25.86	1,549	28.46	2,962
23.31	163	25.91	1,576	28.51	2,989
23.36	190	25.96	1,603	28.56	3,016
23.41	217	26.01	1,630	28.61	3,043
23.46	245	26.06	1,657	28.66	3,070
23.51	272	26.11	1,685	28.71	3,098
23.56	299	26.16	1,712	28.76	3,125
23.61	326	26.21	1,739	28.81	3,152
23.66	353	26.26	1,766	28.86	3,179
23.71	380	26.31	1,793	28.91	**3,206**
23.76	408	26.36	1,821		
23.81	435	26.41	1,848		
23.86	462	26.46	1,875		
23.91	489	26.51	1,902		
23.96	516	26.56	1,929		
24.01	543	26.61	1,956		
24.06	571	26.66	1,984		
24.11	598	26.71	2,011		
24.16	625	26.76	2,038		
24.21	652	26.81	2,065		
24.26	679	26.86	2,092		
24.31	706	26.91	2,119		
24.36	734	26.96	2,147		
24.41	761	27.01	2,174		
24.46	788	27.06	2,201		
24.51	815	27.11	2,228		
24.56	842	27.16	2,255		
24.61	869	27.21	2,282		
24.66	897	27.26	2,310		
24.71	924	27.31	2,337		
24.76	951	27.36	2,364		
24.81	978	27.41	2,391		
24.86	1,005	27.46	2,418		
24.91	1,033	27.51	2,445		
24.96	1,060	27.56	2,473		
25.01	1,087	27.61	2,500		
25.06	1,114	27.66	2,527		
25.11	1,141	27.71	2,554		
25.16	1,168	27.76	2,581		
25.21	1,196	27.81	2,608		
25.26	1,223	27.86	2,636		
25.31	1,250	27.91	2,663		
25.36	1,277	27.96	2,690		
25.41	1,304	28.01	2,717		
25.46	1,331	28.06	2,744		
25.51	1,359	28.11	2,772		
25.56	1,386	28.16	2,799		

Summary for Pond GAP: Area Drain

Flood elevation set at finished floor of level 2.
Loss coefficient of 0.9 for short radius 90-degree fittings between pipes.

Inflow Area = 0.034 ac, 62.61% Impervious, Inflow Depth = 7.75" for 100-Year event
Inflow = 0.28 cfs @ 12.13 hrs, Volume= 0.022 af
Outflow = 0.28 cfs @ 12.13 hrs, Volume= 0.022 af, Atten= 1%, Lag= 0.3 min
Primary = 0.28 cfs @ 12.13 hrs, Volume= 0.022 af
Routed to Pond DC1 : Detention Chamber

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 54.54' @ 12.13 hrs Storage= 9 cf
Flood Elev= 55.00' Storage= 112 cf

Plug-Flow detention time= 1.5 min calculated for 0.022 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (750.7 - 749.3)

Volume	Invert	Avail.Storage	Storage Description
#1	54.50'	2,068 cf	**Open Area (Prismatic)** Listed below -Impervious

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.50	559	0.0	0	0
55.00	559	40.0	112	112
58.50	559	100.0	1,957	2,068

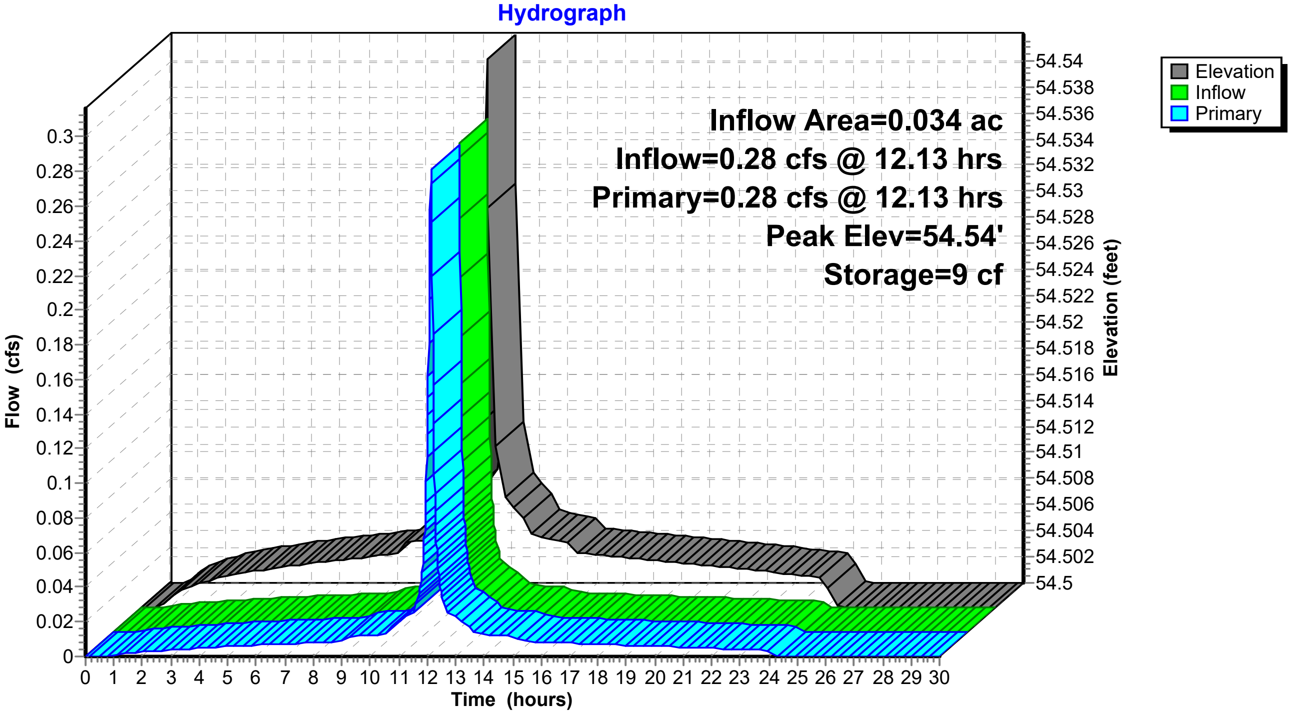
Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 22.5' Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.00' S= 0.0444 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#2	Device 1	50.43'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 5.2' Ke= 0.900 Inlet / Outlet Invert= 50.43' / 50.43' S= 0.0000 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#3	Device 2	50.50'	**6.00" Round Ductile Iron Drain Pipe (SD-4)** L= 3.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.50' / 50.43' S= 0.0200 '/' Cc= 0.900 n= 0.014 Steel, smooth, Flow Area= 0.20 sf
#4	Device 3	54.50'	**2.25" x 5.40" Horiz. Neenah R-6672-F Grate X 8.00 columns** X 4 rows C= 0.600 in 30.00" x 30.00" Grate (43% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.28 cfs @ 12.13 hrs HW=54.54' TW=27.67' (Dynamic Tailwater)
└─1=**Ductile Iron Drain Pipe (SD-4)** (Passes 0.28 cfs of 3.87 cfs potential flow)
  └─2=**Ductile Iron Drain Pipe (SD-4)** (Passes 0.28 cfs of 1.47 cfs potential flow)
    └─3=**Ductile Iron Drain Pipe (SD-4)** (Passes 0.28 cfs of 1.84 cfs potential flow)
      └─4=**Neenah R-6672-F Grate** (Weir Controls 0.28 cfs @ 0.67 fps)

Neenah R-6672-F Grate
Ductile Iron Drain Pipe (SD-4)
Pond GAP: Area Drain

Ductile Iron Drain Pipe (SD-4)

Pond GAP: Area Drain



Stage-Area-Storage for Pond GAP: Area Drain

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
54.50	0	55.54	414	56.58	995	57.62	1,576
54.52	4	55.56	425	56.60	1,006	57.64	1,588
54.54	9	55.58	436	56.62	1,017	57.66	1,599
54.56	13	55.60	447	56.64	1,029	57.68	1,610
54.58	18	55.62	458	56.66	1,040	57.70	1,621
54.60	22	55.64	470	56.68	1,051	57.72	1,632
54.62	27	55.66	481	56.70	1,062	57.74	1,643
54.64	31	55.68	492	56.72	1,073	57.76	1,655
54.66	36	55.70	503	56.74	1,084	57.78	1,666
54.68	40	55.72	514	56.76	1,096	57.80	1,677
54.70	45	55.74	525	56.78	1,107	57.82	1,688
54.72	49	55.76	537	56.80	1,118	57.84	1,699
54.74	54	55.78	548	56.82	1,129	57.86	1,711
54.76	58	55.80	559	56.84	1,140	57.88	1,722
54.78	63	55.82	570	56.86	1,152	57.90	1,733
54.80	67	55.84	581	56.88	1,163	57.92	1,744
54.82	72	55.86	593	56.90	1,174	57.94	1,755
54.84	76	55.88	604	56.92	1,185	57.96	1,766
54.86	80	55.90	615	56.94	1,196	57.98	1,778
54.88	85	55.92	626	56.96	1,207	58.00	1,789
54.90	89	55.94	637	56.98	1,219	58.02	1,800
54.92	94	55.96	648	57.00	1,230	58.04	1,811
54.94	98	55.98	660	57.02	1,241	58.06	1,822
54.96	103	56.00	671	57.04	1,252	58.08	1,834
54.98	107	56.02	682	57.06	1,263	58.10	1,845
55.00	112	56.04	693	57.08	1,275	58.12	1,856
55.02	123	56.06	704	57.10	1,286	58.14	1,867
55.04	134	56.08	716	57.12	1,297	58.16	1,878
55.06	145	56.10	727	57.14	1,308	58.18	1,889
55.08	157	56.12	738	57.16	1,319	58.20	1,901
55.10	168	56.14	749	57.18	1,330	58.22	1,912
55.12	179	56.16	760	57.20	1,342	58.24	1,923
55.14	190	56.18	771	57.22	1,353	58.26	1,934
55.16	201	56.20	783	57.24	1,364	58.28	1,945
55.18	212	56.22	794	57.26	1,375	58.30	1,956
55.20	224	56.24	805	57.28	1,386	58.32	1,968
55.22	235	56.26	816	57.30	1,397	58.34	1,979
55.24	246	56.28	827	57.32	1,409	58.36	1,990
55.26	257	56.30	838	57.34	1,420	58.38	2,001
55.28	268	56.32	850	57.36	1,431	58.40	2,012
55.30	279	56.34	861	57.38	1,442	58.42	2,024
55.32	291	56.36	872	57.40	1,453	58.44	2,035
55.34	302	56.38	883	57.42	1,465	58.46	2,046
55.36	313	56.40	894	57.44	1,476	58.48	2,057
55.38	324	56.42	906	57.46	1,487	58.50	**2,068**
55.40	335	56.44	917	57.48	1,498		
55.42	347	56.46	928	57.50	1,509		
55.44	358	56.48	939	57.52	1,520		
55.46	369	56.50	950	57.54	1,532		
55.48	380	56.52	961	57.56	1,543		
55.50	391	56.54	973	57.58	1,554		
55.52	402	56.56	984	57.60	1,565		

Summary for Pond IC2: Infiltration Chamber Under Parking Lot

Chamber ceiling = 50.58

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 7.39" for 100-Year event
Inflow = 2.31 cfs @ 12.13 hrs, Volume= 0.175 af
Outflow = 1.83 cfs @ 12.17 hrs, Volume= 0.175 af, Atten= 21%, Lag= 2.6 min
Discarded = 0.07 cfs @ 12.17 hrs, Volume= 0.096 af
Primary = 1.75 cfs @ 12.17 hrs, Volume= 0.079 af
Routed to Link DP1-1 : Oakland St. Catch Basin (CB 2)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 50.25' @ 12.17 hrs Surf.Area= 540 sf Storage= 837 cf

