16 Great Neck Road North
Mashpee, Massachusetts 02649

Meeting of the Mashpee Planning Board
Wednesday, April 19, 2023
Waquoit Meeting Room
Mashpee Town Hall
16 Great Neck Road North
Mashpee, MA 02649
6:00 PM
Broadcast Live on Local Channel 18
Streamed Live on the Town of Mashpee Website: https://www.mashpeema.gov/channel-18

Call Meeting to Order

- Pledge of Allegiance

Approval of Minutes

- Review of Meeting Minutes from January 25, 2023, March 1, 2023 and March 8, 2023, and March 15, 2023, and March 29, 2023

Local Comprehensive Plan Update

- Summary of public opinion survey and community engagement workshops/events
- Finalize Proposed Vision Statement
- Finalize questions, comments and any edits of proposed goals, policies, and actions in preparation for the May 17 meeting with Weston and Sampson.

Public Hearings

7:10 PM To review the following zoning articles proposed for action at the May 2, 2023 Town Meeting:

Warrant Article 30:	To see if the Town will vote to amend §174-25 (H)(12) of the Mashpee Zoning By Law "Table of Use Regulations" to allow for medium and large scale solar energy systems in the C-1 and C-2 Zoning Districts.
Warrant Article 31:	To see if the Town will vote to amend §174-31, Land Space Requirements Table to allow for a reduced minimum lot frontage requirements for medium and large scale solar energy systems in the C-1 and C-2 Zoning Districts
Warrant Article 32:	To see if the Town will vote to add new section 174-45.7: Solar Energy Systems to the Mashpee Zoning Bylaws
Warrant Article 43:	To see if the Town will vote to amend §174-25 (H)(12) of the Mashpee Zoning By Law "Table of Use Regulations" to allow for medium and large scale solar energy systems in the C-1 and C-2 Zoning Districts. (Submitted by Petition)
Warramt Article 44	To see if the Town will vote to add new section 174-45.7: Solar Energy Systems to the Mashpee Zoning Bylaws (Submitted by Petition)
Warrant Article 45	To see if the Town will vote to amend the Zoning Bylaws by deleting in its entirety section §174-17.1 Raze and Replace. (Submitted by petition)

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Public Hearings (continued)

7:30 PM (Continued from 03/29/2023)

Applicant: Southworth Mashpee Properties LLC
Location: 275 Quinaquisset Avenue (Map 69 Block 32)
Request: Applicant proposes to modify the Willowbend Country Club Special Permit to construct a 14-unit single family cottage community immediately contiguous to the Willowbend Golf Course. With these changes the total unit count for the Willowbend project would be increased to 287 if the Board authorizes the annexation of 275 Quinaquisset into the Willowbend Special Permit as allowed. 287 dwelling units is the maximum number of dwelling units authorized under the Special Permit. All units will be connected to and served by the existing privately owned wastewater treatment plant which serves the entire Willowbend project.

New Business

- Lisciotti Development requests that the security being held by the Town for completion of the Sherwin Williams Project be reduced to $0.00 after completing construction in accordance with the approved plans.

Old Business

- Affordable and Workforce Housing
  - ADU Workshop
  - HPP
  - Regional Housing Strategy
- Clean Water Initiative
  - Floodplain Development Zoning
  - Tree Protection bylaw

Chairman's Report

Town Planner Report

- District Local Technical Assistance funding request

Board Engineer Report

- Project Reviews and Inspections

Correspondence

- Chapter 91 Waterways Planning Board Notice - Amy Branton, Trustee, Amy Emily Nominee Trust, John A. & Maria Rousou (permittee) – 90 & 94 Summersea Road (location)
- Chapter 91 Waterways Planning Board Notice – Rodney Collins, Town Manager, Town of Mashpee (permittee) – 388 Mashpee Neck Road (location)
- Town of Falmouth Notices
- Town of Sandwich Notices
- Town of Barnstable Notices
- February 2023 Discharge Monitoring Report for South Cape Village – N = 4.0
- January 2023 Discharge Monitoring Report for South Cape Village – N = 5.1

Additional Topics (not reasonably anticipated by Chair)

Adjournment

Town of Mashpee Planning Board

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Mashpee, Massachusetts 02649

Mashpee Planning Board
Minutes of Meeting
Wednesday, March 1, 2023 at 7:00PM
Mashpee Town Hall - Waquoit Meeting Room
16 Great Neck Road North
Mashpee, Ma 02649

Broadcast Live on Local Channel 18
Call-in Conference Number: (508)-539-1400 x 8585
Streamed Live on the Town of Mashpee website
https://www.mashpeema.gov/channel -18

Present: Chair Mary Waygan, Dennis Balzarini, Mike Richardson, Karen Faulkner

Also Present: Evan Lehrer – Town Planner, Jack McElhinney – Attorney for Southworth, Matthew Eddy- Baxter Nye Engineering & Surveying, Troy Miller (Zoom) – Southworth Development

Absent: Rob Hansen, John Fulone

CALL TO ORDER
Chairwoman Waygan called the meeting of the Planning Board to order at 7:00PM. The Pledge of Allegiance was recited.

APPROVAL OF MEETING MINUTES – February 1, 2023
No comments were made regarding the meeting minutes for February 1, 2023.

MOTION:
Mr. Richardson made a motion to accept the meeting minutes for February 1, 2023 as written. Seconded by Mr. Balzarini. All in favor.

PUBLIC HEARING
7:10PM (Continued from 01/18/2023)

Applicant: Southworth Mashpee Properties, LLC
Location: 275 Quinaquisset Avenue (Map 69 Block 32)
Request: Applicant proposes to modify the Willowbend Country Club Special Permit to construct a 14-unit single family cottage community immediately contiguous to the Willowbend Golf Course. With these changes the total unit count for the Willowbend project would be increased to 287 if the Board authorizes the annexation of 275 Quinaquisset into the Willowbend Special Permit as allowed. 287

dwelling units is the maximum number of dwelling units authorized under the Special Permit. All units will be connected to and served by the existing privately owned wastewater treatment plant which serves the entire Willowbend project.

Attorney Jack McElhinney is present tonight representing Southworth Properties. Joining him is Matthew Eddy with Baxter Nye Surveying, Troy Miller from Southworth via Zoom, and Dennis Ring, the President for construction at Southworth is also present. As the Public Hearing notice indicated, they are proposing 14 single family cottages on a 5 acre parcel known as 275 Quinaquisset Ave. It was acquired by Southworth in 2019 and is currently home to a single family 5 bedroom serviced with septic. This single piece is surrounded by the entire golf course, 5 acres surrounded by 400 acres of development. It was not part of the original Special Permit back in 1987. There have been discussions with the Board about including this in a town-wide initiative to develop a cottage colony bylaw for small infill projects, but after input that proposal was not pursued. They are seeking to proceed under section 174-29 C9, which allows the Board to modify a Special Permit to annex in contiguous land, and under Special Permit it does not expand available units or decrease open space. By adding 5 acres it will not allow increase to the original permit limit, but they can relocate some permits onto this piece which is what they are proposing. The current maximum units are fixed at 287, of which 274 have previously been approved by this Board and constructed, with exception to a handful of lots. They would like to reallocate the remaining 13 permits to this parcel and reclaim one permit from North Glen Drive which was a double lot bought by a single owner who decided to install a pool, but there is a restriction that second property would never be built on. There is one question regarding the original permit having a condition to require 100 ft. buffer along Quinaquisset Ave. maintained in a vegetative state included as an original condition. The bylaw at that time required a minimum vegetative buffer of 40 ft. The Board had discretion to impose greater and did, but it has legal authority to require with this in excess of 40 feet. The project will entail wetland impacts, significant mitigation efforts which will involve the retirement of a 2.5 acre active cranberry bog. They are proposing to abandon any active agriculture and restore natural vegetation and species to allow the whole area to re-naturalize over 2 acres, thus will improve overall water quality at Shoestring Bay and Quaker Run.

Matt Eddy added in addition, they met with Design Review and Plan Review on February 21st and received some recommendations. They will be going through Conservation and have intent on filing next week. The lot is in the center of Willowbend. Existing conditions have it as 275 Quinaquisset Ave. It is approximately 5.06 acres with 1.5 acres of wetland. It contains isolated and bordering vegetative wetlands, cranberry bogs, and Quaker Run. There are 4 bogs in total. The existing dwelling is a single family house with 5 BR, septic, driveway and a fair amount of ground disturbance. The larger isolated wetland is an old bog that has been discontinued and has reforested itself. Two small pockets of isolated wetland are excavated

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pits that used sand to process growing the cranberries and over time grew vegetation and isolated wetlands. There is a 200 ft. buffer off of the project where there is a river front. The property is currently zoned R3 and the house has public water service, natural gas, road frontage, and overhead electric. The bog access road marks the property line for the site.

A slide of the master layout plan was displayed with the existing single family. It will be raised and they are proposing 14 single family detached homes with detached garages that accompany each home. Each garage will have two garage bays. To the east side of the project will be a golf amenity with a putting and chipping area comprised of 2,400 sq. ft. They will be providing 40 ft. setback from Quinaquisset Ave and revegetate and enhance the buffer area. Willowbend is working on landscape plans for the entrance and each lot. The pedestrian access will have seashell rows. There will be a shell golf cart path along Quinaquisset Ave. The golf cart path ties into the existing path network with a crosswalk to the right across Quinaquisset where the paths connect back and up to the clubhouse. There is a snack shack that sits at the tee of the bog 1 hole. Access allows a 16 ft. wide paved road with Cape Cod berm totaling 18 ft. to the edge with a 7 ft. seashell surface shoulder along the roads edge. The entrance will be gated. It's just arm control for access through keypad and keycards. Entrance is relocated 120 ft. to the existing driveway. Length of the road is 400 ft. with turn around radius reviewed by the Fire Department and Plan Review approved the layout and width. Parking allows 2 parking spaces per unit, one garage and one driveway space in front of garage. The back appendage on the footprint is a golf cart bay to park a golf cart at the unit.

The storm water management system is a significant design that follows DEP policy. They provide catch basins for overall storm water and drainage. Those tie in and discharge into fore bays along the backs of homes and vegetative buffer strips. This design meets 2, 10, 25, and 100 year storms for runoff. Water quality is met and exceeded, TSS removal water recharge graded 80%, and Quinaquisset runoff is going into wetland. Runoff is being picked up from Quinaquisset and put through 2 forebays so a portion of Quinaquisset that comes into the site is being treated. This project is providing a benefit that doesn't currently exist. Plan Review and the Director of DPW asked them to add some Cape Cod berm edge treatment that currently doesn't exist along frontage and it was agreed upon. A forebay is a vegetative depression that runoff enters into and allows water to pond and slow down where velocities are near zero and particulates settle out. As water reaches certain elevations and overflow and continues downstream, treatment continues in a trained system. Their correct name is sediment forebay. There are 5-6 of them throughout and it was a lot of effort to address this quality of water runoff. The environment will benefit from the improvements to water quality by this project. Taking active cranberry bogs offline is just one overall benefit.

Ms. Waygan watched the informal discussion with the Conservation Commission and one member talked about excess water on Quinaquisset Ave. Is this plan going to draw water off?

Mr. Eddy explained that right now Quinaquisset Ave's high point is to the west and it drains down the road to the east so there is no drainage on that section. With no edge treatment, water goes along the edge of road and erosion and sediment materials come off the road during any rainfall and enters into the wetland system downstream. They are proposing that area coming off of Quinaquisset is being picked up and running it through forebays to treat it before it continues. He explained riprap as large stones that protect soil from erosion in high flow areas.

They plan on extending water into the development and providing two fire hydrants. Plan Review suggested a second hydrant at the entrance. The Willowbend wastewater sewer collection system will be extended to this property. The gravity line to that pump and wet well will be extended to the entire project allowing connection to the plant. All 14 homes will each have three bedrooms and less nitrogen going into the groundwater as opposed to the lots being divided into two each comprising four bedrooms on title 5 septic. The overhead electric and communication on Quinaquisset will be brought underground. Natural gas will be brought in as well.

The green area for the course amenity constitutes the majority of wetland fill and impact. It was a prior bog that was converted so it still represents a wetland. Filling that area as a wetland mitigation for the project is the taking offline of active bogs 1, 2, and 3, and restoring to a natural wetland system. This land area is comprised of 2.5 acres. Bog 1 and 2 are on the stream system of Quaker Run, and restoration areas are significant. Mr. Eddy encouraged the Board to research cranberry bog restoration and the programs the state is running and the significant environmental benefits it possesses. A bog releases nitrogen, phosphorous, and the use of pesticides and fertilizers. With the downstream going into Shoestring Bay, this is a net benefit for environment, along with the elimination of septic, tying into wastewater to reduce nitrogen, restoring over 2.5 acres of bog to natural wetlands, and providing water quality treatment for existing Quinaquisset Ave. that doesn't currently exist, while that road currently runs into wetlands.

Mr. Balzarini stated the C3 has a hundred foot buffer and 50 ft. going to all the houses, its part of conservation filing. Direct wetland impact for golf area and buffer area would equal impact buffer 100 ft. from wetlands system. He asked about visitors and where they would be able to park. It was explained across the street at the clubhouse parking. They have never seen that lot full even in the middle of summer. Mr. Balzarini also noted cottage 6 and 7 are extremely close, and there are two locations where there are pinch points. Developers worked hard to keep in excess of 10 ft., it was discussed in Plan Review and if they can get 10ft. they will. Mr. Balzarini wants to ensure fire access is okay with that.

Ms. Waygan asked if any of this work was in the flood zone. The answer was no. Zone X is in the 500 year event. Looking at the elevation map there is no flood on site or adjacent. The wetland impact area is an acre. Ms. Waygan would like to know the square footage of the area existing disturbed and proposed disturbed. It was noted that in a big rain storm there are other ways for that water to be managed. This plan was modeled through 100 year storm, even though the site's lowest storm is 2 year, but it will be successful for up to 100, which DEP doesn't even require to control, but they still factor it in. They are controlling the run off leaving the site and it will be less that what currently leaves. Ms. Waygan would also like the number of total bedrooms already permitted. The footprint is 2,400 s.f. with the deck and garage as part of the total footprint. She wants to know the s.f. of second floor total living space. It was answered as 2,562 s.f. She inquired about affordable and the seasonality verses year round living. As of right now there are no prices established per unit, but there are 14 different styles and are in the process of discussing the construction budget, which will be in excess of $1 Million. Ms. Waygan would like the Cape Cod Commission decisions. She would like a written statement that the Fire Chief is happy with hydrants and turnaround radiuses. She also inquired if they are still testing groundwater. There is one monitored well but they want it removed. It was explained that drinking water standards were reached over a decade ago. Ms. Waygan would like the wastewater treatment testing figures or monthly reports of the last twelve months.

Mr. Balzarini asked if any ancient roadways were symbolized, there are none on this five acres, but there are several in the area that are currently marked. He noted Quaker Run is significant to the Wampanoags.

Mr. Pesce commented that this plan will require wetland alteration. He commended their pre-application meeting with the ConCom to go over intention, mitigation, and using wetland as a storm water management system. He would want to see a 24 ft. travel way, they currently have 18 ft. but he wants another couple feet on either side to support a fire truck. The wastewater plant will support the flow of 42 additional bedrooms. The Board needs to be provided the current permitting capacity. Landscape plans may come at a later date, and it will be the discretion of the Board for need of a lighting plan. There is no proposed street lighting on site. He made the point of noting the catch basins at the beginning are closer than he would like but that is up to their discretion. The file notes the intent buffer zone that is not shown up in the front eastern set of cottages. Ms. Waygan also advocates to make the entrance width wider. Mr. Eddy will reassess the turning path and discuss with Mr. Pesce.

PUBLIC COMMENT

Mike Ronhock- In looking at the original application there are 287 units, and he is curious where these permits are coming from. He asked if the conservation lawsuit got resolved. He is aware of another cluster subdivision, and when that was approved there were requirements to donate a lot for a Habitat home. He acknowledged nobody from town will be buying these. He also noted you do not see common driveways around here. With 14 units all averaging $1Million+, what is the benefit to the town? This is a wetland dense project that doesn't allow him to see it benefit the town or help in anyway.

Mr. McElhinney stated the original permit from1987 has been modified 35 times, and the current maximum permit count based on the overall open space is 287 permits. The Planning Board approved 274 of those. They have 13 remaining permits that could be used overall Willowbend. They go through using zoning and pinpoint what can support that overall track or variant. Through a clustering aspect and keeping in mind open space, you take those units and cluster to preserve open space. The Willowbend property line and 287 units are within that. They are adding more land, but not more units than what is allowed. He also noted the pedestrian crossing is being improved and the town is responsible for doing that work. They donated to the town for the station on Mashpee Neck Road and they agreed to clean up that area and help out with other road work.

Ms. Waygan stated the groundwater discharge with DEP allows for 10mg per liter per the permit requirement and Willowbend is exceeding and operates closer to 5mg.

Mr. McElhinney said the lawsuit has been resolved. It was a lawsuit against two towns and against Wychmere, but the DEP should never have authorized these permits because they constitute an indirect discharge to Cotuit Bay. The water flows into the bay and felt the state had greater authority that they hadn't exercised. Willowbend made no changes. No one alleged the plant wasn't operating at complete compliance. It was a policy driven lawsuit to encourage towns to put public sewer throughout. He acknowledged his comments were fair and agreed it is intense development but it is consistent with what has been done throughout Willowbend. He would also like to note two things. Last year Willowbend's entire property paid over $3Million to the Town of Mashpee. They have 8 school children who live there. If they put in three single lots, there would likely be more than 8 school children, three septics, more nitrates, and no bog mitigation. They recognize this is an intense undertaking than what could be done, but that's why they have provided an aggressive and innovative mitigation plan. This is not a cheap plan to replicate, there are benefits, and he understands the housing issues and these are not going to provide housing for Mashpee residents. They are very anxious as a company to work with the town on workforce, as they recently bought the Santuit Inn and made it housing for their workforce. They would love to work with the town on more workforce. They too share the burdens and also want to share the solutions.

Ms. Waygan noted this Public Hearing will be continued. She would like a cost estimate for renovation of a cranberry bog as well as its time frame.

Lynne Barbee- She generally likes the concept of the cottages, but it occurred to her that there could be 90 people living there and it would be really crowded. She would like to know if they have considered solar.

Dennis Ring added solar is not currently part of their design. Homes will be built to the latest HERS energy conservation rating, all homes have to reach a certain score and the lower the better. It's done by window insulation, current electrical code, new building outfitted for electric vehicle, furnaces, and heat pumps. They are all about energy conservation and there are many ways to reach HERS score, but solar is not off the table. If you outfit the house with certain minimums you get 5 points off the HERS score. Their sustainability director helps with these initiatives.

Terry Ronhock- She would like to commend the Board for answering her questions. She knows clean water is an issue from fertilization and that golf amenity will be nice and lush with a forebay near, but she questions the shape and the fertilization. She wonders if it could be designed as to not see it from Quinaquisset.

Mr. Eddy stated grading is done so it diverts into the forebay. They fertilize according to best management practices. They can coordinate with Catherine Laurent to augment landscaping, it will be visible to a certain extent but screened to decrease visibility. The DPW wants to see Cape Cod berm asphalt along the edge of roads 3 inches high, as edge treatment controls runoff.

Ms. Faulkner asked about lot coverage in 1985 zoning, the Special Permit for Willowbend does not have a lot coverage requirement.

Mr. Eddy commented building lot coverage is just under 20%. Current zoning today is based on structures not impervious. The building footprint including the garage is 19%. It has 3.5 acres of structures and garages, not counting decks.

Ms. Waygan would like to have a site visit and invite Planning Board members. She wants to see where this golf cart pathway will be. People speed on that road in the summer.

Ms. Waygan noted an email from Tom Fudala she read into the record. He stated the mitigation plan is very interesting. She sent the packet to a couple people as material was not available on the website. He responded that the numbers work under the Special Permit and similar adjustments have been done in the past. One problem under the Special Permit and multifamily bylaw, he is referring to Special Permit for 40-50ft natural vegetative buffer along Quinaquisset Ave. Proposal shows 40 ft. setback measurement and buffer totally clear including a golf cart path.

Mr. Lehrer stated there is a minimum 100 ft. buffer on Quinaquisset Ave. He pulled up 1985 zoning on the computer. Reference to multifamily specific state the minimum buffer on the perimeter seeking approval shall be 40ft. Permitting from 1987 clearly defines condition of 100 ft. buffer along Quinaquisset. Zoning bylaw states, and this permit was approved, the Board shall require minimum front setback, in this case 40ft. The Planning Board Special Permit required more. You are being asked to modify, you cannot allow less than 40ft. from 1985, and one could argue it couldn't be more than 100 ft. as well. That will be left for the Board to decide.

Ms. Waygan is uncomfortable continuing this until April. March has 5 Wednesdays, they should have a meeting to continue the hearing until March 29th. Mr. Lehrer will coordinate with the proponent about the site visit. Ms. Waygan suggested Wednesday, March 8th at 3:00p.m.

MOTION:
Mr. Balzarini made a motion to continue the Public Hearing to March 29, 2023 at 7:10PM. Seconded by Ms. Faulkner. All in favor.

OLD BUSINESS
Zoning Bylaw Amendments Proposed for May 2023 Town Meeting
The Select Board has the bylaw and are starting to review the Warrant. Ms. Waygan has been in touch with Town Manager about being available when the Board discusses that item. Ms. Faulkner and Mr. Lehrer are both available on March 20th. Everyone is invited, she noted to post an agenda that it might be in quorum. Any zoning amendment that goes to the Select Board for inclusion by petition or another town entity gets forwarded to the Planning Board. She would like to set a Public Hearing for April 19, 2023.

MOTION:
Mr. Balzarini made a motion to set at Public Hearing for April 19, 2023 at 7:10PM for all proposed zoning amendments. Seconded by Mr. Richardson. All in favor.

Local Comprehensive Plan Updates with Weston and Sampson
-Survey and Workshop Data Analysis
The data needs to be converted from Zoom and then Mr. Lehrer has to figure out how to distribute it. He may just put it on PlanMashpee.com. Ms. Waygan wants comments from attendees, a data dump.

Affordable and Workforce Housing
- ADU
- HPP

Mr. Lehrer was not able to advertise the HPP before he left for vacation. He is aiming for advertisement Friday then the due date for responses will be the first week in April. He would like to hold a pre-submission conference. Ms. Waygan would like a copy of the legal ad.

- Regional Housing Strategy

There was an update with a page or two housing summary of the region and housing in Mashpee. Ms. Waygan asked Mr. Lehrer to inquire with Mr. Collins about this.

Clean Water Initiative

- Floodplain Development Zoning

- Tree Protection Bylaw

Ms. Faulkner has given Mr. Lehrer the preliminary draft for the Tree Protection Bylaw. She plans on meeting with Conservation agent.

Mr. Lehrer sent a press release for the first two workshops with DNR and Conservation. The first of those will be Saturday, March 18, 2023 at 2:00PM at Mashpee Public Library. The second workshop will be at the Town Hall on April 4, 2023 at 5:00PM. They will focus on articles about the increased wetland buffer and contemplate floodplain and build data. There will be other opportunities for engagement and people are starting to ask questions.

BOARD ENGINEER REPORT

Project Reviews and Inspections

Mr. Pesce performed inspections of the Cottages Phase III at New Seabury for drainage issues. He was asked to take a look at the roadway construction and site work contributing to drainage. There is nothing that visually reveals, one location that has grading concerns and landscaping between top grading and bottom of siding. An engineer was hired and all potential problem locations were listed. He recently received a letter rebutting some of that. He told Mr. Lehrer the only way to respond is with a survey crew to shoot grades on roads to tie into existing benchmarks prepared by Boston Survey's original designs to determine if grade is different. It will be up to the HOA and developer to decide on a resolve.

They are working on closing out the project at Sherwin Williams retailer. There are minor things to complete. The contractor let him know they were taking care of everything he requested and will send pictures upon completion.

They looked at the Willow Circle subdivision lot releases. There were a number of things not completed but surety is required and something the Board already discussed.

He has given input and sent emails to Mr. Morin about Ockway Highlands. He is willing to do the recommended improvements and meet with the Board and staff.

Lastly, the Country Club Estates that is under construction has been in a state of dormancy this winter. Catch basins along with a drainage line have been slowly installed along with water mains. They have been there once a month with nothing much to inspect.

TOWN PLANNER REPORT

Affordable Housing Project – 209 Old Barnstable Road

Mr. Lehrer stated the neighborhood has been interested in traffic impacts. He submitted a letter to the Select Board and Trust and he is hoping that traffic study gets on the agenda soon and authorization occurs. He just launched a ‘Community Education’ tab under the 209 Old Barnstable Road homepage for documents. His intent is the traffic study will be authorized to take place over 4-6 weeks. He will then set up another meeting with the neighborhood with public participation.

Ockway Highlands Tripartite Agreement Update and Process to Enforce

Mr. Lehrer sent an email relative to enforcing the tripartite agreement. A letter will be sent this week notifying of the Boards decision to declare the tripartite in default. He will appear March 15th. A declaration of default will be placed on the agenda with written notice for an appearance before the Board. Mr. Lehrer will reach out to Mrs. Dorsey about the photographs. Ms. Waygan asked if Mr. Pesce could be present for March 15th. Ms. Waygan would like to have technical support. She would also like to check with the Town Manager about the staff capacity to complete the work ourselves. She asked if towns normally hired someone. She also asked that Mr. Pesce make sure there is enough money set aside for a small section of top course of pavement.

Mr. Lehrer stated the Board can find a developer and notify the mortgager to collect the funds. The Board can also request a court action to define roles and responsibilities with what each party has. Counsel stated the path of least resistance is notify mortgager and collect funds. The money the Board has for this purpose is defined in the tripartite and would’ve been cost at the time plus 50%.

Ms. Waygan doesn’t want to get the town in a position to do something and not have the funds. Mr. Pesce will get that document from Mr. Lehrer. He stated from the tone of the response, the applicant is ready to meet with the Board. The surety is held by a bank and we notify the bank and say it’s a default and then the town has access to fund the completion of the work. She would like Mr. Pesce to get a reasonable estimate. Mr. Pesce will look at the site with the developer.

COMMITTEE REPORTS

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Cape Cod Commission-	Executive Director reported to the Select Board this week about regional housing and housing in Mashpee.
Community Preservation Committee-	Meets in Executive Session this week for the land purchase of 751 Rt. 130 Main St.
Design Review-	No Meeting
Plan Review-	Met but Town Planner was on vacation.
Environmental Oversight Committee-	No Meeting
Historic District Commission-	No Meeting

ADJOURNMENT
MOTION:
Mr. Balzarini made a motion to adjourn the meeting of the Planning Board at 10:00p.m. Seconded by Ms. Faulkner. All in favor.

Site Visit:	Wednesday, March 8, 2023 @ 3:00PM
Next Meeting:	Wednesday, March 15, 2023 @ 7:00PM

Respectfully Submitted,

Christine M. MacDonald
Board Secretary

LIST OF DOCUMENTS
Additional documents may be available in the Planning Department.
- Town of Falmouth Notices
- Town of Sandwich Notices
- Town of Barnstable Notices
- January 2023 Discharge Monitoring Report for South Cape Village – N= 5.1
- December 2022 Discharge Monitoring Report for South Cape Village – N= 6.9

Mashpee Planning Board
Minutes of Meeting
Wednesday, March 8, 2023 at 3:00 PM
On-site Visit
275 Quinaquisset Avenue
Mashpee, Ma 02649

Present: Chairman Mary Waygan, Vice-chair Karen Faulkner, and Dennis Balzarini

Also Present: Evan Lehrer- Town Planner, Matthew Eddy P.E.-Baxter Nye Engineering, Dennis Ring – Southworth Mashpee Properties, Troy Miller – Southworth Mashpee Properties

CALL TO ORDER

After mobilizing in the Willowbend Country Club parking lot at 100 Willowbend Drive, Mashpee, MA 02649 the Planning Board and site-visit attendees drove by golf cart to the subject property at 275 Quinaquisset Avenue located more or less across the street from the Country Club parking area. The Chair called the meeting to order in the driveway of 275 Quinaquisset Avenue at 3:05 PM.

SITE VISIT

Matt Eddy led the site visit and oriented attendees to the site in relation to the submitted development plans under consideration. He noted the house was built around 1985 and is currently being utilized by Willowbend as workforce housing. Matt generally described the surrounding existing conditions and began to identify the bog system wrapping around the house more or less along Quaker Run adjacent to the Willowbend Golf Course. He noted that soil borings have been conducted by Briggs and that the locations of those soil borings are shown on the submitted plan set.

The group began a tour around the subject property beginning generally around the westerly lot line adjacent to Bog 1 as shown on the plans. The group toured the property heading south along the western edge before continuing north on the easterly lot line while Matt Eddy gave an overview of the existing wetland conditions. Specifically, Matt pointed out the isolated wetland shown in the southwesterly corner of the subject lot. This isolated wetland was discussed at the public hearing held on 3/1/2023 and asserted to the Board by the engineer that the existing condition was the result of manmade intervention. Bogs require the use of sand which farms would often excavate onsite or adjacent to their bogs. Matt believes the shown isolated wetland is the result of agricultural activity.

As the group moved around the property Dennis Balzarini noted a relatively ‘rolling’ topography and asked about how much regarding would need to occur around the property

Response from Mr. Eddy was inaudible.

Matt wanted to particularly identify for the Board the limits of pre-existing site disturbance.

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Coming to the southern edge of the property offered the Board members a view of Bogs 2 and 3 at which point the Town Planner asked Mr. Eddy to reiterate to the Board which Bogs are proposed for restoration to mitigate the filling of the northernmost wetland onsite to accommodate the golf amenity area.

Matt was able to show the Board how Quaker Run runs North-South directly through this bog system and how manmade dykes are manipulating the flow of water in this area.

Mary asked about whether or not these remaining bogs will be the last remaining active cranberry bogs throughout Willowbend's Development.

It was noted that there are still numerous other active cranberry bogs throughout the development.

Mary noted a bog adjacent Bogs 2 and 3 (active) that was clearly no longer in active agricultural production and asked if these bogs were just left to go fallow.

Matt responded that they had and offered more detailed explanations of his opinions relative to the quality of the wetlands onsite noting particularly a manmade dyke separating the subject parcel and Bog 3 which are in fact connect by a culvert through the dyke. He asserts that the wetland portions of 275 Quinaquisset are the result of pre-disturbance.

As the group moved north along the easterly property line Mary asked Matt to identify to the group the location of the proposed 'Golf Amenity Area'.

While identifying the area to the group the Planner asked if the flagged trees represented the wetlands delineation to give the Board better clarity over the limits of area proposed to be filled. Matt indicated to the Board that the flags were indeed delineating the wetlands.

The Board closed the site walk by walking along the property's Quinaquisset frontage towards the existing driveway.

Dennis asked about the existing striping, signage, and signaling to pedestrians and motorists along Quinaquisset and the plans to improve those. Matt Eddy noted the agreement between the Town and Willowbend for those signage and striping upgrades made in exchange with the donation of land for town use as a lift station for the wastewater collection system.

Mary asked for Willowbend to provide some details regarding the proposed landscaping along Quinaquisset. Troy Miller indicated it will be detailed on the proposed landscaping plan but would utilize native vegetation to create a robust visual barrier that's in harmony with the result of the development concept.

At the end of the driveway Dennis noted plastic pipe/tube protruding from the ground and asked what they were. Matt confirmed these were blow-offs for the Mashpee Water District.

The applicants were asked to follow up with the Fire Department relative to the adequacy of access and to provide the Board something in writing from the Fire Department indicating their approval of the turning radii and access.

The meeting/site-visit was adjourned at 3:53 PM.

Town of Mashpee Planning Board
16 Great Neck Road North
Mashpee, Massachusetts 02649

Mashpee Planning Board
Minutes of Meeting
Wednesday, March 15, 2023 at 7:00 PM
Mashpee Town Hall - Waquoit Meeting Room
16 Great Neck Road North
Mashpee, MA 02649
Streamed Live on the Town of Mashpee website https://www.mashpeema.gov/channel -18

Present: Chairman Mary Waygan, Vice-chair Karen Faulkner, Michael Richardson, John Fulone, Dennis Balzarini

Also Present: Evan Lehrer – Town Planner, Ed Pesce – Consulting Engineer, Christopher Kirrane – Dunning, Kirrane, McNichols & Garner LLP, Jacques Morin – Ockway Highlands LLC / Bayberry Building

Absent: Rob Hansen (Associate)

CALL TO ORDER
Chairman Waygan called the meeting of the Planning Board to order at 7:00P.M. The Pledge of Allegiance was recited.

APPROVAL OF MINUTES – March 1, 2023 and March 8, 2023
The Chair tabled the draft minutes of March 1, 2023 and March 8, 2023 until a future meeting. The Board is still awaiting drafts of the March 1, 2023 meeting from the Board Secretary who is out on maternity leave. The Town Planner prepared a draft of the March 8, 2023 meeting minutes from the 275 Quinaquisset Avenue site visit which the Chair asked be placed on March 29, 2023 agenda where the public hearing for that matter will be reopened.

Approval of Consulting Engineer Invoices - November 2022 through February 2023

The Chair accepted a motion to approve the following invoices:

- Invoice No. 2023-2076 for $160.00 (532 Main Street Definitive)
- Invoice No. 2023-2075 for $549.00 (Willow Circle)
- Invoice No. 2023-2074 for 684.48 (Country Club Estates)
- Invoice No. 2023-2073 for 1,240.00 (Tudor Terrace)
- Invoice No. 2023-2072 for 924.46 (Sherwin Williams)
- Invoice No. 2023-2077 for 1,195.24 (17 Silverleaf Lane)

MOTION:
Mr. Michael Richardson made a motion to authorize payment to the Consulting Engineer for services rendered between November 2022 and February 2023 as presented in the invoices. The motion was seconded by Ms. Faulkner. All were in favor and the motion carried unanimously.

Zoning Bylaw Amendments Proposed for May 2023 Town Meeting
The Chair directed the Board to a public hearing notice in their packets relative to the required public hearing for the zoning articles the Planning Board submitted to the Select Board for consideration in the May 1, 2023 Town Meeting Warrant. The Chair noted that the public hearing was voted by the Board to be held on April 19, 2023 at 7:10 PM. The Board members reviewed the draft public hearing notice and no suggestions or edits were presented. The Chair further noted that on Monday, March 20 that she, Ms. Faulkner and the Town Planner will deliver a PowerPoint presentation to the Select Board to explain the articles submitted.

Local Comprehensive Plan Updates with Weston and Sampson
The Planner asserted to the Board that it is becoming critical for the Planning Board to reconvene and make some decisions relative to the submitted draft LCP Chapters. The Planner suggested that the Board independently, or jointly with him, review the draft chapters alongside the summaries of data collected from workshops, community events, and the survey.

The Chair asked if Weston and Sampson could join us on either April 19, 2023, May 3, or May 17th. The Planner is uncertain of their availability but was confident that if they are available they will make an effort to appear. The Chair asked if the Planner would ask consultants at Weston and Sampson if they would meet with the Board on May 17th at 5:30 PM to work toward finalizing draft chapters. Prior to that meeting it was agreed that we place on an upcoming regularly scheduled meeting agenda an item for discussion amongst Board members relative to the draft chapters in preparation for the May 17th meeting (tentative) with Weston and Sampson

PUBLIC HEARING

Applicant: Marcello Mallegni, Forestdale Road, LLC
Location: 532 Main Street (Map 26, Block 6)
Request: The applicant requests consideration for approval of a 9 lot definitive subdivision plan of land consisting of approximately 18.05 acres located on Main Street (Route 130) between Nicoletta's Way and Echo Road.

At 7:10 PM the Chair opened up the public hearing for Marcello Mallegni (applicant) regarding the matter of 532 Main Street Definitive Subdivision by reading into the record the public hearing notice. This matter was continued from the meeting of December 21, 2022.

The Chair began by welcoming and acknowledging and welcoming the applicant who was being represented by his attorney Mr. Christopher Kirrane from Dunning, Kirrane, McNichols, and Garner.

Mr. Kirrane addressed his submitted request to continue the hearing until the meeting of May 17, 2023. He further requests a 90-day extension of the time the Board has to make its decision on this matter. He noted that his request to continue is being made for two reasons:

1. His client was slow to issue a check for the traffic study the Board voted to authorize but a check has been delivered for the full value of the traffic study to the Planning Department on 3/15/2023.
2. Additionally the applicant has submitted a final offer to Counsel for Nicoletta's Way owners in hopes that an agreement could be made that would not necessitate the approval and construction of a new subdivision road.

MOTION

Mr. Balzarini makes a motion to continue the public hearing until May 17, 2023 at 7:10 and to accept the request to extend the timeframe with which the Board has to make its decision by 90 days. Ms. Faulkner seconded. The motion carried unanimously

Affordable and Workforce Housing

Project Reviews and Inspections

Applicant: Pleasantwood Homes LLC
Location: 20 Tudor Terrace (Map 29, Block 198)
Request: The applicant requests approval of a modification to Spring Hill West Definitive Subdivision Plan of land that would modify the lot lines of Lots 40, 41 and 42 to give adequate frontage for three new building lots proposed for incorporation into the subdivision. The three proposed lots to be created and incorporated into the cluster subdivision are on a parcel of land totaling 6.024 acres. This proposal will continue the cluster configuration of the existing subdivision and will add 2.49 acres of open space consistent with the requirements of the Mashpee Zoning Bylaw at the time of cluster subdivision's approval in 1989.

At 7:20 PM the Chair opened up the public hearing for Pleasantwood Homes LLC (applicant) regarding the matter of 20 Tudor Terrance (Spring Hill West Definitive Modification) by reading into the record the public hearing notice. This matter was continued from the meeting of February 1, 2023.

The Chair recognized attorney Christopher Kirrane again as the representative of Pleasantwood Homes LLC. Mr. Kirrane directed the Board's attention to a letter submitted requesting this matter be withdrawn without prejudice. He told the Board that the withdrawal is being requested because the applicant would prefer to submit a new application that does not modify any lot lines of the Spring Hill West plan as initially contemplated and stated an intent to resubmit a new plan under the current cluster subdivision bylaw only for the 6 acres +/- for Tudor Terrace.

No members of the public appeared to speak on the matter

MOTION

Mr. Balzarini made a motion to close the public hearing. His motion was seconded by Mike Richardson and the motion carried unanimously.

Mr. Richardson made a motion to allow the applicant to withdraw its application without prejudice. His motion was seconded by Mr. Balzarini and the motion carried unanimously.

Declaration of Default of the Ockway Highlands Tripartite Agreement dated March 20, 2019.
The Chair first laid out the ground rules for how she would prefer to manage this agenda item and asked the Town Planner and Consulting Engineer to kick off the discussion.

The Town Planner reiterated to the Board the timeline over the past 6 months that resulted in the appearance of Mr. Jacques Morin before the Board. Ockway Highlands was permitted prior to the Planner beginning in 2018. In 2019 the applicant, Board, and applicant's lender entered into an agreement to secure the completion of the subdivisions roadways and ancillary infrastructure: utilities, drainage, etc. The planner reported that over the past year or so his office had received several complaints. Some were related to traffic but mostly were related to the poor condition of the subdivision and specifically the performance of the stormwater collection system. The Planner shared that he had been on site multiple times throughout the year independently but also with Mr. Morin and the consulting engineer. It was found during those visits that at the end of the improved portion of Blue Castle Drive where only a binder coat is laid down in front of the new homes built in the subdivision that the grading is such that stormwater flows not into, but around the drains and collects in front of 86 Blue Castle Drive. The consulting engineer reported to the Planner and applicant at those visits that the issue can be corrected when the top coat of asphalt is laid on the street. The Planner expressed a concern regarding the amount of time that it may take to wait for the completion of home construction within the subdivision.

The Planner relayed to the Board that when reviewing the Ockway Highlands Tripartite Agreement he realized that the agreement was conditioned on completion of the subdivision by April 2022 and that annual updates would be made to the Board by the applicant which is why the Planner invited Mr. Morin to speak to the Board on February 1, 2023. Just prior to the February 1 meeting Mr. Morin notified the Town Planner that a conflict arose and he would be unable to appear as requested and the Planner suggested that a written update may be adequate. At the February 1, 2023 meeting the Board wished to seek legal counsel's opinion on how to initiate enforcement of the tripartite agreement. After receiving that opinion, Mr. Morin was notified of the Board's intent to declare default of the agreement in writing tonight and that matter was placed on the agenda accordingly.

The Planner reported that the Consulting Engineer met with Mr. Morin onsite today who gave his report to the Board. Ed noted he had a productive meeting with the applicant. The engineer reiterated the issues as reported by the Town Planner but wanted to clarify that not all of the catch basins in the subdivision are exhibiting the same issues as the two catch basins at the end of Blue Castle Drive generally in front of numbers 76, 80, and 84 Blue Castle. Between 86 and 84 Blue Castle is where stormwater is collecting. Ed reported that all parties have discussed this in the field and that it seems clear that the majority of runoff contributing to the problem is a result of the grading of the current binder course and that the appropriate application of the top coat would resolve the issue. The engineer noted further though that the homeowner's roof drains at 86 Blue Castle do not drain subsurface and sheet flows across the lawn to the low point of their lot, which is the same area collecting runoff from Blue Castle Drive. The engineer shared that there is no lawn or landscaping installed at 84 Blue Castle which he believes will attenuate the situation. At his meeting onsite with Mr. Morin they discussed what he may be willing to do now to correct the identified issues. Ed felt confident that Mr. Morin had a willingness to hear what the Board would like to do but additionally offered his own recommendation which was to execute the final paving in front of Lots 9 and 10 (as shown on the subdivision plan) this Spring. Mr. Morin had desired to perform the paving sooner but due to the still cool temperatures he was advised by Lawrence Lynch, his paving subcontractor, to wait until warmer weather which the consulting engineer agreed with.

The engineer shared some images provided by Mr. Morin that showed how he attempted to try and direct water using straw waddles to the catch basins that weren't currently receiving water. This was an admirable effort in the opinion of the engineer because that's what we would want to do to show the contractor what it is that he will need to correct. The engineer restated his recommendation to have the developer pave approximately 180' lineal feet of Blue Castle but also reported that Mr. Morin expressed a willingness to pave the entire portion of Blue Castle Drive that he was required to improve and pave in front of lots 1-10 pursuant to the Definitive Subdivision Approval for the project. They may take some traffic during the construction of the remaining three houses on Carriage Road, and he normally wouldn't recommend that. Lastly, the engineer requested Mr. Morin re-loam and reseed all of the detention basins for the areas that haven't established yet.

The Chair recognized the applicant/developer Jacques Morin after the engineer completed his report. Mr. Morin affirmed that he is happy to do as recommended to resolve the issues as soon as the plants open.

Mike Richardson asked when this could occur. Mr. Morin responded he would have attempted it before this meeting but he was advised against it. The Chair asked by what date and the engineer said it should be performance based and offer a 'complete within 60 days timeframe.' The Chair asked if Mr. Morin would be available on May 17th to report back to the Board and he responded that he is. The Board asked that the recommendations be implemented no later than May 17th.

Dennis Balzarini asked how many more houses to be built on Blue Castle. No more foundations are going in on Blue Castle Mr. Morin responded but there are outstanding landscaping items for Lots 9 and 10 and there are three houses on Carriage Road waiting to have foundations poured. Dennis stated a preference for having the applicant execute final paving on the entire portion of Blue Castle Drive that the approved subdivision plans require.

Mr. Balzarini further addressed his observations that the detention basins at the end of Carriage Road at the intersection of Degrass are not draining well, particularly the first one closest to Degrass. Dennis would like the Engineer to evaluate the condition of those basins along with Mr. Morin. Additionally, Dennis would like to see an evaluation and inspection of all the catch basins in the subdivision.

Mr. Morin agreed to look at these issues in totality but would prefer to remain within the bounds of the immediate recommendations to address the drainage issue in front of Lots 9 and 10. He noted an intention to bring forth a request to modify the definitive subdivision plan to eliminate the sidewalks at the request of the neighborhood. The scope of which he didn't wish to address during this meeting but wanted to notify the Board because there will be continued opportunity to engage with him through that process to ensure inspections of the basins. Mr. Morin stated an intention or desire to pave the entire length of Blue Castle Drive and would like to see where that might go and that it might be appropriate to revisit with the Board on May 17th.

The Consulting Engineer asked if the request to eliminate the sidewalks would constitute a minor modification. The Chair responded that it could be however, given the potential impact to abutting property owners and their interest in the subject, she feels strongly that a fully advertised public hearing would be more appropriate. Mr. Balzarini called a point of order noting that the Board, upon submission of an application, needs to review the applicable facts and vote to determine whether or not a modification is de minimus and does not require a public hearing.

Vice-chair Faulkner looked at the tripartite agreement and she noted the condition in that agreement that stated construction should have been completed by April 1, 2022. She asked if Mr. Morin had ever received an extension or sought an extension. Mr. Morin noted that COVID was the reason for the delays and that he was of the opinion that the tolling provisions of Governor Baker's Executive Order pertaining to the COVID-19 Public Health Emergency applied and that the agreement was extended an additional 462 days or until July 7, 2023.

The Town Planner reported that he had sought a legal opinion from Town Counsel relative to Mr. Morin's assertion that the tolling provisions applied. Counsel's opinion was that the Board could clearly proceed to enforce the terms of the Tripartite Agreement as a breach of a contractual commitment based upon the developer's failure to provide construction updates to the Board. However, counsel opined with respect to the developer's failure to complete infrastructure work by April 1, 2022, that if said completion date was a condition of the Planning Board's subdivision approval then the developer could make a compelling argument that said completion date is subject to the tolling provisions of the Governor's COVID-19 Emergency Order No. 17 and Chapter 53 of the Acts of 2020. If the performance of this work was not stated as a condition of approval, the Board could assert that this failure is, likewise, a breach of a contractual obligation.

Vice-Chair Faulkner noted that July 2023 was right around the corner and that definite rules need to be established. All were in agreement that appropriate loam and seed of the shoulders must occur within 60 days. What was still under discussion was whether the applicant should be required the entire portion of Blue Castle Drive from Lots 1-10 or if 180 lineal feet only in front of Lots 9 and 10. Vice-chair Faulkner felt strongly that the applicant should be required to pave the entire section required by the subdivision plan.

The Chair turned to the audience to see if anyone from the public wished to provide comment.

Ms. Terri Ronhock of 104 Degrass Road appeared to share some pictures and some of her concerns and seek points of clarity. She confirmed that the Board was discussing the top coat of pavement at the end of Blue Castle. She specifically wanted to point out the serious problem that has persisted with the detention basins at Degrass Road and Carriage Road adjacent to the Habitat house. She noted that there is a serious flooding issue there. She further elevated a few additional concerns:

- Open trenches and pits
- Exposed wires
- Hay bales (waddles) deteriorating and lack of maintenance makes them useless
- Construction debris stockpiled on open space parcels

She noted that this has not been weeks or months, but years, of tolerating the condition of the subdivision.

Ms. Joanne Dorsey of 86 Blue Castle Drive addressed the Board. She stated her house sits right at the end of the paced section of Blue Castle where water is pooling. She noted that after every rainfall her lawn is full of siltation as if made obvious when she mows the lawn. Further she is concerned with the standing water because the mosquitos are unbearable and no amount of spraying will be curative. She has stated that she lived in her home on Blue Castle Drive for 23 years and never has she had an issue with water like they've had. She said she would be grateful for whatever interventions could be agreed upon to rectify this. She asked the consulting engineer about his comments relative to the downspouts noting she isn't clear on what he meant. The engineer clarified, for purposes of being thorough, that the roof drains on her house contribute to the problem of pooling. He agreed that the road runoff from Blue Castle is the primary culprit and absent this runoff the roof drain's discharge would likely have more success percolating into the ground

Mr. Tim Dorsey of 86 Blue Castle Drive addressed the Board and stated that it is absolutely the problem of the developer to rectify if runoff from Blue Castle past Lot 10 enters his property. All were in agreement. Mr. Dorsey said he heard Mr. Morin desire to pave the entire road which he would support also. The engineer clarified his statement relative to roof drains and runoff.

In closing on this matter the chair confirmed the course of action before May 17, 2023. The applicant agreed to loam and seed the road shoulders and detention basins as recommended by the consulting engineer, and to replace and/or maintain adequately the existing erosion controls, and further agrees to pave the entirety of Blue Castle Drive between Lots 1 and 10 of the subdivision before reporting back to the Board on May 17th. John Fulone asked the applicant to give consideration to his action plan thereafter of May 17th considering the subdivision will not be completed by July. His request was for him to return to the Board with a proposal to modify the tripartite agreement to accommodate those plans if agreeable to the Board. Additionally he asked if it would be prudent to install a construction fence with a gate of some kind to mask the construction equipment for the neighborhood. The applicant felt it would be a burden to construction. The engineer recommended everyone go out and take a look at it for themselves to determine if anything else should be required. The matter will be discussed again on May 17th.

Dennis addressed the open trenches and wanted the applicant to at least put something to deter accidents from kids and neighbors. It was suggested that orange cones could be placed to identify the hazard at the edge of the road.

MOTION

Mr. Richardson made a motion to require the applicant, Ockway Highlands LLC, re-loam and seed the shoulders of the roads and detention basins on Carriage Road and to pave the entire portion of Blue Castle Drive as required by the subdivision approval by May 17, 2023. The motion was seconded by Mr. Balzarini. The motion carried unanimously.

Joanne Dorsey readdressed the Board and asked that the applicant take proper care to notify dig safe when cutting across the road stating her phone lines have been cut four times since the subdivision approval. Mr. Morin noted that dig safe had always been called and there are tickets to support that. He agreed the line was cut however it was the result of dig safe not marking the Verizon crossing. Ms. Dorsey was satisfied with his response.

The motion carried unanimously.

Chairman's Report

The Chair reported that she, the vice-chair and the planner would be presenting the Planning Boards submitted zoning articles to the Select Board on Monday March 20, 2023.

Town Planner Report

Zoning articles for future Town Meetings were raised by the Planner. The tree protection bylaw requires further review with staff, particularly with regard to administration and enforcement. The Planner will follow up with Karen to address these issues.

Floodplain Development provisions are going via the bylaw review subcommittee in the Conservation Commission and a zoning article may need to follow thereafter.

Redevelopment bylaw is something that remains a priority and is something to prioritize as we approach completion of the Local Comprehensive Plan assuming there all be action items related to redevelopment goals and priorities. Unlikely an October 2023 proposition.

Solar Overlay remains an option for expanding solar uses beyond the expansion to the C1 and C2 zoning districts if approved by Town Meeting. Should follow a planning exercise that assesses existing conditions of various parcels to determine their adequacy for inclusion in the overlay.

Accessory apartment bylaw should be re-evaluated to encourage property owners to live in the accessory apartment and rent their current unit. Current language states the principal dwelling must be occupied by the person on the latest recorded deed. Would like to prepare a draft article to rectify.

Lastly the planner reported that the second scheduled workshop for the Wetlands Buffer proposals on April 4, 2023 is moving from the Waquoit Room at 5:00 PM to the Library at 5:00 PM.

COMMITTEE REPORTS

Cape Cod Commission –	No Report
Community Preservation Committee-	Applications are available for the October Town Meeting funding cycle. Applications are available on the website and via the Town manager's office. Waiting for Select Board to execute the warrant.
Design Review-	No Meeting
Plan Review-	CatDogg LLC met with Plan Review however the Planner has a conflict of interest and had to recuse himself from this matter.
Environmental Oversight Committee–	Uncertain of status of committee.
Historic District Commission-	Dennis will be meeting with Planner and the Chair to discuss upcoming applications and a review of the rules and regulations.
Military Civilian Advisory Council-	No Meeting

PUBLIC COMMENT

-none-

CORRESPONDENCE

Received correspondence relative to a recent court finding that pertains to conduct during public meetings. Town Counsel is reviewing and the Board needs to review and possible repeal its policy. The Chair has questions for Counsel and asked for the Board to provide any questions they may have for his review. The Planner will confirm counsel's question.

The Chair asked about the correspondence received from the FCC. The Planner reported that he is receiving emails from the FCC related to a new application before them for a proposed cell tower installation at the Verizon Building just north of the Mashpee Rotary. They informally presented to the Board in 2022. The planner believes they are undergoing their preliminary review process with federal agencies before filing a special permit application with the Planning Board.

ADJOURNMENT

MOTION:

Mr. Balzarini makes a motion to adjourn the meeting at 8:42 p.m. Seconded by Mr. Richardson. The motion carried unanimously

16 Great Neck Road North
Mashpee, Massachusetts 02649

The meeting ended at 8:42.m.

Next Meeting: Wednesday, March 29, 2023 at 7:00P.M.

Respectfully Submitted,

Evan R Lehrer
Town Planner

1.0 Housing

Goals

1. Ensure that current and future Mashpee residents have access to adequate and diverse types of housing options.
2. Ensure that sustainable practices are integrated into all housing development decisions to create a safer, healthier community.

Policies

1. Prioritize redevelopment of single-use, auto-centric commercial strip development into compact, walkable, and pedestrian-friendly mixed-use neighborhoods that provide a variety of housing types.
2. Maximize the Town's potential to provide Subsidized Housing Inventory (SHI) eligible deed restricted affordable units by using Town owned property.
3. Expand the diversity of housing types to provide all residents with appropriate shelter.
4. Diligently and efficiently monitor and enforce inclusionary zoning requirements and provide professional oversight for any locally run housing programs and nurture relationships with community housing partners.
5. Incentivize the production of Accessory Dwelling Units (ADUs).
6. Implement sustainable building practices for all new construction and redevelopment.
7. Minimize housing vulnerabilities to climate change and natural disasters.

Actions

1. Conduct a visual preference survey to determine the types and styles of housing that is supported by the community.
2. Procure a consultant to assist with community engagement and facilitation of design charrettes to support the development of a Form Based Code.
3. Develop, adopt, and implement a form-based code in the form of an overlay district.
4. Develop and adopt an Affordable Housing Bylaw that requires a minimum contribution of SHI eligible affordable units in exchange for density bonuses.
5. Change zoning to allow 'missing middle' housing typologies in appropriate residential areas with the possibility of establishing a new zoning district(s) to encourage the development or redevelopment of these building types in areas where its desirable and discouraging it where its unsustainable.
6. Regularly fund the Affordable Housing Trust to take advantage of opportunities as they arise.
7. Update and adopt the Housing Production Plan (HPP) with a focus on developing a roadmap and implementation plan for the development of the Town's identified sites for affordable/workforce housing.
8. Implement the Housing Production Plan update.
9. Prioritize options for year-round rental housing.
10. Develop incentivizes to encourage developers to build affordable senior housing.
11. Create a new position titled Affordable Housing Coordinator or Housing Planner within the Planning Department whose job description would be consistent with the objectives outlined in the Housing Production Plan.

12. Conduct bi-annual workshops led by the Town Planner and Building Commissioner alongside community partners such as HAC to inform property owners of the permitting process.
13. Assess ways for the private sector to contribute to the Town's inventory of Affordable Dwelling Units (ADUs).
14. Establish a revolving loan fund to provide small forgivable loans to property owners to construct an ADU to supplement programs offered by Housing Assistance and certain private lenders.
15. Restrict development in flood zones.
16. Identify suitable sites for infill development outside of flood zones.

2.0 Economic Development

Goals

1. Ensure a prosperous local economy that supports financial independence for all residents.
2. Bolster support for local businesses and the "blue economy."

Policies

1. Provide financial and policy-based support for local fishers and businesses.
2. Minimize homelessness and the proportion of Mashpee residents living below the poverty line.
3. Explore potential grant funding programs to support housing, natural systems, and community programs and services.

Actions

1. Incentivize locally owned, small business development and maintain its long-term growth.
2. Partner with higher education and regional institutions, including Woods Hole MBL, to enhance childcare and afterschool programs.
3. Evaluate use conflicts in fisheries and invest in appropriate infrastructure.
4. Require living wages for all Mashpee residents.

3.0. Sustainability

Goals

1. Ensure Mashpee serves as an exemplary regional leader in municipal electrification.

Policies

1. Reduce the Town's reliance on fossil fuel for energy by investing in renewable technologies.
2. Maximize the opportunities and monies available to the Town following receipt of Municipal Vulnerability Preparedness Certification from the Commonwealth.
3. Assist with transition of gasoline-powered vehicles to electric vehicles.

Actions

1. Develop a pipeline of projects potentially eligible for MVP Action Grants from the Commonwealth that are consistent with the Town's climate vulnerability planning priorities.
2. Convert the municipal fleet to electric vehicles and install adequate charging stations for the fleet.
3. Identify and construct sites for public EV charging stations.
4. Develop solar canopy 'carports' in municipal parking lots and on install solar panels on any municipal structure where solar is viable and productive.

4.0 Natural Resources

Goals

1. Ensure that all residents have access to high quality water.
2. Protect terrestrial and aquatic habitats for long-term environmental and social benefits.
3. Protect the health, safety, and welfare of residents who use and enjoy Mashpee's waterways.

Policies

1. Return Mashpee's water quality to within normal parameters.
2. Identify areas for coastal and habitat restoration to enhance water quality.
3. Identify, preserve, and enhance ancient ways to water.
4. Limit construction in land under ocean to maintain and restore habitat vital to our fisheries.
5. Maintain and enhance cross-sector collaborations such as with educational institutions and research organizations to bolster water quality sampling programs and reporting.
6. Identify the most appropriate sites to establish Aquaculture Development Zones consistent with the Department of Natural Resources Harbor Management Plan.

Actions

1. Conduct a personnel needs assessment to understand gaps in consideration of current and planned water quality monitoring and testing programs.
2. Establish Water Quality Task force as a subcommittee of the Environmental Oversight Committee to conduct necessary engagement and community education around recommended bylaw changes to address water quality issues: fertilizer and pesticide use, wetlands buffers, floodplain management.
3. Implement recommended stormwater improvements within the Santuit Pond Watershed as recommended by the Fuss & O'Neill MVP Action Grant.
4. Construct the Wastewater Treatment Facility and wastewater collection system consistent with the Watershed Nitrogen Management plan as amended from time to time.
5. Continue acquisition of conservation lands in recharge areas.
6. Implement water quality improvement measures as recommended upon completion of the Mashpee Wakeby Diagnostic Study - To be completed in 2025.
7. Invest in necessary equipment and facilities to test cyanobacteria in-house that would specifically identify species in real time to assist in determinations of toxicity.
8. Remedy user conflicts within waterways consistent with the DNRHMP.
9. Continue to maintain navigational channels for not only navigation but for adequate stream and tidal flow.
10. Continue to investigate and inventory the legal status of all known public landings and access to coastal water and great ponds to develop an access plan.
11. Work to purchase parcels if feasible to enhance public access to water or create new sites for public landings.

5.0 Land Use and Growth Management

Goals

1. Maintain Mashpee's small-town community character and appearance.
2. Ensure development is consistent with current and future growth projections.
3. Promote mixed-use development to concentrate various activities in appropriate centralized locations.

Policies

1. Focus new growth in already disturbed areas of Town where adequate infrastructure is planned or in place and incentivize the protection/preservation of the remaining vacant properties where the only feasible growth does not meet the projected housing need.
2. Ensure Town services and facilities are adequate in consideration of current shortfalls and future growth projections.
3. Maintain the legitimacy and accuracy of the zoning bylaw and other local regulatory documents.
4. Identify opportunities for mixed-use development in existing commercial areas as appropriate.

Actions

1. Re-establish an ambitious program of acquisition of undeveloped lands for open space protection, including all currently undeveloped land within the Mashpee National Wildlife Refuge and all other lands shown as being for conservation or recreation interest in the Open Space and Recreation element of this plan via the establishment of an Open Space Committee to be appointed by the Select Board.
2. Prioritize redevelopment of single-use, auto-centric commercial strip development into compact, walkable, and pedestrian-friendly mixed-use neighborhoods that provide a variety of housing types as described in the Housing element of this plan.
3. Reassess the role of Transfer of Development Rights in the Town's land use and growth management priorities and consider overhaul of the Open Space Incentive Development Zoning Bylaw (OSID).
4. Continue buildout of Town cemetery as needed in consideration of capacity and the Cemetery Master Plan.
5. Construct a new Fire Department substation in North Mashpee.
6. Construct a new Community Center that may include those recreation services and facilities identified in the Open Space and Recreation element of this plan.
7. Consider the development of a dog/animal pound facility.
8. Develop a tree bylaw that would prohibit, or require permits for, clear cutting of lots as well as provide for performance standards and impact fees for the removal and replacement of certain native specimen trees.
9. Overhaul the Mashpee sign code with a form-based approach.
10. Develop a form-based code that would encourage structures that will be both aesthetically pleasing, consistent with the traditional character of the Town and be cohesive with the surrounding town-fabric by ensuring building scale and type that is consistent with the character of surrounding neighborhood.
11. Reassess current parking requirements and consider how to minimize parking impacts on aesthetic quality and the environment.
12. Re-codify and clarify the entire zoning bylaw.
13. Amend ADU bylaw to expand opportunity for property owners and affordable housing.
14. Consider form-based code revisions to existing zoning.
15. Proper siting of development.

6.0 Heritage and Preservation

Goals

1. Ensure that unique archaeological resources are preserved.
2. Ensure that future development and redevelopment reflects the historic character of Mashpee and celebrates local culture.

Policies

1. Enhance the vitality of the Mashpee Historic District located at the Traditional Village Center of Mashpee.
2. Preserve and protect the Town's known archaeological and scenic resources and work to investigate and catalogue any potentially unknown archaeological resources.
3. Support Mashpee's unique cultural heritage through education programs.

Actions

1. Nominate any additional structures beyond the Avant House located within the Mashpee Historic District for inclusion on the National Register of Historic Places.
2. Adopt a form-based code in the form of an overlay district intended to reflect traditional settlement patterns and historic main streets.
3. Adopt and implement financial incentives for the rehabilitation of historic structures.
4. Collaborate with the Mashpee Wampanoag Tribe on the reconstruction of the Attaquin Hotel in its location across from Lake Avenue as a workforce/attainable housing project.
5. Determine a location for an appropriately designed "monument" of Wampanoag heritage significance.
6. Adopt a demolition delay bylaw*
7. Protect existing known burial sites and enhance with more dignified fencing and regular cleaning of grave markers.
8. Highlight tribal heritage throughout local school curriculum.
9. Create wayfinding and cultural heritage program to tell the story of Mashpee through trails.

7.0 Open Space & Recreation

Goals

1. Ensure that residents and visitors have access to a variety of passive and active recreation opportunities.
2. Preserve the quantity and quality of conservation and open space lands as a means to protect natural resources, provide a high quality of life for residents, provide access for passive recreation, ensure adequate wildlife habitat, and preserve access for hunting and fishing rights.

Policies

1. Ensure that public access to open space and water bodies is preserved where it will not adversely affect sensitive natural resources.
2. Provide adequate recreational programs and facilities for existing residents and plan for additional programs and services for projected future growth.
3. Continue to pursue opportunities to preserve sensitive areas as conservation and passive open space lands.

Actions

1. Upload map of trails to the Town website.
2. Increase signage and wayfinding for trails to promote use by residents and visitors.

3. Consider adding facilities (i.e., bathrooms, water fountains, water etc.) to provide residents with access to passive recreation when visiting conservation lands.
4. Improve the protection of the Mashpee River Corridor by acquiring the properties surrounding Trout Pond owned by Mashpee Commons with the exception of any land area necessary to complete a rotary bypass road between Route 28 and Great Neck Road S as identified in the Transportation Element of the LCP.
5. Identify and work to acquire any parcels of conservation interest that were defined as priority acquisitions in both the 1998 LCP and 2007 Open Space Plan that remain unprotected particularly in recharge areas, identified rare species habitat (as per the August 1st, 2021, Estimated and Priority Habitat Map from MA Natural Heritage and Endangered Species Program) and/or the acquisition boundary of the Mashpee National Wildlife Refuge.
6. Identify site for construction of a new Community Center complete with public community spaces, active recreation, etc.
7. Construct public bathroom facilities at beach/pond parking areas.
8. Continue acquisition of cranberry bogs (active and/or abandoned) for wetlands restoration.
9. Assess trail networks for gaps and plan to connect those areas.
10. Plan a Town sponsored trail half marathon to bring community together and put Mashpee's open spaces on display.
11. Acquisition of 423 Main St (Map 27 Parcel 43) using CPA funds or other grant sources. This undeveloped parcel directly abuts Mill Pond, the Mashpee River, and the upper portion of the Mashpee River Herring Run. Acquisition of this parcel will allow for much needed maintenance of the land immediately abutting the Mashpee River herring run and improvements for recreational access to this area to highlight the herring run on the Mill Pond side of Rte. 130. The town owns the paved pull off area that abuts Mill Pond, which is also in need of improvements, including stormwater runoff.
12. Acquisition of parcels on Timber Landing and River roads (primarily unbuildable Sandalwood subdivision lots) to protect and enhance Mashpee River Woodlands (Map 82 Blocks 3, 13A, 13B, 94 & 95 and map 89, blocks 75 & 77. Funding through Town CPA funds or state grant funding.
13. Acquisition of 4 undeveloped parcels on Main Street: 493 *(map 27/parcel 164)*, 495 *(map 27/parcel 164)*, 497*(Map 27/parcel 162)* and 499 *(map 27/parcel 161)* for open space/conservation land.

8.0 Municipal Buildings, Facilities and Services

Goals

1. Ensure all Mashpee residents have access to the highest quality of physical, mental, and emotional health care.
2. Provide safe, equitable school facilities that allow all Mashpee students to receive an excellent education and achieve their full potential.

Policies

1. Encourage sustainable solid waste management practices to prevent hazardous waste from infiltrating natural areas and municipal systems.
2. Protect Mashpee residents, visitors, and their property from crime.

3. Expand role of emergency management in minimizing loss and suffering from man-made and natural disasters.
4. Efficiently coordinate public safety services to ensure rapid response times and high-quality care.
5. Increase collaboration internally between Town departments and externally with Mashpee residents to limit the chance for a lack of communication or miscommunication.
6. Maintain and enhance cross-sector collaborations such as with educational institutions and research organizations to bolster water quality sampling programs and reporting.
7. Identify a site to be used for materials storage and develop the materials storage site
8. Enhance Suicide Prevention programing and educational awareness.
9. Enhance collaboration and communication with Mashpee Wampanoag Tribe.
10. Ensure critical facilities are located near populated centers while promoting equitable access to underserved communities.

Actions

1. Remedy user conflicts within waterways consistent with the DNRHMP.
2. Assess Town's staff capacity.
3. Conduct parking needs assessment and modify parking layout as recommended.
4. Construct a unisex locker room and shower facility for Town Employees.
5. Add EV charging stations as discussed in the Transportation and Circulation Element of this plan.
6. Construct solar canopies in the parking area as discussed in the Sustainability element of this plan.
7. Audio/Visual overhaul of Waquoit Meeting Room system with most advanced technology that will better facilitate remote and other alternate forms of participation.
8. Consider a new website host platform.
9. Implement recommended stormwater improvements within the Santuit Pond Watershed as recommended by the Fuss & O'Neill MVP Action Grant.
10. Construct the Wastewater Treatment Facility and wastewater collection system consistent with the Watershed Nitrogen Management plan.
11. Identify the most appropriate sites to establish Aquaculture Development Zones consistent with the Department of Natural Resources Harbor Management Plan.
12. Continue to investigate and inventory the legal status of all known public landings and access to coastal water and great ponds to develop an access plan.
13. Purchase parcels, where feasible, to enhance public access to water or create new sites for public landings.
14. Create Town information hub (i.e., "Get to Know Mashpee), staffed with volunteers.
15. Develop emergency communication system between Town and media.
16. Update Town website and social media presence to enhance user-friendliness and communication.
17. Designated moorings for commercial entities may alleviate this issue and remove a significant barrier to entry for the burgeoning aquaculture industry especially.
18. Increase enforcement and identify a more streamlined solution to protect diggers from speeding boats and recreational boats that stray from channels.
19. Hire a Town grant-writer.
20. Hire a Town communication director.
21. Increase public participation opportunities regarding government processes
22. Design and build community center for educational programs, gym, pools, and senior services.
23. Offer additional options for internet and cell services.

24. Inspect, maintain, and upgrade septic systems.
25. Consider redevelopment of DPW Building with a LEED Certified Net Zero building
26. Add at least 8,000 square feet of additional garage space with at least some portion of that additional capacity heated.
27. Build an additional 1,600 ft^2 bay into the maintenance garage
28. Install audio/visual capabilities into the Event Room and Zoom Meeting tech in the conference room of the library.
29. Install publicly accessible EV Charging stations in library parking lot.
30. Lease or purchase EV for use of Library Staff.
31. Redevelop Harbormaster Shack with a modern, climate resilient, facility.
32. Identify and construct site for Fire Department's north station
33. Consider expanding Kids Klub into a second location.
34. Offer Town employees free tuition for the Kids Klub.
35. Identify and construct site for community center.
36. Move recreation facility to community center
37. Open new childcare facility at 505 Main Street.
38. Construct wastewater treatment plant and all lift stations and phases as needed in accordance with the Watershed Nitrogen management plan.
39. Re-establish regular in-person drop-in nights with the Substance Abuse Task Force.
40. Offer NARCAN Training through Human Services Department.

9.0 Transportation and Circulation

Goals

1. Maintain and enhance a cost-effective, efficient, safe, and accessible multi-modal transportation system that is sensitive to and respectful of the Town's small-town character.
2. Support efforts to enhance and increase alternative modes of transportation such as ride shares, bicycling, and public transportation with an eye towards reductions in greenhouse gasses and air pollution.

Policies

1. Implement road design and maintenance standards and procedures that promote, protect, and encourage exiting patterns of development and neighborhood character.
2. Maintain a formal program for road maintenance, new road construction, and accompanying drainage infrastructure that is economically responsible and implementable.
3. Promote cooperative state/local efforts in transportation planning, ensuring that the Town's qualities are maintained throughout any transportation planning and construction projects.
4. Encourage alternative modes of transportation and increase opportunities in Town for access to biking, walking, and carpooling.

Actions

1. Improve entrance at Deer Crossing and Route 28 by making entrance a right-turn in and right turn out only.
2. Direct Deer Crossing Commercial traffic seeking to make left turns out to Route 28 to the traffic light at Route 28 and Shellback Way adjacent to the Ace Hardware

3. Consider improving access to and from Deer Crossing from Shellback Way via mitigation monies held as a requirement of any approved retail grocery DRI at 647 Falmouth Road.
4. In addition to the proposed conversion of the Route 130 and Great Neck Road North intersection to a modern roundabout, consider alternative design options that would slow traffic, keep volume moving, but be less detrimental to pedestrian accommodations (seek input from BETA here). What could work instead of a roundabout and is it possible to make roundabouts in growth/activity centers more pedestrian friendly? IS a roundabout good for multimodal accommodation?
5. A connector street should be constructed between Route 28 and Great Neck Road South generally from the Mashpee Commons primary entrance from Route 28 to the Laurentide entrance on Great Neck Road South either in anticipation of additional development in this area or as a condition of such development.
6. Develop a town-wide bicycle and pedestrian master plan that would map out potential connections in the existing network and prioritize projects for future funding.
7. Develop and adopt formula that would provide the additional funding necessary to the Department of Public Works as private roads are petitioned for taking by the Town.
8. Conduct a needs assessment of DPW staff and equipment to determine adequacy of current level of service as it pertains to regular cleaning, leaf removal, snow plowing, and maintenance of bicycle facilities and sidewalks.
9. Work with the Cape Cod Regional Transit Authority and MassDOT to identify priority sites for bus-shelters along Routes 28 and 151 to allow for more safe drop offs and pick-ups.
10. Consider establishing regional transit hub in or around Mashpee Commons
11. Work with MassDOT to implement the Mashpee Rotary Retrofit and evaluate the long-term potential of transitioning existing rotary to a modern roundabout consistent with the recommendations of the Mashpee Rotary Study done by the Cape Cod Commission.
12. Consolidate and reduce the number of curb-cuts along Route 28 and 151 especially when considering redevelopment opportunities along these corridors.
13. Develop bypass roads around the Mashpee Rotary to accommodate local traffic both north-south (Route 151 to Old Barnstable Road) and east-west Route 28/Great Neck Road South to Route 28 east of the rotary through (Trout Pond neighborhood).
14. Prioritize roadway and intersection improvements to accommodate all roadway users, not just automobiles.
15. Convert remainder of Town Hall fleet to electric vehicles and install requisite charging stations to support those vehicles.
16. Change over additional municipal gas-powered vehicles to Electric Vehicles in outside departments if suitable electric alternative is on the market: DPW Director, Police Chief, Fire Chief and Fire Inspector, Recreation vehicles.
17. Install EV charging stations for public use at Town Hall, Mashpee Community Park, Public Library, Senior Center, Mashpee Beach, Attaquin Park.

10.0 Water and Coastal Resources

Goals

1. Maintain and restore the quality of Mashpee's groundwater to ensure an adequate supply of safe, high quality drinking water.
2. Protect Mashpee's groundwater supply, wetlands, and surface water from contamination.
3. Prevent harmful algal blooms in Mashpee waters to maximize recreational opportunities and preserve safe drinking water for all residents.

4. Maintain and expand wastewater treatment and disposal facilities.

Policies

1. Continue to support the shellfish propagation program to enhance local fisheries, restore vital habitat, and remove excessive nitrogen in both Waquoit and Popponesset Bay.
2. Protect the seashore from erosion.
3. Preserve fish and hunting rights of way on shore.
4. Promote shellfish seeding programs.

Actions

1. Continue to maintain navigational channels for not only navigation but for adequate stream and tidal flow.
2. Invest in necessary equipment and facilities to test cyanobacteria in-house that would specifically identify species in real time to assist in determinations of toxicity.
3. Conduct personnel needs assessment to understand gaps in consideration of current and planned water quality monitoring and testing programs.
4. Establish Water Quality Task force as subcommittee of the Environmental Oversight Committee to conduct necessary engagement and community education around recommended bylaw changes to address water quality issues: fertilizer and pesticide use, wetlands buffers, floodplain management.
5. Identify areas for coastal and habitat restoration to enhance water quality.
6. Establish at least one Aquaculture Development Zone (ADZ) in Town
7. Provide additional public access to the ocean.
8. Ban chemicals that increase nutrient load in waterways.
9. Establish boat washes to prevent invasive species from spawning in waterways.

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Office of the Town Manager
Mashpee Town Hall
16 Great Neck Road North
Mashpee, MA 02649

MEMORANDUM

TO: Chair Mary Waygan and Members of the Planning Board
CC: Town Manager, Town Planner

FROM: Terrie Cook – Administrative Assistant to the Town Manager

DATE: February 24, 2023

RE: ***2023 May Town Meeting Zoning Bylaw and Road Taking Warrant Articles***

The 2023 May Town Meeting Zoning Bylaws and Road Taking Warrant Articles, as they appear on Draft #1 of the warrant, are attached for your reference and discussion.

Three were submitted by the Planning Board, two petitioned road taking articles, and three petitioned zoning bylaw articles.

Thank you.

Article

To see if the Town will vote to amend §174-25 (H)(12) of the Mashpee Zoning By Law "Table of Use Regulations" by adding the letters 'SP' located in the columns identified as C-1 and C-2, and further by deleting the phrase, "provided that neighboring properties are effectively protected from any significant adverse impacts from glare, that any such systems are properly fenced or otherwise secured, and that no hazardous materials are stored in quantities greater than permitted by other sections of this bylaw, subject to approval by the Plan Review Committee and Design Review Committee" under the "Type of Use column" and replacing that phrase with "subject to the provisions of Section 174-45.7"

Type of Use	Residential		Commercial			Industrial
	R-3	R-5	C-1	C-2	C-3	I-1
Medium-scale and Large Scale Ground Mounted Solar Energy Systems, subject to the provisions of Sec. 174-45.7	--	--	SP	SP	--	PR

Submitted by the Planning Board

Explanation: This article would allow the development of medium scale solar energy systems as an accessory and/or principal use in the residential, commercial and industrial zoning districts with a Special Permit from the Planning Board in the C-1 and C-2 zoning districts subject to a new special provision 174-45.7 proposed containing performance standards and design criteria for the use.

Article

To see if the Town will vote to amend §174-31, Land Space Requirements Table by referencing footnote 15 in the Minimum Lot Frontage column title and adding new footnote 15 to read as follows:

[15] Minimum lot frontage required for the development of solar energy systems shall be twenty-five (25) feet.

Submitted by the Planning Board

Explanation: This article would allow the development of solar energy systems on lots that have a minimum of twenty-five (25) feet by amending the footnotes of the Land Space Requirements table in the Zoning Bylaw. Lot frontage of 150 feet is the minimum requirement for other uses in the Town. The Town may consider reducing frontage to encourage solar energy on otherwise unbuildable lots. Solar Energy systems require only one access driveway for maintenance.

Article

To see if the Town will vote to add new section 174-45.7: Solar Energy Systems to the Mashpee Zoning Bylaws as follows:

Solar Energy Systems

A. Purpose and Intent

This section promotes the creation of new small, medium and large-scale, ground-mounted solar energy systems by providing standards for the placement, design, construction, operation, monitoring, modification and removal of such installations that address public safety, minimize impacts on scenic, natural and historic resources and for providing adequate financial assurance for the eventual decommissioning of such installations. This bylaw is adopted pursuant to the Commonwealth of Massachusetts Green Communities Act and Massachusetts General Laws Chapter 40A Section 3.

B. General Provisions

1. Small scale ground mounted solar energy systems and roof mounted solar energy systems shall be considered an accessory use allowed as-of-right in the R-3, R-5, C-1, C-2, C-3, and I-1 districts. In issuing a building permit for such a system, the Building Inspector shall ensure that neighboring properties are effectively protected from any adverse impacts arising from glare.
2. Any medium or large-scale solar energy system shall be allowed in the C-1 and C-2 Zoning Districts only after the issuance of a Special Permit by the Planning Board. In issuing such Special Permit, the Board shall ensure that neighboring properties are effectively protected from any significant adverse impacts arising from glare, that any such systems are properly fenced or otherwise secured, and that no hazardous materials are stored in quantities greater than permitted by other sections of this bylaw.
3. Any medium or large-scale solar energy system in the I-1 Industrial Zoning District shall be allowed after review and approval by the Plan Review Committee.
4. The construction and operation of all ground-mounted solar energy systems shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and fixtures constituting part of a ground-mounted solar energy system shall be constructed in accordance with all applicable requirements of the Massachusetts State Building Code.
5. The solar energy system’s owner or operator shall maintain system facilities in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures. Site access shall be maintained to a level acceptable to the Town’s Fire Chief and Emergency Management Director. The owner or operator shall be responsible for the cost of maintaining the ground-mounted solar energy system and any related access road(s).
6. No solar energy system may use panels manufactured with per-and polyfluoroalkyl substances (PFAS).

C. Dimensional Criteria

1. Small Scale Solar Energy Systems
    1. Small scale ground mounted systems shall comply with the setback requirements typical of the zoning district and shall not exceed fifteen (15') feet in height.

    2. Small scale ground mounted systems shall be exempt from the performance standards defined in Section G of this chapter.

2. Medium and Large Scale Solar Energy Systems
    a. Medium and Large Scale Solar energy systems may be accessory to another principal structure or use provided that they satisfy the dimensional criteria and performance standards contained in this section.

    b. Ground-mounted solar energy systems shall be set back a distance of at least 100 feet from a public or private way. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

    c. Ground-mounted solar energy systems shall be set back a distance of at least 125 feet from any inhabited Residence, and 100 feet from any property in residential use. For the purposes of this section, a Residence is defined as the primary living structure and not accessory structures. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

    d. Ground-mounted solar energy systems shall be set back a distance of at least 50 feet from any commercial property or use, and 25 feet from any industrial property or use notwithstanding the provisions of paragraph 2 above (relative to medium and large-scale solar energy systems). The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

    e. Ground-mounted solar energy systems shall be set back a distance of at least 50 feet from abutting conservation land and any property not included in the Ground-mounted solar array application. The Planning Board may reduce the minimum setback distance as it may deem appropriate based on site-specific considerations.

    f. Ground-mounted systems (medium and large) shall be set back a distance of at least 200 feet from any river and set back a distance of at least 100 feet from any water and wetlands.

    g. Fixed tilt Ground-mounted solar energy systems shall have a maximum height of 15 feet above grade. In the case of single or dual axis tracking Ground-mounted solar energy systems, the Planning Board may increase the maximum height as it may deem appropriate based on site-specific considerations.

    h. Inverters, energy storage systems, and transmission system substations shall be set back a distance of at least 200 feet from any residence. The Planning Board may reduce the minimum setback distance as it may deem appropriate based on site-specific considerations.

D. Special Permits Rules and Application Requirements

A Solar Energy System Special Permit shall not be granted unless each of the following submittal requirements, in addition to the requirements in §174-24 C Special Permit use, are satisfied:

1. A properly completed and executed application form and application fee;
2. Any requested waivers;
3. Name, address, phone number and signature of the project proponent, as well as all co-proponents or property owners, if any;
4. Name, contact information and signature of any agents representing the project proponent;
5. Name, address, and contact information for proposed system installer;
6. Documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar energy system;
7. Proposed hours of operation and construction activity;
8. Blueprints or drawings of the solar energy system signed by a Massachusetts licensed Registered Professional Engineer showing the proposed layout of the system and any potential shading from nearby structures;
9. <u>Utility Notification</u> - evidence that the utility company that operates the electrical grid where a grid-intertie solar energy system is to be located has been informed of the system owner or operator's intent to install an interconnected facility and acknowledges receipt of such notification, and a copy of an Interconnection Application filed with the utility including a one or three line electrical diagram detailing the solar electric installation, associated components, and electrical interconnection methods, with all Massachusetts Electrical Code (527 CMR § 12.00) compliant disconnects and overcurrent devices. Off-grid solar energy systems shall be exempt from this requirement;
10. Documentation of the major system components to be used, including the electric generating components, battery or other electric storage systems, transmission systems, mounting system, inverter, etc.;
11. Preliminary Operation & Maintenance Plan for the solar energy system, which shall include measures for maintaining safe access to the installation, storm water management, vegetation controls, and general procedures for operational maintenance of the installation;
12. Abandonment & Decommissioning Plan - Any ground-mounted solar energy system which has reached the end of its useful life or has been abandoned (i.e., when it fails to operate for more than one year without the written consent of the Planning Board) shall be removed. The owner or operator shall physically remove the installation within 150 days of abandonment or the proposed date of decommissioning. The owner or operator shall notify the Planning Board by certified mail of the proposed date of discontinued operations and plans for removal. The Abandonment & Decommissioning Plan shall include a detailed description of how all of the following will be addressed:
    a. Physical removal of all structures; equipment, building, security barriers and transmission lines from the site, including any materials used to limit vegetation.
    b. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
    c. Stabilization or re-vegetation of the site as necessary to minimize erosion. The Planning Board may allow landscaping or below-grade foundations left *in situ* in order to minimize erosion and disturbance of the site.

d. Description of financial surety for decommissioning - Proponents of ground-mounted solar energy systems shall provide a form of surety, either through escrow account, bond or other form of surety approved by the Planning Board to cover the cost of removal in the event the Town must remove the installation and remediate the landscape, in an amount and form determined to be commercially reasonable by the Planning Board, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the project proponent and the Town. Such surety will not be required for municipal or state-owned facilities. The project proponent shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.
e. It shall be a condition of any special permit that all legal documents required to enable the Town to exercise its rights and responsibilities under the plan to decommission the site, enter the property and physically remove the installation shall be provided prior to the issuance of a building permit.

13. Proof of liability insurance in such form and with policy limits satisfactory to the Planning Board;
14. A storm water management plan prepared by a Massachusetts licensed Registered Professional Engineer; and
15. A Site Plan, with stamp and signature of the Massachusetts licensed Registered Professional Engineer that prepared the plan, including the following:
    a. Everything required under this bylaw and Site Plan Approval.
    b. Existing Conditions Plan, showing property lines, map and lot from the Assessor's records, and physical features, including roads and topography, for the entire project site, signed and sealed by a Massachusetts licensed Registered Land Surveyor.
    c. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, screening vegetation, fencing or structures including their height, and placement of system components, including solar arrays and related structures and equipment.
    d. An estimate of earthwork operations including the volume of cut and fill and the amount of soil material to be imported or exported from the site.
    e. Locations of wetlands, vernal pools, and Priority Habitat Areas defined by the Natural Heritage & Endangered Species Program (NHESP).
    f. Locations of floodplain area(s).
    g. Zoning district designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose).
    h. Materials storage and delivery and equipment staging area(s).
    i. Location of screening vegetation or structures.

E. Required Performance Standards – Medium and Large Scale Solar Energy Systems

1. <u>Visual Impact Mitigation</u> – The site plan for a ground-mounted solar energy system shall be designed to screen the array to the maximum extent practicable, on a year round basis, from adjacent properties in residential use and from all roadways.

2. All required setbacks shall be left in their undisturbed natural vegetated condition for the duration of the solar energy system's installation. In situations where the naturally vegetated condition within required setbacks is not wooded and does provide adequate screening of the solar array, the Planning Board may require additional intervention including, but not limited to:
    a. A landscaping plan showing sufficient trees and understory vegetation, of a type common in natural areas of Mashpee, to replicate a naturally wooded area and to constitute a visual barrier between the proposed array and neighboring properties and roadways.
    b. Berms along property lines and roadways with suitable plantings to provide adequate screening to neighboring properties and roadways.

3. Lighting – Lighting of ground-mounted solar energy systems shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Lighting shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

4. Signage – Signs on ground-mounted solar energy systems shall comply with all applicable regulations of this bylaw and/or any Town sign bylaw. A sign shall be required to identify the owner, operator and interconnected utility and provide a 24-hour emergency contact phone number. Ground-mounted solar energy systems shall not be used for displaying any advertising signage.

5. Utility Connections – Within setback distances and except where soil conditions, location, property shape, and topography of the site or requirements of the utility provider prevent it, all utility connections from grid-intertie solar energy systems shall be placed underground. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

6. Vegetation Management – All land associated with the ground-mounted solar energy system shall be covered and grown in natural vegetation. The height of vegetation must be managed by regular mowing or grazing so as to minimize the amount and height of combustible material available in case of fire. Herbicides, pesticides, or chemical fertilizers shall not be used to manage vegetation. To the greatest extent practicable, a diversity of plant species shall be used, with preference given to species that are native to New England. Use of plants identified by the most recent copy of the "Massachusetts Prohibited Plant List" maintained by the Massachusetts Department of Agricultural Resources is prohibited. Management of all vegetated areas shall be maintained throughout the duration of the solar energy system's installation through mechanical means without the use of chemical herbicides.

7. Noise Generation – Noise generated by ground-mounted solar energy systems and associated equipment and machinery shall conform to applicable state and local noise regulations, including the DEP's Division of Air Quality noise regulations, 310 CMR 7.10.

8. Fencing – Fencing around solar arrays shall provide 6 inches of clearance between the fence bottom and the ground to allow passage of small wildlife. Clearance shall not exceed 6 inches unless otherwise approved by the Planning Board in its written decision for good cause. The Planning Board shall require residential style fencing where necessary to screen the solar energy systems on a year round basis from adjacent residences.

9. Land Clearing and Soil Erosion – Clearing of natural vegetation and topsoil shall be limited to what is necessary for the construction, operation, and maintenance of the ground-mounted solar energy system. No topsoil removed during construction shall be exported from the site.

10. Erosion Control and Stormwater – Erosion Control and Stormwater Management notation shall be included to show that adequate provisions against erosion and adverse impacts of runoff are appropriately mitigated.

11. Emergency Services – The ground-mounted solar energy system owner or operator shall provide a copy of the project summary, electrical schematic, and site plan to the Mashpee Fire Department, and any other neighboring Fire Department upon request. Upon request the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of shutting down the solar energy system shall be clearly marked. The owner or operator shall identify a responsible person for public inquiries throughout the life of the installation.

F. Waivers

The Planning Board may, upon the prior written request of the applicant, waive any of the requirements of this Section, and shall state its reasons for doing so, in writing, as part of its decision.

Submitted by the Planning Board

Explanation: This article would expand solar energy system uses for medium scale (up to 40,000 square feet) and large scale (greater than 40,000 square feet) into the C-1 and C-2 Commercial Zoning Districts. Any medium and large-scale solar energy system proposed in either of those zoning districts would require an application to the Planning Board for a special permit outlining compliance with the minimum required performance standards of this article.

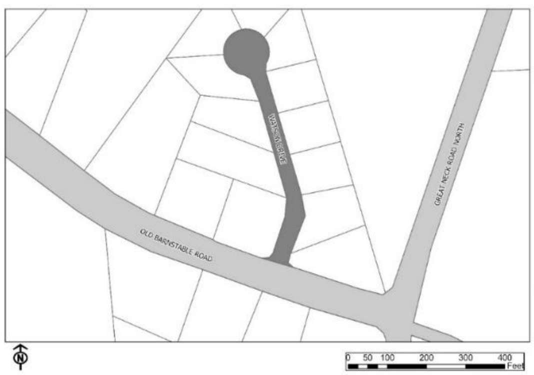
THE FOLLOWING WERE SUBMITTED BY PETITION:

Article

To see if the Town will vote to authorize and empower the Select Board to prepare a plan laying out and defining Watson Drive and to accomplish said purpose and for expenses related thereto, the Town vote to appropriate and transfer from revenue available for appropriation $10,000 to the Watson Drive Roadways Account, or take any other action relating thereto.

Submitted by Petition

Explanation: This Article authorizes the Town to layout and define Watson Drive and to appropriate funding for this purpose.
Map: Watson Drive

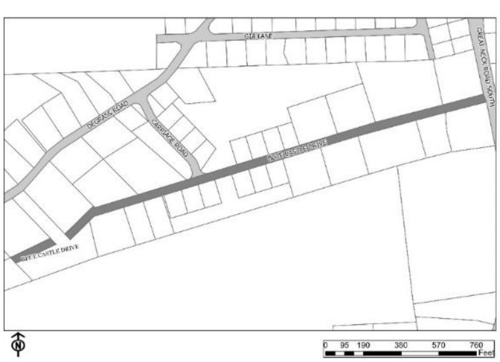


Article

To see if the Town will vote to authorize and empower the Select Board to prepare a plan laying out and defining Blue Castle Drive and to accomplish said purpose and for expenses related thereto, the Town vote to appropriate and transfer from revenue available for appropriation $10,000 to the Blue Castle Roadways Account, or take any other action relating thereto.

Submitted by Petition

Explanation: This article authorizes the Town to layout and define Blue Castle Drive and to appropriate funding for that purpose.
Map: Blue Castle Drive



Article

To see if the Town will vote to amend §174-25 (H)(12) of the Mashpee Zoning Bylaw Table of Use Regulations by replacing §174-25 (H)(12) in its entirety with the following:

Type of Use		Residential		Commercial			Industrial
		R-3	R-5	C-1	C-2	C-3	I-1
(12)	Medium-scale and Large-scale ground mounted solar energy systems subject to the provisions of §174-45.7: Solar Energy Systems	---	---	SP	SP	---	PR

Submitted by Petition

Explanation: This article would allow the development of medium- and large-scale ground mounted solar energy systems in the commercial (C-1) and (C-2) zoning districts with a Special Permit (SP) from the Planning Board and in the industrial (I-1) zoning district by approval of Site Plan Review per the standards for the placement, design, construction, operation, monitoring, modification, and removal of such installations as set by §174-45.7: Solar Energy Systems of the Mashpee Zoning Bylaws.

Article

To see if the Town will vote to add new section 174-45.7: Solar Energy Systems to the Mashpee Zoning Bylaws as follows:

Solar Energy Systems

Purpose and Intent

This section promotes the creation of small, medium and large-scale, ground-mounted solar energy systems by providing standards for the placement, design, construction, operation, monitoring, modification and removal of such installations that address public safety, minimize impacts on scenic, natural and historic resources and for providing adequate financial assurance for the eventual decommissioning of such installations.

General Provisions

A. Small scale ground mounted solar energy systems and roof mounted solar energy systems shall be considered an accessory use allowed as-of-right in the R-3, R-5, C-1, C-2, C-3, and I-1 districts. In issuing such building permit, the Building Inspector shall ensure that neighboring properties are effectively protected from any adverse impacts from glare.

B. Any medium or large scale solar energy system shall be allowed in the C-1 and C-2 Zoning Districts only after the issuance of a Special Permit by the Planning Board. In issuing such Special Permit, the Board shall ensure that neighboring properties are effectively protected from any significant adverse impacts from glare, that any such systems are properly fenced or otherwise secured, and that no hazardous materials are stored in quantities greater than permitted by other sections of this bylaw.

Any medium or large scale solar energy system shall be allowed as-of-right in the I-1 Zoning District subject to approval the Plan Review Committee and the Design Review Committee. The Plan Review Committee and the Design Review Committee shall ensure that neighboring properties are effectively protected from any significant adverse impacts from glare, that any such systems are properly fenced or otherwise secured, and that no hazardous materials are stored in quantities greater than permitted by other sections of this bylaw.

C. The construction and operation of all ground-mounted solar energy systems shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and fixtures forming part of a ground-mounted solar energy system shall be constructed in accordance with the Massachusetts State Building Code.

D. The solar energy system's owner or operator shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures. Site access shall be maintained to a level acceptable to the local Fire Chief and Emergency Management Director. The owner or operator shall be responsible for the cost of maintaining the ground-mounted solar energy system and any access road(s).

E. Dimensional Criteria

Small Scale Solar Energy Systems

1. Small scale ground mounted systems shall comply with the setback requirements typical of the zoning district and shall not exceed fifteen (15') feet in height.

2. Small scale ground mounted systems shall be exempt from the performance standards defined in Section G of this chapter.

Medium and Large Scale Solar Energy Systems

1. Medium and Large Scale Solar energy systems may be accessory to another principal structure or use provided that they satisfy the dimensional criteria and performance standards contained in this section.

2. Ground-mounted solar energy systems shall be set back a distance of at least 100 feet from a public or private way. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

3. Ground-mounted solar energy systems shall be set back a distance of at least 125 feet from any inhabited Residence, and 100 feet from any property in residential use. For the purposes of this section, a Residence is defined as the primary living structure and not accessory structures. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

4. Ground-mounted solar energy systems shall be set back a distance of at least 50 feet from any commercial property or use, and 25 feet from any industrial property or use notwithstanding the provisions of paragraph 2 above (relative to medium and large scale solar energy systems). The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

5. Ground-mounted solar energy systems shall be set back a distance of at least 50 feet from abutting conservation land and any property not included in the Ground-mounted solar array application. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

6. Ground-mounted systems (medium and large) shall be set back a distance of at least 200 feet from any river and set back a distance of at least 100 feet from any water and wetlands.

7. Fixed tilt Ground-mounted solar energy systems shall have a maximum height of 15 feet above grade. In the case of single or dual axis tracking Ground-mounted solar energy systems, the Planning Board may increase the maximum height as appropriate based on site-specific considerations.

8. Inverters, energy storage systems, and transmission system substations shall be set back a distance of at least 200 feet from any residence. The Planning Board may reduce the minimum setback distance as appropriate based on site-specific considerations.

F. Special Permits Rules and Application Requirements

A Solar Energy System Special Permit shall not be granted unless each of the following requirements, in addition to the requirements in §174-24 C Special Permit use, are satisfied:

1. A properly completed and executed application form and application fee
2. Any requested waivers
3. Name, address, phone number and signature of the project proponent, as well as all co-proponents or property owners, if any
4. Name, contact information and signature of any agents representing the project proponent
5. Name, address, and contact information for proposed system installer
6. Documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar energy system
7. Proposed hours of operation and construction activity
8. Blueprints or drawings of the solar energy system signed by a Massachusetts licensed Registered Professional Engineer showing the proposed layout of the system and any potential shading from nearby structures
9. Utility Notification - evidence that the utility company that operates the electrical grid where a grid-intertie solar energy system is to be located has been informed of the system owner or operator's intent to install an interconnected facility and acknowledges receipt of such notification, and a copy of an Interconnection Application filed with the utility including a one or three line electrical diagram detailing the solar electric installation, associated components, and electrical interconnection methods, with all Massachusetts Electrical Code (527 CMR § 12.00) compliant disconnects and overcurrent devices. Off-grid solar energy systems shall be exempt from this requirement.
10. Documentation of the major system components to be used, including the electric generating components, battery or other electric storage systems, transmission systems, mounting system, inverter, etc.
11. Preliminary Operation & Maintenance Plan for the solar energy system, which shall include measures for maintaining safe access to the installation, storm water management, vegetation controls, and general procedures for operational maintenance of the installation

12. Abandonment & Decommissioning Plan - Any ground-mounted solar energy system which has reached the end of its useful life or has been abandoned (i.e., when it fails to operate for more than one year without the written consent of the Planning Board) shall be removed. The owner or operator shall physically remove the installation within 150 days of abandonment or the proposed date of decommissioning. The owner or operator shall notify the Planning Board by certified mail of the proposed date of discontinued operations and plans for removal. The Abandonment & Decommissioning Plan shall include a detailed description of how all of the following will be addressed:

    a. Physical removal of all structures; equipment, building, security barriers and transmission lines from the site, including any materials used to limit vegetation.

    b. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.

    c. Stabilization or re-vegetation of the site as necessary to minimize erosion. The Planning Board may allow landscaping or below-grade foundations left *in situ* in order to minimize erosion and disturbance of the site.

    d. Description of financial surety for decommissioning - Proponents of ground-mounted solar energy systems shall provide a form of surety, either through escrow account, bond or other form of surety approved by the Planning Board to cover the cost of removal in the event the Town must remove the installation and remediate the landscape, in an amount and form determined to be commercially reasonable by the Planning Board, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the project proponent and the Town. Such surety will not be required for municipal or state-owned facilities. The project proponent shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.
    e. It shall be a condition of any special permit that all legal documents required to enable the Town to exercise its rights and responsibilities under the plan to decommission the site, enter the property and physically remove the installation shall be provided prior to the issuance of a building permit.

13. Proof of liability insurance

14. A storm water management plan prepared by a Massachusetts licensed Registered Professional Engineer

15. A Site Plan, with stamp and signature of the Massachusetts licensed Registered Professional Engineer that prepared the plan, including the following:
    a. Everything required under this bylaw and Site Plan Approval
    b. Existing Conditions Plan, showing property lines, map and lot from the Assessor's records, and physical features, including roads and topography, for the entire project site, signed and sealed by a Massachusetts licensed Registered Land Surveyor

c. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, screening vegetation, fencing or structures including their height, and placement of system components, including solar arrays and related structures and equipment
d. An estimate of earthwork operations including the volume of cut and fill and the amount of soil material to be imported or exported from the site
e. Locations of wetlands, vernal pools, and Priority Habitat Areas defined by the Natural Heritage & Endangered Species Program (NHESP)
f. Locations of floodplain area(s)
g. Zoning district designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose)
h. Materials storage and delivery and equipment staging area(s)
i. Location of screening vegetation or structures

G. Required Performance Standards – Medium and Large Scale Solar Energy Systems

1. Visual Impact Mitigation – The site plan for a ground-mounted solar energy system shall be designed to screen the array to the maximum extent practicable year round from adjacent properties in residential use and from all roadways.

2. All required setbacks shall be left in their undisturbed natural vegetated condition for the duration of the solar energy system's installation. In situations where the naturally vegetated condition within required setbacks is not wooded and does provide adequate screening of the solar array, the Planning Board may require additional intervention including, but not limited to:

   a. A landscaping plan showing sufficient trees and understory vegetation, of a type common in natural areas of Mashpee, to replicate a naturally wooded area and to constitute a visual barrier between the proposed array and neighboring properties and roadways
   b. Berms along property lines and roadways with suitable plantings to provide adequate screening to neighboring properties and roadways.

3. Lighting – Lighting of ground-mounted solar energy systems shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Lighting shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

4. Signage – Signs on ground-mounted solar energy systems shall comply with all applicable regulations of this bylaw and/or any Town sign bylaw. A sign shall be required to identify the owner, operator and interconnected utility and provide a 24-hour emergency contact phone number. Ground-mounted solar energy systems shall not be used for displaying any advertising signage.

5. Utility Connections – Within setback distances and except where soil conditions, location, property shape, and topography of the site or requirements of the utility provider prevent it, all utility connections from grid-intertie solar energy systems shall be placed underground. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

6. Vegetation Management – All land associated with the ground-mounted solar energy system shall be covered and grown in natural vegetation. The height of vegetation must be managed by regular mowing or grazing so as to minimize the amount and height of combustible material available in case of fire. Herbicides, pesticides, or chemical fertilizers shall not be used to manage vegetation. To the greatest extent practicable, a diversity of plant species shall be used, with preference given to species that are native to New England. Use of plants identified by the most recent copy of the "Massachusetts Prohibited Plant List" maintained by the Massachusetts Department of Agricultural Resources is prohibited. Management of all vegetated areas shall be maintained throughout the duration of the solar energy system's installation through mechanical means without the use of chemical herbicides.

7. Noise Generation – Noise generated by ground-mounted solar energy systems and associated equipment and machinery shall conform to applicable state and local noise regulations, including the DEP's Division of Air Quality noise regulations, 310 CMR 7.10.

8. Fencing – Fencing around solar arrays shall provide 6 inches of clearance between the fence bottom and the ground to allow passage of small wildlife. Clearance shall not exceed 6 inches unless otherwise approved by the Planning Board in its written decision for good cause. Residential style fencing is necessary to screen the solar energy systems year round from adjacent residences.

9. Land Clearing and Soil Erosion – Clearing of natural vegetation and topsoil shall be limited to what is necessary for the construction, operation and maintenance of the ground-mounted solar energy system. No topsoil removed during construction shall be exported from the site.

10. Erosion Control and Stormwater – Erosion Control and Stormwater Management notation shall be included to show that adequate provisions against erosion and adverse impacts of runoff are appropriately mitigated.

11. Emergency Services – The ground-mounted solar energy system owner or operator shall provide a copy of the project summary, electrical schematic, and site plan to the Mashpee Fire Department, and any other neighboring Fire Department upon request. Upon request the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of shutting down the solar energy system shall be clearly marked. The owner or operator shall identify a responsible person for public inquiries throughout the life of the installation.

Submitted by Petition

Explanation: This section promotes the creation of new small, medium and large-scale, ground-mounted solar energy systems by providing standards for the placement, design, construction, operation, monitoring, modification and removal of such installations that address public safety, minimize impacts on scenic, natural and historic resources and for providing adequate financial assurance for the eventual decommissioning of such installations.

Article

To see if the Town will vote to amend the Zoning Bylaws by deleting in its entirety section §174-17.1 Raze and Replace. or take any other action relating thereto.

Submitted by Petition

Explanation: Article removes the ability of Board of Appeals to approve the raze/replacement of pre-existing/non-conforming dwellings by Special Permit. Passed in 2018, §174-17.1 Raze and Replace has not been employed in the spirit promised resulting in detrimental building height, lot coverage, and impacts on natural resources. Structures may still be altered under §174-17 Continuance/Extensions/Alterations.

JACK McELHINNEY
Attorney at Law

63 Shore Road, Suite 23
Winchester, MA 01890
jmcelhin@aol.com

Office: 781.729.7299
Cell: 617.816.4092

January 23, 2023

By Hand Delivery

Planning Board
Town of Mashpee
16 Great Neck Road North
Mashpee, MA 02649

Attn: Evan Lehrer, Town Planner

Re: Willowbend Country Club – Request for Modification No. 37 of Special Permit

Dear Members of the Planning Board:

Enclosed please find the applications of Southworth Mashpee Properties LLC for a modification of the Special Permit for Willowbend Country Club. A check in the amounts of $500 is included to cover application fees. The application is submitted pursuant to Section 174-24C(9)(g) of the Mashpee Zoning By-law and seeks approval to include within the Special Permit the 5.03 acre parcel known as 275 Quinnaquisset Avenue immediately contiguous to the golf course and to demolish the existing single family home currently served by a septic system and to construct thereon 14 single family cottages. All units would be connected to the existing Willowbend Sewage Treatment plant. A brief project description is included with the application. Plans, prepared by Baxter Nye Engineering & Survey, Inc. are included with this submittal and have also been transmitted electronically to the Planning office.

Please feel free to contact me should you have any questions.

Sincerely yours,

JEM

Jack McElhinney, attorney for
Southworth Mashpee Properties LLC

cc: Town Clerk
Matthew Eddy, P.E.

Project Description

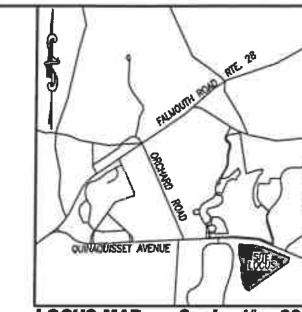
The proposed project, known as Cranberry Point, will consist of the construction of fourteen single family cottages on a 5.06 acre parcel known as 275 Quinaquisset Avenue. The parcel is triangular in shape and is bounded on two sides by the existing golf course and on the third side by Quinaquisset Avenue. The cottages will each be designed for three bedrooms and contain approximately 2500 s.f. on average and would be offered for sale. The new neighborhood would be served by a sixteen foot paved driveway with an additional seven foot shell shoulder. All units will be connected to the Willowbend Sewer Treatment plant. Cranberry Point will also include a community putting area and golf cart path which will connect the neighborhood with pedestrian access to the existing first hole of the "Bay" course and the existing golf cart crossing on Quinaquisset. In order to construct the project, the owner will be seeking approval from the Conservation Commission to fill portions of two old bog areas on the property. As mitigation for the wetland impacts, the proponent is proposing to "naturalize" one and a half acres of contiguous bogs along the channel of Quaker Run. The proponent has met informally with the Commission and the agent to discuss this part of the work.

Requested Relief

Although the parcel is not currently subject to the terms of the Willowbend Special Permit, under the terms of Section 174-24C.(9)(g) of the By-law, the Planning Board may modify the Special Permit to include this land under the terms of the Special Permit provided that the project does not increase the overall number of units for the project or otherwise result in any loss of protected open space. The proposed project is eligible for approval under this section as the existing Special Permit provides for a maximum cap of 287 permits for the entire Willowbend Project. As of the most recent modification in 2021 for the six lot Willow Circle subdivision, the overall number of residential permits approved by the Planning Board for Willowbend stands at 274, leaving 13 remaining permits available under the 287 unit cap. The fourteenth permit would be made available by re-assigning a permit previously approved for the parcel at 24 North Glen Drive which parcel has since been permanently restricted and cannot be built on. [1]

1

By way of background, in 2009, two approved building sites at 24 and 26 North Glen Drive (approved by Modification 15 in April, 1996 attached) were permanently merged into a single building site now known as 24A North Glen. As part of that merger, the development rights pertaining to the two parcels were permanently relinquished by the parcel owner and converted to the right to construct a single home on the two merged parcels along with an adjacent pool. Copies of the relevant documents have been provided to the Planning office. Willowbend is now requesting that the existing approval for 27 lots granted in the 1996 Modification No. 15 for North Glen Drive be reduced from 27 to 26 thereby increasing the number of permits currently available under the 287 overall cap from 13 to 14.



LOCUS MAP Scale: 1" = 2000'

GENERAL NOTES:

1. THE INTENT OF THIS PLAN IS TO DETAIL EXISTING SITE CONDITIONS AT 0 QUINAQUISSET AVE. AND 275 QUINAQUISSET AVE, MASHPEE, MA 02649.
2. LOCUS AREA IS COMPRISED OF: PER CURRENT ASSESSOR'S RECORDS:

OWNER: SOUTHWORTH MASHPEE PROPERTIES, LLC
130 WILLOWBEND DRIVE, MASHPEE, MA 02649
DEED BOOK 32022 PAGE 219
RECORD PLAN BOOK 448 PAGE 38 LOT 1 AND 2
ASSESSOR'S MAP 69, PARCEL 32 AND 169

3. BENCHMARK AS SHOWN ON THIS PLAN.
4. ZONING INFORMATION:

ZONING DISTRICT: R3
CURRENT MINIMUM ZONING REQUIREMENTS:
MIN. LOT AREA = 40,000 SF.
MIN. LOT FRONTAGE = 150 FEET
MIN. YARD SETBACKS: FRONT = 40 FEET, SIDE = 15 FEET, REAR = 15 FEET
MAXIMUM BUILDING HEIGHT = 2-1/2 STORIES
MAXIMUM LOT COVERAGE = 20%

5. A TITLE SEARCH HAS NOT BEEN PERFORMED FOR THIS SITE. THERE MAY BE RIGHTS BY OTHERS, EASEMENT, TAKINGS, MORTGAGES, RIGHT OF WAYS ETC. NOT DEPICTED. IF DETERMINED TO BE NECESSARY, A TITLE SEARCH SHALL BE PERFORMED BY OTHERS AND SUPPLIED TO BAXTER NYE ENGINEERING & SURVEYING.
6. THE PROPERTY LINE INFORMATION SHOWN IS PER THE PROPERTY LINES SET BY THE REGISTERED PROFESSIONAL LAND SURVEYOR (PLS) AS SHOWN ON THE CERTIFIED PLOT PLAN AS SEALED BY THE PLS WITHIN THIS PLAN SET. THE EXISTING FEATURES SHOWN HEREON WERE OBTAINED FROM AN ON THE GROUND FIELD SURVEY PERFORMED BY BAXTER NYE ENGINEERING & SURVEYING ON MARCH 17, 2022, ON AUGUST 12 AND 16 AND DECEMBER 12 2022. THE PROPERTY LINE AND SURVEY INFORMATION WAS COMMISSIONED AS PART OF THE PROJECT AND IS SHOWN AS BACKGROUND INFORMATION ON THE DESIGN PLANS.
7. COMMUNITY PANEL NUMBER: 250009 0752 J. THE FLOOD INSURANCE RATE MAP DEFINES THIS AREA AS ZONE X (UNSHADED) AND ZONE X (SHADED).
8. ENVIRONMENTAL INFORMATION:

PER MASS GIS OLIVER AS OF 08/23/2022:

- SITE DOES NOT APPEAR TO BE WITHIN AN A.C.E.C. (AREA OF CRITICAL ENVIRONMENTAL CONCERN).
- SITE DOES NOT APPEAR TO BE WITHIN AN AREA OF ESTIMATED HABITAT OF RARE WILDLIFE AS MAPPED ON MASS GIS OLIVER PER NHESP "ESTIMATED HABITATS OF RARE WILDLIFE" FOR USE WITH THE MA WETLANDS PROTECTION ACT REGULATIONS (310 CMR 10)."
- SITE DOES NOT APPEAR TO BE WITHIN A PRIORITY HABITAT AS MAPPED ON MASS GIS OLIVER PER NHESP "PRIORITY HABITATS OF RARE SPECIES" FOR SPECIES UNDER THE MASSACHUSETTS ENDANGERED SPECIES ACT, REGULATIONS (321 CMR 10).
- SITE DOES NOT APPEAR TO CONTAIN A CERTIFIED VERNAL POOL AS MAPPED ON MASS GIS OLIVER PER NHESP "CERTIFIED VERNAL POOLS."
- SITE APPEARS TO BE WITHIN A WETLAND RESOURCE AREA AS MAPPED ON MASS GIS SYSTEM.
- SITE DOES NOT APPEAR TO BE WITHIN A STATE APPROVED ZONE II GROUNDWATER RECHARGE PROTECTION AREA.

9. UTILITY INFORMATION SHOWN HEREIN:

- THE CONTRACTOR SHALL CONTACT DIG SAFE (AT 1-888-DIG-SAFE) AND UTILITY COMPANIES TO LOCATE THE LOCATION OF ALL EXISTING UTILITIES, AT LEAST 72 HOURS PRIOR TO THE START OF CONSTRUCTION. EXISTING UNDERGROUND INFRASTRUCTURE, UTILITIES, CONDUITS AND LINES ARE SHOWN IN AN APPROXIMATE WAY ONLY, MAY NOT BE LIMITED TO THOSE SHOWN HEREIN AND HAVE BEEN RESEARCHED BASED ON THE AVAILABLE UTILITY RECORDS NOTED HEREON. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE SAID INFRASTRUCTURE AND UTILITIES EXACTLY. IF FIELD CONDITIONS DIFFER FROM PLAN INFORMATION, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY FOR POSSIBLE REDESIGN.
- SOURCE INFORMATION FROM PLANS HAS BEEN COMBINED WITH OBSERVED EVIDENCE OF UTILITIES TO DEVELOP A VIEW OF THOSE UNDERGROUND UTILITIES. HOWEVER, LACKING EXCAVATION, THE EXACT LOCATION OF UNDERGROUND FEATURES CANNOT BE ACCURATELY, COMPLETELY AND RELIABLY DEPICTED. WHERE ADDITIONAL OR MORE DETAILED INFORMATION IS REQUIRED, THE CLIENT IS ADVISED THAT EXCAVATION MAY BE NECESSARY.
- UTILITIES NOTED HEREON AS "COMPILED" ARE SHOWN BASED ON SOURCE INFORMATION (RECORD PLANS) OBTAINED FROM UTILITY COMPANIES AND/OR MUNICIPALITIES. LOCATIONS OF "COMPILED" UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE ONLY.
- EXISTING SEPTIC SYSTEM INFORMATION OBTAINED FROM TITLE 5 SEPTIC SYSTEM INSPECTION REPORT BY PAUL C. MARTIN, DATED 3/27/2019, ON FILE AT BOARD OF HEALTH.
- TOWN WATER SERVICE SHOWN ON PLAN FROM WATER DEPARTMENT TIE CARD "275 QUINAQUISETT AVENUE ACCT#5043" DATED 10/17/1996.
- GAS SERVICE SHOWN ON PLAN FROM NATIONAL GRID "MA-S02570" DATED 4/26/2019.
- ELECTRIC LINE SHOWN ON THIS PLAN COMPILED FROM EVERSOURCE T-PLAN DATED 6/10/2022 AND PHYSICAL SITE FEATURES.

FOR PERMIT ONLY - NOT FOR CONSTRUCTION

BAXTER NYE
ENGINEERING & SURVEYING

BAXTER NYE ENGINEERING & SURVEYING

Registered Professional Engineers and Land Surveyors

1597 Falmouth Road
Centerville, MA 02632

Phone – (508) 771-7502
Fax – (508) 771-7622
www.baxter-nye.com

STAMP

CONSULTANT

CONSULTANT

PREPARED FOR:

Southworth Mashpee Properties, LLC
130 Willowbend Drive
Mashpee, MA 02649

PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE DESCRIPTION

SHEET TITLE

Existing Conditions Plan

SHEET NO

C2.0

DATE: JANUARY 16, 2023

30 0 30 60
SCALE IN FEET
SCALE: 1"=30'

DRAWN BY: ZDP CHECKED BY: MWE
JOB NO: 2014-009 FILE: 2014-009 QUIN EC.dwg

NOTES:

1. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH MHDSS, TOWN ORDINANCES, REQUIREMENTS, AND SPECIFICATIONS.

2. THE CONTRACTOR SHALL CONTACT THE ENGINEER TO SCHEDULE A PRE-CONSTRUCTION MEETING AT LEAST TWO (2) WEEKS PRIOR TO COMMENCING CONSTRUCTION.

3. THE CONTRACTOR SHALL MAKE SUBMITTALS TO THE ENGINEER FOR APPROVAL BEFORE ANY FABRICATION OR DELIVERY OF PRODUCTS OR MATERIALS.

4. ALL PROPOSED WALKWAYS WILL BE HANDICAPPED ACCESSIBLE WHERE REQUIRED. ALL PROPOSED RUNNING SLOPES ON WALKWAYS SHALL BE LESS THAN 5%, ALL CROSS SLOPES AND ALL LANDING SLOPES SHALL BE LESS THAN 2%. RAMPS WHERE NEEDED SHALL HAVE SLOPES LESS THAN 8%. RAILINGS SHALL BE PER ARCHITECT. THESE ARE MAXIMUM SLOPES WITH NO TOLERANCE. ALL WORK WILL BE IN ACCORDANCE WITH THE MOST CURRENT REQUIREMENTS OF THE U.S. ACCESS BOARD, AMERICANS WITH DISABILITIES ACT & COMMONWEALTH OF MASSACHUSETTS, ARCHITECTURAL ACCESS BOARD.

5. CONTRACTOR SHALL CONFIRM AND PROVIDE ALL LANDINGS OUTSIDE OF DOORWAYS, AT THE TOP AND BOTTOM OF STEPS, AND AT TOP AND BOTTOM OF RAMPS, TO BE CONSTRUCTED SO THE LANDING IS 5 FT X 5 FT MIN. (UON) AND IS LESS THAN A 2% SLOPE IN ALL DIRECTIONS ON THE LANDING. THE CONTRACTOR SHALL VERIFY THE LANDING CONDITIONS IN THE FIELD AND CONTACT THE SITE ENGINEER WITH ANY QUESTIONS PRIOR TO INSTALLING LANDING.

STAIRS REPRESENTED ON THE SITE PLANS DO NOT INDICATE THE EXACT NUMBER OF TREADS AND RISERS NEEDED. THESE WILL VARY BASED ON SPECIFIC FIELD CONDITIONS. THE CONTRACTOR SHALL VERIFY THE CONDITION IN THE FIELD AND DETERMINE TREADS AND RISERS REQUIRED PER THE BUILDING CODE. REFERENCE SHALL BE MADE TO THE ARCHITECTURAL PLANS.

THE CONTRACTOR SHALL CONTACT THE SITE ENGINEER AS NEEDED WITH QUESTIONS REGARDING SPECIFIC TREADS AND RISERS PRIOR TO INSTALLING THE STAIRS.

6. DEMOLISH/REMOVE ALL EXISTING STRUCTURES, FOUNDATIONS, CONCRETE PADS, FENCES AND APPURTENANT ITEMS UNLESS OTHERWISE NOTED TO SAVE, SALVAGE OR RESET.

7. EXISTING PAVING EDGES SHALL BE SAWCUT TO CREATE A CLEAN EDGE WHERE IT IS TO BE TIED INTO NEW PAVING, OR WHERE ASPHALT IS REMOVED ADJACENT TO ASPHALT WHICH IS TO REMAIN. BROKEN OR UNSTABLE PAVEMENT SHALL BE REMOVED AND SUBBASE REPLACED WITH SUITABLE COMPACTED MATERIAL PER PAVEMENT SECTION DETAIL HEREIN. ANY SAWCUT LINES SHOWN ON THE PLANS ARE APPROXIMATE ONLY. THE EXACT EDGE OF SAWCUT SHALL BE DETERMINED BY THE CONTRACTOR IN THE FIELD TO PROPERLY BLEND TO THE SURROUNDING GRADES. PROPOSED ASPHALT SHALL BE PROPERLY BUTTED AND BLENDED TO SURROUNDING ASPHALT WHICH IS TO REMAIN. THE BLENDED TRANSITION BETWEEN PROPOSED AND EXISTING ASPHALT SHALL BE WITH AN APPROXIMATE 1.5% GRADE UNLESS OTHERWISE IDENTIFIED. THE JOINT SHALL NOT BE ABRUPT.

8. THE PROPERTY LINE INFORMATION SHOWN HEREIN/HEREON IS PER THE PROPERTY LINES SET BY THE REGISTERED PROFESSIONAL LAND SURVEYOR (PLS) AS SHOWN ON THE CERTIFIED PLOT PLAN AS SEALED BY THE PLS WITHIN THIS PLAN SET. THE PROPERTY LINE AND SURVEY INFORMATION WAS COMMISSIONED AS PART OF THE PROJECT AND IS SHOWN AS BACKGROUND INFORMATION ON THE DESIGN PLANS. SETBACKS SHOWN ARE TO THE PROPERTY LINE SET BY THE PLS. DIMENSIONS SHOWN ARE TO OUTSIDE FACE OF FOUNDATION OR TO THE FACE OF CURB/BERM WHERE APPLICABLE.

9. ALL CURBING SHALL BE INSTALLED SO THAT WHEN A TERMINAL END OF A CURB EXISTS IT SHALL HAVE A TAPERED END PER MDOT SPECIFICATIONS SO THAT THERE IS NOT A BLUNT SQUARE END PROJECTING.

10. THE CONTRACTOR SHALL NOTIFY AND COORDINATE A SITE MEETING WITH THE ENGINEER PRIOR TO PLACING FINAL PAVING COURSE. LAYOUT AND FINAL REQUIRED DIMENSIONS ARE TO BE REVIEWED AT THIS MEETING PRIOR TO PAVING OPERATION. REQUIREMENTS SHALL BE PER MASSDOT STANDARD SPECIFICATIONS.

11. SITE LIGHTING – SEE ELECTRICAL DRAWINGS IN ARCHITECTURAL PLAN PACKAGE FOR DETAILED INFORMATION.

12. ALL WORK WITHIN THESE PLANS SHALL BE PERFORMED AND PROVIDED BY THE CONTRACTOR IN ACCORDANCE WITH THE CONSTRUCTION DETAILS PROVIDED IN THIS PLAN SET WHETHER OR NOT THE DETAIL NUMBER IS SPECIFICALLY REFERENCED.

ZONING TABLE

ZONING DISTRICT(S): R3*
OVERLAY DISTRICTS: NONE
ALLOWED USE: SINGLE FAMILY RES.
EXIST USE: SINGLE-FAMILY RES.

PROPOSED USE:
14 DETACHED SINGLE FAM. RESIDENTIAL UNITS
TYPICAL UNIT FOOTPRINT:
BUILDING = 1,802 SF
REAR DECK = 309 SF
FREE STANDING GARAGE = 296 SF
TOTAL FOOTPRINT/UNIT = 2,407 SF

EXIST BLDGS FOOTPRINT=3,873 SF
EXIST BUILDING TO BE DEMOLISHED

PROP TOTAL SITE BLDG FOOTPRINT = 33,698 SF

TOTAL PARCEL AREA: 220,650 SF TOTAL (UPLAND-152,288± SF; WETLAND-68,362 SF)

	REQUIRED/ALLOWED	PROPOSED
LOT AREA:	40,000 SF (UPLAND)	152,288 SF
FRONTAGE:	150 FT	658 FT
BUILDING SETBACKS*		
FRONT SETBACK	40 FT	40.0 FT
SIDE SETBACK	15 FT*	N/A INTERIOR LOT LINE
REAR SETBACK	15 FT*	N/A INTERIOR LOT LINE
PARKING SETBACK TO ABUTTER LOTS	10 FT	N/A
MAX. BLDG. HEIGHT (STORIES)	2.5 STORIES / 35 FT	2 STORIES/30.7 FT
MAX. LOT COVERAGE (STRUCTURES):	20%*	PER WILLOWBEND S.P.
PARKING TABLE		
SINGLE FAMILY = 2 PER UNIT x 14 UNITS (1 GARAGE AND 1 DRIVEWAY SPACE)	28 SPACES	28 SPACES
PARKING STALL SIZE – 90°	19.33' x 9'	19' x 9'
DESIGN VEHICLE		AERIAL LADDER

*PROP. BUILDING REQUIREMENTS TO BE PER WILLOWBEND SPECIAL PERMIT MODIFICATION

SIGN SUMMARY

M.U.T.C.D. NUMBER	SPECIFICATION		TEXT/ GRAPHIC	QUAN.
	WIDTH	HEIGHT		
R1-1	24"	24"	STOP	1

ALL SIGNAGE MUST BE IN CONFORMANCE WITH THE FEDERAL HIGHWAY ADMINISTRATION "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD), LATEST EDITION, ALL APPLICABLE CODES, AND LOCAL REQUIREMENTS, ORDINANCES, AND BYLAWS. SEE SIGN INSTALLATION DETAIL HEREIN.

SIGN INSTALLER SHALL COORDINATE SPECIFIC SIGN WORDING AND COLOR REQUIREMENTS WITH LOCAL AGENCIES AS NECESSARY (NOTE TO CONTRACTOR TO VERIFY HANDICAP PARKING SIGN FORMAT – SEE DETAIL HEREIN)

* ADD "VAN ACCESSIBLE" SIGN WHERE ASTERISKED

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130 Willowbend Drive
Mashpee, MA 02649

PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

		DATE	DESCRIPTION

SHEET TITLE

Master Layout Plan

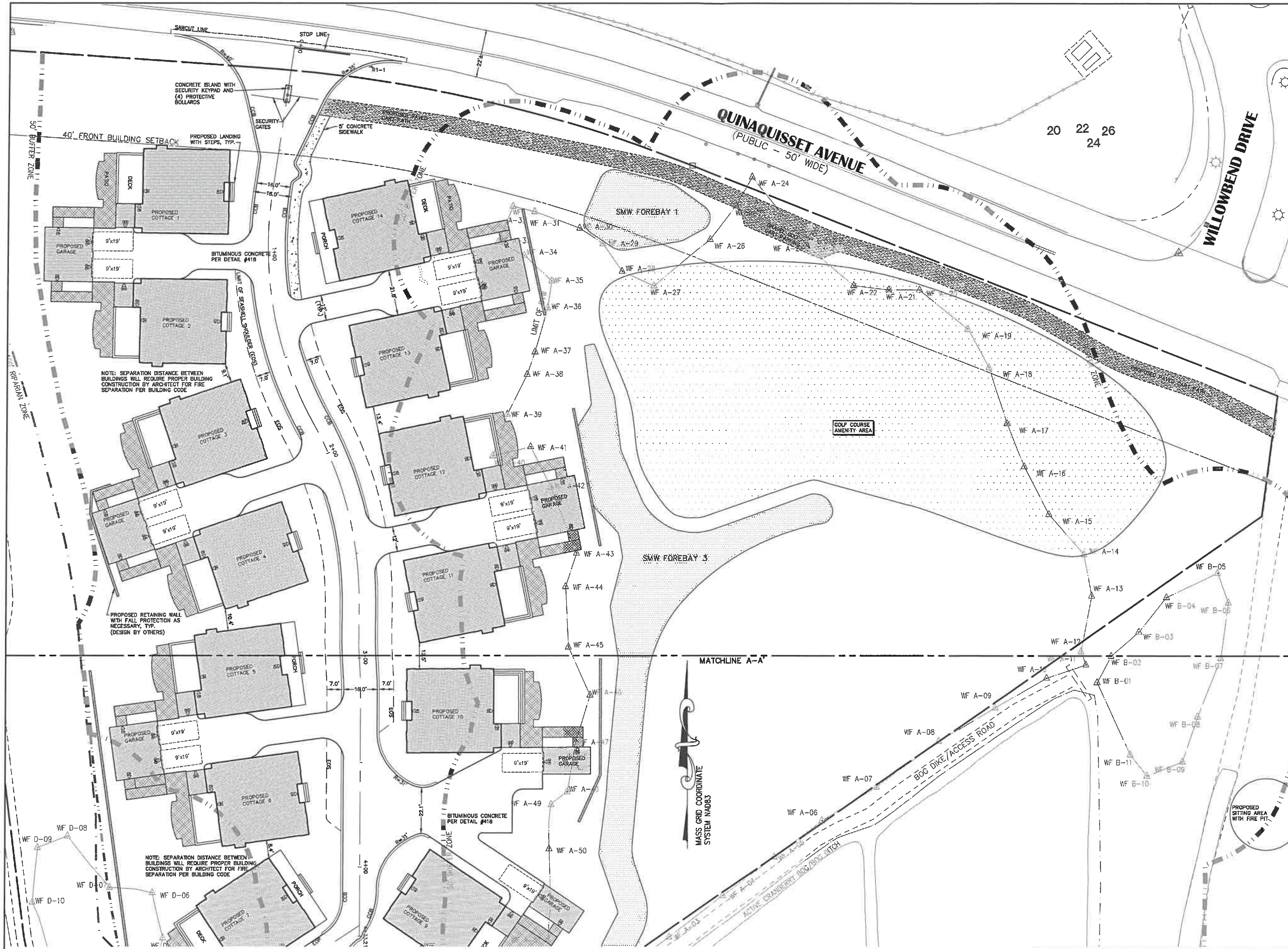
SHEET NO

C3.0

DATE: JANUARY 16, 2023

30 0 30 60
SCALE IN FEET
SCALE: 1"=30'

DRAWN BY: JKL CHECKED BY: MWE
JOB NO: 2014-009 FILE: 2014-009 QUIN DM.dwg



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COMMONWEALTH OF MASSACHUSETTS
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Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE	DESCRIPTION

SHEET TITLE
Site Layout Plan
Sheet 1 of 2

SHEET NO
C3.1

DATE: JANUARY 18, 2023

SCALE IN FEET
SCALE: 1"=20'

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PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE	DESCRIPTION

SHEET TITLE

Site Layout Plan
Sheet 2 of 2

SHEET NO

C3.2

DATE: JANUARY 16, 2023

SCALE IN FEET
SCALE: 1"=20'

DRAWN BY: JKL CHECKED BY: MWE

JOB NO: 2014-009 FILE: 2014-009 QUIN DM.dwg

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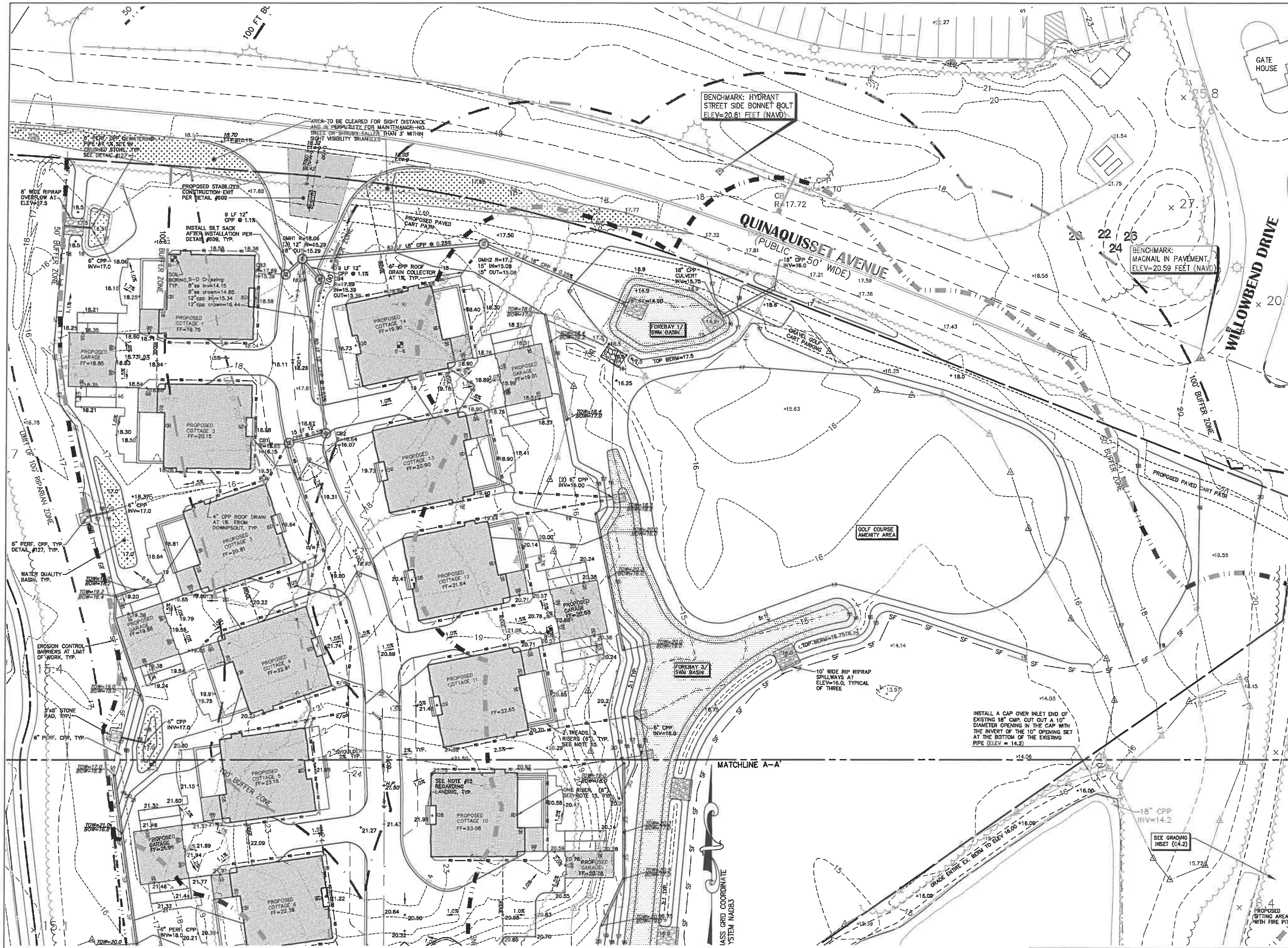

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Mashpee, MA 02649

PROJECT TITLE
Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE	DESCRIPTION

SHEET TITLE
Grading & Drainage Plan - Sheet 1 Of 2

SHEET NO
C4.0

DATE: JANUARY 16, 2023

SCALE: 1"=20'

DRAWN BY: JKL
CHECKED BY: MME
JOB NO: 2014-009
FILE: 2014-009 QUIN 00.dwg

GRADING AND DRAINAGE NOTES:

1. THE PROJECT ELEVATIONS ARE BASED ON THE NAVD VERTICAL DATUM.

2. DEBRIS, STUMPS, EXCESS, AND UNSUITABLE MATERIALS FROM THE CLEARING & DEMOLITION OPERATIONS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LEGAL MANNER BY THE CONTRACTOR.

3. DISTURBED AREAS SHALL BE PROTECTED AT ALL TIMES TO CONTROL SEDIMENT TRANSPORT BEYOND THE LIMIT OF WORK.

4. DISTURBED AREAS SHALL BE TREATED WITH WATER DURING EXCAVATION, OR APPROVED ALTERNATIVE, TO CONTROL THE DUST.

5. THE SITE SUBCONTRACTOR SHALL PROVIDE ALL EXCAVATION, BACKFILL AND COMPACTION NECESSARY TO ACHIEVE THE FINISH GRADES SHOWN ON THE PLANS AND FOR INSTALLATION OF BUILDING STRUCTURES, PAVING, STORMWATER MANAGEMENT AND ALL UTILITIES (INTERIOR AND EXTERIOR). SITE CONTRACTOR TO REFER TO SITE ELECTRICAL, MEP AND LANDSCAPE PLANS FOR ADDITIONAL INFORMATION AND DETAIL.
EXISTING PAVING EDGES SHALL BE SAWCUT TO CREATE A CLEAN EDGE WHERE IT IS TO BE TIED INTO NEW PAVING, OR WHERE ASPHALT IS REMOVED ADJACENT TO ASPHALT WHICH IS TO REMAIN. BROKEN OR UNSTABLE PAVEMENT SHALL BE REMOVED AND SUBBASE REPLACED WITH SUITABLE COMPACTED MATERIAL PER PAVEMENT SECTION DETAIL HEREIN. ANY SAWCUT LINES SHOWN ON THE PLANS ARE APPROXIMATE ONLY. THE EXACT EDGE OF SAWCUT SHALL BE DETERMINED BY THE CONTRACTOR IN THE FIELD TO PROPERLY BLEND TO THE SURROUNDING GRADES. PROPOSED ASPHALT SHALL BE PROPERLY BUTTED AND BLENDED TO SURROUNDING ASPHALT WHICH IS TO REMAIN. THE BLENDED TRANSITION BETWEEN PROPOSED AND EXISTING ASPHALT SHALL BE ACCOMPLISHED WITH AN APPROXIMATE 1.5% GRADE UNLESS OTHERWISE IDENTIFIED. THE JOINT SHALL NOT BE ABRUPT.

6. ALL PIPE OUTFALLS, CURB OPENINGS, STONE WEIRS, AND OTHER DRAINAGE OVERFLOW AND OUTLET AREAS SHALL HAVE RIPRAP EXTENDED FROM THE OUTLET TO THE BOTTOM OF SLOPE WITH A MINIMUM 10 FT x 10 FT RIPRAP LEVEL SPREADER, UNLESS OTHERWISE SPECIFICALLY DETAILED. ALL STONE OUTFALLS SHALL BE PROPERLY SHAPED SO THE RUNOFF IS CONTAINED WITH THE STONE LINING. SEE TYPICAL DETAILS FOR ADDITIONAL INFORMATION.

7. ALL DISTURBED AREAS NOT OTHERWISE TREATED SHALL BE STABILIZED WITH 4" LOAM, SEED, & MULCH. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AREAS UNTIL VEGETATION HAS BEEN PERMANENTLY ESTABLISHED. SLOPES IN EXCESS OF 3:1 AND AREAS THAT SHOW SIGNS OF EROSION FROM CONCENTRATED FLOWS SHALL BE FURTHER STABILIZED WITH EROSION CONTROL BLANKETS (ECB) OF CURLEX DOUBLE NET – CURLEX II .98 BY AMERICAN EXCELSIOR COMPANY OR EQUAL. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE REQUIRED ECB'S AND PROPERLY STABILIZE ALL AREAS OF THE SITE.

8. ALL DRAINAGE STRUCTURES AND PIPING SHALL BE DESIGNED AND INSTALLED FOR H-20 LOADING. SETTING OF CATCH BASINS AND MANHOLE STRUCTURES SHALL BE ADJUSTED WITH CONCENTRIC OR OFFSET TOPS AS NEEDED FOR MINOR ADJUSTMENTS TO AVOID CONFLICTS WITH UNDERGROUND UTILITIES OR OTHER STRUCTURES. THE GRATE OR MANHOLE COVER SHALL ALSO BE ADJUSTED OVER THE STRUCTURE TO NOT CONFLICT WITH STEPS INSIDE THE STRUCTURE.

9. A 10 FOOT MINIMUM SEPARATION SHALL BE MAINTAINED BETWEEN ALL SWM INFILTRATION FACILITIES AND SANITARY SEWER LINES AND MANHOLES.

10. CPP – HIGH DENSITY POLYETHYLENE CORRUGATED PIPE WITH SMOOTH INTERIOR WALL TO MEET ADS N-12 PIPE SPECIFICATION OR EQUAL. CPP PIPE USE SHALL BE ALLOWED AS NOTED, WITH A DIAMETER UP TO AND INCLUDING 24". BACKFILLING CPP MUST FOLLOW MANUFACTURER'S RECOMMENDATIONS AND SPECIAL CARE MUST BE EXERCISED (SEE ADS PRODUCT NOTE 3.115).

11. ALL COTTAGES ROOF DOWNSPOUTS SHALL BE TIED INTO ROOF DRAINS. REFER TO ARCHITECTURAL PLANS FOR ALL LOCATIONS OF DOWNSPOUTS. CONTRACTOR SHALL PROVIDE TIE-INS TO ALL DOWNSPOUT LOCATIONS. ROOF DRAINS TO BE AT LEAST 4" CPP AT 1% SLOPE MINIMUM WITH 1 FOOT MINIMUM COVER, TYPICAL, UNLESS OTHERWISE NOTED ON THE PLAN. GARAGES SHALL BE PROVIDED WITH STONE DRIP STRIPS ALONG FOUNDATION OUT PAST ROOF LINES TO CONTROL ALL GARAGE ROOF RUNOFF.

12. ALL GRADING WORK SHALL BE DONE IN A WORKMANLIKE MANNER ACCOMPLISHED TO CREATE POSITIVE DRAINAGE AND ELIMINATE ANY PUDDLING OR PONDING. WHERE NOT OTHERWISE NOTED OR DEFINED ON THE PLAN, ALL CUT AND FILL SHALL BE BLENDED TO DAYLIGHT AT EXISTING GRADE WITH A 3:1 SLOPE.

13. THE CONTRACTOR SHALL NOTIFY THE ENGINEER WITH ANY GRADE ISSUES OR QUESTIONS PRIOR TO PERFORMING THE FINISH GRADING WORK.

14. ALL PROPOSED WALKWAYS WILL HAVE RUNNING SLOPES OF LESS THAN 5% AND ALL CROSS SLOPES < 2%, U.O.N. THESE ARE MAXIMUM SLOPES WITH NO TOLERANCE. ALL WORK WILL BE IN ACCORDANCE WITH THE MOST CURRENT REQUIREMENTS OF THE U.S. ACCESS BOARD, AMERICANS WITH DISABILITIES ACT & COMMONWEALTH OF MASSACHUSETTS, ARCHITECTURAL ACCESS BOARD, WHERE REQUIRED.

15. CONTRACTOR SHALL CONFIRM AND PROVIDE ALL LANDINGS OUTSIDE OF DOORWAYS, AT THE TOP AND BOTTOM OF STEPS, AND AT TOP AND BOTTOM OF RAMPS, TO BE CONSTRUCTED SO THE LANDING IS 5 FT X 5 FT MIN. (UON) AND IS LESS THAN A 2% SLOPE IN ALL DIRECTIONS ON THE LANDING. THE CONTRACTOR SHALL VERIFY THE LANDING CONDITIONS IN THE FIELD AND CONTACT THE SITE ENGINEER WITH ANY QUESTIONS PRIOR TO INSTALLING LANDING.

STAIRS REPRESENTED ON THE SITE PLANS DO NOT INDICATE THE EXACT NUMBER OF TREADS AND RISERS NEEDED. THESE WILL VARY BASED ON SPECIFIC FIELD CONDITIONS. THE CONTRACTOR SHALL VERIFY THE CONDITION IN THE FIELD AND DETERMINE TREADS AND RISERS REQUIRED PER THE BUILDING CODE. REFERENCE SHALL BE MADE TO THE ARCHITECTURAL PLANS. THE CONTRACTOR SHALL CONTACT THE SITE ENGINEER AS NEEDED WITH QUESTIONS REGARDING SPECIFIC TREADS AND RISERS PRIOR TO INSTALLING THE STAIRS.

16. BOTTOM OF WALL (BOW) OR TOP OF WALL (TOW) ELEVATIONS FOR RETAINING WALLS NOTED ON THE PLAN ARE APPROXIMATE ELEVATIONS WHERE THE WALL IS EXPECTED TO DAYLIGHT WITH EXISTING GRADE. STRUCTURAL RETAINING WALL DESIGN IS DONE BY OTHERS AND THE BOW OR TOW EXISTING GROUND ELEVATIONS FOR WHERE THE WALL WOULD DAYLIGHT TO EXISTING GRADES SHALL BE VERIFIED AS NEEDED FOR THE STRUCTURAL DESIGN. THE ACTUAL BOW OR TOW ELEVATION AT THE PROPOSED WALL(S) MAY DIFFER FROM CONTOURS SHOWN ON THE PLANS ESPECIALLY AT STEEP SLOPES AREAS.

17. STORMWATER MANAGEMENT FACILITIES SHALL BE PROTECTED FROM SEDIMENT AND SILTATION AT ALL TIMES. JUST PRIOR TO COMPLETION, THE SITE SUBCONTRACTOR SHALL PERFORM A FINAL INSPECTION AND CLEANING OF THE STORMWATER MANAGEMENT SYSTEM. ALL SEDIMENT AND SILTATION SHALL BE REMOVED FROM THE BASINS, FOREBAYS, ETC. AND THESE AREAS SHALL BE SHAPED TO FINAL CONTOURS AND ELEVATION PER THE PLANS. ALL REPAIRS SHALL BE MADE AS NECESSARY TO THE SATISFACTION OF THE ENGINEER PRIOR TO PLACING FINAL TOPSOIL, MULCH, VEGETATION, SEEDING, ETC.

18. ANY DEWATERING OPERATION, WHEN REQUIRED AS PART OF THE CONSTRUCTION PROCESS, SHALL ENSURE ALL DEWATERING OCCURS THROUGH A PROPER DEWATERING BASIN (STONE, FILTER FABRIC AND HAYBALES OR OTHER ACCEPTABLE MEANS) PRIOR TO DISCHARGE FROM THE SITE.

19. ALL WORK WITHIN THESE PLANS SHALL BE PERFORMED AND PROVIDED BY THE CONTRACTOR IN ACCORDANCE WITH THE CONSTRUCTION DETAILS PROVIDED IN THIS PLAN SET WHETHER OR NOT THE DETAIL NUMBER IS SPECIFICALLY REFERENCED.

20. FOUNDATION DRAINS ARE REQUIRED. REFER TO STRUCTURAL AND ARCHITECTURAL PLANS (SEE DETAIL #120).

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Mashpee, MA 02649

PROJECT TITLE

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Mashpee, MA 02649

DATE	DESCRIPTION

SHEET TITLE

Grading & Drainage Plan - Sheet 2 of 2

SHEET NO

C4.1

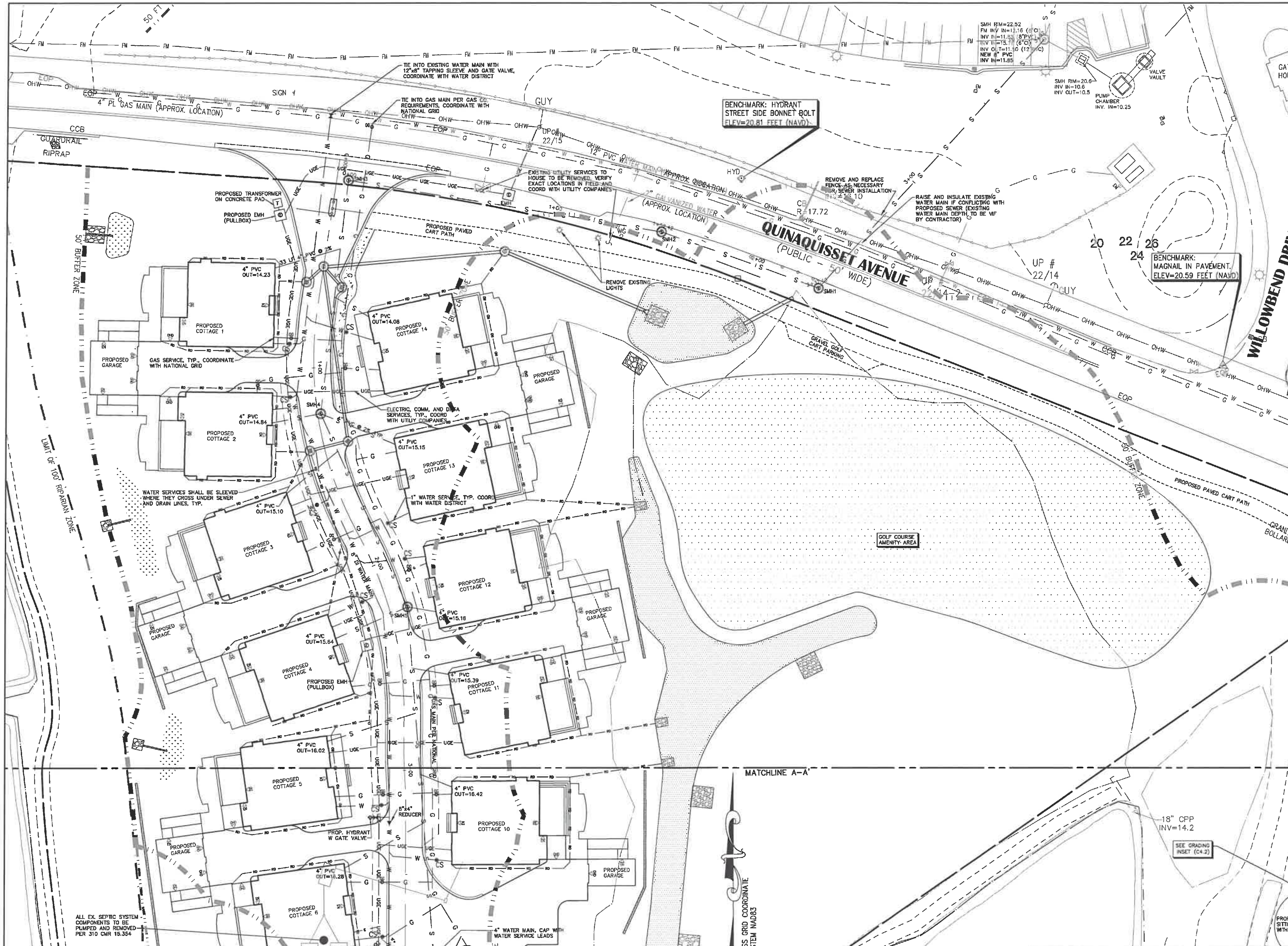
DATE: JANUARY 16, 2023

SCALE IN FEET: 20 0 20 40

SCALE: 1"=20'

DRAWN BY: JKL CHECKED BY: MWE

JOB NO: 2014-009 FILE: 2014-009 QUIN GD.dwg



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PROJECT TITLE

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275 Quinaquisset Avenue
Mashpee, MA 02649

	DATE	DESCRIPTION

SHEET TITLE

Utilities Plan
Sheet 1 of 2

SHEET NO

C5.0

DATE: JANUARY 16, 2023

20 0 20 40

SCALE IN FEET

SCALE: 1"=20'

DRAWN BY: JKL CHECKED BY: MME

JOB NO: 2014-009 FILE: 2014-009 QUIN UT.dwg

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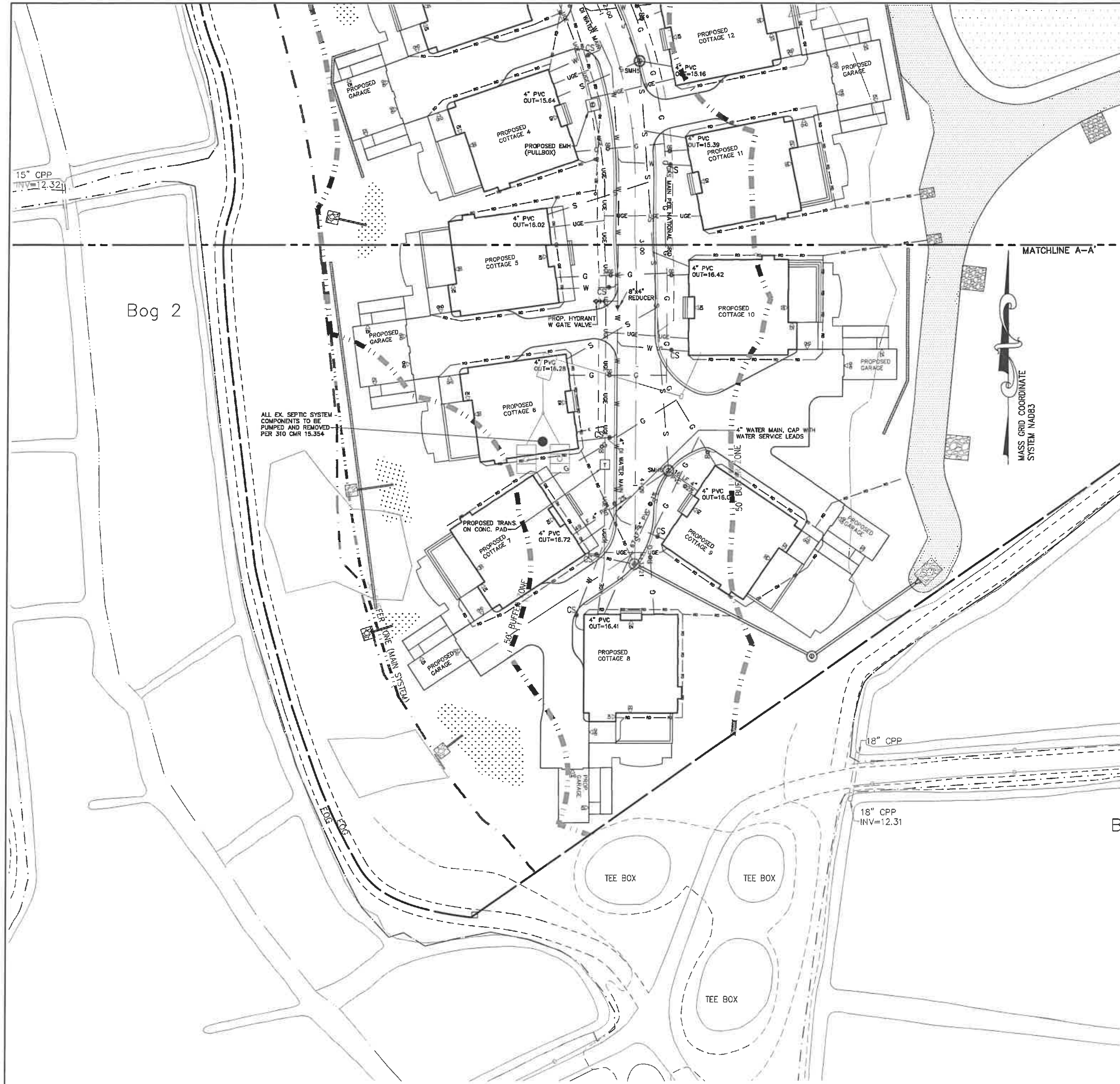

UTILITY NOTES:

1. CAUTION: THE CONTRACTOR SHALL CONTACT DIG SAFE (AT 1-888-DIG-SAFE) AND UTILITY COMPANIES TO LOCATE ALL EXISTING UTILITIES, AT LEAST 72 HOURS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION, BOTH HORIZONTALLY AND VERTICALLY, OF ALL EXISTING UTILITIES BEFORE THE START OF ANY WORK. THE LOCATION OF EXISTING UNDERGROUND SYSTEMS, INFRASTRUCTURE, UTILITIES, CONDUITS AND LINES ARE SHOWN IN AN APPROXIMATE WAY ONLY, MAY NOT BE LIMITED TO THOSE SHOWN HEREIN AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER, THE ENGINEER, OR ITS REPRESENTATIVE. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE SAID SYSTEMS, INFRASTRUCTURE AND UTILITIES EXACTLY. IF ELEVATION INFORMATION DIFFERS FROM PLAN INFORMATION, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY FOR POSSIBLE REDESIGN. AT UTILITY CROSSINGS, VERIFY IN FIELD THE LOCATION AND INVERTS OF WATER, ELECTRIC, GAS, TELEPHONE & DATA/COMM AND RELOCATE IF CONFLICTING WITH PROPOSED INVERTS PER THE ENGINEERS DIRECTION. THE CONTRACTOR SHALL PRESERVE ALL UNDERGROUND SYSTEMS, INFRASTRUCTURE AND UTILITIES AS REQUIRED.

2. 12" MINIMUM VERTICAL CLEARANCE SHALL BE MAINTAINED BETWEEN ALL UTILITY CROSSINGS.

3. A MINIMUM 10' HORIZONTAL SEPARATION SHALL BE MAINTAINED BETWEEN WATER AND SEWER LINES. WHERE WATER LINES CROSS SEWER LINES, THE SEWER LINE SHALL BE LOCATED WITH A MINIMUM VERTICAL CLEARANCE OF 18" BELOW THE WATER LINE. THE SEWER LINE JOINTS SHALL BE LOCATED EQUIDISTANT AND AS FAR AWAY FROM THE WATER LINE AS POSSIBLE. WHEN IT IS IMPOSSIBLE TO ACHIEVE HORIZONTAL AND/OR VERTICAL SEPARATION AS STIPULATED ABOVE, BOTH THE WATER LINE AND SEWER LINE AT THE CROSSING LOCATION SHALL BE CONSTRUCTED OF MECHANICAL JOINT CEMENT-LINED DUCTILE IRON PIPE FOR ONE FULL 20' PIPE LENGTH OR ANOTHER EQUIVALENT THAT IS WATERTIGHT AND STRUCTURALLY SOUND. THE JOINTS FOR BOTH PIPES SHALL BE LOCATED AS FAR AWAY FROM THE CROSSING AS POSSIBLE. BOTH PIPES SHOULD BE PRESSURE TESTED TO 150 PSI TO ENSURE THAT THEY ARE WATERTIGHT.

4. SEWER MAINS TO BE 8" MIN. SDR-35 PVC WITH A MIN. SLOPE OF 0.50% UNLESS OTHERWISE NOTED. SEWER MAINS AND SEWER FORCE MAINS TYPICAL COVER OVER SEWER LINE SHALL BE 6'. IF LESS THAN 4' OF COVER IS PROVIDED, INSULATE SEWER LINE AGAINST FREEZING IN ACCORDANCE WITH DETAIL #205 OR EQUAL.

5. RESIDENTIAL SEWER BUILDING CONNECTIONS SHALL BE 4" MIN. SCHEDULE 40 PVC, U.O.N., AT A MIN. SLOPE OF 1% U.O.N. INSTALL A CLEANOUT ON EACH SERVICE LINE AT DISTANCE OF 10'± (U.O.N.) OFF THE FOUNDATION, AT A CHANGE OF HORIZONTAL DIRECTION GREATER THAN 45° OR WHERE MORE THAN ONE CHANGE OF HORIZONTAL DIRECTION GREATER THAN 45° OCCURS WITHIN 40 FEET. CLEANOUTS SHOULD BE LOCATED AT INTERVALS OF NOT MORE THAN 100 FEET.

6. ALL WATERLINE MATERIALS AND WORKMANSHIP TO CONFORM TO THE RULES, REGULATIONS AND SPECIFICATIONS OF THE MASHPEE WATER DISTRICT AS AMENDED TO PRESENT. WATER DISTRICT HAS AUTHORITY TO AMEND PLANS. IF ANY CONFLICTS WITH THE CONTRACT DOCUMENT OCCUR THE HIGHER STANDARD SHALL APPLY. THE WRITTEN SPECIFICATIONS OF THE MASHPEE WATER DISTRICT ARE HEREBY INCLUDED BY REFERENCE AND CONSIDERED A PART OF THE CONTRACT DOCUMENTS. ALL WATER LINE ABANDONMENT SHALL BE DONE AT THE WATER MAIN, NOT LEAVING A STUB LINE, UNLESS OTHERWISE APPROVED BY THE WATER DISTRICT.

7. WATER MAINS TO BE CEMENT LINED DUCTILE IRON PIPE CLASS 52, U.O.N. ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE AS REQUIRED BY, AND IN ACCORDANCE WITH THE LOCAL WATER DEPARTMENT AND APPLICABLE AWWA SPECIFICATIONS. DOMESTIC SERVICE TO BE 200 PSI CTS PLASTIC LINE U.O.N., TO DIVISION SPECIFICATIONS SLEEVED WHERE REQUIRED.

8. GATE VALVES SHALL BE MUELLER ONLY. IRON BODY, BRONZE MOUNTED, DOUBLE DISC, WITH TWO INCH OPERATING NUT WITH MECHANICAL JOINT HUBS. GATE VALVES SHALL CONFORM IN EVERY RESPECT TO ALL APPLICABLE AWWA STANDARDS. VALVES SHALL BE DESIGNED FOR 200 PSI WORKING AND 300 PSI TEST PRESSURE AND SHALL OPEN LEFT.

9. VALVES SHALL ALSO CONFORM TO THE SPECIFICATIONS OF THE AWWA AS TO SIZE STEM, PITCH OF THREAD, GASKET SEATING AREA SHALL BE FULLY MACHINED TO THE FIXED DIMENSIONS AND TOLERANCES AS PER AWWA SPECIFICATIONS. ALL VALVES SHALL BE PROVIDED WITH "O" RINGS. THE DESIGN OF THE VALVE SHALL BE SUCH THAT THE SEAL PLATE CAN BE FITTED WITH NEW "O" RINGS WHILE THE VALVE IS UNDER PRESSURE IN THE FULLY OPEN POSITION.

10. VALVE BOXES AND CURB BOXES SHALL BE BUFFALO OR PIONEER AND SHALL BE FURNISHED AND INSTALLED FOR ALL VALVES. THEY SHALL BE CAST IRON, TAR COATED, SLIDING TYPE ADJUSTABLE VALVE BOXES TOGETHER WITH CAST IRON COVERS. SEE WATER DIVISION REGULATIONS.

11. TYPICAL COVER OVER WATER LINE SHALL BE 5'. IF LESS THAN 4' OF COVER IS PROVIDED, INSULATE WATER LINE AGAINST FREEZING IN ACCORDANCE WITH DETAIL #205 OR EQUAL.

12. WATERLINE INSTALLATION REQUIRES TIE ROD RESTRAINED JOINTS TO BE USED AT ALL BENDS, ENDS OF LINE, VALVES AND FIRE HYDRANTS, PER WATER DISTRICT REQUIREMENTS. RESTRAINED JOINTS TO BE INSTALLED PER WATER DISTRICT REQUIREMENTS.

13. IF RESTRAINED JOINTS CAN'T BE USED DUE TO PHYSICAL CONSTRAINTS, ONLY AS SPECIFICALLY APPROVED BY THE WATER DISTRICT, THRUST BLOCKS TO BE INSTALLED AT ALL BENDS, ENDS OF LINE, VALVES AND FIRE HYDRANTS IN ACCORDANCE DETAIL #301. CONCRETE THRUST BLOCKS AS REQUIRED, CONCRETE SHALL BE 1 PART CEMENT TO 2 PARTS SAND AND 4 PARTS COARSE AGGREGATE. CONCRETE CLASS "C" WITH A 28 DAY COMPRESSION STRENGTH OF 2000 PSI MINIMUM AGGREGATE SIZE OF 1-1/2". THRUST BLOCKS SIZED PER SPECIFICATIONS. ALTERNATELY PRECAST THRUST BLOCKS TO DISTRICT SPECIFICATIONS MAY BE UTILIZED. CARE SHALL BE TAKEN TO ENSURE THAT ALL CONCRETE THRUST BLOCKS BEAR AGAINST UNDISTURBED TRENCH WALLS AND NOT TO ENCASE FLANGES AND BOLTS ON MECHANICAL JOINT FITTINGS. WHERE UNSUITABLE BEARING MATERIAL IS ENCOUNTERED, EXCAVATE AND PLACE SUFFICIENT CONCRETE BALLAST TO OFFSET THE ANTICIPATED THRUSTS.

14. MASHPEE WATER DISTRICT APPROVED WATER SUBCONTRACTOR AND THIRD PARTY INSPECTOR REQUIRED. COST OF THE INSPECTOR SHALL BE BORN BY THE CONTRACTOR/WATER SUBCONTRACTOR.

15. GAS, ELECTRIC, DATA/COM IS SHOWN SCHEMATICALLY HEREON. ALL LABOR, WORK, EQUIPMENT AND MATERIALS FOR INSTALLATION OF THESE UTILITIES SHALL BE OWNED AND PERFORMED BY THE CONTRACTOR. UTILITIES SHALL BE INSTALLED WITH A MINIMUM COVER OF 3 FEET U.O.N. OR OTHERWISE DIRECTED BY THE CONTROLLING UTILITY COMPANY. CONTRACTOR SHALL COORDINATE ALL FINAL LAYOUTS AND DETAILS WITH APPLICABLE UTILITY COMPANY.

16. POWER AND COMMUNICATION DUCT BANKS SHALL BE INSTALLED IN ACCORDANCE WITH DETAIL #C-832. WHERE A DESIGN BY THE UTILITY COMPANY OR MEP ENGINEERS ARE PROVIDED, THOSE SHALL SUPERCEDE #C-832.

17. EXTERIOR RESIDENTIAL LIGHTING SHALL BE LOW WATTAGE TYPE AND DIRECTED SO AS TO KEEP ALL LIGHTING WITHIN SUBJECT LOT. SITE LIGHTING USED SHALL BE LOW WATTAGE LED STREET LANTERNS ON 15' MAXIMUM POLE LOCATED ADJACENT TO ROAD SHOULDERS OR WALKWAYS. LIGHTING FIXTURES TO BE FULL 90° CUTOFF ("DARK SKY" COMPLIANT). A FINAL PHOTOMETRIC AND LIGHTING SCHEDULE PLAN SHALL BE PREPARED BY THE ELECTRICAL ENGINEER OR LIGHTING VENDOR.

18. ALL UTILITY CUTS THROUGH EXISTING CONCRETE OR BITUMINOUS CONCRETE PAVED SURFACES SHALL BE SAWCUT. BACK FILLING OF TRENCH SHALL INCLUDE 12" IN DEPTH FLOWABLE FILL TO THE BASE COURSE OF THE SURFACE TREATMENT. THE SURFACE TREATMENT SHALL THEN BE REPLACED IN KIND.

19. SITE CONTRACTOR TO OWN ALL EXCAVATION, TRENCHING, & BACKFILLING FOR ALL UTILITIES AND MISCELLANEOUS WORK INCIDENTAL TO THE SCOPE OF THE PROJECT AND CONTRACT DOCUMENTS. CONTRACTOR SHALL REFER TO MEP AND LANDSCAPE PLANS BY OTHERS FOR ADDITIONAL INFORMATION AS APPLICABLE.

20. ALL WORK WITHIN THESE PLANS SHALL BE PERFORMED AND PROVIDED BY THE CONTRACTOR IN ACCORDANCE WITH THE SPECIFICATIONS REFERENCED AND CONSTRUCTION DETAILS PROVIDED IN THIS PLAN SET WHETHER OR NOT THE DETAIL NUMBER IS SPECIFICALLY REFERENCED.

21. ALL COVERS, CURB BOXES, GRATES, AND OTHER FINISH SURFACES SHALL BE RESET TO THE NEW FINISH GRADE.

22. THE FIRST 10 FEET FROM THE BUILDING FACE FOR STORM DRAIN, SEWER AND WATER PIPING SHALL FOLLOW THE PLUMBING CODE. REFER TO PLUMBING PLANS BY OTHERS AS APPLICABLE.

23. WHERE UTILITIES CALLED OUT TO BE ABANDONED OR REMOVED AS NEEDED, CONTRACTOR SHALL OWN REMOVING ALL TANKS, PIPE AND APPURTENANCES AS NEEDED WHERE WITHIN THE PROPOSED AREA OF WORK.

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STAMP

CONSULTANT

CONSULTANT

PREPARED FOR:

Southworth Mashpee Properties, LLC
130 Willowbend Drive
Mashpee, MA 02649

PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE	DESCRIPTION

SHEET TITLE

Utilities Plan Sheet 2 of 2

SHEET NO

C5.1

DATE: JANUARY 16, 2023

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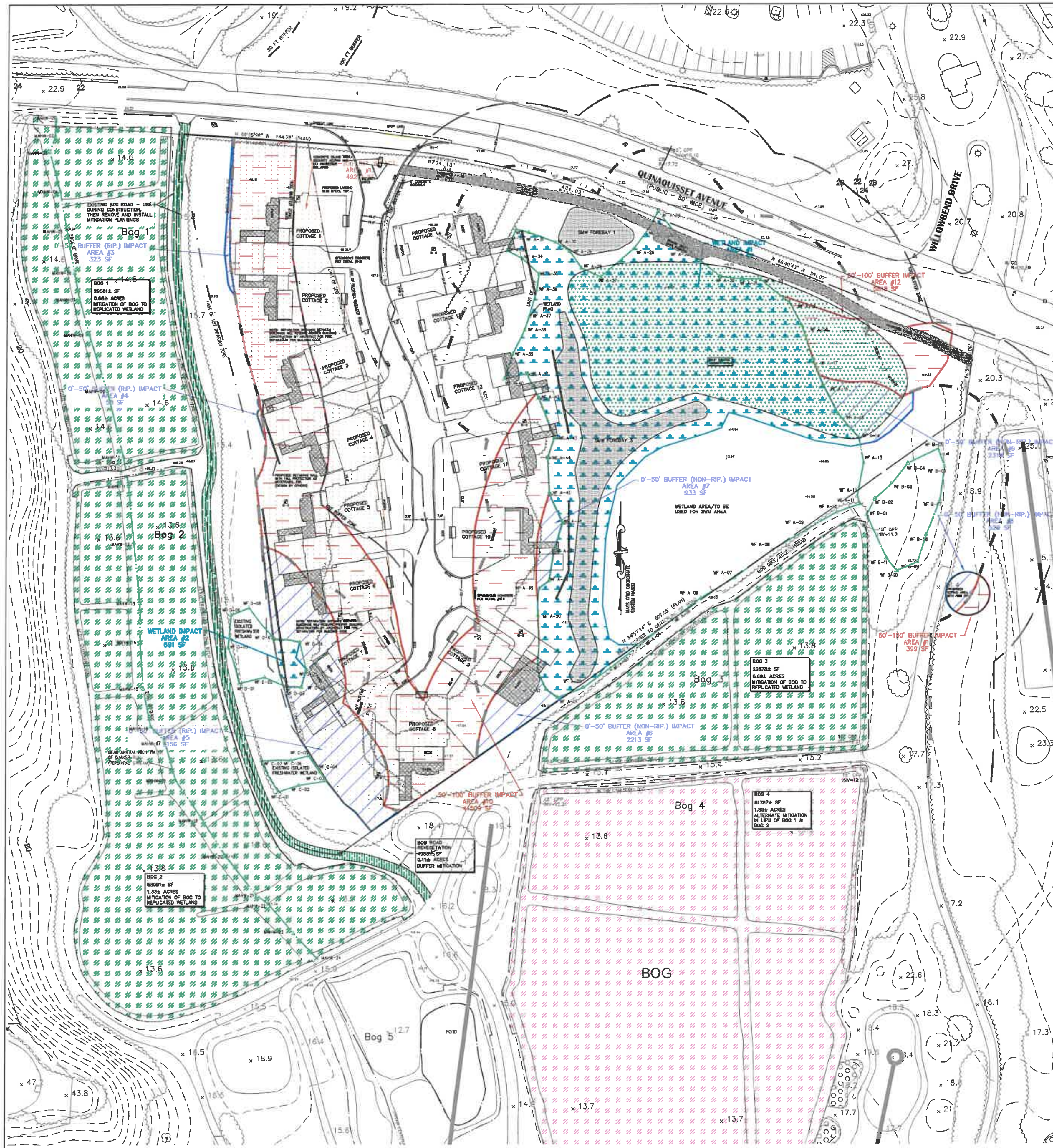
SCALE IN FEET
SCALE: 1"=20'

DRAWN BY: JKL CHECKED BY: MWE
JOB NO: 2014-009 FILE: 2014-009 QUIN UT.dwg



WETLAND MITIGATION CALCULATIONS

Buffer Impact Areas (SF)		Mitigation Multiple	Required Buffer Mitigation Area sf	Ac.	Wetland Restoration Required (Ac)	
					Mitigation is being provided in the form of Wetland Restoration of existing active Bog Areas. As this is a higher form of mitigation we propose the total Buffer Mitigation requirement to be at a ratio of 0.25: 1 Wetland	
(0-50) NR	6,989	2.9	17,468	0.40		
(0-50) R	9,537	3.3	31,260	0.72		
(50-100)	47,726	1.0	47,726	1.10		
(100-200) R	49,271					
Total Mitigation for Buffer Impact				2.21		
Upland Buffer Mitigation Provided on Existing Bog Road				0.11		
Net Mitigation required for Buffer Impact				2.10	0.25 *	0.53
					*.25/1 Ratio taken as comparison to Bylaw Mitigation Table. Between a 5 to 6:1 ratio is required at 0 ft to 10 ft buffer impact. Reasoning a 4:1 credit ratio for actual wetland restoration vs. buffer restoration is a conservative assumption.	

Wetland Impact Area (SF) Wetland Number	Wetland Area (SF)		Required Wetland Replication Area sf	Ac.	
1	42,417				
2	691				
Total Mitigation for Wetland Impact	43,108	2.0	86,216	1.98	1.98
TOTAL MITIGATION REQUIRED					2.51

Mitigation Provided — Bog Areas Bog Number	Bog Area (SF)	Wetland Restoration Provided sf	Ac.
1	29,561	29,561	0.68
2	58,091	58,091	1.33
3	29,878	29,878	0.69
4 (Alternate in-lieu-of Bogs 1&2	81,787	81,787	1.88
TOTAL WETLAND RESTORATION MITIGATION PROVIDED USING 1,2,& 3			2.70
OR			
TOTAL ALTERNATE WETLAND RESTORATION MITIGATION PROVIDED USING BOG 3 & Alternate 4			2.56

USING EITHER BOGS 1, 2, & 3 FOR MITIGATION OR BOGS 3 & 4 FOR MITIGATION MEET THE MITIGATION AREA REQUIREMENTS.

SHADING KEY

- WETLAND IMPACT
- 0' TO 50' BUFFER IMPACT
- 50' TO 100' BUFFER IMPACT
- OUTER RIPARIAN' BUFFER IMPACT
- BOG TO WETLAND RESTORATION
- ALTERNATE BOG TO WETLAND RESTORATION
- BOG ROAD REVEGETATION

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PREPARED FOR:
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130 Willowbend Drive
Mashpee, MA 02649

PROJECT TITLE
Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

DATE DESCRIPTION

SHEET TITLE
Master Mitigation Plan

SHEET NO
C6.0

DATE: JANUARY 16, 2023

40 0 40 80
SCALE IN FEET
SCALE: 1"=40'

DRAWN BY: ZDP CHECKED BY: MNE
JOB NO: 2014-009 FILE: 2014-009 QUIN DM.dwg

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Stormwater Management Report

for

CRANBERRY POINT at
WILLOWBEND GOLF & COUNTRY CLUB

275 Quinaquisset Avenue

Mashpee, Massachusetts

Prepared for:

Southworth Mashpee Properties, LLC

130 Willowbend Drive

Mashpee, MA 02649

1/16/2023

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PROJECT STATEMENT

PROJECT: **Cranberry Point**
LOCATION: **275 Quinaquisset Ave, Mashpee, MA**

BN JOB NUMBER: **2014-009 QUIN**

CLIENT: Southworth Mashpee Properties, LLC .

SUBJECT: Stormwater Management Calculations

OBJECTIVES:

1) Meet the objectives of the Mashpee Zoning Ordinance & MA DEP SWM Policy
   (a) Evaluate the pre-development conditions and calculate the peak rate of runoff.
   (b) Evaluate the post-development conditions and provide stormwater management and treatment to prevent any increase in the 2, 10, and 25 year storms, from the pre-development conditions peak discharge at the site study point.
   (c) Safely pass the 100 year storm event without causing any downstream detrimental impact.
   (d) Provide for Water Quality Treatment for the first flush 1” of rainfall (in Critical Areas) in accordance with MDEP SWM Policy and Mashpee Zoning Ordinance SWM Regulations.
   (e) Provide for Groundwater Recharge in accordance with MDEP SWM Policy.

CALCULATION METHODS & DESIGN STORMS:

1) Soil information was taken from the SCS Soil Survey of Barnstable County. Field analysis of the soils was performed via Soil Borings by Briggs Engineering.
2) Subcatchment areas, flow paths, and design points were delineated using standard engineering practice.
3) The existing and proposed conditions were modeled using HydroCAD, which incorporates the methodologies of SCS TR-55 and TR-20.
4) The proposed stormwater management system was designed to control the 2, 10, and 25-year storm event using the SCS TR-20 Method. The 100-year storm event will pass safely through the system with no detrimental impact to downstream areas.

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INTRODUCTION

Baxter Nye Engineering & Surveying (BN) performed a Stormwater Management (SWM) analysis of the subject site at Cranberry Point at Willowbend Golf & Country Club, at 275 Quinaquisset Avenue in Mashpee, MA to evaluate the post-development impacts associated with the proposed development. The hydrology for both the pre and post development drainage areas was analyzed to determine the impact of development.

SCS TR-55 and HydroCAD Stormwater Modeling System were used to model the site for existing and proposed conditions and the associated runoffs. HydroCAD utilizes the SCS TR20 Method to determine peak rates of runoff, which were computed and compared to the existing conditions.

BN designed a system for storm runoff collection and management using BMP's (Best Management Practices) as defined by MDEP. The collection and conveyance system is comprised of hooded deep sump catch basins, water quality swales, sediment forebays and a wet basin. The stormwater collection system discharge to sediment forebays, and an open air extended detention facility.

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METHODOLOGY & ANALYSIS

Hydrology and Hydraulics

Drainage calculations are performed to demonstrate that there is no increase in the rate of runoff (and therefore, no increase in downstream flooding) from the subject site due to the proposed improvements. The rate of runoff is compared at a common point referred to as the design point of interest, for both the pre and post development condition. The hydrologic and hydraulic model created to analyze the pre and post development condition was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (TR 20, SCS unit hydrograph procedures), SCS Technical Release No. 55 (TR 55, Time of Concentration (T_c) and Curve Number (CN)), National Weather Service Technical Paper No. 40 (TP 40, rainfall intensity) or the “Northeast Regional Climate Center – Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada” (as identified herein), and the stormwater detention facilities were modeled using the SCS Storage Indication Method.

Time of Concentration (T_c) is the time required for stormwater runoff to travel from the most hydraulically distant point in a drainage area or subcatchment to the design point. The T_c is calculated based upon slope, distance, surface cover and type of flow. A longer time of concentration will generally result in a smaller rate of runoff.

The Curve Number (CN) represents the amount of runoff expected from a particular segment of the drainage area. A higher curve number represents a more impervious surface and hence will have a larger rate of runoff. The CN is based upon three characteristics: (1) The Hydrologic Soil Group (HSG) A, B, C, or D; A is the most infiltratable and has the lowest runoff potential, D is the least infiltratable and has the highest runoff potential; (2) The soil cover (vegetated, developed, farmland or impervious); impervious cover obviously having the highest runoff potential. The final factor is the condition of the surface cover, being classified as good, fair or poor; surface cover in good condition has the lowest runoff potential.

The soil types for the drainage areas were determined from the Soil Conservation Service Soil Survey for the appropriate County and State where the project is located. The soil survey contains maps, which delineate the extent of the various soil types and their characteristics.

To assist in the analysis, software entitled HydroCAD, (developed by Applied Microcomputer Systems) was utilized. The HydroCAD program calculates the runoff based on rainfall and watershed characteristics, and produces a runoff hydrograph (a runoff rate versus time curve). Then the stage-storage-discharge curves for a specific SWM facility are calculated. The stage-storage-discharge curves are a set of curves for a specific SWM facility that depict the outflow from the outlet control structure versus the volume of runoff stored in the facility. The stage-storage-discharge curves are used to compute an outflow hydrograph by hydraulically routing an inflow hydrograph through the detention facility. The rate of infiltration used in the analysis of these proposed facilities is per the Rawls Rate table attached with this report. The rates are entered into HydroCad in the format of velocity (ft/min) or flow rate (cfs – which is obtained by applying the velocity – or infiltration rate - over the infiltratable area of the SWM facility).

The peak rates of runoff, at the design points, were calculated for the pre and post development conditions for the design storm events with Type III – 24 hour rainfall distribution. The peak rate of runoff was compared for each required design storm event to confirm that there was no increase from the pre to post development conditions for the required storm events.

Volumes were analyzed as well for comparison of pre to post-development levels. The "Discarded" number represented in the HyrdoCad/TR-20 Outputs represents the rate and volume of runoff, which is infiltrated into the ground through the bottom of the basin.

Assumptions

1) Shallow concentrated flow occurs at a maximum of 300 feet. If the slope is greater than two percent (2%), shallow concentrated flow occurs at a maximum of 200 feet. This is based on an assumed drainage area of several hundred acres. Smaller drainage areas should have their shallow concentrated flow occurrence adjusted to a lesser distance accordingly.
2) The minimum time of concentration (tc) value used shall be five (5) minutes.
3) Rainfall distribution is even over the drainage areas to be analyzed for a given storm event.
4) Base flow contribution has a negligible effect on the peak discharge.
5) Flows are steady, turbulent, and uniform.
6) Fluids are incompressible.

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DRAINAGE DESIGN CONDITIONS

Summary of Proposed Drainage Facilities

Baxter Nye has designed a system for storm runoff collection and management using BMP's (Best Management Practices) as defined by MDEP. The collection and conveyance systems are comprised of hooded sump catch basins, corrugated plastic pipe, sediment forebays, and vegetated swales. The deep sump catch basins and forebays will separate gas, oil and heavy particulates from the runoff. The forebays and vegetated swales will attenuate runoff, assist in removing suspended solids, and allow for nitrogen uptake through the vegetation.

The stormwater collection system discharges to an open-air detention basin. The facilities are sized to detain the runoff for the 2, 10, 25 and 100-year storm events down to or below the existing conditions runoff conditions. There is no flooding impact to downstream areas.

The proposed stormwater management system (SMS) will be installed to control stormwater runoff for water quality and quantity in accordance with MDEP SWM Policy. The SMS as designed will have a net benefit to the wetland resource over the existing conditions. Since, under the existing conditions, no SMS exists, and therefore, there has been no control of water quality and quantity being discharged from the site. Additionally, we have sized the forebays for additional water quality treatment for the existing road runoff from Quinaquisset Ave.

Under the proposed conditions, both stormwater quantity and quality are controlled. The post-development peak storm discharges and volumes are reduced for the 2, 10, 25, and 100 year events. The Water Quality Volume (see Appendix E) is treated through multiple sediment forebays and swm basins. Hooded Deep Sump Catch Basins, with a sump of 4 ft. and vegetated swales are also provided for pretreatment. The runoff is then conveyed through sediment forebays prior to entering the wet detention basin facility. The swm facilities have been designed with sediment trap forebays to enhance pollutant removal. All the runoff from the impervious areas passes through these facilities. The combined BMP treatments are designed in accordance with the MDEP sizing requirements. This combination of BMP's results in the removal of 89% of the initial T.S.S. loading. This exceeds the MDEP requirement of 80%.

The Groundwater Recharge Volume required are also met for the noted Hydrologic Soil Groups. The water to the wetland resources will be affected positively, as it will receive the same volume of runoff, but at attenuated peaks, thereby, reducing velocities and erosion.

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Refer to Table 1, Peak Discharge and Volume Release below for pre and post-development flows at the Study Point, for each of the 2, 10, 25, and 100 year storm events.