Plug-Flow detention time= 34.0 min calculated for 0.175 af (100% of inflow)
Center-of-Mass det. time= 33.9 min (800.4 - 766.5)

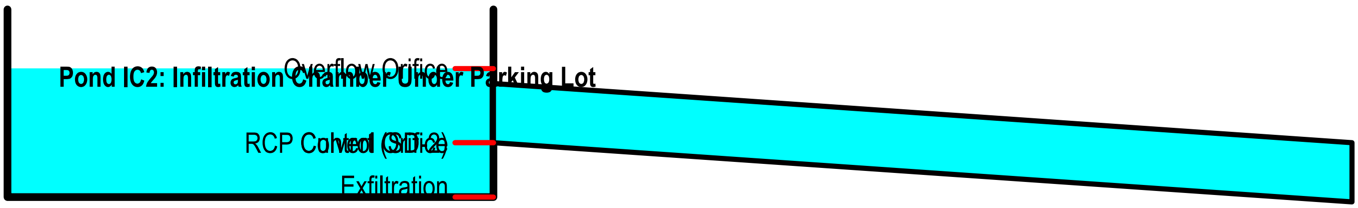
Volume	Invert	Avail.Storage	Storage Description
#1A	48.08'	206 cf	**18.00'W x 30.00'L x 3.17'H Field A** 1,712 cf Overall - 1,196 cf Embedded = 516 cf x 40.0% Voids
#2A	48.58'	800 cf	**Shea Leaching Chamber 8x14x2.7** x 4 Inside #1 Inside= 84.0"W x 24.0"H => 15.38 sf x 13.00'L = 200.0 cf Outside= 96.0"W x 32.0"H => 21.36 sf x 14.00'L = 299.0 cf 4 Chambers in 2 Rows
		1,006 cf	Total Available Storage

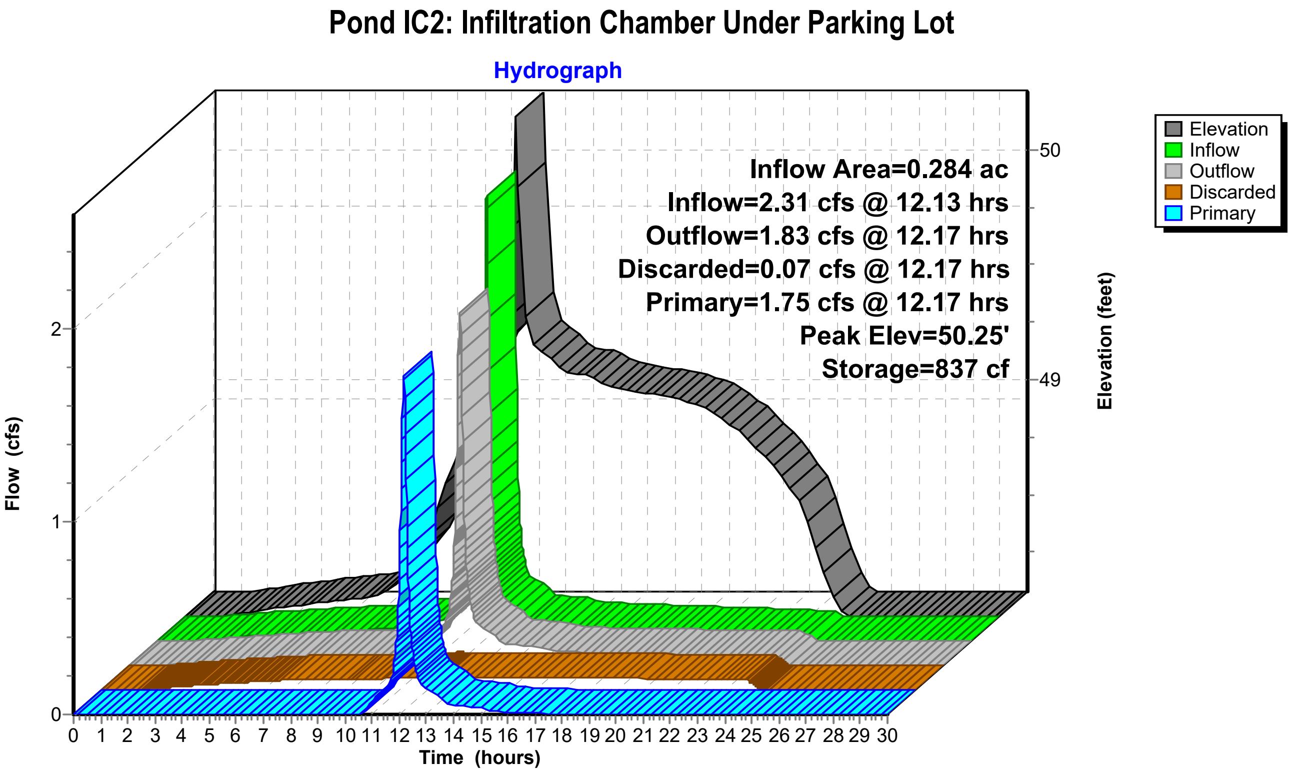
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.08'	**4.000 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 17.50' Phase-In= 0.08'
#2	Primary	49.00'	**12.00" Round RCP Culvert (SD-2)** L= 53.0' Ke= 1.800 Inlet / Outlet Invert= 49.00' / 48.00' S= 0.0189 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#3	Device 2	49.00'	**9.00" Vert. Control Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	50.25'	**12.00" Horiz. Overflow Orifice** C= 0.600 in 13.50" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.17 hrs HW=50.25' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.75 cfs @ 12.17 hrs HW=50.25' TW=0.00' (Dynamic Tailwater)
└─**2=RCP Culvert (SD-2)** (Inlet Controls 1.75 cfs @ 2.23 fps)
  ├─**3=Control Orifice** (Passes 1.75 cfs of 1.98 cfs potential flow)
  └─**4=Overflow Orifice** (Controls 0.00 cfs)


Pond IC2: Infiltration Chamber Under Parking Lot
Overflow Orifice
RCP Culvert (SD-2)
Vent (Ditch)
Exfiltration


Pond IC2: Infiltration Chamber Under Parking Lot
Hydrograph
Inflow Area=0.284 ac
Inflow=2.31 cfs @ 12.13 hrs
Outflow=1.83 cfs @ 12.17 hrs
Discarded=0.07 cfs @ 12.17 hrs
Primary=1.75 cfs @ 12.17 hrs
Peak Elev=50.25'
Storage=837 cf
Elevation
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Elevation (feet)
Time (hours)

Stage-Area-Storage for Pond IC2: Infiltration Chamber Under Parking Lot

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
48.08	0	49.12	344	50.16	798	51.20	1,004
48.10	4	49.14	353	50.18	807	51.22	1,005
48.12	9	49.16	361	50.20	816	51.24	**1,006**
48.14	13	49.18	370	50.22	824		
48.16	17	49.20	379	50.24	833		
48.18	22	49.22	388	50.26	842		
48.20	26	49.24	396	50.28	851		
48.22	30	49.26	405	50.30	859		
48.24	35	49.28	414	50.32	868		
48.26	39	49.30	422	50.34	877		
48.28	43	49.32	431	50.36	886		
48.30	48	49.34	440	50.38	894		
48.32	52	49.36	449	50.40	903		
48.34	56	49.38	457	50.42	912		
48.36	60	49.40	466	50.44	920		
48.38	65	49.42	475	50.46	929		
48.40	69	49.44	484	50.48	938		
48.42	73	49.46	492	50.50	947		
48.44	78	49.48	501	50.52	955		
48.46	82	49.50	510	50.54	964		
48.48	86	49.52	519	50.56	973		
48.50	91	49.54	527	50.58	982		
48.52	95	49.56	536	50.60	982		
48.54	99	49.58	545	50.62	983		
48.56	104	49.60	554	50.64	984		
48.58	108	49.62	562	50.66	985		
48.60	117	49.64	571	50.68	985		
48.62	125	49.66	580	50.70	986		
48.64	134	49.68	588	50.72	987		
48.66	143	49.70	597	50.74	987		
48.68	152	49.72	606	50.76	988		
48.70	160	49.74	615	50.78	989		
48.72	169	49.76	623	50.80	990		
48.74	178	49.78	632	50.82	990		
48.76	187	49.80	641	50.84	991		
48.78	195	49.82	650	50.86	992		
48.80	204	49.84	658	50.88	993		
48.82	213	49.86	667	50.90	993		
48.84	222	49.88	676	50.92	994		
48.86	230	49.90	685	50.94	995		
48.88	239	49.92	693	50.96	996		
48.90	248	49.94	702	50.98	996		
48.92	257	49.96	711	51.00	997		
48.94	265	49.98	720	51.02	998		
48.96	274	50.00	728	51.04	999		
48.98	283	50.02	737	51.06	999		
49.00	291	50.04	746	51.08	1,000		
49.02	300	50.06	754	51.10	1,001		
49.04	309	50.08	763	51.12	1,001		
49.06	318	50.10	772	51.14	1,002		
49.08	326	50.12	781	51.16	1,003		
49.10	335	50.14	789	51.18	1,004		

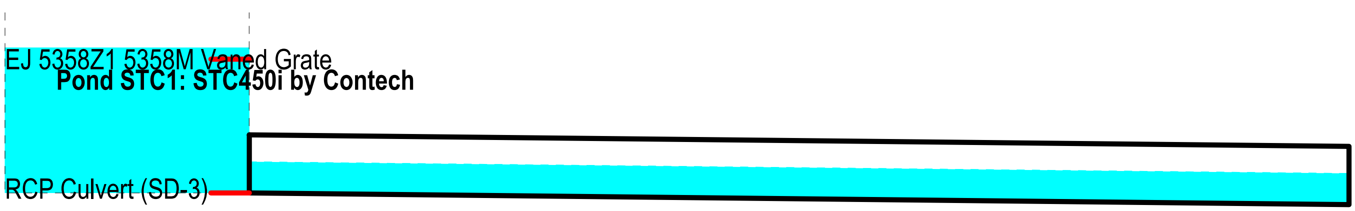
Summary for Pond STC1: STC450i by Contech

Inflow Area = 0.284 ac, 87.12% Impervious, Inflow Depth = 7.39" for 100-Year event
Inflow = 2.31 cfs @ 12.13 hrs, Volume= 0.175 af
Outflow = 2.31 cfs @ 12.13 hrs, Volume= 0.175 af, Atten= 0%, Lag= 0.0 min
Primary = 2.31 cfs @ 12.13 hrs, Volume= 0.175 af
Routed to Pond IC2 : Infiltration Chamber Under Parking Lot