TABLE 1: PEAK DISCHARGE AND VOLUME RELEASE

STORM (YEAR)	DRAINAGE AREA	PRE-DEVELOPMENT		POST DEVELOPMENT	
		PEAK DISCHARGE (cfs)	VOLUME (ac-ft)	PEAK DISCHARGE (cfs)	VOLUME (ac-ft)
2	SP1	0.10	0.0.093	0.05	0.014
10	SP1	0.48	0.361	0.48	0.248
25	SP1	1.07	0.604	0.99	0.514
100	SP1	2.52	1.066	2.09	1.010

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FIGURES 1A and 1B

Figure 1A: Site Location Map - U.S.G.S. Topographical Quad Map

Figure 1B: Site Location Map - Aerial Photograph

FIGURE 1A – USGS TOPOGRAPHIC MAP

CRANBERRY POINT at WILLOWBEND COUNTRY CLUB, MASHPEE

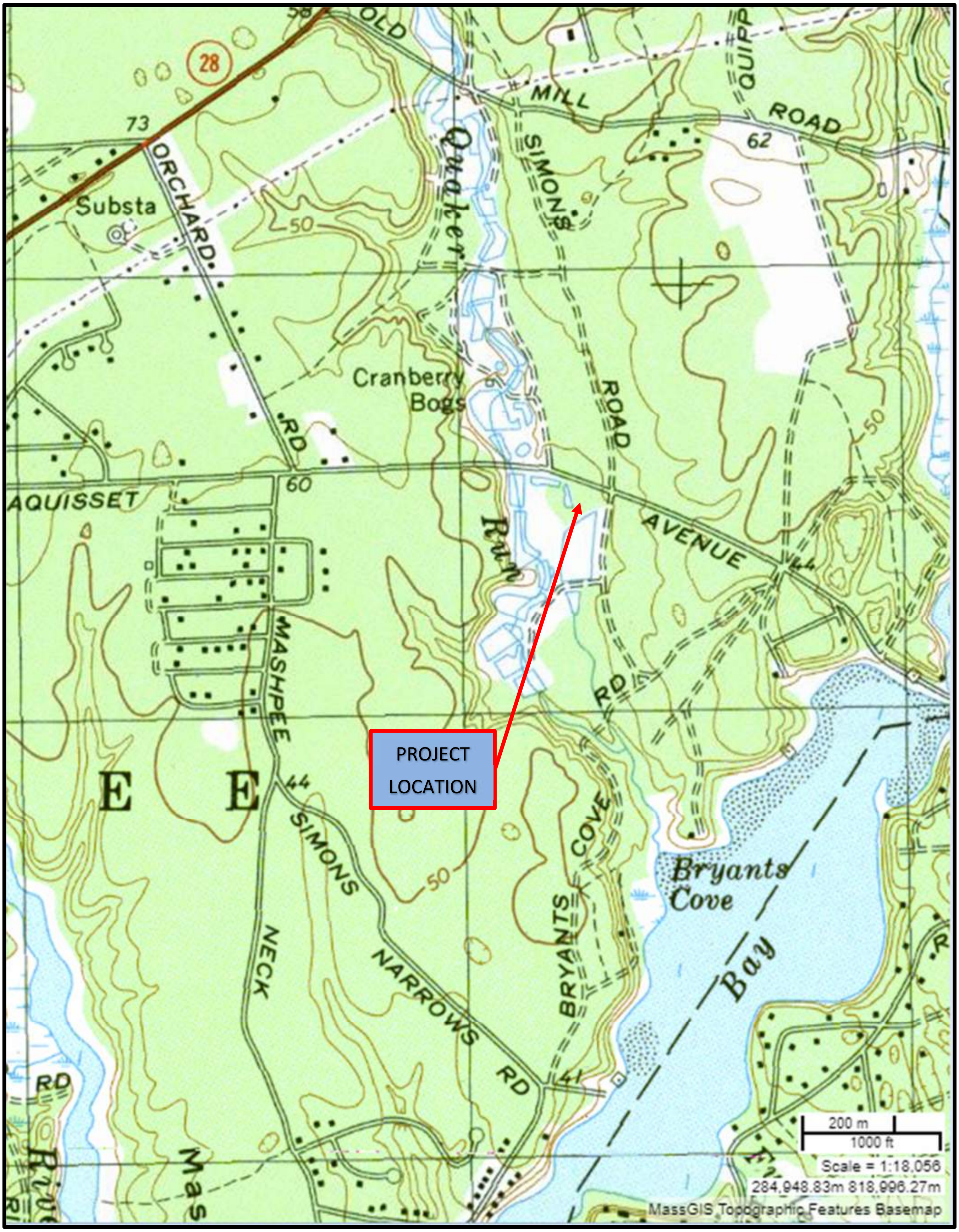


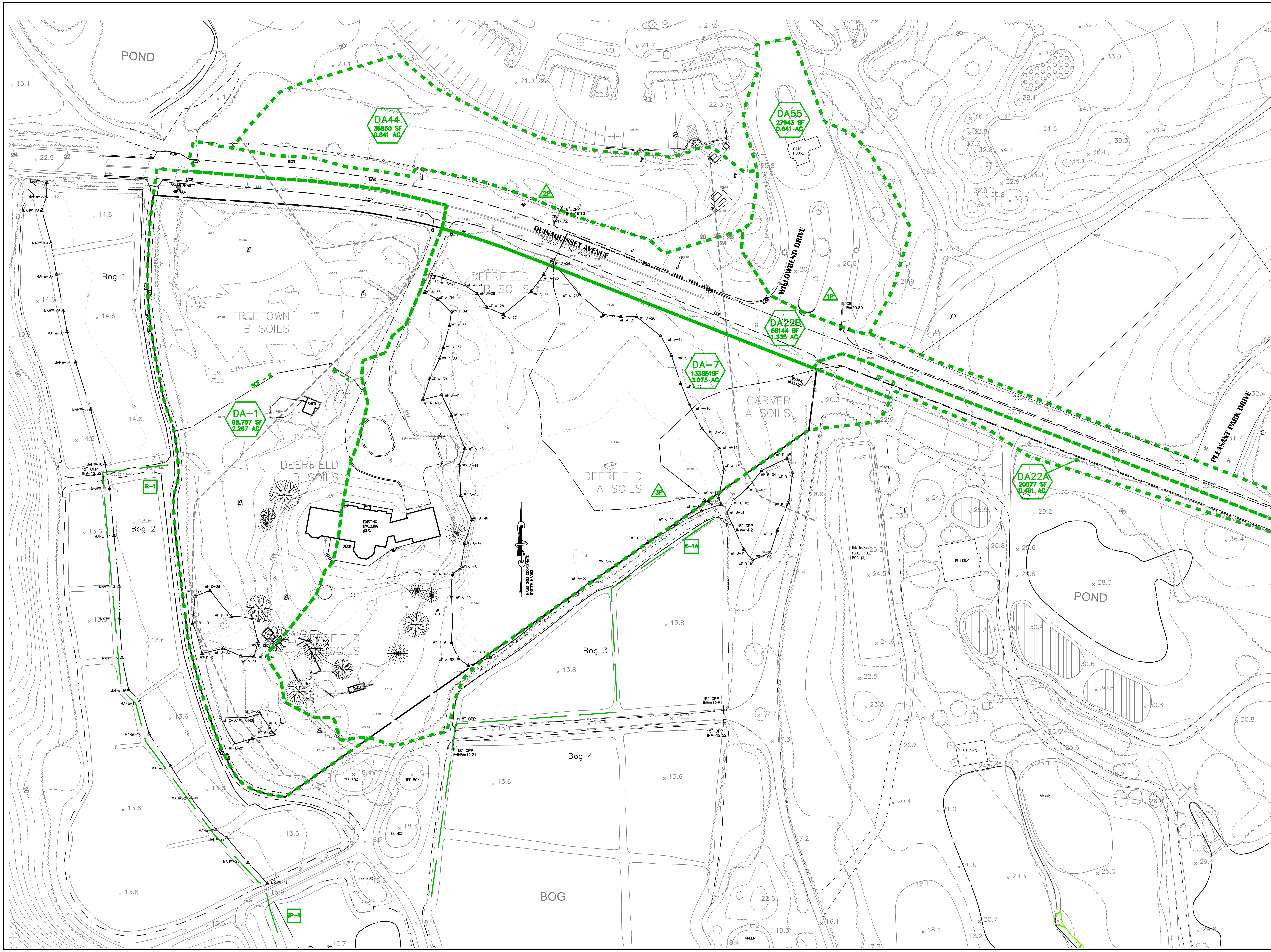
FIGURE 1B – AERIAL PHOTO LOCUS

CRANBERRY POINT at WILLOWBEND COUNTRY CLUB, MASHPEE

SOURCE: Google Earth

FIGURE 2

Pre-Development Drainage Area Plan



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Mashpee, MA 02649

PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

		DATE	DESCRIPTION

SHEET TITLE

Pre-Devt Drainage Areas Plan

SHEET NO

DA1.0

DATE: JANUARY 16, 2023

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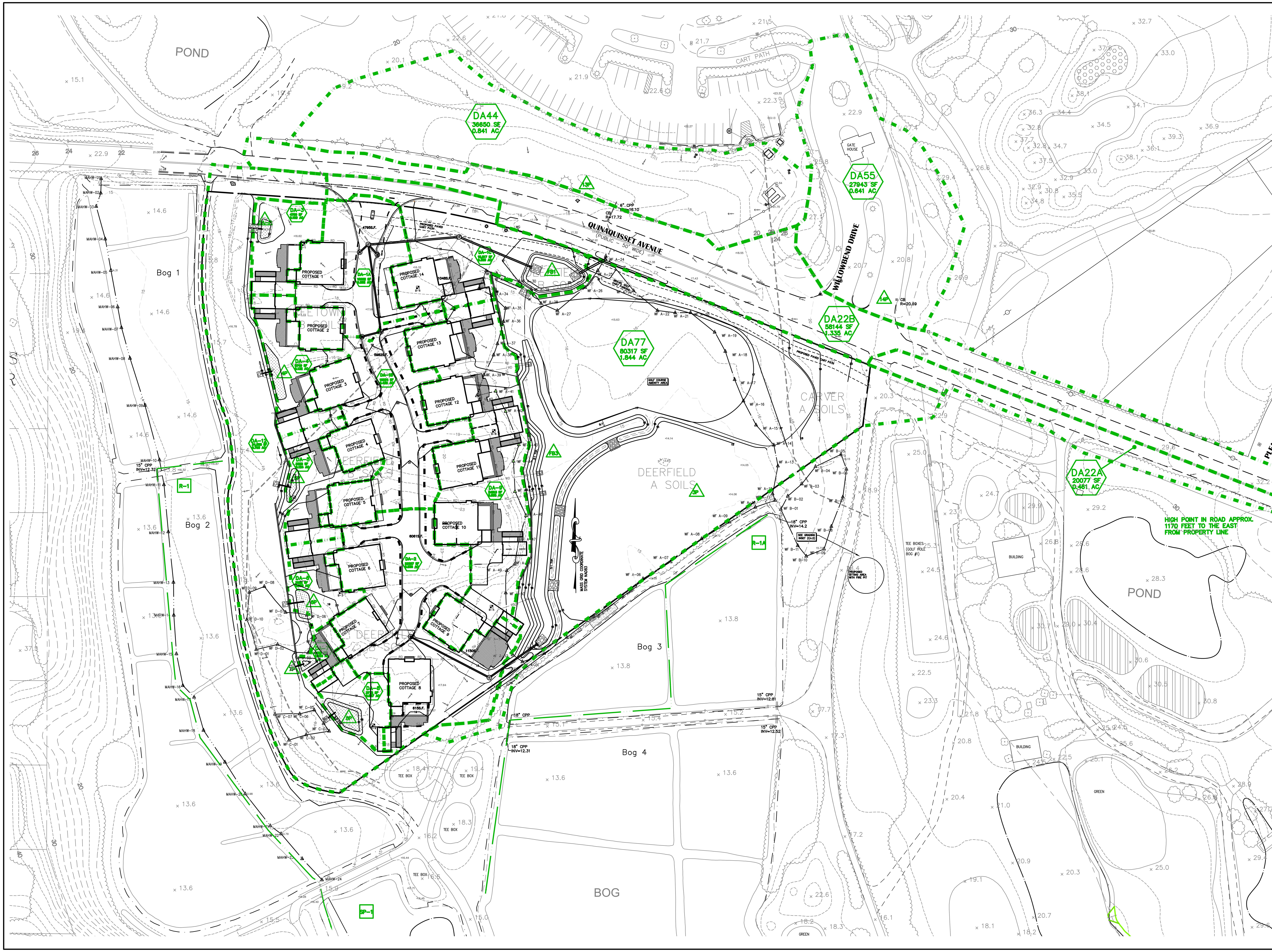
SCALE IN FEET
SCALE: 1"=40'

DRAWN BY: JKL CHECKED BY: MWE
JOB NO: 2014-009 FILE: 2014-009QUIN DA-PRE.dwg

FIGURE 3

Post-Development Drainage Area Plan



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Mashpee, MA 02649

PROJECT TITLE

Cranberry Point
275 Quinaquisset Avenue
Mashpee, MA 02649

	DATE	DESCRIPTION

SHEET TITLE

Post-Devt Drainage Areas Plan

SHEET NO

DA2.0

DATE: JANUARY 16, 2023

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SCALE: 1"=40'

DRAWN BY: JKL
CHECKED BY: MWE
JOB NO: 2014-009
FILE: 2014-009QUINDA-POST.dwg

APPENDIX A

SITE SOIL INFORMATION

- SOIL SURVEY MAPS AND MAP UNITS
- CLASSIFICATION AND DESCRIPTION OF SOILS ON SITE
- TEST PIT SOIL LOGS

Soil Map—Barnstable County, Massachusetts
(Soil Map-275 Quinaquisset Ave.)

Barnstable County, Massachusetts

259B—Carver loamy coarse sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07t
Elevation: 0 to 240 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Carver, Loamy Coarse Sand

Setting

Landform: Moraines, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Oe - 2 to 3 inches: moderately decomposed plant material
A - 3 to 7 inches: loamy coarse sand
E - 7 to 10 inches: coarse sand
Bw1 - 10 to 15 inches: coarse sand
Bw2 - 15 to 28 inches: coarse sand
BC - 28 to 32 inches: coarse sand
C - 32 to 67 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 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): 3s
Hydrologic Soil Group: A
Ecological site: F149BY005MA - Dry Outwash
Hydric soil rating: No

Minor Components

Deerfield

Percent of map unit: 10 percent
Landform: Outwash terraces, outwash plains, kame terraces, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Kame terraces, moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains
Landform position (two-dimensional): Summit, toeslope, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mashpee

Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 18, Sep 1, 2021

Barnstable County, Massachusetts

55A—Freetown coarse sand, 0 to 3 percent slopes, sanded surface

Map Unit Setting

National map unit symbol: 2t2qj
Elevation: 0 to 180 feet
Mean annual precipitation: 40 to 52 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 190 to 250 days
Farmland classification: Farmland of unique importance

Map Unit Composition

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

Description of Freetown, Sanded Surface

Setting

Landform: Kettles, bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy human-transported material over highly decomposed organic material

Typical profile

^Ap - 0 to 15 inches: coarse sand
2Oa - 15 to 79 inches: muck

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 20.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands

Hydric soil rating: Yes

Minor Components

Swansea, sanded surface, inactive

Percent of map unit: 5 percent
Landform: Kettles, bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Rainberry, sanded surface

Percent of map unit: 4 percent
Landform: Kettles, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Udipsamments, wet substratum

Percent of map unit: 3 percent
Landform: Dikes on bogs
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex
Across-slope shape: Concave, linear
Hydric soil rating: No

Tihonet

Percent of map unit: 3 percent
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 18, Sep 1, 2021

Barnstable County, Massachusetts

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

Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 18, Sep 1, 2021

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 18, Sep 1, 2021

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

Date(s) aerial images were photographed: Jul 10, 2018—Nov 17, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	2.0	32.0%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	4.0	63.1%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	0.3	4.9%
Totals for Area of Interest		**6.4**	**100.0%**

Table 2.3.3. 1982 Rawls Rates[1]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

1 Rawls, Brakensiek and Saxton, 1982

Client: Briggs		Date: 12-21-22	Page # 1 of 1
Location: Crab Point Mashpee MA			

Boring No. B1	Ground Elev 16.6	Date Start 12/21	Date Complete 12/21	Drilling Foreman: T Perry	Eng/Hydrol. Geologist: D. Geisser

Sample NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
1	0-2	1-2-4-2	12		0.3	Topsoil - f/m S. Hy organic Sand
					1.7	subsoil - f/m Sand, little Silt trace(-) organic, brown
2	2-4'	1-2-1-4	14			Sand - f/c, trace Gravel, trace Silt, light brown.
3	5-7	3-5-4-5	12			Sand - f/c, trace Silt, light brown, wet
4	10-12	3-5-5-5	12			Similar to above
5	15-17	1-4-3-4	9			similar to above
6	20-22	3-4-5-7	10			Similar to above
7	25-27	4-5-6-7	12			Similar to above
						Bottom of Boring at 27ft

Type Of Boring: Casing Size Hollow Stem Auger Size

Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

Client: Briggs | Date: 12-21-22 | Page # 1 of 1

Location: Cran Point, Mashpee, MA

Boring No: B2 | Ground Elev: 17.0 | Date Start: 12/21 | Date Complete: 12/21 | Drilling Foreman: T Perry | Eng/Hydrol. Geologist: D Geisser

DEPTH	Sample NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0-2	0-1-0-1	16		0.4	Topsoil - organic silty Sand
						2'	Subsoil - fine Sand, little (+) silt, orange brown
	2	2-4	1-2-1-2	16			Sand - fine, trace silt, light brown
	3	5-7	2-3-3-4	14			Similar to above, wet
	4	10-12	3-4-3-3	16			Similar to above.
	5	15-17	3-3-3-4	10			Similar to above
	6	20-22	2-4-4-4	12			Similar to above
							Bottom of Boring at 22 ft

Type Of Boring: Casing Size | Hollow Stem Auger Size | Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

Geosearch Inc.

Client: Briggs Date: 12-21-22 Page # 1 of 1

Location: Cran Point - Mashpee, MA

Boring No. B3 Ground Elev 21' Date Start 12/21 Date Complete 12/21 Drilling Foreman: T. Perry Eng/Hydrol. Geologist: D. Geisser

DEPTH	Sample Data NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0-2	2-1-1-2	20			Sandy Topsoil - f/m, trace(+) Silt
						1.0	trace(-) organic, dk grey.
							subsoil - f/m Silty Sand - little
						1.6'	silt, orange brown
							Sand - f/m, trace silt, light brown
		2-4	1-2-2-5	20			
							similar to above,
		5-7	5-3-4-4	16			Similar to above, trace Gravel
		10-12	2-2-3-4	10			Similar to above
		15-17	3-4-3-5	14			Similar to above
		20-22	3-5-4-5	16			similar to above
							Bottom of Boring at 22ft

Type Of Boring: Casing Size Hollow Stem Auger Size

Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

Client: Briggs		Date: 12-21-22	Page # 1 of 1
Location: Cran Point - Mashpee, MA			
Boring No. B4	Ground Elev 17.7'	Date Start 12/21/22	Date Complete 12/2
Drilling Foreman: T. Perry		Eng/Hydrol. Geologist: D. Geisser	

DEPTH	Sample NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0-2	2-1-3-4	10		0.5	Topsoil - f/m Sand, trace silt, trace(-) organic, dark brown
							Subsoil - f/m Sand, little silt orange brown.
	2	2-4'	2-2-2-1	14		2.2	Sand - f/m, trace silt, light brown
	3	5-7	3-3-4-5	16			Similar to above, wet
	4	10-12	2-4-4-4	14			Similar to above
	5	15-17	2-3-4-4	14			Similar to above
	6	20-22	1-3-3-4	12			Similar to above
	7	25-27	5-4-4-6	14			Similar to above.
						28	
	8	30-32	3-5-10-13	14			Silt and Sand - nonplastic, brown, wet
	9	35-37	4-6-9-14	12			Silty Sand - f/m, some silt brown, wet
							Bottom of Boring at 37 ft.
							GW at 4'8" at 10 minutes 5'0 @ 30 min

Type Of Boring: Casing Size Hollow Stem Auger Size

Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

Geosearch Inc.

Client: Briggs Date: 12-21-22 Page #

Location: Cran Point - Mashpee, MA

Boring No. B5 Ground Elev 16.5 Date Start 12/21 Date Complete 12/21 Drilling Foreman: T Perry Eng/Hydrol. Geologist: D. Geisser

DEPTH	Sample Data				Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	Sample NO.	Depth(ft.)	Blows 6" Penetration	Rec. Inches			
	1	0-2	1-1-2-2	10		0.5	Topsoil - f/m sand, little silt trace organic, black
						2'	Subsoil - f/m sand, little silt orange brown
	2	2-4	4-3-2 2	18			Sand - f/c, trace Gravel, trace Silt, light brown
	3	5-7	3-4-4-6	12			Sand - f/m, trace Silt, light brown, wet.
	4	10-12	2-4-5-4	12		14	
	5	15-17	4-6-6-8	14			Silty Sand - f/m, little silt, grey brown, wet
							Bottom of Boring at 17 ft

Type Of Boring: Casing Size Hollow Stem Auger Size Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard
	Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.			

Client: Briggs			Date: 12-21-22	Page # 1 of 1	
Location: Cran Point - Mashpee MA					
Boring No. B6	Ground Elev 19.0	Date Start 12/21	Date Complete 12/21	Drilling Foreman: T Perry	Eng/Hydrol. Geologist: D Geisser

DEPTH	Sample Data NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0-2	4-4-5-6	10		2'	Sandy Fill - f/c, sand, trace(+) silt, trace(+) Gravel, brown
	2	2-4	8-7-5-4	14		4'	Gravelly Sand - f/c, little Gravel, trace(+) silt, brown - orange brown
	3	5-7	2-2-2-3	10			Sand - f/m, trace silt, light brown
	4	10-12	3-5-4-5	14			Similar to above
	5	15-17	3-5-5-6	14			Similar to above
							Bottom of Boring at 17 ft
							Groundwater at 5'2" at 20 mins. 5'9" at 1 hr.

Type Of Boring: Casing Size Hollow Stem Auger Size

Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

Client: Briggs				Date: 12-21-22	Page # 1 of 1	
Location. Cran Point - Mashpee MA						
Boring No. B7	Ground Elev 16.8	Date Start 12/21	Date Complete 12/21	Drilling Foreman: T Perry	Eng/Hydrol. Geologist: D. Geisser	

DEPTH	Sample NO.	Sample Depth(ft.)	Blows 6" Penetration	Rec. Inches	Casing Blows Per Ft.	Strata Change Depth	Visual Identification of Soil and/or Rock Strata
	1	0-2	1-0-1-0	19		0.3	Topsoil - f/m Silty Sand, organic
						1.5	subsoil - f/m Sand, little Silt, light brown
	2	2-4	1-1-1-1	18			Sand - f/m, trace silt, light brown
	3	5-7	3-3-6-3	18			Similar to above, wet
	4	10-12	2-4-5 8	16		14	similar to above
	5	15-17	10-5-4 4	18			silty Sand - f/m, little (-) Silt, light grey
	6	20-22	2-8-12 12	14		21	clayey Silty Sand - f/m, trace clay, some silt, grey
	7	25-27	8-6-12 19	16			Similar to above
							Bottom of Boring at 27 ft

Type Of Boring: Casing Size Hollow Stem Auger Size

Standard Penetration Test (ST) = 140lb hammer falling 30"

Proportion Percentages	Granular Soils (blows per ft.)		Cohesive Soils (blows per ft.)	
Trace 0 to 10%	0 to 4 Very Loose	30 to 50 Dense	0 to 2 Very Soft	8 to 15 Stiff
Some 10 to 40%	4 to 10 Loose	Over 50 Very Dense	2 to 4 Soft	15 to 30 Very Stiff
And 40 to 50%	10 to 30 Medium Dense		4 to 8 Medium Stiff	Over 30 Hard

Blows are per 6" taken with an 24" long X 2" OD X 1 3/8" I.D.

APPENDIX B

HYDROLOGIC INFORMATION

- ATLAS 14 RAINFALL DATA INFORMATION

NOAA Atlas 14, Volume 10, Version 3
Location name: Mashpee, Massachusetts, USA*
Latitude: 41.6205°, Longitude: -70.4615°
Elevation: 24.79 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.281** (0.230-0.344)	**0.352** (0.287-0.432)	**0.468** (0.380-0.575)	**0.564** (0.455-0.697)	**0.696** (0.541-0.894)	**0.794** (0.603-1.04)	**0.900** (0.661-1.22)	**1.03** (0.701-1.39)	**1.22** (0.794-1.70)	**1.38** (0.875-1.95)
10-min	**0.398** (0.325-0.488)	**0.498** (0.407-0.612)	**0.662** (0.539-0.815)	**0.798** (0.644-0.986)	**0.986** (0.767-1.27)	**1.13** (0.855-1.47)	**1.27** (0.937-1.72)	**1.45** (0.993-1.97)	**1.72** (1.13-2.40)	**1.95** (1.24-2.76)
15-min	**0.468** (0.383-0.574)	**0.586** (0.479-0.720)	**0.779** (0.634-0.959)	**0.939** (0.759-1.16)	**1.16** (0.902-1.49)	**1.32** (1.00-1.73)	**1.50** (1.10-2.03)	**1.71** (1.17-2.32)	**2.03** (1.32-2.82)	**2.30** (1.46-3.25)
30-min	**0.680** (0.556-0.834)	**0.851** (0.695-1.05)	**1.13** (0.919-1.39)	**1.36** (1.10-1.68)	**1.68** (1.31-2.16)	**1.92** (1.46-2.51)	**2.17** (1.60-2.94)	**2.48** (1.69-3.36)	**2.94** (1.92-4.10)	**3.34** (2.12-4.72)
60-min	**0.892** (0.730-1.09)	**1.12** (0.911-1.37)	**1.48** (1.21-1.82)	**1.79** (1.44-2.21)	**2.20** (1.71-2.83)	**2.51** (1.91-3.29)	**2.85** (2.09-3.85)	**3.25** (2.22-4.41)	**3.86** (2.52-5.38)	**4.39** (2.78-6.20)
2-hr	**1.24** (1.02-1.51)	**1.54** (1.26-1.87)	**2.03** (1.66-2.48)	**2.43** (1.98-2.98)	**2.99** (2.34-3.81)	**3.40** (2.61-4.42)	**3.85** (2.86-5.17)	**4.39** (3.03-5.90)	**5.22** (3.45-7.21)	**5.93** (3.82-8.31)
3-hr	**1.47** (1.22-1.79)	**1.82** (1.50-2.21)	**2.38** (1.96-2.89)	**2.84** (2.32-3.47)	**3.48** (2.75-4.42)	**3.96** (3.05-5.12)	**4.47** (3.34-5.98)	**5.09** (3.54-6.82)	**6.04** (4.02-8.29)	**6.85** (4.44-9.55)
6-hr	**1.93** (1.60-2.32)	**2.34** (1.94-2.82)	**3.02** (2.50-3.64)	**3.58** (2.94-4.34)	**4.35** (3.45-5.47)	**4.92** (3.82-6.29)	**5.53** (4.17-7.30)	**6.26** (4.41-8.31)	**7.35** (4.95-10.00)	**8.27** (5.43-11.4)
12-hr	**2.42** (2.03-2.90)	**2.89** (2.42-3.46)	**3.66** (3.05-4.39)	**4.30** (3.56-5.18)	**5.17** (4.13-6.44)	**5.83** (4.56-7.37)	**6.53** (4.93-8.48)	**7.31** (5.21-9.61)	**8.45** (5.77-11.4)	**9.38** (6.24-12.8)
24-hr	**2.91** (2.45-3.45)	**3.43** (2.89-4.08)	**4.29** (3.60-5.11)	**5.00** (4.17-5.98)	**5.97** (4.81-7.36)	**6.72** (5.28-8.39)	**7.48** (5.69-9.58)	**8.32** (6.00-10.8)	**9.49** (6.56-12.7)	**10.4** (7.03-14.1)
2-day	**3.37** (2.86-3.97)	**3.95** (3.35-4.66)	**4.89** (4.13-5.78)	**5.67** (4.76-6.73)	**6.74** (5.47-8.23)	**7.56** (6.00-9.36)	**8.40** (6.45-10.7)	**9.31** (6.79-12.0)	**10.6** (7.40-14.0)	**11.6** (7.90-15.5)
3-day	**3.69** (3.14-4.33)	**4.28** (3.64-5.03)	**5.25** (4.45-6.18)	**6.05** (5.10-7.15)	**7.15** (5.83-8.69)	**7.99** (6.37-9.84)	**8.85** (6.84-11.2)	**9.78** (7.19-12.5)	**11.1** (7.82-14.5)	**12.1** (8.33-16.1)
4-day	**3.95** (3.38-4.63)	**4.55** (3.89-5.33)	**5.53** (4.71-6.49)	**6.34** (5.37-7.47)	**7.46** (6.10-9.03)	**8.30** (6.65-10.2)	**9.18** (7.12-11.5)	**10.1** (7.47-12.9)	**11.4** (8.11-14.9)	**12.5** (8.63-16.5)
7-day	**4.63** (3.99-5.40)	**5.25** (4.51-6.12)	**6.26** (5.36-7.30)	**7.09** (6.04-8.31)	**8.24** (6.79-9.90)	**9.12** (7.35-11.1)	**10.0** (7.81-12.5)	**11.0** (8.17-13.9)	**12.2** (8.78-15.9)	**13.2** (9.27-17.4)
10-day	**5.27** (4.55-6.11)	**5.91** (5.09-6.86)	**6.95** (5.98-8.09)	**7.82** (6.68-9.13)	**9.01** (7.45-10.8)	**9.93** (8.04-12.0)	**10.9** (8.50-13.4)	**11.8** (8.86-14.9)	**13.1** (9.45-16.9)	**14.0** (9.89-18.4)
20-day	**7.19** (6.25-8.28)	**7.93** (6.88-9.13)	**9.13** (7.90-10.5)	**10.1** (8.71-11.7)	**11.5** (9.57-13.6)	**12.6** (10.2-15.0)	**13.6** (10.7-16.5)	**14.6** (11.1-18.2)	**15.9** (11.6-20.3)	**16.8** (12.0-21.7)
30-day	**8.84** (7.72-10.1)	**9.66** (8.42-11.1)	**11.0** (9.56-12.6)	**12.1** (10.5-14.0)	**13.6** (11.4-16.0)	**14.8** (12.2-17.6)	**16.0** (12.6-19.3)	**17.0** (13.1-21.2)	**18.3** (13.6-23.3)	**19.2** (13.9-24.8)
45-day	**11.0** (9.60-12.5)	**11.9** (10.4-13.6)	**13.4** (11.7-15.3)	**14.6** (12.7-16.8)	**16.4** (13.8-19.1)	**17.7** (14.6-20.9)	**19.0** (15.1-22.8)	**20.2** (15.6-24.9)	**21.5** (16.0-27.1)	**22.4** (16.3-28.6)
60-day	**12.8** (11.2-14.5)	**13.8** (12.1-15.7)	**15.4** (13.5-17.6)	**16.8** (14.6-19.2)	**18.7** (15.8-21.8)	**20.2** (16.7-23.8)	**21.6** (17.2-25.7)	**22.8** (17.7-28.0)	**24.2** (18.2-30.4)	**25.1** (18.3-32.0)

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

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

Please refer to NOAA Atlas 14 document for more information.

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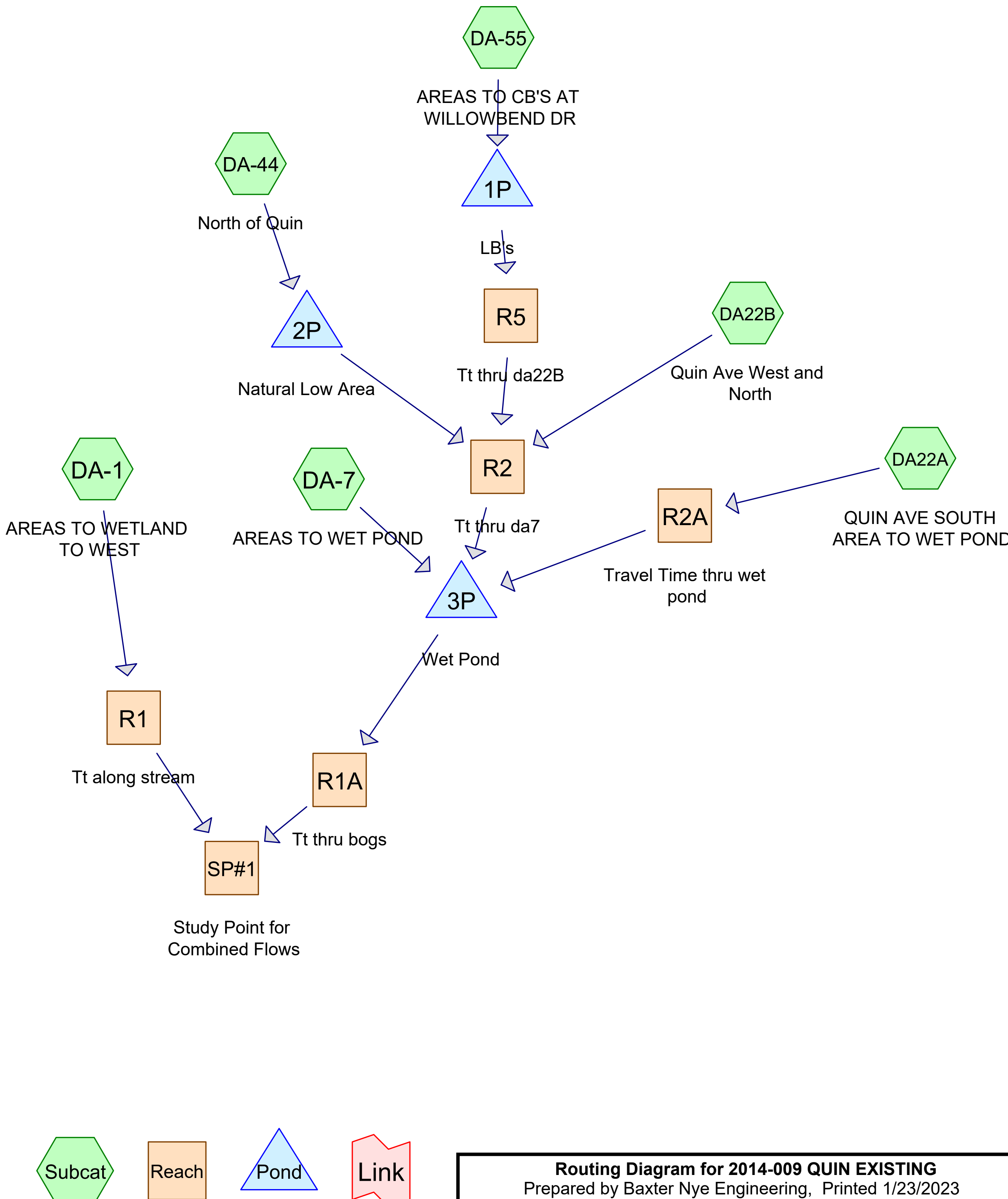
PF graphical

APPENDIX C

PRE-DEVELOPMENT

WATERSHED RUNOFF & ROUTING



Routing Diagram for 2014-009 QUIN EXISTING
Prepared by Baxter Nye Engineering, Printed 1/23/2023
HydroCAD® 10.00-11 s/n 04803 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.464	39	>75% Grass cover, Good, HSG A (DA-1, DA-7, DA22A, DA22B)
0.183	76	Gravel roads, HSG A (DA-1, DA-7)
0.315	39	Pasture/grassland/range, Good, HSG A (DA-55)
0.326	98	Paved parking, HSG A (DA-55)
0.172	98	Roofs, HSG A (DA-1, DA-7)
0.872	98	Unconnected pavement, HSG A (DA22A, DA22B)
3.381	30	Woods, Good, HSG A (DA-1, DA-7)
1.064	55	Woods, Good, HSG B (DA-1)
0.841	32	Woods/grass comb., Good, HSG A (DA-44)
8.618	**47**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-1: AREAS TO WETLAND Runoff Area=2.267 ac 3.62% Impervious Runoff Depth=0.08"
Flow Length=200' Tc=16.2 min CN=45 Runoff=0.03 cfs 0.016 af

SubcatchmentDA-44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.000 af

SubcatchmentDA-55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=0.95"
Tc=5.0 min CN=69 Runoff=0.68 cfs 0.051 af

SubcatchmentDA-7: AREAS TO WET POND Runoff Area=3.073 ac 2.93% Impervious Runoff Depth=0.00"
Flow Length=431' Tc=26.3 min CN=35 Runoff=0.00 cfs 0.000 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=1.37"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=0.70 cfs 0.052 af

SubcatchmentDA22B: Quin Ave West and Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=0.75"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=0.89 cfs 0.084 af

Reach R1: Tt along stream Avg. Flow Depth=0.05' Max Vel=0.23 fps Inflow=0.03 cfs 0.016 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.02 cfs 0.016 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.05' Max Vel=0.28 fps Inflow=0.08 cfs 0.079 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.08 cfs 0.077 af

Reach R2: Tt thru da7 Avg. Flow Depth=0.10' Max Vel=0.73 fps Inflow=0.99 cfs 0.101 af
n=0.025 L=380.0' S=0.0074 '/' Capacity=330.00 cfs Outflow=0.85 cfs 0.101 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.14' Max Vel=2.41 fps Inflow=0.70 cfs 0.052 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=0.68 cfs 0.052 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.05' Max Vel=1.39 fps Inflow=0.39 cfs 0.017 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=0.31 cfs 0.017 af

Reach SP#1: Study Point for Combined Flows Inflow=0.10 cfs 0.093 af
Outflow=0.10 cfs 0.093 af

Pond 1P: LB's Peak Elev=20.64' Storage=448 cf Inflow=0.68 cfs 0.051 af
Discarded=0.03 cfs 0.033 af Primary=0.39 cfs 0.017 af Outflow=0.42 cfs 0.051 af

Pond 2P: Natural Low Area Peak Elev=16.01' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 3P: Wet Pond Peak Elev=14.39' Storage=4,532 cf Inflow=1.20 cfs 0.154 af
Outflow=0.08 cfs 0.079 af

Total Runoff Area = 8.618 ac Runoff Volume = 0.203 af Average Runoff Depth = 0.28"
84.10% Pervious = 7.248 ac 15.90% Impervious = 1.370 ac

Summary for Subcatchment DA-1: AREAS TO WETLAND TO WEST

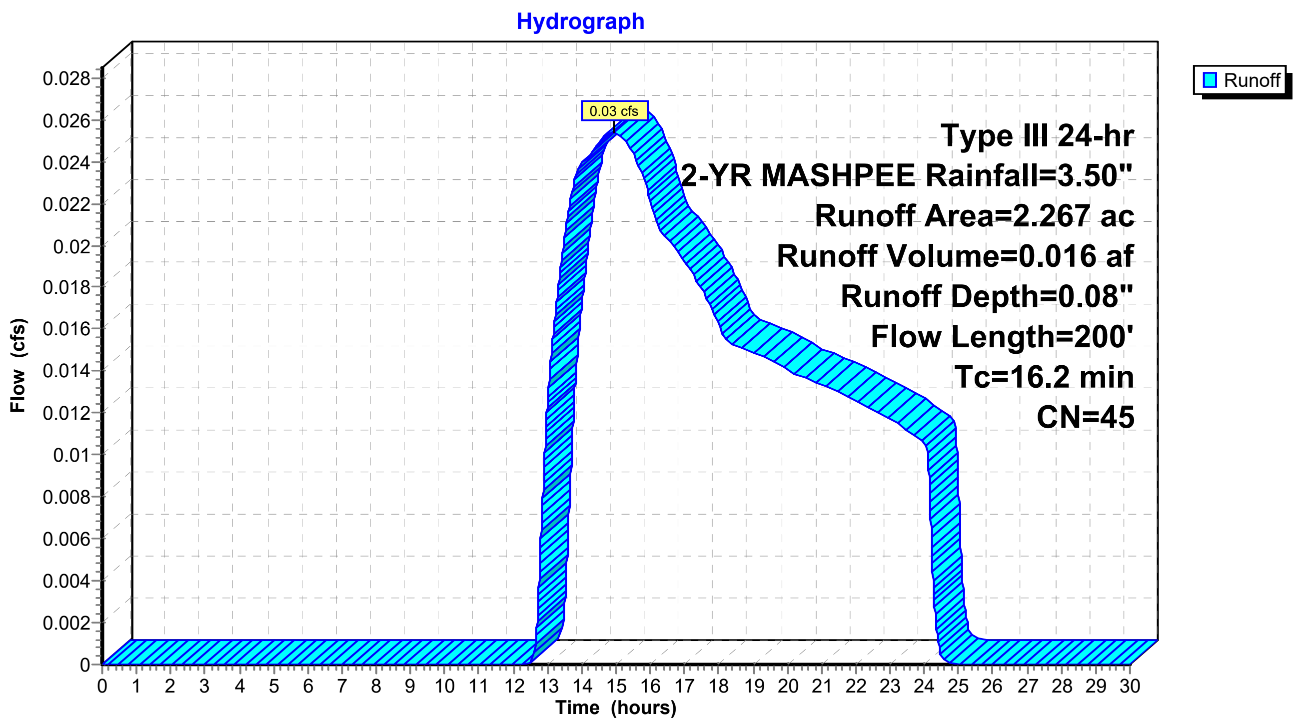
Runoff = 0.03 cfs @ 14.92 hrs, Volume= 0.016 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.986	30	Woods, Good, HSG A
0.045	76	Gravel roads, HSG A
0.082	98	Roofs, HSG A
1.064	55	Woods, Good, HSG B
2.267	45	Weighted Average
2.185		96.38% Pervious Area
0.082		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
7.9	150	0.0040	0.32		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
16.2	200	Total			

Subcatchment DA-1: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-44: North of Quin

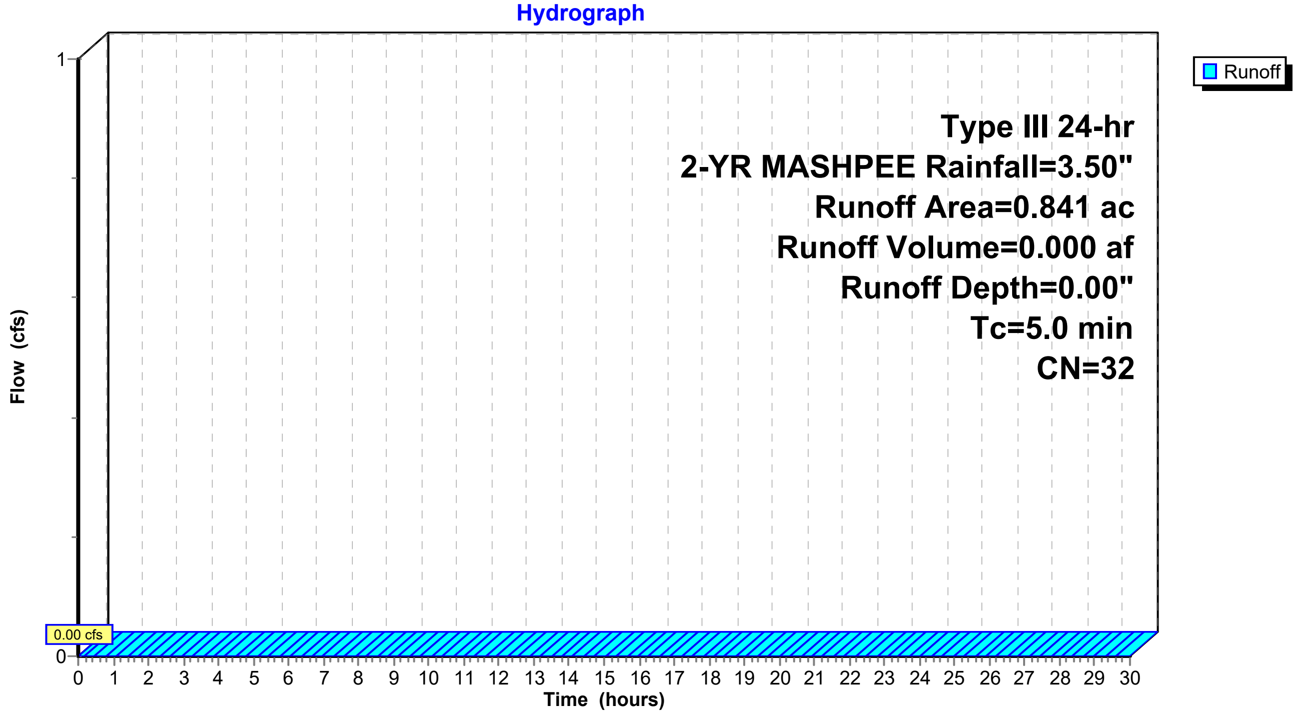
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA-44: North of Quin



Summary for Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR

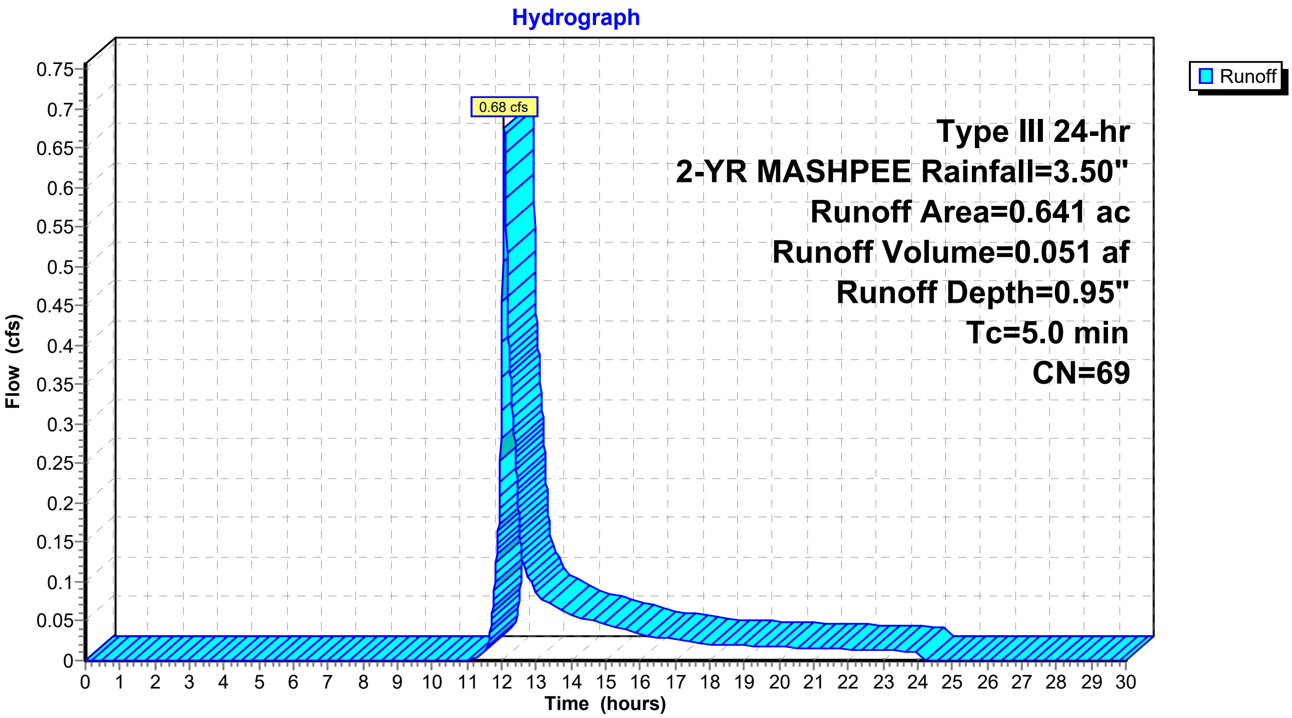
Runoff = 0.68 cfs @ 12.08 hrs, Volume= 0.051 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA-7: AREAS TO WET POND

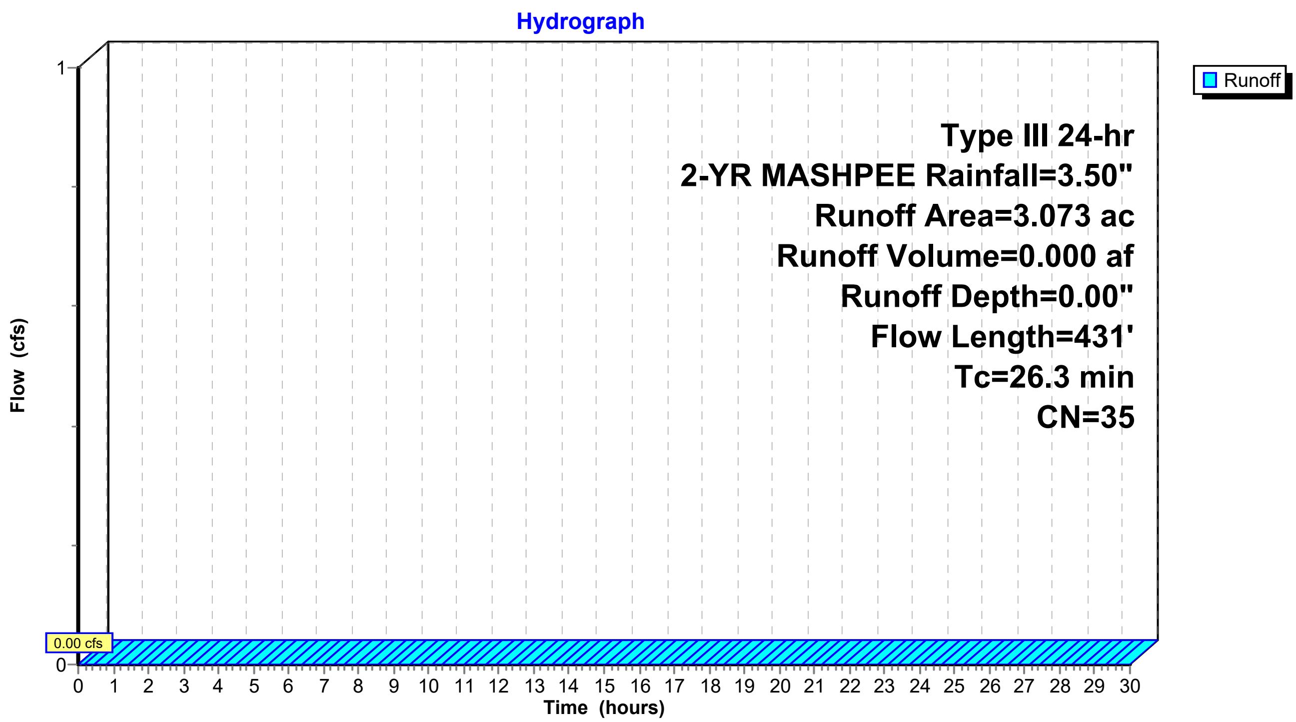
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.450	39	>75% Grass cover, Good, HSG A
2.230	30	Woods, Good, HSG A
0.138	76	Gravel roads, HSG A
0.090	98	Roofs, HSG A
0.165	30	Woods, Good, HSG A
3.073	35	Weighted Average
2.983		97.07% Pervious Area
0.090		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, A** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA-7: AREAS TO WET POND



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

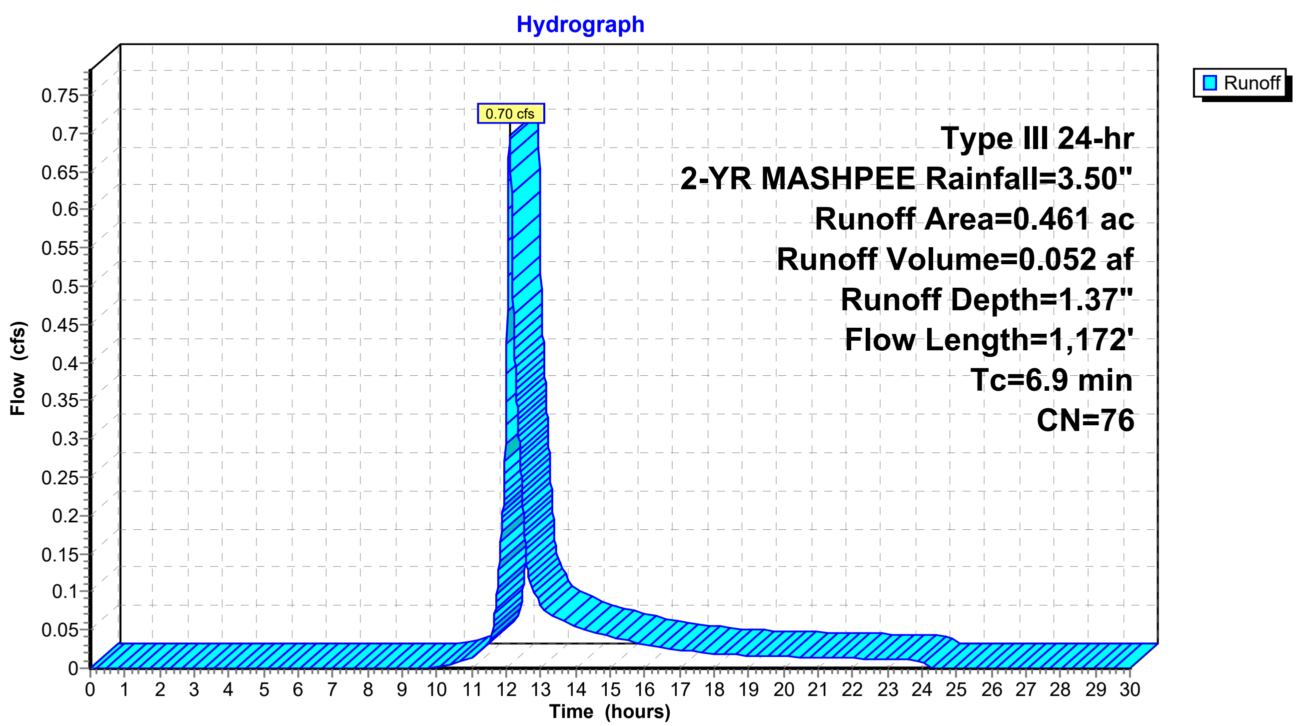
Runoff = 0.70 cfs @ 12.11 hrs, Volume= 0.052 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: Quin Ave West and North

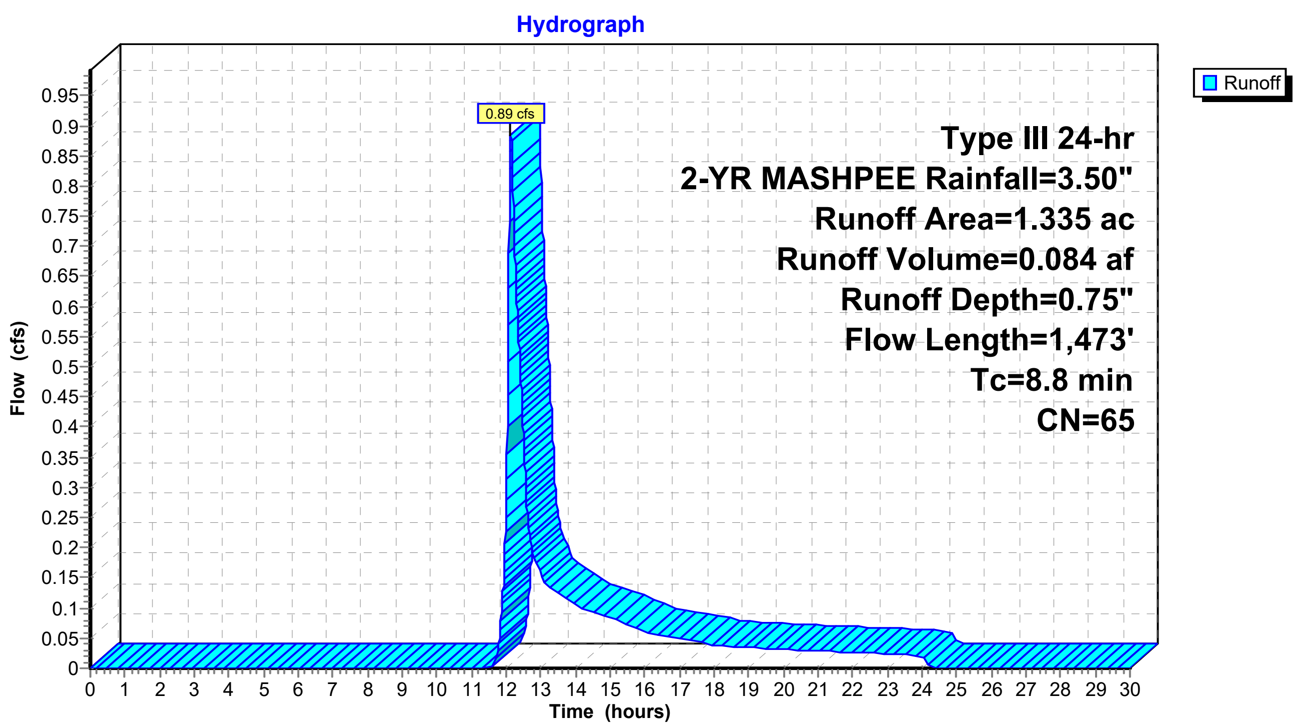
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 0.084 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: Quin Ave West and North



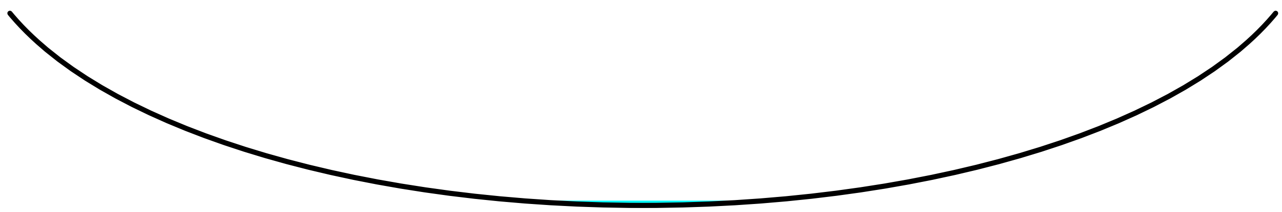
Summary for Reach R1: Tt along stream

Inflow Area = 2.267 ac, 3.62% Impervious, Inflow Depth = 0.08" for 2-YR MASHPEE event
Inflow = 0.03 cfs @ 14.92 hrs, Volume= 0.016 af
Outflow = 0.02 cfs @ 15.40 hrs, Volume= 0.016 af, Atten= 3%, Lag= 28.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 39.3 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 52.2 min

Peak Storage= 58 cf @ 15.40 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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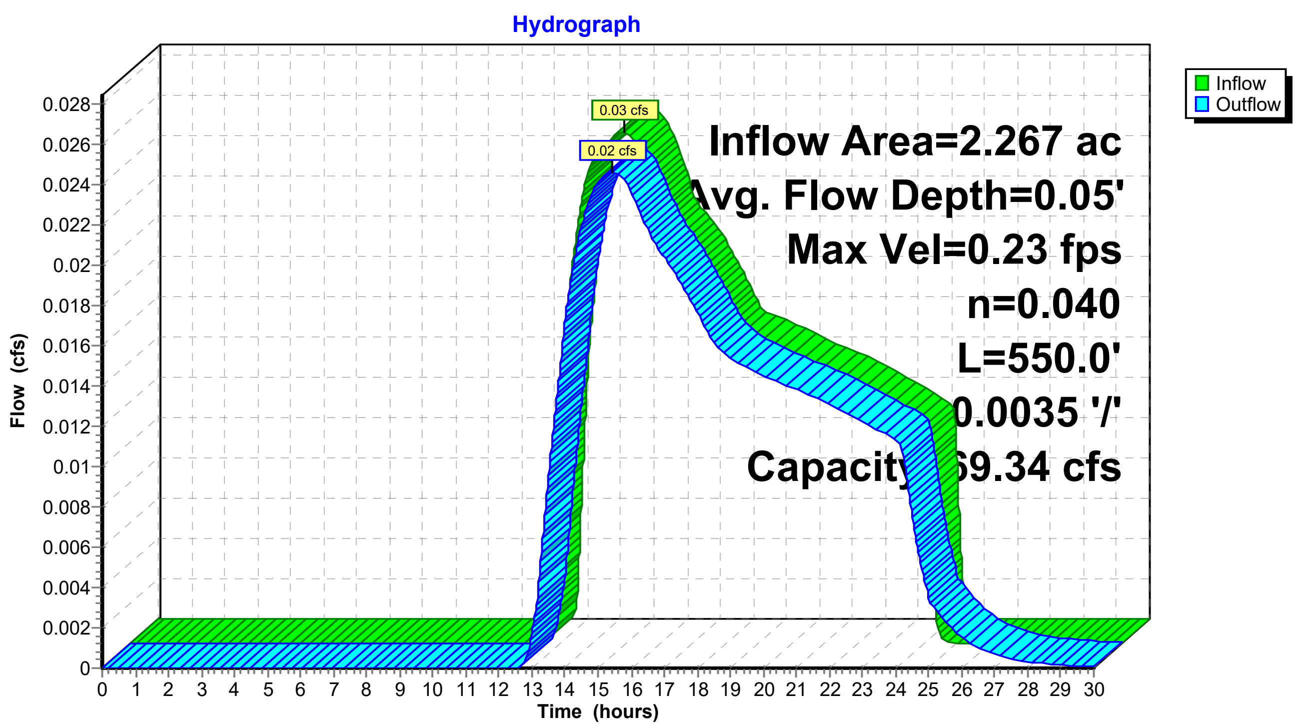
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth > 0.15" for 2-YR MASHPEE event
Inflow = 0.08 cfs @ 16.88 hrs, Volume= 0.079 af
Outflow = 0.08 cfs @ 17.28 hrs, Volume= 0.077 af, Atten= 0%, Lag= 23.9 min

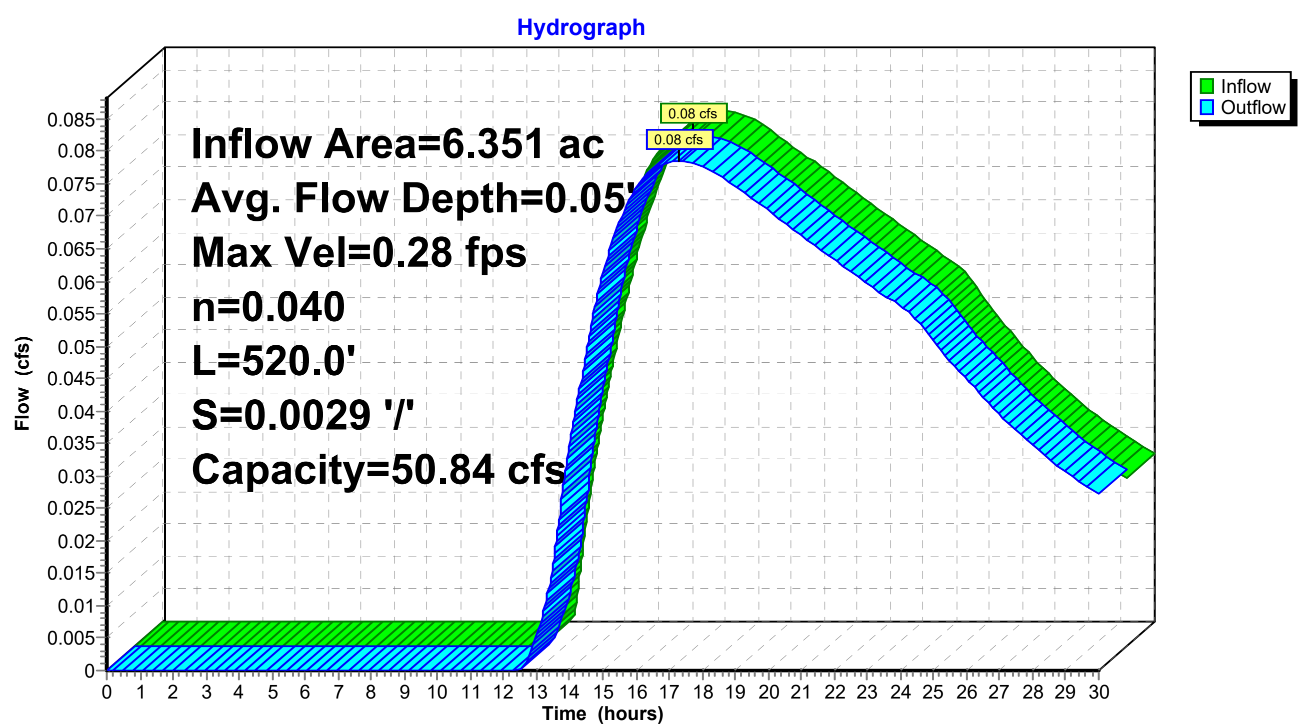
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.28 fps, Min. Travel Time= 30.7 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 36.0 min

Peak Storage= 145 cf @ 17.28 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

‡

Reach R1A: Tt thru bogs



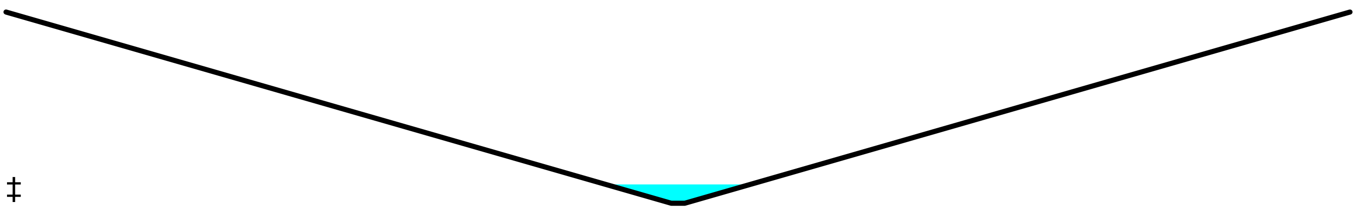
Summary for Reach R2: Tt thru da7

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 0.43" for 2-YR MASHPEE event
Inflow = 0.99 cfs @ 12.23 hrs, Volume= 0.101 af
Outflow = 0.85 cfs @ 12.35 hrs, Volume= 0.101 af, Atten= 14%, Lag= 7.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.73 fps, Min. Travel Time= 8.7 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 18.7 min

Peak Storage= 443 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 102.0 sf, Capacity= 330.00 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 100.0 '/' Top Width= 202.00'
Length= 380.0' Slope= 0.0074 '/'
Inlet Invert= 17.00', Outlet Invert= 14.20'



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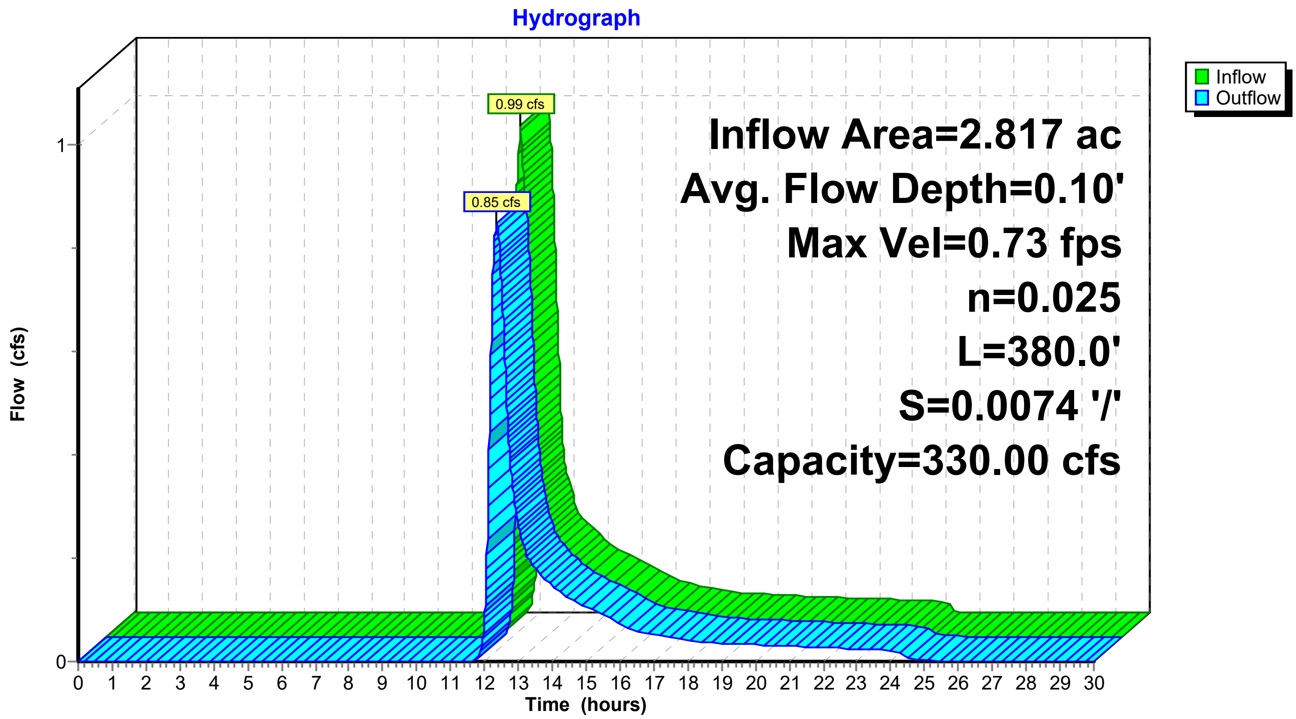
Reach R2: Tt thru da7



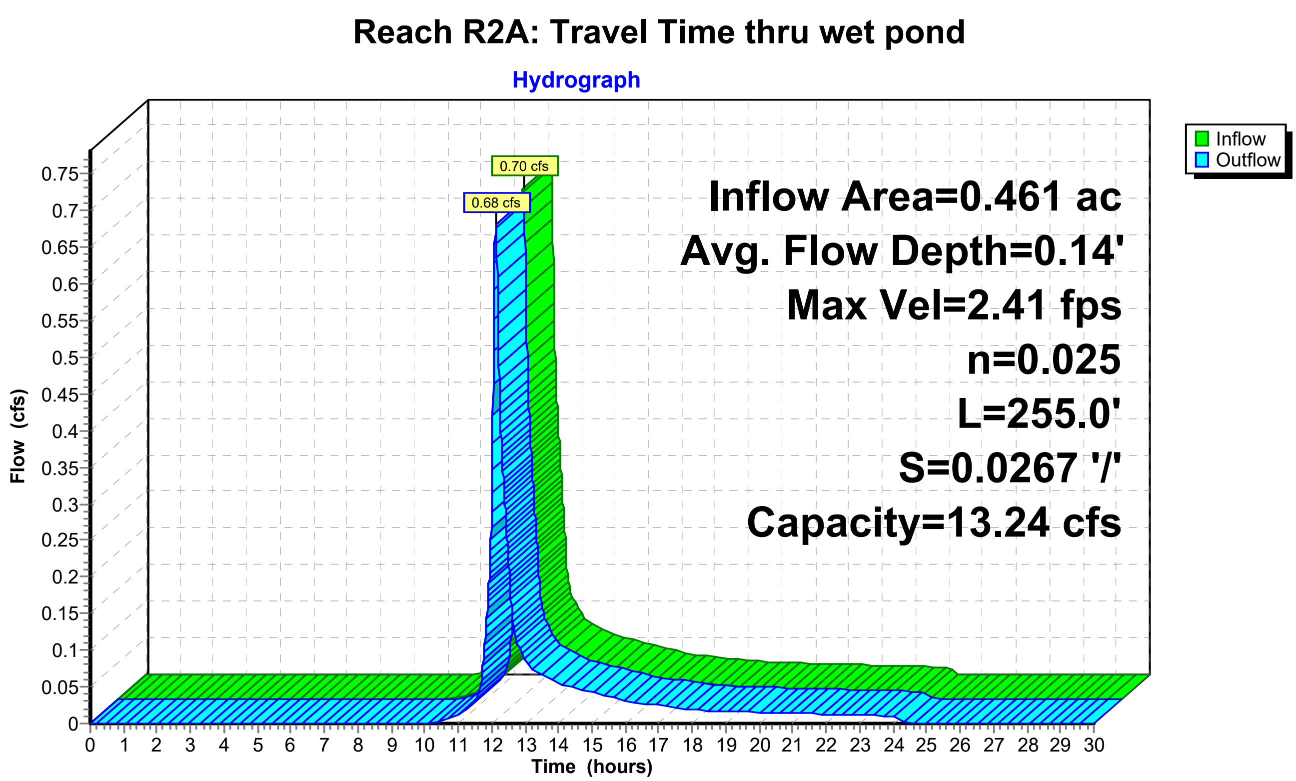
Summary for Reach R2A: Travel Time thru wet pond

Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 1.37" for 2-YR MASHPEE event
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 0.052 af
Outflow = 0.68 cfs @ 12.12 hrs, Volume= 0.052 af, Atten= 2%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.41 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 5.9 min

Peak Storage= 72 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'



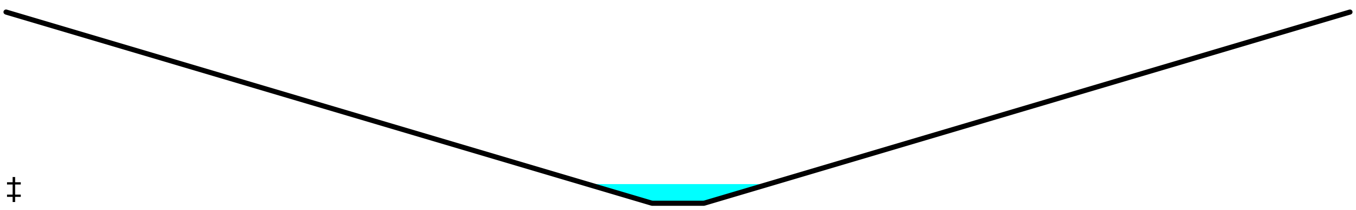
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 0.33" for 2-YR MASHPEE event
Inflow = 0.39 cfs @ 12.19 hrs, Volume= 0.017 af
Outflow = 0.31 cfs @ 12.29 hrs, Volume= 0.017 af, Atten= 21%, Lag= 6.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.39 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 6.1 min

Peak Storage= 55 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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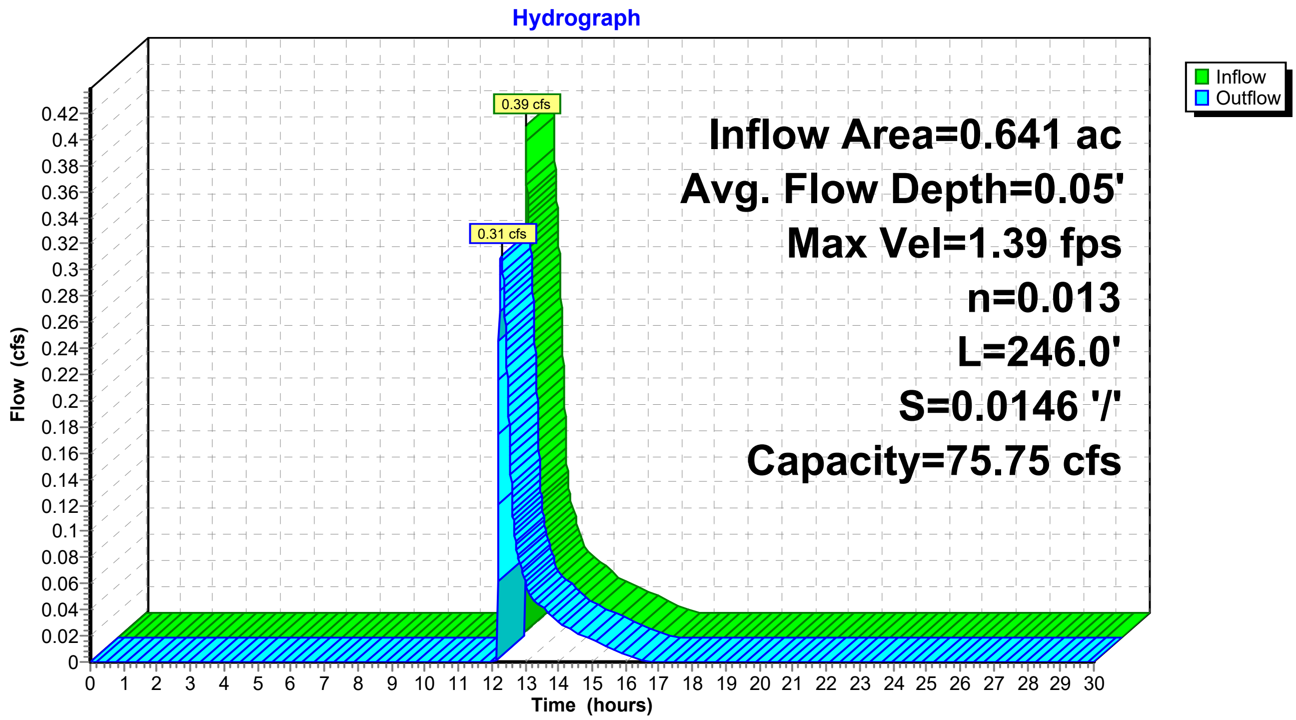
Reach R5: Tt thru da22B

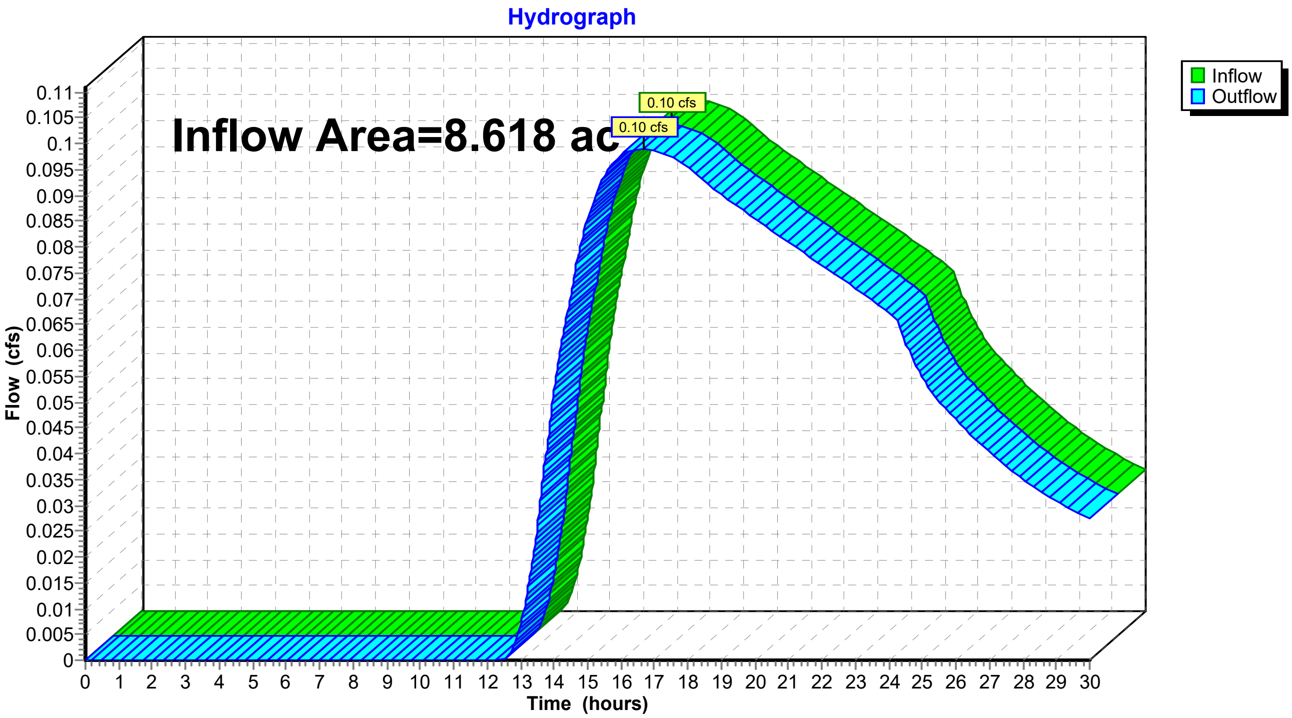


Summary for Reach SP#1: Study Point for Combined Flows

Inflow Area = 8.618 ac, 15.90% Impervious, Inflow Depth > 0.13" for 2-YR MASHPEE event
Inflow = 0.10 cfs @ 16.64 hrs, Volume= 0.093 af
Outflow = 0.10 cfs @ 16.64 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach SP#1: Study Point for Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 0.95" for 2-YR MASHPEE event
Inflow = 0.68 cfs @ 12.08 hrs, Volume= 0.051 af
Outflow = 0.42 cfs @ 12.19 hrs, Volume= 0.051 af, Atten= 38%, Lag= 6.1 min
Discarded = 0.03 cfs @ 11.74 hrs, Volume= 0.033 af
Primary = 0.39 cfs @ 12.19 hrs, Volume= 0.017 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 20.64' @ 12.27 hrs Surf.Area= 574 sf Storage= 448 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 114.3 min (986.0 - 871.7)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2 707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

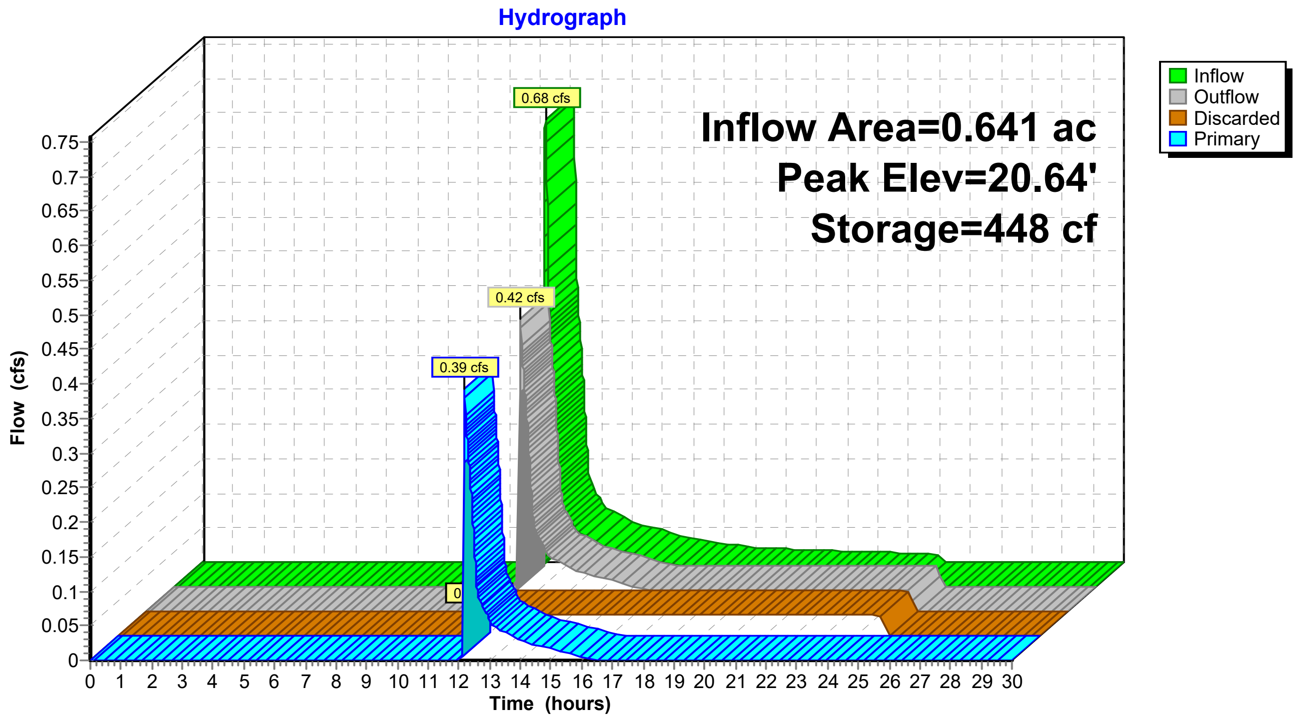
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 11.74 hrs HW=13.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.37 cfs @ 12.19 hrs HW=20.63' TW=20.61' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.37 cfs @ 0.58 fps)

Pond 1P: LB's


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=0.641 ac
Peak Elev=20.64'
Storage=448 cf
0.68 cfs
0.42 cfs
0.39 cfs
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Summary for Pond 2P: Natural Low Area

Inflow Area = 0.841 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR MASHPEE event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 16.01' @ 0.00 hrs Surf.Area= 1 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

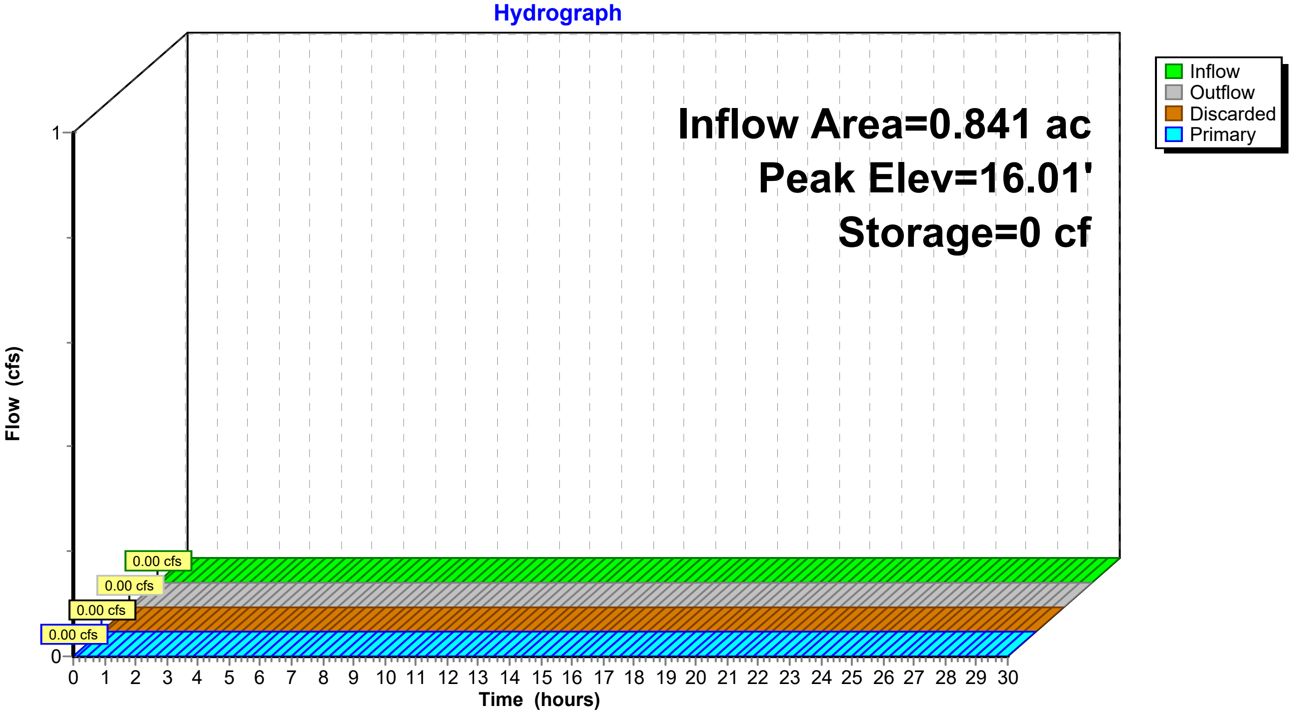
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	6,669	3,704	4,070
18.10	7,000	683	4,754

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.72'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 in 24.0" x 24.0" Grate Limited to weir flow at low heads
#3	Primary	18.00'	**25.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' (Free Discharge)
└─**1=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3P: Wet Pond

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth = 0.29" for 2-YR MASHPEE event
Inflow = 1.20 cfs @ 12.30 hrs, Volume= 0.154 af
Outflow = 0.08 cfs @ 16.88 hrs, Volume= 0.079 af, Atten= 93%, Lag= 275.0 min
Primary = 0.08 cfs @ 16.88 hrs, Volume= 0.079 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.39' @ 16.88 hrs Surf.Area= 18,444 sf Storage= 4,532 cf

Plug-Flow detention time= 482.3 min calculated for 0.079 af (51% of inflow)
Center-of-Mass det. time= 353.5 min (1,228.4 - 874.9)

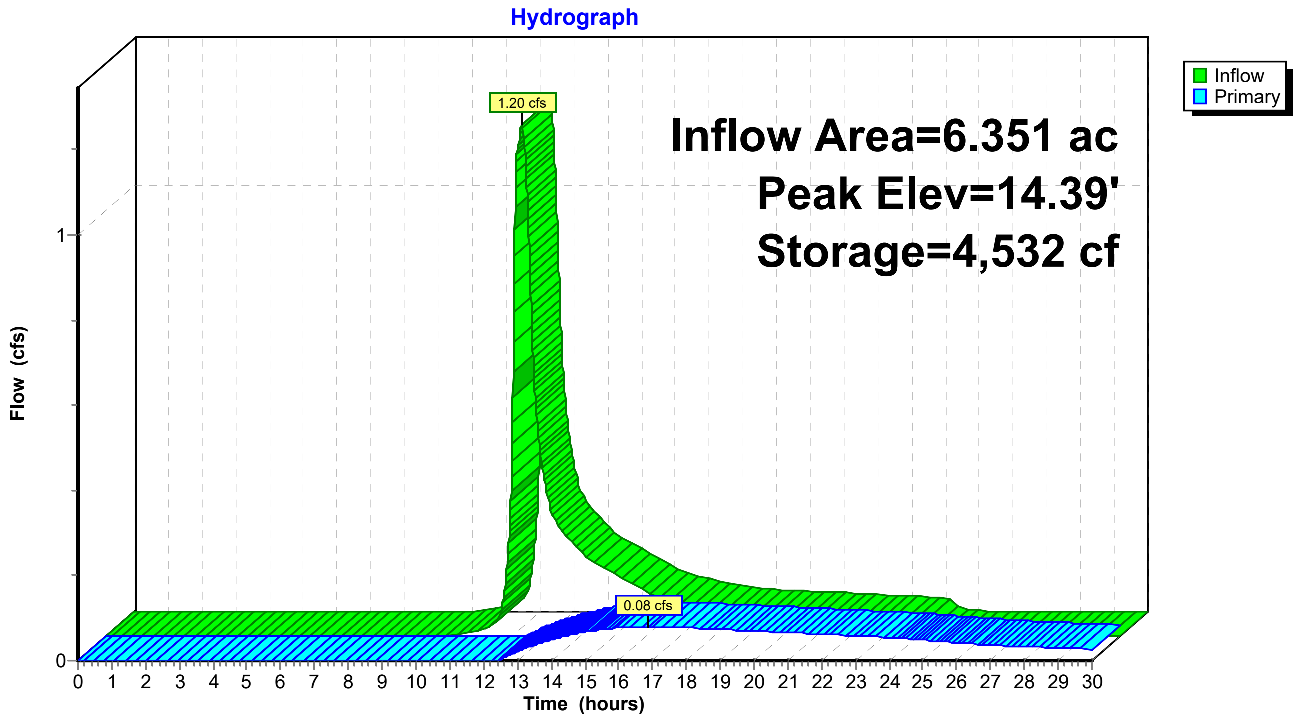
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	63,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,877	1,393	1,394
15.00	32,693	18,628	20,022
16.00	53,790	43,242	63,264

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**18.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Primary	15.00'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.08 cfs @ 16.88 hrs HW=14.39' TW=14.25' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.08 cfs @ 0.89 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-1: AREAS TO WETLAND Runoff Area=2.267 ac 3.62% Impervious Runoff Depth=0.45"
Flow Length=200' Tc=16.2 min CN=45 Runoff=0.41 cfs 0.084 af

SubcatchmentDA-44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.03"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.002 af

SubcatchmentDA-55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=69 Runoff=1.50 cfs 0.105 af

SubcatchmentDA-7: AREAS TO WET POND Runoff Area=3.073 ac 2.93% Impervious Runoff Depth=0.08"
Flow Length=431' Tc=26.3 min CN=35 Runoff=0.03 cfs 0.022 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=2.54"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=1.33 cfs 0.098 af

SubcatchmentDA22B: Quin Ave West and Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=1.66"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=2.24 cfs 0.185 af

Reach R1: Tt along stream Avg. Flow Depth=0.16' Max Vel=0.49 fps Inflow=0.41 cfs 0.084 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.30 cfs 0.084 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.13' Max Vel=0.49 fps Inflow=0.35 cfs 0.279 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.35 cfs 0.277 af

Reach R2: Tt thru da7 Avg. Flow Depth=0.16' Max Vel=0.98 fps Inflow=3.57 cfs 0.248 af
n=0.025 L=380.0' S=0.0074 '/' Capacity=330.00 cfs Outflow=2.83 cfs 0.248 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.21' Max Vel=3.06 fps Inflow=1.33 cfs 0.098 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=1.31 cfs 0.098 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.10' Max Vel=2.04 fps Inflow=1.44 cfs 0.063 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=1.36 cfs 0.063 af

Reach SP#1: Study Point for Combined Flows Inflow=0.48 cfs 0.361 af
Outflow=0.48 cfs 0.361 af

Pond 1P: LB's Peak Elev=20.70' Storage=477 cf Inflow=1.50 cfs 0.105 af
Discarded=0.03 cfs 0.042 af Primary=1.44 cfs 0.063 af Outflow=1.47 cfs 0.105 af

Pond 2P: Natural Low Area Peak Elev=16.08' Storage=2 cf Inflow=0.00 cfs 0.002 af
Discarded=0.00 cfs 0.002 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.002 af

Pond 3P: Wet Pond Peak Elev=14.58' Storage=8,391 cf Inflow=3.87 cfs 0.367 af
Outflow=0.35 cfs 0.279 af

Total Runoff Area = 8.618 ac Runoff Volume = 0.495 af Average Runoff Depth = 0.69"
84.10% Pervious = 7.248 ac 15.90% Impervious = 1.370 ac

Summary for Subcatchment DA-1: AREAS TO WETLAND TO WEST

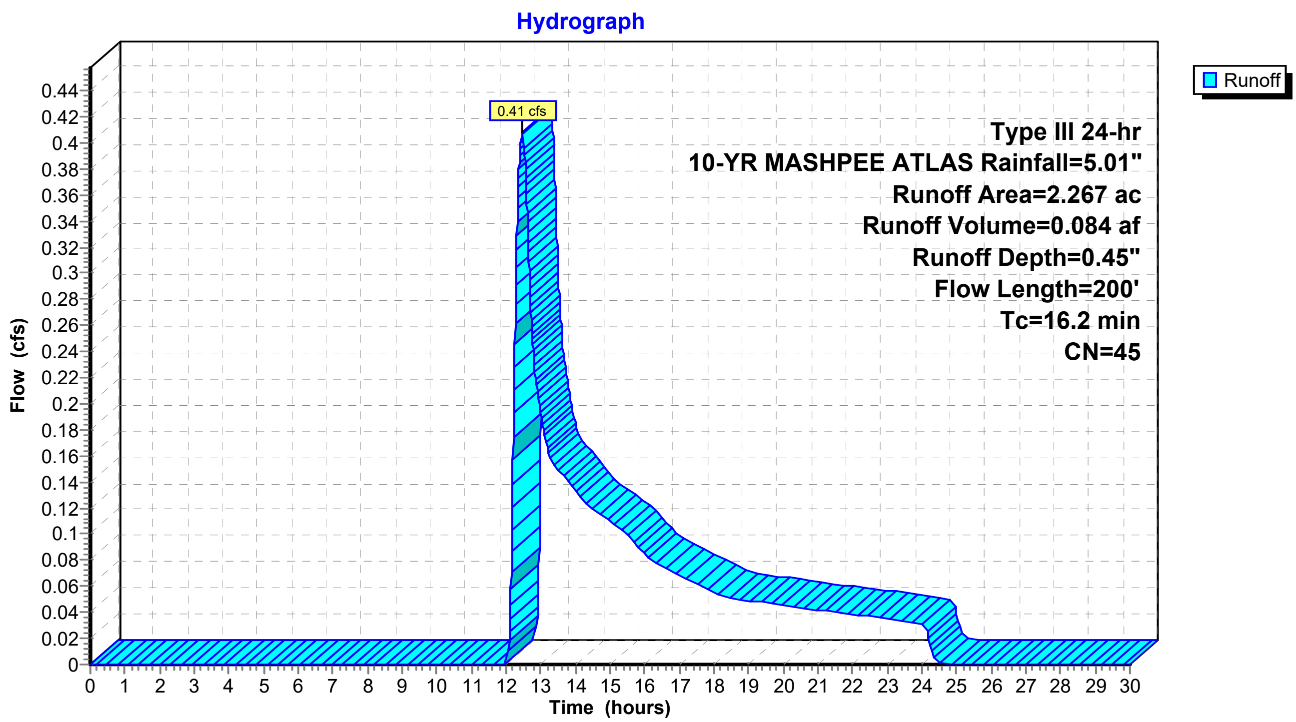
Runoff = 0.41 cfs @ 12.47 hrs, Volume= 0.084 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.986	30	Woods, Good, HSG A
0.045	76	Gravel roads, HSG A
0.082	98	Roofs, HSG A
1.064	55	Woods, Good, HSG B
2.267	45	Weighted Average
2.185		96.38% Pervious Area
0.082		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
7.9	150	0.0040	0.32		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
16.2	200	Total			

Subcatchment DA-1: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-44: North of Quin

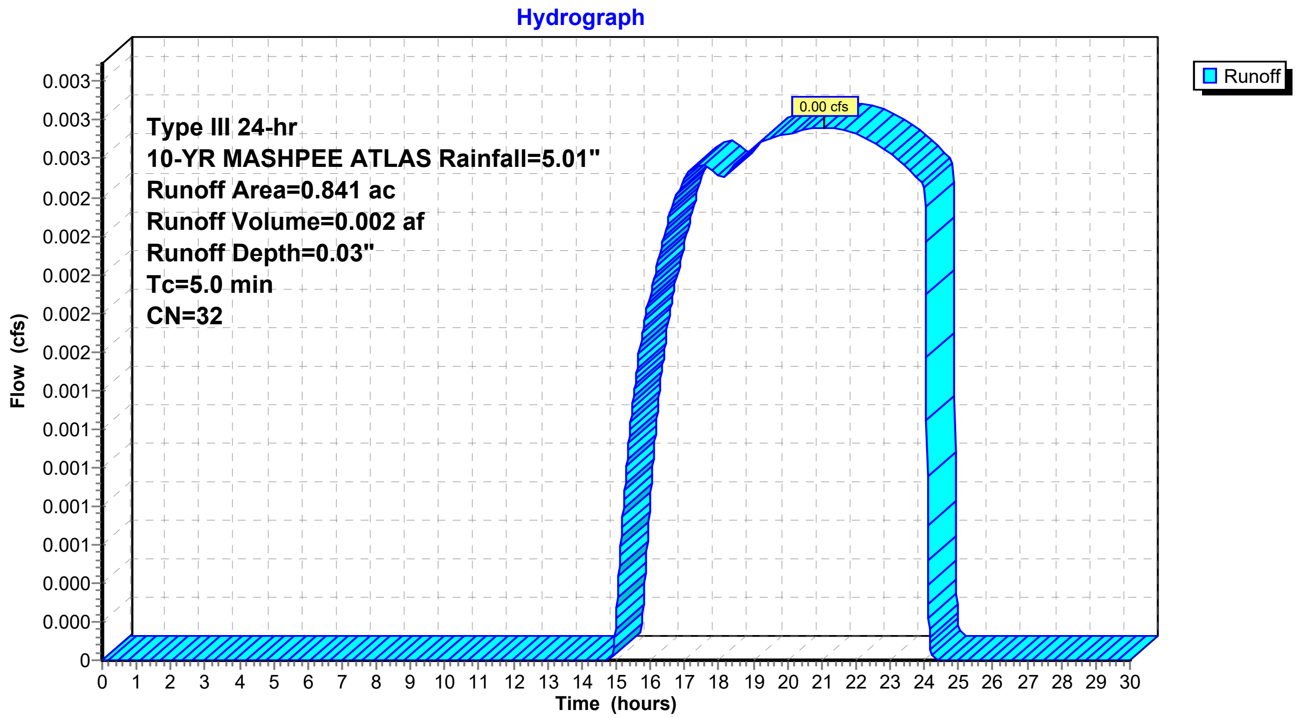
Runoff = 0.00 cfs @ 21.05 hrs, Volume= 0.002 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA-44: North of Quin



Summary for Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR

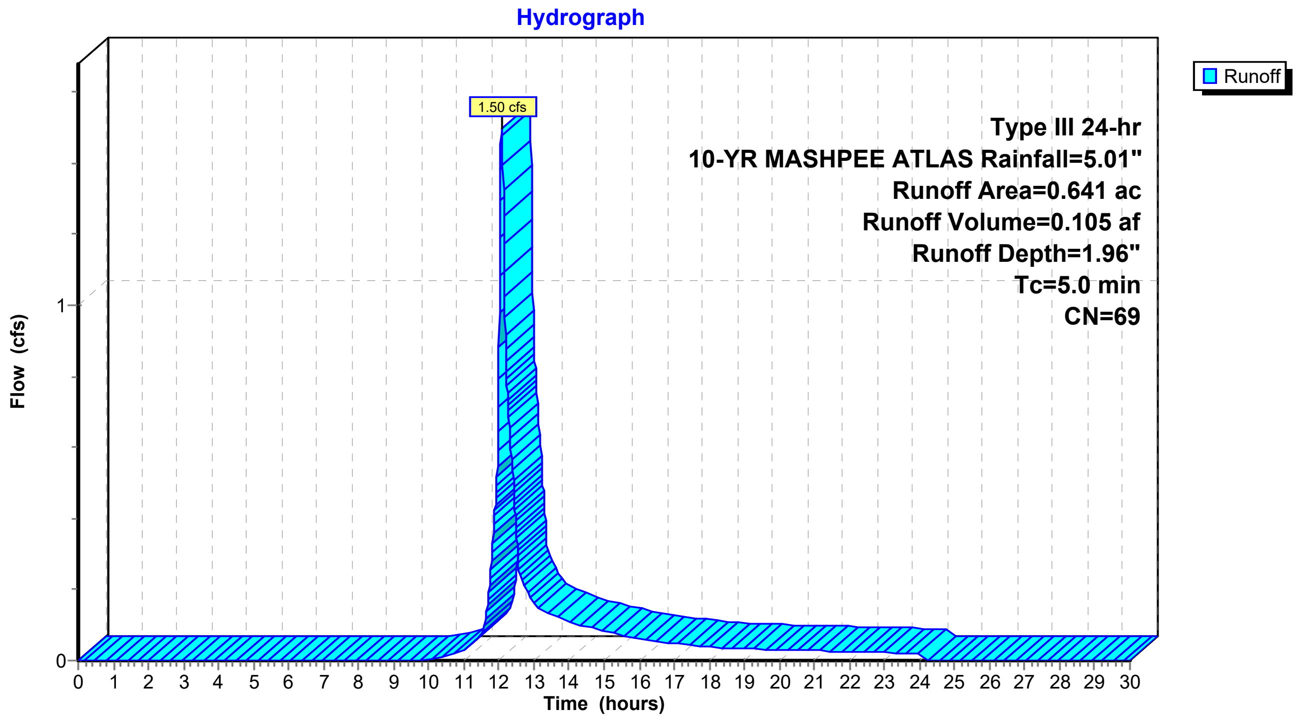
Runoff = 1.50 cfs @ 12.08 hrs, Volume= 0.105 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA-7: AREAS TO WET POND

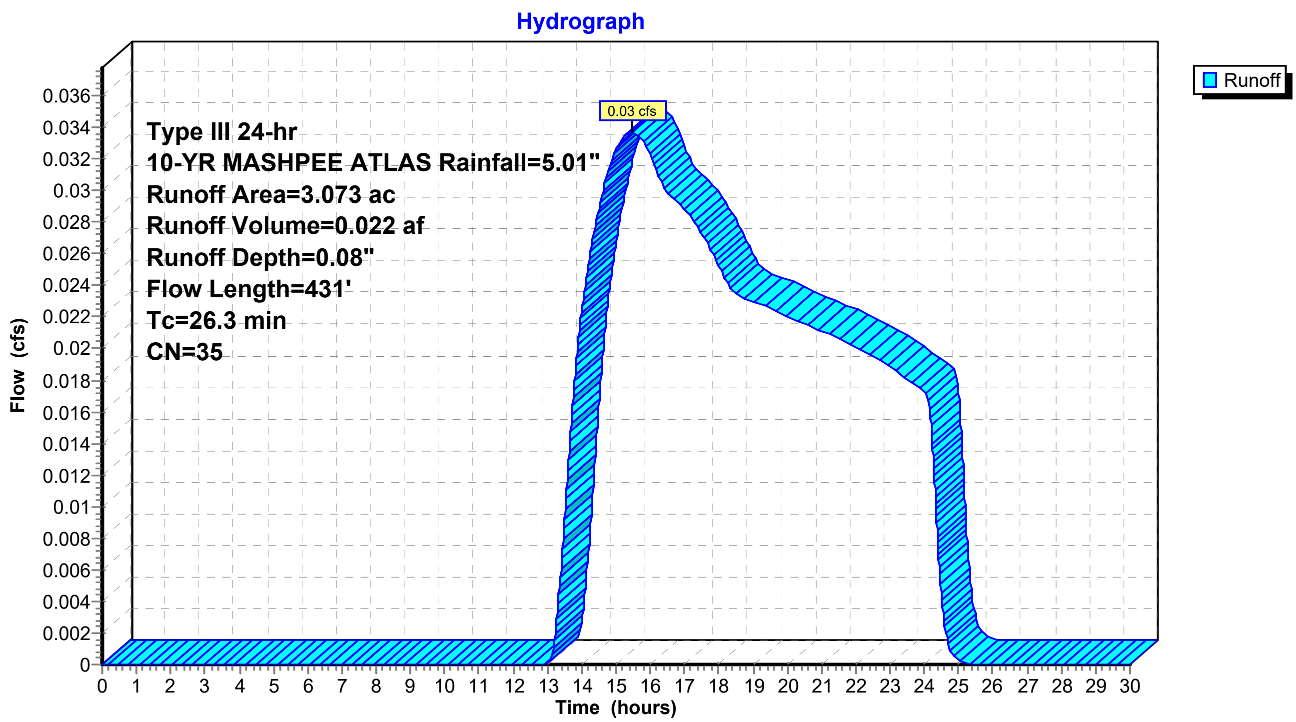
Runoff = 0.03 cfs @ 15.46 hrs, Volume= 0.022 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.450	39	>75% Grass cover, Good, HSG A
2.230	30	Woods, Good, HSG A
0.138	76	Gravel roads, HSG A
0.090	98	Roofs, HSG A
0.165	30	Woods, Good, HSG A
3.073	35	Weighted Average
2.983		97.07% Pervious Area
0.090		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, A** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA-7: AREAS TO WET POND



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

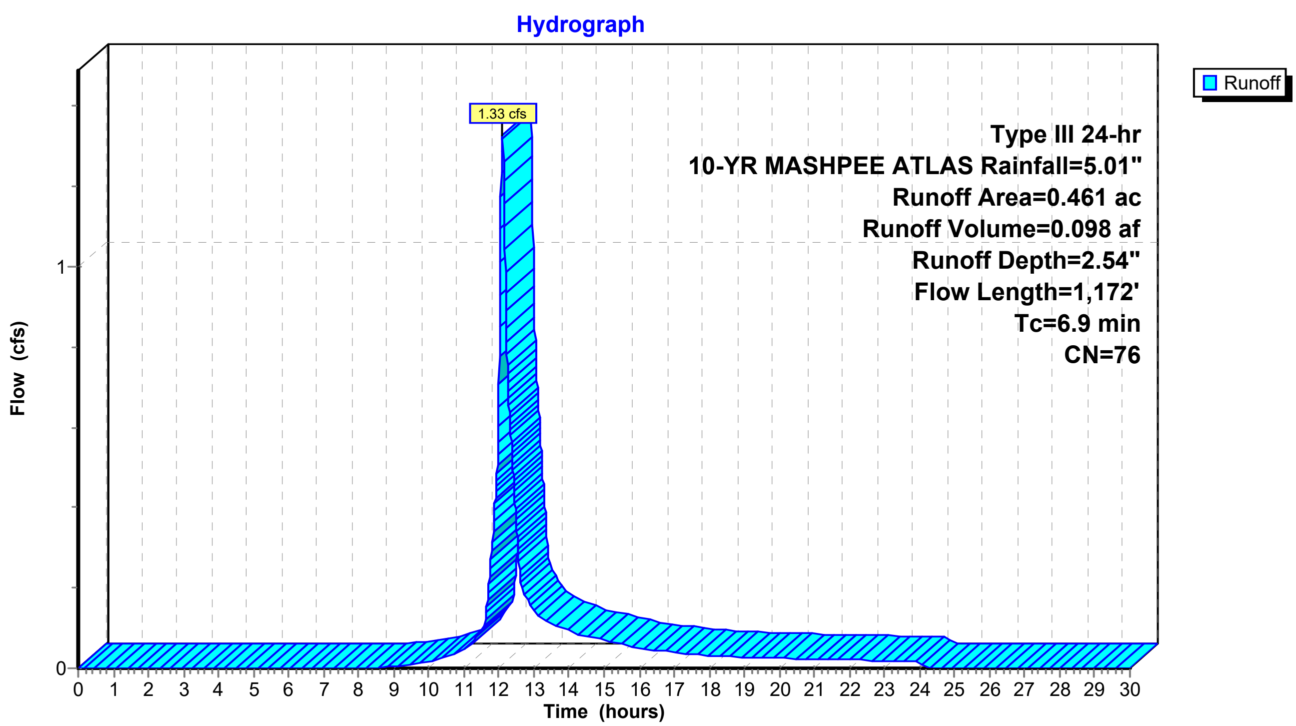
Runoff = 1.33 cfs @ 12.10 hrs, Volume= 0.098 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: Quin Ave West and North

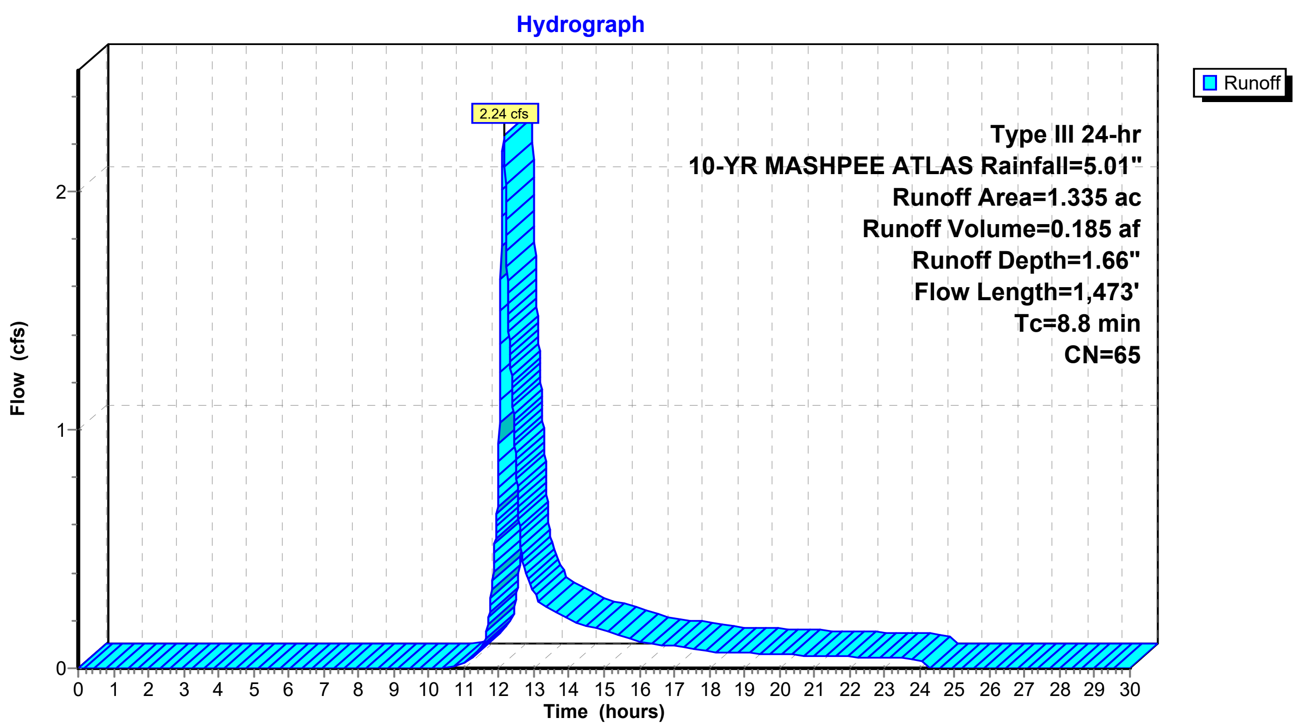
Runoff = 2.24 cfs @ 12.13 hrs, Volume= 0.185 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: Quin Ave West and North



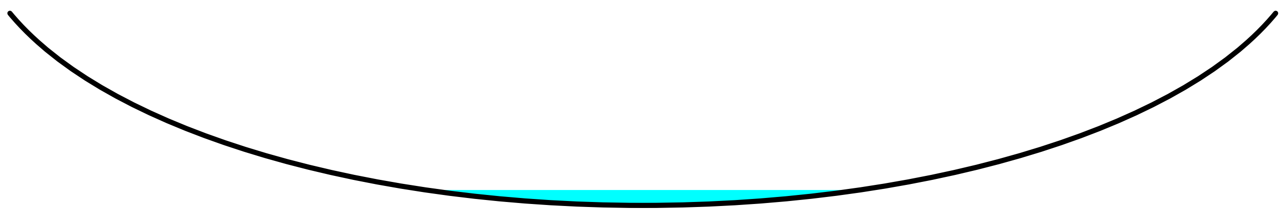
Summary for Reach R1: Tt along stream

Inflow Area = 2.267 ac, 3.62% Impervious, Inflow Depth = 0.45" for 10-YR MASHPEE ATLAS event
Inflow = 0.41 cfs @ 12.47 hrs, Volume= 0.084 af
Outflow = 0.30 cfs @ 12.68 hrs, Volume= 0.084 af, Atten= 28%, Lag= 12.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.49 fps, Min. Travel Time= 18.7 min
Avg. Velocity = 0.26 fps, Avg. Travel Time= 35.4 min

Peak Storage= 332 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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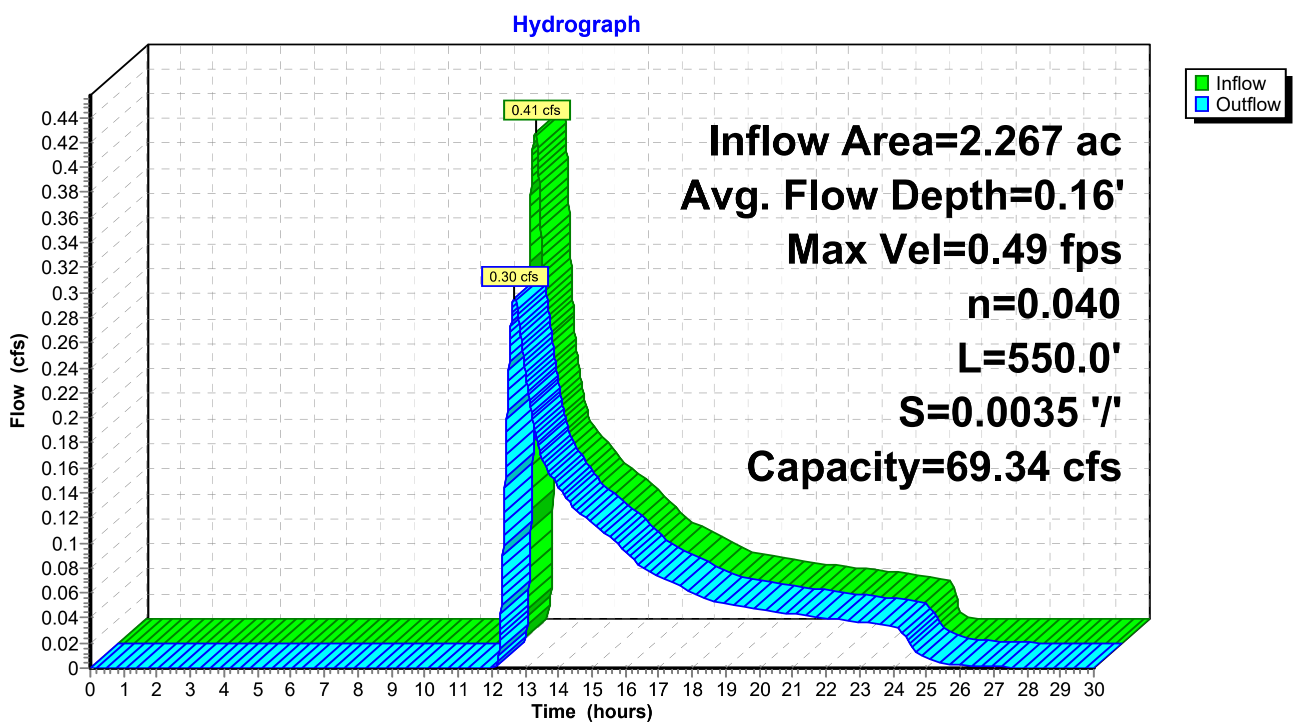
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth > 0.53" for 10-YR MASHPEE ATLAS event
Inflow = 0.35 cfs @ 14.73 hrs, Volume= 0.279 af
Outflow = 0.35 cfs @ 14.93 hrs, Volume= 0.277 af, Atten= 0%, Lag= 11.9 min

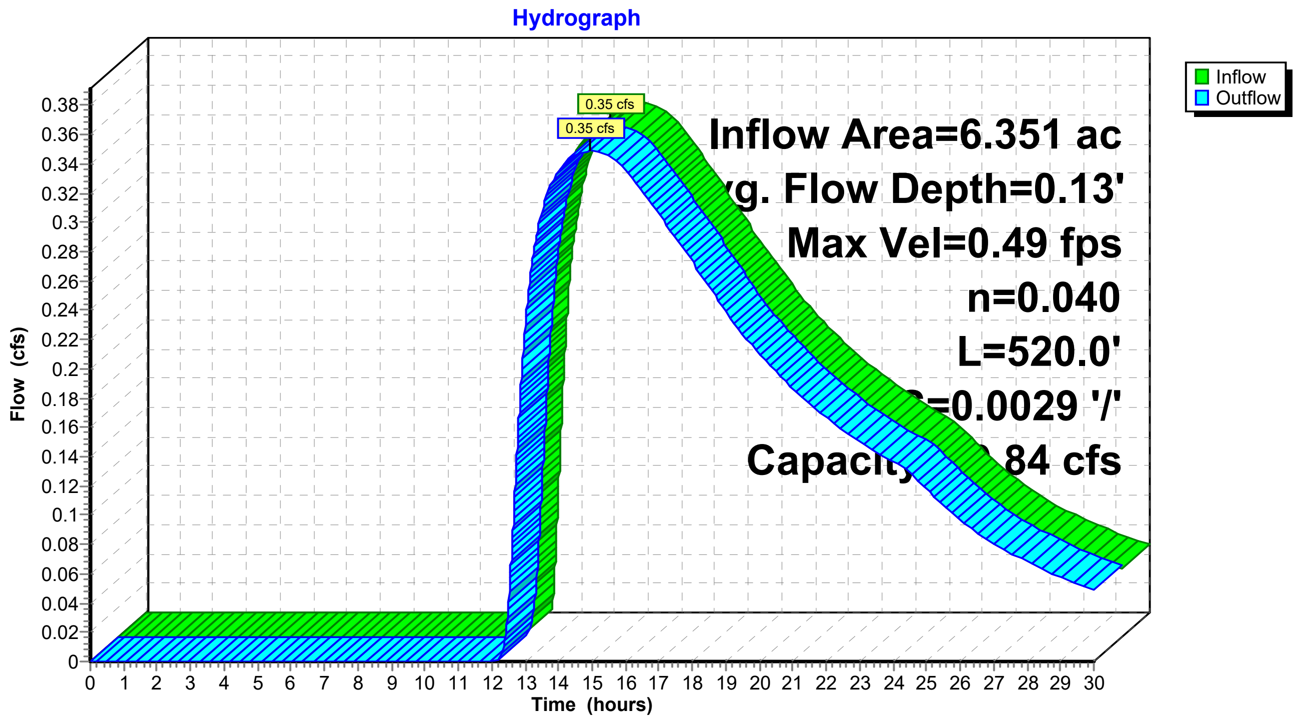
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.49 fps, Min. Travel Time= 17.6 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 23.2 min

Peak Storage= 369 cf @ 14.93 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

‡

Reach R1A: Tt thru bogs



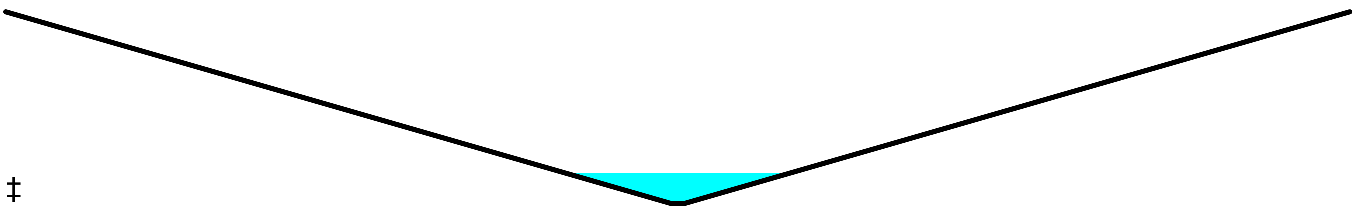
Summary for Reach R2: Tt thru da7

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 1.06" for 10-YR MASHPEE ATLAS event
Inflow = 3.57 cfs @ 12.12 hrs, Volume= 0.248 af
Outflow = 2.83 cfs @ 12.20 hrs, Volume= 0.248 af, Atten= 21%, Lag= 4.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.98 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 16.1 min

Peak Storage= 1,093 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 102.0 sf, Capacity= 330.00 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 100.0 '/' Top Width= 202.00'
Length= 380.0' Slope= 0.0074 '/'
Inlet Invert= 17.00', Outlet Invert= 14.20'



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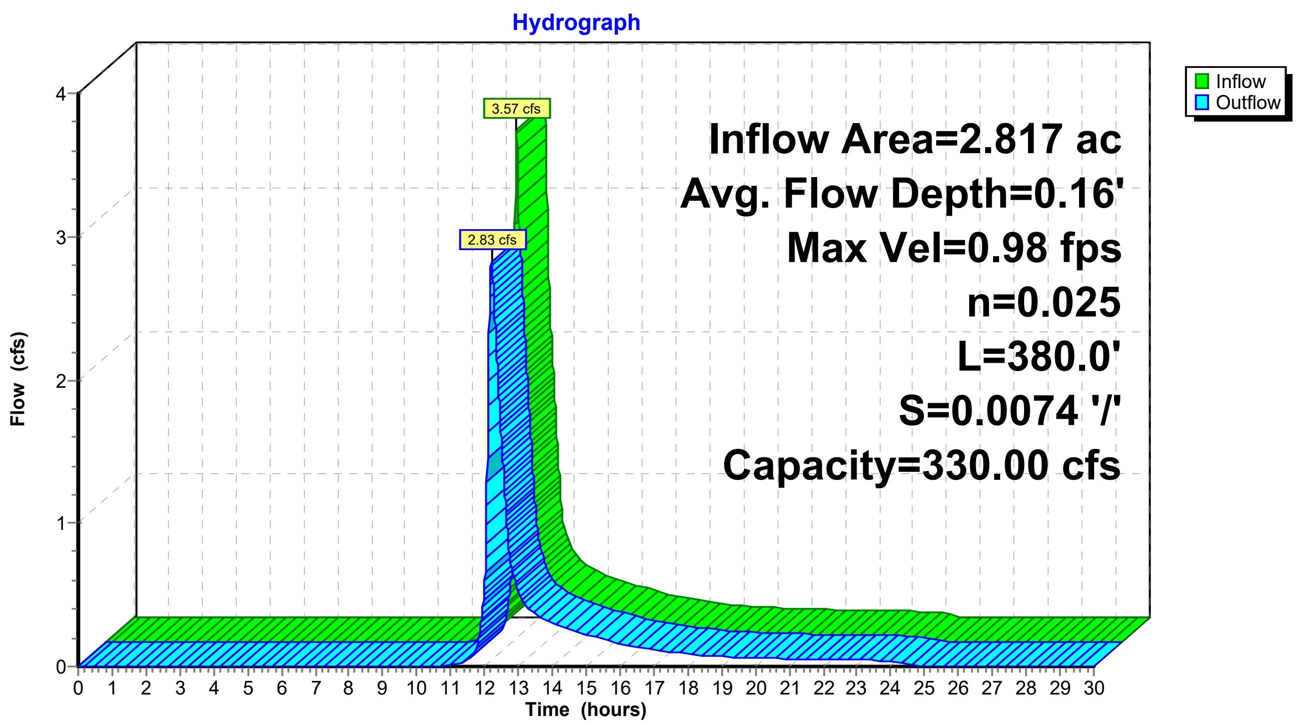
Reach R2: Tt thru da7



Summary for Reach R2A: Travel Time thru wet pond

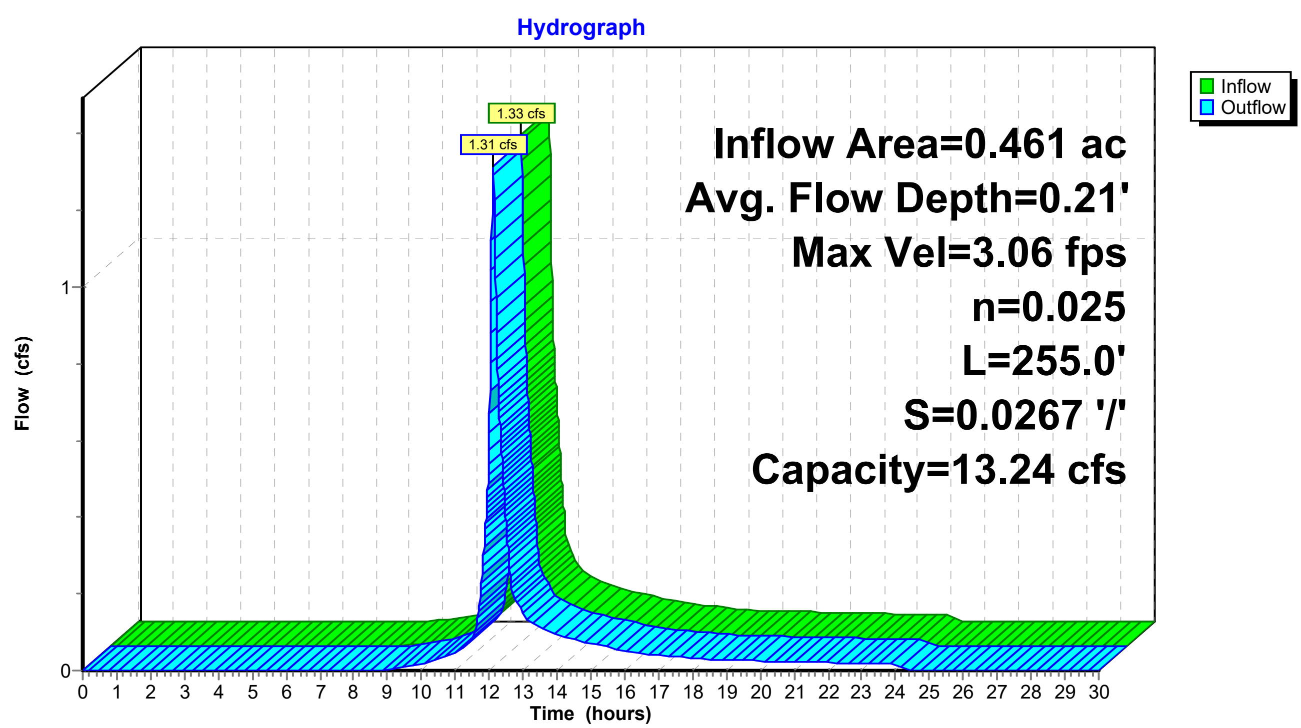
Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 2.54" for 10-YR MASHPEE ATLAS event
Inflow = 1.33 cfs @ 12.10 hrs, Volume= 0.098 af
Outflow = 1.31 cfs @ 12.12 hrs, Volume= 0.098 af, Atten= 2%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.06 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 5.0 min

Peak Storage= 109 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'

Reach R2A: Travel Time thru wet pond



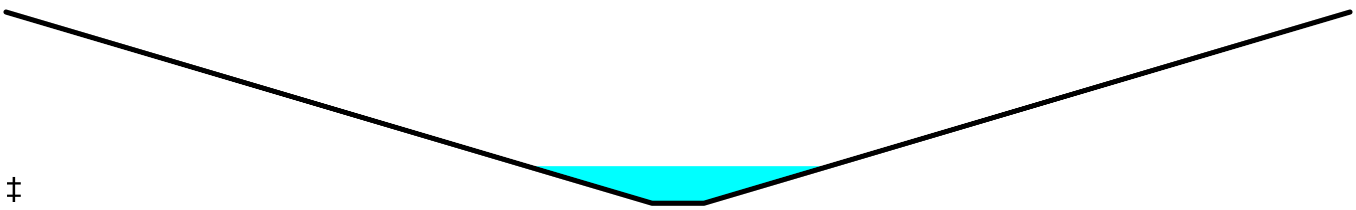
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.18" for 10-YR MASHPEE ATLAS event
Inflow = 1.44 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 1.36 cfs @ 12.11 hrs, Volume= 0.063 af, Atten= 6%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.04 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 5.4 min

Peak Storage= 164 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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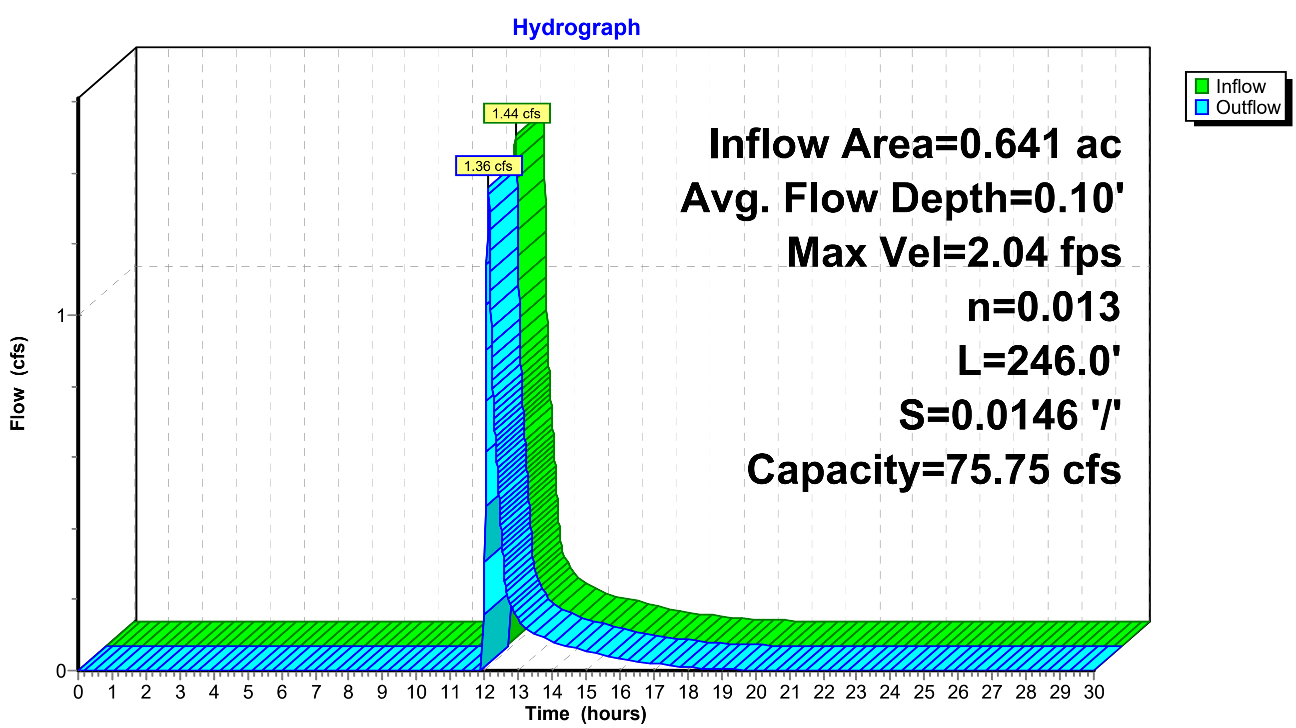
Reach R5: Tt thru da22B

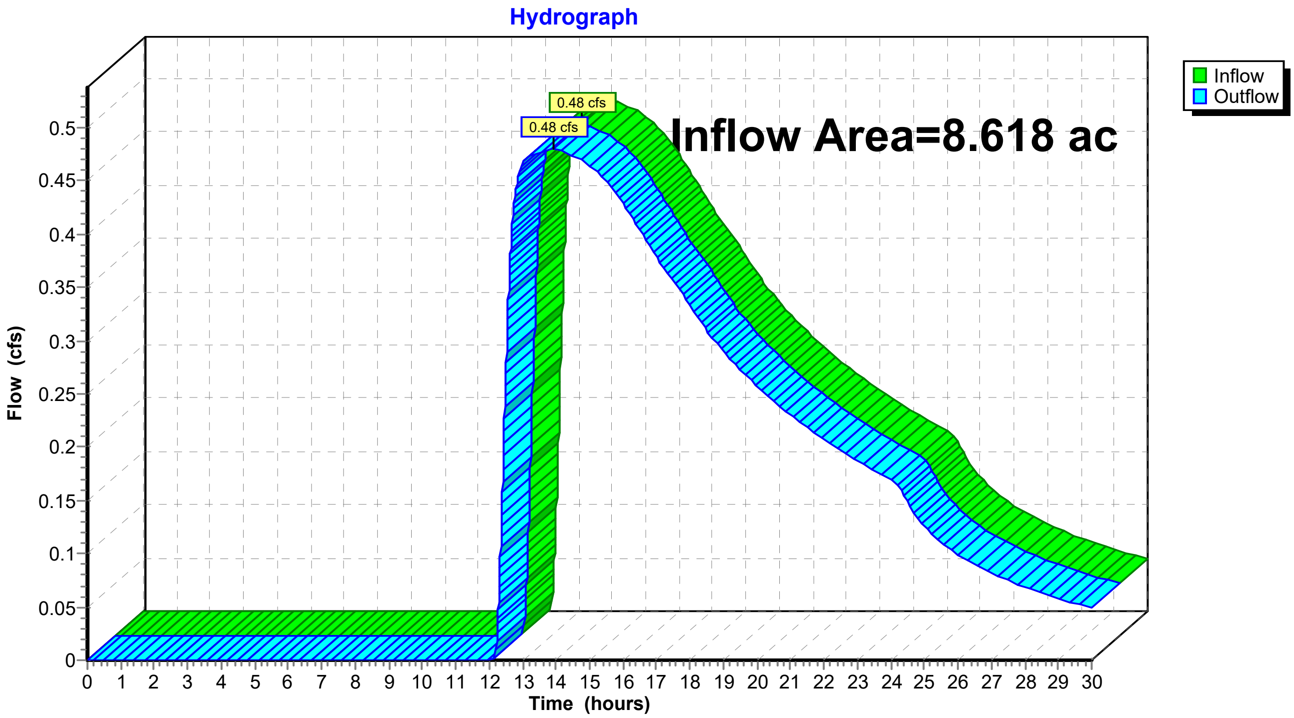


Summary for Reach SP#1: Study Point for Combined Flows

Inflow Area =	8.618 ac,	15.90% Impervious,	Inflow Depth > 0.50"	for 10-YR MASHPEE ATLAS event
Inflow =	0.48 cfs @	13.95 hrs, Volume=	0.361 af	
Outflow =	0.48 cfs @	13.95 hrs, Volume=	0.361 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach SP#1: Study Point for Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.96" for 10-YR MASHPEE ATLAS event
Inflow = 1.50 cfs @ 12.08 hrs, Volume= 0.105 af
Outflow = 1.47 cfs @ 12.09 hrs, Volume= 0.105 af, Atten= 2%, Lag= 0.4 min
Discarded = 0.03 cfs @ 11.22 hrs, Volume= 0.042 af
Primary = 1.44 cfs @ 12.09 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 20.70' @ 12.10 hrs Surf.Area= 748 sf Storage= 477 cf

Plug-Flow detention time= 76.3 min calculated for 0.105 af (100% of inflow)
Center-of-Mass det. time= 76.3 min (925.5 - 849.2)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder**x 2
			707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder**x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		794 cf	Total Available Storage

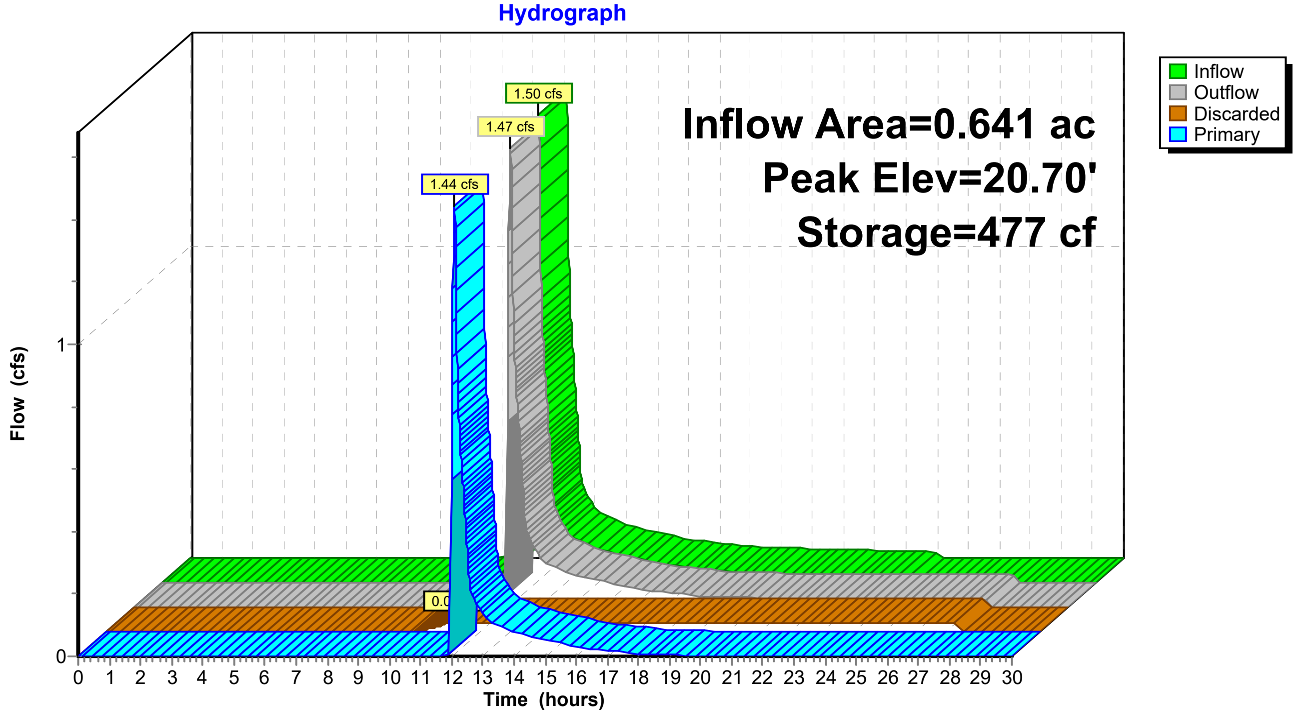
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'**
			Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir**
			Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 11.22 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.38 cfs @ 12.09 hrs HW=20.69' TW=20.67' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.38 cfs @ 0.63 fps)

Pond 1P: LB's


Hydrograph
1.50 cfs
1.47 cfs
1.44 cfs
0.0
Inflow Area=0.641 ac
Peak Elev=20.70'
Storage=477 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area = 0.841 ac, 0.00% Impervious, Inflow Depth = 0.03" for 10-YR MASHPEE ATLAS event
Inflow = 0.00 cfs @ 21.05 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 21.37 hrs, Volume= 0.002 af, Atten= 0%, Lag= 19.1 min
Discarded = 0.00 cfs @ 21.37 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 16.08' @ 21.37 hrs Surf.Area= 49 sf Storage= 2 cf

Plug-Flow detention time= 9.0 min calculated for 0.002 af (100% of inflow)
Center-of-Mass det. time= 9.0 min (1,200.9 - 1,191.9)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

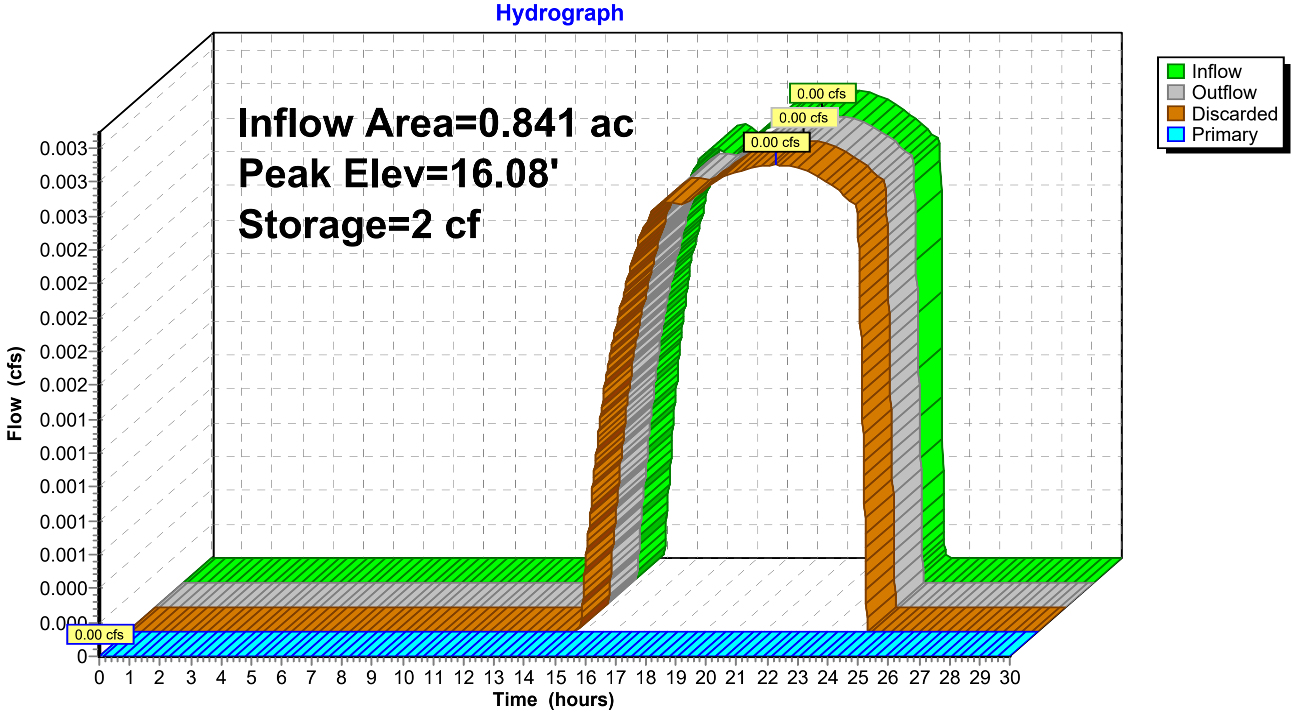
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	6,669	3,704	4,070
18.10	7,000	683	4,754

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.72'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 in 24.0" x 24.0" Grate Limited to weir flow at low heads
#3	Primary	18.00'	**25.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.00 cfs @ 21.37 hrs HW=16.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3P: Wet Pond

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth = 0.69" for 10-YR MASHPEE ATLAS event
Inflow = 3.87 cfs @ 12.17 hrs, Volume= 0.367 af
Outflow = 0.35 cfs @ 14.73 hrs, Volume= 0.279 af, Atten= 91%, Lag= 153.3 min
Primary = 0.35 cfs @ 14.73 hrs, Volume= 0.279 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.58' @ 14.73 hrs Surf.Area= 22,841 sf Storage= 8,391 cf

Plug-Flow detention time= 344.9 min calculated for 0.279 af (76% of inflow)
Center-of-Mass det. time= 254.3 min (1,119.0 - 864.7)

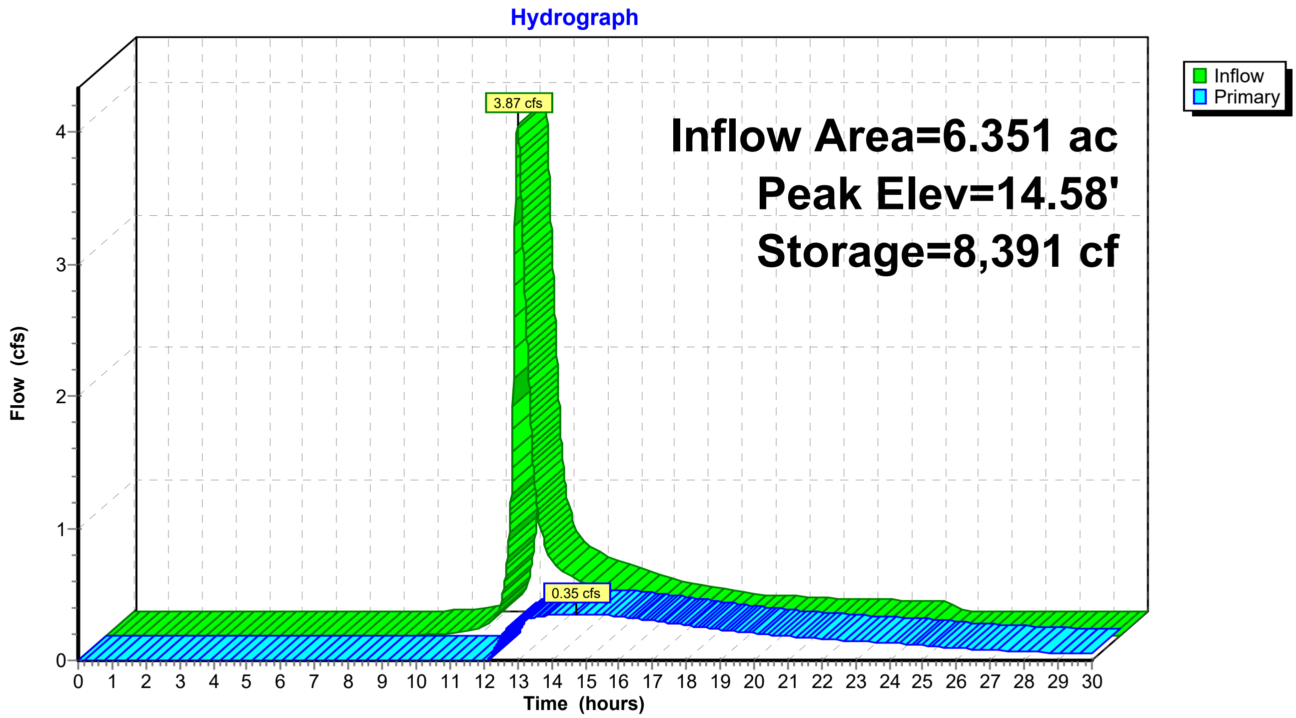
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	63,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,877	1,393	1,394
15.00	32,693	18,628	20,022
16.00	53,790	43,242	63,264

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**18.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Primary	15.00'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.35 cfs @ 14.73 hrs HW=14.58' TW=14.33' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.35 cfs @ 1.49 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-1: AREAS TO WETLAND Runoff Area=2.267 ac 3.62% Impervious Runoff Depth=0.79"
Flow Length=200' Tc=16.2 min CN=45 Runoff=0.96 cfs 0.150 af

SubcatchmentDA-44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.13"
Tc=5.0 min CN=32 Runoff=0.01 cfs 0.009 af

SubcatchmentDA-55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=2.70"
Tc=5.0 min CN=69 Runoff=2.09 cfs 0.144 af

SubcatchmentDA-7: AREAS TO WET POND Runoff Area=3.073 ac 2.93% Impervious Runoff Depth=0.25"
Flow Length=431' Tc=26.3 min CN=35 Runoff=0.11 cfs 0.063 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=3.36"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=1.76 cfs 0.129 af

SubcatchmentDA22B: Quin Ave West and Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=2.34"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=3.24 cfs 0.260 af

Reach R1: Tt along stream Avg. Flow Depth=0.25' Max Vel=0.66 fps Inflow=0.96 cfs 0.150 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.77 cfs 0.150 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.19' Max Vel=0.61 fps Inflow=0.64 cfs 0.457 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.64 cfs 0.454 af

Reach R2: Tt thru da7 Avg. Flow Depth=0.19' Max Vel=1.09 fps Inflow=5.14 cfs 0.359 af
n=0.025 L=380.0' S=0.0074 '/' Capacity=330.00 cfs Outflow=4.28 cfs 0.359 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.25' Max Vel=3.37 fps Inflow=1.76 cfs 0.129 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=1.74 cfs 0.129 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.11' Max Vel=2.23 fps Inflow=2.03 cfs 0.099 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=1.95 cfs 0.099 af

Reach SP#1: Study Point for Combined Flows Inflow=1.07 cfs 0.604 af
Outflow=1.07 cfs 0.604 af

Pond 1P: LB's Peak Elev=20.72' Storage=489 cf Inflow=2.09 cfs 0.144 af
Discarded=0.03 cfs 0.045 af Primary=2.03 cfs 0.099 af Outflow=2.06 cfs 0.144 af

Pond 2P: Natural Low Area Peak Elev=16.32' Storage=35 cf Inflow=0.01 cfs 0.009 af
Discarded=0.01 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.009 af

Pond 3P: Wet Pond Peak Elev=14.71' Storage=11,519 cf Inflow=5.74 cfs 0.551 af
Outflow=0.64 cfs 0.457 af

Total Runoff Area = 8.618 ac Runoff Volume = 0.755 af Average Runoff Depth = 1.05"
84.10% Pervious = 7.248 ac 15.90% Impervious = 1.370 ac

Summary for Subcatchment DA-1: AREAS TO WETLAND TO WEST

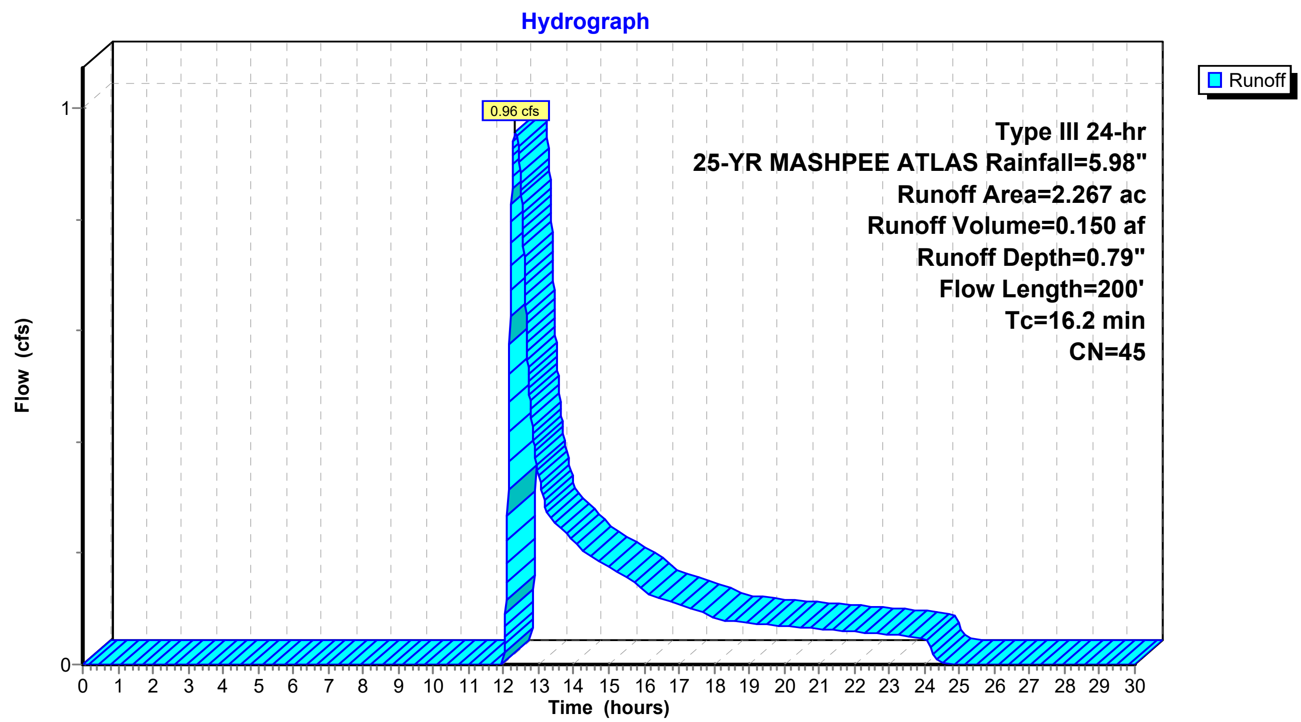
Runoff = 0.96 cfs @ 12.33 hrs, Volume= 0.150 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.986	30	Woods, Good, HSG A
0.045	76	Gravel roads, HSG A
0.082	98	Roofs, HSG A
1.064	55	Woods, Good, HSG B
2.267	45	Weighted Average
2.185		96.38% Pervious Area
0.082		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
7.9	150	0.0040	0.32		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
16.2	200	Total			

Subcatchment DA-1: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-44: North of Quin

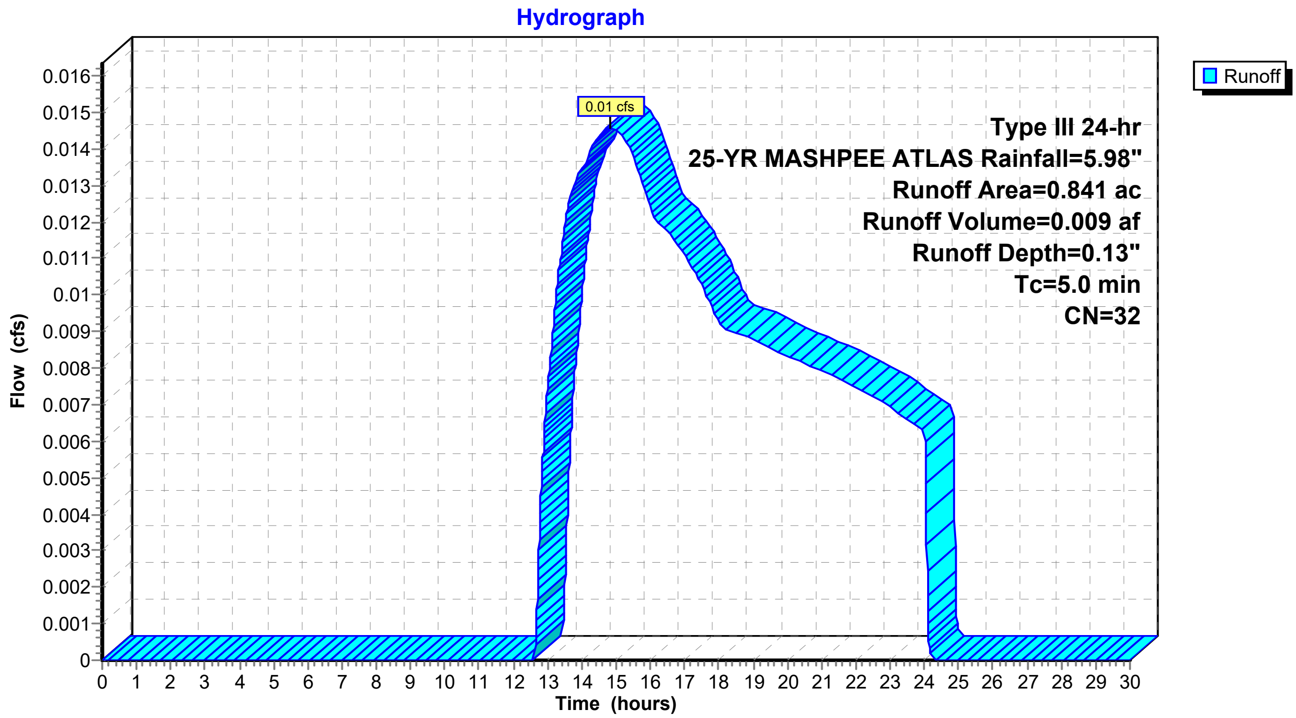
Runoff = 0.01 cfs @ 14.84 hrs, Volume= 0.009 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA-44: North of Quin



Summary for Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR

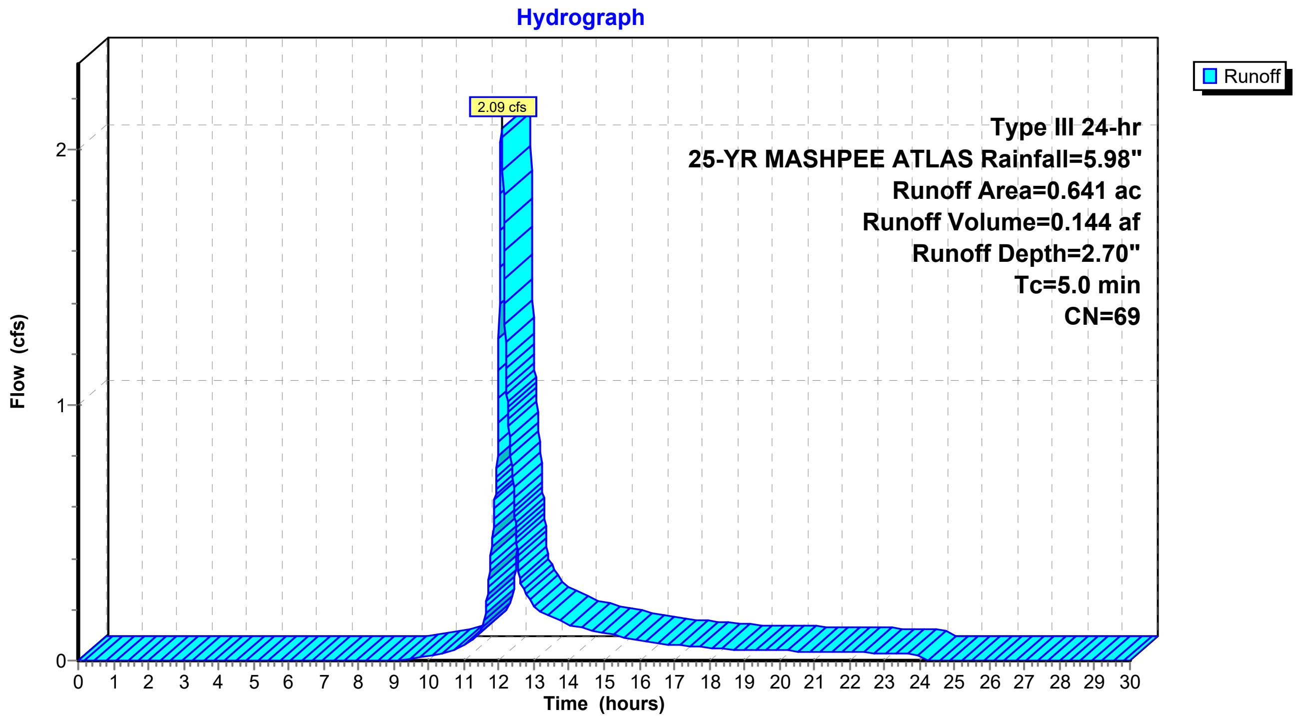
Runoff = 2.09 cfs @ 12.08 hrs, Volume= 0.144 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA-7: AREAS TO WET POND

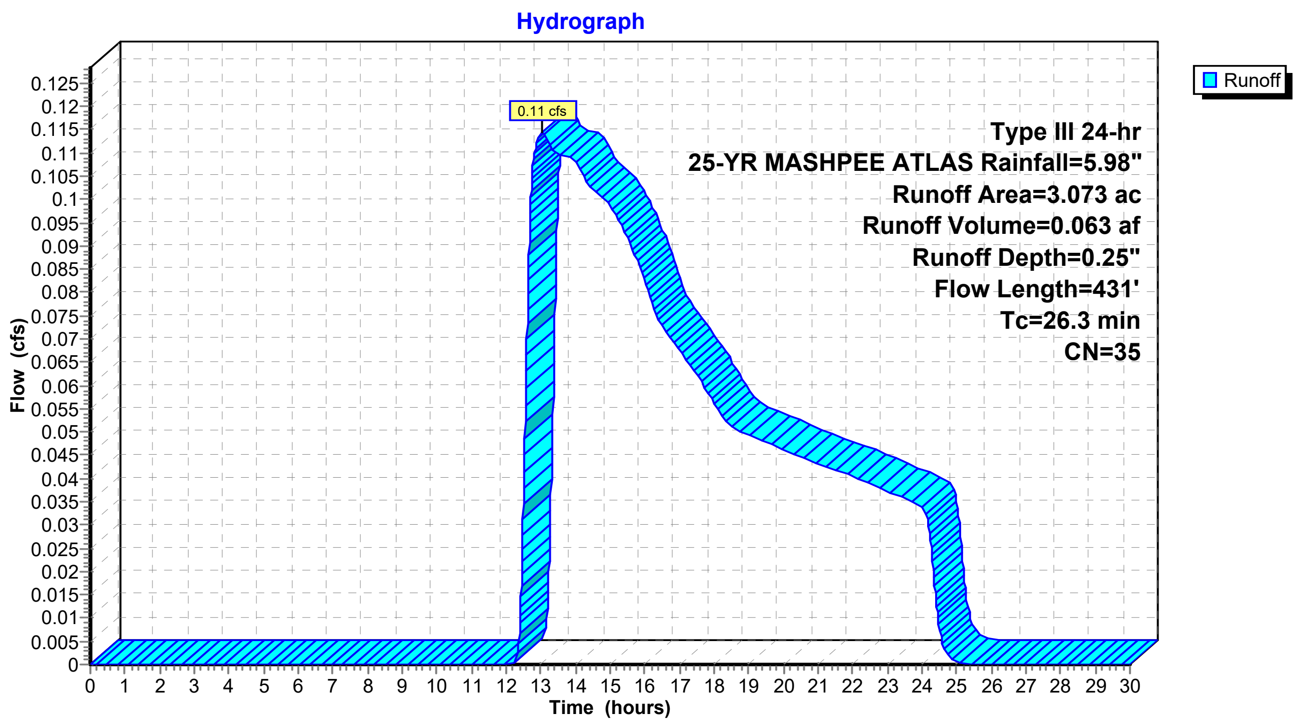
Runoff = 0.11 cfs @ 13.06 hrs, Volume= 0.063 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.450	39	>75% Grass cover, Good, HSG A
2.230	30	Woods, Good, HSG A
0.138	76	Gravel roads, HSG A
0.090	98	Roofs, HSG A
0.165	30	Woods, Good, HSG A
3.073	35	Weighted Average
2.983		97.07% Pervious Area
0.090		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, A** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA-7: AREAS TO WET POND



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

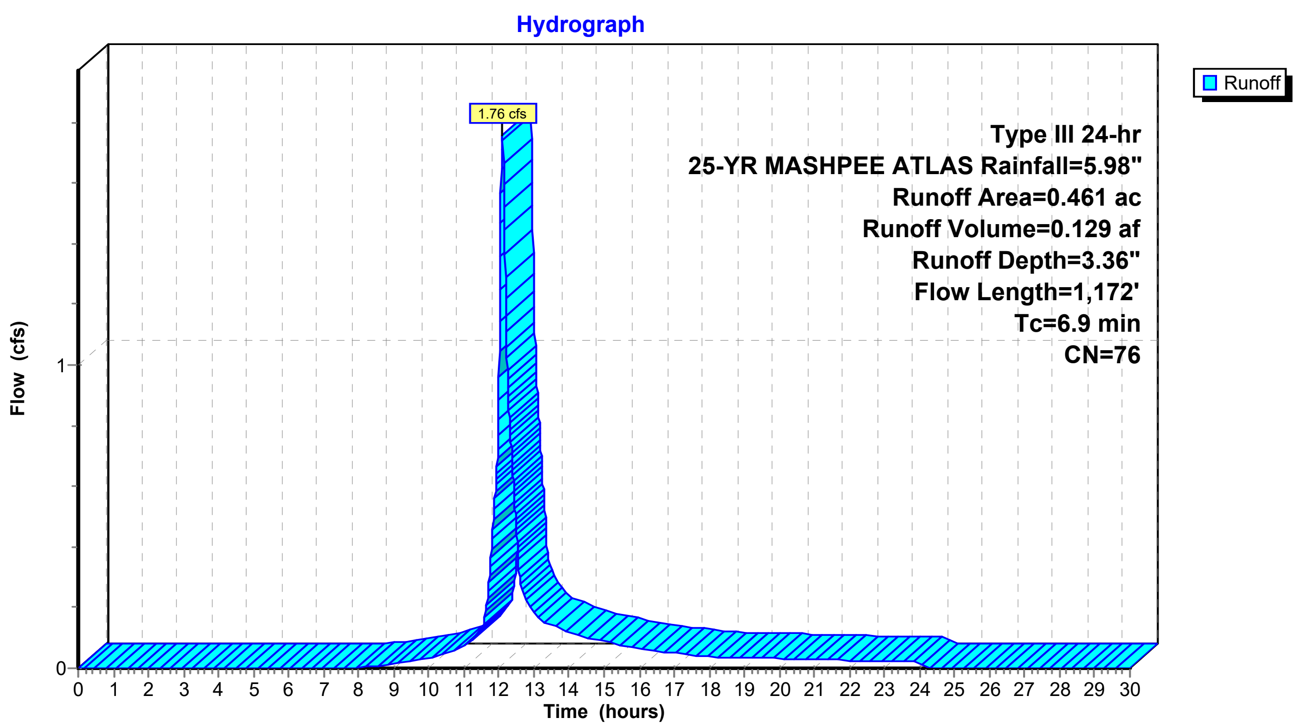
Runoff = 1.76 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: Quin Ave West and North

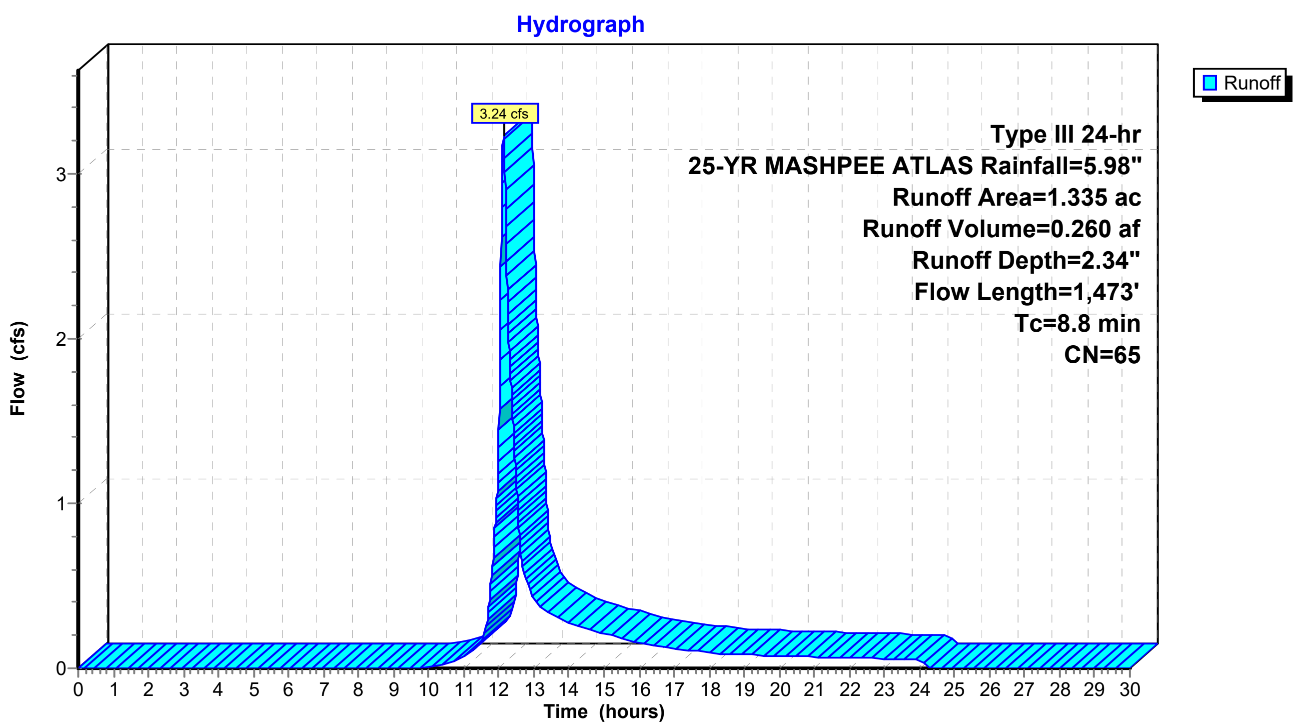
Runoff = 3.24 cfs @ 12.13 hrs, Volume= 0.260 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: Quin Ave West and North



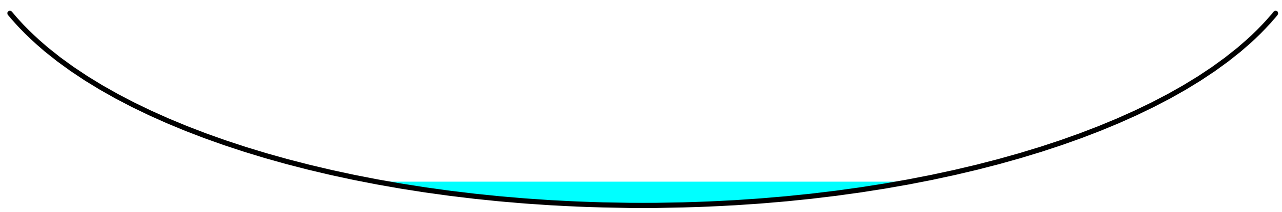
Summary for Reach R1: Tt along stream

Inflow Area = 2.267 ac, 3.62% Impervious, Inflow Depth = 0.79" for 25-YR MASHPEE ATLAS event
Inflow = 0.96 cfs @ 12.33 hrs, Volume= 0.150 af
Outflow = 0.77 cfs @ 12.56 hrs, Volume= 0.150 af, Atten= 20%, Lag= 13.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.66 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 31.0 min

Peak Storage= 642 cf @ 12.56 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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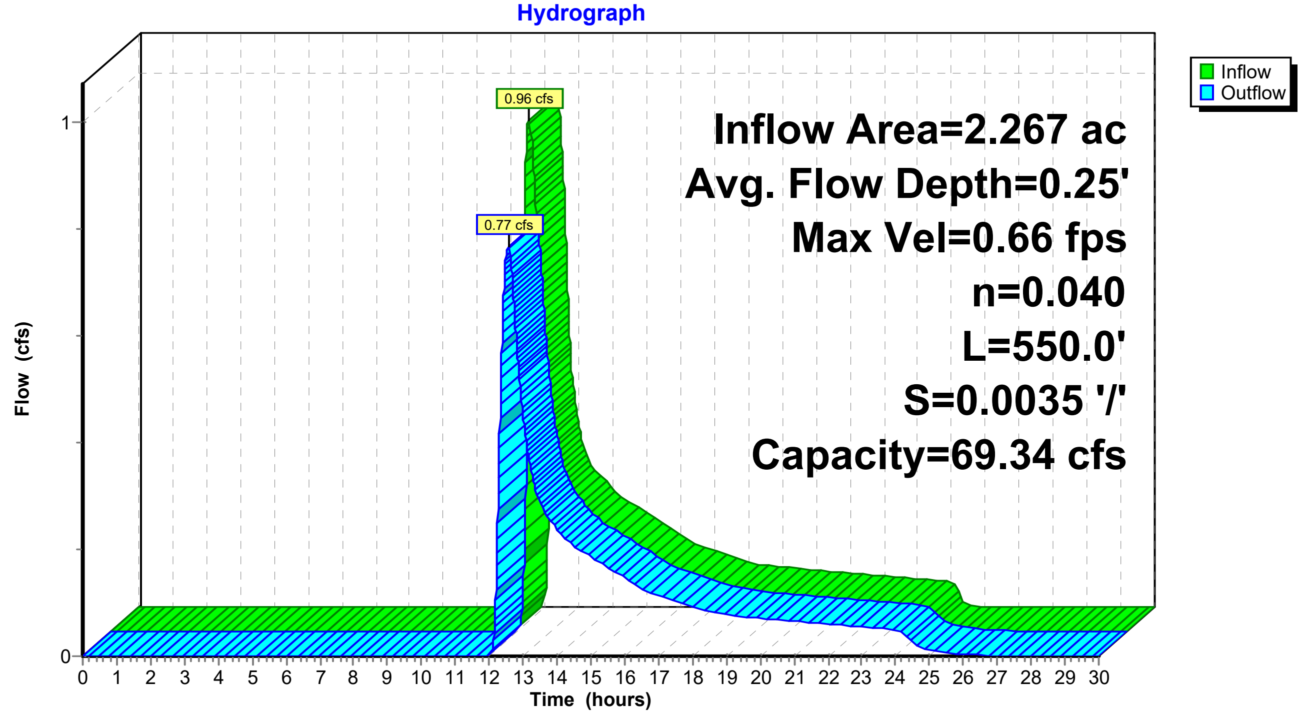
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth > 0.86" for 25-YR MASHPEE ATLAS event
Inflow = 0.64 cfs @ 13.99 hrs, Volume= 0.457 af
Outflow = 0.64 cfs @ 14.15 hrs, Volume= 0.454 af, Atten= 0%, Lag= 9.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.61 fps, Min. Travel Time= 14.2 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 19.6 min

Peak Storage= 544 cf @ 14.15 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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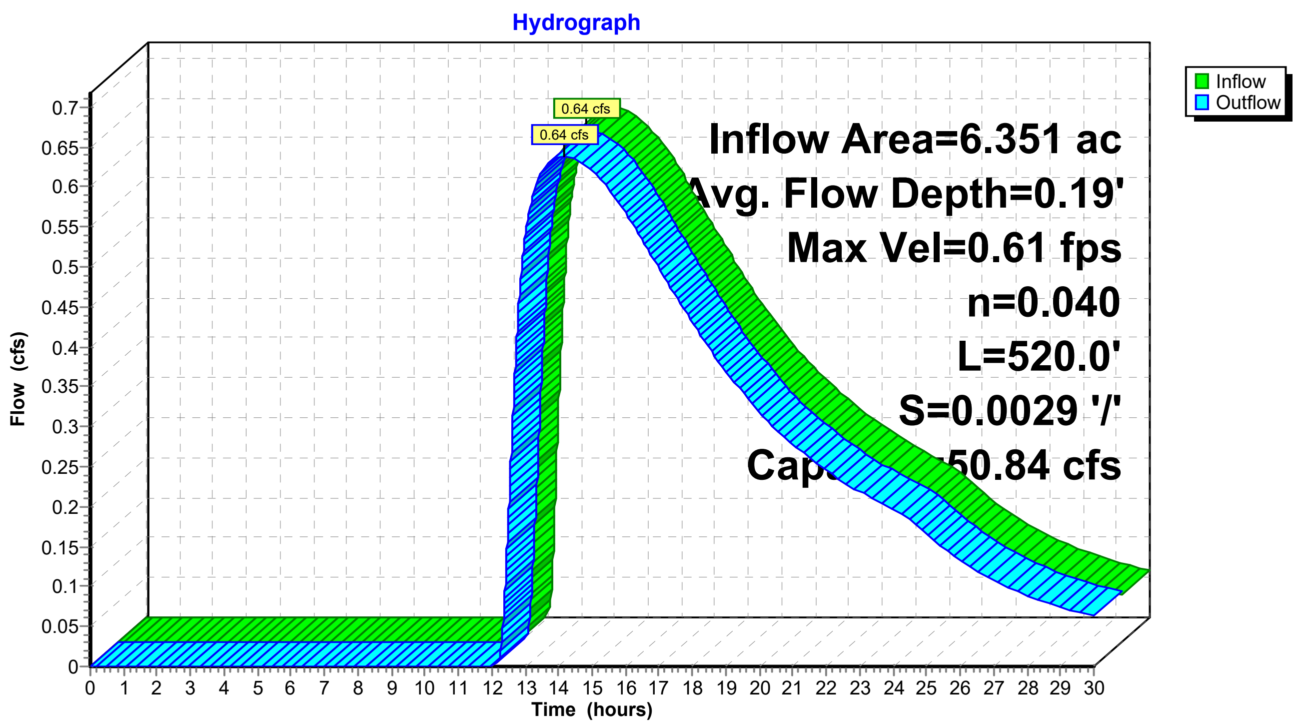
Reach R1A: Tt thru bogs



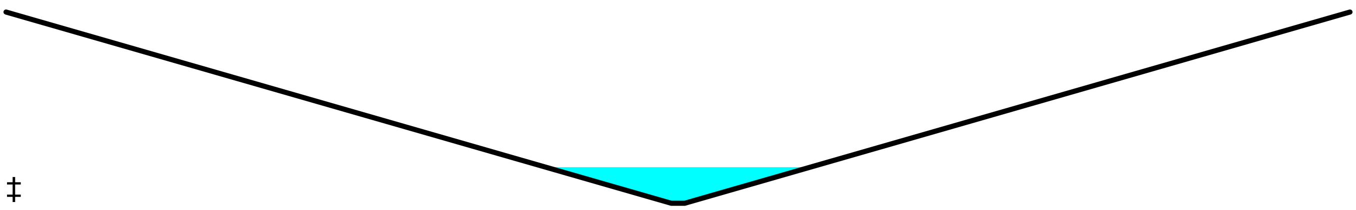
Summary for Reach R2: Tt thru da7

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 1.53" for 25-YR MASHPEE ATLAS event
Inflow = 5.14 cfs @ 12.12 hrs, Volume= 0.359 af
Outflow = 4.28 cfs @ 12.18 hrs, Volume= 0.359 af, Atten= 17%, Lag= 3.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.09 fps, Min. Travel Time= 5.8 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 15.0 min

Peak Storage= 1,490 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.00' Flow Area= 102.0 sf, Capacity= 330.00 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 100.0 '/' Top Width= 202.00'
Length= 380.0' Slope= 0.0074 '/'
Inlet Invert= 17.00', Outlet Invert= 14.20'



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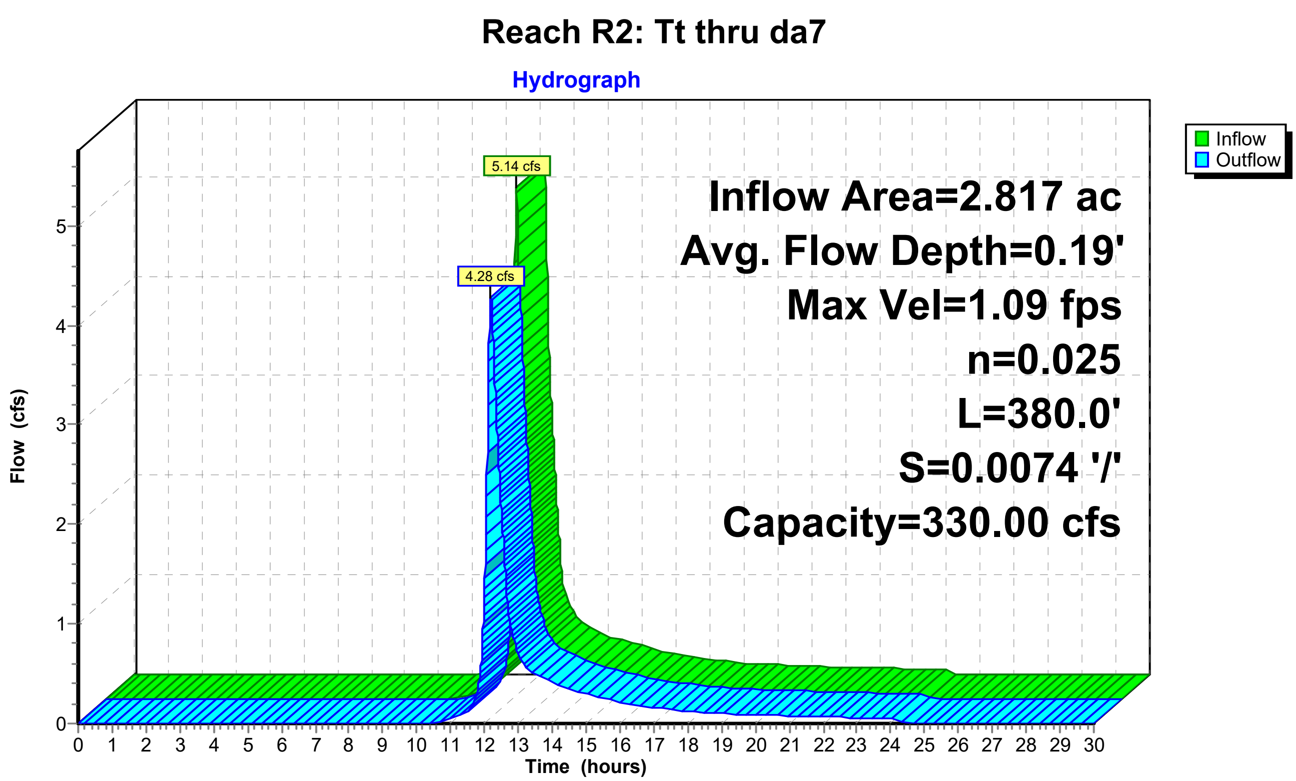


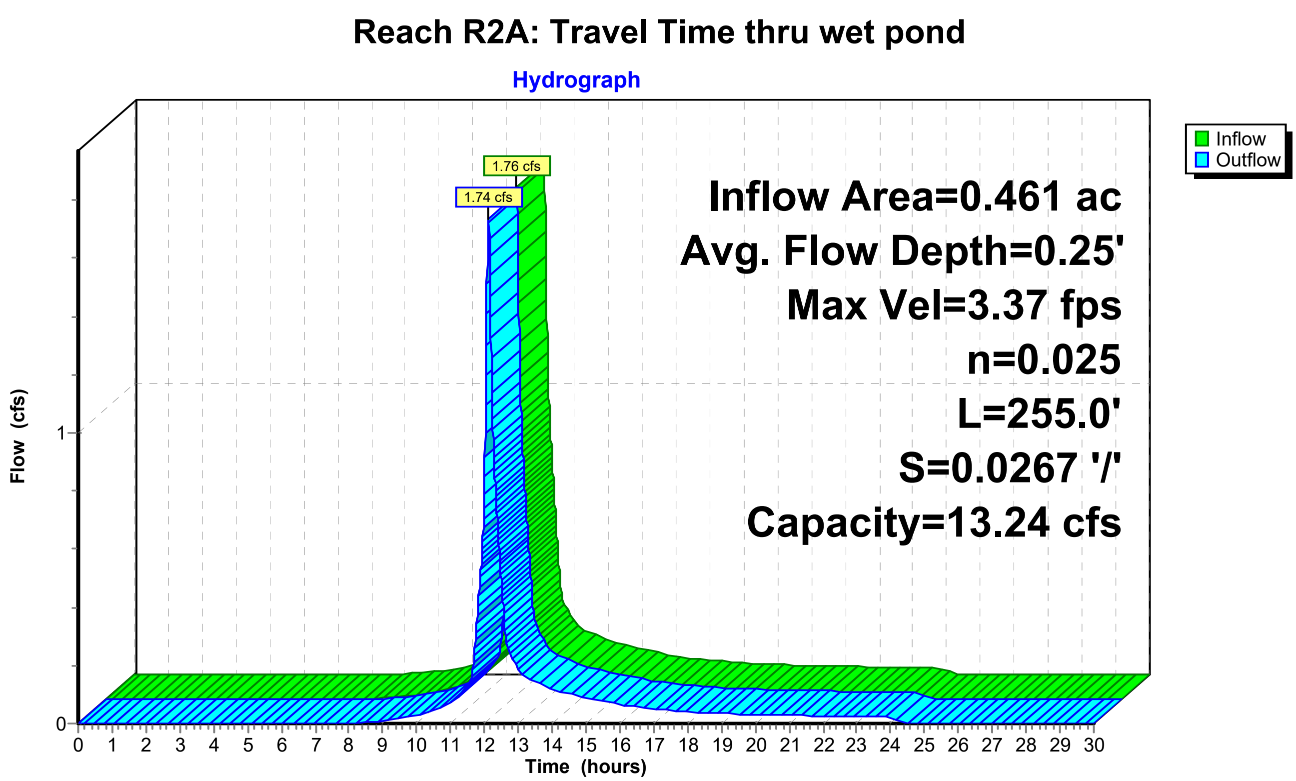
Summary for Reach R2A: Travel Time thru wet pond

Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 3.36" for 25-YR MASHPEE ATLAS event
Inflow = 1.76 cfs @ 12.10 hrs, Volume= 0.129 af
Outflow = 1.74 cfs @ 12.11 hrs, Volume= 0.129 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.37 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 4.6 min

Peak Storage= 131 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'



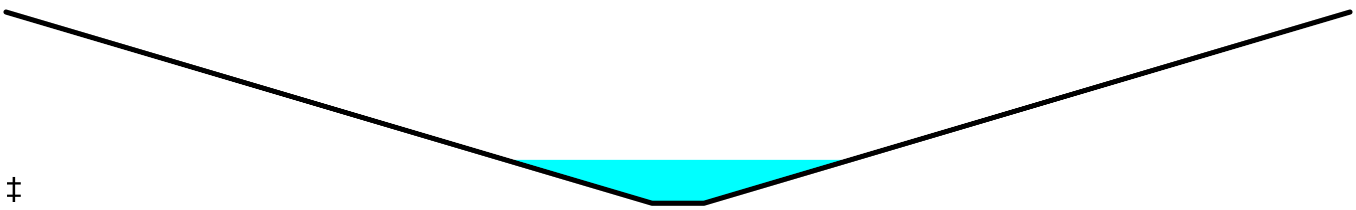
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.86" for 25-YR MASHPEE ATLAS event
Inflow = 2.03 cfs @ 12.08 hrs, Volume= 0.099 af
Outflow = 1.95 cfs @ 12.11 hrs, Volume= 0.099 af, Atten= 4%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 5.3 min

Peak Storage= 214 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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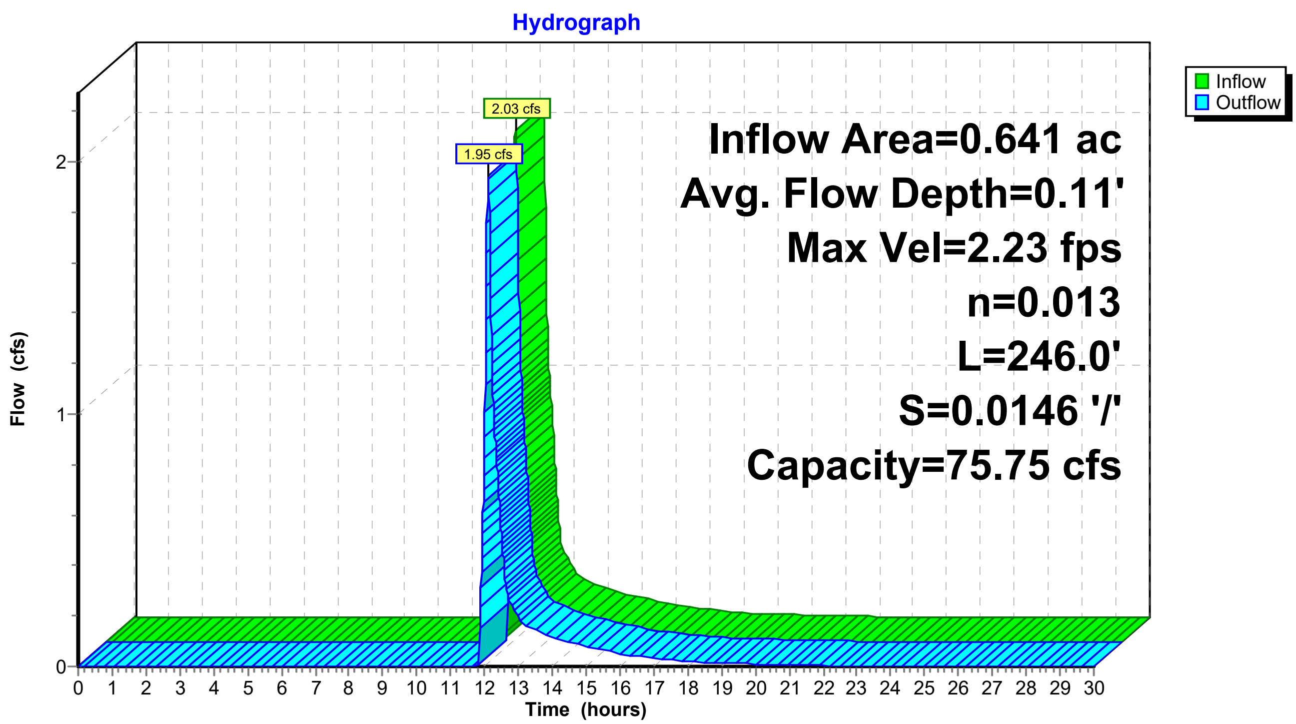
Reach R5: Tt thru da22B

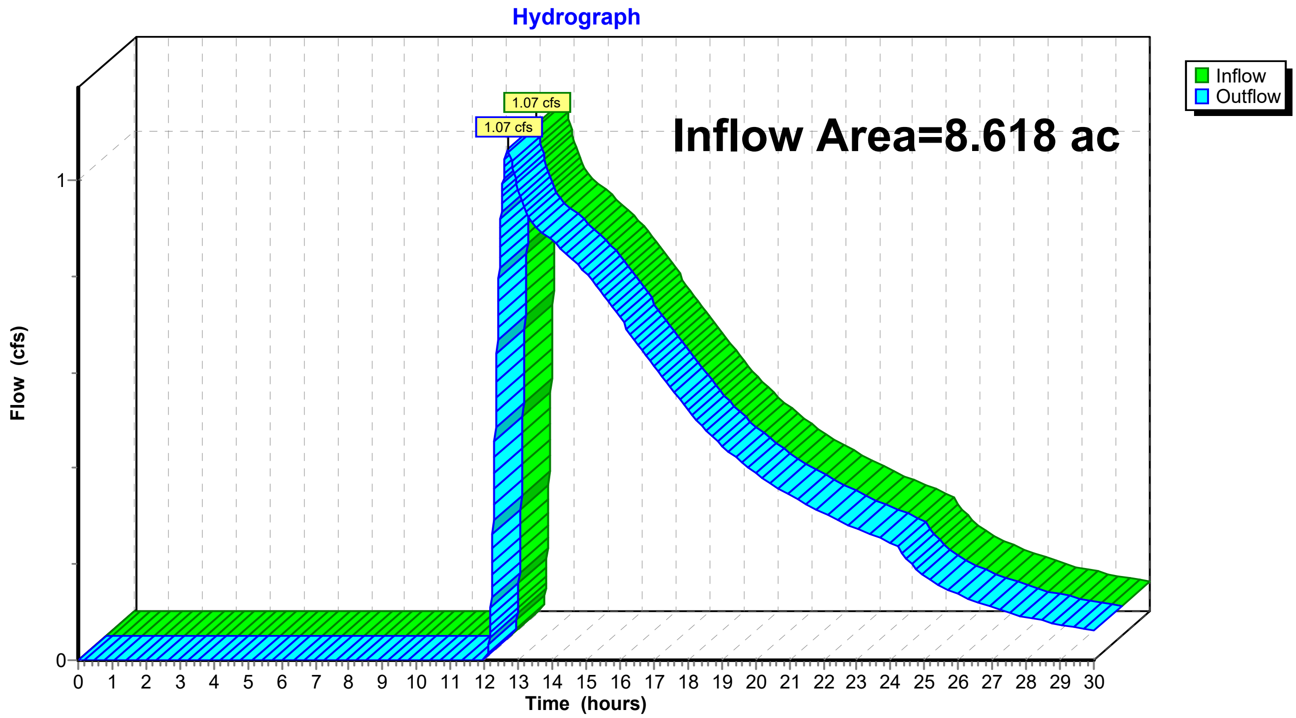


Summary for Reach SP#1: Study Point for Combined Flows

Inflow Area = 8.618 ac, 15.90% Impervious, Inflow Depth > 0.84" for 25-YR MASHPEE ATLAS event
Inflow = 1.07 cfs @ 12.67 hrs, Volume= 0.604 af
Outflow = 1.07 cfs @ 12.67 hrs, Volume= 0.604 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach SP#1: Study Point for Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 2.70" for 25-YR MASHPEE ATLAS event
Inflow = 2.09 cfs @ 12.08 hrs, Volume= 0.144 af
Outflow = 2.06 cfs @ 12.08 hrs, Volume= 0.144 af, Atten= 1%, Lag= 0.3 min
Discarded = 0.03 cfs @ 10.67 hrs, Volume= 0.045 af
Primary = 2.03 cfs @ 12.08 hrs, Volume= 0.099 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 20.72' @ 12.10 hrs Surf.Area= 809 sf Storage= 489 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 59.7 min (899.6 - 839.8)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2 707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