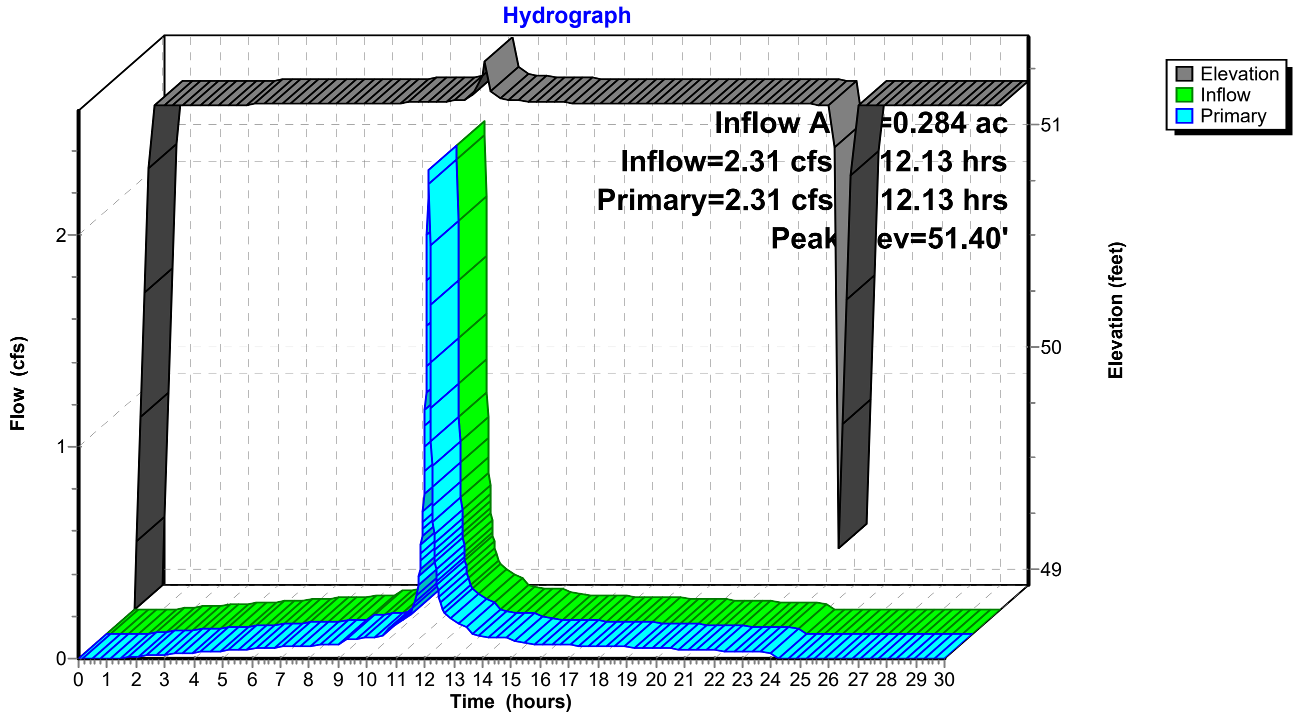
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 51.40' @ 12.13 hrs
Flood Elev= 52.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	48.90'	**12.00" Round RCP Culvert (SD-3)** L= 22.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.90' / 48.70' S= 0.0089 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	51.20'	**EJ 5358Z1 5358M Vaned Grate** Head (feet) 0.00 0.08 0.17 0.25 Disch. (cfs) 0.000 0.600 1.800 3.300

Primary OutFlow Max=2.29 cfs @ 12.13 hrs HW=51.40' TW=50.12' (Dynamic Tailwater)
└─**1=RCP Culvert (SD-3)** (Passes 2.29 cfs of 4.27 cfs potential flow)
  └─**2=EJ 5358Z1 5358M Vaned Grate** (Custom Controls 2.29 cfs)



Pond STC1: STC450i by Contech



Stage-Area-Storage for Pond STC1: STC450i by Contech

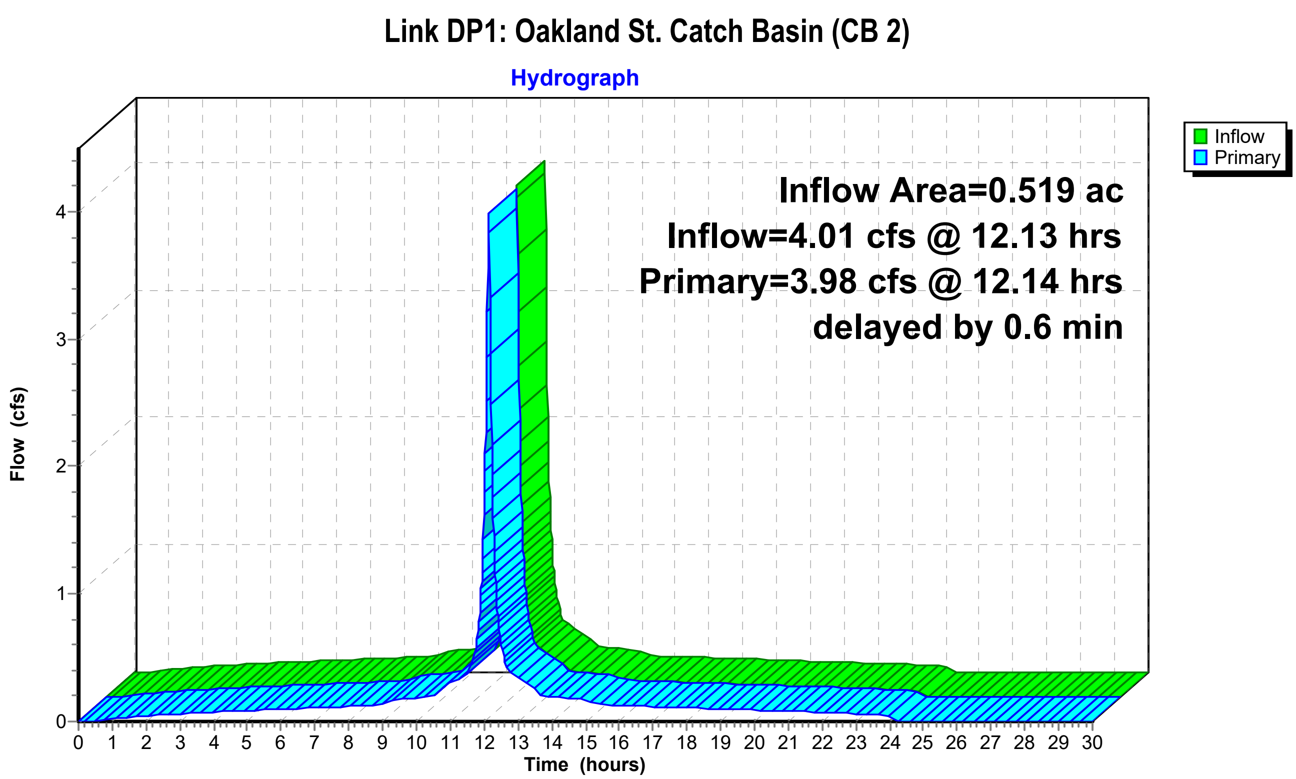
Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
48.90	**0.000**	49.94	0.000	50.98	0.000
48.92	0.000	49.96	0.000	51.00	0.000
48.94	0.000	49.98	0.000	51.02	0.000
48.96	0.000	50.00	0.000	51.04	0.000
48.98	0.000	50.02	0.000	51.06	0.000
49.00	0.000	50.04	0.000	51.08	0.000
49.02	0.000	50.06	0.000	51.10	0.000
49.04	0.000	50.08	0.000	51.12	0.000
49.06	0.000	50.10	0.000	51.14	0.000
49.08	0.000	50.12	0.000	51.16	0.000
49.10	0.000	50.14	0.000	51.18	0.000
49.12	0.000	50.16	0.000	51.20	0.000
49.14	0.000	50.18	0.000	51.22	0.000
49.16	0.000	50.20	0.000	51.24	0.000
49.18	0.000	50.22	0.000	51.26	0.000
49.20	0.000	50.24	0.000	51.28	0.000
49.22	0.000	50.26	0.000	51.30	0.000
49.24	0.000	50.28	0.000	51.32	0.000
49.26	0.000	50.30	0.000	51.34	0.000
49.28	0.000	50.32	0.000	51.36	0.000
49.30	0.000	50.34	0.000	51.38	0.000
49.32	0.000	50.36	0.000	51.40	0.000
49.34	0.000	50.38	0.000	51.42	0.000
49.36	0.000	50.40	0.000	51.44	0.000
49.38	0.000	50.42	0.000	51.46	0.000
49.40	0.000	50.44	0.000	51.48	0.000
49.42	0.000	50.46	0.000	51.50	0.000
49.44	0.000	50.48	0.000	51.52	0.000
49.46	0.000	50.50	0.000	51.54	0.000
49.48	0.000	50.52	0.000	51.56	0.000
49.50	0.000	50.54	0.000	51.58	0.000
49.52	0.000	50.56	0.000	51.60	0.000
49.54	0.000	50.58	0.000	51.62	0.000
49.56	0.000	50.60	0.000	51.64	0.000
49.58	0.000	50.62	0.000	51.66	0.000
49.60	0.000	50.64	0.000	51.68	0.000
49.62	0.000	50.66	0.000	51.70	0.000
49.64	0.000	50.68	0.000	51.72	0.000
49.66	0.000	50.70	0.000	51.74	0.000
49.68	0.000	50.72	0.000	51.76	0.000
49.70	0.000	50.74	0.000	51.78	0.000
49.72	0.000	50.76	0.000	51.80	0.000
49.74	0.000	50.78	0.000	51.82	0.000
49.76	0.000	50.80	0.000	51.84	0.000
49.78	0.000	50.82	0.000	51.86	0.000
49.80	0.000	50.84	0.000	51.88	0.000
49.82	0.000	50.86	0.000	51.90	0.000
49.84	0.000	50.88	0.000	51.92	0.000
49.86	0.000	50.90	0.000	51.94	0.000
49.88	0.000	50.92	0.000	51.96	0.000
49.90	0.000	50.94	0.000	51.98	0.000
49.92	0.000	50.96	0.000	52.00	0.000

Summary for Link DP1: Oakland St. Catch Basin (CB 2)

Lag time for this node is the sum of lines 1-3 of the Tc calculations in the Extra Tc Calc's Node

Inflow Area = 0.519 ac, 98.58% Impervious, Inflow Depth = 7.77" for 100-Year event
Inflow = 4.01 cfs @ 12.13 hrs, Volume= 0.336 af
Primary = 3.98 cfs @ 12.14 hrs, Volume= 0.336 af, Atten= 1%, Lag= 0.6 min
Routed to Link DP3 : Chestnut St. Drain Manhole (DMH 3)

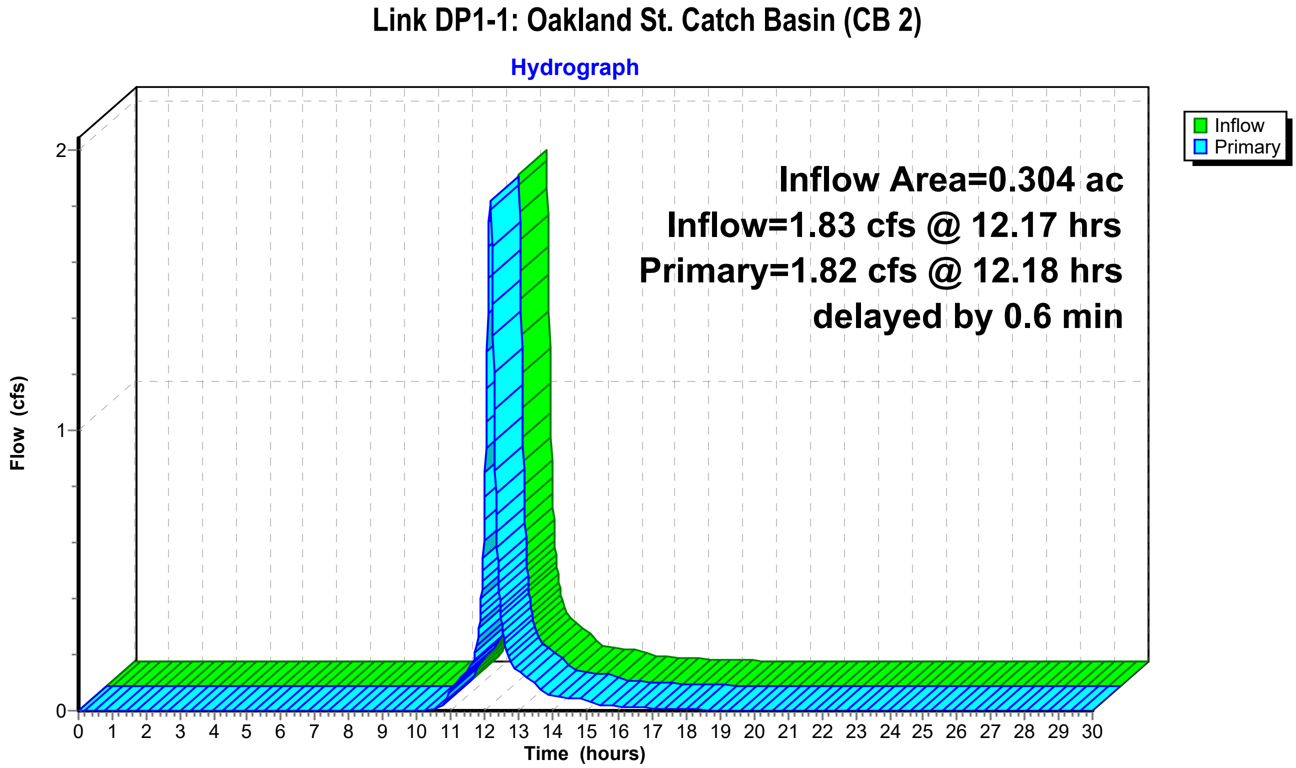
Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link DP1-1: Oakland St. Catch Basin (CB 2)

Inflow Area = 0.304 ac, 84.11% Impervious, Inflow Depth = 3.38" for 100-Year event
Inflow = 1.83 cfs @ 12.17 hrs, Volume= 0.086 af
Primary = 1.82 cfs @ 12.18 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.6 min
Routed to Link DP3-1 : Chestnut St. Drain Manhole (DMH 3)

Primary outflow = Inflow delayed by 0.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

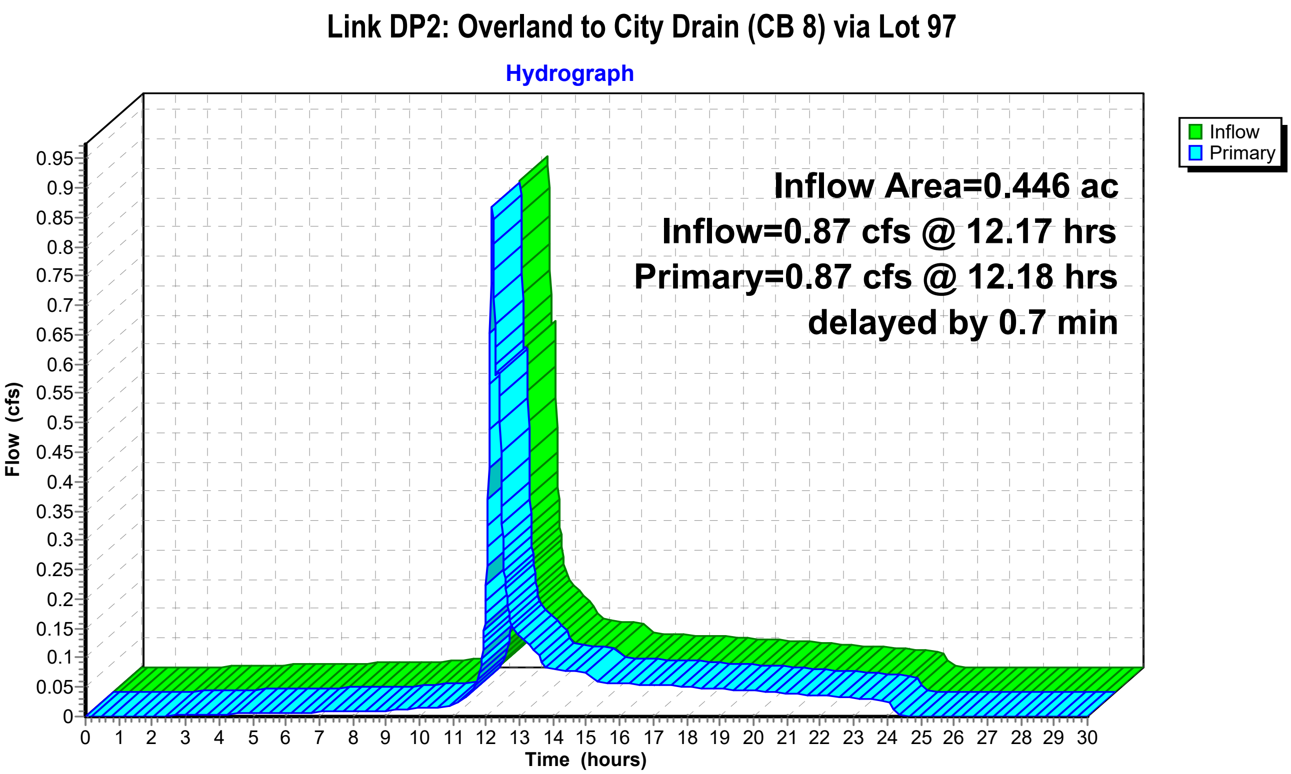


Summary for Link DP2: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.446 ac, 30.85% Impervious, Inflow Depth = 2.41" for 100-Year event
Inflow = 0.87 cfs @ 12.17 hrs, Volume= 0.089 af
Primary = 0.87 cfs @ 12.18 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.7 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

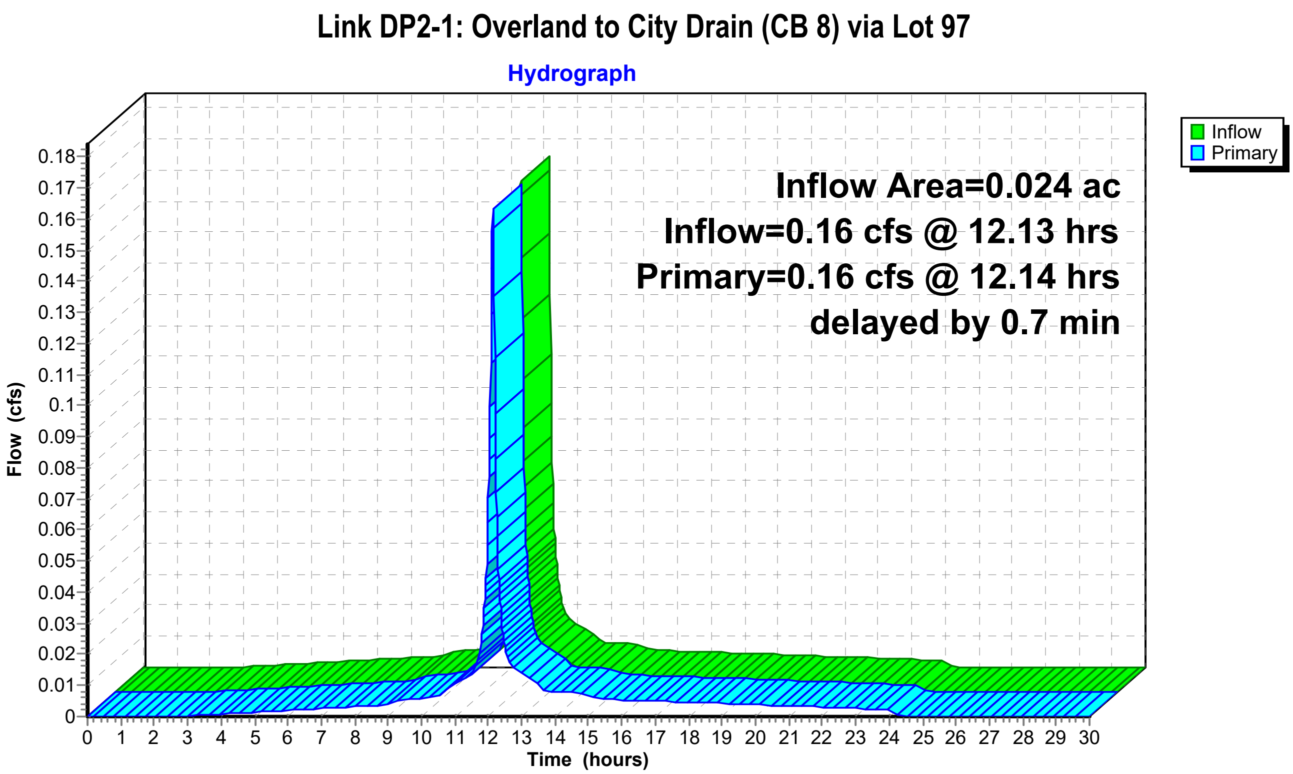


Summary for Link DP2-1: Overland to City Drain (CB 8) via Lot 97

Lag time for this node was computed using the sum of lines 5 and 6 of the Tc calculations of the Extra Tc Calculations.

Inflow Area = 0.024 ac, 0.00% Impervious, Inflow Depth = 5.86" for 100-Year event
Inflow = 0.16 cfs @ 12.13 hrs, Volume= 0.012 af
Primary = 0.16 cfs @ 12.14 hrs, Volume= 0.012 af, Atten= 1%, Lag= 0.7 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.7 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

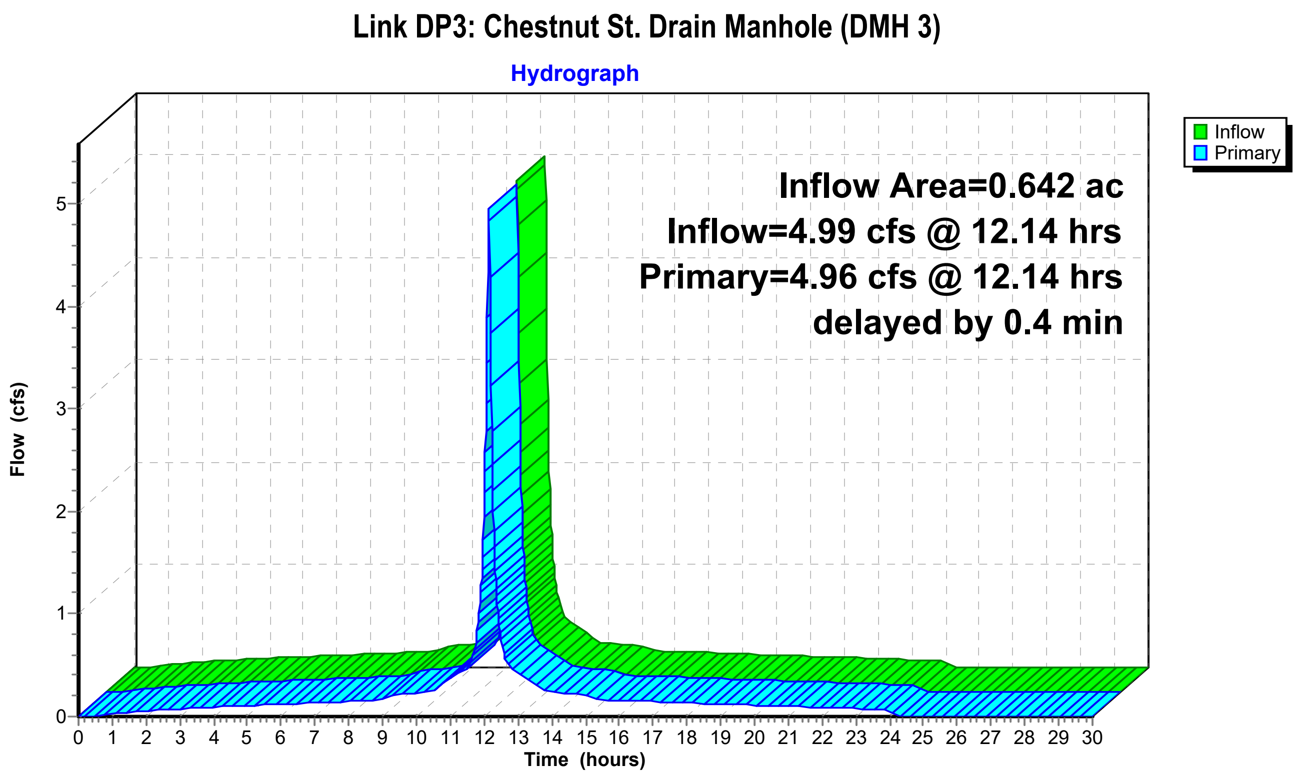


Summary for Link DP3: Chestnut St. Drain Manhole (DMH 3)

Lag time for this node was computed using line 8 of the Tc Calculations of the Extra Tc Calc's node.