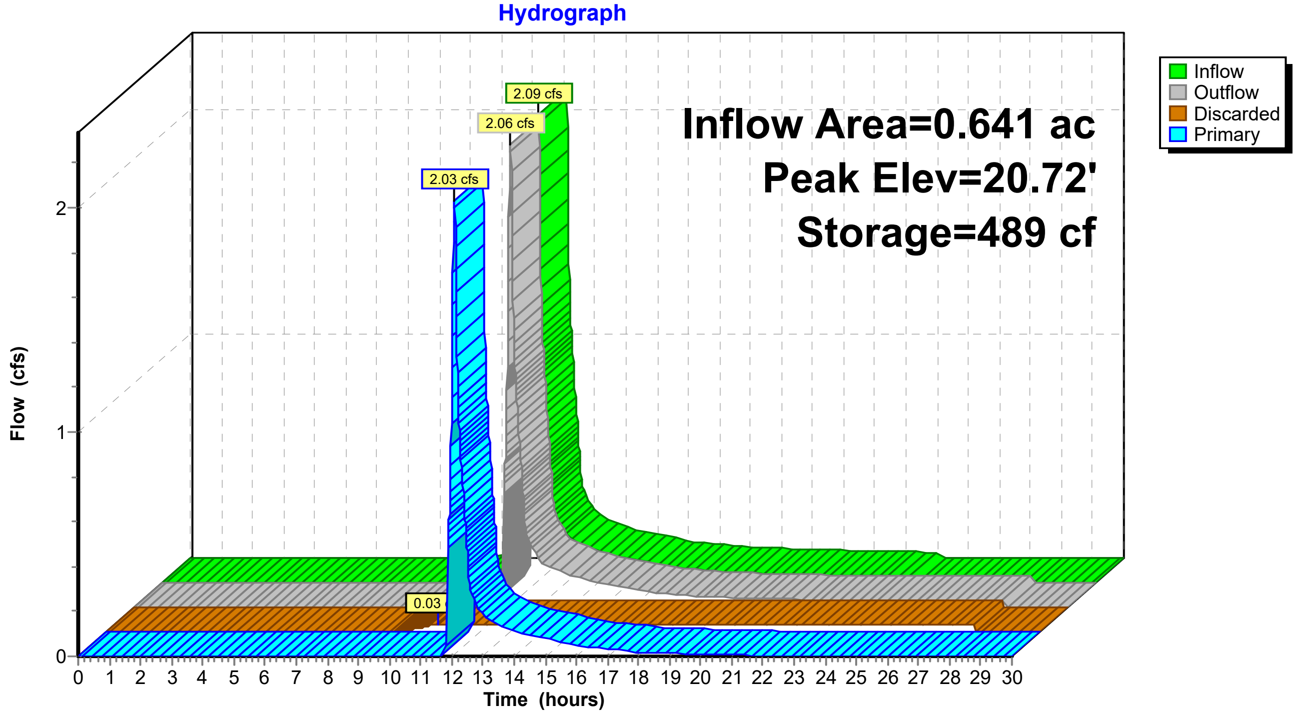
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 10.67 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.97 cfs @ 12.08 hrs HW=20.72' TW=20.69' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.97 cfs @ 0.67 fps)

Pond 1P: LB's


Hydrograph
2.09 cfs
2.06 cfs
2.03 cfs
0.03
Inflow Area=0.641 ac
Peak Elev=20.72'
Storage=489 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area = 0.841 ac, 0.00% Impervious, Inflow Depth = 0.13" for 25-YR MASHPEE ATLAS event
Inflow = 0.01 cfs @ 14.84 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 15.88 hrs, Volume= 0.009 af, Atten= 12%, Lag= 62.0 min
Discarded = 0.01 cfs @ 15.88 hrs, Volume= 0.009 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 16.32' @ 15.88 hrs Surf.Area= 229 sf Storage= 35 cf

Plug-Flow detention time= 35.6 min calculated for 0.009 af (100% of inflow)
Center-of-Mass det. time= 35.6 min (1,099.6 - 1,063.9)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

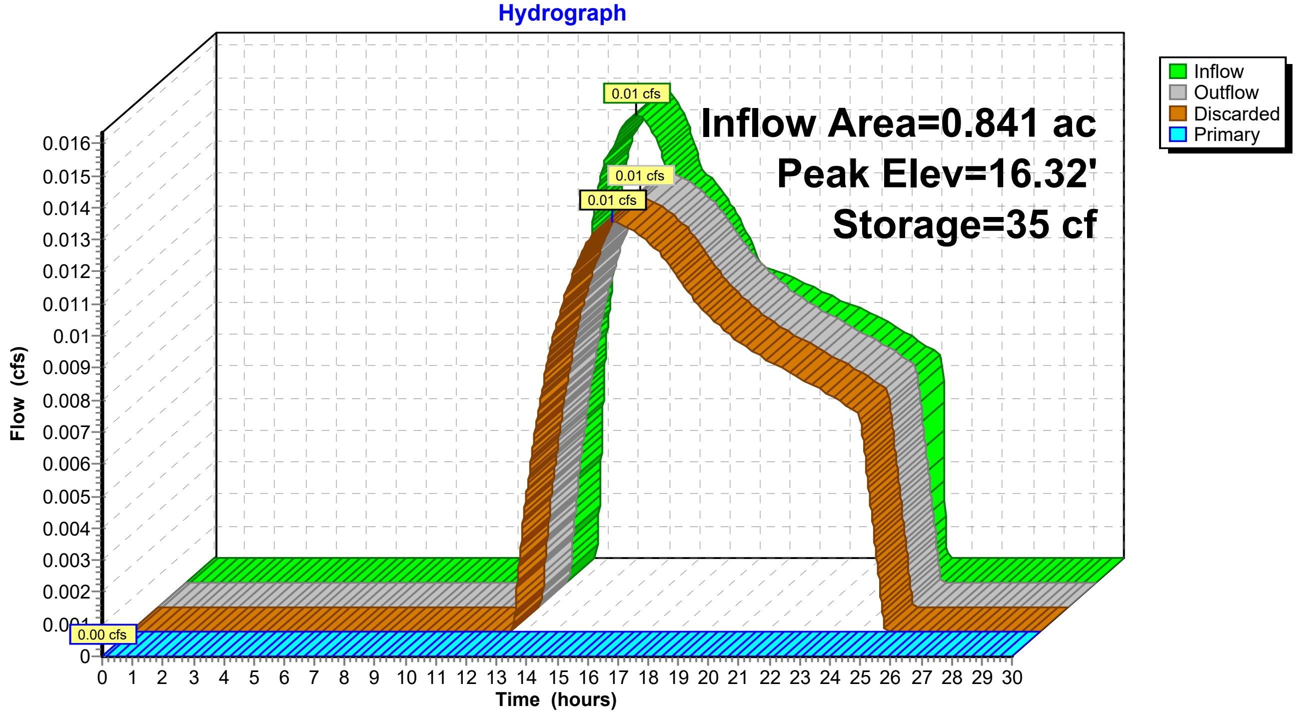
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	6,669	3,704	4,070
18.10	7,000	683	4,754

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.72'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 in 24.0" x 24.0" Grate Limited to weir flow at low heads
#3	Primary	18.00'	**25.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 15.88 hrs HW=16.32' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3P: Wet Pond

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth = 1.04" for 25-YR MASHPEE ATLAS event
Inflow = 5.74 cfs @ 12.16 hrs, Volume= 0.551 af
Outflow = 0.64 cfs @ 13.99 hrs, Volume= 0.457 af, Atten= 89%, Lag= 109.7 min
Primary = 0.64 cfs @ 13.99 hrs, Volume= 0.457 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.71' @ 13.99 hrs Surf.Area= 25,862 sf Storage= 11,519 cf

Plug-Flow detention time= 296.4 min calculated for 0.457 af (83% of inflow)
Center-of-Mass det. time= 223.4 min (1,086.4 - 863.0)

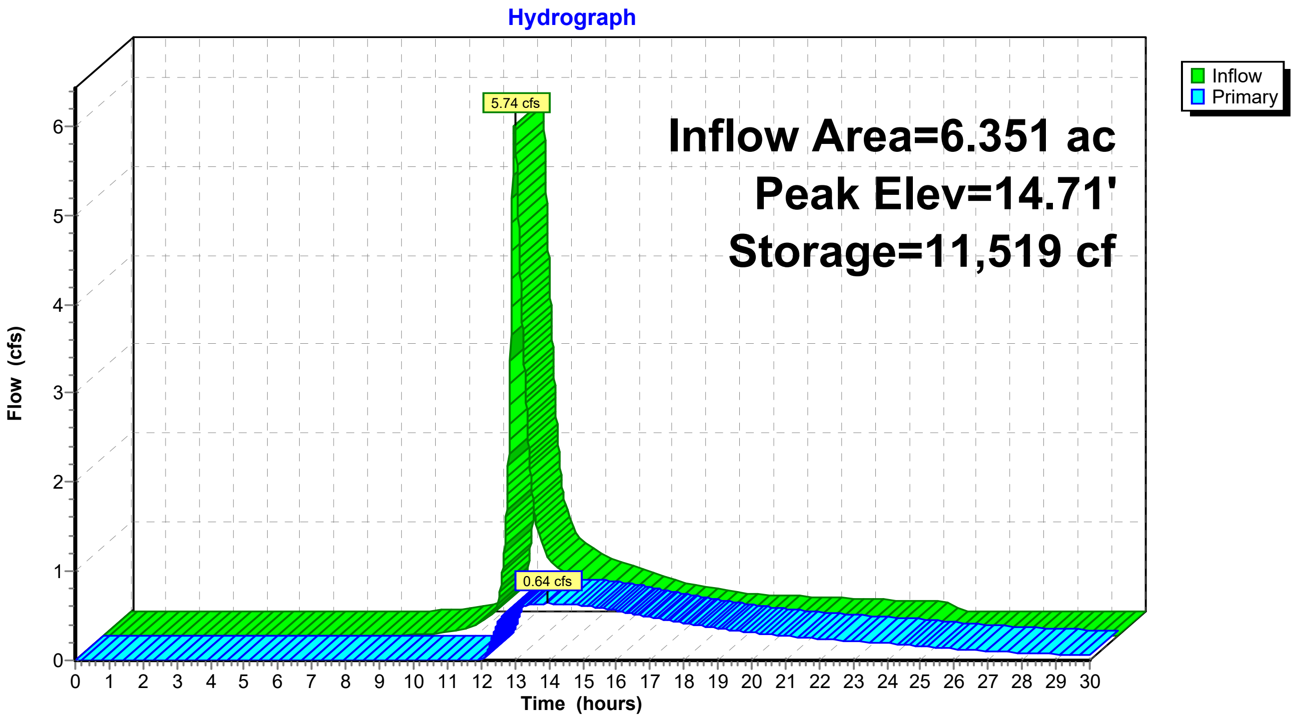
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	63,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,877	1,393	1,394
15.00	32,693	18,628	20,022
16.00	53,790	43,242	63,264

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**18.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Primary	15.00'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.64 cfs @ 13.99 hrs HW=14.71' TW=14.39' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.64 cfs @ 1.80 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-1: AREAS TO WETLAND Runoff Area=2.267 ac 3.62% Impervious Runoff Depth=1.47"
Flow Length=200' Tc=16.2 min CN=45 Runoff=2.28 cfs 0.279 af

SubcatchmentDA-44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.43"
Tc=5.0 min CN=32 Runoff=0.11 cfs 0.030 af

SubcatchmentDA-55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=3.92"
Tc=5.0 min CN=69 Runoff=3.05 cfs 0.209 af

SubcatchmentDA-7: AREAS TO WET POND Runoff Area=3.073 ac 2.93% Impervious Runoff Depth=0.64"
Flow Length=431' Tc=26.3 min CN=35 Runoff=0.66 cfs 0.163 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=4.70"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=2.45 cfs 0.180 af

SubcatchmentDA22B: Quin Ave West and Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=3.49"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=4.92 cfs 0.388 af

Reach R1: Tt along stream Avg. Flow Depth=0.38' Max Vel=0.86 fps Inflow=2.28 cfs 0.279 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=1.88 cfs 0.279 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.28' Max Vel=0.78 fps Inflow=1.28 cfs 0.791 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=1.28 cfs 0.787 af

Reach R2: Tt thru da7 Avg. Flow Depth=0.22' Max Vel=1.22 fps Inflow=7.73 cfs 0.550 af
n=0.025 L=380.0' S=0.0074 '/' Capacity=330.00 cfs Outflow=6.65 cfs 0.550 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.32' Max Vel=3.78 fps Inflow=2.45 cfs 0.180 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=2.43 cfs 0.180 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.13' Max Vel=2.47 fps Inflow=2.99 cfs 0.162 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=2.89 cfs 0.162 af

Reach SP#1: Study Point for Combined Flows Inflow=2.52 cfs 1.066 af
Outflow=2.52 cfs 1.066 af

Pond 1P: LB's Peak Elev=20.74' Storage=507 cf Inflow=3.05 cfs 0.209 af
Discarded=0.03 cfs 0.047 af Primary=2.99 cfs 0.162 af Outflow=3.02 cfs 0.209 af

Pond 2P: Natural Low Area Peak Elev=16.90' Storage=293 cf Inflow=0.11 cfs 0.030 af
Discarded=0.04 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.030 af

Pond 3P: Wet Pond Peak Elev=14.92' Storage=17,498 cf Inflow=8.77 cfs 0.894 af
Outflow=1.28 cfs 0.791 af

Total Runoff Area = 8.618 ac Runoff Volume = 1.250 af Average Runoff Depth = 1.74"
84.10% Pervious = 7.248 ac 15.90% Impervious = 1.370 ac

Summary for Subcatchment DA-1: AREAS TO WETLAND TO WEST

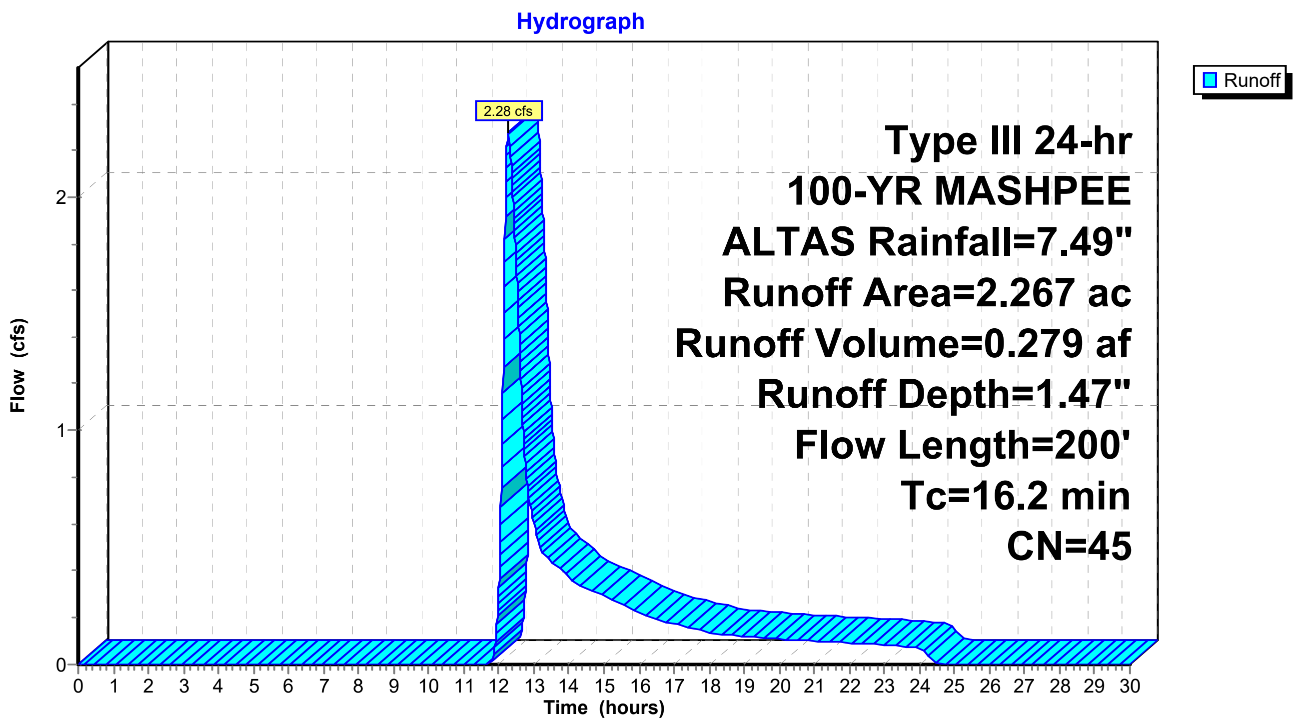
Runoff = 2.28 cfs @ 12.26 hrs, Volume= 0.279 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.986	30	Woods, Good, HSG A
0.045	76	Gravel roads, HSG A
0.082	98	Roofs, HSG A
1.064	55	Woods, Good, HSG B
2.267	45	Weighted Average
2.185		96.38% Pervious Area
0.082		3.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
7.9	150	0.0040	0.32		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
16.2	200	Total			

Subcatchment DA-1: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-44: North of Quin

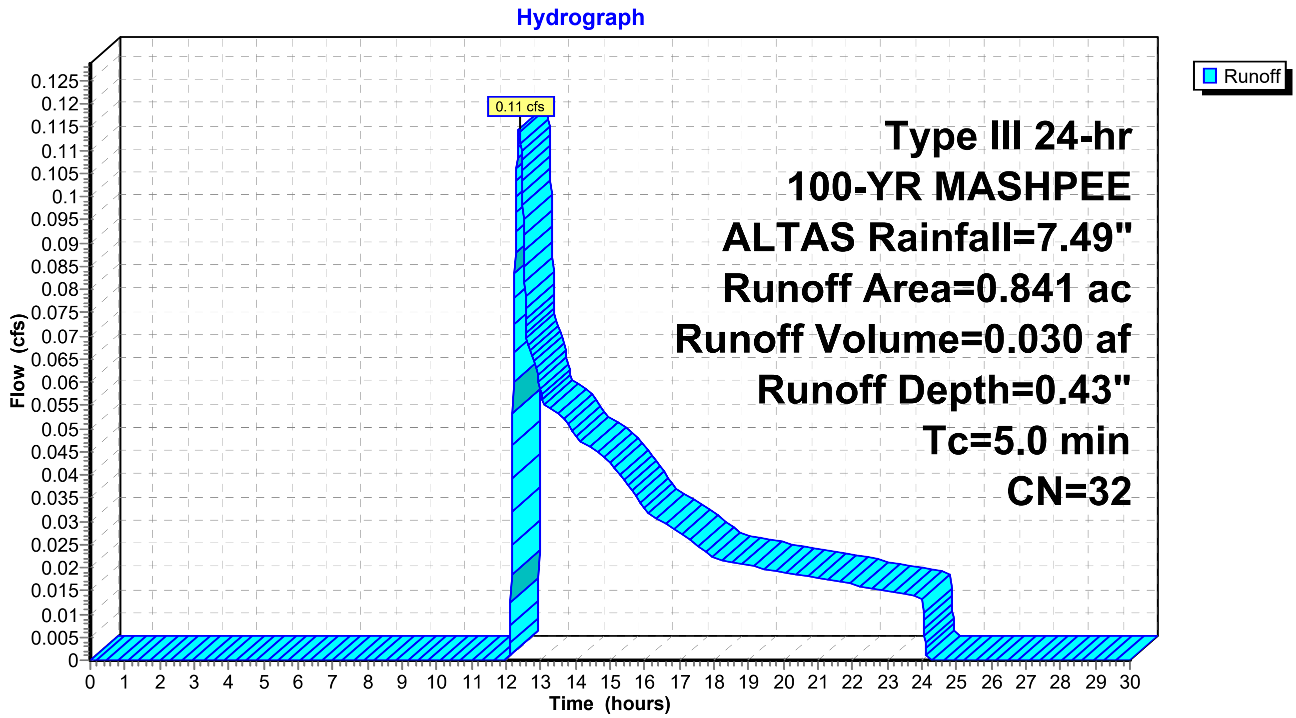
Runoff = 0.11 cfs @ 12.38 hrs, Volume= 0.030 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA-44: North of Quin



Summary for Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR

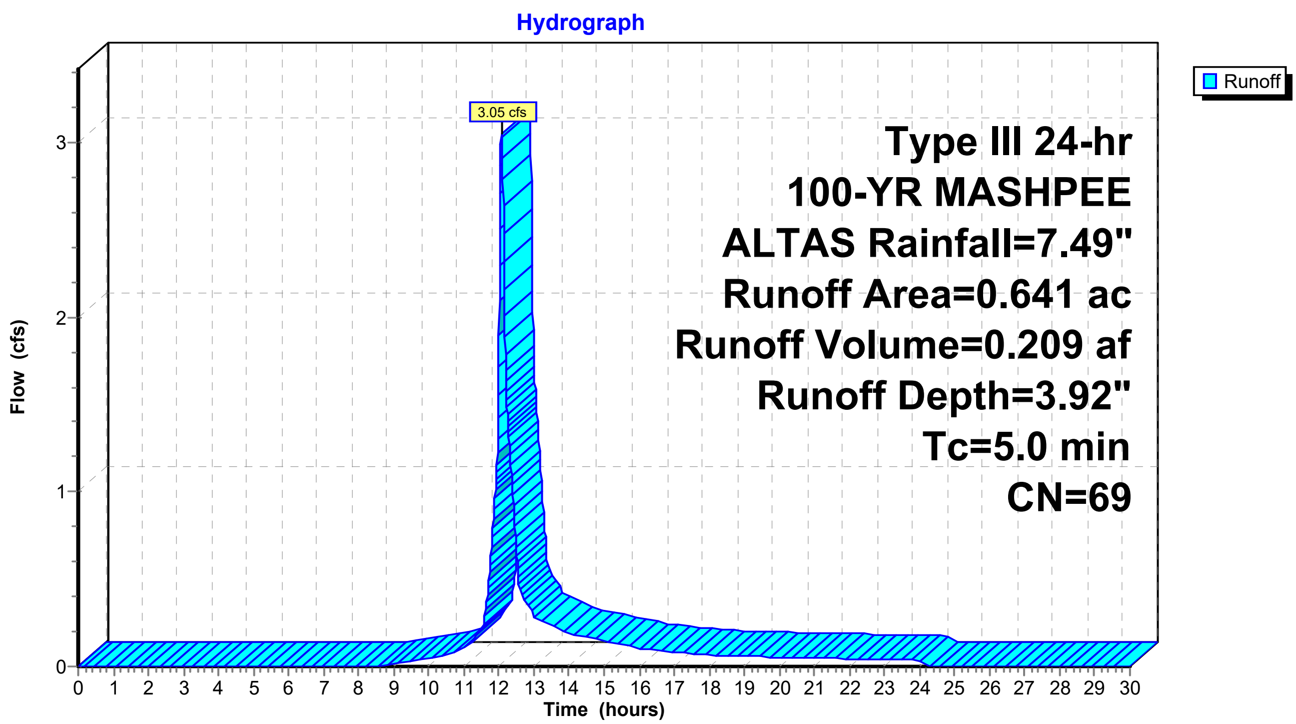
Runoff = 3.05 cfs @ 12.08 hrs, Volume= 0.209 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA-55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA-7: AREAS TO WET POND

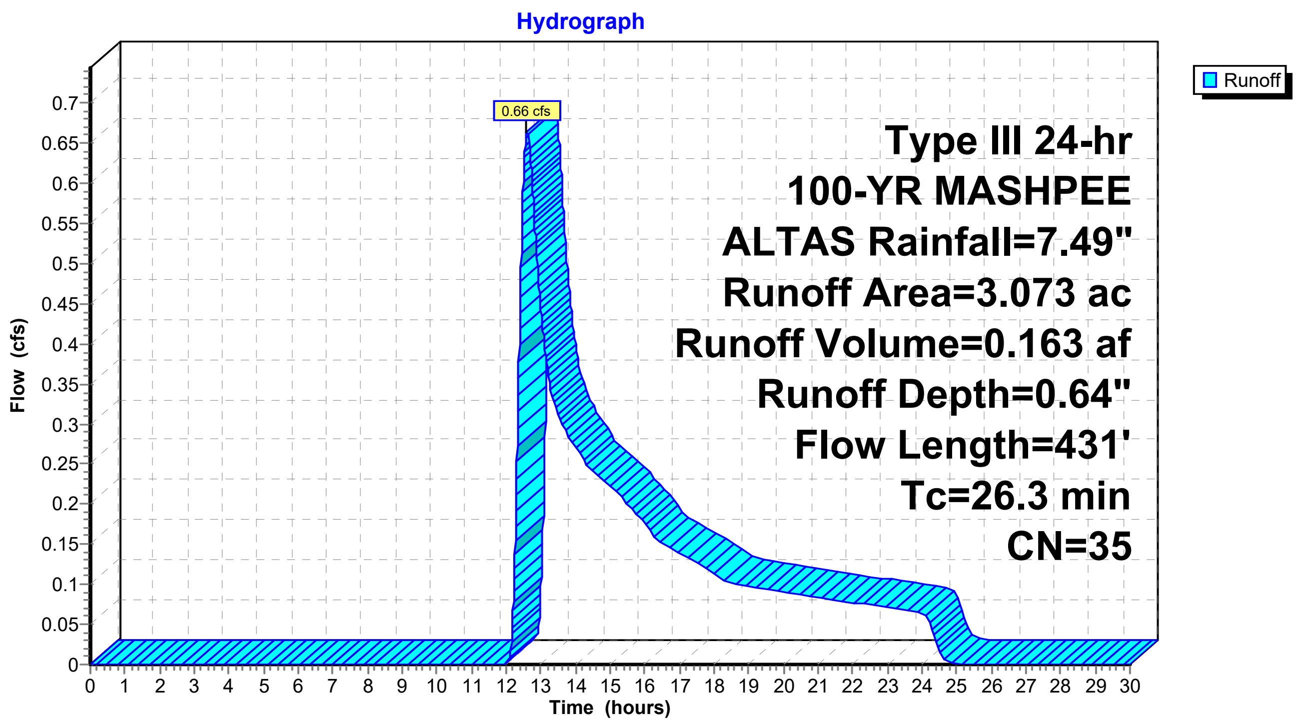
Runoff = 0.66 cfs @ 12.60 hrs, Volume= 0.163 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.450	39	>75% Grass cover, Good, HSG A
2.230	30	Woods, Good, HSG A
0.138	76	Gravel roads, HSG A
0.090	98	Roofs, HSG A
0.165	30	Woods, Good, HSG A
3.073	35	Weighted Average
2.983		97.07% Pervious Area
0.090		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, A** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA-7: AREAS TO WET POND



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

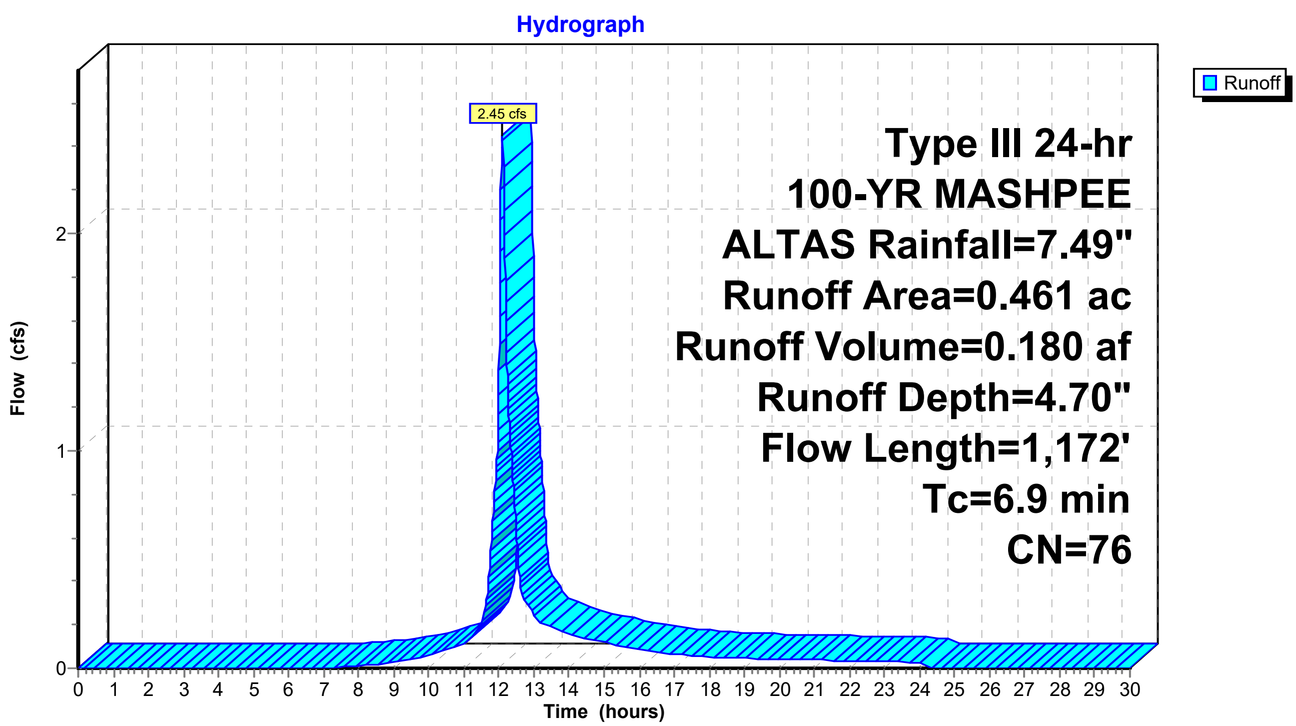
Runoff = 2.45 cfs @ 12.10 hrs, Volume= 0.180 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: Quin Ave West and North

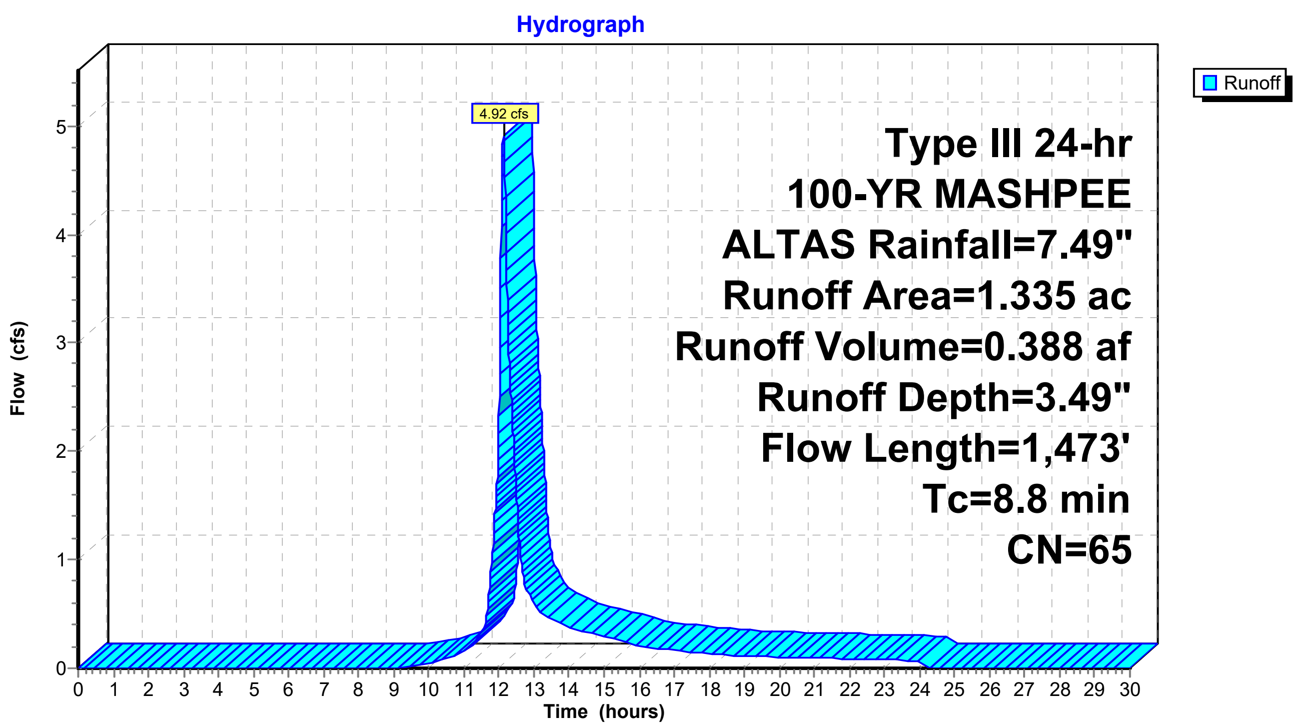
Runoff = 4.92 cfs @ 12.13 hrs, Volume= 0.388 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: Quin Ave West and North



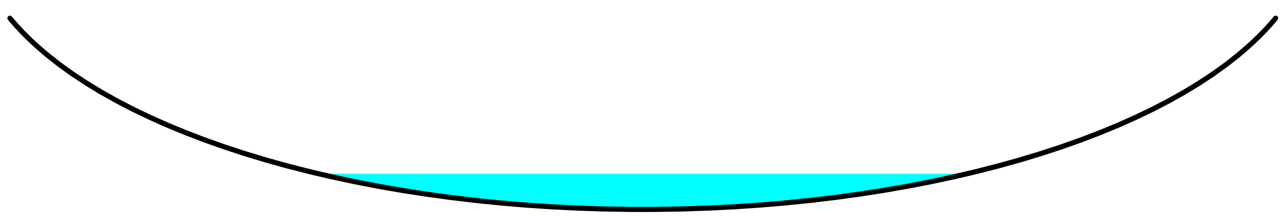
Summary for Reach R1: Tt along stream

Inflow Area = 2.267 ac, 3.62% Impervious, Inflow Depth = 1.47" for 100-YR MASHPEE ALTAS event
Inflow = 2.28 cfs @ 12.26 hrs, Volume= 0.279 af
Outflow = 1.88 cfs @ 12.44 hrs, Volume= 0.279 af, Atten= 18%, Lag= 10.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.86 fps, Min. Travel Time= 10.6 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 26.8 min

Peak Storage= 1,193 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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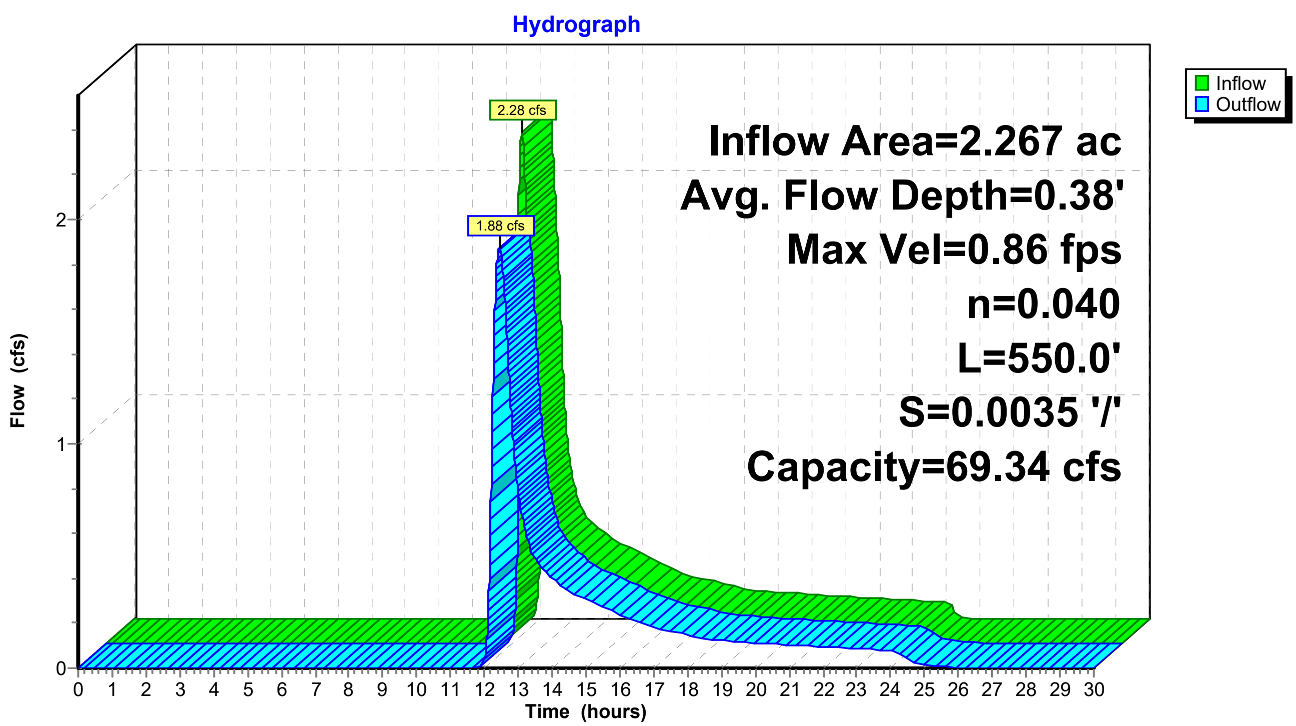
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth > 1.49" for 100-YR MASHPEE ALTAS event
Inflow = 1.28 cfs @ 13.35 hrs, Volume= 0.791 af
Outflow = 1.28 cfs @ 13.51 hrs, Volume= 0.787 af, Atten= 0%, Lag= 9.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.78 fps, Min. Travel Time= 11.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 16.6 min

Peak Storage= 856 cf @ 13.51 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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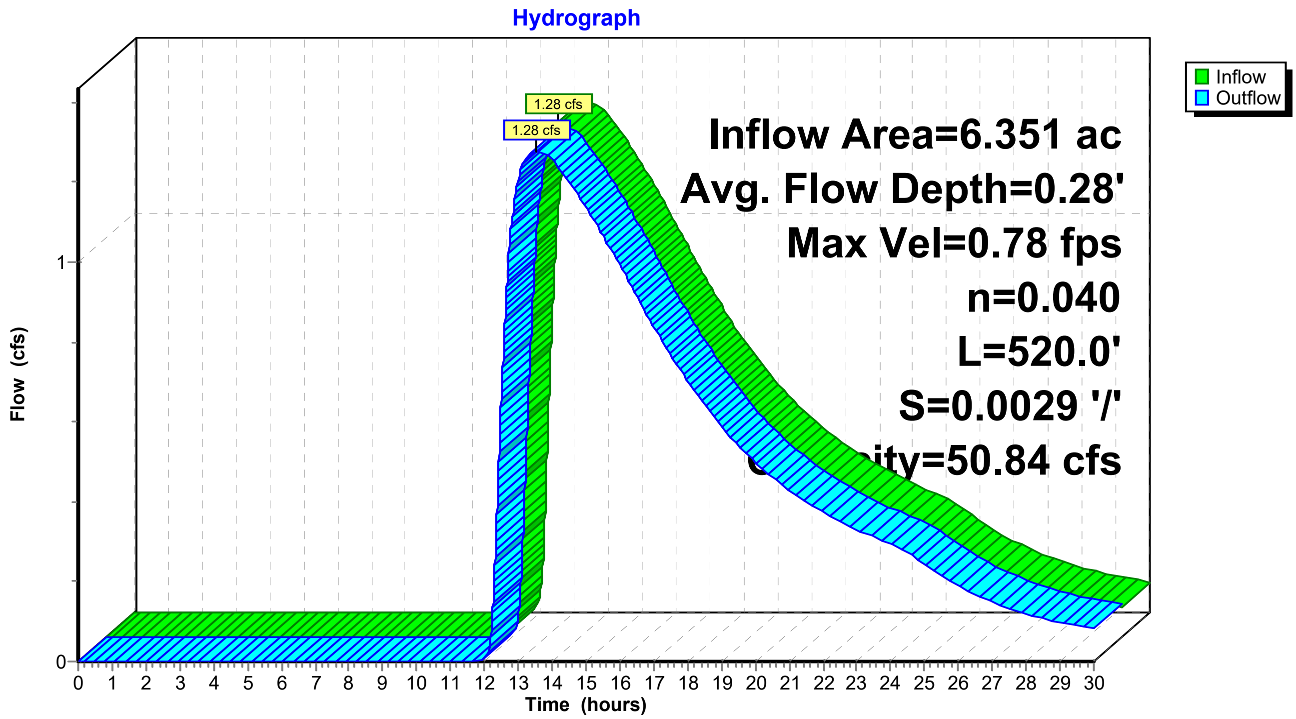
Reach R1A: Tt thru bogs



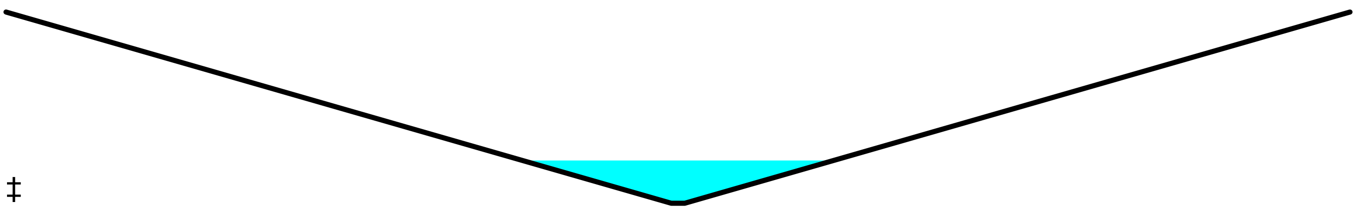
Summary for Reach R2: Tt thru da7

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 2.34" for 100-YR MASHPEE ALTAS event
Inflow = 7.73 cfs @ 12.12 hrs, Volume= 0.550 af
Outflow = 6.65 cfs @ 12.17 hrs, Volume= 0.550 af, Atten= 14%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.22 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 13.8 min

Peak Storage= 2,072 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.00' Flow Area= 102.0 sf, Capacity= 330.00 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 100.0 '/' Top Width= 202.00'
Length= 380.0' Slope= 0.0074 '/'
Inlet Invert= 17.00', Outlet Invert= 14.20'



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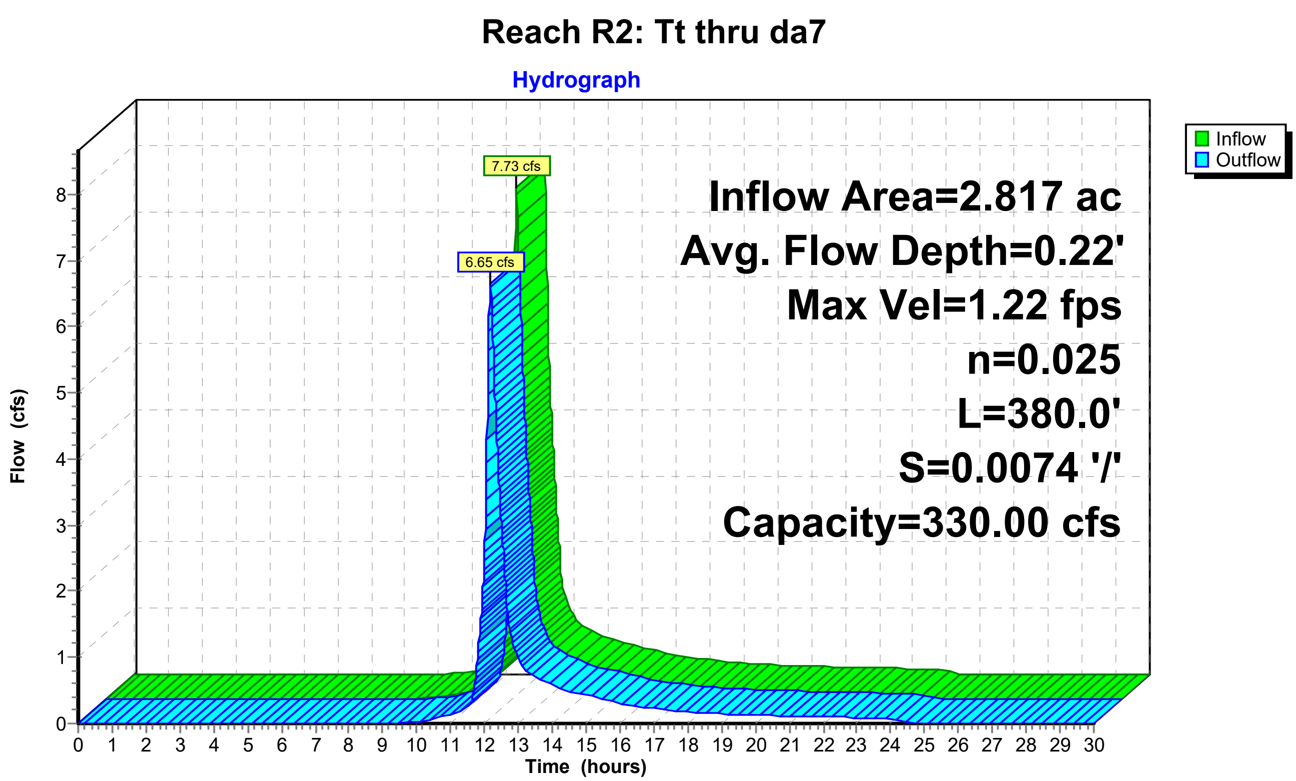


Summary for Reach R2A: Travel Time thru wet pond

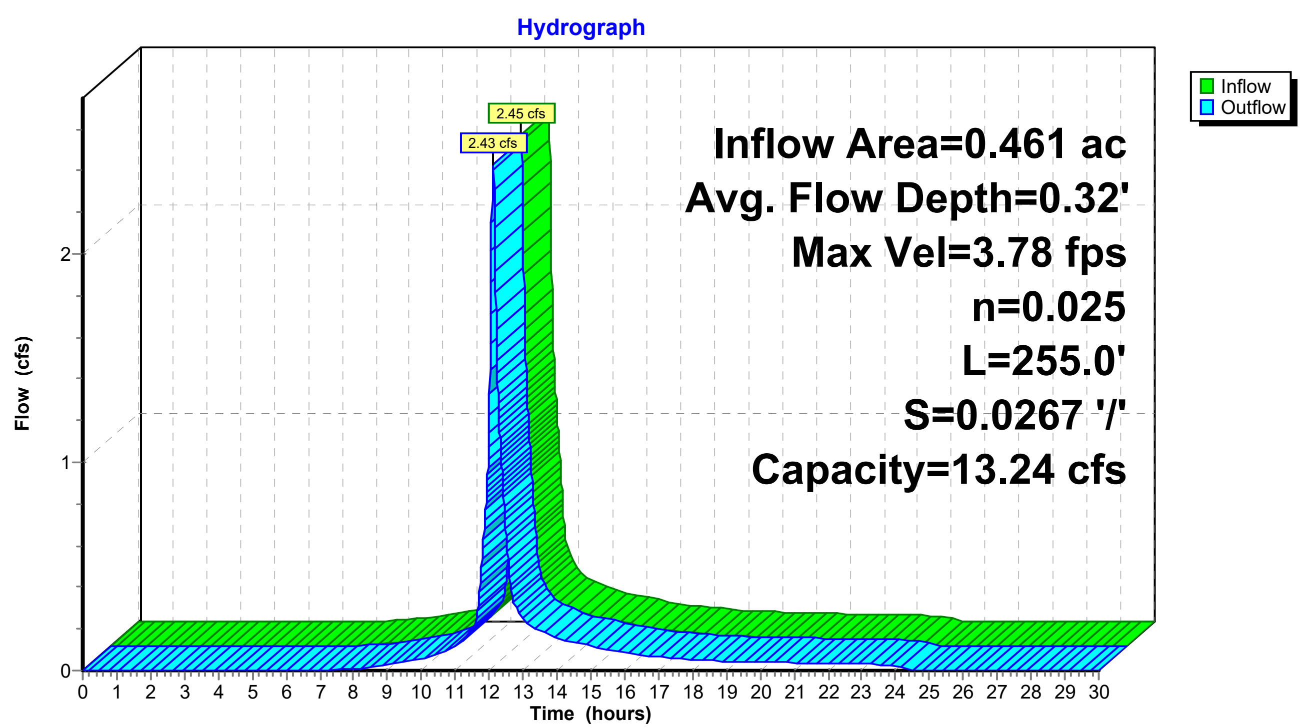
Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 4.70" for 100-YR MASHPEE ALTAS event
Inflow = 2.45 cfs @ 12.10 hrs, Volume= 0.180 af
Outflow = 2.43 cfs @ 12.11 hrs, Volume= 0.180 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 4.2 min

Peak Storage= 163 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'

Reach R2A: Travel Time thru wet pond



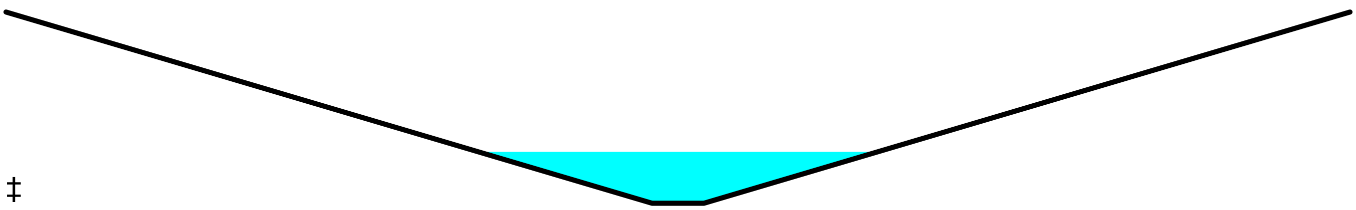
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 3.04" for 100-YR MASHPEE ALTAS event
Inflow = 2.99 cfs @ 12.08 hrs, Volume= 0.162 af
Outflow = 2.89 cfs @ 12.10 hrs, Volume= 0.162 af, Atten= 3%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.47 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 4.7 min

Peak Storage= 288 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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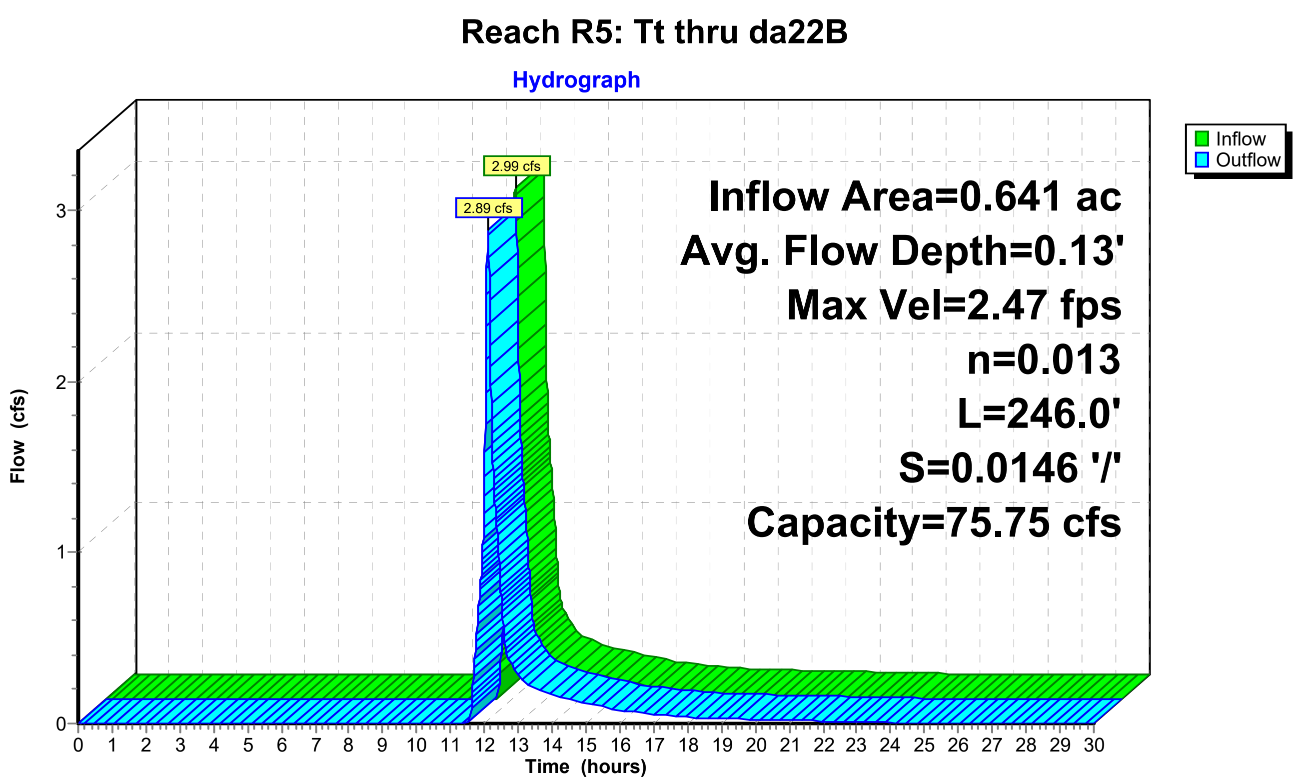
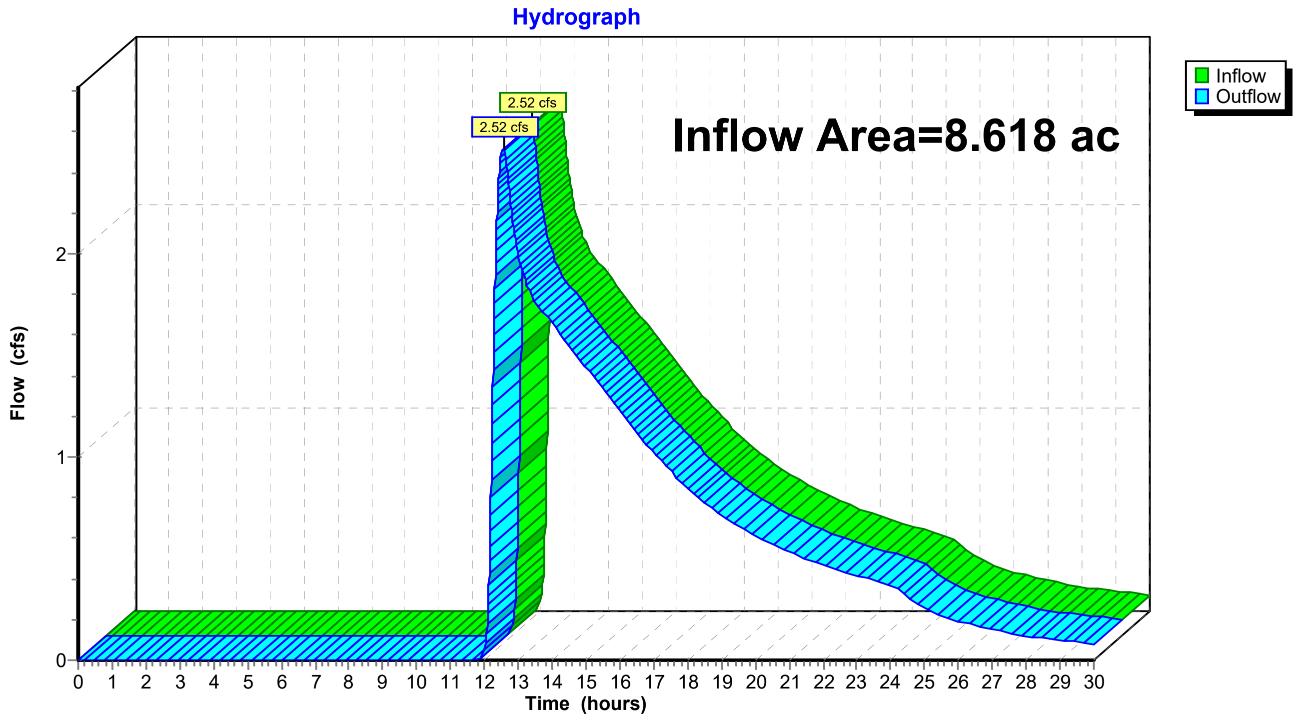


Summary for Reach SP#1: Study Point for Combined Flows

Inflow Area = 8.618 ac, 15.90% Impervious, Inflow Depth > 1.48" for 100-YR MASHPEE ALTAS event
Inflow = 2.52 cfs @ 12.55 hrs, Volume= 1.066 af
Outflow = 2.52 cfs @ 12.55 hrs, Volume= 1.066 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach SP#1: Study Point for Combined Flows



Summary for Pond 1P: LB's

Inflow Area =	0.641 ac, 50.86% Impervious, Inflow Depth = 3.92"	for 100-YR MASHPEE ALTAS event	
Inflow =	3.05 cfs @ 12.08 hrs, Volume=	0.209 af	
Outflow =	3.02 cfs @ 12.08 hrs, Volume=	0.209 af,	Atten= 1%, Lag= 0.3 min
Discarded =	0.03 cfs @ 9.90 hrs, Volume=	0.047 af	
Primary =	2.99 cfs @ 12.08 hrs, Volume=	0.162 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 20.74' @ 12.09 hrs Surf.Area= 887 sf Storage= 507 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 43.1 min (872.1 - 829.0)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2 707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

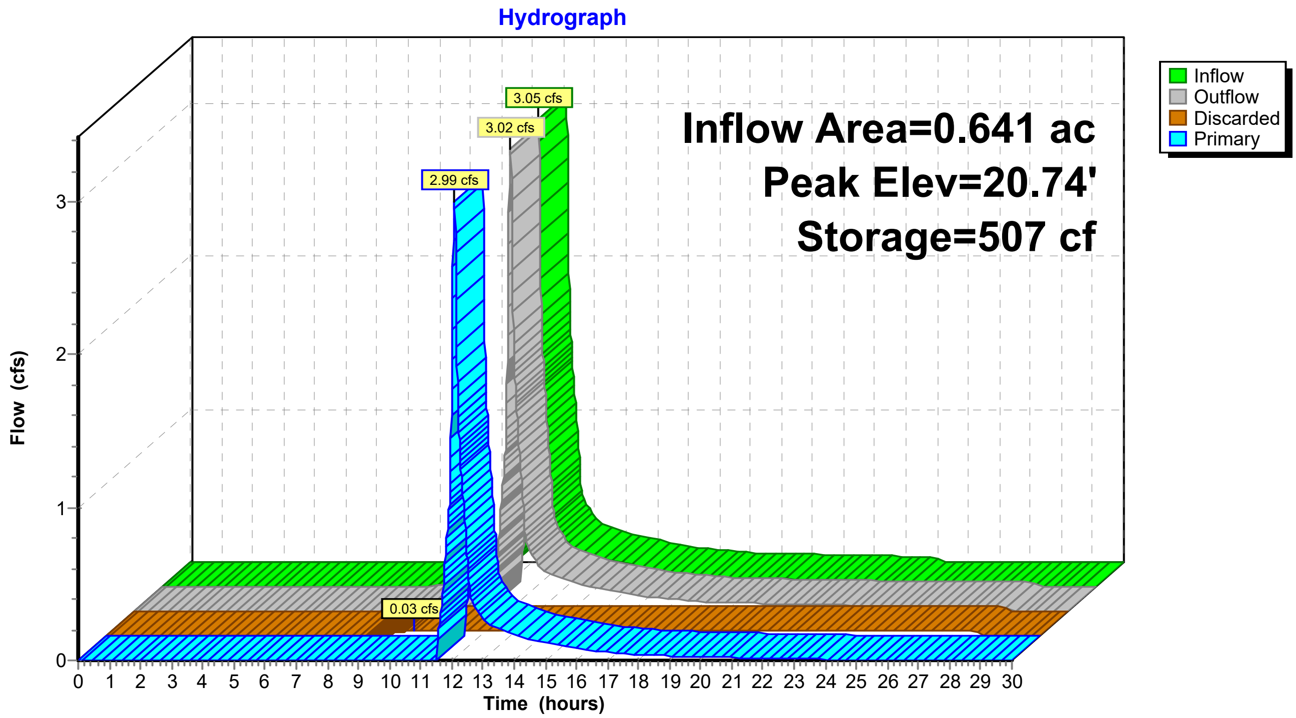
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 9.90 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.92 cfs @ 12.08 hrs HW=20.74' TW=20.71' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.92 cfs @ 0.73 fps)

Pond 1P: LB's


Hydrograph
3.05 cfs
3.02 cfs
2.99 cfs
0.03 cfs
Inflow Area=0.641 ac
Peak Elev=20.74'
Storage=507 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area =	0.841 ac,	0.00% Impervious, Inflow Depth = 0.43"	for 100-YR MASHPEE ALTAS event	
Inflow =	0.11 cfs @	12.38 hrs, Volume=	0.030 af	
Outflow =	0.04 cfs @	15.61 hrs, Volume=	0.030 af,	Atten= 68%, Lag= 193.5 min
Discarded =	0.04 cfs @	15.61 hrs, Volume=	0.030 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 16.90' @ 15.61 hrs Surf.Area= 661 sf Storage= 293 cf

Plug-Flow detention time= 105.3 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 105.3 min (1,084.6 - 979.3)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

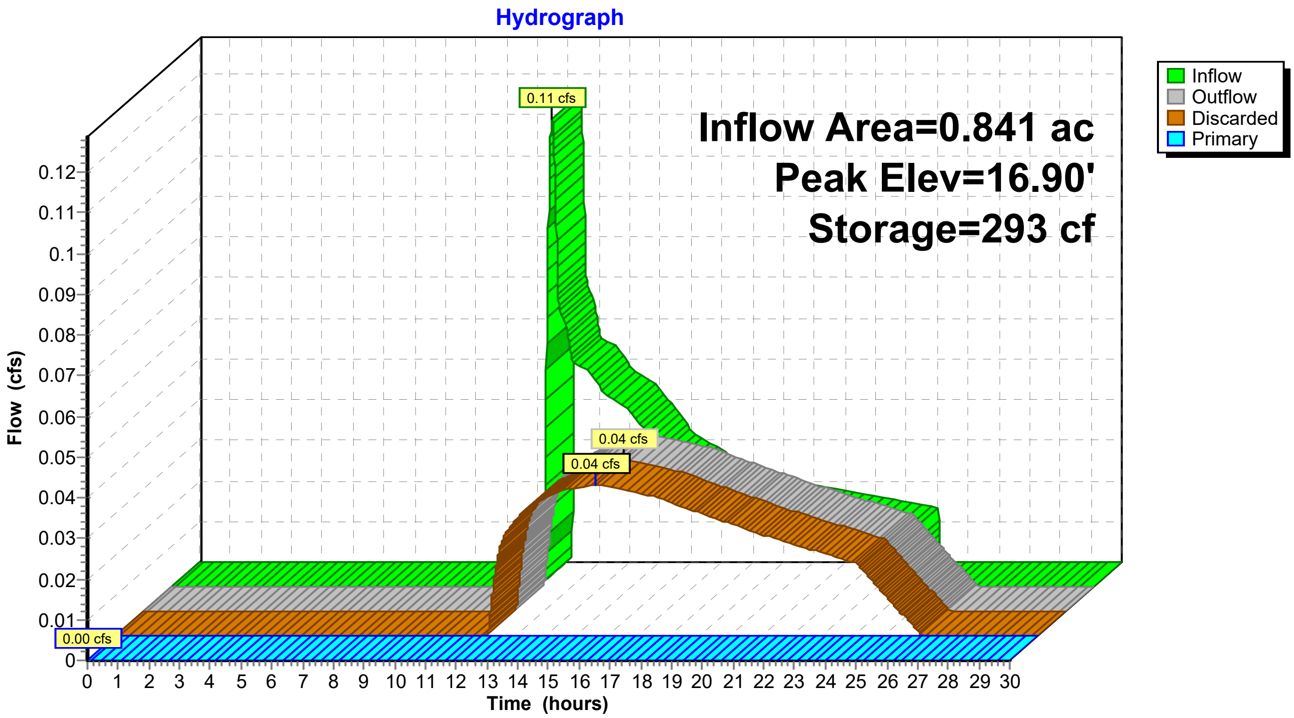
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	6,669	3,704	4,070
18.10	7,000	683	4,754

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.72'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 in 24.0" x 24.0" Grate Limited to weir flow at low heads
#3	Primary	18.00'	**25.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.04 cfs @ 15.61 hrs HW=16.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3P: Wet Pond

Inflow Area = 6.351 ac, 20.28% Impervious, Inflow Depth = 1.69" for 100-YR MASHPEE ALTAS event
Inflow = 8.77 cfs @ 12.15 hrs, Volume= 0.894 af
Outflow = 1.28 cfs @ 13.35 hrs, Volume= 0.791 af, Atten= 85%, Lag= 71.8 min
Primary = 1.28 cfs @ 13.35 hrs, Volume= 0.791 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.92' @ 13.35 hrs Surf.Area= 30,823 sf Storage= 17,498 cf

Plug-Flow detention time= 250.3 min calculated for 0.791 af (88% of inflow)
Center-of-Mass det. time= 195.4 min (1,053.8 - 858.4)

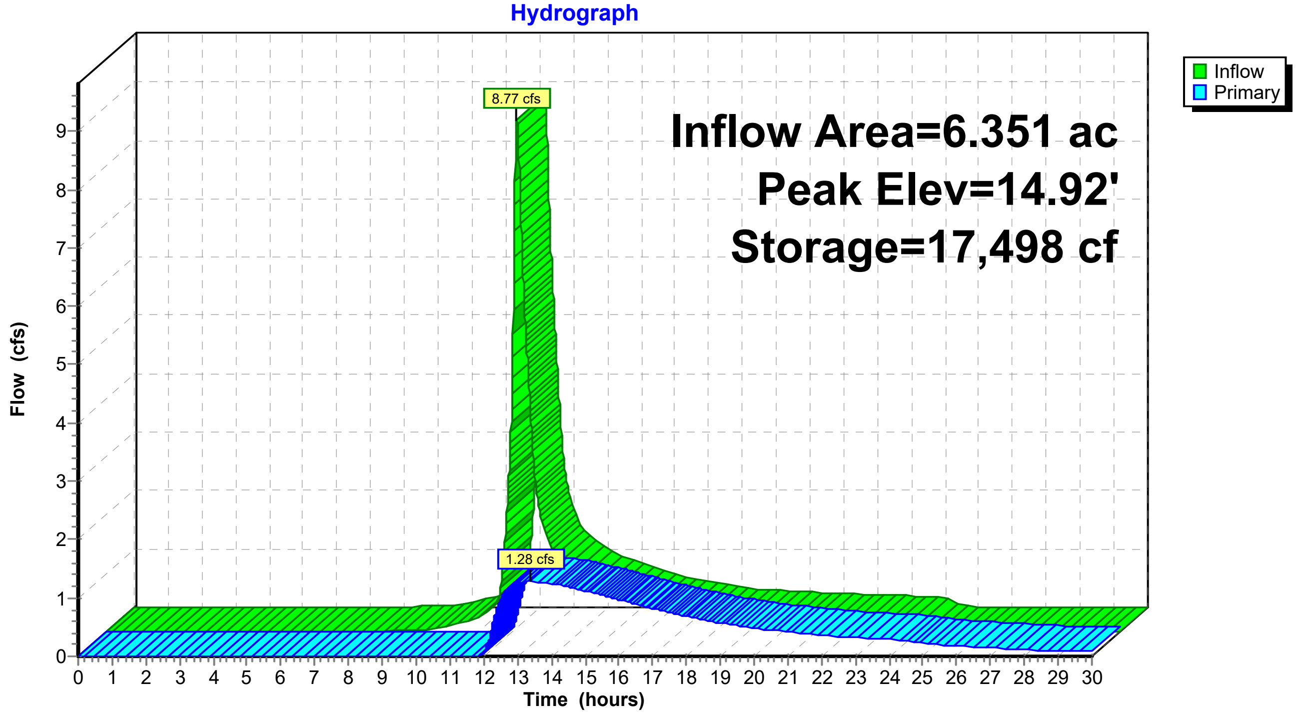
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	63,264 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,877	1,393	1,394
15.00	32,693	18,628	20,022
16.00	53,790	43,242	63,264

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**18.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Primary	15.00'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.28 cfs @ 13.35 hrs HW=14.92' TW=14.48' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 1.28 cfs @ 2.23 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

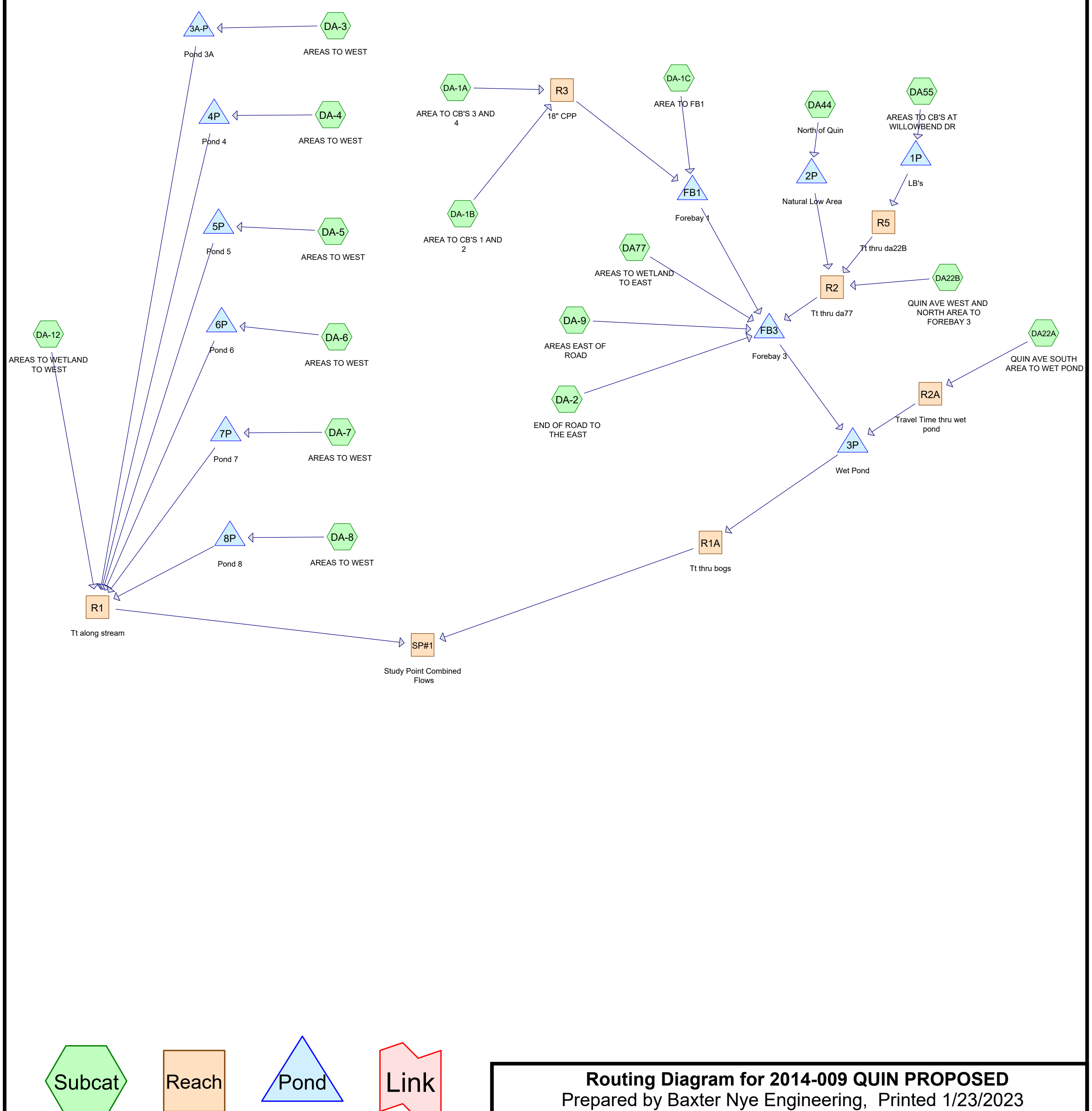
Pond 3P: Wet Pond



APPENDIX D

POST- DEVELOPMENT WATERSHED

RUNOFF & ROUTING



Routing Diagram for 2014-009 QUIN PROPOSED
Prepared by Baxter Nye Engineering, Printed 1/23/2023
HydroCAD® 10.00-11 s/n 04803 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.442	39	>75% Grass cover, Good, HSG A (DA-12, DA-1A, DA-1C, DA-2, DA-5, DA-6, DA-7, DA-8, DA-9, DA22A, DA22B, DA77)
0.151	61	>75% Grass cover, Good, HSG B (DA-3, DA-4)
0.023	76	Gravel roads, HSG A (DA-12)
0.022	85	Gravel roads, HSG B (DA-12)
0.442	39	Pasture/grassland/range, Good, HSG A (DA-1B, DA55)
0.326	98	Paved parking, HSG A (DA55)
0.515	98	Roofs, HSG A (DA-1B, DA-2, DA-6, DA-9)
0.084	98	Roofs, HSG B (DA-1A, DA-1C)
1.660	98	Unconnected pavement, HSG A (DA-1A, DA-1B, DA-1C, DA-2, DA-5, DA-6, DA-7, DA-8, DA-9, DA22A, DA22B)
0.113	98	Unconnected pavement, HSG B (DA-12, DA-3, DA-4)
1.686	30	Woods, Good, HSG A (DA-12, DA77)
0.317	55	Woods, Good, HSG B (DA-12)
0.841	32	Woods/grass comb., Good, HSG A (DA44)
8.622	**56**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-12: AREAS TO WETLAND Runoff Area=0.793 ac 2.90% Impervious Runoff Depth=0.08"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.01 cfs 0.006 af

SubcatchmentDA-1A: AREA TO CB'S 3 Runoff Area=0.252 ac 59.92% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=74 Runoff=0.36 cfs 0.026 af

SubcatchmentDA-1B: AREA TO CB'S 1 Runoff Area=0.432 ac 70.60% Impervious Runoff Depth=1.71"
Tc=5.0 min CN=81 Runoff=0.89 cfs 0.062 af

SubcatchmentDA-1C: AREA TO FB1 Runoff Area=0.356 ac 32.58% Impervious Runoff Depth=0.45"
Tc=5.0 min CN=58 Runoff=0.11 cfs 0.013 af

SubcatchmentDA-2: END OF ROAD TO Runoff Area=0.536 ac 58.02% Impervious Runoff Depth=1.18"
Flow Length=250' Tc=6.2 min CN=73 Runoff=0.70 cfs 0.053 af

SubcatchmentDA-3: AREAS TO WEST Runoff Area=0.109 ac 21.10% Impervious Runoff Depth=0.75"
Tc=5.0 min UI Adjusted CN=65 Runoff=0.08 cfs 0.007 af

SubcatchmentDA-4: AREAS TO WEST Runoff Area=0.132 ac 50.76% Impervious Runoff Depth=1.64"
Tc=5.0 min CN=80 Runoff=0.26 cfs 0.018 af

SubcatchmentDA-5: AREAS TO WEST Runoff Area=0.124 ac 58.87% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=74 Runoff=0.18 cfs 0.013 af

SubcatchmentDA-6: AREAS TO WEST Runoff Area=0.088 ac 17.05% Impervious Runoff Depth=0.10"
Tc=5.0 min UI Adjusted CN=46 Runoff=0.00 cfs 0.001 af

SubcatchmentDA-7: AREAS TO WEST Runoff Area=0.033 ac 63.64% Impervious Runoff Depth=1.43"
Tc=5.0 min CN=77 Runoff=0.06 cfs 0.004 af

SubcatchmentDA-8: AREAS TO WEST Runoff Area=0.087 ac 35.63% Impervious Runoff Depth=0.53"
Tc=5.0 min CN=60 Runoff=0.04 cfs 0.004 af

SubcatchmentDA-9: AREAS EAST OF Runoff Area=0.558 ac 65.23% Impervious Runoff Depth=1.43"
Tc=5.0 min CN=77 Runoff=0.95 cfs 0.067 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=1.37"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=0.69 cfs 0.052 af

SubcatchmentDA22B: QUIN AVE WEST Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=0.75"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=0.88 cfs 0.084 af

SubcatchmentDA44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.000 af

SubcatchmentDA55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=0.95"
Tc=5.0 min CN=69 Runoff=0.67 cfs 0.051 af

Subcatchment DA77: AREAS TO WETLAND Runoff Area=1.844 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=431' Tc=26.3 min CN=32 Runoff=0.00 cfs 0.000 af

Reach R1: Tt along stream Avg. Flow Depth=0.07' Max Vel=0.28 fps Inflow=0.21 cfs 0.011 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.05 cfs 0.011 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.00' Max Vel=0.15 fps Inflow=0.00 cfs 0.003 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.00 cfs 0.003 af

Reach R2: Tt thru da77 Avg. Flow Depth=0.10' Max Vel=0.71 fps Inflow=0.99 cfs 0.101 af
n=0.030 L=210.0' S=0.0095 '/' Capacity=50.53 cfs Outflow=0.93 cfs 0.101 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.14' Max Vel=2.41 fps Inflow=0.69 cfs 0.052 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=0.68 cfs 0.052 af

Reach R3: 18" CPP Avg. Flow Depth=0.51' Max Vel=2.37 fps Inflow=1.25 cfs 0.088 af
18.0" Round Pipe n=0.012 L=81.0' S=0.0020 '/' Capacity=5.06 cfs Outflow=1.25 cfs 0.088 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.05' Max Vel=1.39 fps Inflow=0.38 cfs 0.017 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=0.31 cfs 0.017 af

Reach SP#1: Study Point Combined Flows Inflow=0.05 cfs 0.014 af
Outflow=0.05 cfs 0.014 af

Pond 1P: LB's Peak Elev=20.64' Storage=448 cf Inflow=0.67 cfs 0.051 af
Discarded=0.03 cfs 0.033 af Primary=0.38 cfs 0.017 af Outflow=0.41 cfs 0.051 af

Pond 2P: Natural Low Area Peak Elev=16.01' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 3A-P: Pond 3A Peak Elev=17.33' Storage=97 cf Inflow=0.08 cfs 0.007 af
Discarded=0.01 cfs 0.007 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.007 af

Pond 3P: Wet Pond Peak Elev=14.26' Storage=2,214 cf Inflow=0.68 cfs 0.052 af
Outflow=0.00 cfs 0.003 af

Pond 4P: Pond 4 Peak Elev=18.01' Storage=236 cf Inflow=0.26 cfs 0.018 af
Discarded=0.01 cfs 0.013 af Primary=0.21 cfs 0.005 af Outflow=0.22 cfs 0.018 af

Pond 5P: Pond 5 Peak Elev=19.00' Storage=228 cf Inflow=0.18 cfs 0.013 af
Discarded=0.02 cfs 0.012 af Primary=0.01 cfs 0.000 af Outflow=0.03 cfs 0.013 af

Pond 6P: Pond 6 Peak Elev=18.06' Storage=1 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond 7P: Pond 7 Peak Elev=17.88' Storage=65 cf Inflow=0.06 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond 8P: Pond 8 Peak Elev=17.01' Storage=6 cf Inflow=0.04 cfs 0.004 af
Discarded=0.02 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.004 af

Pond FB1: Forebay 1 Peak Elev=16.48' Storage=2,008 cf Inflow=1.36 cfs 0.101 af
Discarded=0.09 cfs 0.101 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.101 af

Pond FB3: Forebay 3 Peak Elev=15.65' Storage=3,311 cf Inflow=2.06 cfs 0.220 af
Discarded=0.33 cfs 0.220 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 0.220 af

Total Runoff Area = 8.622 ac Runoff Volume = 0.459 af Average Runoff Depth = 0.64"
68.71% Pervious = 5.924 ac 31.29% Impervious = 2.698 ac

Summary for Subcatchment DA-12: AREAS TO WETLAND TO WEST

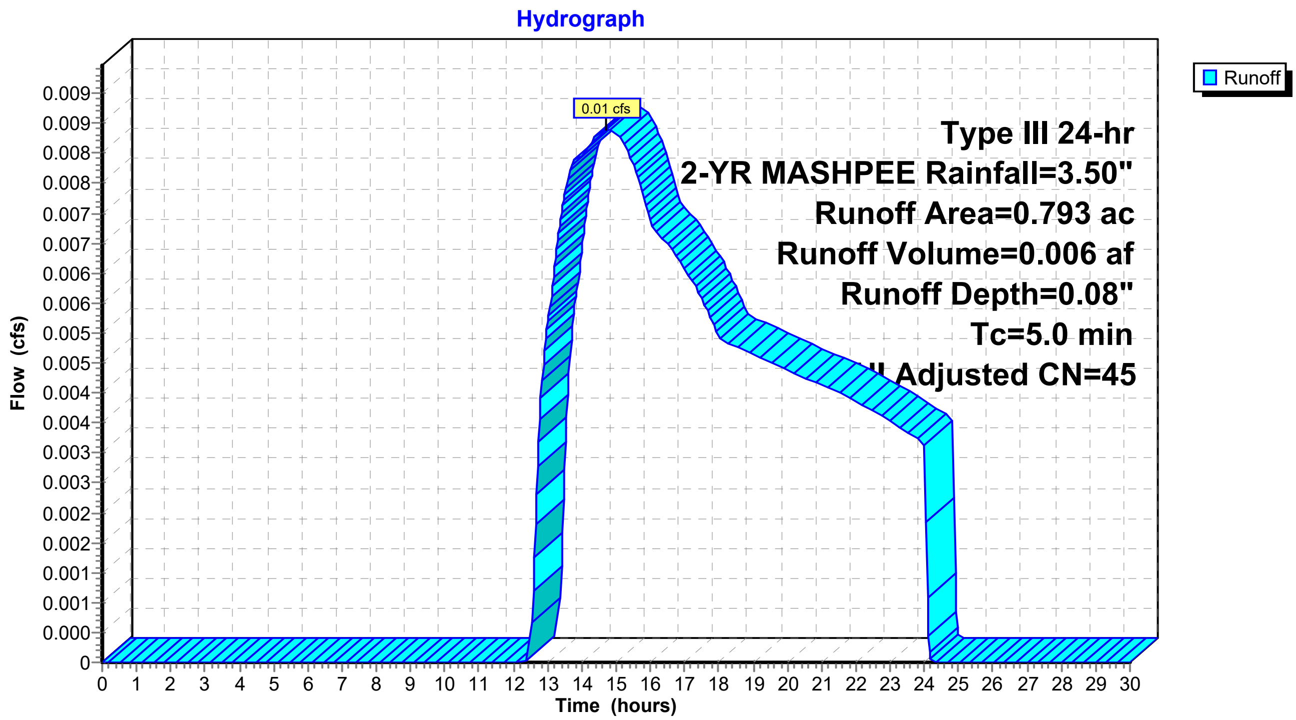
Runoff = 0.01 cfs @ 14.73 hrs, Volume= 0.006 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Adj	Description
0.090	39		>75% Grass cover, Good, HSG A
0.318	30		Woods, Good, HSG A
0.023	76		Gravel roads, HSG A
0.023	98		Unconnected pavement, HSG B
0.317	55		Woods, Good, HSG B
0.022	85		Gravel roads, HSG B
0.793	46	45	Weighted Average, UI Adjusted
0.770			97.10% Pervious Area
0.023			2.90% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-12: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-1A: AREA TO CB'S 3 AND 4

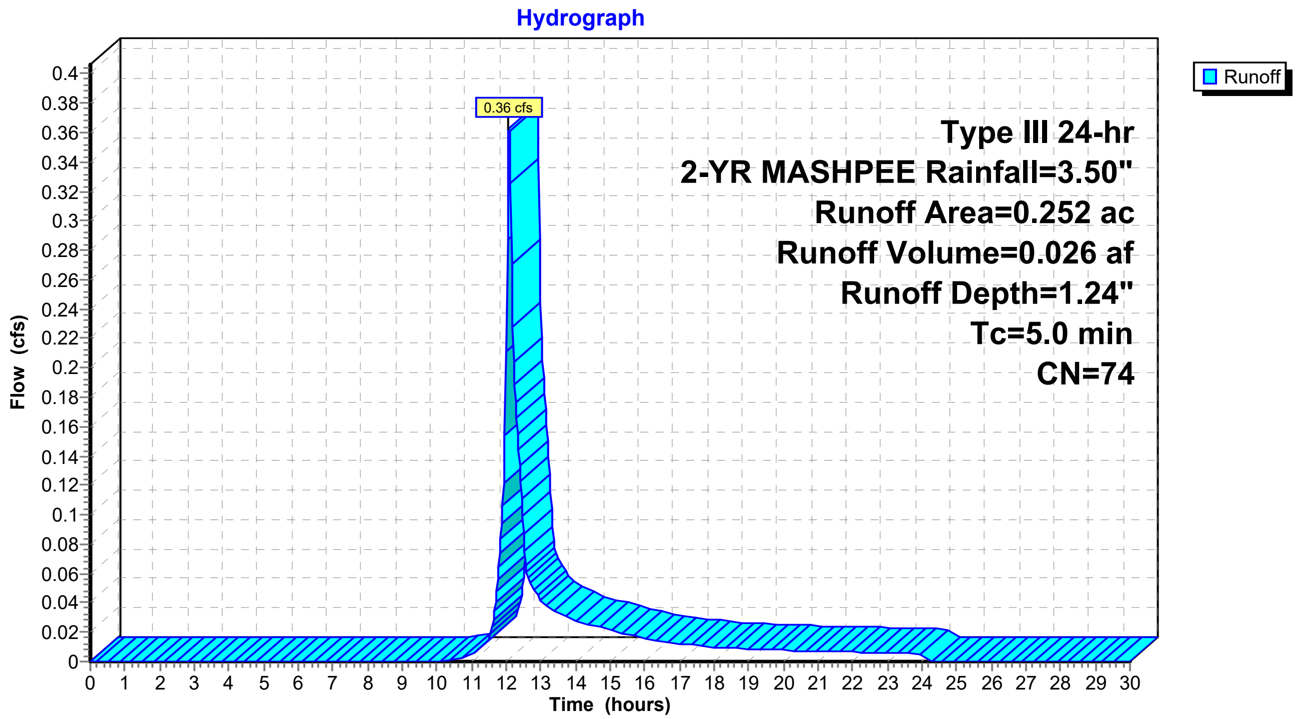
Runoff = 0.36 cfs @ 12.08 hrs, Volume= 0.026 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.101	39	>75% Grass cover, Good, HSG A
0.109	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.252	74	Weighted Average
0.101		40.08% Pervious Area
0.151		59.92% Impervious Area
0.109		72.19% Unconnected

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

Subcatchment DA-1A: AREA TO CB'S 3 AND 4



Summary for Subcatchment DA-1B: AREA TO CB'S 1 AND 2

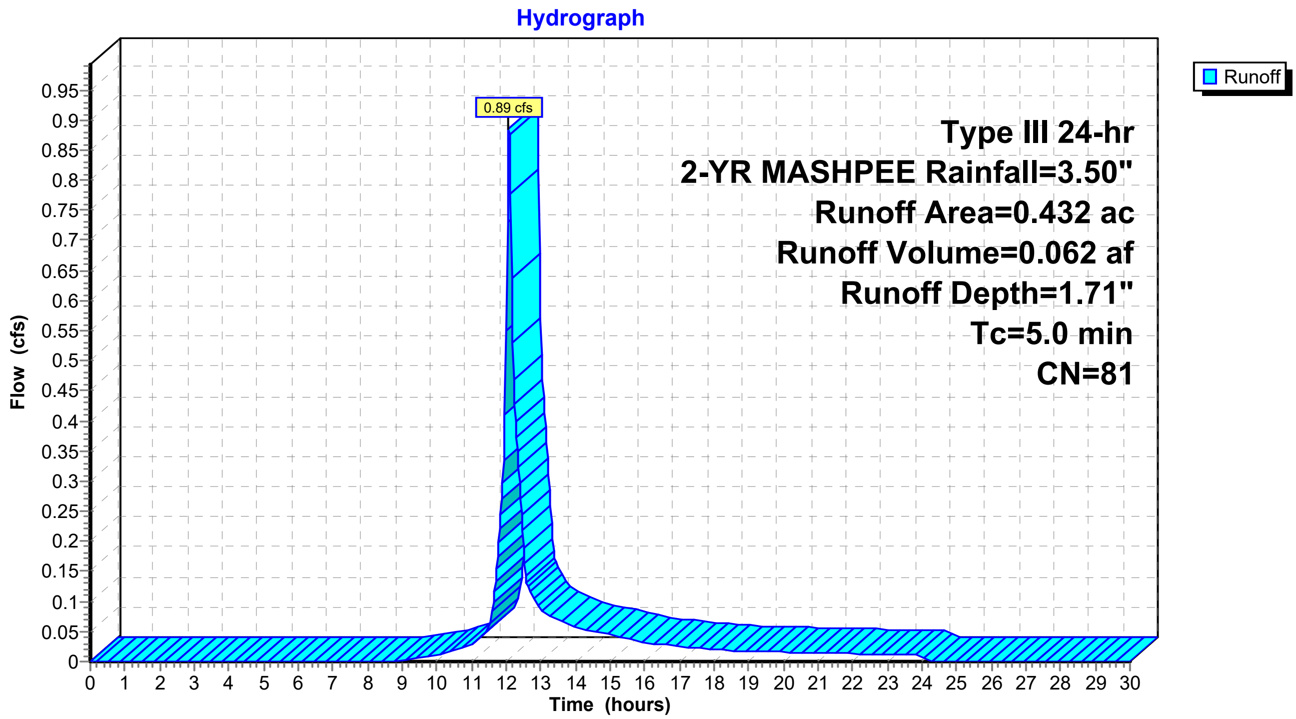
Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.062 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.137	98	Unconnected pavement, HSG A
0.127	39	Pasture/grassland/range, Good, HSG A
0.168	98	Roofs, HSG A
0.432	81	Weighted Average
0.127		29.40% Pervious Area
0.305		70.60% Impervious Area
0.137		44.92% Unconnected

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

Subcatchment DA-1B: AREA TO CB'S 1 AND 2



Summary for Subcatchment DA-1C: AREA TO FB1

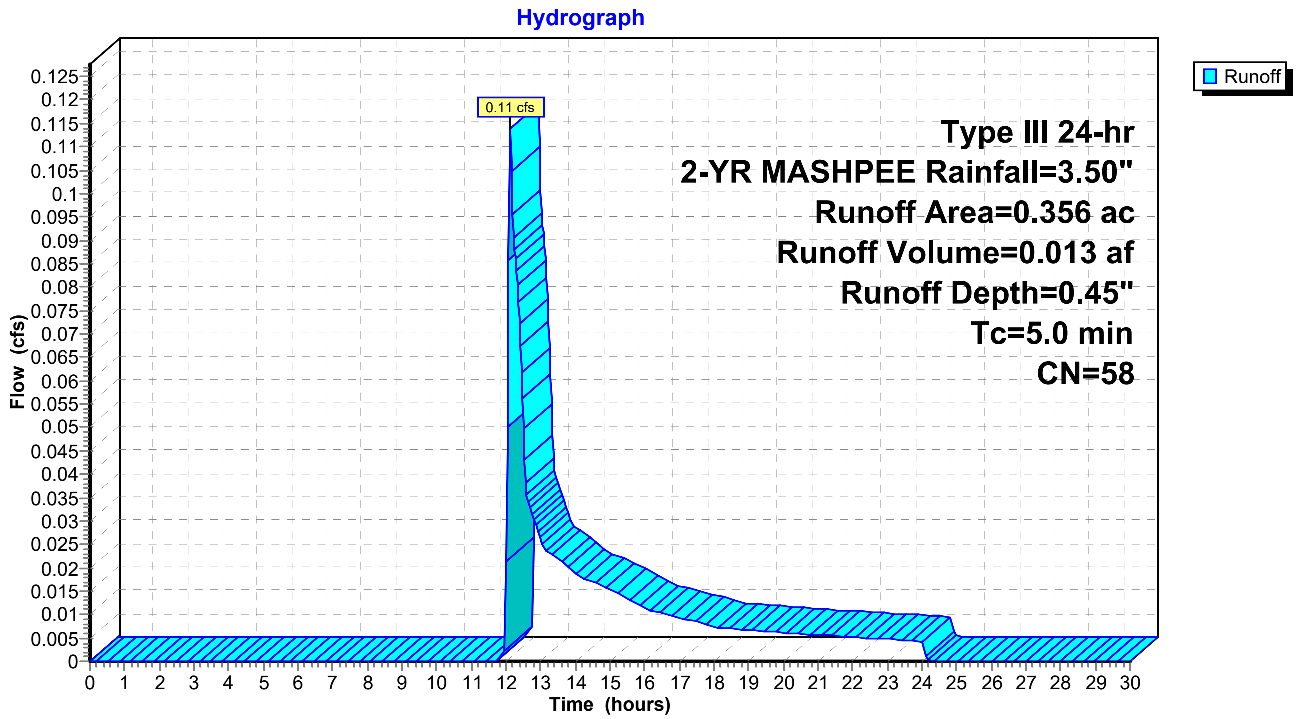
Runoff = 0.11 cfs @ 12.11 hrs, Volume= 0.013 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.240	39	>75% Grass cover, Good, HSG A
0.074	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.356	58	Weighted Average
0.240		67.42% Pervious Area
0.116		32.58% Impervious Area
0.074		63.79% Unconnected

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

Subcatchment DA-1C: AREA TO FB1



Summary for Subcatchment DA-2: END OF ROAD TO THE EAST

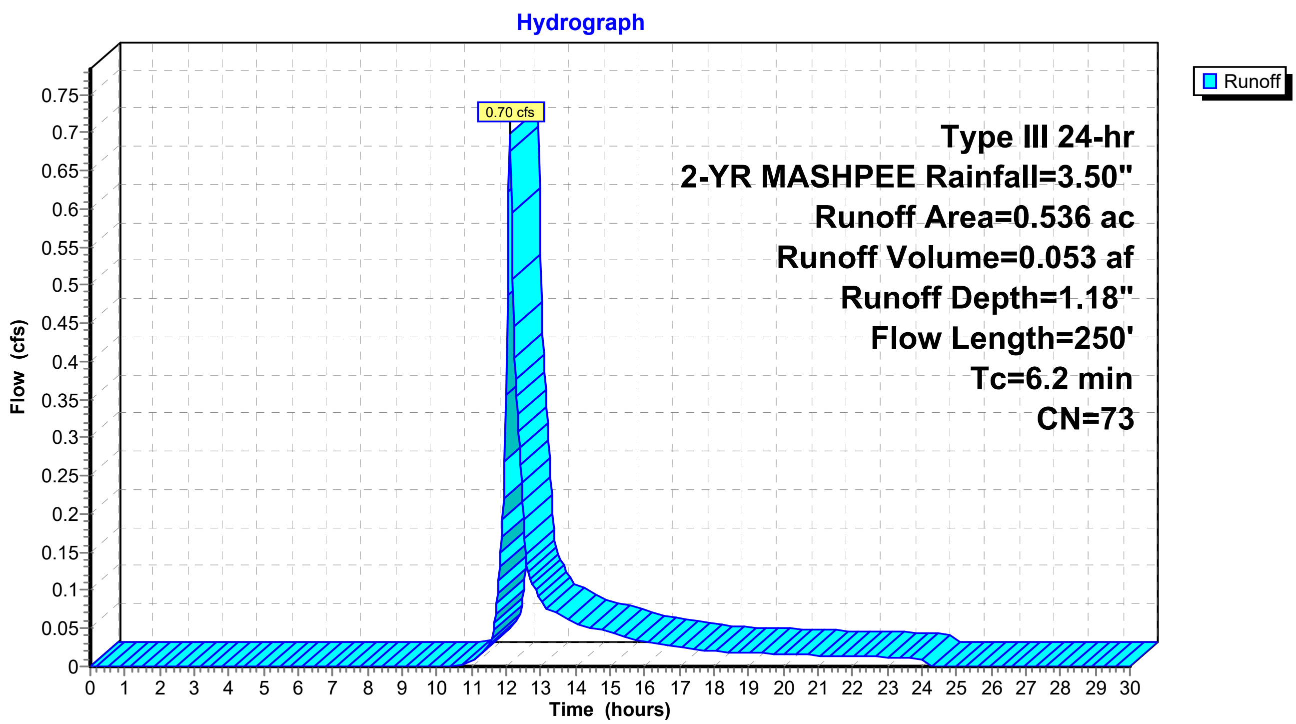
Runoff = 0.70 cfs @ 12.10 hrs, Volume= 0.053 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.225	39	>75% Grass cover, Good, HSG A
0.181	98	Unconnected pavement, HSG A
0.130	98	Roofs, HSG A
0.536	73	Weighted Average
0.225		41.98% Pervious Area
0.311		58.02% Impervious Area
0.181		58.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	30	0.0200	0.10		**Sheet Flow, LAWN** Grass: Dense n= 0.240 P2= 3.55"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow, ROAD** Paved Kv= 20.3 fps
0.5	140	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
6.2	250	Total			

Subcatchment DA-2: END OF ROAD TO THE EAST



Summary for Subcatchment DA-3: AREAS TO WEST

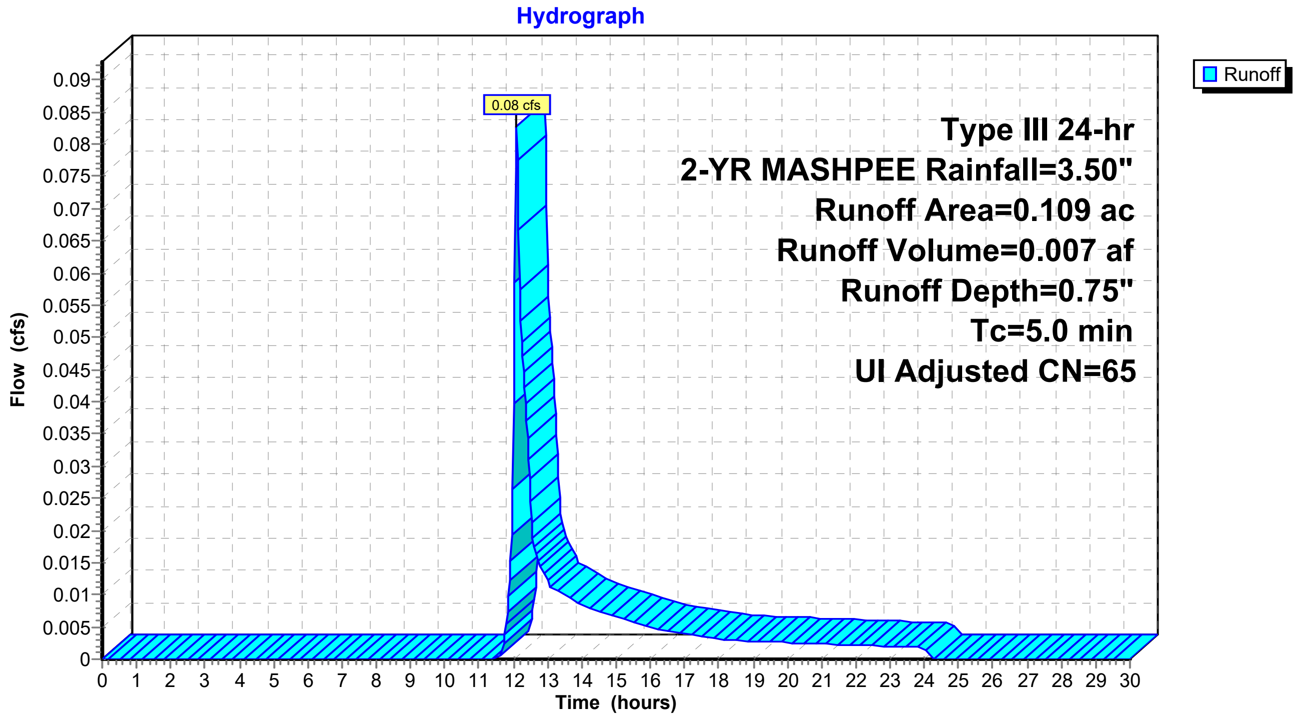
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Adj	Description
0.086	61		>75% Grass cover, Good, HSG B
0.023	98		Unconnected pavement, HSG B
0.109	69	65	Weighted Average, UI Adjusted
0.086			78.90% Pervious Area
0.023			21.10% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-3: AREAS TO WEST



Summary for Subcatchment DA-4: AREAS TO WEST

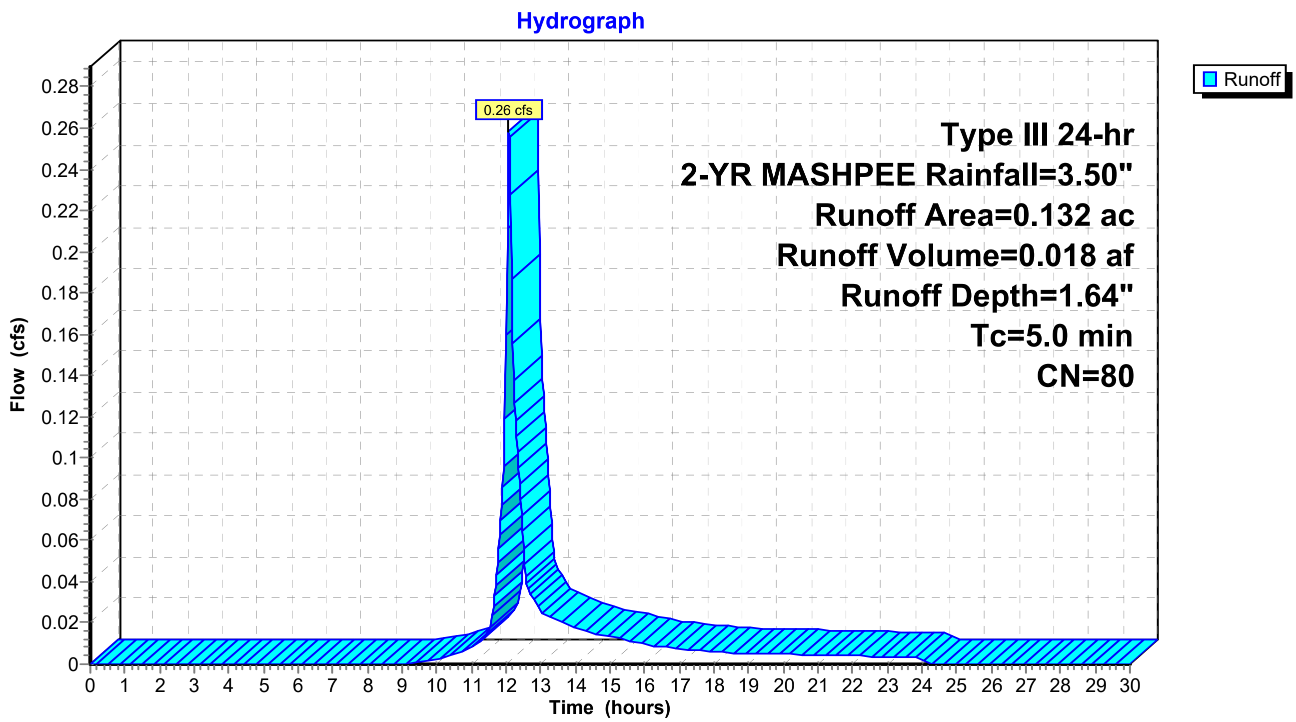
Runoff = 0.26 cfs @ 12.08 hrs, Volume= 0.018 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.065	61	>75% Grass cover, Good, HSG B
0.067	98	Unconnected pavement, HSG B
0.132	80	Weighted Average
0.065		49.24% Pervious Area
0.067		50.76% Impervious Area
0.067		100.00% Unconnected

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

Subcatchment DA-4: AREAS TO WEST



Summary for Subcatchment DA-5: AREAS TO WEST

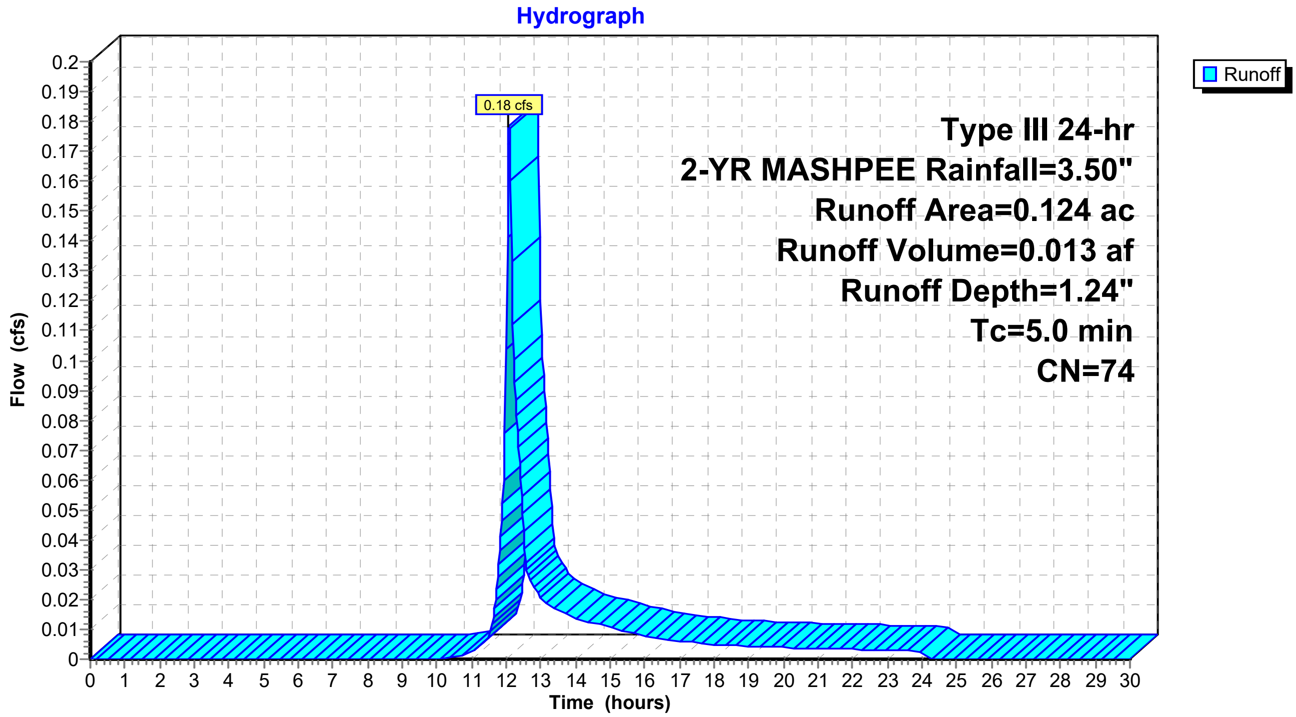
Runoff = 0.18 cfs @ 12.08 hrs, Volume= 0.013 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.051	39	>75% Grass cover, Good, HSG A
0.073	98	Unconnected pavement, HSG A
0.124	74	Weighted Average
0.051		41.13% Pervious Area
0.073		58.87% Impervious Area
0.073		100.00% Unconnected

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

Subcatchment DA-5: AREAS TO WEST



Summary for Subcatchment DA-6: AREAS TO WEST

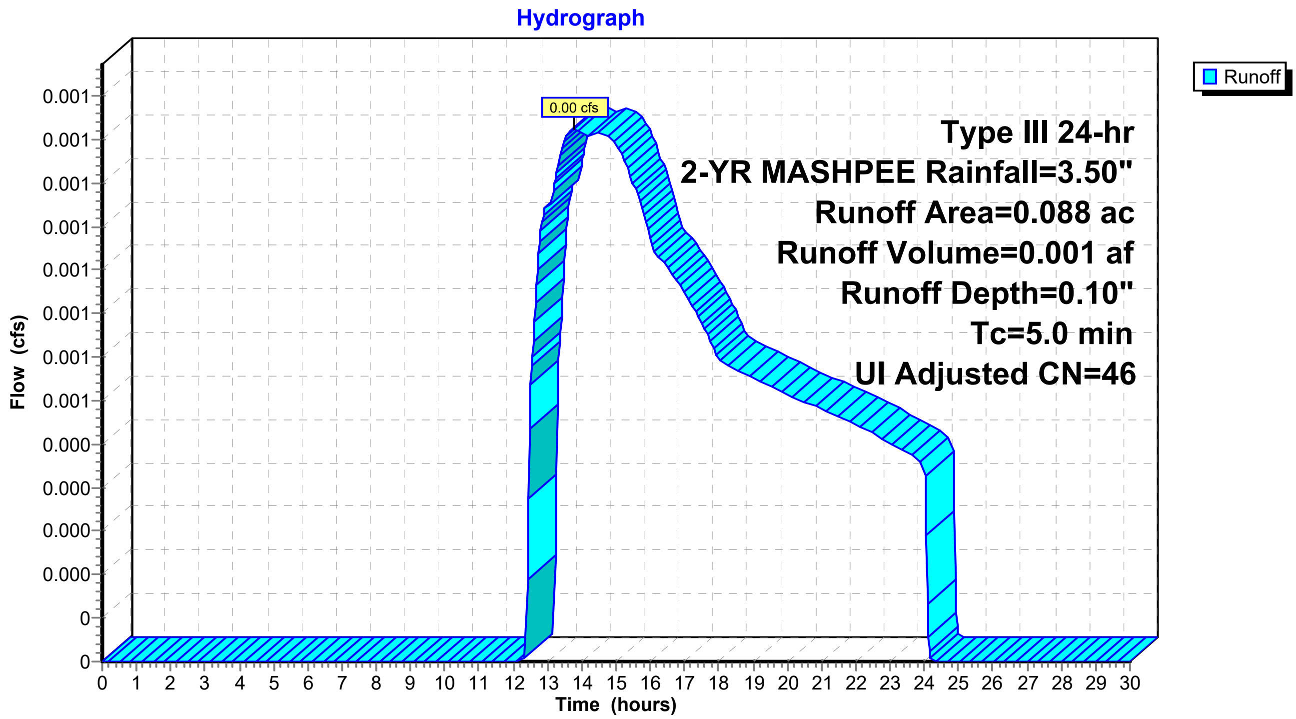
Runoff = 0.00 cfs @ 13.77 hrs, Volume= 0.001 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Adj	Description
0.073	39		>75% Grass cover, Good, HSG A
0.008	98		Unconnected pavement, HSG A
0.007	98		Roofs, HSG A
0.088	49	46	Weighted Average, UI Adjusted
0.073			82.95% Pervious Area
0.015			17.05% Impervious Area
0.008			53.33% Unconnected

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

Subcatchment DA-6: AREAS TO WEST



Summary for Subcatchment DA-7: AREAS TO WEST

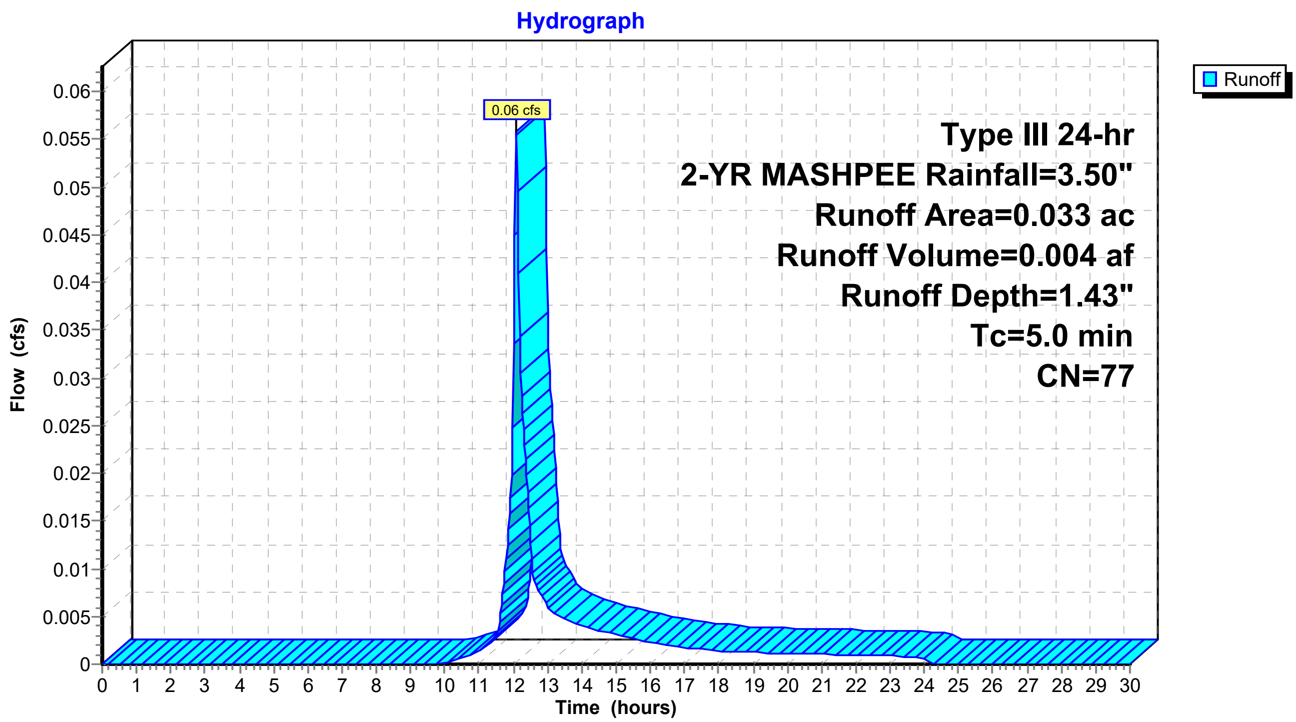
Runoff = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.012	39	>75% Grass cover, Good, HSG A
0.021	98	Unconnected pavement, HSG A
0.033	77	Weighted Average
0.012		36.36% Pervious Area
0.021		63.64% Impervious Area
0.021		100.00% Unconnected

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

Subcatchment DA-7: AREAS TO WEST



Summary for Subcatchment DA-8: AREAS TO WEST

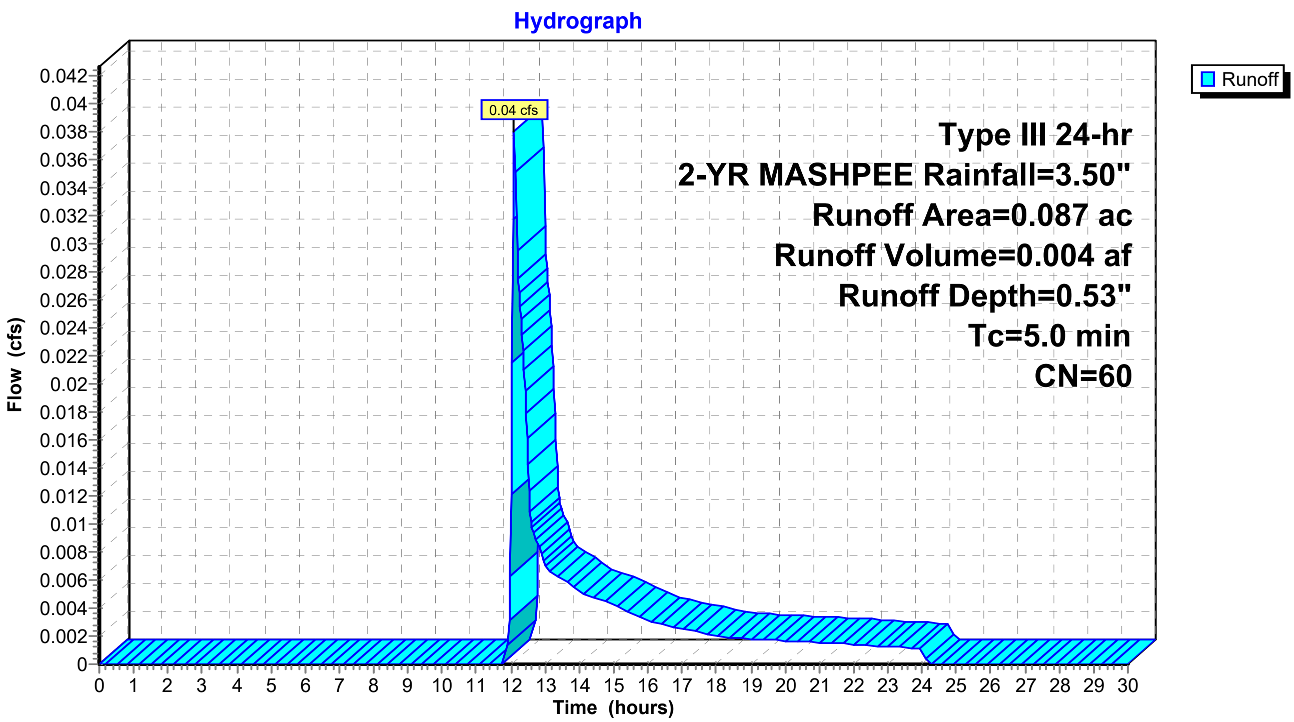
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.056	39	>75% Grass cover, Good, HSG A
0.031	98	Unconnected pavement, HSG A
0.087	60	Weighted Average
0.056		64.37% Pervious Area
0.031		35.63% Impervious Area
0.031		100.00% Unconnected

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

Subcatchment DA-8: AREAS TO WEST



Summary for Subcatchment DA-9: AREAS EAST OF ROAD

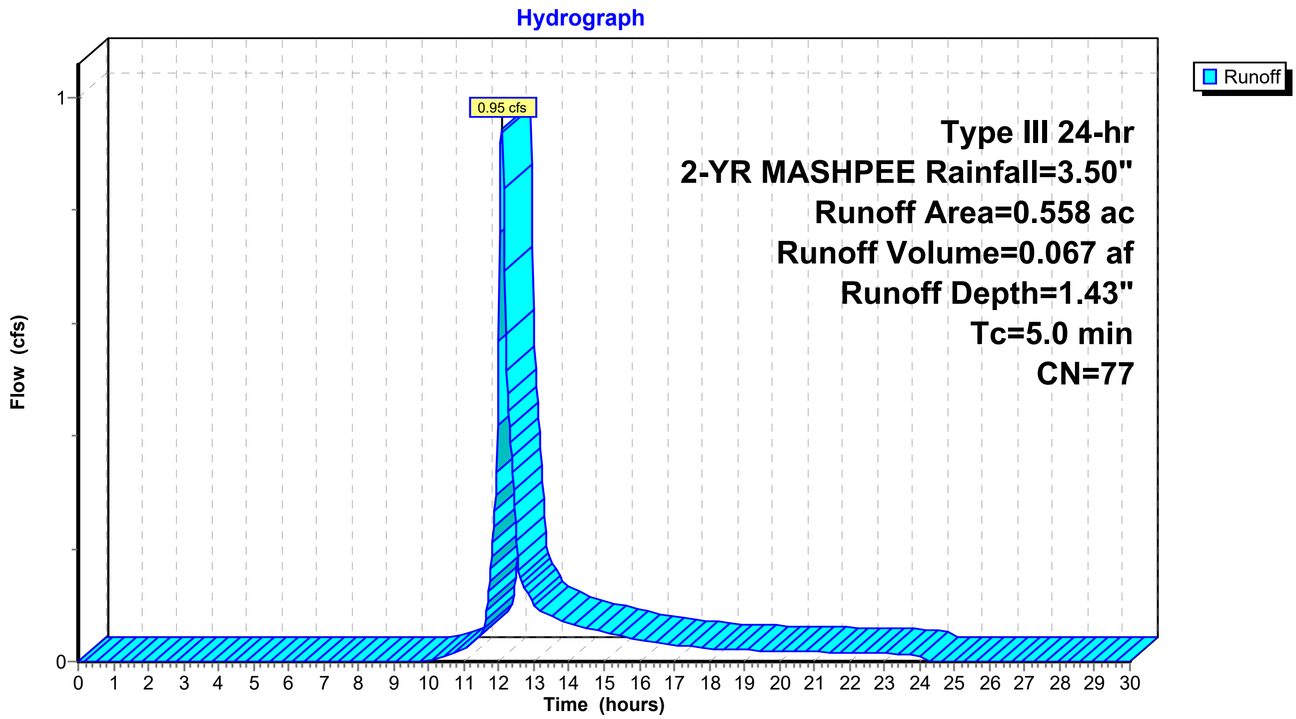
Runoff = 0.95 cfs @ 12.08 hrs, Volume= 0.067 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.194	39	>75% Grass cover, Good, HSG A
0.154	98	Unconnected pavement, HSG A
0.210	98	Roofs, HSG A
0.558	77	Weighted Average
0.194		34.77% Pervious Area
0.364		65.23% Impervious Area
0.154		42.31% Unconnected

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

Subcatchment DA-9: AREAS EAST OF ROAD



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

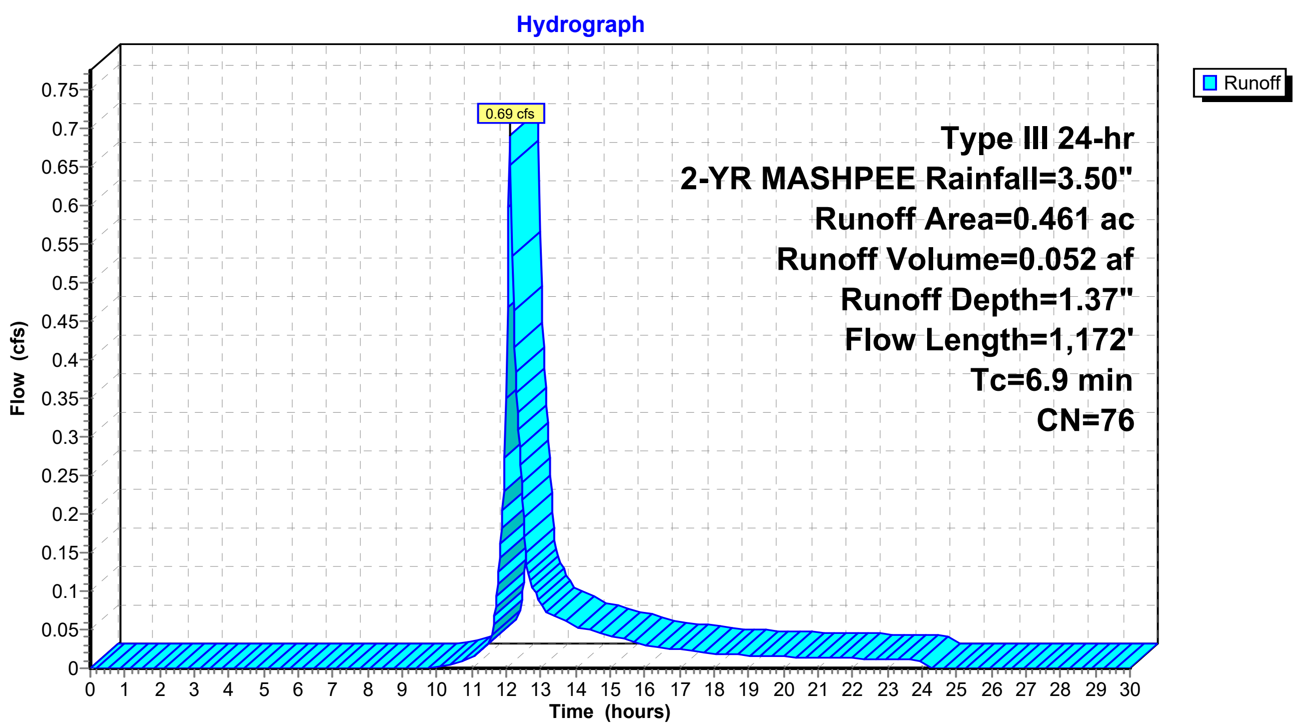
Runoff = 0.69 cfs @ 12.11 hrs, Volume= 0.052 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3

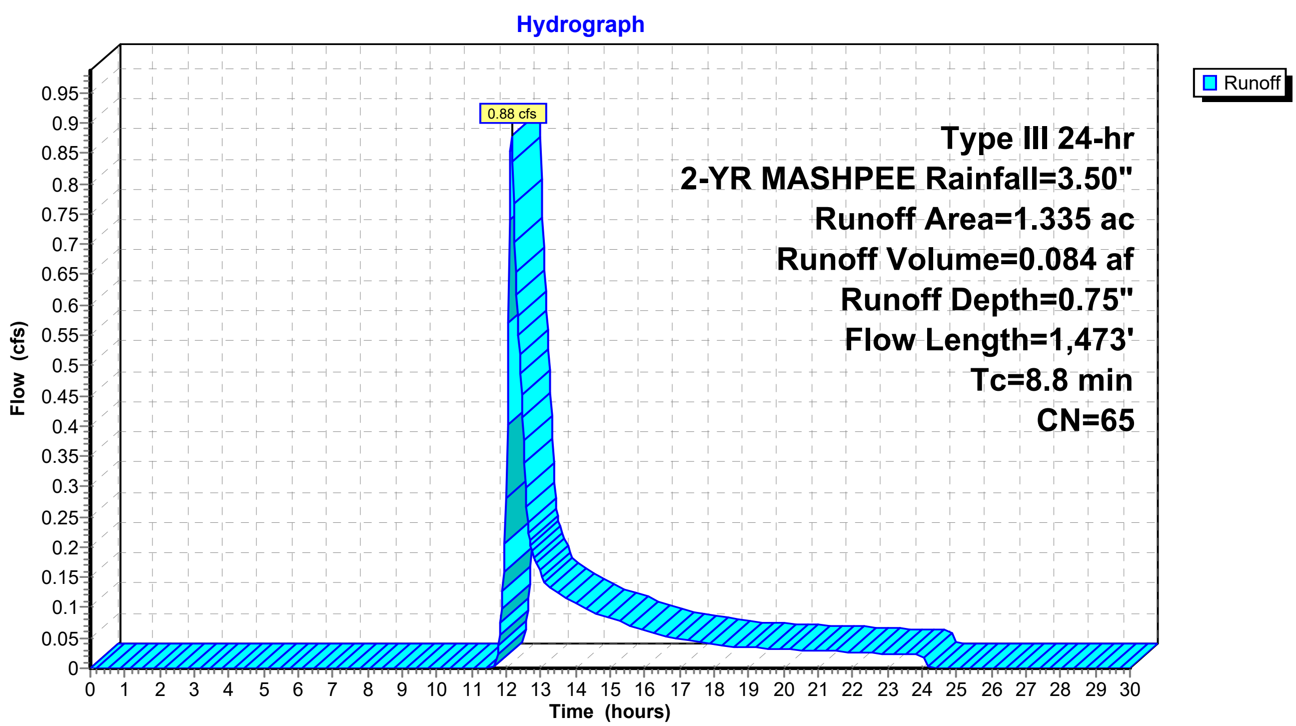
Runoff = 0.88 cfs @ 12.15 hrs, Volume= 0.084 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3



Summary for Subcatchment DA44: North of Quin

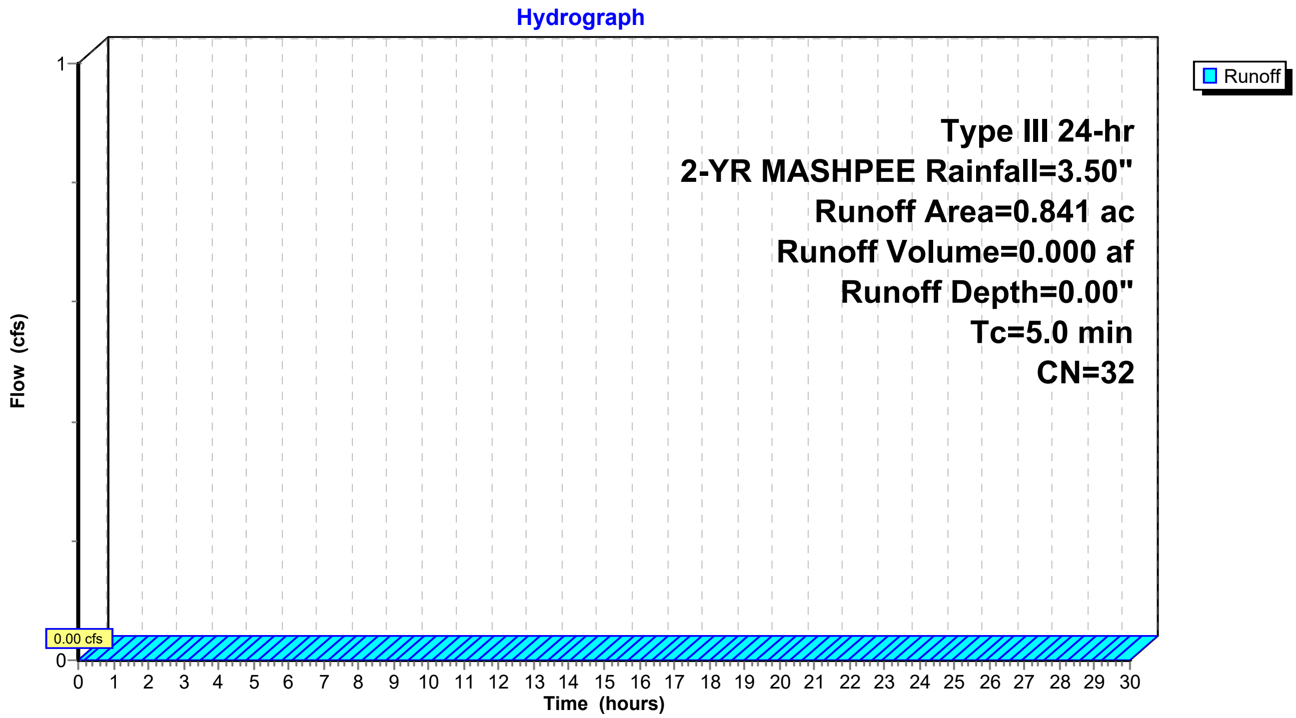
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA44: North of Quin



Summary for Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR

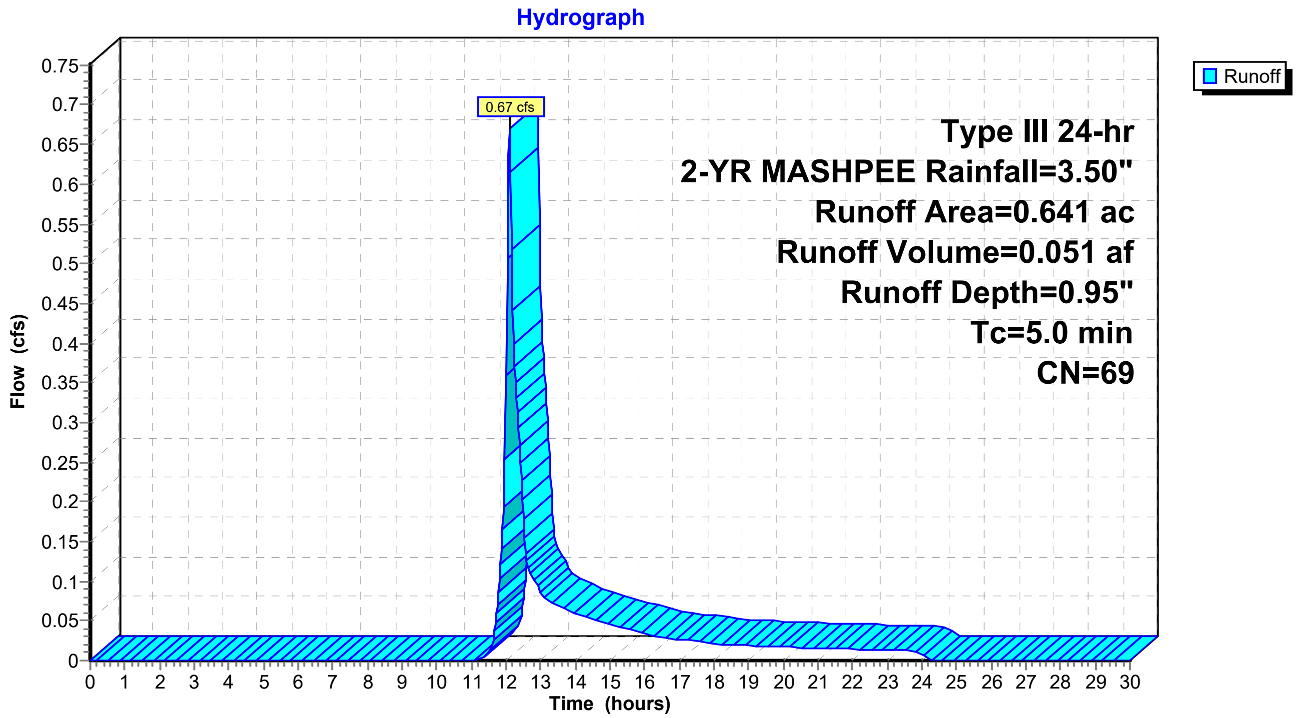
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 0.051 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA77: AREAS TO WETLAND TO EAST

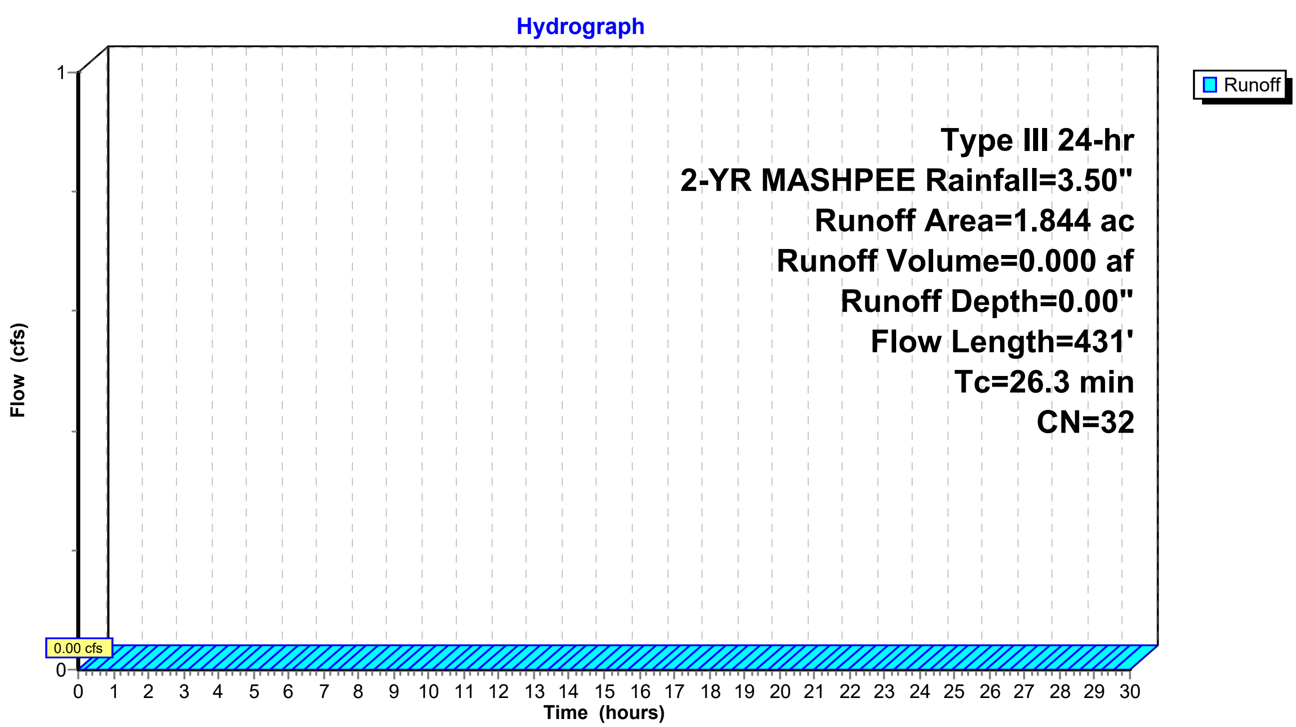
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR MASHPEE Rainfall=3.50"

Area (ac)	CN	Description
0.476	39	>75% Grass cover, Good, HSG A
1.201	30	Woods, Good, HSG A
0.167	30	Woods, Good, HSG A
1.844	32	Weighted Average
1.844		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA77: AREAS TO WETLAND TO EAST



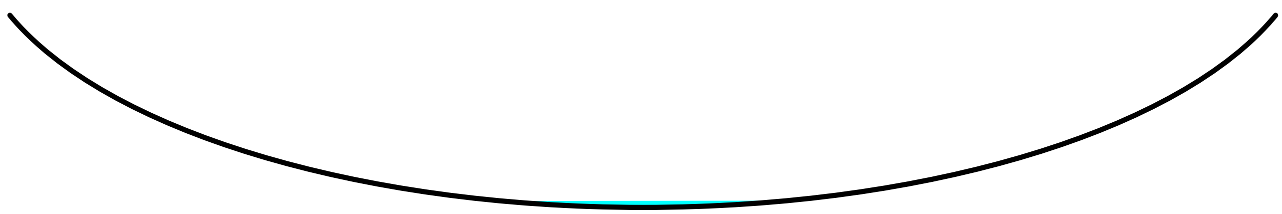
Summary for Reach R1: Tt along stream

Inflow Area = 1.366 ac, 18.52% Impervious, Inflow Depth = 0.10" for 2-YR MASHPEE event
Inflow = 0.21 cfs @ 12.18 hrs, Volume= 0.011 af
Outflow = 0.05 cfs @ 12.52 hrs, Volume= 0.011 af, Atten= 78%, Lag= 20.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.28 fps, Min. Travel Time= 33.0 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 58.8 min

Peak Storage= 89 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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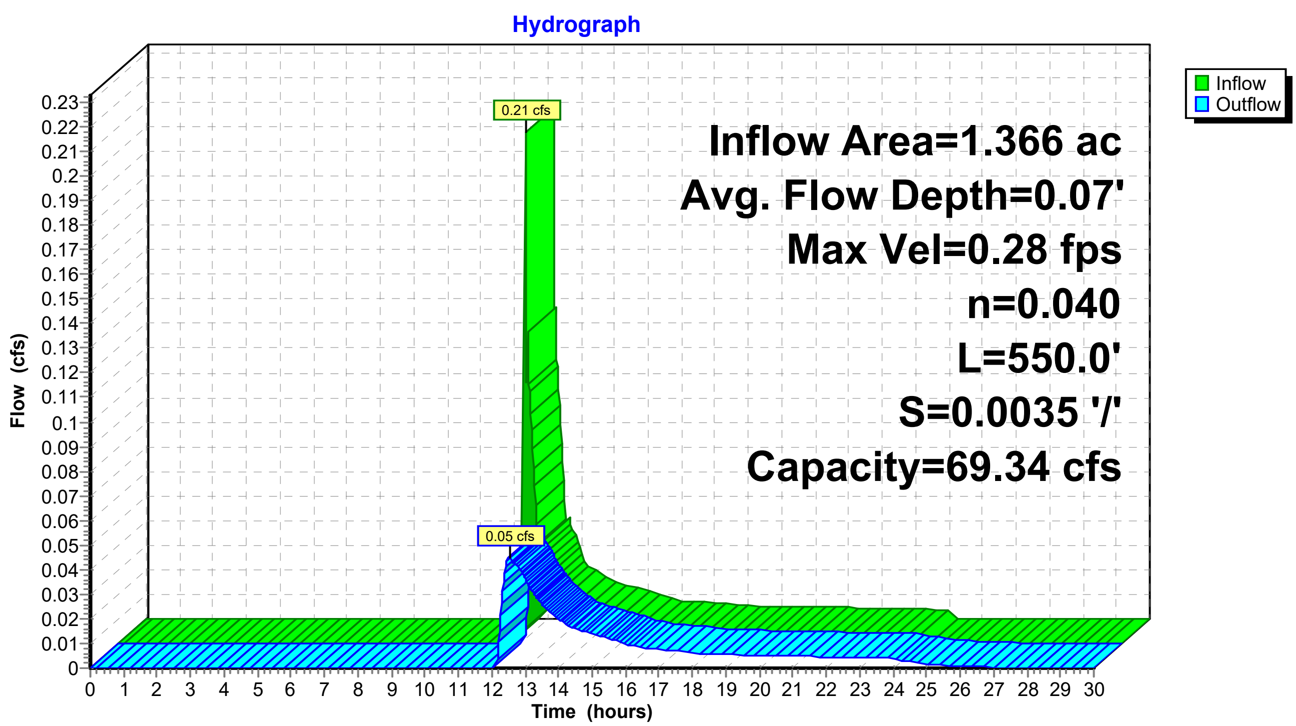
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth > 0.01" for 2-YR MASHPEE event
Inflow = 0.00 cfs @ 24.28 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 25.42 hrs, Volume= 0.003 af, Atten= 3%, Lag= 68.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.15 fps, Min. Travel Time= 59.5 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 59.5 min

Peak Storage= 12 cf @ 25.42 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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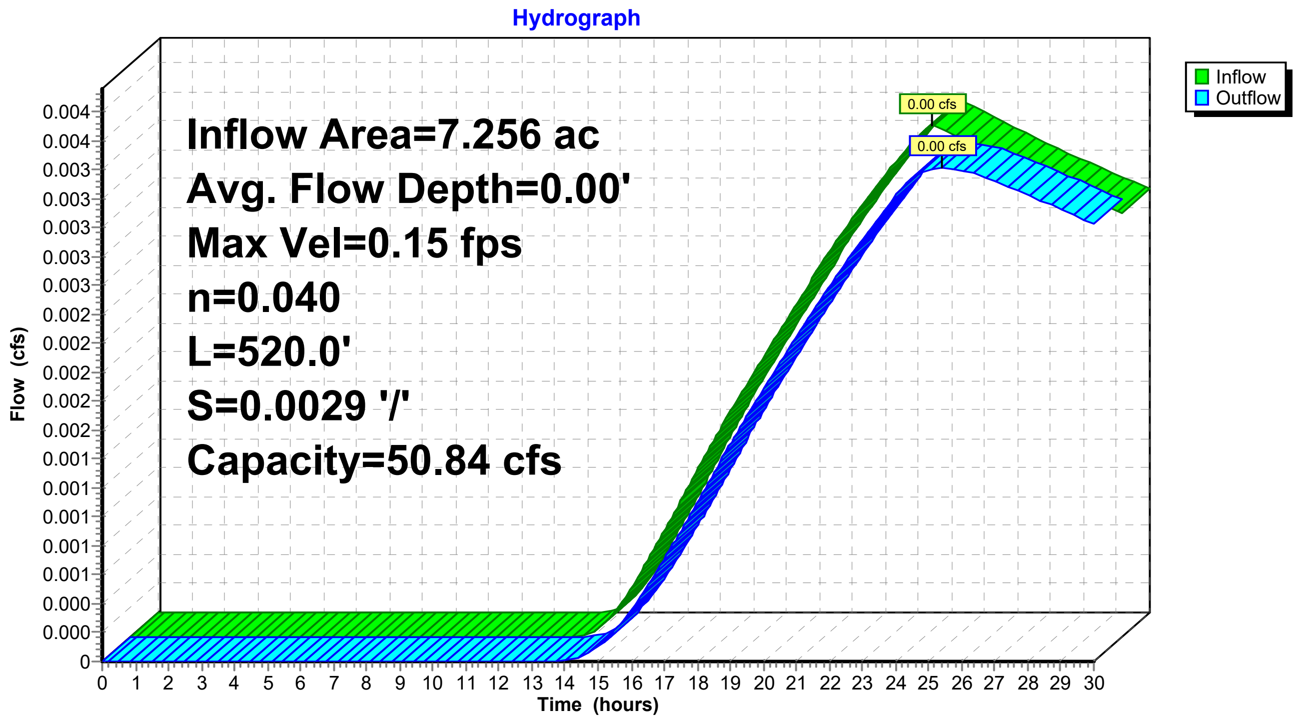
Reach R1A: Tt thru bogs



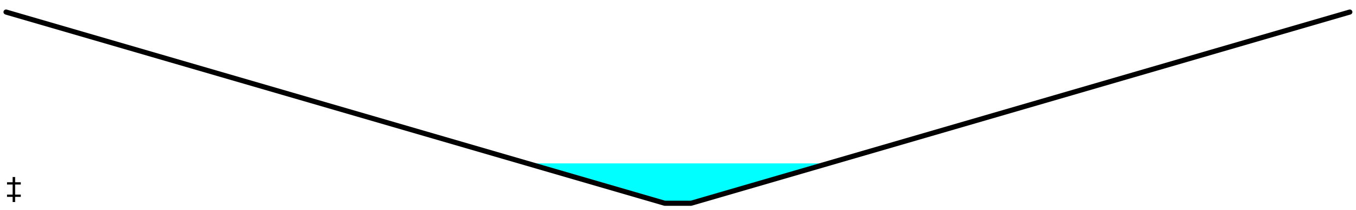
Summary for Reach R2: Tt thru da77

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 0.43" for 2-YR MASHPEE event
Inflow = 0.99 cfs @ 12.24 hrs, Volume= 0.101 af
Outflow = 0.93 cfs @ 12.30 hrs, Volume= 0.101 af, Atten= 6%, Lag= 3.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.71 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 11.0 min

Peak Storage= 273 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 26.0 sf, Capacity= 50.53 cfs

2.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 100.0 '/' Top Width= 102.00'
Length= 210.0' Slope= 0.0095 '/'
Inlet Invert= 17.00', Outlet Invert= 15.00'



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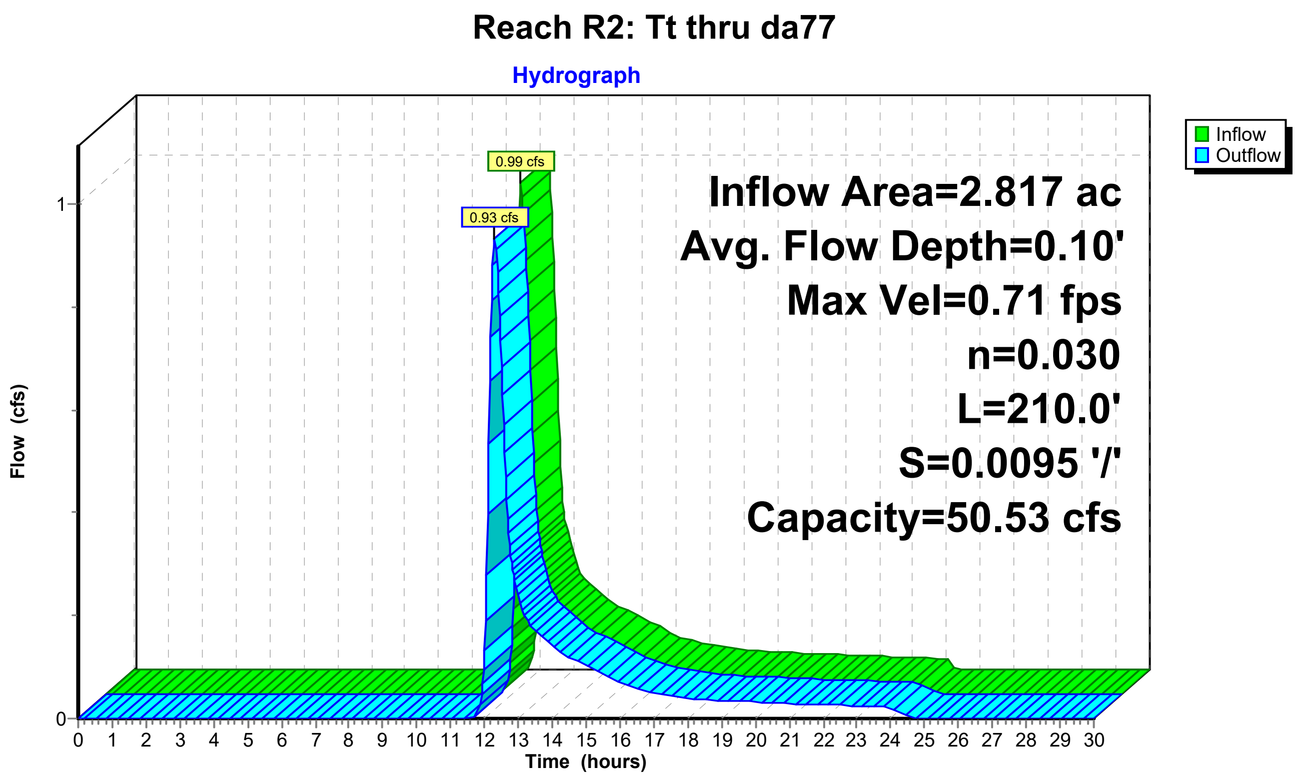


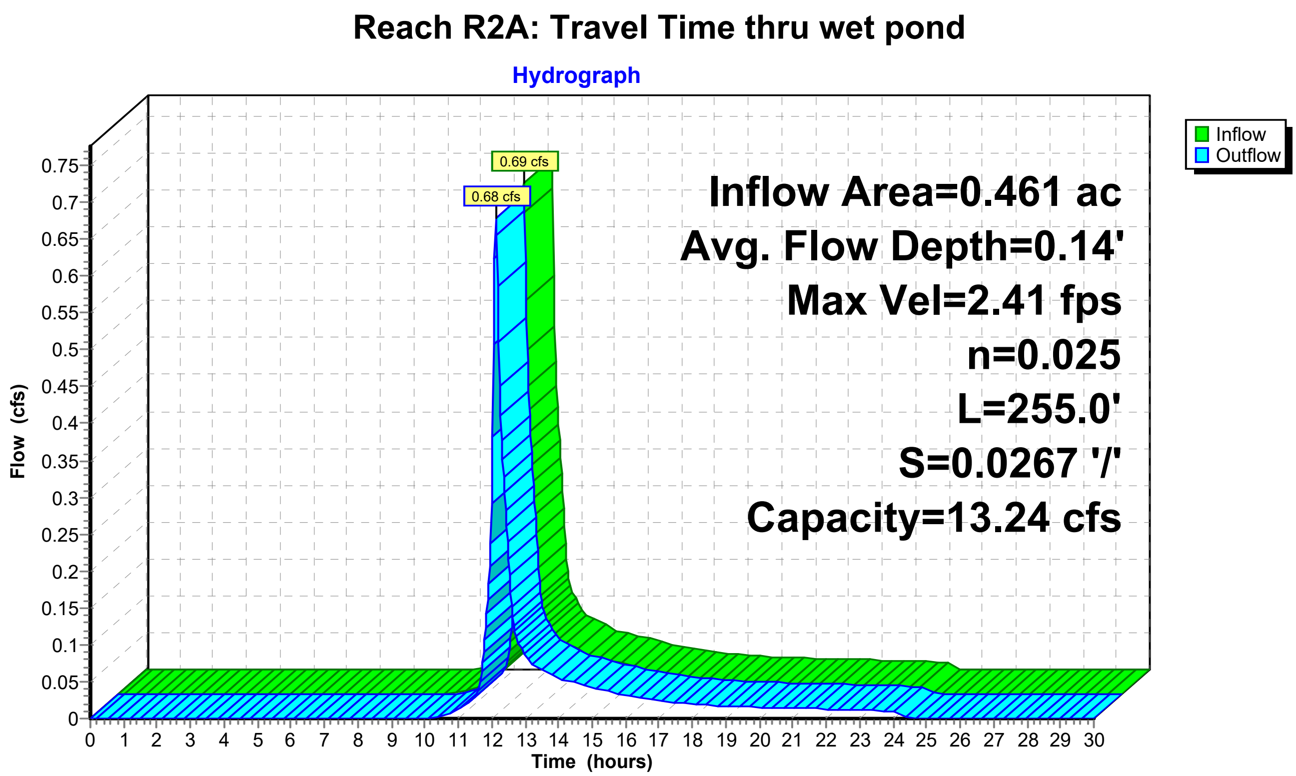
Summary for Reach R2A: Travel Time thru wet pond

Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 1.37" for 2-YR MASHPEE event
Inflow = 0.69 cfs @ 12.11 hrs, Volume= 0.052 af
Outflow = 0.68 cfs @ 12.13 hrs, Volume= 0.052 af, Atten= 2%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.41 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 5.9 min

Peak Storage= 72 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'



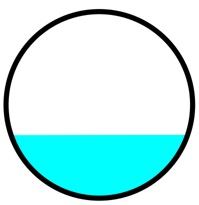
Summary for Reach R3: 18" CPP

Inflow Area = 0.684 ac, 66.67% Impervious, Inflow Depth = 1.54" for 2-YR MASHPEE event
Inflow = 1.25 cfs @ 12.08 hrs, Volume= 0.088 af
Outflow = 1.25 cfs @ 12.09 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.5 min

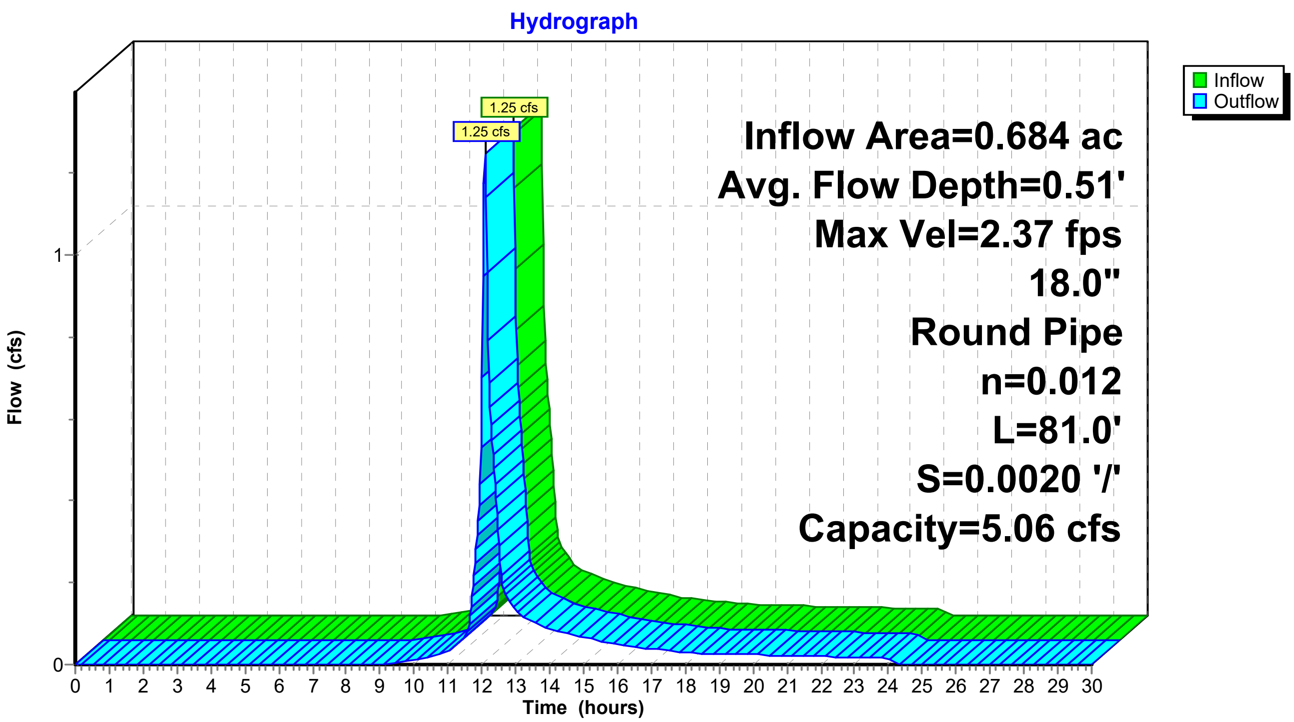
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.37 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 1.6 min

Peak Storage= 43 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.06 cfs

18.0" Round Pipe
n= 0.012
Length= 81.0' Slope= 0.0020 '/'
Inlet Invert= 15.06', Outlet Invert= 14.90'



Reach R3: 18" CPP



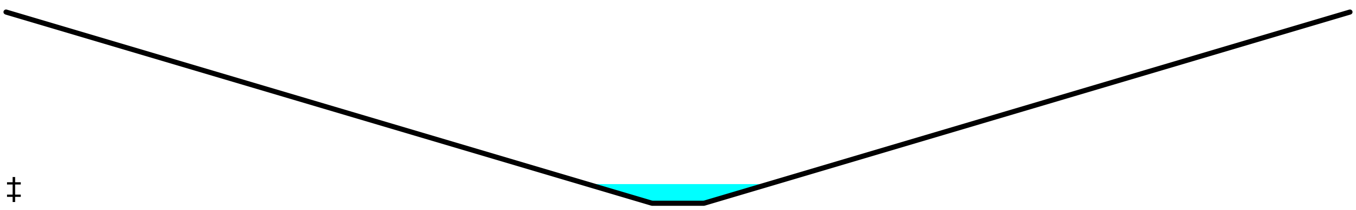
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 0.33" for 2-YR MASHPEE event
Inflow = 0.38 cfs @ 12.21 hrs, Volume= 0.017 af
Outflow = 0.31 cfs @ 12.29 hrs, Volume= 0.017 af, Atten= 18%, Lag= 5.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 1.39 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 6.1 min

Peak Storage= 55 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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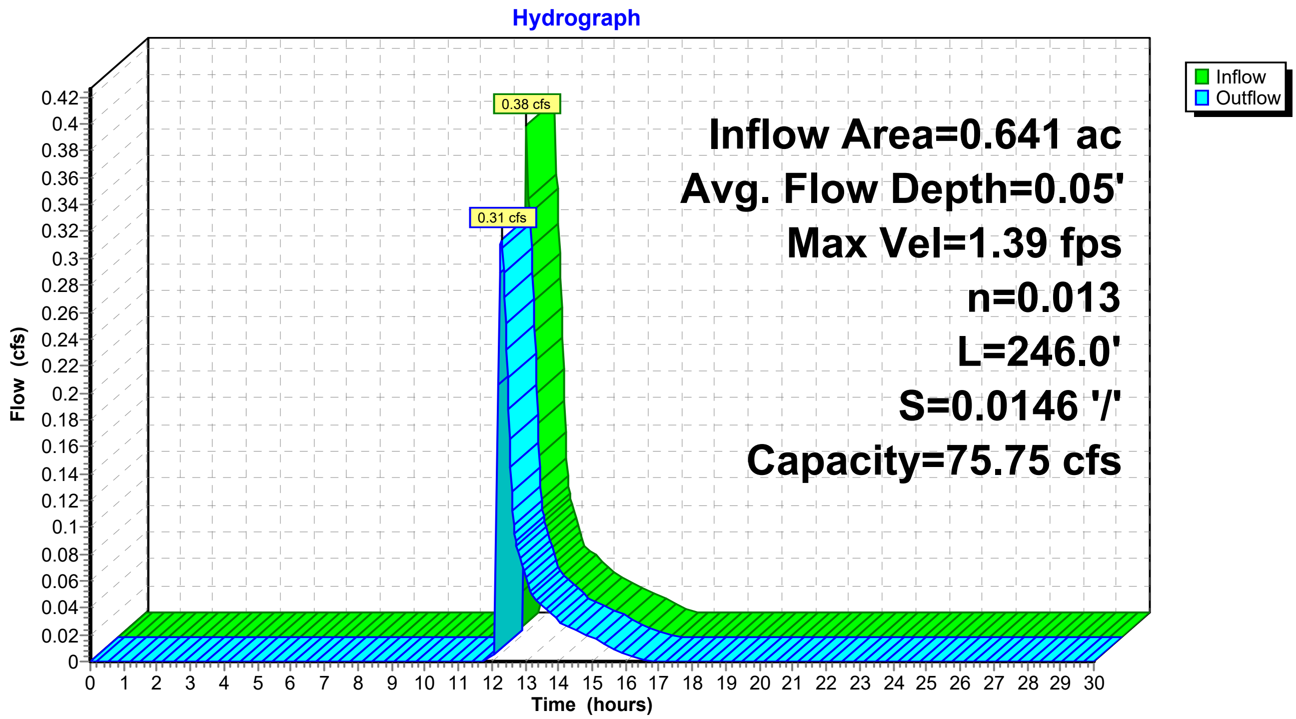
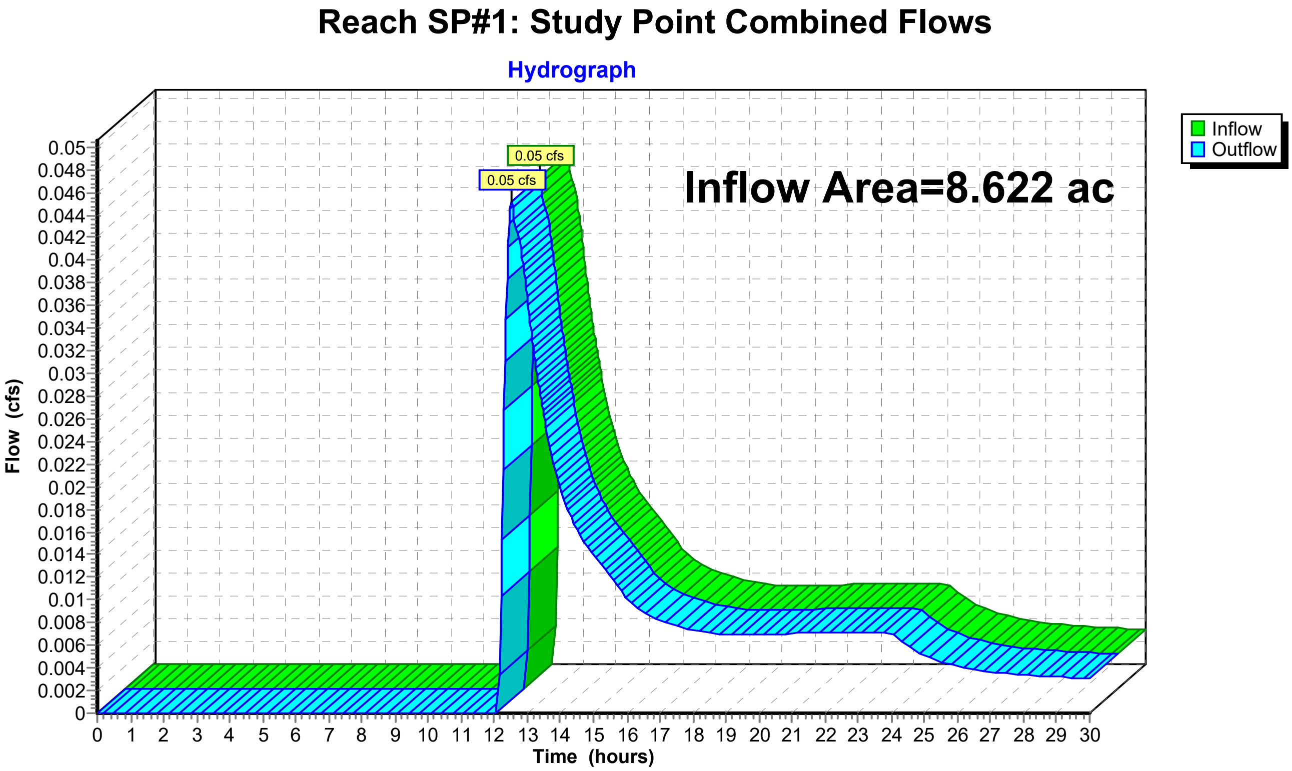
Reach R5: Tt thru da22B



Summary for Reach SP#1: Study Point Combined Flows

Inflow Area = 8.622 ac, 31.29% Impervious, Inflow Depth > 0.02" for 2-YR MASHPEE event
Inflow = 0.05 cfs @ 12.52 hrs, Volume= 0.014 af
Outflow = 0.05 cfs @ 12.52 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 0.95" for 2-YR MASHPEE event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.41 cfs @ 12.21 hrs, Volume= 0.051 af, Atten= 39%, Lag= 7.2 min
Discarded = 0.03 cfs @ 11.76 hrs, Volume= 0.033 af
Primary = 0.38 cfs @ 12.21 hrs, Volume= 0.017 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 20.64' @ 12.27 hrs Surf.Area= 576 sf Storage= 448 cf

Plug-Flow detention time= 114.3 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 114.5 min (986.2 - 871.7)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2
			707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

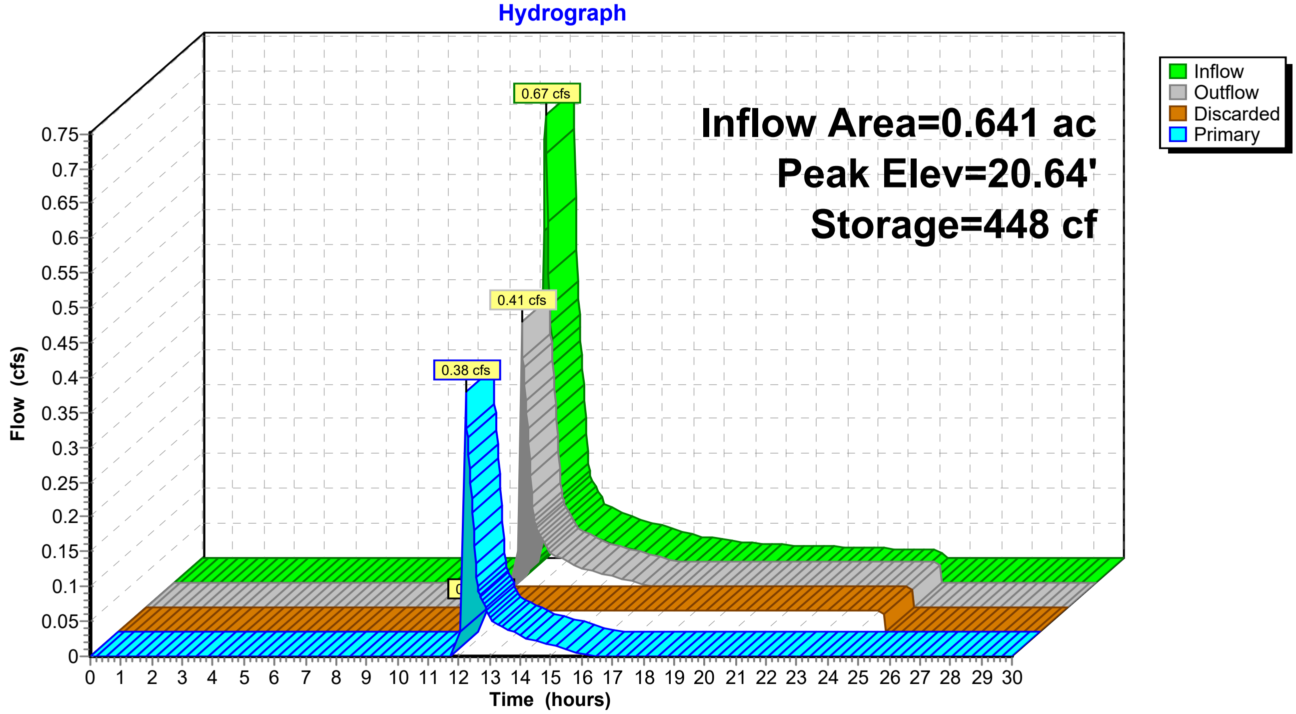
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'**
			Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir**
			Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 11.76 hrs HW=13.63' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.38 cfs @ 12.21 hrs HW=20.64' TW=20.62' (Dynamic Tailwater)
└**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.38 cfs @ 0.54 fps)

Pond 1P: LB's


Hydrograph
Inflow
Outflow
Discarded
Primary
0.67 cfs
0.41 cfs
0.38 cfs
Inflow Area=0.641 ac
Peak Elev=20.64'
Storage=448 cf
Flow (cfs)
Time (hours)
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Summary for Pond 2P: Natural Low Area

Inflow Area = 0.841 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR MASHPEE event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.01' @ 0.00 hrs Surf.Area= 1 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

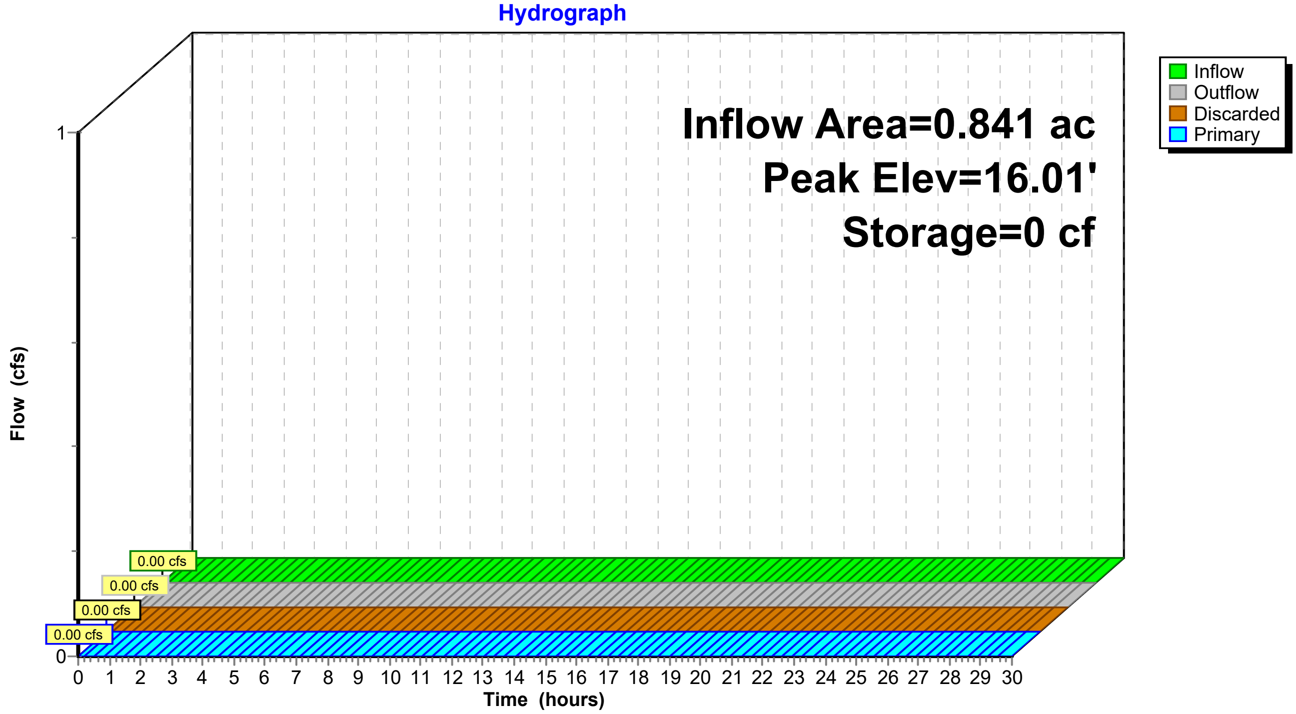
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	7,467	4,103	4,469

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.58'	**50.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' (Free Discharge)
└─**1=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3A-P: Pond 3A

Inflow Area = 0.109 ac, 21.10% Impervious, Inflow Depth = 0.75" for 2-YR MASHPEE event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 13.35 hrs, Volume= 0.007 af, Atten= 87%, Lag= 75.2 min
Discarded = 0.01 cfs @ 13.35 hrs, Volume= 0.007 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.33' @ 13.35 hrs Surf.Area= 442 sf Storage= 97 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 106.4 min (992.5 - 886.1)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	520 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

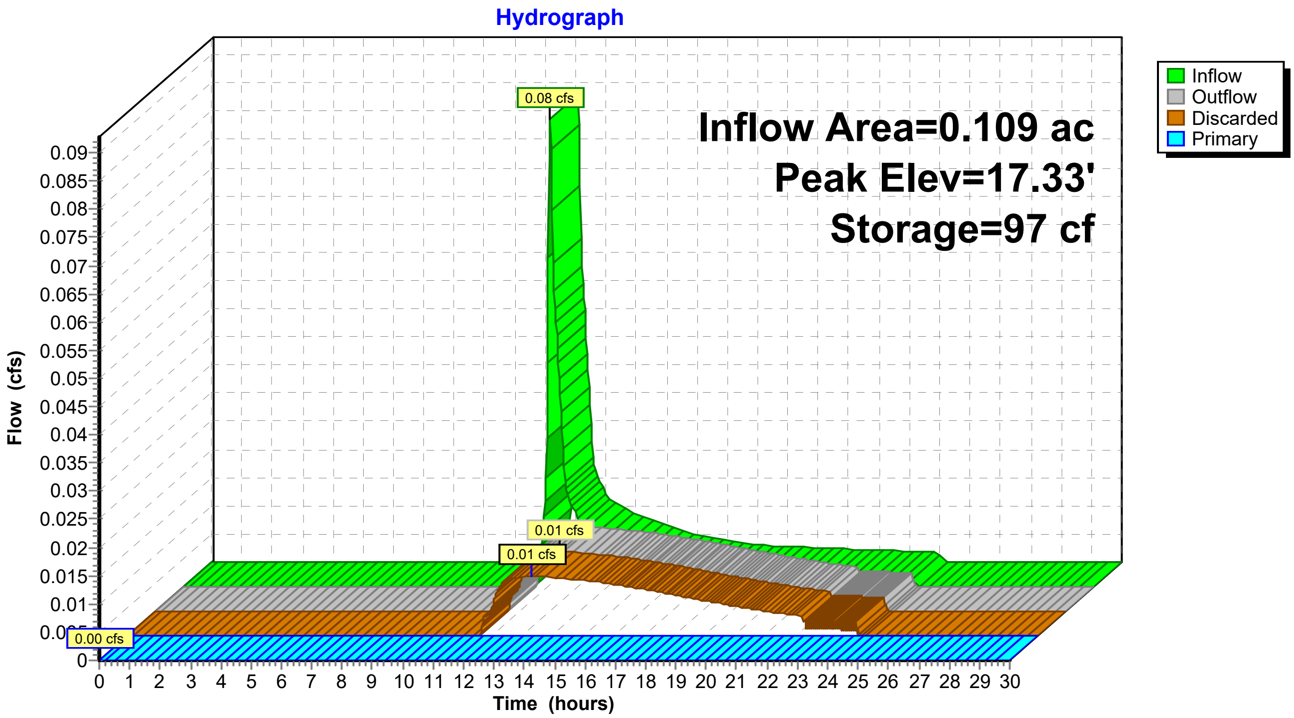
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	144	0	0
17.50	594	185	185
18.00	749	336	520

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	17.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 13.35 hrs HW=17.33' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3A-P: Pond 3A



Summary for Pond 3P: Wet Pond

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth = 0.09" for 2-YR MASHPEE event
Inflow = 0.68 cfs @ 12.13 hrs, Volume= 0.052 af
Outflow = 0.00 cfs @ 24.28 hrs, Volume= 0.003 af, Atten= 99%, Lag= 729.0 min
Primary = 0.00 cfs @ 24.28 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 14.26' @ 24.28 hrs Surf.Area= 13,904 sf Storage= 2,214 cf

Plug-Flow detention time= 745.4 min calculated for 0.003 af (6% of inflow)
Center-of-Mass det. time= 578.5 min (1,433.9 - 855.5)

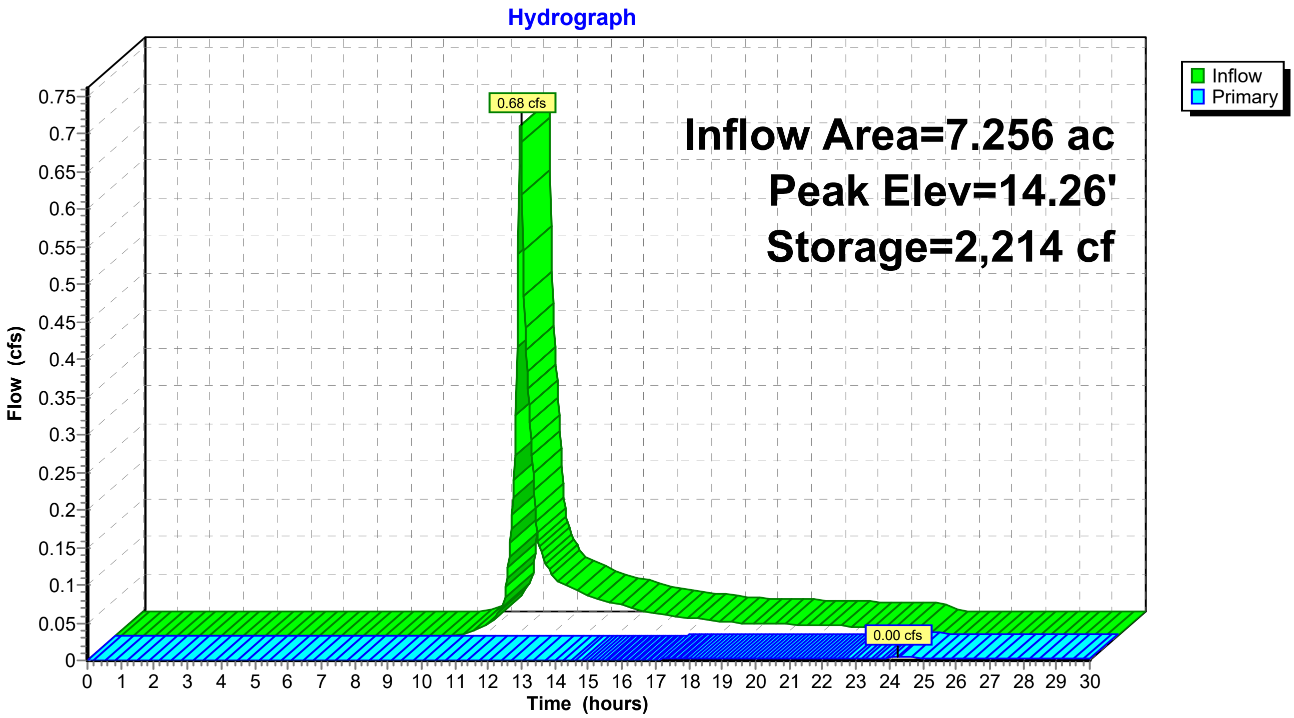
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	38,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,319	1,337	1,338
15.00	20,594	13,565	14,904
16.00	25,633	23,114	38,017

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**8.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Primary	15.75'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 24.28 hrs HW=14.26' TW=14.20' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.00 cfs @ 0.31 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Summary for Pond 4P: Pond 4

Inflow Area = 0.132 ac, 50.76% Impervious, Inflow Depth = 1.64" for 2-YR MASHPEE event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 0.018 af
Outflow = 0.22 cfs @ 12.18 hrs, Volume= 0.018 af, Atten= 15%, Lag= 6.3 min
Discarded = 0.01 cfs @ 12.18 hrs, Volume= 0.013 af
Primary = 0.21 cfs @ 12.18 hrs, Volume= 0.005 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.01' @ 12.18 hrs Surf.Area= 458 sf Storage= 236 cf

Plug-Flow detention time= 203.1 min calculated for 0.018 af (99% of inflow)
Center-of-Mass det. time= 196.1 min (1,033.4 - 837.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	253 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

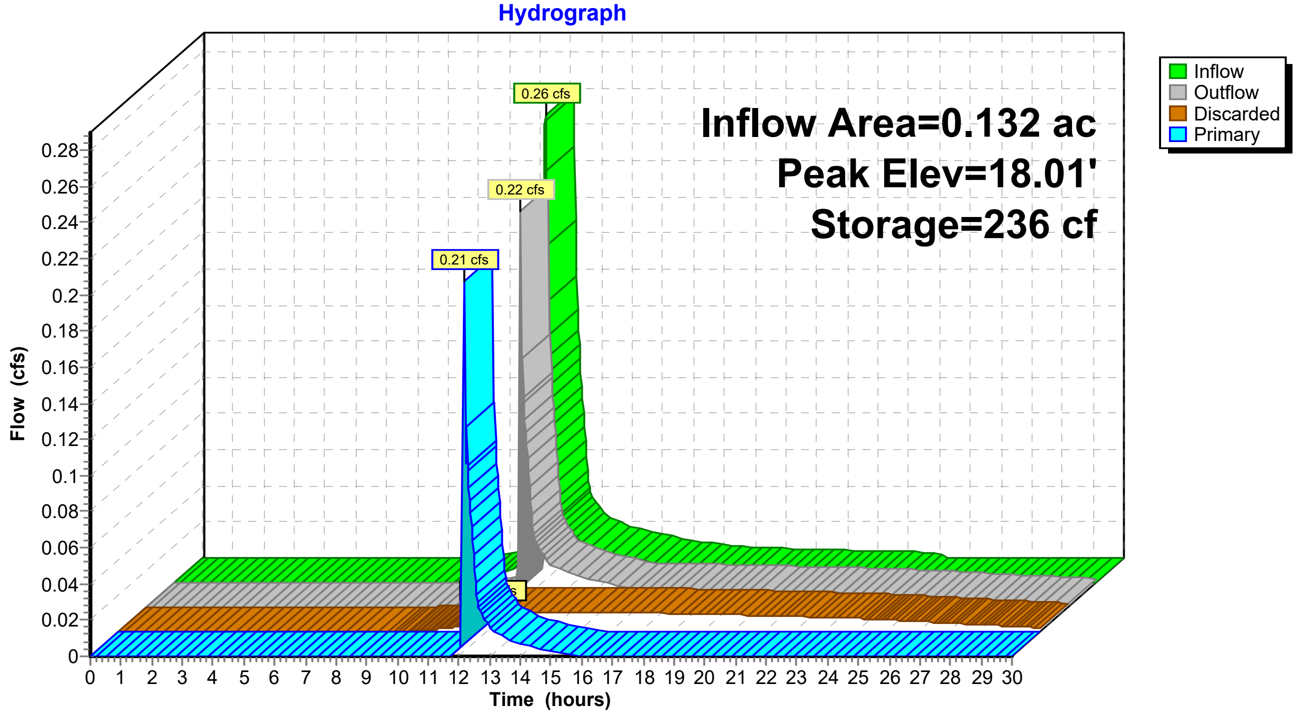
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	10	0	0
18.00	450	230	230
18.05	478	23	253

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.18 hrs HW=18.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.19 cfs @ 12.18 hrs HW=18.01' TW=14.62' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.37 fps)

Pond 4P: Pond 4



Summary for Pond 5P: Pond 5

Inflow Area = 0.124 ac, 58.87% Impervious, Inflow Depth = 1.24" for 2-YR MASHPEE event
Inflow = 0.18 cfs @ 12.08 hrs, Volume= 0.013 af
Outflow = 0.03 cfs @ 12.67 hrs, Volume= 0.013 af, Atten= 84%, Lag= 35.0 min
Discarded = 0.02 cfs @ 12.67 hrs, Volume= 0.012 af
Primary = 0.01 cfs @ 12.67 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 19.00' @ 12.67 hrs Surf.Area= 286 sf Storage= 228 cf

Plug-Flow detention time= 190.0 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 190.1 min (1,045.8 - 855.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	244 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

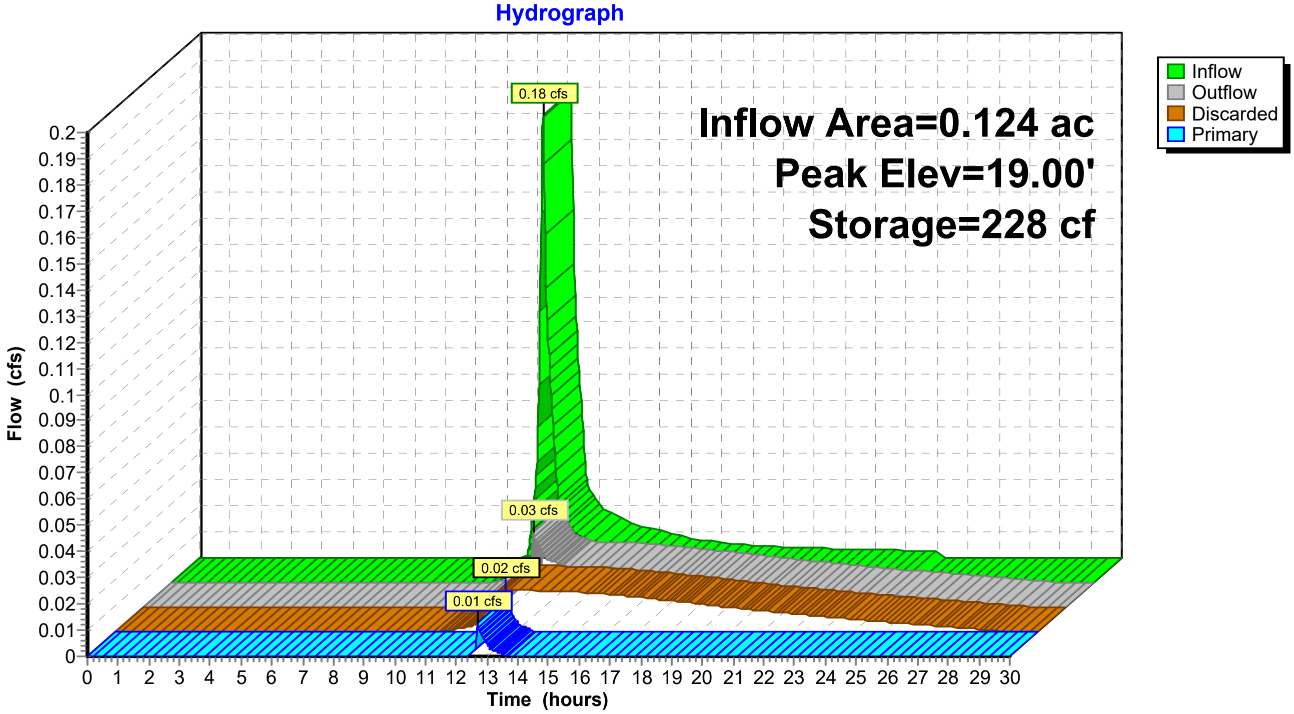
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	1	0	0
18.00	86	44	44
19.00	282	184	228
19.05	366	16	244

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.67 hrs HW=19.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.01 cfs @ 12.67 hrs HW=19.00' TW=14.66' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.15 fps)