Inflow Area = 0.642 ac, 98.80% Impervious, Inflow Depth = 7.79" for 100-Year event
Inflow = 4.99 cfs @ 12.14 hrs, Volume= 0.417 af
Primary = 4.96 cfs @ 12.14 hrs, Volume= 0.417 af, Atten= 1%, Lag= 0.4 min
Routed to Link DP4 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

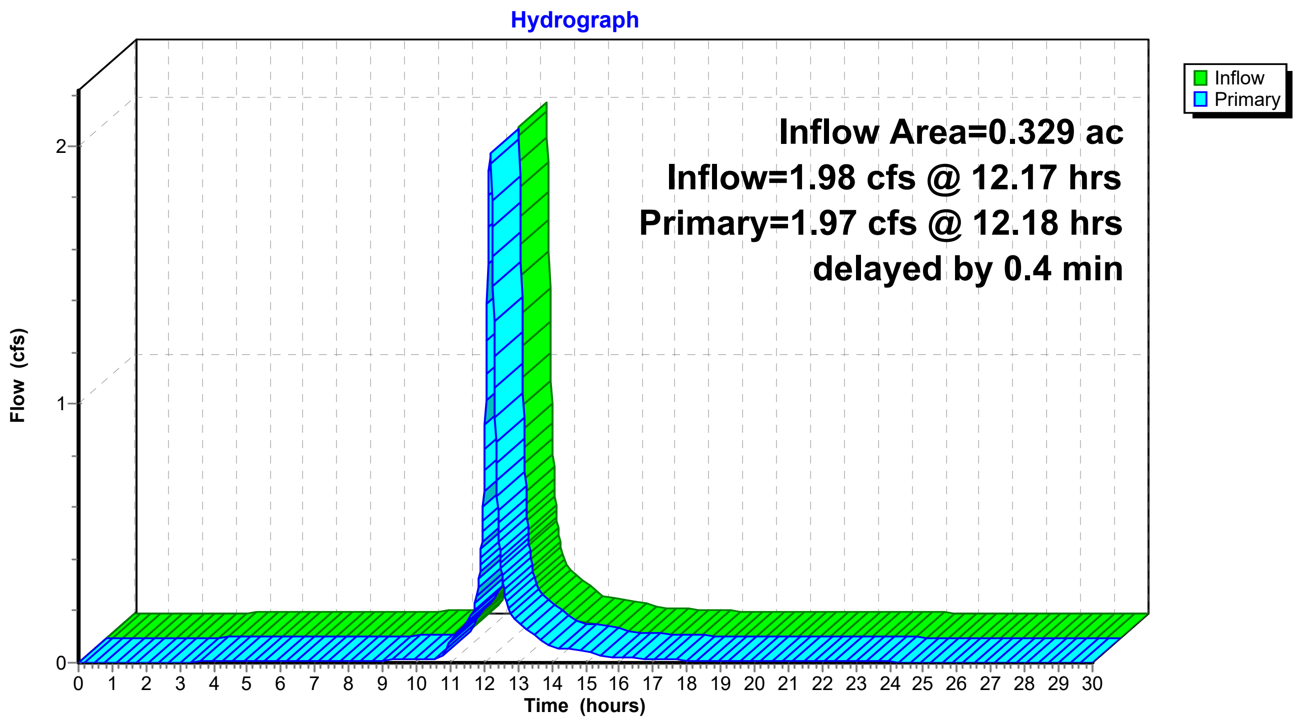


Summary for Link DP3-1: Chestnut St. Drain Manhole (DMH 3)

Inflow Area = 0.329 ac, 85.14% Impervious, Inflow Depth = 3.71" for 100-Year event
Inflow = 1.98 cfs @ 12.17 hrs, Volume= 0.102 af
Primary = 1.97 cfs @ 12.18 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.4 min
Routed to Link DP4-1 : Chestnut St. Drain Manhole (DMH 4)

Primary outflow = Inflow delayed by 0.4 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

Link DP3-1: Chestnut St. Drain Manhole (DMH 3)

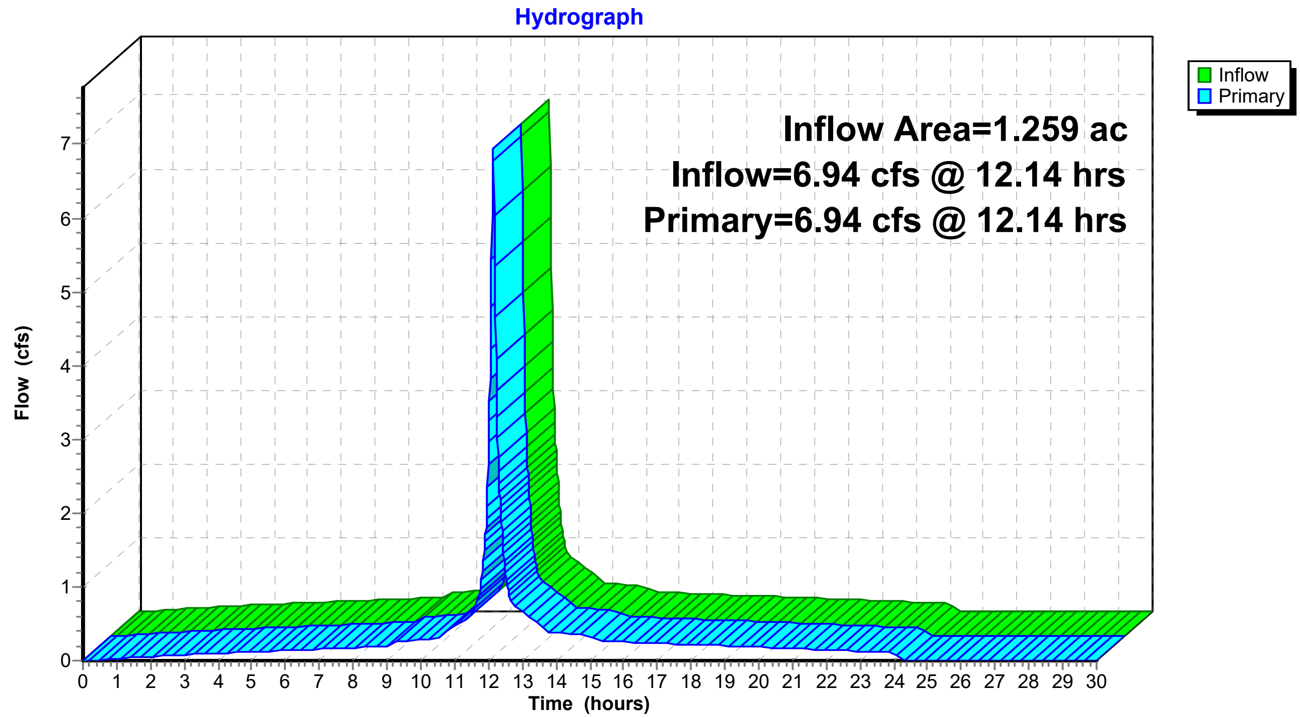


Summary for Link DP4: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 69.90% Impervious, Inflow Depth = 5.64" for 100-Year event
Inflow = 6.94 cfs @ 12.14 hrs, Volume= 0.591 af
Primary = 6.94 cfs @ 12.14 hrs, Volume= 0.591 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

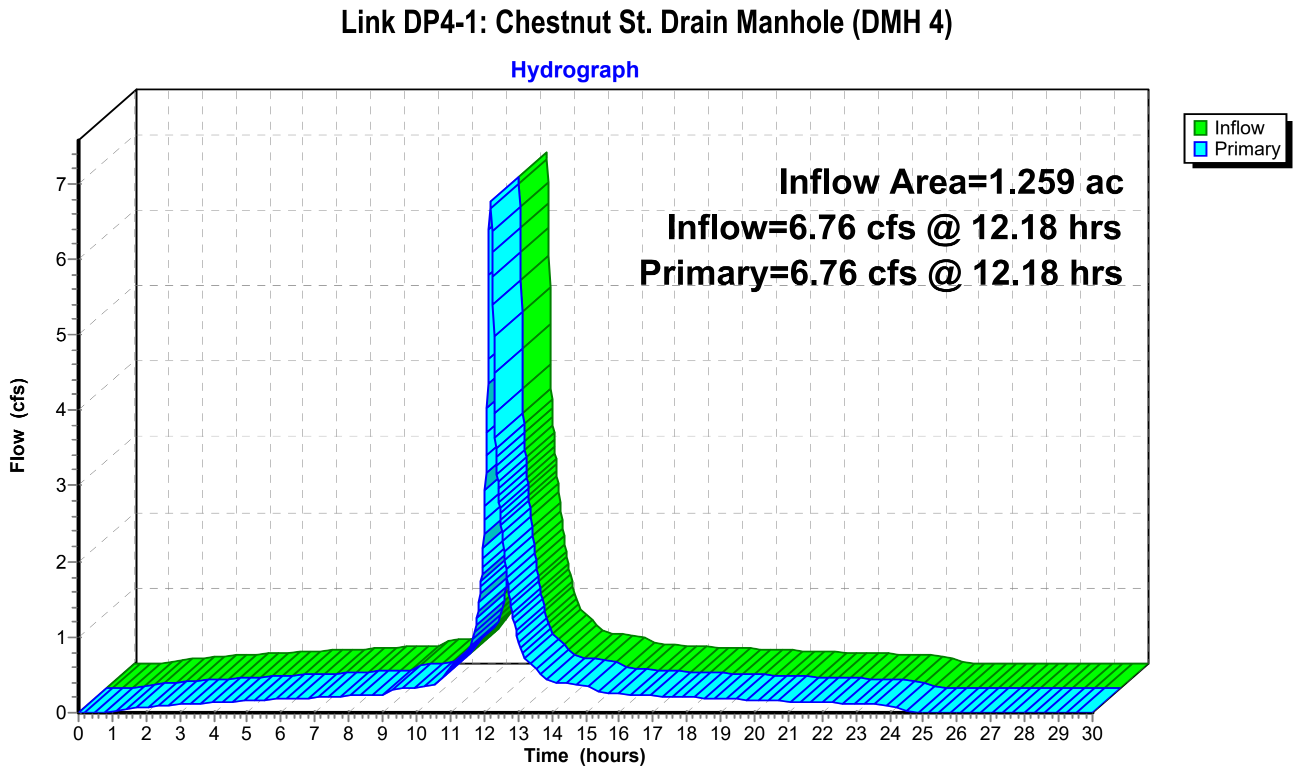
Link DP4: Chestnut St. Drain Manhole (DMH 4)