Pond 5P: Pond 5



Summary for Pond 6P: Pond 6

Inflow Area = 0.088 ac, 17.05% Impervious, Inflow Depth = 0.10" for 2-YR MASHPEE event
Inflow = 0.00 cfs @ 13.77 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 14.71 hrs, Volume= 0.001 af, Atten= 1%, Lag= 56.0 min
Discarded = 0.00 cfs @ 14.71 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.06' @ 14.71 hrs Surf.Area= 22 sf Storage= 1 cf

Plug-Flow detention time= 7.1 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 7.1 min (1,043.7 - 1,036.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

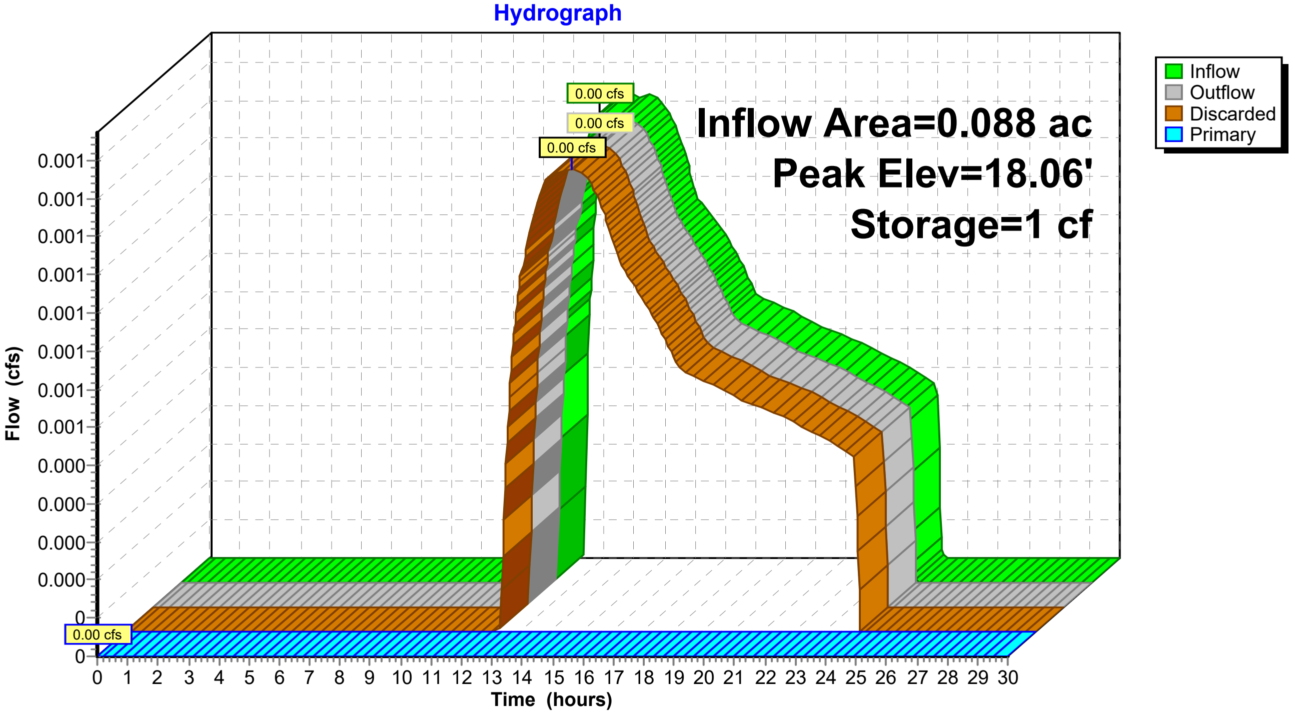
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	1	0	0
19.00	326	164	164
19.05	394	18	182

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	**2.410 in/hr Exfiltration over Surface area from 17.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.00 cfs @ 14.71 hrs HW=18.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 6



Summary for Pond 7P: Pond 7

Inflow Area = 0.033 ac, 63.64% Impervious, Inflow Depth = 1.43" for 2-YR MASHPEE event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 12.86 hrs, Volume= 0.004 af, Atten= 88%, Lag= 46.6 min
Discarded = 0.01 cfs @ 12.86 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.88' @ 12.86 hrs Surf.Area= 124 sf Storage= 65 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 102.8 min (949.3 - 846.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	87 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

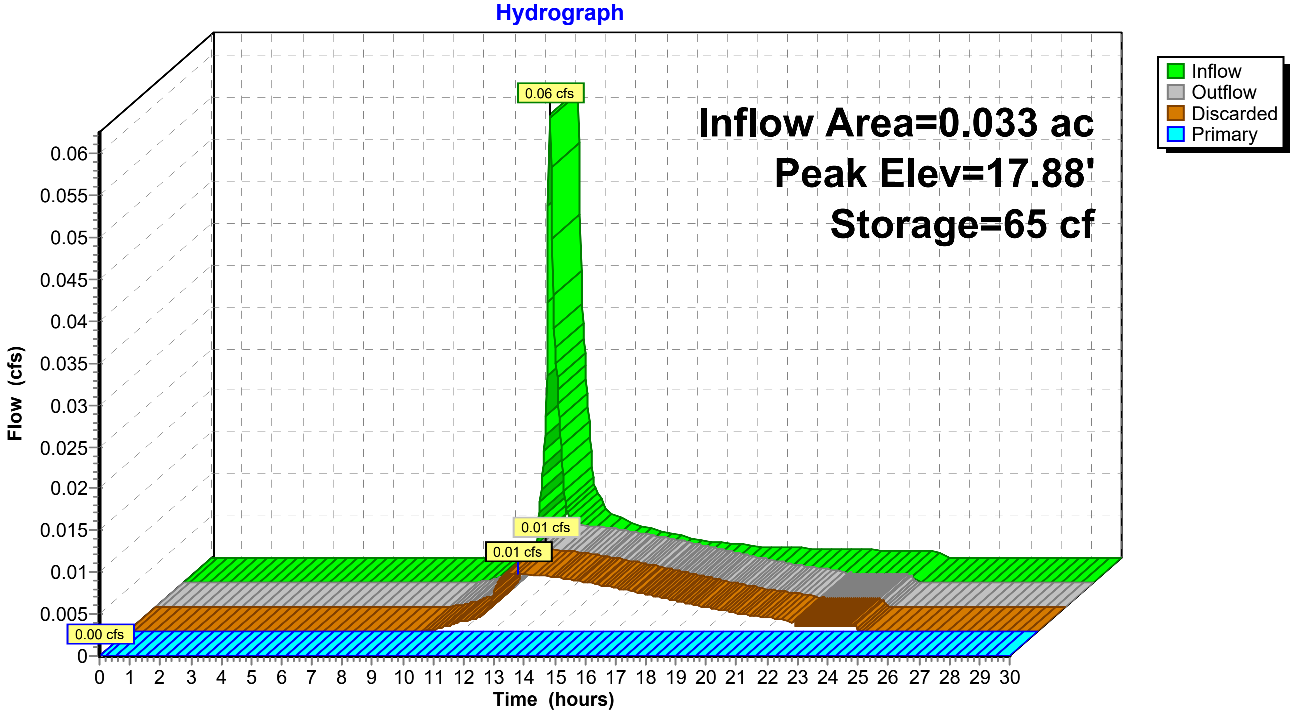
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	23	0	0
18.00	137	80	80
18.05	159	7	87

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.86 hrs HW=17.88' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Pond 7



Summary for Pond 8P: Pond 8

Inflow Area = 0.087 ac, 35.63% Impervious, Inflow Depth = 0.53" for 2-YR MASHPEE event
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af
Outflow = 0.02 cfs @ 12.32 hrs, Volume= 0.004 af, Atten= 37%, Lag= 12.8 min
Discarded = 0.02 cfs @ 12.32 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.01' @ 12.32 hrs Surf.Area= 431 sf Storage= 6 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.9 min (908.8 - 907.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	622 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

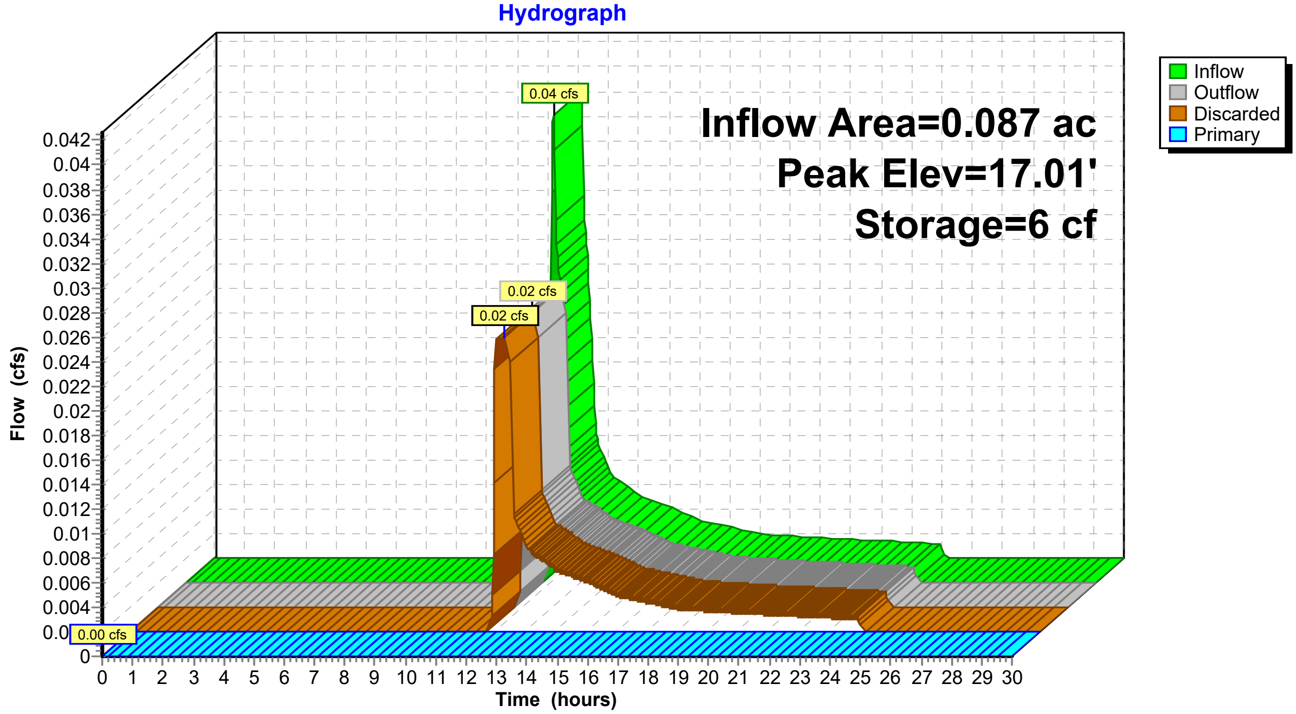
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	426	0	0
18.00	741	584	584
18.05	791	38	622

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.32 hrs HW=17.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Pond 8



Summary for Pond FB1: Forebay 1

Inflow Area = 1.040 ac, 55.00% Impervious, Inflow Depth = 1.17" for 2-YR MASHPEE event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 0.101 af
Outflow = 0.09 cfs @ 14.61 hrs, Volume= 0.101 af, Atten= 93%, Lag= 151.2 min
Discarded = 0.09 cfs @ 14.61 hrs, Volume= 0.101 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.48' @ 14.61 hrs Surf.Area= 1,623 sf Storage= 2,008 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 254.3 min (1,106.2 - 851.9)

Volume	Invert	Avail.Storage	Storage Description
#1	14.90'	3,175 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

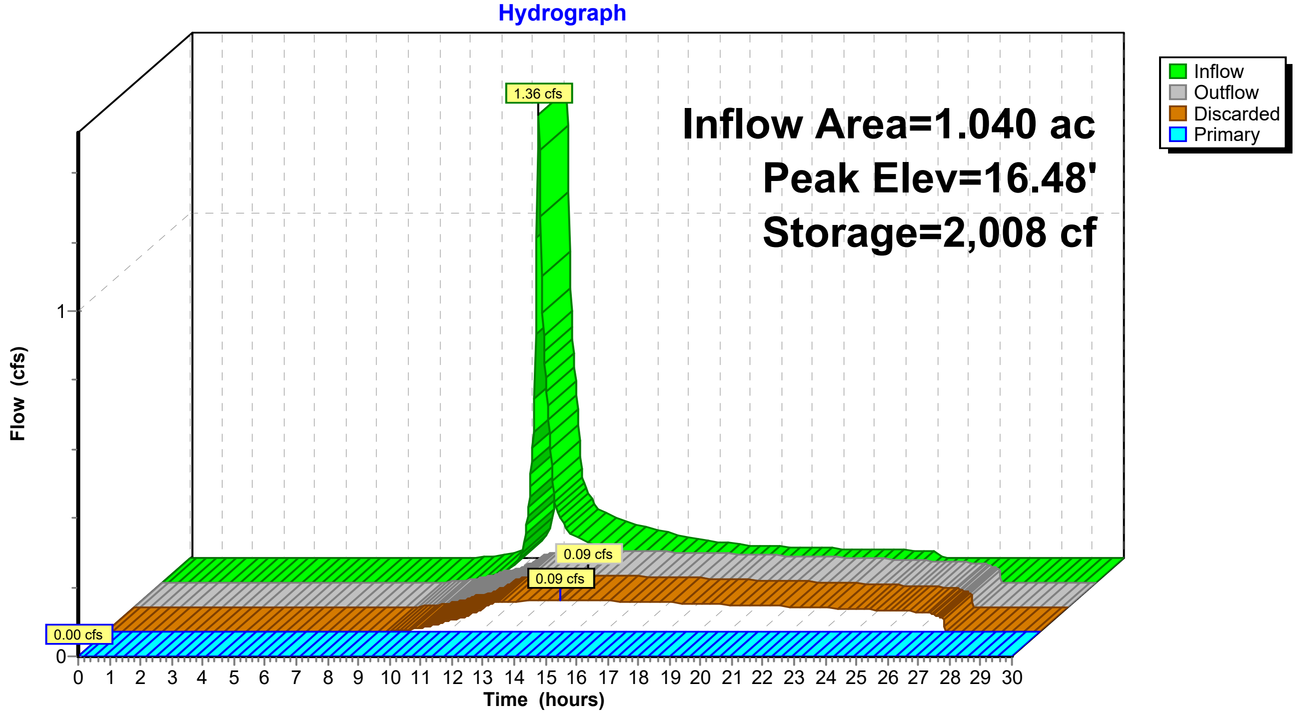
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.90	661	0	0
15.00	996	83	83
16.00	1,406	1,201	1,284
16.50	1,633	760	2,044
17.00	2,893	1,132	3,175

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.90'	**2.410 in/hr Exfiltration over Surface area from 14.80' - 16.50'** Excluded Surface area = 0 sf
#2	Primary	16.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.09 cfs @ 14.61 hrs HW=16.48' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.90' TW=15.00' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond FB1: Forebay 1



Summary for Pond FB3: Forebay 3

Inflow Area = 6.795 ac, 31.67% Impervious, Inflow Depth = 0.39" for 2-YR MASHPEE event
Inflow = 2.06 cfs @ 12.11 hrs, Volume= 0.220 af
Outflow = 0.33 cfs @ 13.46 hrs, Volume= 0.220 af, Atten= 84%, Lag= 81.2 min
Discarded = 0.33 cfs @ 13.46 hrs, Volume= 0.220 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 15.65' @ 13.46 hrs Surf.Area= 5,861 sf Storage= 3,311 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 99.1 min (963.8 - 864.7)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	10,961 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

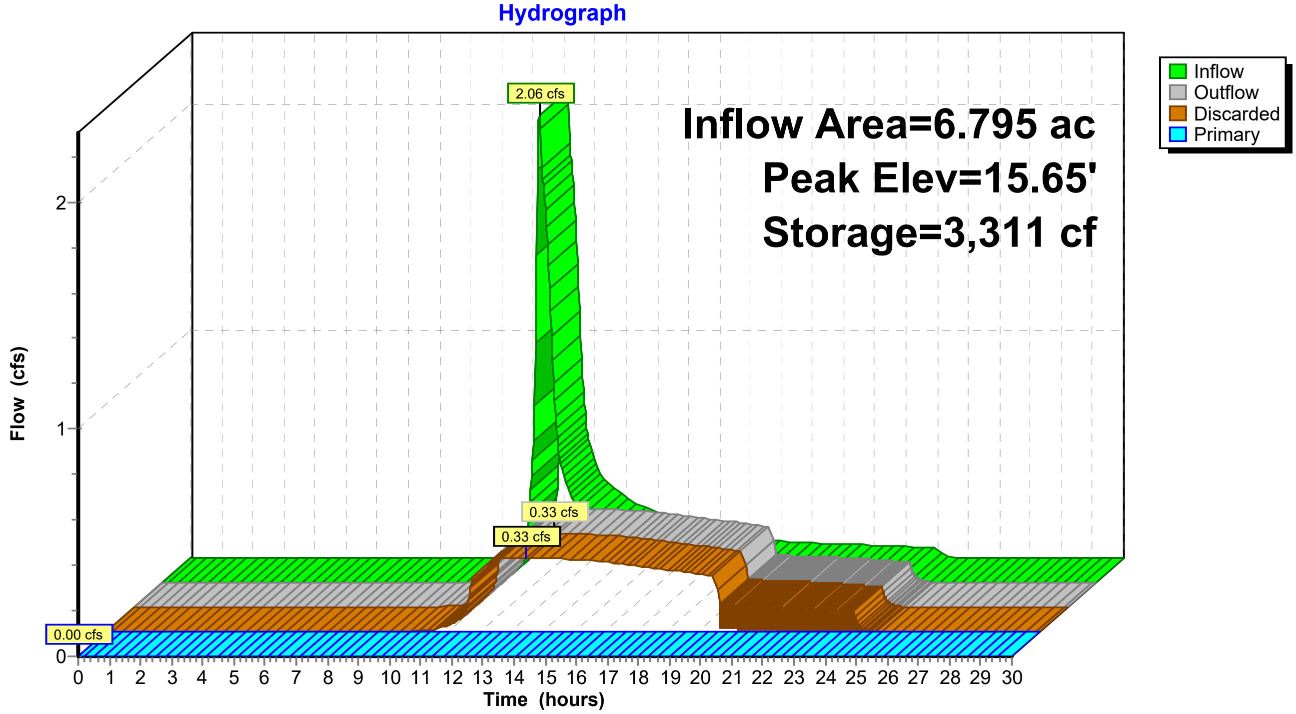
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.00	4,358	0	0
16.00	6,677	5,518	5,518
16.75	7,840	5,444	10,961

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.00'	**2.410 in/hr Exfiltration over Surface area from 14.90' - 16.75'** Excluded Surface area = 0 sf
#2	Primary	16.00'	**10.0' long Sharp-Crested Rectangular Weir X 3.00** 2 End Contraction(s) 0.7' Crest Height

Discarded OutFlow Max=0.33 cfs @ 13.46 hrs HW=15.65' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.00' TW=13.97' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond FB3: Forebay 3



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-12: AREAS TO WETLAND Runoff Area=0.793 ac 2.90% Impervious Runoff Depth=0.45"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.16 cfs 0.029 af

SubcatchmentDA-1A: AREA TO CB'S 3 Runoff Area=0.252 ac 59.92% Impervious Runoff Depth=2.37"
Tc=5.0 min CN=74 Runoff=0.72 cfs 0.050 af

SubcatchmentDA-1B: AREA TO CB'S 1 Runoff Area=0.432 ac 70.60% Impervious Runoff Depth=2.99"
Tc=5.0 min CN=81 Runoff=1.56 cfs 0.108 af

SubcatchmentDA-1C: AREA TO FB1 Runoff Area=0.356 ac 32.58% Impervious Runoff Depth=1.17"
Tc=5.0 min CN=58 Runoff=0.44 cfs 0.035 af

SubcatchmentDA-2: END OF ROAD TO Runoff Area=0.536 ac 58.02% Impervious Runoff Depth=2.29"
Flow Length=250' Tc=6.2 min CN=73 Runoff=1.41 cfs 0.102 af

SubcatchmentDA-3: AREAS TO WEST Runoff Area=0.109 ac 21.10% Impervious Runoff Depth=1.66"
Tc=5.0 min UI Adjusted CN=65 Runoff=0.21 cfs 0.015 af

SubcatchmentDA-4: AREAS TO WEST Runoff Area=0.132 ac 50.76% Impervious Runoff Depth=2.90"
Tc=5.0 min CN=80 Runoff=0.46 cfs 0.032 af

SubcatchmentDA-5: AREAS TO WEST Runoff Area=0.124 ac 58.87% Impervious Runoff Depth=2.37"
Tc=5.0 min CN=74 Runoff=0.35 cfs 0.025 af

SubcatchmentDA-6: AREAS TO WEST Runoff Area=0.088 ac 17.05% Impervious Runoff Depth=0.49"
Tc=5.0 min UI Adjusted CN=46 Runoff=0.02 cfs 0.004 af

SubcatchmentDA-7: AREAS TO WEST Runoff Area=0.033 ac 63.64% Impervious Runoff Depth=2.63"
Tc=5.0 min CN=77 Runoff=0.10 cfs 0.007 af

SubcatchmentDA-8: AREAS TO WEST Runoff Area=0.087 ac 35.63% Impervious Runoff Depth=1.31"
Tc=5.0 min CN=60 Runoff=0.12 cfs 0.009 af

SubcatchmentDA-9: AREAS EAST OF Runoff Area=0.558 ac 65.23% Impervious Runoff Depth=2.63"
Tc=5.0 min CN=77 Runoff=1.77 cfs 0.122 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=2.54"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=1.32 cfs 0.098 af

SubcatchmentDA22B: QUIN AVE WEST Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=1.66"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=2.23 cfs 0.185 af

SubcatchmentDA44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.03"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.002 af

SubcatchmentDA55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=69 Runoff=1.48 cfs 0.105 af

Subcatchment DA77: AREAS TO WETLAND Runoff Area=1.844 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=431' Tc=26.3 min CN=32 Runoff=0.01 cfs 0.004 af

Reach R1: Tt along stream Avg. Flow Depth=0.20' Max Vel=0.57 fps Inflow=0.99 cfs 0.059 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.48 cfs 0.059 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.12' Max Vel=0.47 fps Inflow=0.31 cfs 0.191 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.30 cfs 0.189 af

Reach R2: Tt thru da77 Avg. Flow Depth=0.17' Max Vel=0.97 fps Inflow=3.57 cfs 0.248 af
n=0.030 L=210.0' S=0.0095 '/' Capacity=50.53 cfs Outflow=3.21 cfs 0.248 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.21' Max Vel=3.05 fps Inflow=1.32 cfs 0.098 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=1.30 cfs 0.098 af

Reach R3: 18" CPP Avg. Flow Depth=0.70' Max Vel=2.78 fps Inflow=2.27 cfs 0.158 af
18.0" Round Pipe n=0.012 L=81.0' S=0.0020 '/' Capacity=5.06 cfs Outflow=2.27 cfs 0.158 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.10' Max Vel=2.04 fps Inflow=1.44 cfs 0.063 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=1.36 cfs 0.063 af

Reach SP#1: Study Point Combined Flows Inflow=0.48 cfs 0.248 af
Outflow=0.48 cfs 0.248 af

Pond 1P: LB's Peak Elev=20.70' Storage=477 cf Inflow=1.48 cfs 0.105 af
Discarded=0.03 cfs 0.042 af Primary=1.44 cfs 0.063 af Outflow=1.47 cfs 0.105 af

Pond 2P: Natural Low Area Peak Elev=16.08' Storage=2 cf Inflow=0.00 cfs 0.002 af
Discarded=0.00 cfs 0.002 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.002 af

Pond 3A-P: Pond 3A Peak Elev=17.52' Storage=195 cf Inflow=0.21 cfs 0.015 af
Discarded=0.01 cfs 0.012 af Primary=0.08 cfs 0.003 af Outflow=0.09 cfs 0.015 af

Pond 3P: Wet Pond Peak Elev=14.67' Storage=8,564 cf Inflow=4.66 cfs 0.274 af
Outflow=0.31 cfs 0.191 af

Pond 4P: Pond 4 Peak Elev=18.02' Storage=240 cf Inflow=0.46 cfs 0.032 af
Discarded=0.01 cfs 0.015 af Primary=0.45 cfs 0.017 af Outflow=0.46 cfs 0.031 af

Pond 5P: Pond 5 Peak Elev=19.02' Storage=234 cf Inflow=0.35 cfs 0.025 af
Discarded=0.02 cfs 0.016 af Primary=0.44 cfs 0.009 af Outflow=0.46 cfs 0.025 af

Pond 6P: Pond 6 Peak Elev=18.40' Storage=26 cf Inflow=0.02 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond 7P: Pond 7 Peak Elev=18.01' Storage=82 cf Inflow=0.10 cfs 0.007 af
Discarded=0.01 cfs 0.006 af Primary=0.11 cfs 0.002 af Outflow=0.12 cfs 0.007 af

Pond 8P: Pond 8 Peak Elev=17.20' Storage=92 cf Inflow=0.12 cfs 0.009 af
Discarded=0.03 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.009 af

Pond FB1: Forebay 1 Peak Elev=16.63' Storage=2,277 cf Inflow=2.71 cfs 0.192 af
Discarded=0.09 cfs 0.125 af Primary=1.57 cfs 0.067 af Outflow=1.66 cfs 0.192 af

Pond FB3: Forebay 3 Peak Elev=16.12' Storage=6,313 cf Inflow=6.78 cfs 0.544 af
Discarded=0.38 cfs 0.368 af Primary=4.03 cfs 0.176 af Outflow=4.41 cfs 0.544 af

Total Runoff Area = 8.622 ac Runoff Volume = 0.931 af Average Runoff Depth = 1.30"
68.71% Pervious = 5.924 ac 31.29% Impervious = 2.698 ac

Summary for Subcatchment DA-12: AREAS TO WETLAND TO WEST

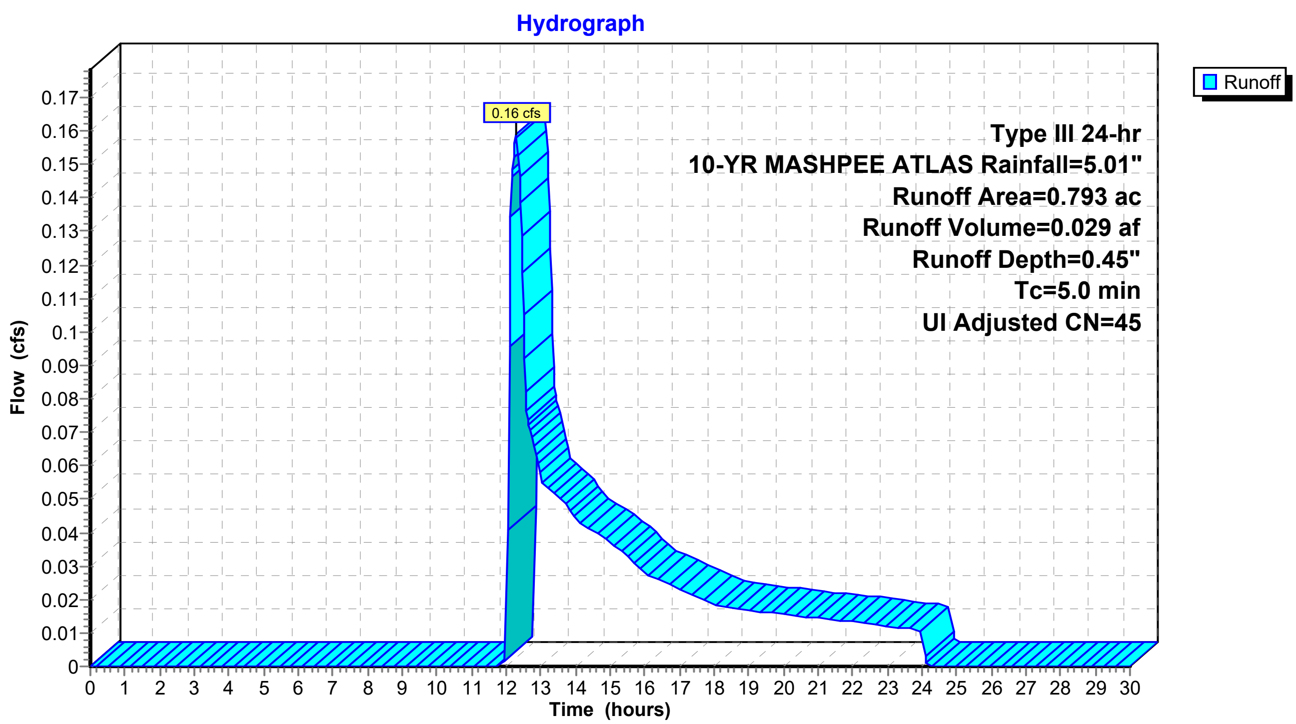
Runoff = 0.16 cfs @ 12.29 hrs, Volume= 0.029 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Adj	Description
0.090	39		>75% Grass cover, Good, HSG A
0.318	30		Woods, Good, HSG A
0.023	76		Gravel roads, HSG A
0.023	98		Unconnected pavement, HSG B
0.317	55		Woods, Good, HSG B
0.022	85		Gravel roads, HSG B
0.793	46	45	Weighted Average, UI Adjusted
0.770			97.10% Pervious Area
0.023			2.90% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-12: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-1A: AREA TO CB'S 3 AND 4

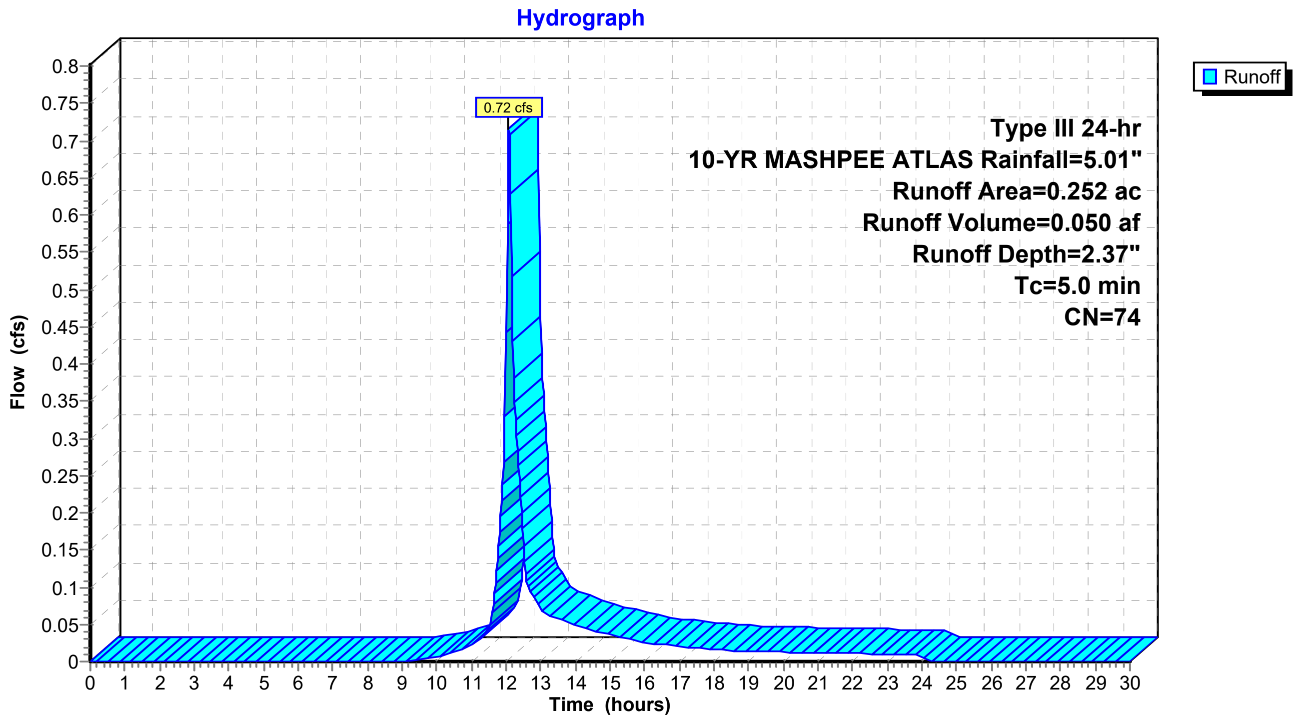
Runoff = 0.72 cfs @ 12.08 hrs, Volume= 0.050 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.101	39	>75% Grass cover, Good, HSG A
0.109	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.252	74	Weighted Average
0.101		40.08% Pervious Area
0.151		59.92% Impervious Area
0.109		72.19% Unconnected

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

Subcatchment DA-1A: AREA TO CB'S 3 AND 4



Summary for Subcatchment DA-1B: AREA TO CB'S 1 AND 2

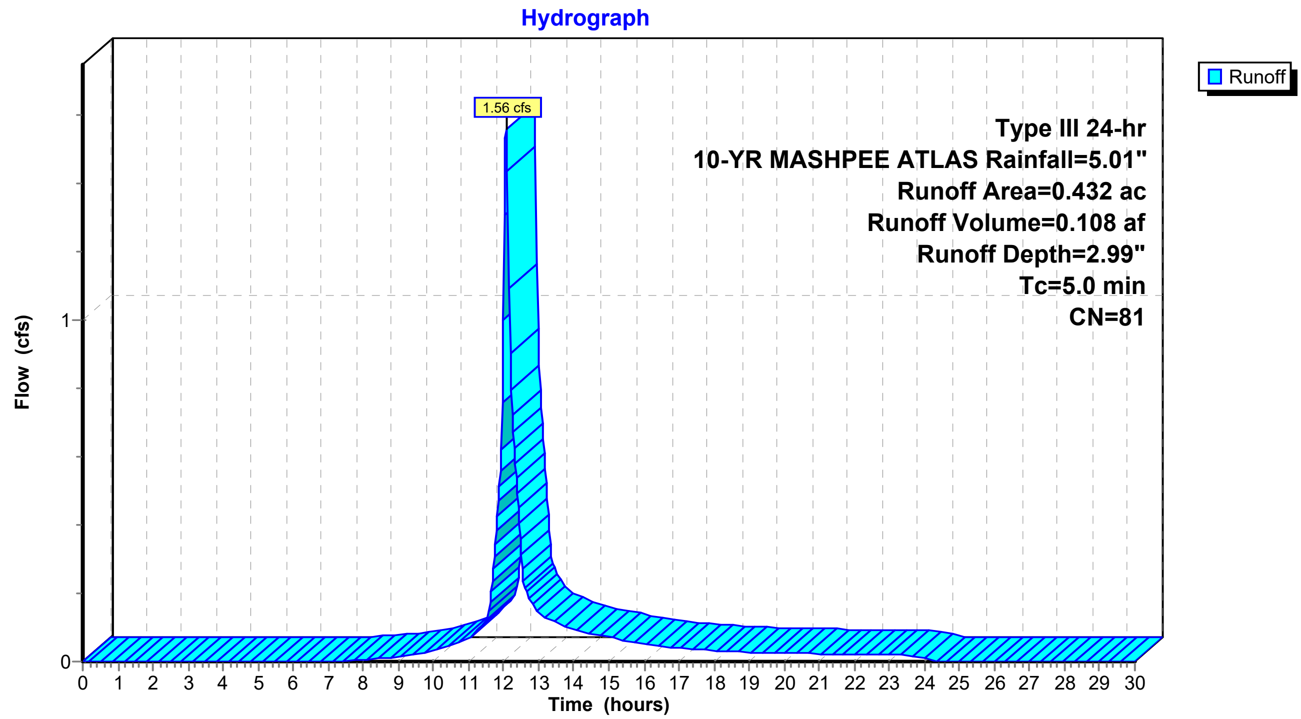
Runoff = 1.56 cfs @ 12.07 hrs, Volume= 0.108 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.137	98	Unconnected pavement, HSG A
0.127	39	Pasture/grassland/range, Good, HSG A
0.168	98	Roofs, HSG A
0.432	81	Weighted Average
0.127		29.40% Pervious Area
0.305		70.60% Impervious Area
0.137		44.92% Unconnected

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

Subcatchment DA-1B: AREA TO CB'S 1 AND 2



Summary for Subcatchment DA-1C: AREA TO FB1

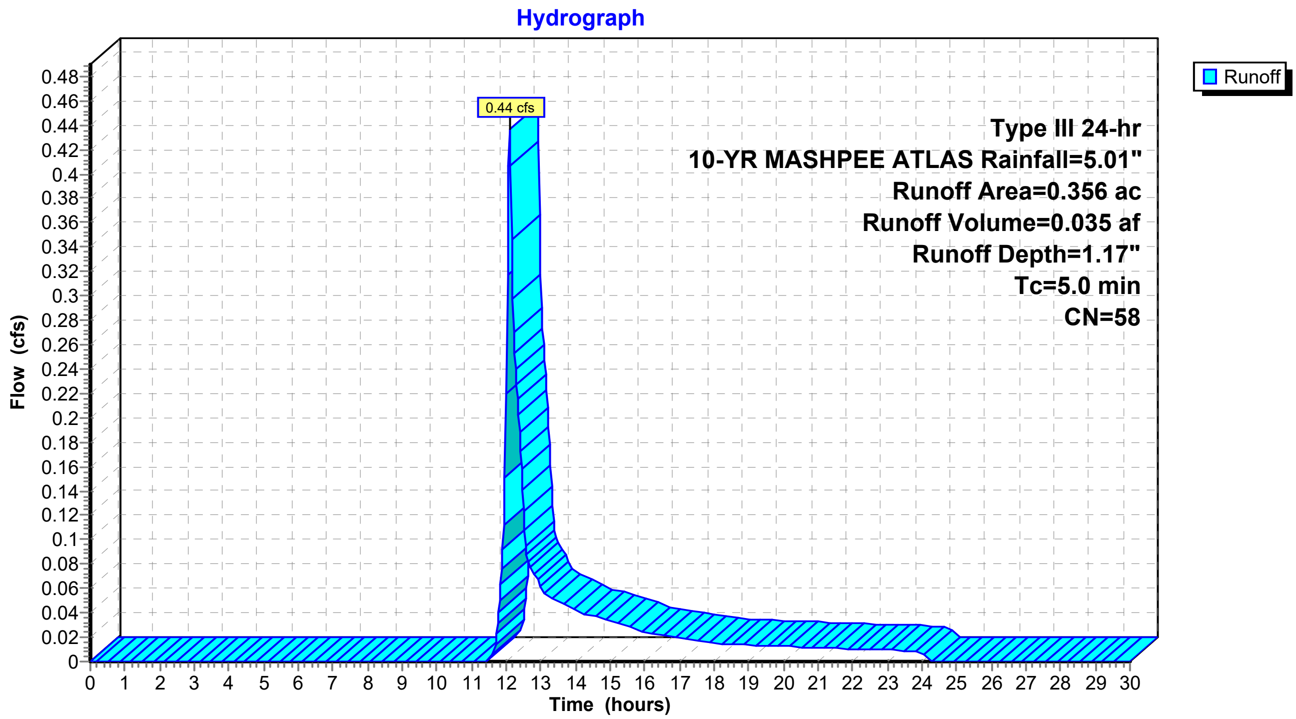
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.240	39	>75% Grass cover, Good, HSG A
0.074	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.356	58	Weighted Average
0.240		67.42% Pervious Area
0.116		32.58% Impervious Area
0.074		63.79% Unconnected

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

Subcatchment DA-1C: AREA TO FB1



Summary for Subcatchment DA-2: END OF ROAD TO THE EAST

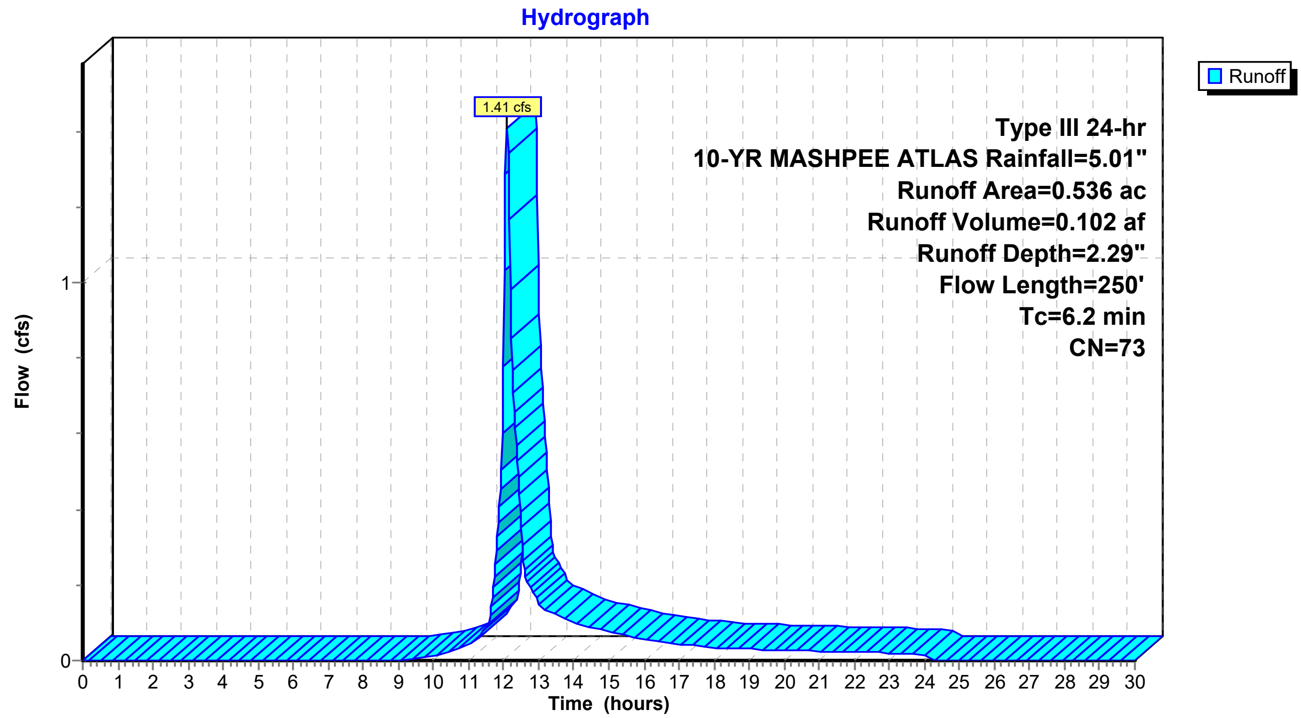
Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.225	39	>75% Grass cover, Good, HSG A
0.181	98	Unconnected pavement, HSG A
0.130	98	Roofs, HSG A
0.536	73	Weighted Average
0.225		41.98% Pervious Area
0.311		58.02% Impervious Area
0.181		58.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	30	0.0200	0.10		**Sheet Flow, LAWN** Grass: Dense n= 0.240 P2= 3.55"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow, ROAD** Paved Kv= 20.3 fps
0.5	140	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
6.2	250	Total			

Subcatchment DA-2: END OF ROAD TO THE EAST



Summary for Subcatchment DA-3: AREAS TO WEST

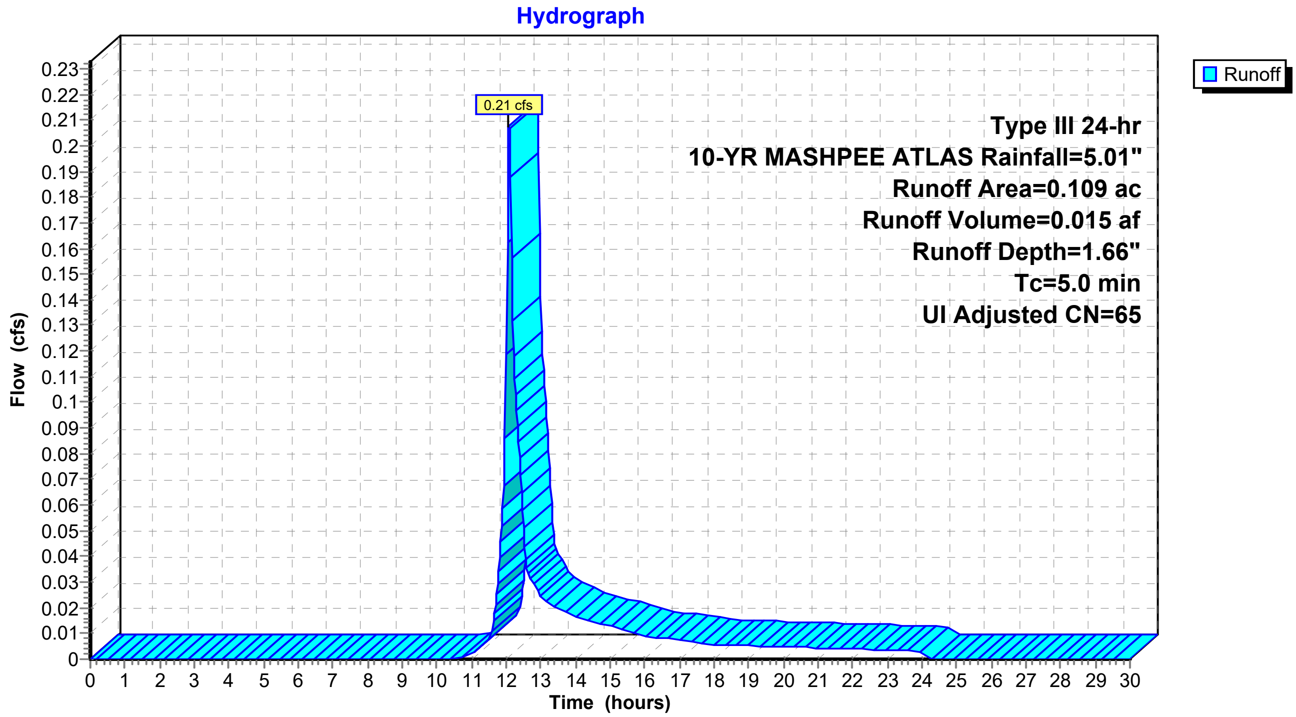
Runoff = 0.21 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Adj	Description
0.086	61		>75% Grass cover, Good, HSG B
0.023	98		Unconnected pavement, HSG B
0.109	69	65	Weighted Average, UI Adjusted
0.086			78.90% Pervious Area
0.023			21.10% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-3: AREAS TO WEST



Summary for Subcatchment DA-4: AREAS TO WEST

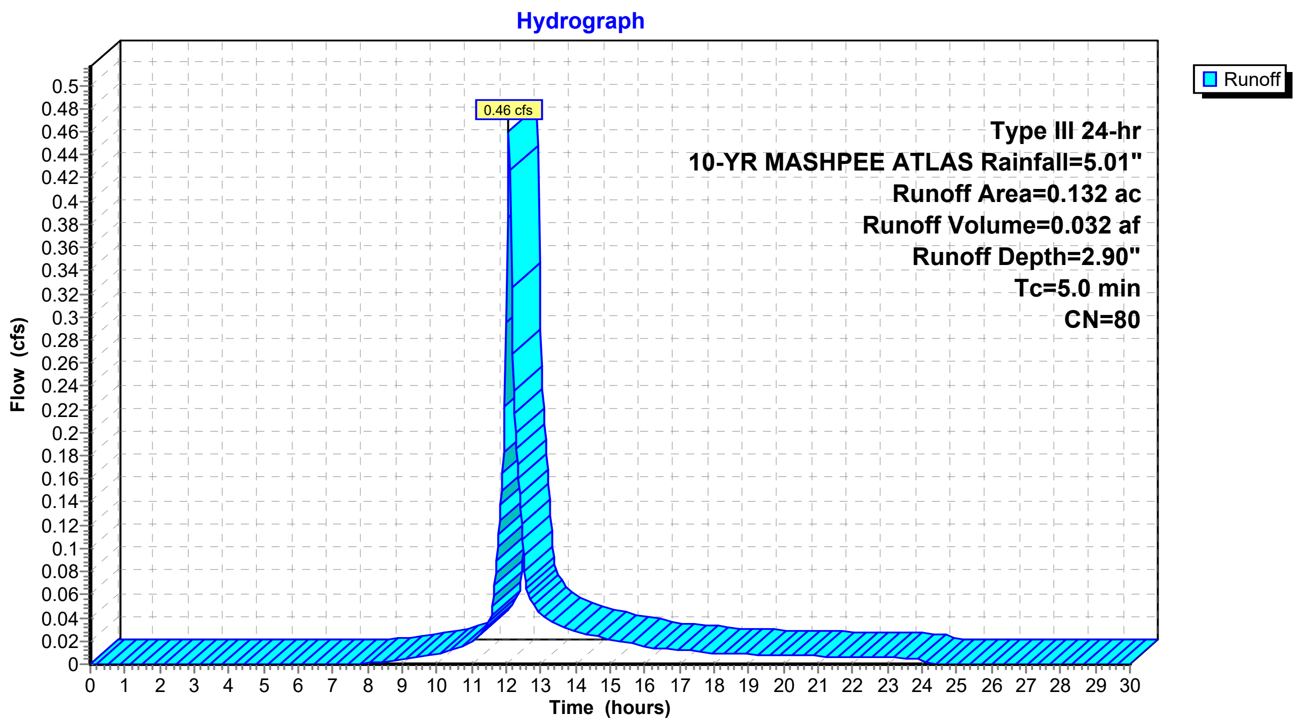
Runoff = 0.46 cfs @ 12.08 hrs, Volume= 0.032 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.065	61	>75% Grass cover, Good, HSG B
0.067	98	Unconnected pavement, HSG B
0.132	80	Weighted Average
0.065		49.24% Pervious Area
0.067		50.76% Impervious Area
0.067		100.00% Unconnected

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

Subcatchment DA-4: AREAS TO WEST



Summary for Subcatchment DA-5: AREAS TO WEST

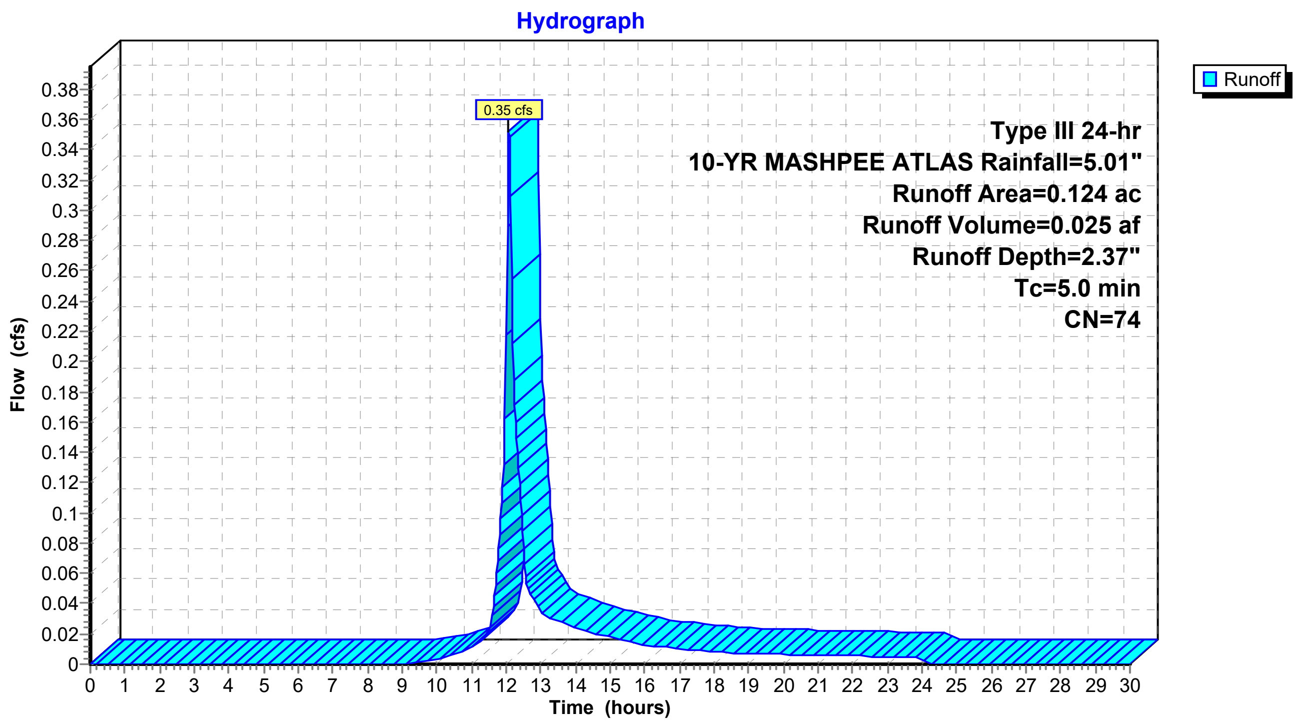
Runoff = 0.35 cfs @ 12.08 hrs, Volume= 0.025 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.051	39	>75% Grass cover, Good, HSG A
0.073	98	Unconnected pavement, HSG A
0.124	74	Weighted Average
0.051		41.13% Pervious Area
0.073		58.87% Impervious Area
0.073		100.00% Unconnected

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

Subcatchment DA-5: AREAS TO WEST



Summary for Subcatchment DA-6: AREAS TO WEST

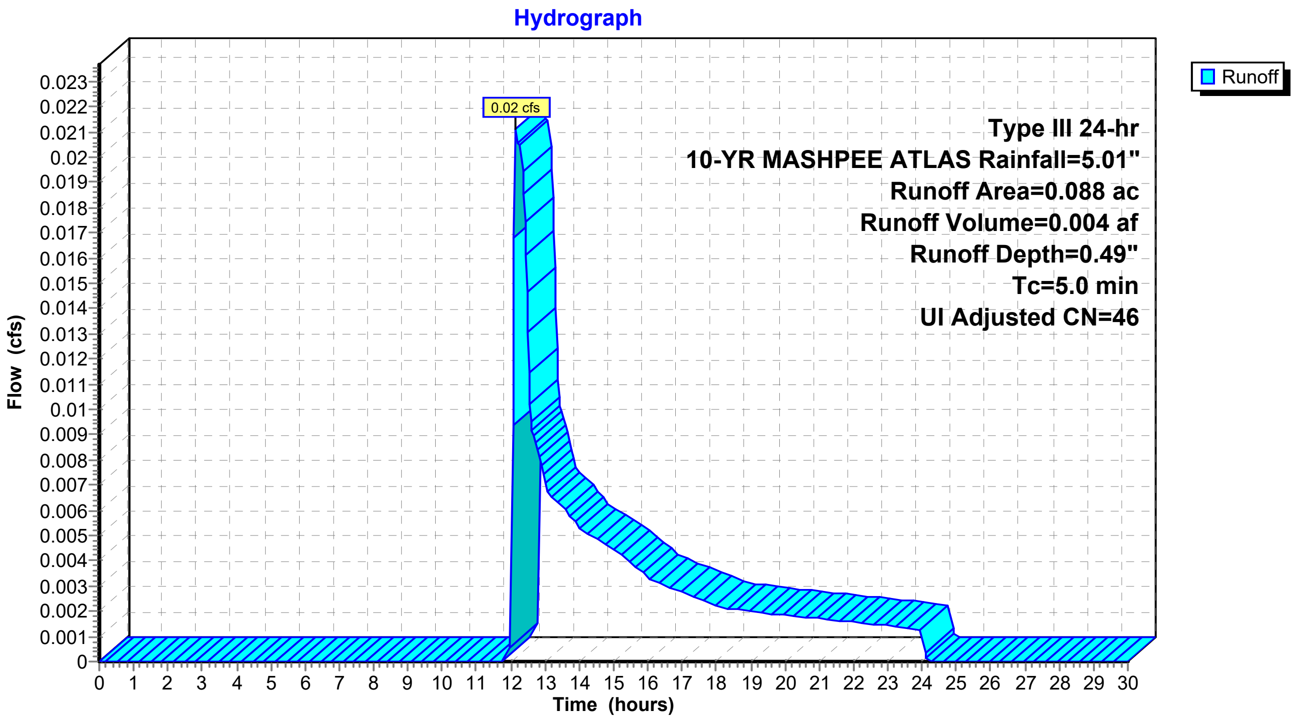
Runoff = 0.02 cfs @ 12.15 hrs, Volume= 0.004 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Adj	Description
0.073	39		>75% Grass cover, Good, HSG A
0.008	98		Unconnected pavement, HSG A
0.007	98		Roofs, HSG A
0.088	49	46	Weighted Average, UI Adjusted
0.073			82.95% Pervious Area
0.015			17.05% Impervious Area
0.008			53.33% Unconnected

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

Subcatchment DA-6: AREAS TO WEST



Summary for Subcatchment DA-7: AREAS TO WEST

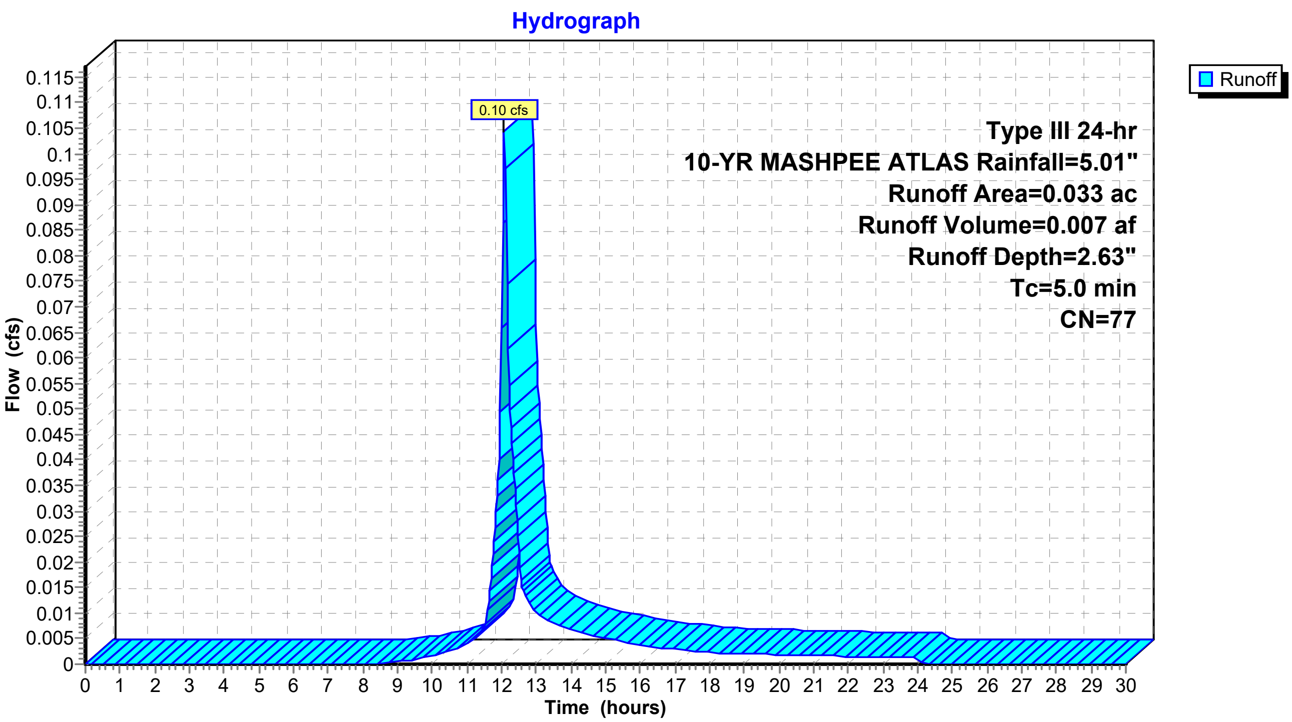
Runoff = 0.10 cfs @ 12.08 hrs, Volume= 0.007 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.012	39	>75% Grass cover, Good, HSG A
0.021	98	Unconnected pavement, HSG A
0.033	77	Weighted Average
0.012		36.36% Pervious Area
0.021		63.64% Impervious Area
0.021		100.00% Unconnected

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

Subcatchment DA-7: AREAS TO WEST



Summary for Subcatchment DA-8: AREAS TO WEST

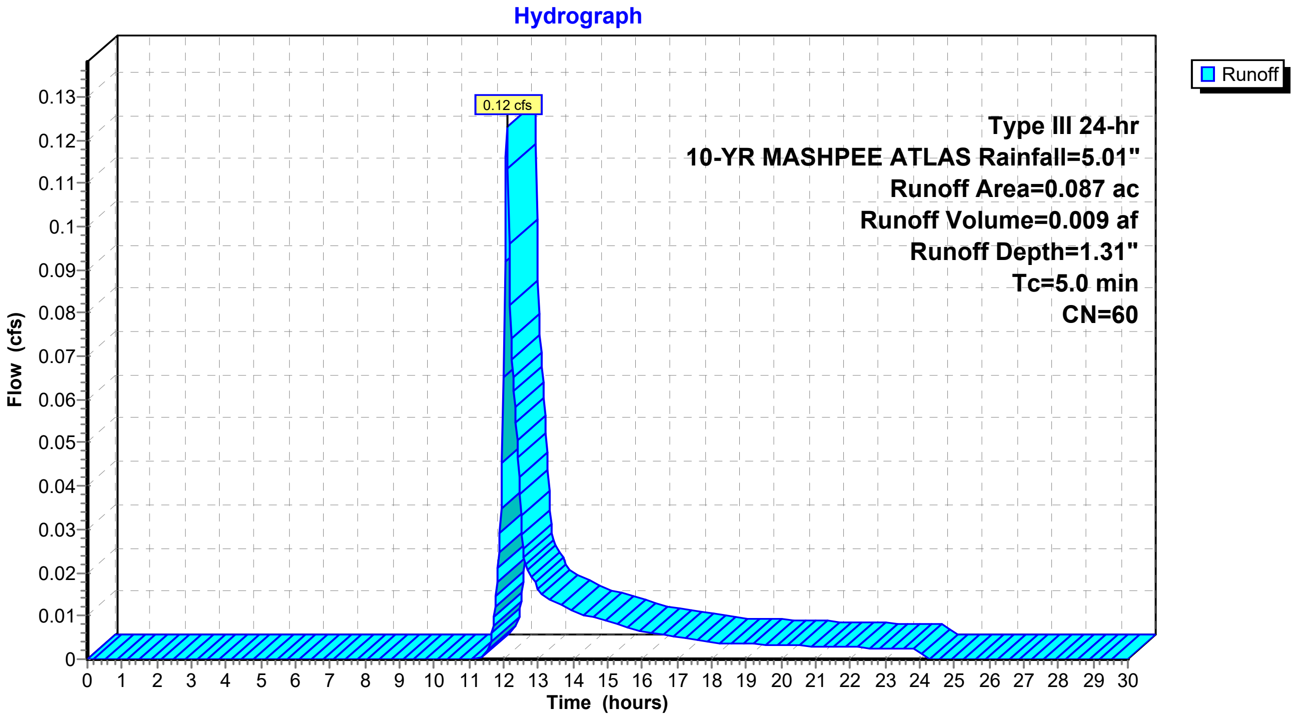
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.056	39	>75% Grass cover, Good, HSG A
0.031	98	Unconnected pavement, HSG A
0.087	60	Weighted Average
0.056		64.37% Pervious Area
0.031		35.63% Impervious Area
0.031		100.00% Unconnected

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

Subcatchment DA-8: AREAS TO WEST



Summary for Subcatchment DA-9: AREAS EAST OF ROAD

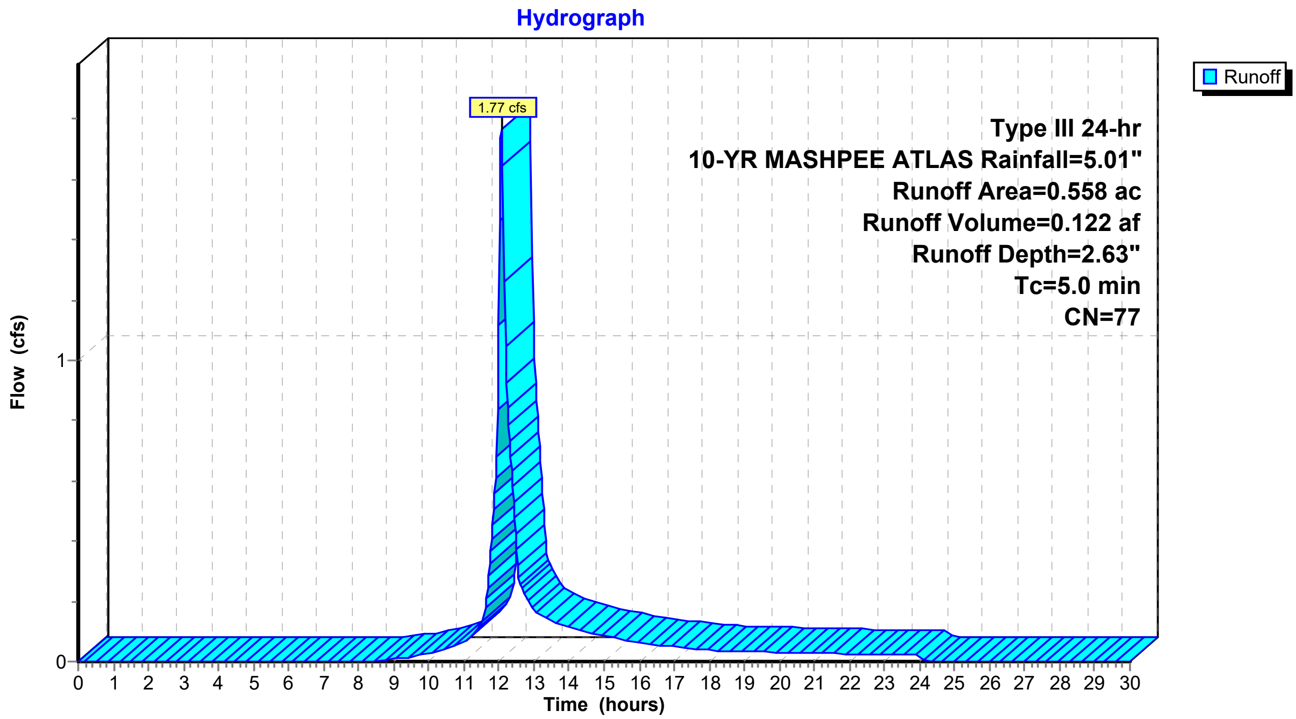
Runoff = 1.77 cfs @ 12.08 hrs, Volume= 0.122 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.194	39	>75% Grass cover, Good, HSG A
0.154	98	Unconnected pavement, HSG A
0.210	98	Roofs, HSG A
0.558	77	Weighted Average
0.194		34.77% Pervious Area
0.364		65.23% Impervious Area
0.154		42.31% Unconnected

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

Subcatchment DA-9: AREAS EAST OF ROAD



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

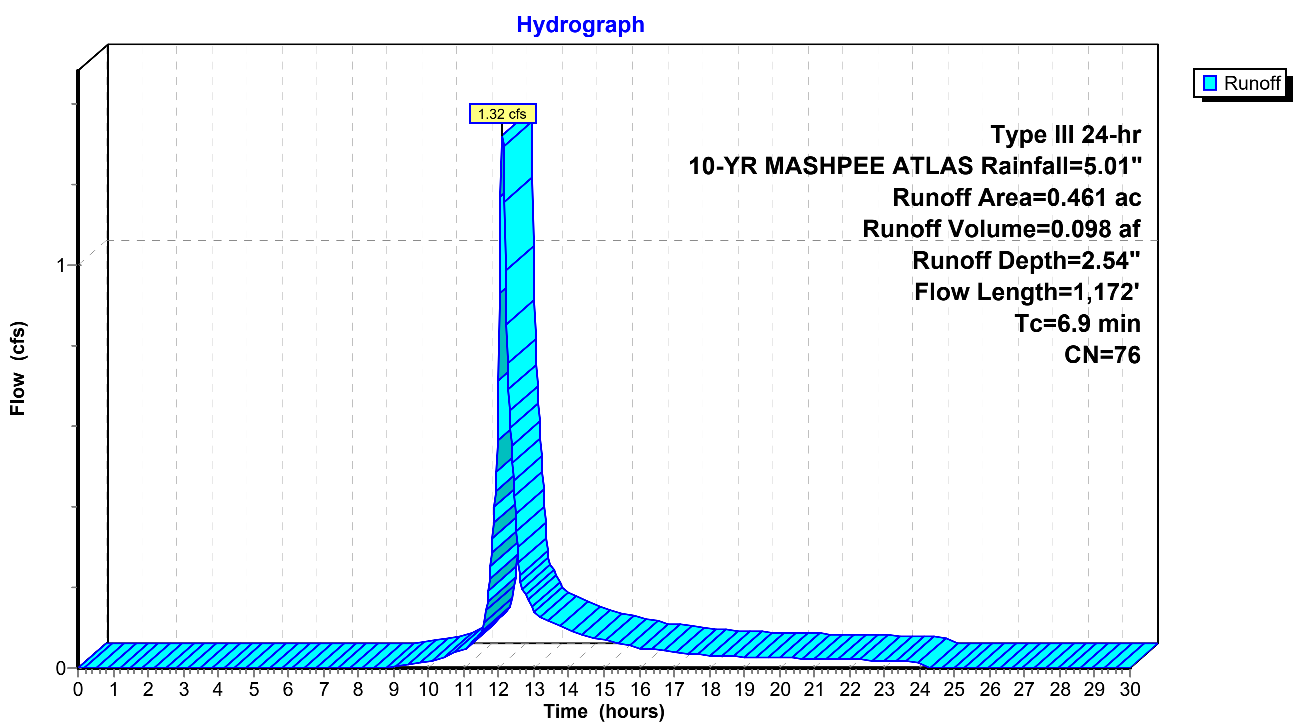
Runoff = 1.32 cfs @ 12.10 hrs, Volume= 0.098 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3

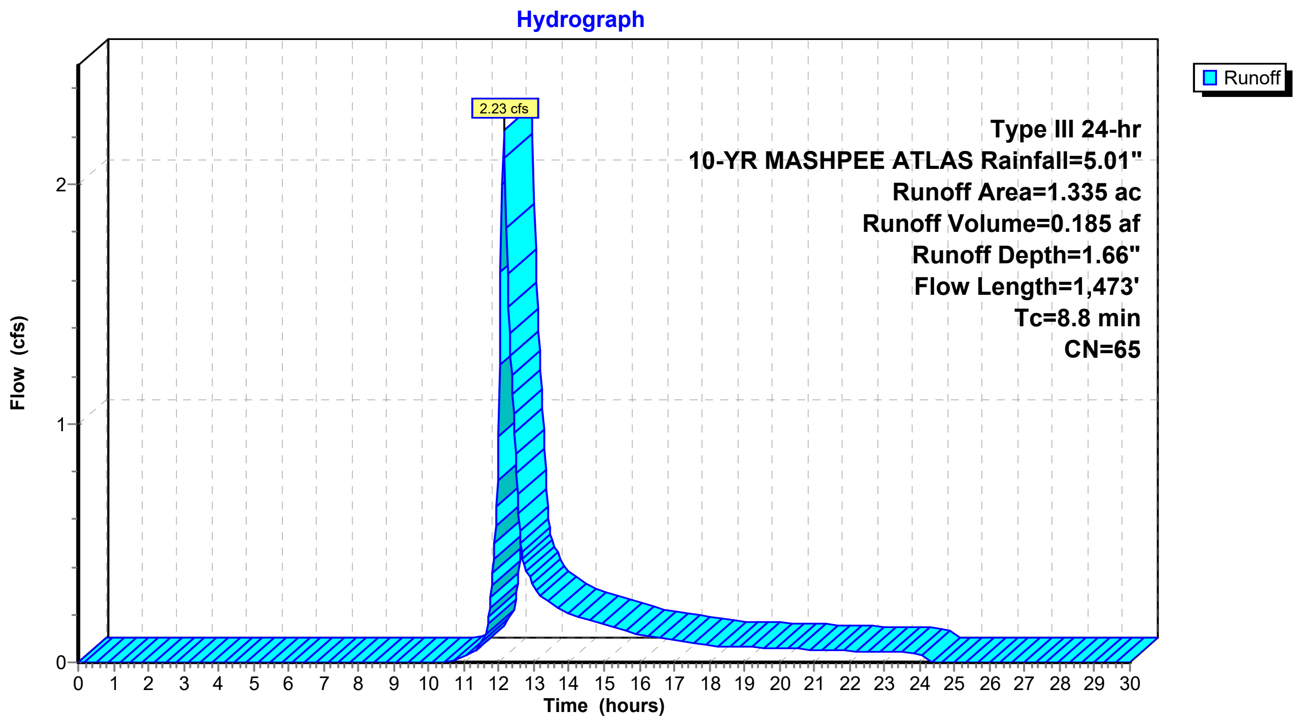
Runoff = 2.23 cfs @ 12.13 hrs, Volume= 0.185 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3



Summary for Subcatchment DA44: North of Quin

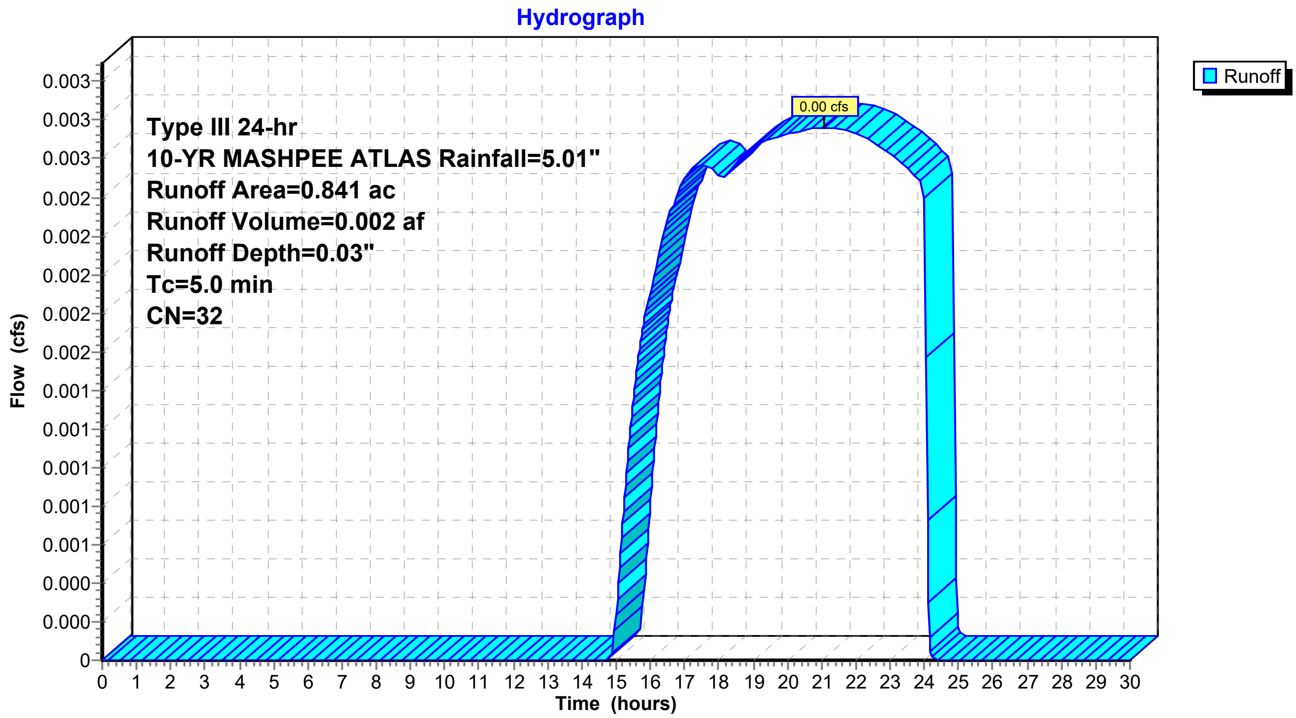
Runoff = 0.00 cfs @ 21.05 hrs, Volume= 0.002 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA44: North of Quin



Summary for Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR

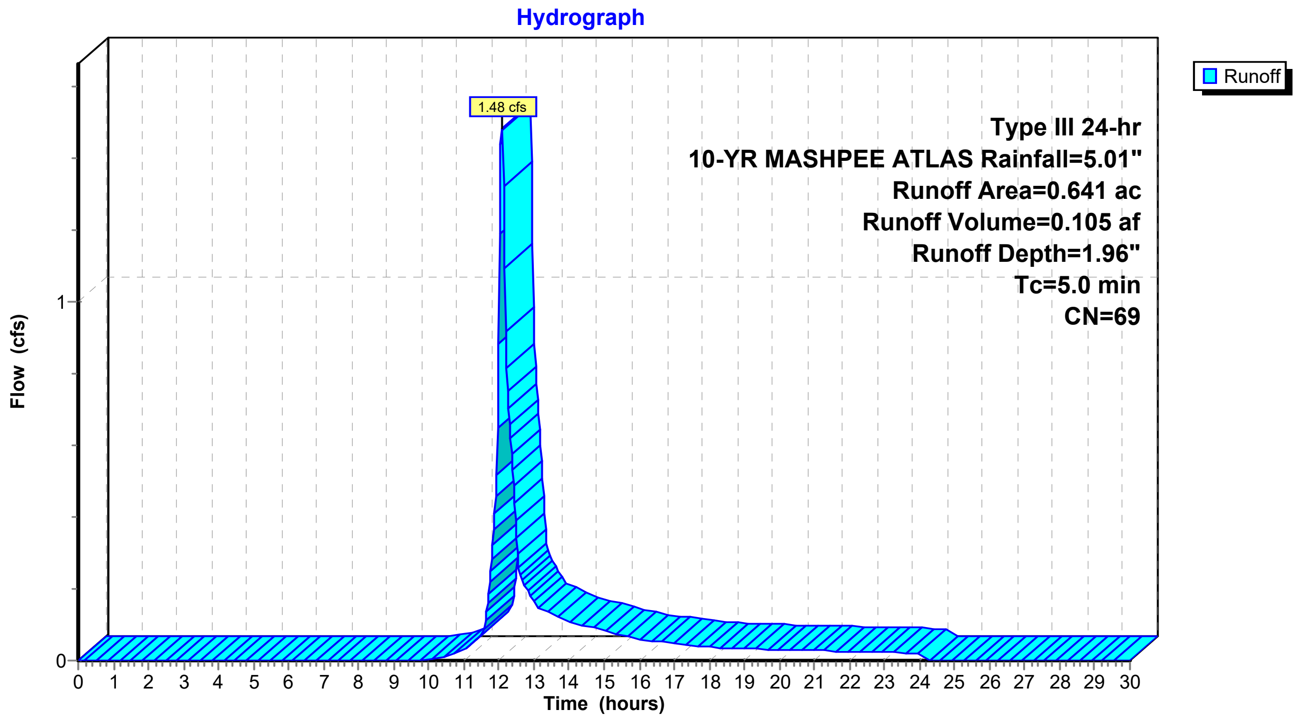
Runoff = 1.48 cfs @ 12.08 hrs, Volume= 0.105 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA77: AREAS TO WETLAND TO EAST

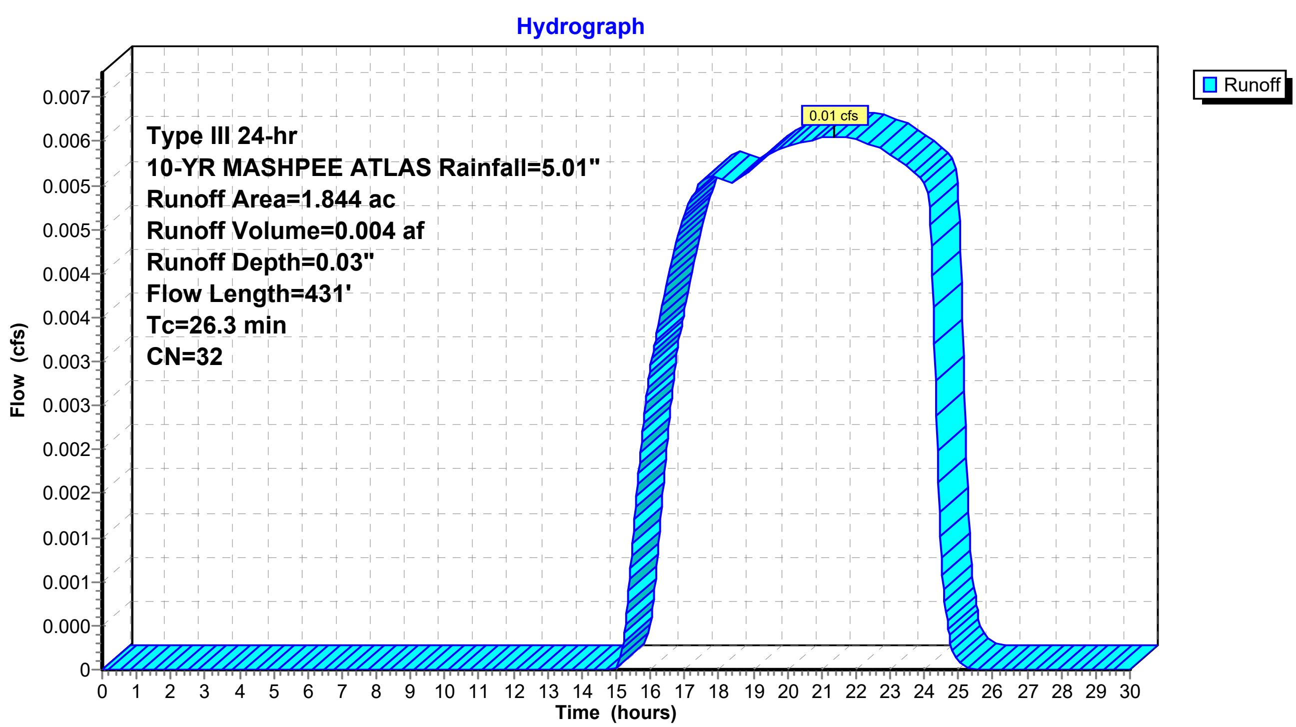
Runoff = 0.01 cfs @ 21.36 hrs, Volume= 0.004 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR MASHPEE ATLAS Rainfall=5.01"

Area (ac)	CN	Description
0.476	39	>75% Grass cover, Good, HSG A
1.201	30	Woods, Good, HSG A
0.167	30	Woods, Good, HSG A
1.844	32	Weighted Average
1.844		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA77: AREAS TO WETLAND TO EAST



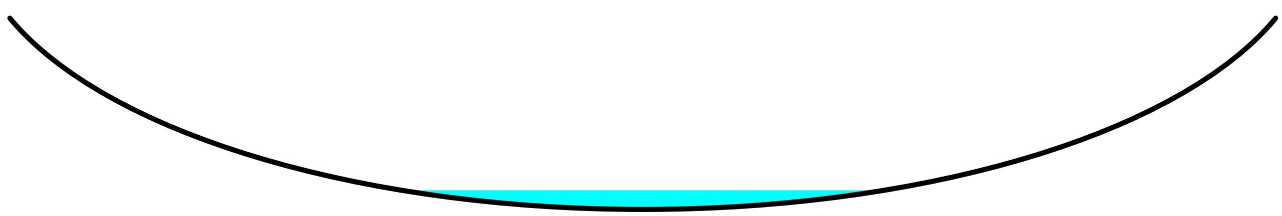
Summary for Reach R1: Tt along stream

Inflow Area = 1.366 ac, 18.52% Impervious, Inflow Depth = 0.52" for 10-YR MASHPEE ATLAS event
Inflow = 0.99 cfs @ 12.10 hrs, Volume= 0.059 af
Outflow = 0.48 cfs @ 12.39 hrs, Volume= 0.059 af, Atten= 51%, Lag= 17.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.57 fps, Min. Travel Time= 16.1 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 42.3 min

Peak Storage= 466 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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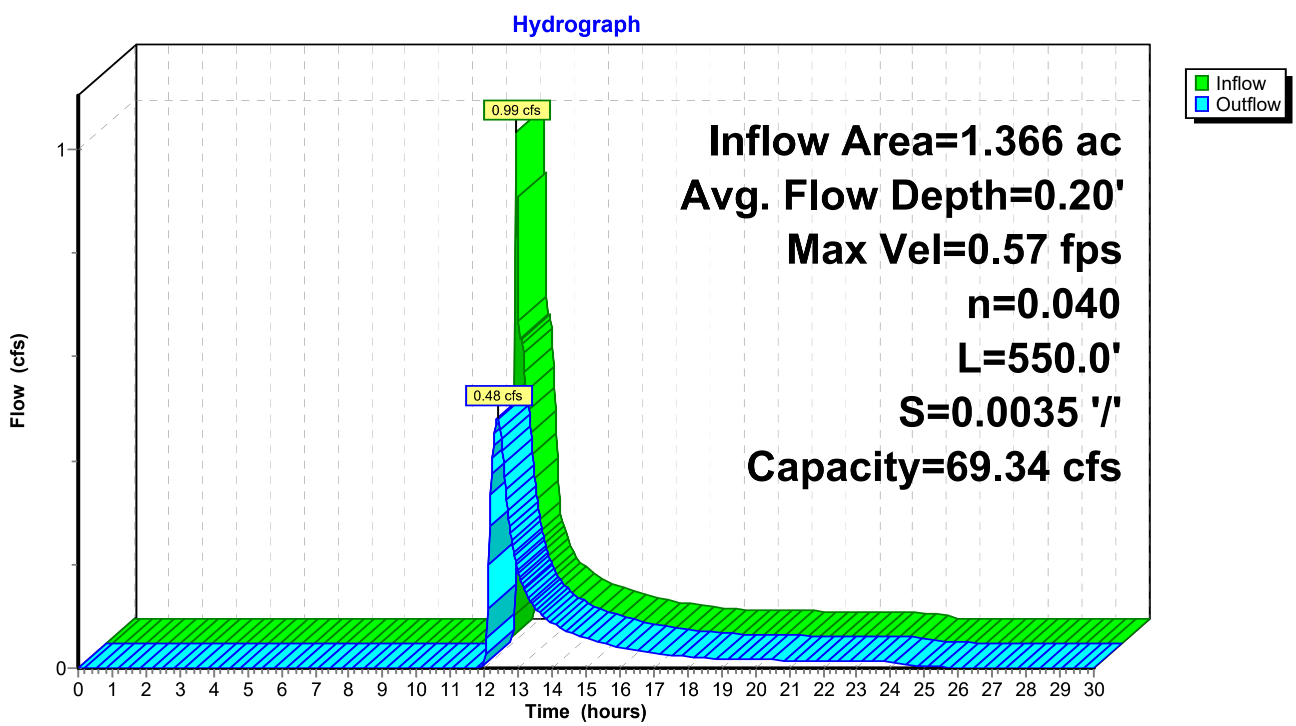
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth > 0.32" for 10-YR MASHPEE ATLAS event
Inflow = 0.31 cfs @ 14.15 hrs, Volume= 0.191 af
Outflow = 0.30 cfs @ 14.38 hrs, Volume= 0.189 af, Atten= 1%, Lag= 13.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.47 fps, Min. Travel Time= 18.6 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 27.0 min

Peak Storage= 339 cf @ 14.38 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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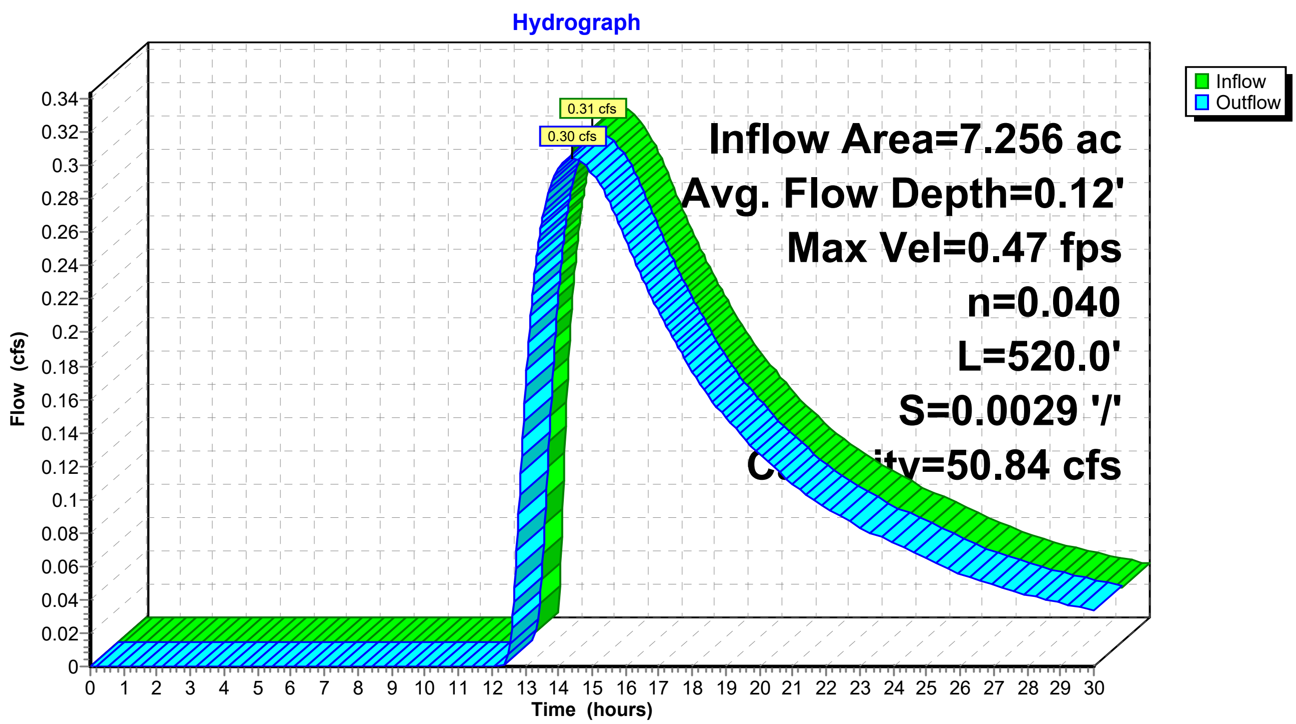
Reach R1A: Tt thru bogs



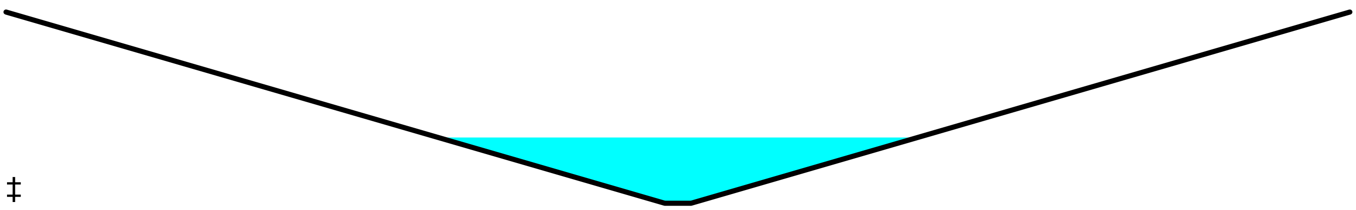
Summary for Reach R2: Tt thru da77

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 1.06" for 10-YR MASHPEE ATLAS event
Inflow = 3.57 cfs @ 12.13 hrs, Volume= 0.248 af
Outflow = 3.21 cfs @ 12.18 hrs, Volume= 0.248 af, Atten= 10%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.97 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 9.3 min

Peak Storage= 691 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.50' Flow Area= 26.0 sf, Capacity= 50.53 cfs

2.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 100.0 '/' Top Width= 102.00'
Length= 210.0' Slope= 0.0095 '/'
Inlet Invert= 17.00', Outlet Invert= 15.00'



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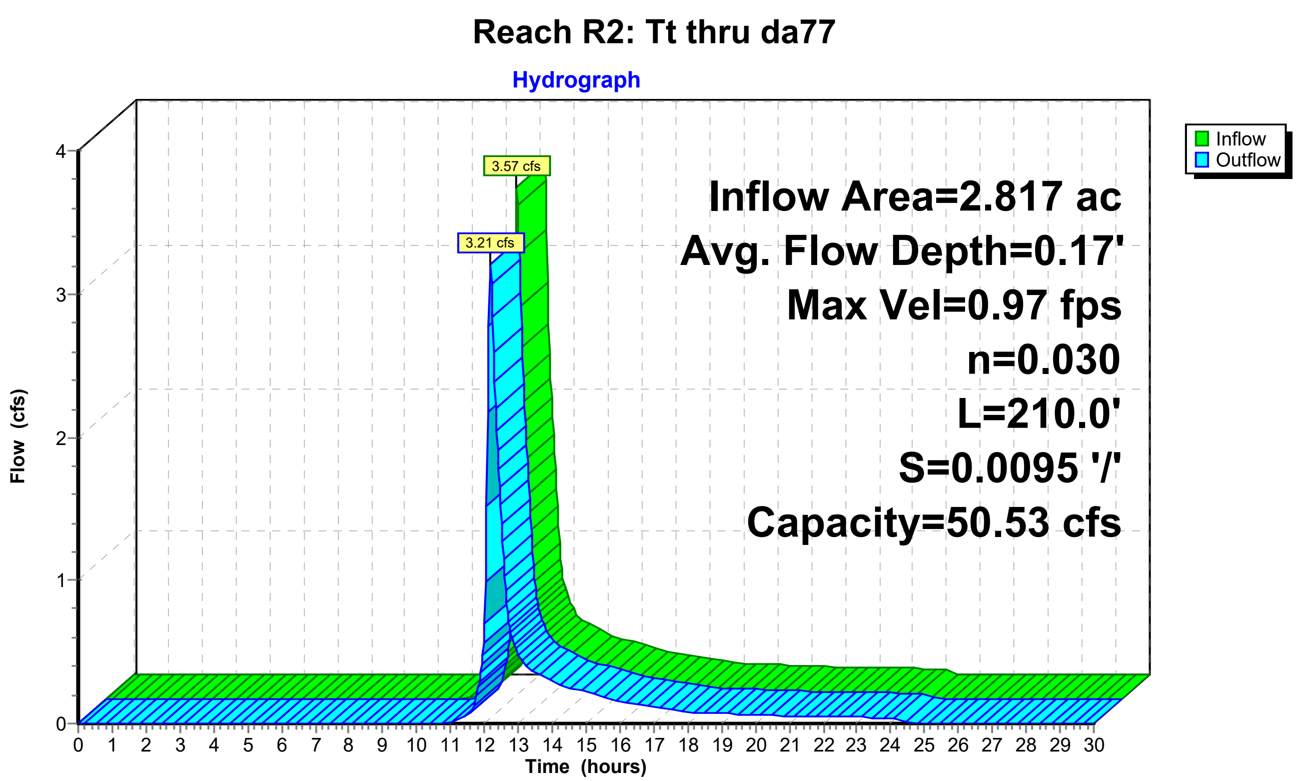