Summary for Link DP4-1: Chestnut St. Drain Manhole (DMH 4)

Inflow Area = 1.259 ac, 92.15% Impervious, Inflow Depth = 6.71" for 100-Year event
Inflow = 6.76 cfs @ 12.18 hrs, Volume= 0.704 af
Primary = 6.76 cfs @ 12.18 hrs, Volume= 0.704 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

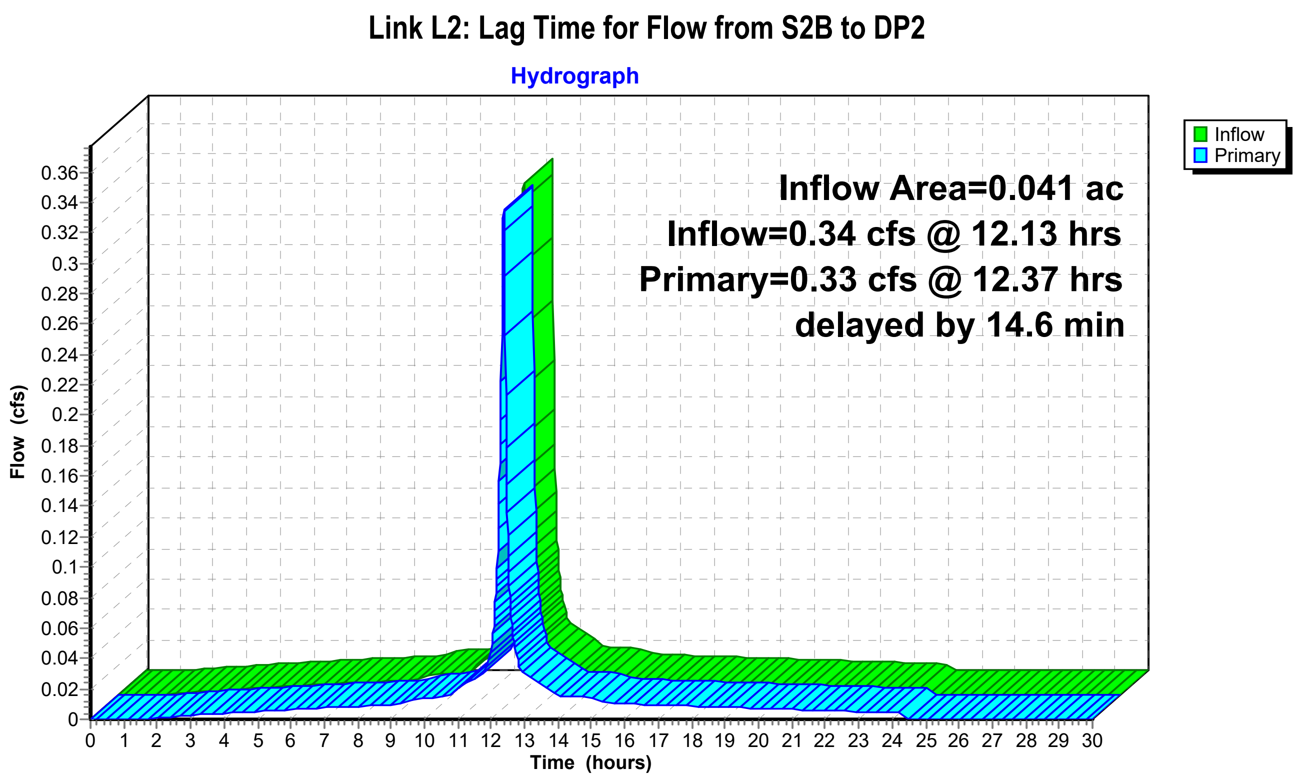


Summary for Link L2: Lag Time for Flow from S2B to DP2

Lag time for this node is the sum of the Tc of Node S2C and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.041 ac, 93.46% Impervious, Inflow Depth = 7.39" for 100-Year event
Inflow = 0.34 cfs @ 12.13 hrs, Volume= 0.025 af
Primary = 0.33 cfs @ 12.37 hrs, Volume= 0.025 af, Atten= 0%, Lag= 14.6 min
Routed to Link DP2 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 14.6 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



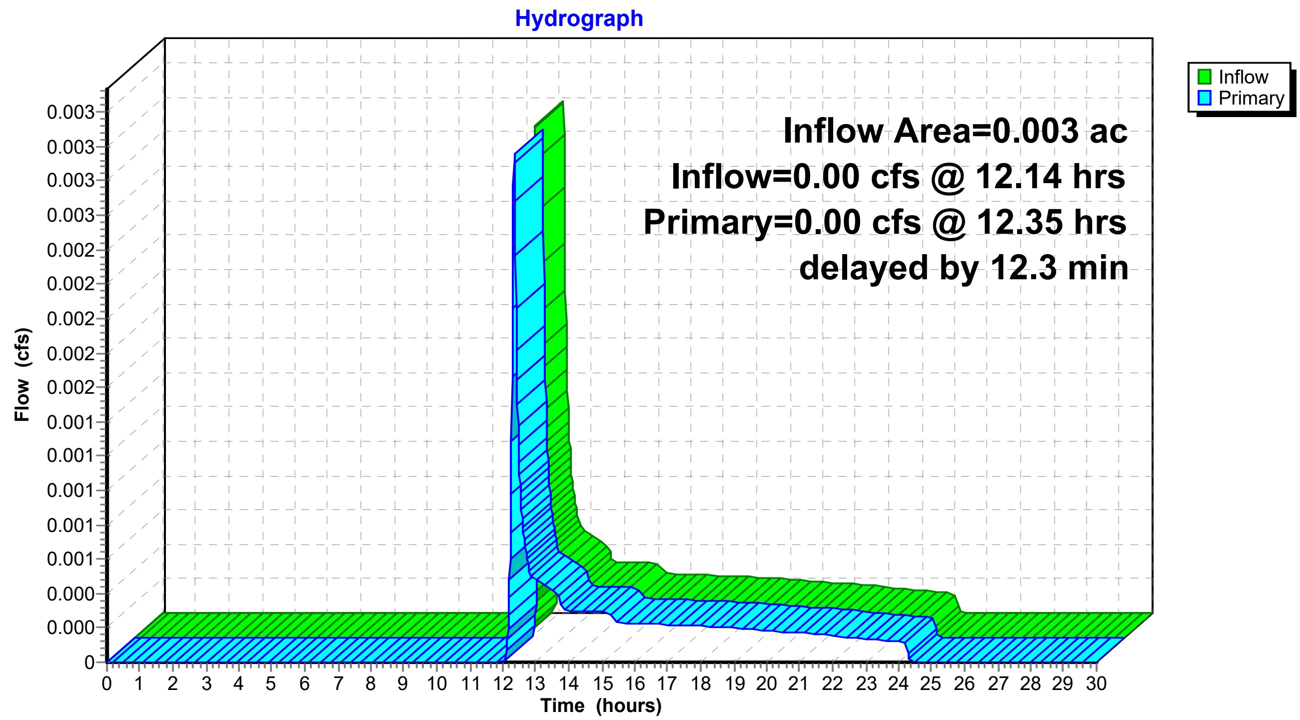
Summary for Link L2-1: Lag Time for Flow from S2B-1 to DP2-1

Lag time for this node is the sum of the Tc of Node S2C-1 and the sheet flow calculation on line 4 of the Tc calculations of the Extra Tc Calc's node. This time was not included in the Tc calculations for S2B so that node could accurately represent the flow of runoff discharged onto Lot 214.

Inflow Area = 0.003 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-Year event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.35 hrs, Volume= 0.000 af, Atten= 1%, Lag= 12.3 min
Routed to Link DP2-1 : Overland to City Drain (CB 8) via Lot 97

Primary outflow = Inflow delayed by 12.3 min, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs

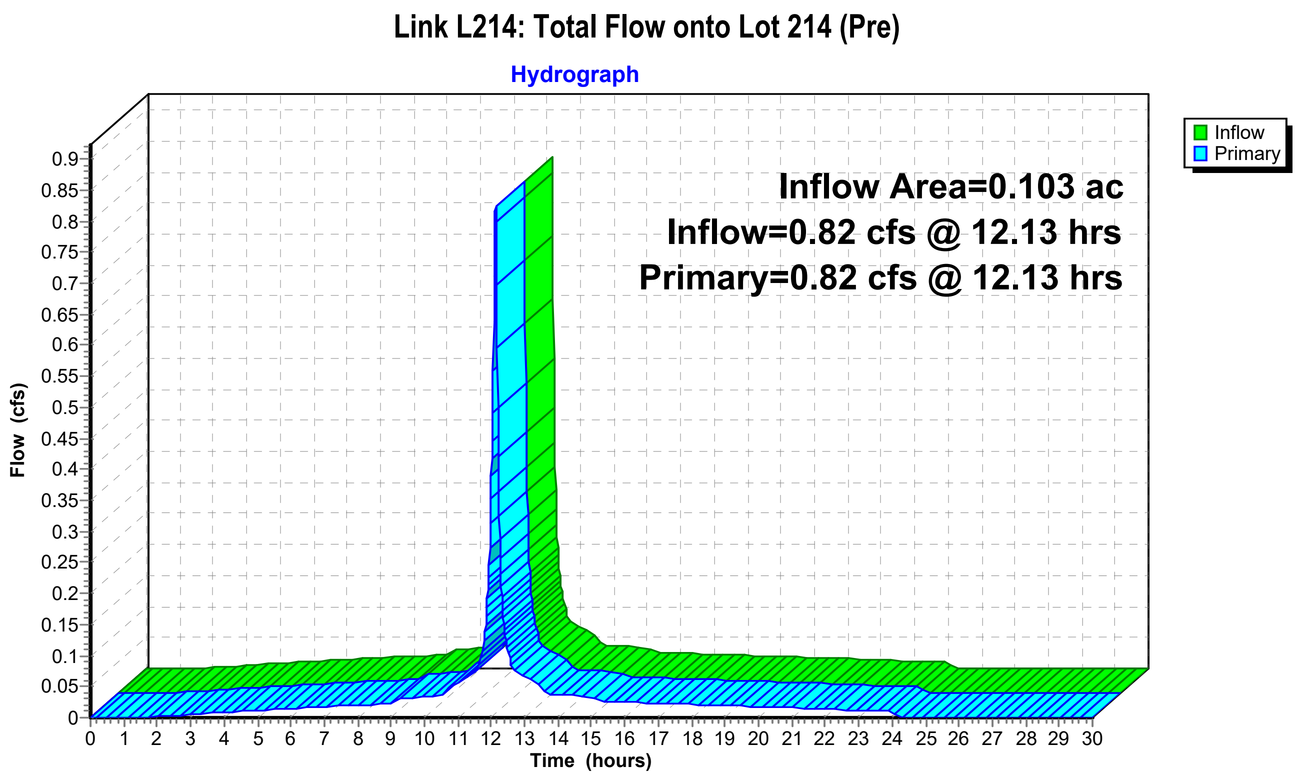
Link L2-1: Lag Time for Flow from S2B-1 to DP2-1



Summary for Link L214: Total Flow onto Lot 214 (Pre)

Inflow Area = 0.103 ac, 90.17% Impervious, Inflow Depth = 7.18" for 100-Year event
Inflow = 0.82 cfs @ 12.13 hrs, Volume= 0.061 af
Primary = 0.82 cfs @ 12.13 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

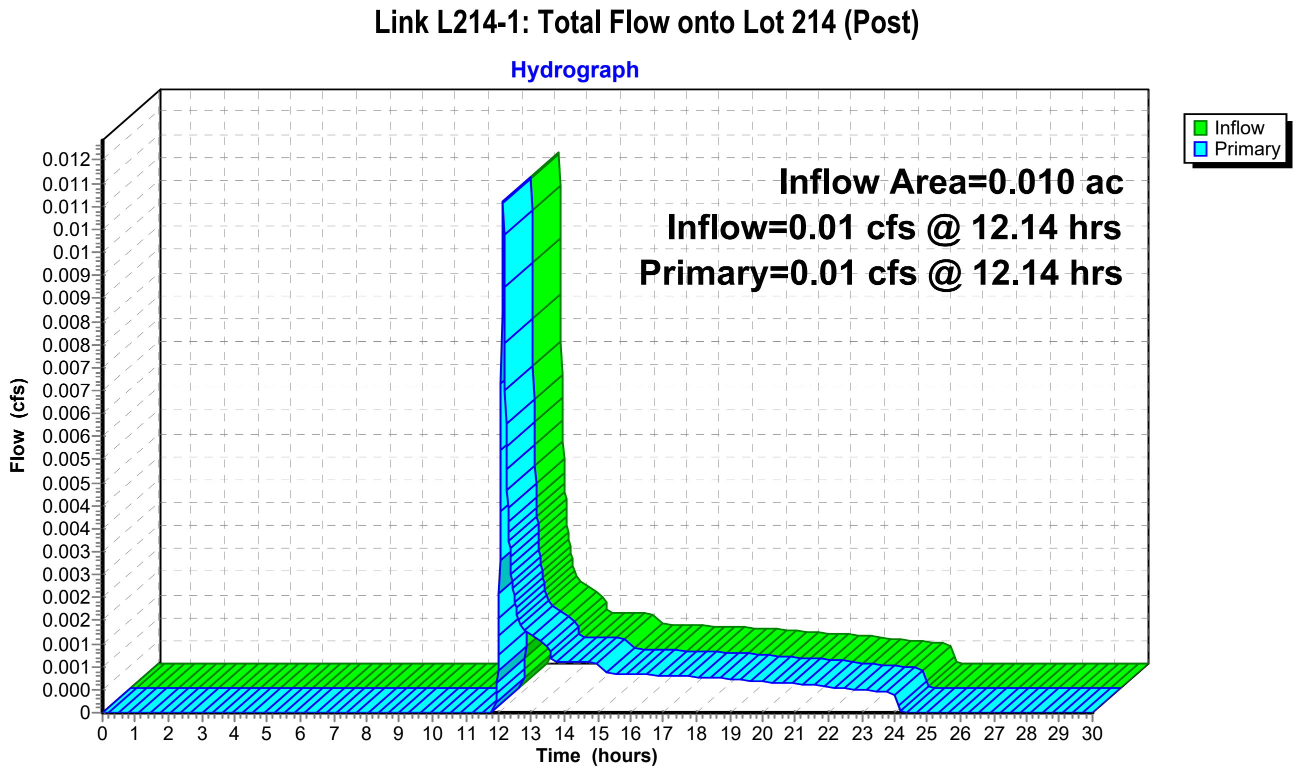
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



Summary for Link L214-1: Total Flow onto Lot 214 (Post)

Inflow Area =	0.010 ac,	0.00% Impervious, Inflow Depth = 1.20"	for 100-Year event	
Inflow =	0.01 cfs @	12.14 hrs, Volume=	0.001 af	
Primary =	0.01 cfs @	12.14 hrs, Volume=	0.001 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.015 hrs



ATTACHMENT 5

STORMWATER MANAGEMENT OPERATION & MAINTENANCE PLAN

MILLENNIUM ENGINEERING, INC.
Land Surveyors and Civil Engineers

LONG-TERM POLLUTION PREVENTION AND OPERATION & MAINTENANCE PLAN FOR STORMWATER MANAGEMENT

AT

OAK STREET LOFTS
9 OAKLAND ST.
AMESBURY, MA

<u>PREPARED FOR</u>

9 OAKLAND STREET LLC.
PO BOX 999
DANVILLE, NH 03819

DATE: 5/19/2026

STEPHEN B.
SAWYER
CIVIL
No. 38[illegible]

MEI

Massachusetts:

62 Elm Street
Salisbury, MA 01952
Phone: 978-463-8980

New Hampshire:

13 Hampton Road
Exeter, NH 03833
Phone: 603-778-0528

INTRODUCTION

This long-term Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the City of Amesbury, shall be implemented for the proposed Oak Street Lofts redevelopment to ensure that the stormwater management system functions as designed. The Owner holds the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. At the time of this writing, the cost of annual maintenance activities for the stormwater BMP's is estimated to be $4,500.00/year. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the number of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, and prohibitions on the use of pesticides.

The purpose of the Stormwater Operations and Maintenance (O&M) plan is to ensure inspection of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities.

The ongoing responsibility is the Owner, its successors, and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Curt Sweet – 978-815-1853
9 Oakland Street LLC
PO Box 999
Danville, NH

ILLICIT DISCHARGE COMPLIANCE STATEMENT:

I,____________________________ (Signing on behalf of the owner Sweet Management, Inc.) verify that all illicit discharges to the stormwater management system are prohibited and no illicit discharges exist on the site.

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POST CONSTRUCTION BMP'S

1.Snow & Snow Melt Management

Maintenance Activities: Storage and removal of snow. Application of deicing compounds and management of snowmelt. Snow will be stored in areas adjacent to the edge of the roadway and/or within the areas shown on the project plans. Stored snow must be allowed to melt naturally. Alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

Activity Frequency: Seasonally.

Activity Purpose: Minimize the likelihood of a sudden high flow or a sudden increase in the pollutant concentration caused by rapid melting.

2.Proprietary Water Quality Catch Basins

Maintenance Activities: Visual inspection, removal of collected sediment and other debris. Sediment and debris must be disposed of at a landfill or other facility that has been approved by MADEP to accept them. As with any proprietary BMP, always check with the manufacturer for additional maintenance requirements.

Activity Frequency: Four visual inspections per year. If debris is observed during the inspection, remove it immediately. Sediment must be removed from the sump as needed to prevent six or more inches of from accumulating. As with any proprietary BMP, always check with the manufacturer regarding the frequency of additional maintenance requirements.

Activity Purpose: Prevent debris clogs from reducing discharge capacity. Prevent floating hydrocarbons like oils and gasoline from reaching the infiltration chambers where they could be released into the groundwater. Prevent sediment from accumulating to the point where it can be resuspended and carried out of the catch basin.

3.Infiltration Chamber

Maintenance Activities: Visual inspection, removal of collected sediment and other debris. Sediment and other grit can be removed manually with buckets and shovels or mechanically with a vacuum truck. Personnel shall be advised that entering the chambers is considered a confined space and shall take safety measures per OHSA confined space requirements.

Activity Frequency: During the first 4 months of operation, visually inspect the chambers after any storm that drops more than one inch of rain within a 24-hr period. After the first four months, chambers must be inspected no less than twice per year; once in late spring/early summer, and once in the autumn before snow begins to fall. Any debris found during an inspection should be removed immediately, and sediment should be removed frequently enough that no more than three inches is ever allowed to accumulate. If the chamber takes more than 48 hours to fully drain, remove all accumulated sediment regardless of how much has accumulated.

Inspect the outlet standpipe to confirm all openings are free and clear of debris.

Purpose of Activity: The chamber cannot function properly if excessive sediment is allowed to build up. If this happens, storms that the chambers were designed to handle will instead overwhelm them; and pressurize the water within them. This excess pressure causes sediment and other pollutants to escape.

4. Garage S.W. Holding Tank

Maintenance Activities: Visual inspection, removal of collected sediment and other debris. Sediment and other grit can be removed manually with buckets and shovels or mechanically with a vacuum truck. Personnel shall be advised that entering the chambers is considered a confined space and shall take safety measures per OHSA confined space requirements.

Activity Frequency: During the first 4 months of operation, visually inspect the chambers after any storm that drops more than one inch of rain within a 24-hr period. After the first four months, chambers must be inspected no less than twice per year; once in late spring/early summer, and once in autumn before snow begins to fall. Any debris found during an inspection should be removed immediately, and sediment should be removed frequently enough that no more than three inches is ever allowed to accumulate. If the chamber takes more than 48 hours to fully drain, remove all accumulated sediment regardless of how much has accumulated.

Inspect the outlet standpipe to confirm all openings are free and clear of debris.

5. Area Drain

Maintenance Activities: Visual inspection, removal of collected sediment and other debris. Sediment and other grit can be removed manually with buckets and shovels

Activity Frequency: During the first 4 months of operation, visually inspect the chambers after any storm that drops more than one inch of rain within a 24-hr period. After the first four months, chambers must be inspected no less than twice per year; once in late spring/early summer, and once in autumn before snow begins to fall. Any debris found during an inspection should be removed immediately, and sediment should be removed frequently enough that no more than 2 inches is ever allowed to accumulate.

5. Trench Drain

Maintenance Activities: Visual inspection, removal of collected sediment and other debris. Sediment and other grit can be removed manually with buckets and shovels or by vacuum truck

Activity Frequency: During the first 4 months of operation, visually inspect the chambers after any storm that drops more than one inch of rain within a 24-hr period. After the first four months, chambers must be inspected no less than twice per year; once in late spring/early summer, and once in autumn before snow begins to fall. Any debris found during an inspection should be removed immediately, and sediment should be removed frequently enough that no more than 1 inch is ever allowed to accumulate.

LONG-TERM OPERATION AND MAINTENANCE PLAN

Good Housekeeping

The site shall be regularly inspected for any trash and debris. Any trash or debris shall be picked up and placed into waste containers.

Storing of Materials & Waste Products Inside or Under Cover

It is not anticipated that there will be storing of materials or waste products on site. If any materials are to be stored, they shall be stored inside or under cover.

Spill Control/Notification Practices

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill control, notification, and cleanup:

a) Manufacturer's recommended methods for spill cleanup will be clearly posted, and project area personnel will be informed of the procedures and the location of the information and cleanup supplies.
b) Materials and equipment necessary for spill cleanup will be kept in the material storage area on- site. Equipment and materials will include, but will not be limited to, shovels, wheelbarrows, brooms, dust pans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
c) All spills will be cleaned up immediately after discovery.
d) The spill area will be kept well ventilated, and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
e) Spills of toxic or hazardous material in excess of reportable quantities, as established in the Massachusetts Contingency Plan (MCP), will be reported to the Massachusetts Department of Environmental Protection Division of Hazardous Waste [617) 292-5851 or (978) 661-7679].
f) The construction superintendent responsible for the daily operations will be the spill prevention and cleanup coordinator. He will designate at least three other project area personnel to receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of the responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

Lawn Care & Landscaping

All lawn clippings, leaves, mulch, and any other landscaping items shall be kept out of storm drains. The use of pesticides and fertilizers on the lawn shall never be applied before a rain event. Only approved aquatic safe herbicides shall be allowed. The application of any fertilizers or pesticides shall be in accordance with the Manufacturer’s specifications.

Vehicle Washing

No harmful soaps or chemicals that are detrimental to the environment may be used in washing of cars or other items on the property.

Pet Waste Collection
Pet owners shall be responsible for picking up and disposing of all pet waste into waste containers.

Waste Collection
All trash and waste shall be placed in the dumpster on site. The cover to the dumpster shall remain closed at all times. Any trash or debris found on site shall be disposed of in the dumpster. Regular pickup of the dumpster shall occur to avoid the waste exceeding the dumpster capacity.

Street Sweeping
The driveway, parking lot, sidewalks, and patios shall be swept every spring season after the last snowfall. All sediment shall be removed and discarded off the property in accordance with all Local, State and Federal regulations.

Training
The individual who will be responsible for the inspection and maintenance of the stormwater system shall be trained by the previous person responsible or by contacting a local engineer for assistance.

REPORTING

Provide copies of the inspection reports to the Amesbury DPW located at 39 South Hunt Road, Amesbury MA on an annual basis in accordance with EPA NPDES MS4 reporting requirements.

Stormwater System Inspection Report

General Information			
Location: OAKLAND STREET LOFTS			
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Purpose of Inspection			

Site-Specific Stormwater Devices

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
1	Snow Removal	❑Yes ❑No		
2	Water Quality Catch Basin	❑Yes ❑No		
3	Infiltration Chambers	❑Yes ❑No		
4	Garage S.W. Holding Tank	❑Yes ❑No		
5	Area Drains			
6	Trench Drain	❑Yes ❑No		

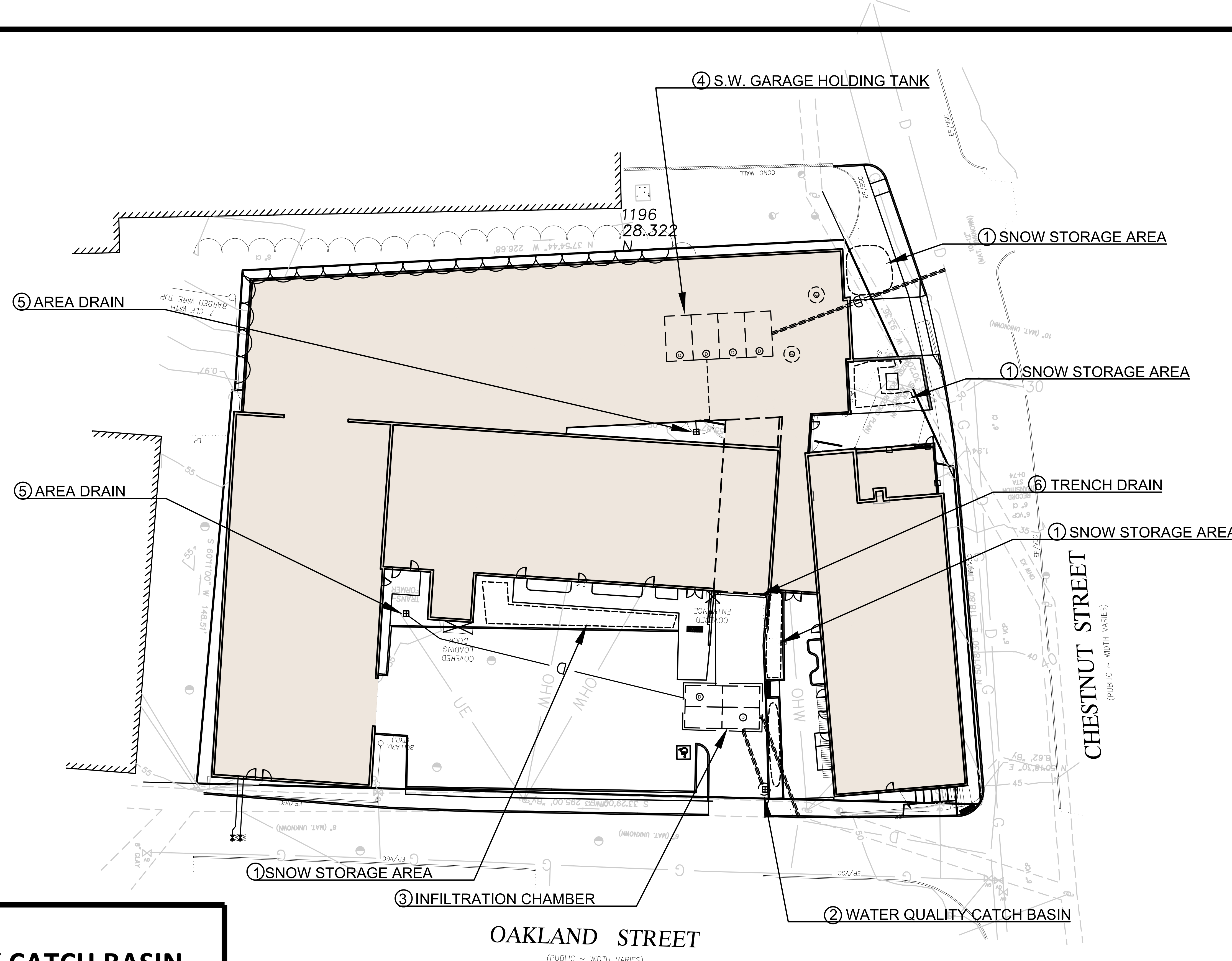
Certification Statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name: ___________________________________

Signature: ____________________________________

Date: __________________



1. SNOW STORAGE
2. WATER QUALITY CATCH BASIN
3. INFILTRATION CHAMBER
4. GARAGE S.W. HOLDING TANK
5. AREA DRAINS
7. TRENCH DRAIN

9 Oakland Sreet Oakland Street Lofts Amesbury MA SITE NAME/ADDRESS	Operation & Maintenance KEY PLAN SHEET NAME	O&M 1 SHEET #	DR BY: GS/SBS CHK BY: SBS PROJ NO.: 9 OAKLAND DATE:5/19/26 SCALE:N.T.S.

ATTACHMENT 6

WATER QUALITY CALCULATIONS FOR STC450I STORMCEPTOR BY CONTECH E.S.

Project: Carriage Hill Lofts
Location: Amesbury, MA
Prepared For: Millennium Engineering

CONTECH ENGINEERED SOLUTIONS

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1 of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 3 or Table in Figure 4. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (P)$$

where
:

Q = flow rate associated with first 1 of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
P = water quality volume in watershed inches (1 in this case)
WQV = impervious area (sq ft) * rainfall depth (P)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	P (in)	WQv (cu ft) (Total)	qu (csm/in.)	Q (cfs)
HDS Unit	0.24	0.0003734	6.0	0.100	1.00	867.6	752.00	0.28

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.

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Brief Stormceptor Sizing Report - HDS Unit

Project Information & Location			
Project Name	Carriage Hill Lofts	**Project Number**	902405
City	Amesbury	**State/ Province**	Massachusetts
Country	United States of America	**Date**	3/27/2026
Designer Information		**EOR Information (optional)**	
Name	Josh Stackhouse	**Name**	
Company	Contech Engineered Solutions	**Company**	
Phone #	207-219-9110	**Phone #**	
Email	jstackhouse@conteches.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	HDS Unit
Target TSS Removal (%)	80
TSS Removal (%) Provided	93
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	93
STC 900	96
STC 1200	96
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	98
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

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Sizing Details

Drainage Area	
Total Area (acres)	0.24
Imperviousness %	100.0

Rainfall	
Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

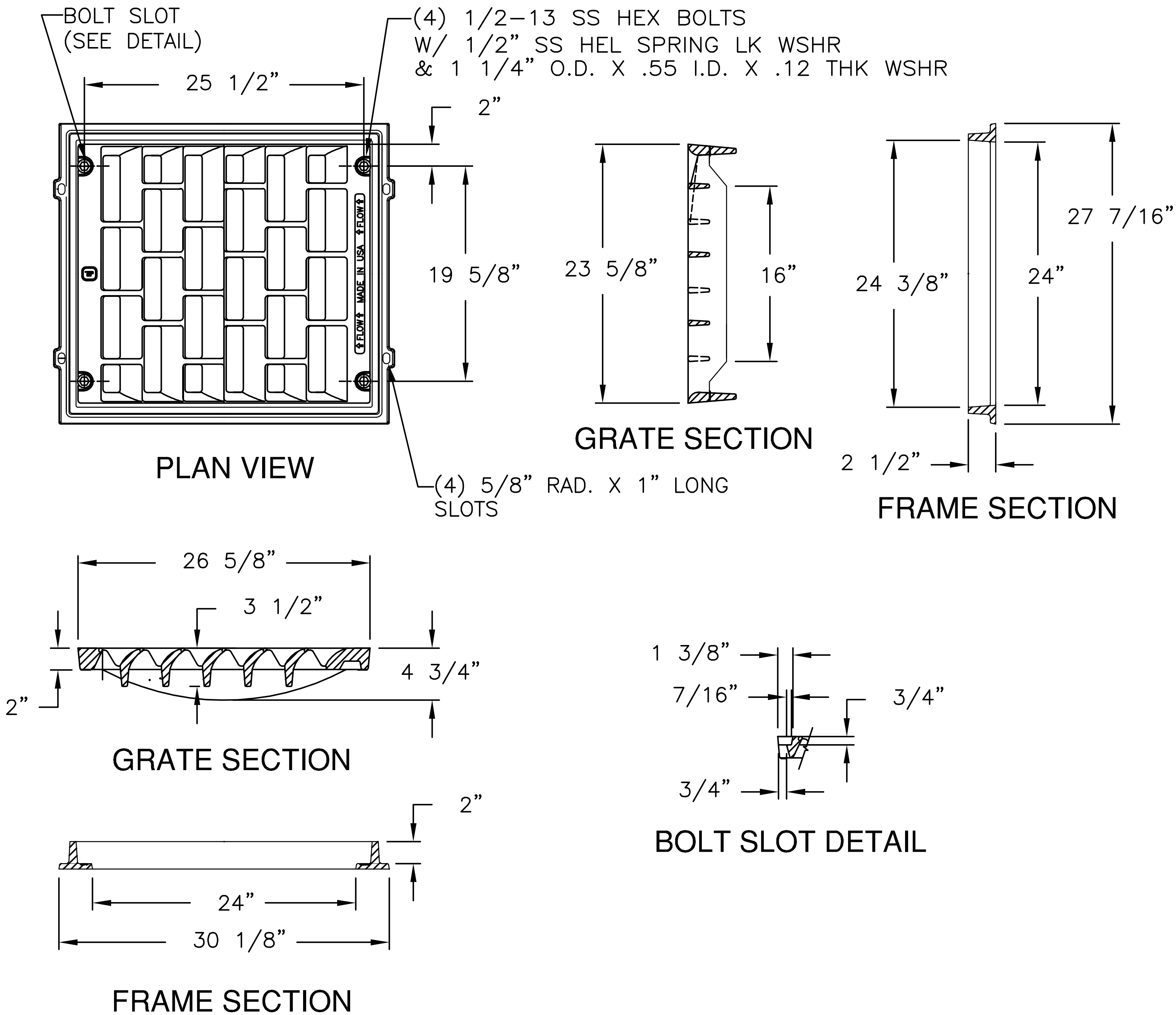
Particle Size Distribution (PSD) The selected PSD defines TSS removal		
OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

5358Z1 5358M Assembly



Product Number

00535801

Design Features

-Materials
  Frame
    Gray Iron (CL35B)
  Grate
    Gray Iron (CL35B)

-Design Load
  Heavy Duty
-Open Area
  245 Sq. Inches
-Coating
  Undipped
- √ Designates Machined Surface

Certification

-
- AASHTO M306
- ASTM A48
-Country of Origin: USA

Major Components

00535811
00535831

Drawing Revision

03/08/2005 Designer: DEW
3/8/2018 Revised By: MAH

Disclaimer

Weights (lbs./kg) dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

Contact

800 626 4653
ejco.com

Weir Flow Calculator

Calculator type: Flow
Length (inches): 24
Width (inches): 24
Grate type - shape: Catch Basin Inlet - Rectangle/Square

Results:

Water Depth (IN):	Flow Capacity (CFS):
1	0.6
2	1.8
3	3.3