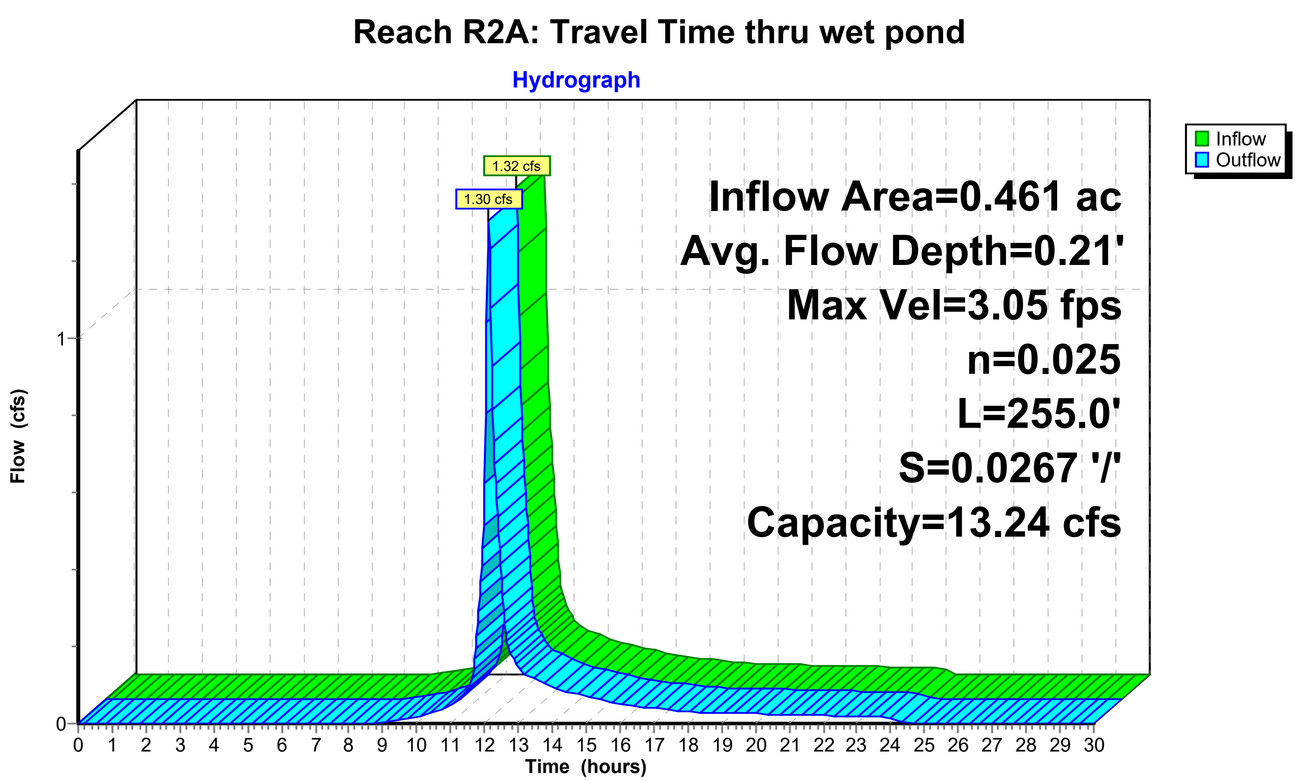
Summary for Reach R2A: Travel Time thru wet pond

Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 2.54" for 10-YR MASHPEE ATLAS event
Inflow = 1.32 cfs @ 12.10 hrs, Volume= 0.098 af
Outflow = 1.30 cfs @ 12.12 hrs, Volume= 0.098 af, Atten= 2%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 3.05 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 5.0 min

Peak Storage= 109 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'



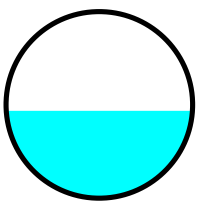
Summary for Reach R3: 18" CPP

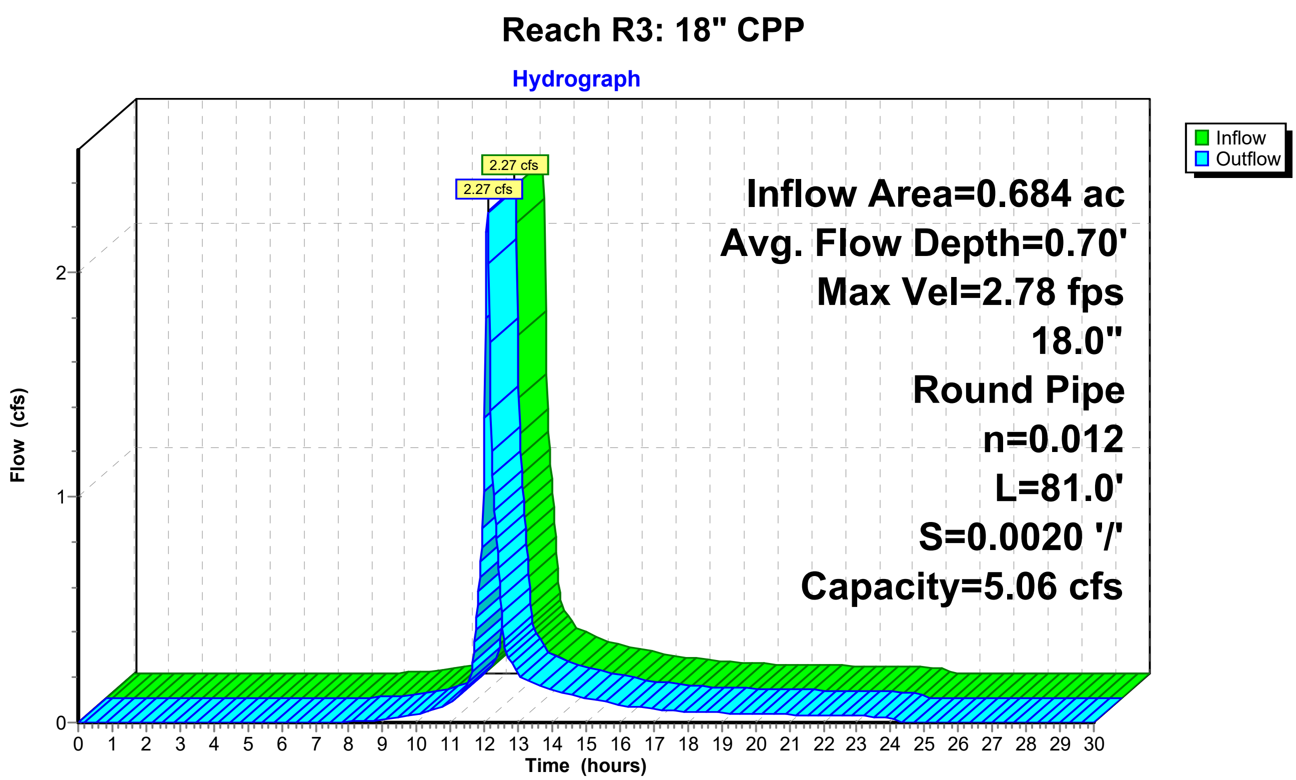
Inflow Area = 0.684 ac, 66.67% Impervious, Inflow Depth = 2.77" for 10-YR MASHPEE ATLAS event
Inflow = 2.27 cfs @ 12.08 hrs, Volume= 0.158 af
Outflow = 2.27 cfs @ 12.08 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.78 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 1.4 min

Peak Storage= 66 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.06 cfs

18.0" Round Pipe
n= 0.012
Length= 81.0' Slope= 0.0020 '/'
Inlet Invert= 15.06', Outlet Invert= 14.90'





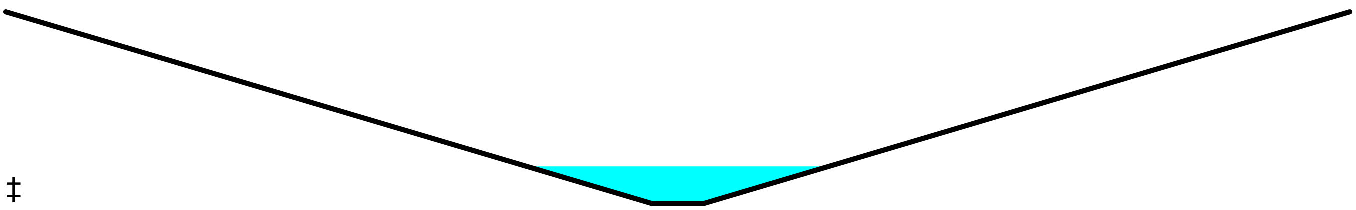
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.18" for 10-YR MASHPEE ATLAS event
Inflow = 1.44 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 1.36 cfs @ 12.12 hrs, Volume= 0.063 af, Atten= 6%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.04 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 5.4 min

Peak Storage= 164 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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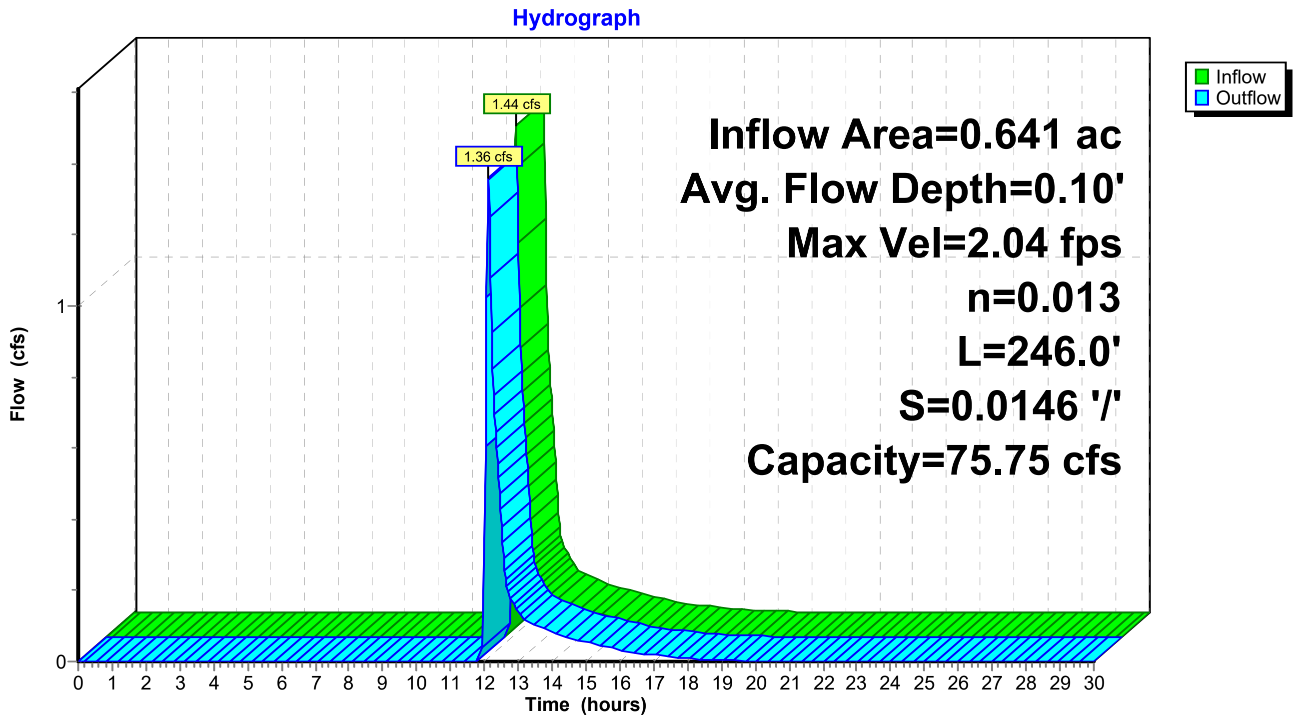
Reach R5: Tt thru da22B

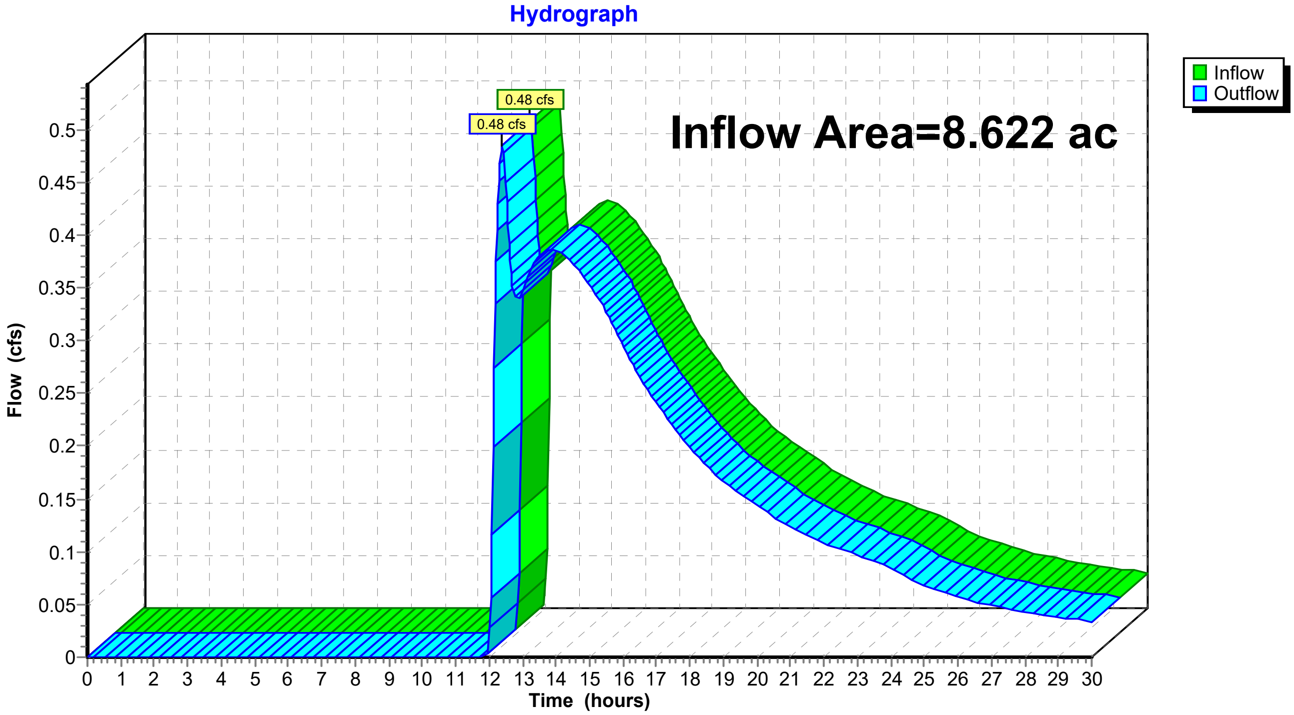


Summary for Reach SP#1: Study Point Combined Flows

Inflow Area = 8.622 ac, 31.29% Impervious, Inflow Depth > 0.35" for 10-YR MASHPEE ATLAS event
Inflow = 0.48 cfs @ 12.40 hrs, Volume= 0.248 af
Outflow = 0.48 cfs @ 12.40 hrs, Volume= 0.248 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3

Reach SP#1: Study Point Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.96" for 10-YR MASHPEE ATLAS event
Inflow = 1.48 cfs @ 12.08 hrs, Volume= 0.105 af
Outflow = 1.47 cfs @ 12.09 hrs, Volume= 0.105 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.03 cfs @ 11.22 hrs, Volume= 0.042 af
Primary = 1.44 cfs @ 12.09 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 20.70' @ 12.10 hrs Surf.Area= 750 sf Storage= 477 cf

Plug-Flow detention time= 76.2 min calculated for 0.105 af (100% of inflow)
Center-of-Mass det. time= 76.3 min (925.5 - 849.2)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2
			707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

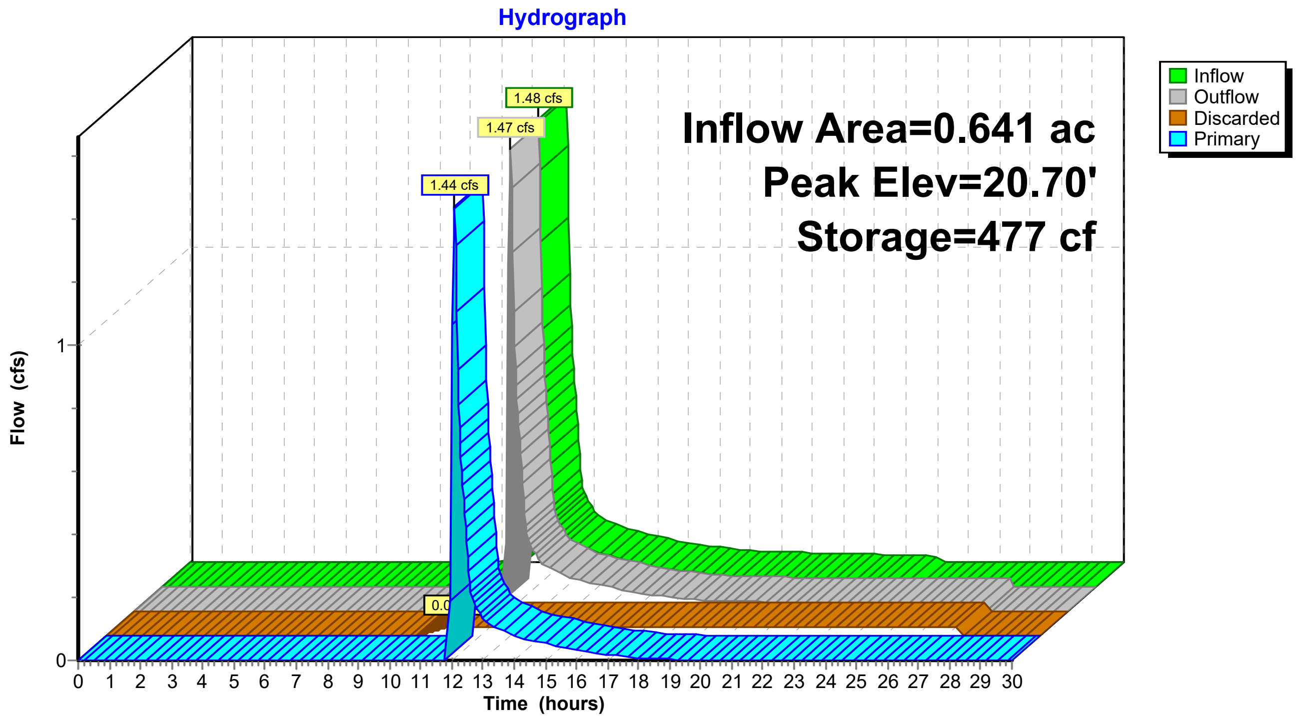
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'**
			Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir**
			Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 11.22 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.43 cfs @ 12.09 hrs HW=20.70' TW=20.67' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.43 cfs @ 0.64 fps)

Pond 1P: LB's


Hydrograph
1.48 cfs
1.47 cfs
1.44 cfs
Inflow Area=0.641 ac
Peak Elev=20.70'
Storage=477 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area = 0.841 ac, 0.00% Impervious, Inflow Depth = 0.03" for 10-YR MASHPEE ATLAS event
Inflow = 0.00 cfs @ 21.05 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 21.37 hrs, Volume= 0.002 af, Atten= 0%, Lag= 18.9 min
Discarded = 0.00 cfs @ 21.37 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.08' @ 21.37 hrs Surf.Area= 49 sf Storage= 2 cf

Plug-Flow detention time= 9.0 min calculated for 0.002 af (100% of inflow)
Center-of-Mass det. time= 9.0 min (1,200.9 - 1,191.9)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

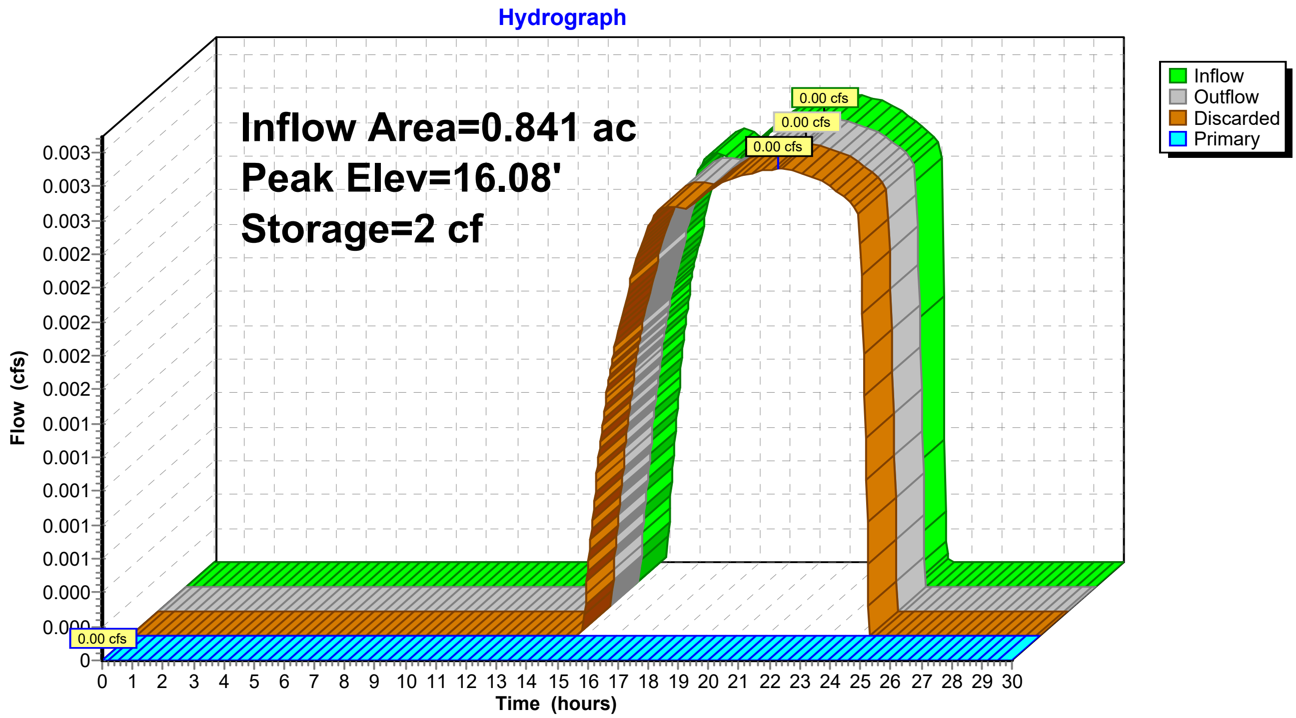
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	7,467	4,103	4,469

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.58'	**50.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.00 cfs @ 21.37 hrs HW=16.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3A-P: Pond 3A

Inflow Area = 0.109 ac, 21.10% Impervious, Inflow Depth = 1.66" for 10-YR MASHPEE ATLAS event
Inflow = 0.21 cfs @ 12.08 hrs, Volume= 0.015 af
Outflow = 0.09 cfs @ 12.33 hrs, Volume= 0.015 af, Atten= 56%, Lag= 14.9 min
Discarded = 0.01 cfs @ 12.33 hrs, Volume= 0.012 af
Primary = 0.08 cfs @ 12.33 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.52' @ 12.33 hrs Surf.Area= 600 sf Storage= 195 cf

Plug-Flow detention time= 139.0 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 139.0 min (998.9 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	520 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

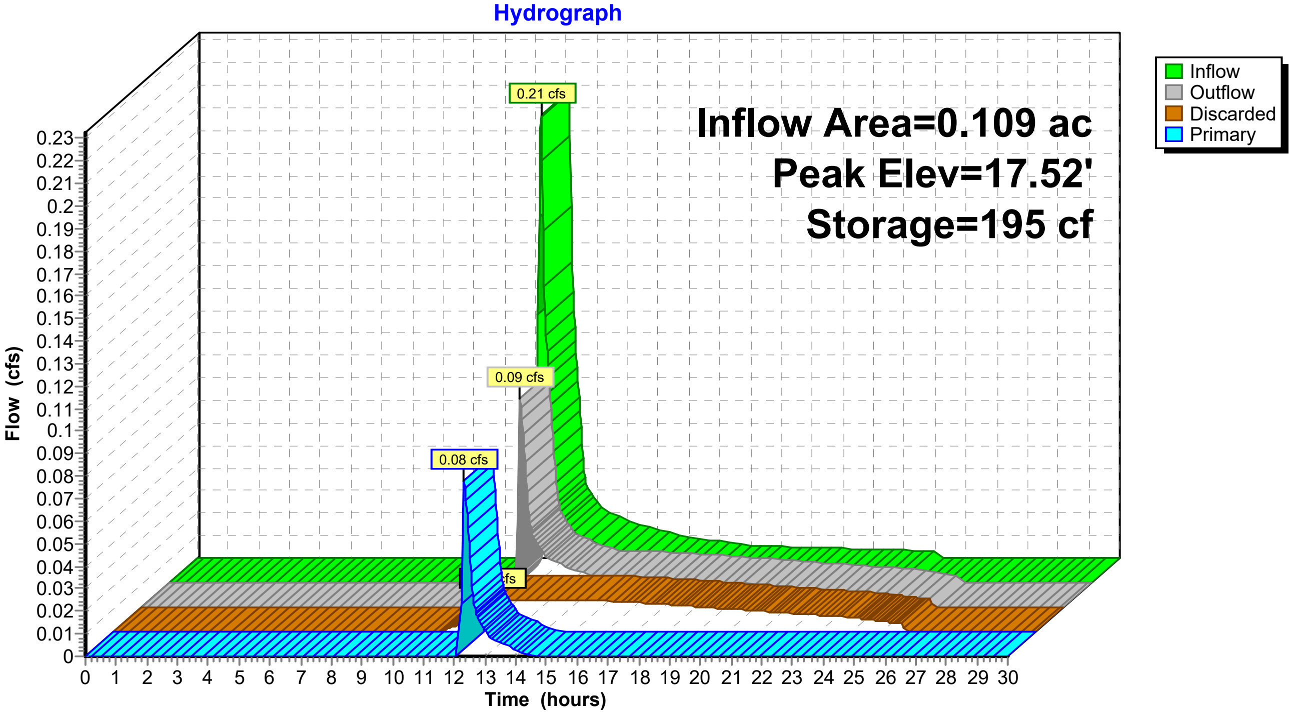
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	144	0	0
17.50	594	185	185
18.00	749	336	520

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	17.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.33 hrs HW=17.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.08 cfs @ 12.33 hrs HW=17.52' TW=14.80' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Weir Controls 0.08 cfs @ 0.44 fps)

Pond 3A-P: Pond 3A



Summary for Pond 3P: Wet Pond

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth = 0.45" for 10-YR MASHPEE ATLAS event
Inflow = 4.66 cfs @ 12.34 hrs, Volume= 0.274 af
Outflow = 0.31 cfs @ 14.15 hrs, Volume= 0.191 af, Atten= 93%, Lag= 108.2 min
Primary = 0.31 cfs @ 14.15 hrs, Volume= 0.191 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 14.67' @ 14.15 hrs Surf.Area= 17,573 sf Storage= 8,564 cf

Plug-Flow detention time= 340.2 min calculated for 0.191 af (70% of inflow)
Center-of-Mass det. time= 290.1 min (1,085.4 - 795.3)

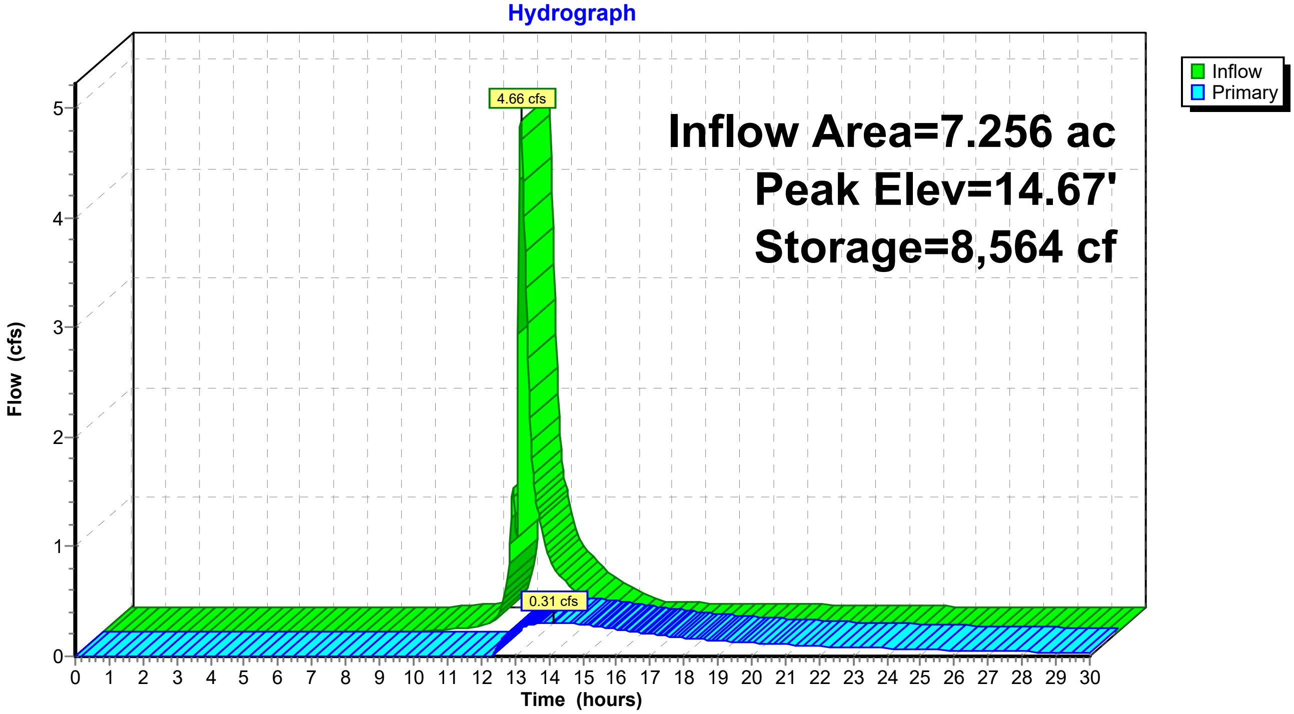
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	38,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,319	1,337	1,338
15.00	20,594	13,565	14,904
16.00	25,633	23,114	38,017

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**8.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Primary	15.75'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.31 cfs @ 14.15 hrs HW=14.67' TW=14.32' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.31 cfs @ 1.65 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Wet Pond



Summary for Pond 4P: Pond 4

Inflow Area = 0.132 ac, 50.76% Impervious, Inflow Depth = 2.90" for 10-YR MASHPEE ATLAS event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.032 af
Outflow = 0.46 cfs @ 12.08 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.015 af
Primary = 0.45 cfs @ 12.08 hrs, Volume= 0.017 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.02' @ 12.08 hrs Surf.Area= 463 sf Storage= 240 cf

Plug-Flow detention time= 136.1 min calculated for 0.031 af (98% of inflow)
Center-of-Mass det. time= 124.1 min (944.9 - 820.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	253 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

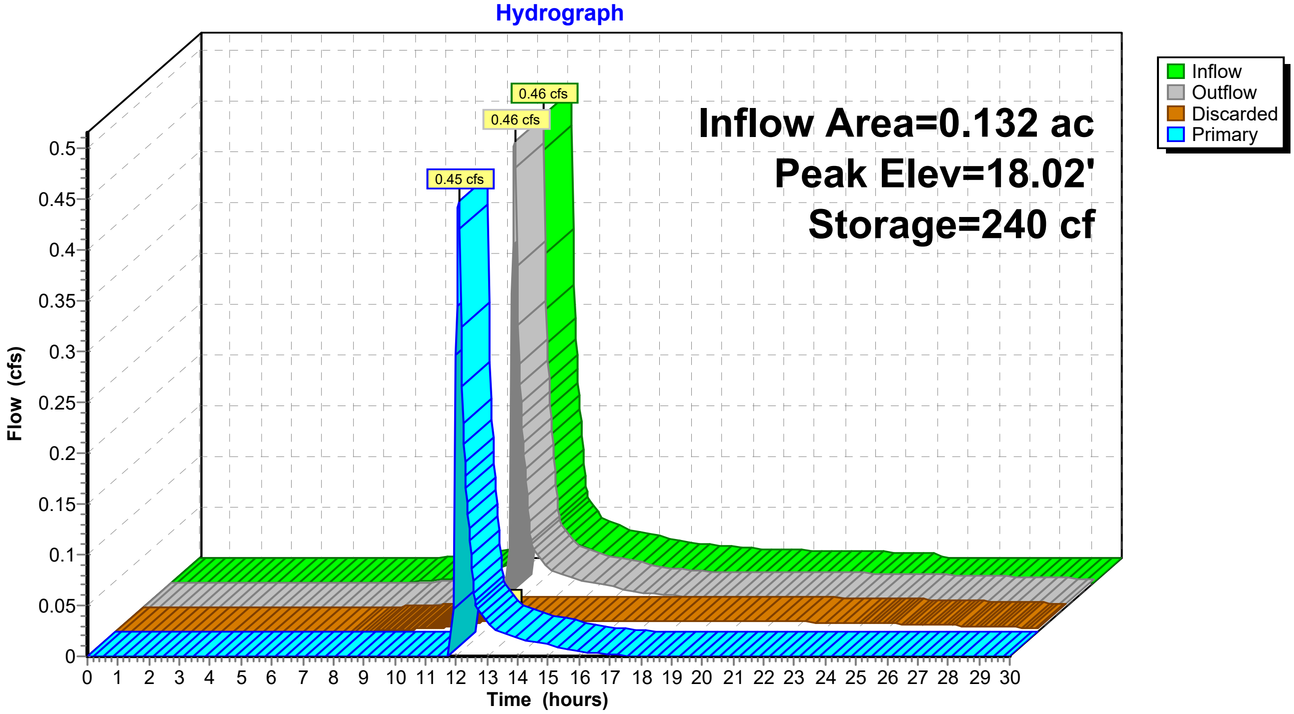
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	10	0	0
18.00	450	230	230
18.05	478	23	253

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=18.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.44 cfs @ 12.08 hrs HW=18.02' TW=14.69' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.44 cfs @ 0.49 fps)

Pond 4P: Pond 4



Summary for Pond 5P: Pond 5

Inflow Area = 0.124 ac, 58.87% Impervious, Inflow Depth = 2.37" for 10-YR MASHPEE ATLAS event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 0.025 af
Outflow = 0.46 cfs @ 12.10 hrs, Volume= 0.025 af, Atten= 0%, Lag= 1.1 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 0.016 af
Primary = 0.44 cfs @ 12.10 hrs, Volume= 0.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 19.02' @ 12.09 hrs Surf.Area= 319 sf Storage= 234 cf

Plug-Flow detention time= 131.4 min calculated for 0.025 af (100% of inflow)
Center-of-Mass det. time= 131.1 min (967.5 - 836.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	244 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

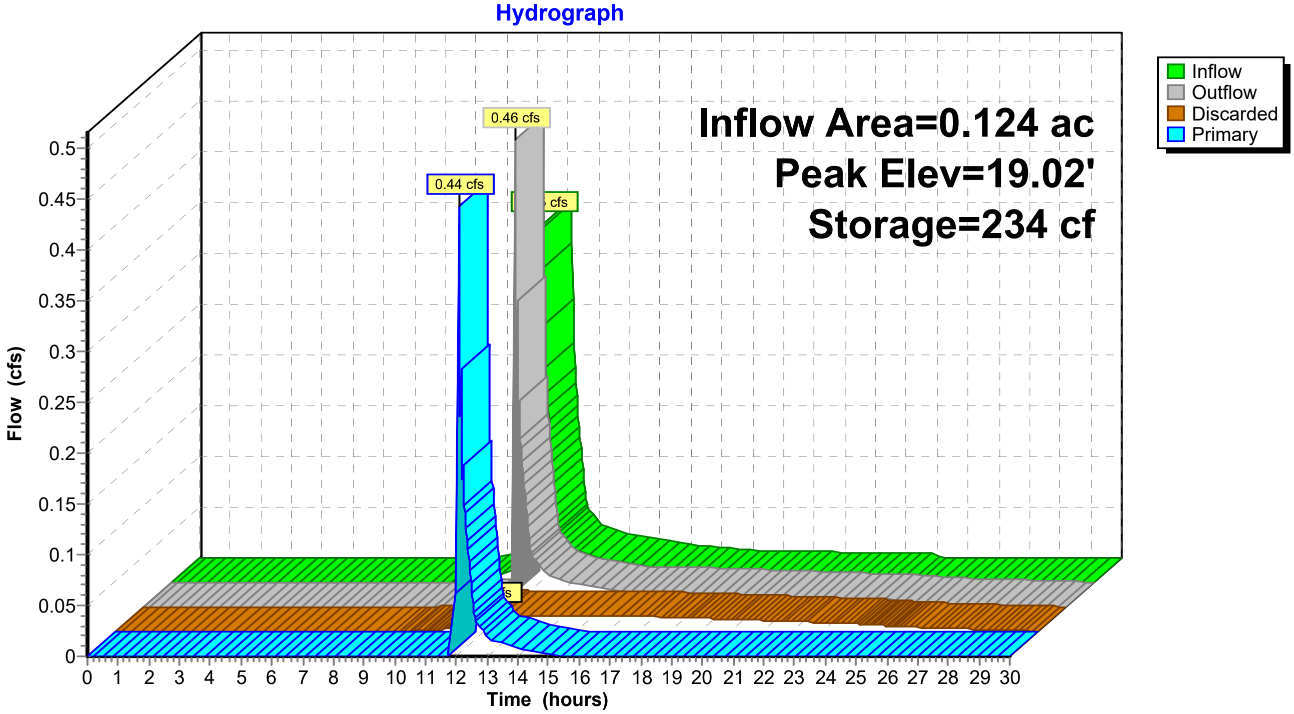
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	1	0	0
18.00	86	44	44
19.00	282	184	228
19.05	366	16	244

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.10 hrs HW=19.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.39 cfs @ 12.10 hrs HW=19.02' TW=14.71' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.39 cfs @ 0.47 fps)

Pond 5P: Pond 5



Summary for Pond 6P: Pond 6

Inflow Area = 0.088 ac, 17.05% Impervious, Inflow Depth = 0.49" for 10-YR MASHPEE ATLAS event
Inflow = 0.02 cfs @ 12.15 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 12.98 hrs, Volume= 0.004 af, Atten= 66%, Lag= 49.9 min
Discarded = 0.01 cfs @ 12.98 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.40' @ 12.98 hrs Surf.Area= 130 sf Storage= 26 cf

Plug-Flow detention time= 39.2 min calculated for 0.004 af (100% of inflow)
Center-of-Mass det. time= 39.2 min (976.9 - 937.7)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

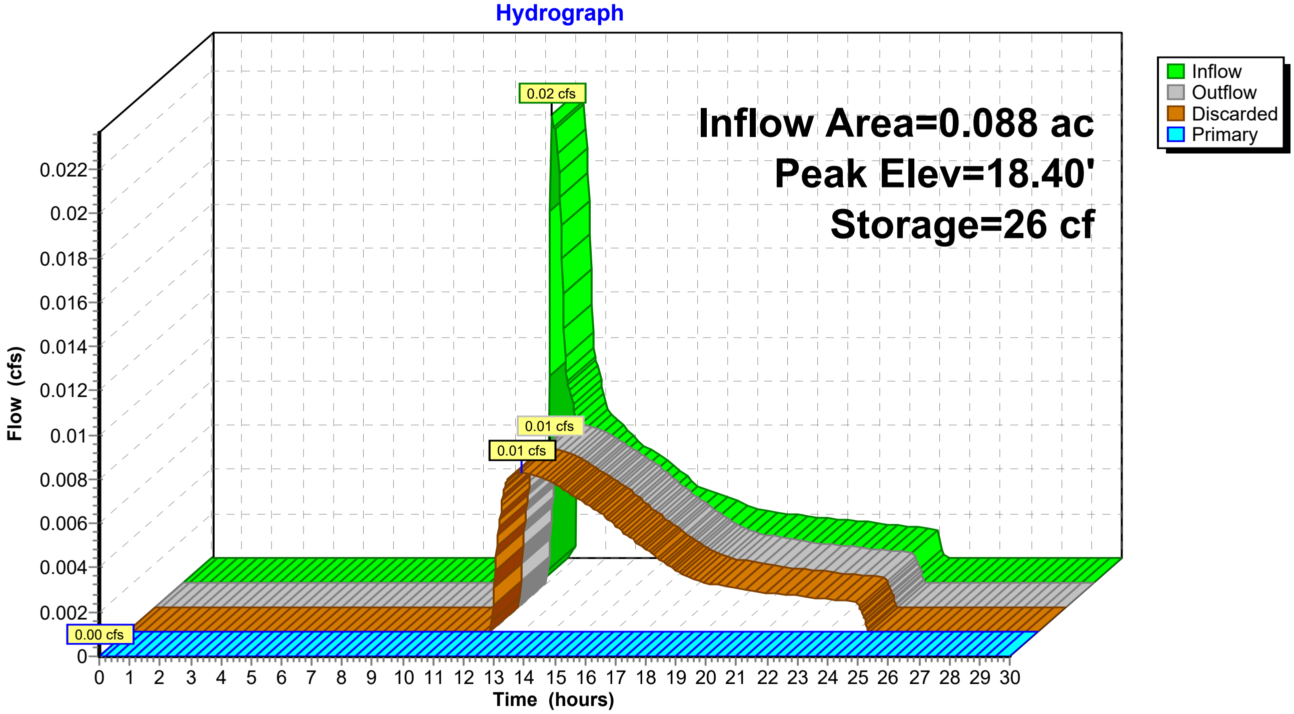
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	1	0	0
19.00	326	164	164
19.05	394	18	182

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	**2.410 in/hr Exfiltration over Surface area from 17.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.98 hrs HW=18.40' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 6



Summary for Pond 7P: Pond 7

Inflow Area =	0.033 ac, 63.64% Impervious, Inflow Depth = 2.63" for 10-YR MASHPEE ATLAS event			
Inflow =	0.10 cfs @	12.08 hrs, Volume=	0.007 af	
Outflow =	0.12 cfs @	12.15 hrs, Volume=	0.007 af,	Atten= 0%, Lag= 4.5 min
Discarded =	0.01 cfs @	12.15 hrs, Volume=	0.006 af	
Primary =	0.11 cfs @	12.15 hrs, Volume=	0.002 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.01' @ 12.15 hrs Surf.Area= 143 sf Storage= 82 cf

Plug-Flow detention time= 98.6 min calculated for 0.007 af (100% of inflow)
Center-of-Mass det. time= 98.7 min (927.4 - 828.7)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	87 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

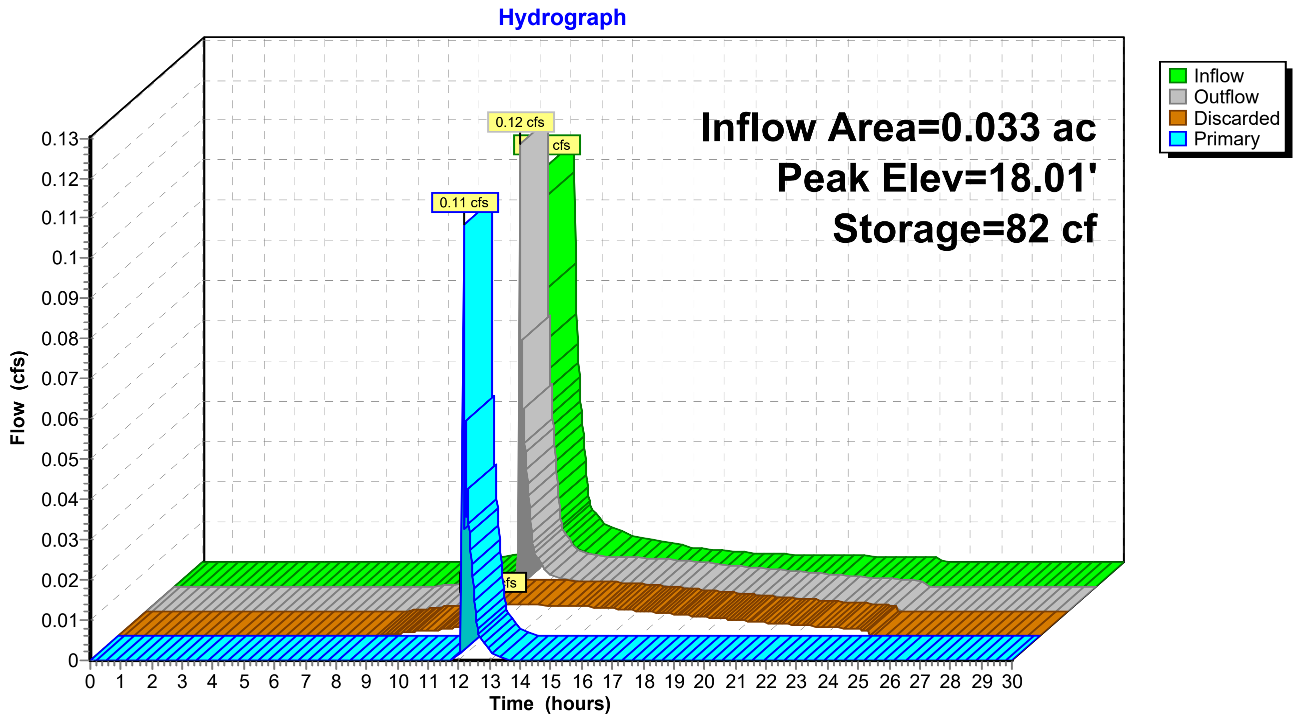
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	23	0	0
18.00	137	80	80
18.05	159	7	87

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=18.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.10 cfs @ 12.15 hrs HW=18.01' TW=14.76' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.38 fps)

Pond 7P: Pond 7



Summary for Pond 8P: Pond 8

Inflow Area = 0.087 ac, 35.63% Impervious, Inflow Depth = 1.31" for 10-YR MASHPEE ATLAS event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af
Outflow = 0.03 cfs @ 12.55 hrs, Volume= 0.009 af, Atten= 78%, Lag= 27.9 min
Discarded = 0.03 cfs @ 12.55 hrs, Volume= 0.009 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.20' @ 12.55 hrs Surf.Area= 489 sf Storage= 92 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 21.3 min (895.6 - 874.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	622 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

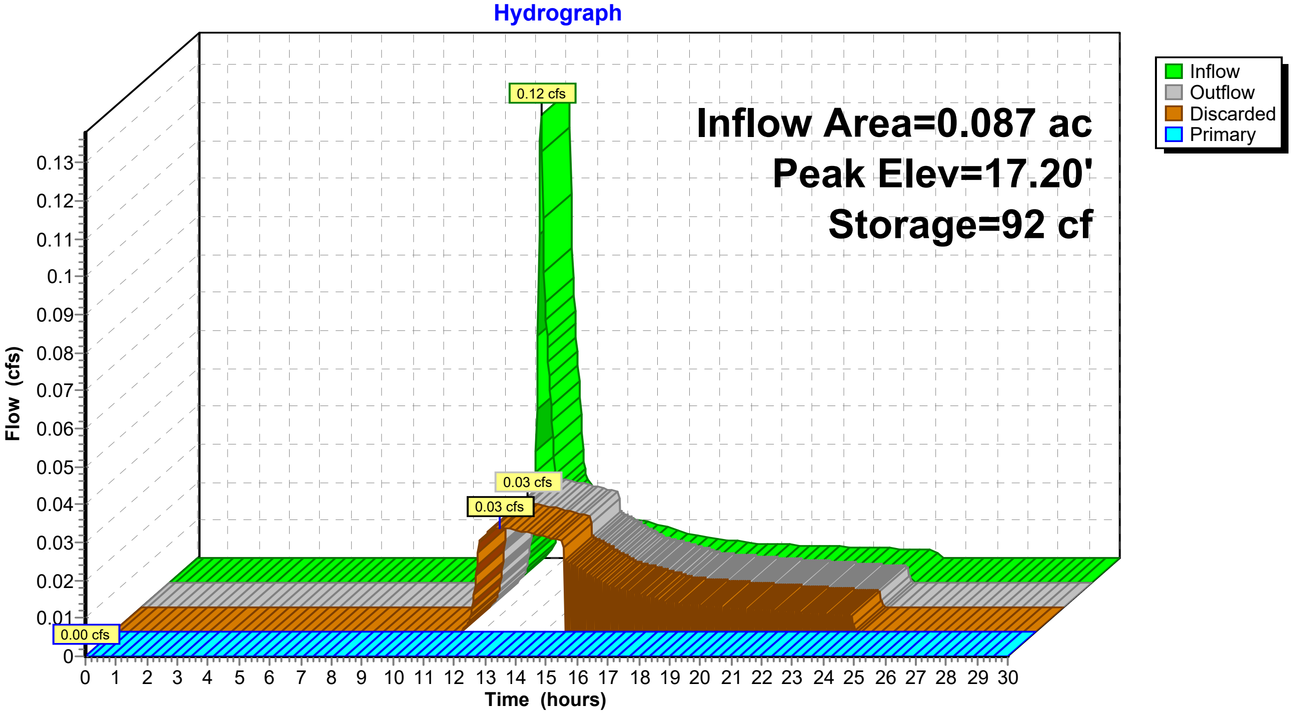
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	426	0	0
18.00	741	584	584
18.05	791	38	622

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.03 cfs @ 12.55 hrs HW=17.20' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Pond 8



Summary for Pond FB1: Forebay 1

Inflow Area =	1.040 ac, 55.00% Impervious, Inflow Depth = 2.22"	for 10-YR MASHPEE ATLAS event		
Inflow =	2.71 cfs @	12.08 hrs, Volume=	0.192 af	
Outflow =	1.66 cfs @	12.19 hrs, Volume=	0.192 af,	Atten= 39%, Lag= 6.5 min
Discarded =	0.09 cfs @	12.12 hrs, Volume=	0.125 af	
Primary =	1.57 cfs @	12.19 hrs, Volume=	0.067 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.63' @ 12.19 hrs Surf.Area= 1,960 sf Storage= 2,277 cf

Plug-Flow detention time= 179.4 min calculated for 0.192 af (100% of inflow)
Center-of-Mass det. time= 179.6 min (1,014.6 - 834.9)

Volume	Invert	Avail.Storage	Storage Description
#1	14.90'	3,175 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

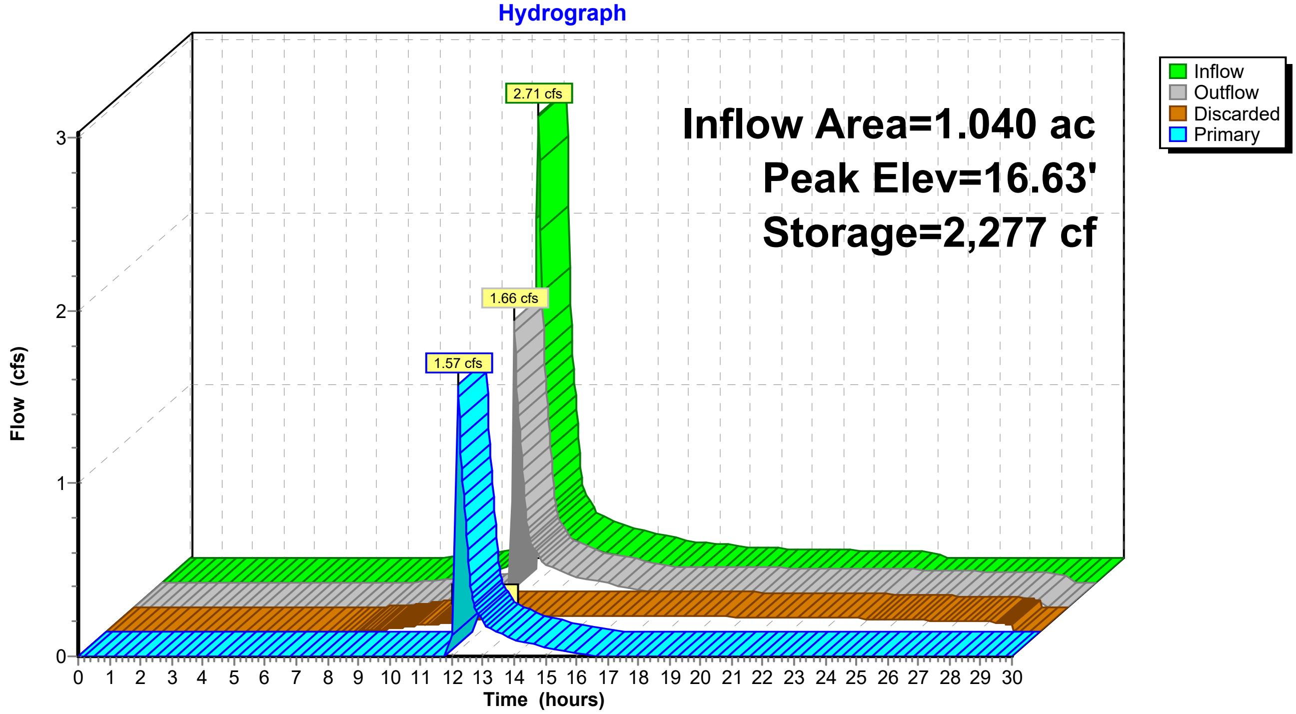
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.90	661	0	0
15.00	996	83	83
16.00	1,406	1,201	1,284
16.50	1,633	760	2,044
17.00	2,893	1,132	3,175

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.90'	**2.410 in/hr Exfiltration over Surface area from 14.80' - 16.50'** Excluded Surface area = 0 sf
#2	Primary	16.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.09 cfs @ 12.12 hrs HW=16.50' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.51 cfs @ 12.19 hrs HW=16.63' TW=15.85' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.51 cfs @ 1.20 fps)

Pond FB1: Forebay 1



Summary for Pond FB3: Forebay 3

Inflow Area = 6.795 ac, 31.67% Impervious, Inflow Depth = 0.96" for 10-YR MASHPEE ATLAS event
Inflow = 6.78 cfs @ 12.17 hrs, Volume= 0.544 af
Outflow = 4.41 cfs @ 12.35 hrs, Volume= 0.544 af, Atten= 35%, Lag= 10.7 min
Discarded = 0.38 cfs @ 12.35 hrs, Volume= 0.368 af
Primary = 4.03 cfs @ 12.35 hrs, Volume= 0.176 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.12' @ 12.35 hrs Surf.Area= 6,859 sf Storage= 6,313 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 117.4 min (954.3 - 836.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	10,961 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

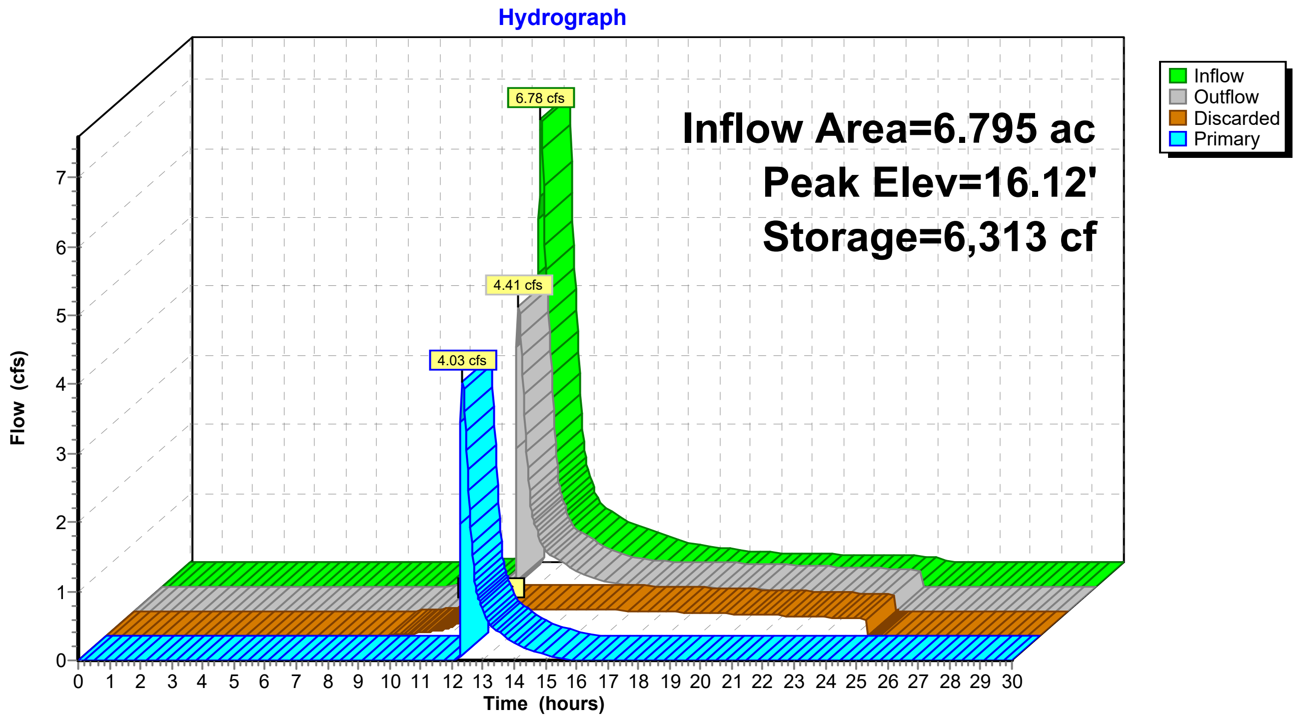
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.00	4,358	0	0
16.00	6,677	5,518	5,518
16.75	7,840	5,444	10,961

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.00'	**2.410 in/hr Exfiltration over Surface area from 14.90' - 16.75'** Excluded Surface area = 0 sf
#2	Primary	16.00'	**10.0' long Sharp-Crested Rectangular Weir X 3.00** 2 End Contraction(s) 0.7' Crest Height

Discarded OutFlow Max=0.38 cfs @ 12.35 hrs HW=16.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=4.01 cfs @ 12.35 hrs HW=16.12' TW=14.32' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.01 cfs @ 1.14 fps)

Pond FB3: Forebay 3



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-12: AREAS TO WETLAND Runoff Area=0.793 ac 2.90% Impervious Runoff Depth=0.79"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.46 cfs 0.052 af

SubcatchmentDA-1A: AREA TO CB'S 3 Runoff Area=0.252 ac 59.92% Impervious Runoff Depth=3.17"
Tc=5.0 min CN=74 Runoff=0.96 cfs 0.067 af

SubcatchmentDA-1B: AREA TO CB'S 1 Runoff Area=0.432 ac 70.60% Impervious Runoff Depth=3.87"
Tc=5.0 min CN=81 Runoff=2.00 cfs 0.139 af

SubcatchmentDA-1C: AREA TO FB1 Runoff Area=0.356 ac 32.58% Impervious Runoff Depth=1.74"
Tc=5.0 min CN=58 Runoff=0.69 cfs 0.052 af

SubcatchmentDA-2: END OF ROAD TO Runoff Area=0.536 ac 58.02% Impervious Runoff Depth=3.07"
Flow Length=250' Tc=6.2 min CN=73 Runoff=1.91 cfs 0.137 af

SubcatchmentDA-3: AREAS TO WEST Runoff Area=0.109 ac 21.10% Impervious Runoff Depth=2.34"
Tc=5.0 min UI Adjusted CN=65 Runoff=0.30 cfs 0.021 af

SubcatchmentDA-4: AREAS TO WEST Runoff Area=0.132 ac 50.76% Impervious Runoff Depth=3.76"
Tc=5.0 min CN=80 Runoff=0.60 cfs 0.041 af

SubcatchmentDA-5: AREAS TO WEST Runoff Area=0.124 ac 58.87% Impervious Runoff Depth=3.17"
Tc=5.0 min CN=74 Runoff=0.47 cfs 0.033 af

SubcatchmentDA-6: AREAS TO WEST Runoff Area=0.088 ac 17.05% Impervious Runoff Depth=0.86"
Tc=5.0 min UI Adjusted CN=46 Runoff=0.06 cfs 0.006 af

SubcatchmentDA-7: AREAS TO WEST Runoff Area=0.033 ac 63.64% Impervious Runoff Depth=3.46"
Tc=5.0 min CN=77 Runoff=0.14 cfs 0.010 af

SubcatchmentDA-8: AREAS TO WEST Runoff Area=0.087 ac 35.63% Impervious Runoff Depth=1.91"
Tc=5.0 min CN=60 Runoff=0.19 cfs 0.014 af

SubcatchmentDA-9: AREAS EAST OF Runoff Area=0.558 ac 65.23% Impervious Runoff Depth=3.46"
Tc=5.0 min CN=77 Runoff=2.32 cfs 0.161 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=3.36"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=1.75 cfs 0.129 af

SubcatchmentDA22B: QUIN AVE WEST Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=2.34"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=3.23 cfs 0.260 af

SubcatchmentDA44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.13"
Tc=5.0 min CN=32 Runoff=0.01 cfs 0.009 af

SubcatchmentDA55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=2.70"
Tc=5.0 min CN=69 Runoff=2.07 cfs 0.144 af

Subcatchment DA77: AREAS TO WETLAND Runoff Area=1.844 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=431' Tc=26.3 min CN=32 Runoff=0.03 cfs 0.020 af

Reach R1: Tt along stream Avg. Flow Depth=0.28' Max Vel=0.71 fps Inflow=1.66 cfs 0.103 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=0.98 cfs 0.103 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.20' Max Vel=0.63 fps Inflow=0.71 cfs 0.414 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=0.71 cfs 0.411 af

Reach R2: Tt thru da77 Avg. Flow Depth=0.20' Max Vel=1.07 fps Inflow=5.13 cfs 0.359 af
n=0.030 L=210.0' S=0.0095 '/' Capacity=50.53 cfs Outflow=4.73 cfs 0.359 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.25' Max Vel=3.37 fps Inflow=1.75 cfs 0.129 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=1.73 cfs 0.129 af

Reach R3: 18" CPP Avg. Flow Depth=0.82' Max Vel=2.97 fps Inflow=2.97 cfs 0.206 af
18.0" Round Pipe n=0.012 L=81.0' S=0.0020 '/' Capacity=5.06 cfs Outflow=2.96 cfs 0.206 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.11' Max Vel=2.23 fps Inflow=2.02 cfs 0.099 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=1.93 cfs 0.099 af

Reach SP#1: Study Point Combined Flows Inflow=0.99 cfs 0.514 af
Outflow=0.99 cfs 0.514 af

Pond 1P: LB's Peak Elev=20.72' Storage=490 cf Inflow=2.07 cfs 0.144 af
Discarded=0.03 cfs 0.045 af Primary=2.02 cfs 0.099 af Outflow=2.05 cfs 0.144 af

Pond 2P: Natural Low Area Peak Elev=16.32' Storage=35 cf Inflow=0.01 cfs 0.009 af
Discarded=0.01 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.009 af

Pond 3A-P: Pond 3A Peak Elev=17.54' Storage=206 cf Inflow=0.30 cfs 0.021 af
Discarded=0.01 cfs 0.014 af Primary=0.22 cfs 0.007 af Outflow=0.24 cfs 0.021 af

Pond 3P: Wet Pond Peak Elev=14.98' Storage=14,406 cf Inflow=9.98 cfs 0.505 af
Outflow=0.71 cfs 0.414 af

Pond 4P: Pond 4 Peak Elev=18.03' Storage=242 cf Inflow=0.60 cfs 0.041 af
Discarded=0.01 cfs 0.016 af Primary=0.58 cfs 0.025 af Outflow=0.60 cfs 0.040 af

Pond 5P: Pond 5 Peak Elev=19.02' Storage=234 cf Inflow=0.47 cfs 0.033 af
Discarded=0.02 cfs 0.018 af Primary=0.46 cfs 0.015 af Outflow=0.47 cfs 0.033 af

Pond 6P: Pond 6 Peak Elev=18.64' Storage=67 cf Inflow=0.06 cfs 0.006 af
Discarded=0.01 cfs 0.006 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.006 af

Pond 7P: Pond 7 Peak Elev=18.02' Storage=82 cf Inflow=0.14 cfs 0.010 af
Discarded=0.01 cfs 0.006 af Primary=0.13 cfs 0.003 af Outflow=0.14 cfs 0.010 af

Pond 8P: Pond 8 Peak Elev=17.36' Storage=173 cf Inflow=0.19 cfs 0.014 af
Discarded=0.03 cfs 0.014 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.014 af

Pond FB1: Forebay 1 Peak Elev=16.71' Storage=2,435 cf Inflow=3.65 cfs 0.257 af
Discarded=0.09 cfs 0.136 af Primary=3.22 cfs 0.121 af Outflow=3.31 cfs 0.257 af

Pond FB3: Forebay 3 Peak Elev=16.20' Storage=6,855 cf Inflow=11.38 cfs 0.798 af
Discarded=0.39 cfs 0.423 af Primary=8.76 cfs 0.376 af Outflow=9.15 cfs 0.798 af

Total Runoff Area = 8.622 ac Runoff Volume = 1.295 af Average Runoff Depth = 1.80"
68.71% Pervious = 5.924 ac 31.29% Impervious = 2.698 ac

Summary for Subcatchment DA-12: AREAS TO WETLAND TO WEST

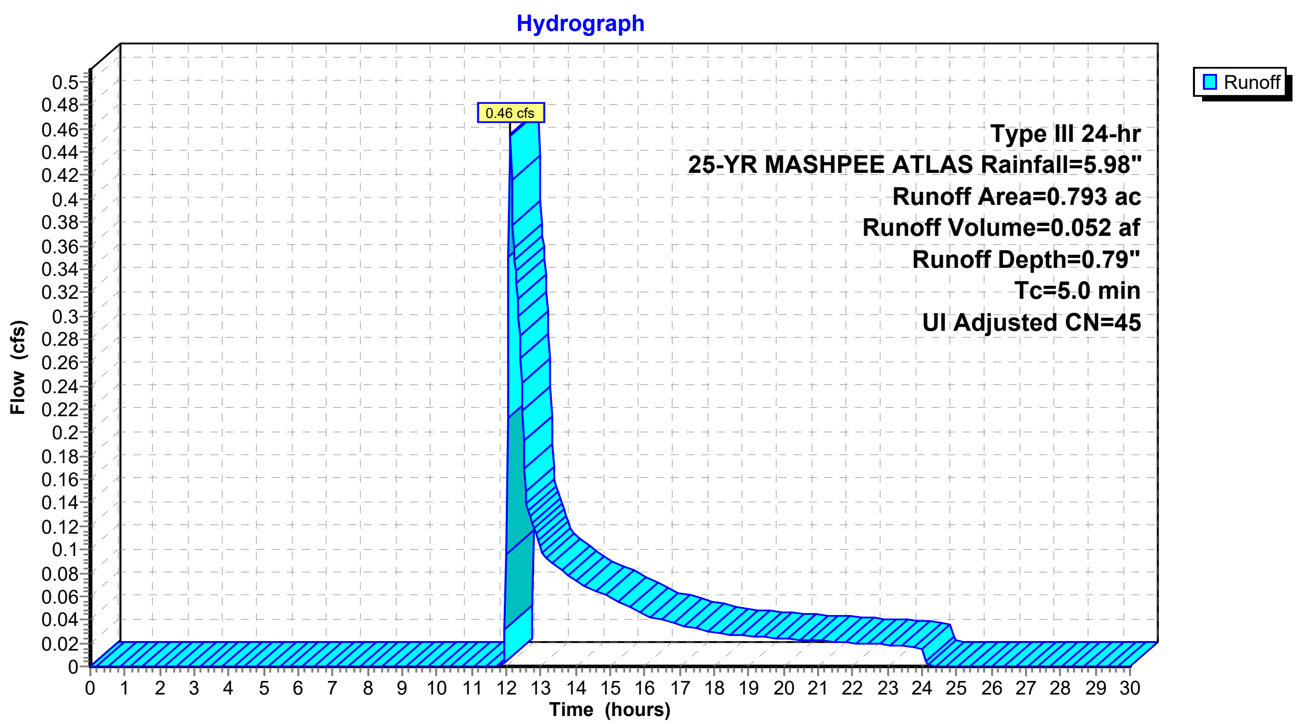
Runoff = 0.46 cfs @ 12.11 hrs, Volume= 0.052 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Adj	Description
0.090	39		>75% Grass cover, Good, HSG A
0.318	30		Woods, Good, HSG A
0.023	76		Gravel roads, HSG A
0.023	98		Unconnected pavement, HSG B
0.317	55		Woods, Good, HSG B
0.022	85		Gravel roads, HSG B
0.793	46	45	Weighted Average, UI Adjusted
0.770			97.10% Pervious Area
0.023			2.90% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-12: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-1A: AREA TO CB'S 3 AND 4

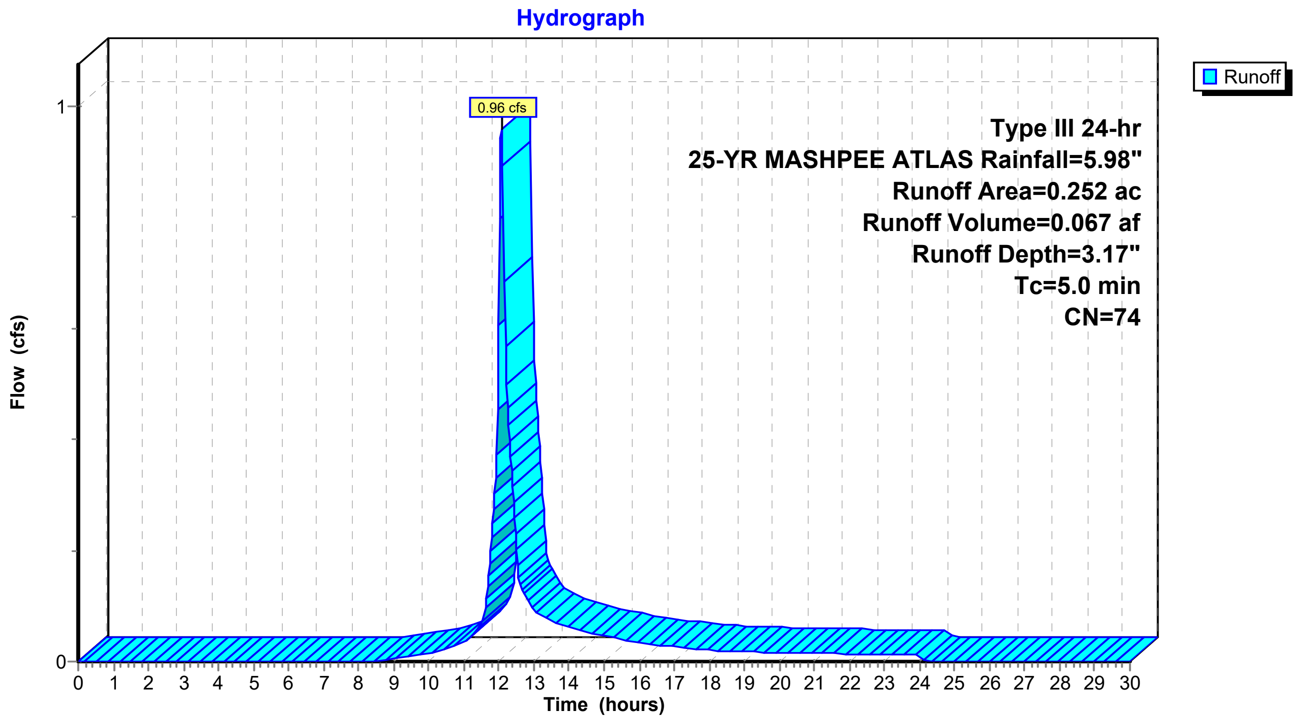
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.067 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.101	39	>75% Grass cover, Good, HSG A
0.109	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.252	74	Weighted Average
0.101		40.08% Pervious Area
0.151		59.92% Impervious Area
0.109		72.19% Unconnected

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

Subcatchment DA-1A: AREA TO CB'S 3 AND 4



Summary for Subcatchment DA-1B: AREA TO CB'S 1 AND 2

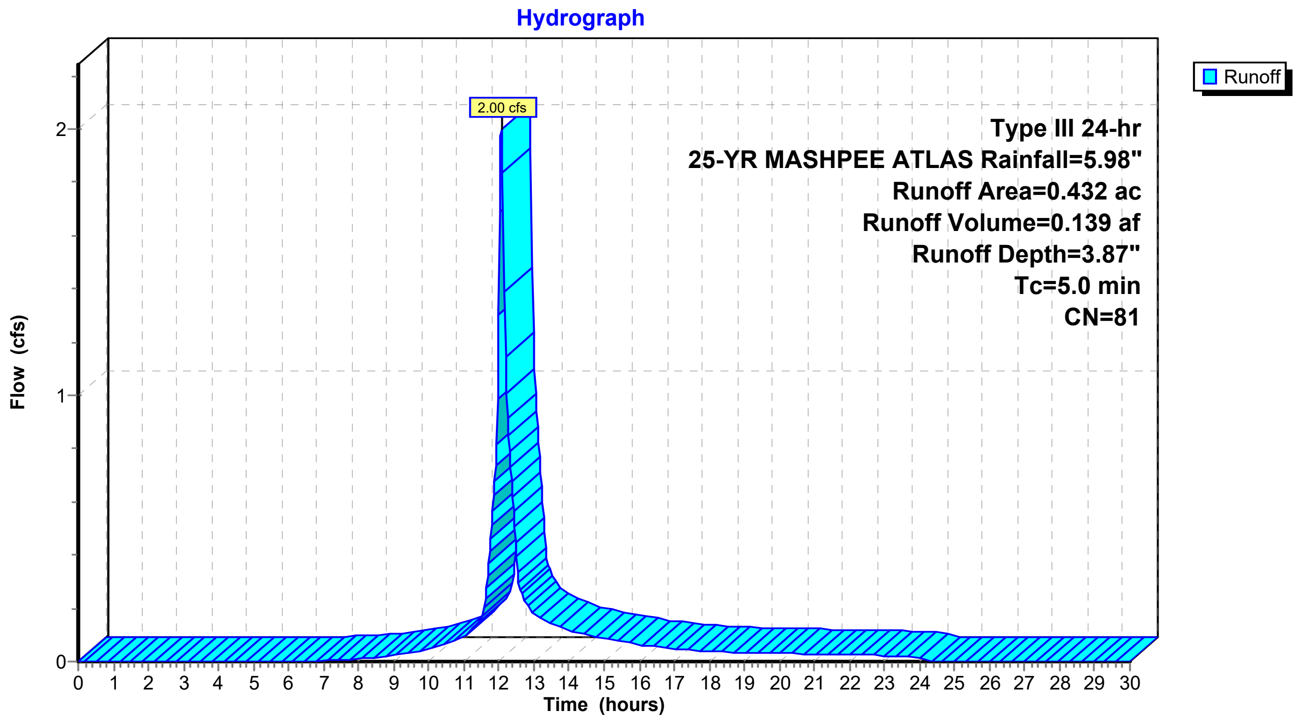
Runoff = 2.00 cfs @ 12.07 hrs, Volume= 0.139 af, Depth= 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.137	98	Unconnected pavement, HSG A
0.127	39	Pasture/grassland/range, Good, HSG A
0.168	98	Roofs, HSG A
0.432	81	Weighted Average
0.127		29.40% Pervious Area
0.305		70.60% Impervious Area
0.137		44.92% Unconnected

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

Subcatchment DA-1B: AREA TO CB'S 1 AND 2



Summary for Subcatchment DA-1C: AREA TO FB1

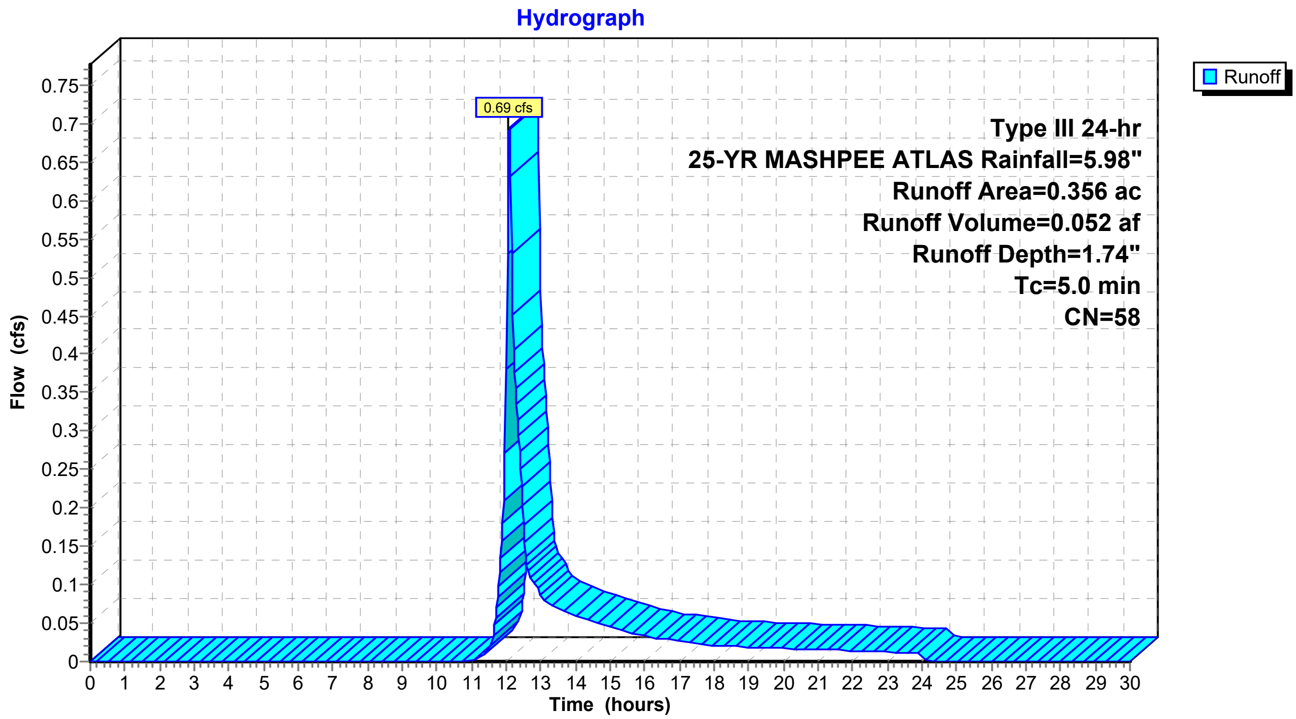
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.240	39	>75% Grass cover, Good, HSG A
0.074	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.356	58	Weighted Average
0.240		67.42% Pervious Area
0.116		32.58% Impervious Area
0.074		63.79% Unconnected

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

Subcatchment DA-1C: AREA TO FB1



Summary for Subcatchment DA-2: END OF ROAD TO THE EAST

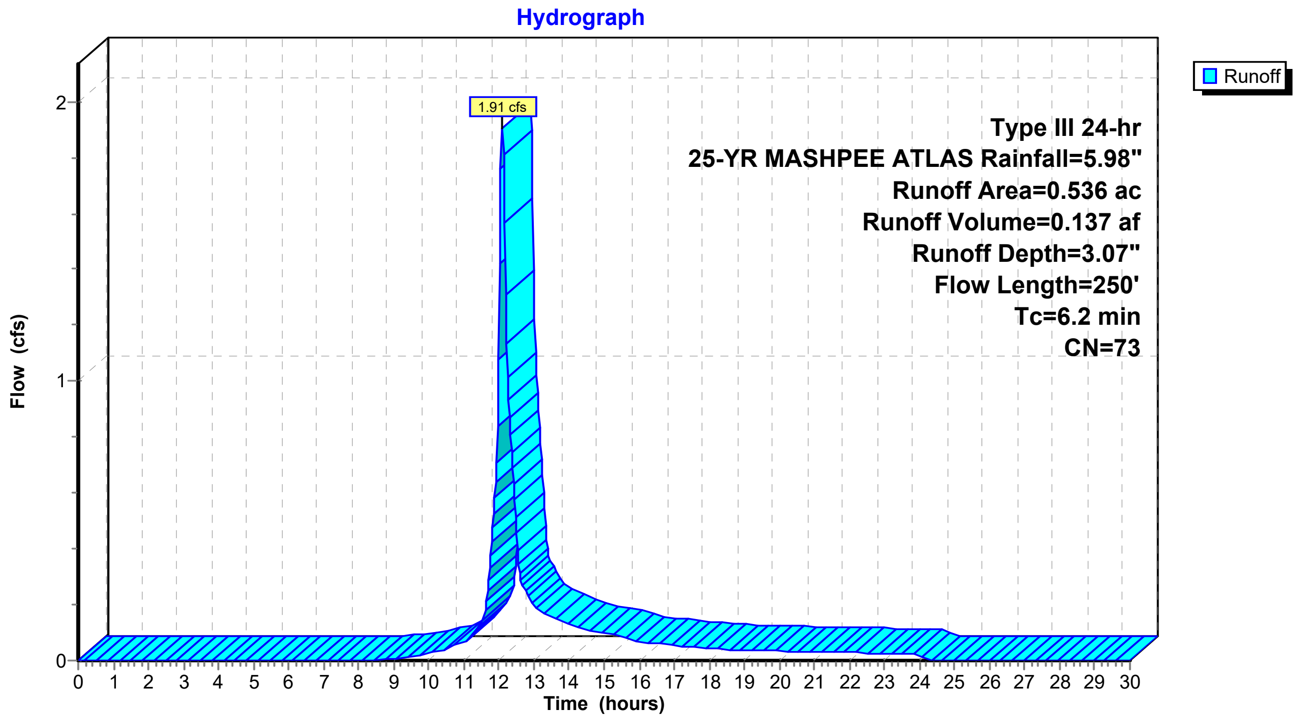
Runoff = 1.91 cfs @ 12.09 hrs, Volume= 0.137 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.225	39	>75% Grass cover, Good, HSG A
0.181	98	Unconnected pavement, HSG A
0.130	98	Roofs, HSG A
0.536	73	Weighted Average
0.225		41.98% Pervious Area
0.311		58.02% Impervious Area
0.181		58.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	30	0.0200	0.10		**Sheet Flow, LAWN** Grass: Dense n= 0.240 P2= 3.55"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow, ROAD** Paved Kv= 20.3 fps
0.5	140	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
6.2	250	Total			

Subcatchment DA-2: END OF ROAD TO THE EAST



Summary for Subcatchment DA-3: AREAS TO WEST

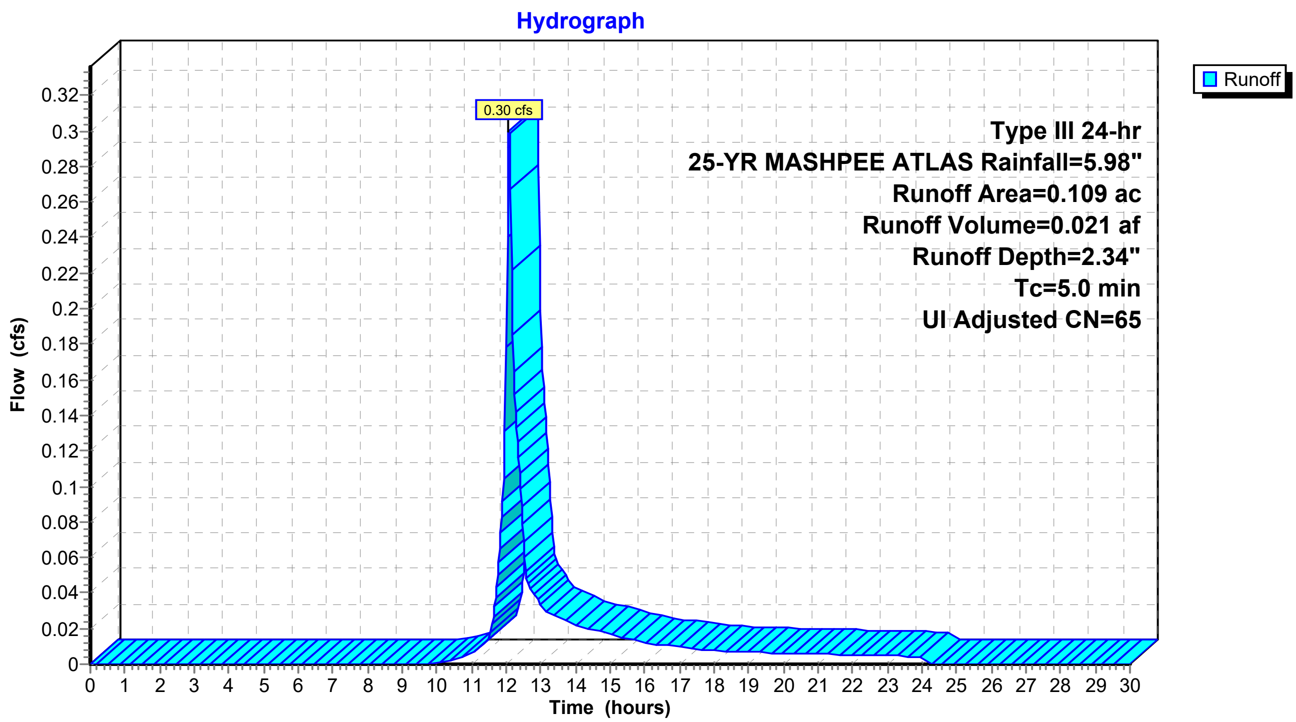
Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Adj	Description
0.086	61		>75% Grass cover, Good, HSG B
0.023	98		Unconnected pavement, HSG B
0.109	69	65	Weighted Average, UI Adjusted
0.086			78.90% Pervious Area
0.023			21.10% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-3: AREAS TO WEST



Summary for Subcatchment DA-4: AREAS TO WEST

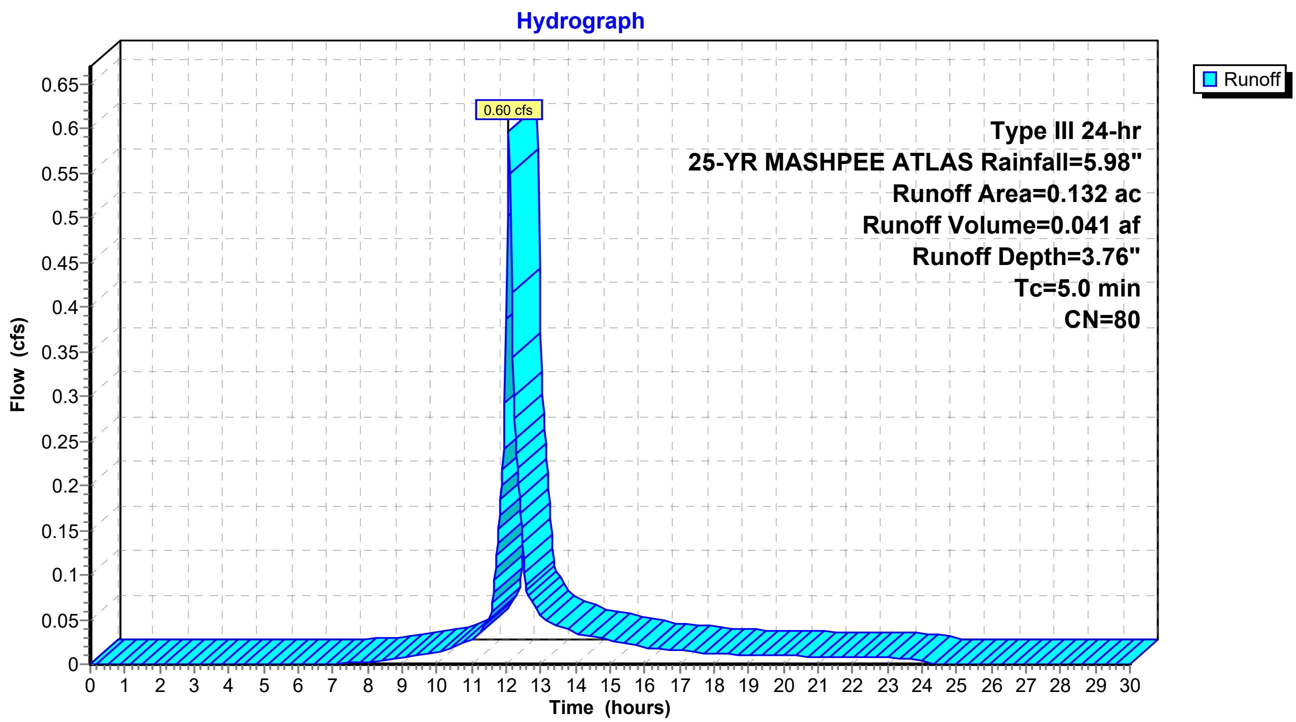
Runoff = 0.60 cfs @ 12.07 hrs, Volume= 0.041 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.065	61	>75% Grass cover, Good, HSG B
0.067	98	Unconnected pavement, HSG B
0.132	80	Weighted Average
0.065		49.24% Pervious Area
0.067		50.76% Impervious Area
0.067		100.00% Unconnected

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

Subcatchment DA-4: AREAS TO WEST



Summary for Subcatchment DA-5: AREAS TO WEST

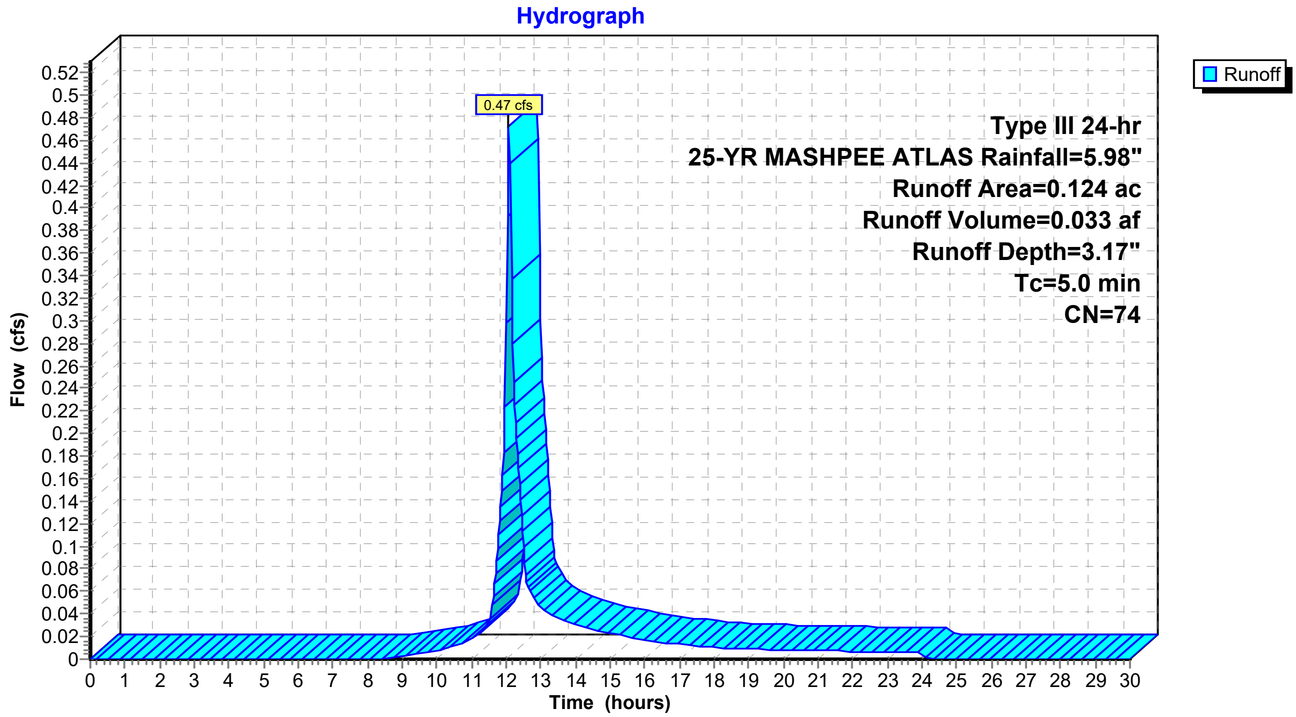
Runoff = 0.47 cfs @ 12.08 hrs, Volume= 0.033 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.051	39	>75% Grass cover, Good, HSG A
0.073	98	Unconnected pavement, HSG A
0.124	74	Weighted Average
0.051		41.13% Pervious Area
0.073		58.87% Impervious Area
0.073		100.00% Unconnected

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

Subcatchment DA-5: AREAS TO WEST



Summary for Subcatchment DA-6: AREAS TO WEST

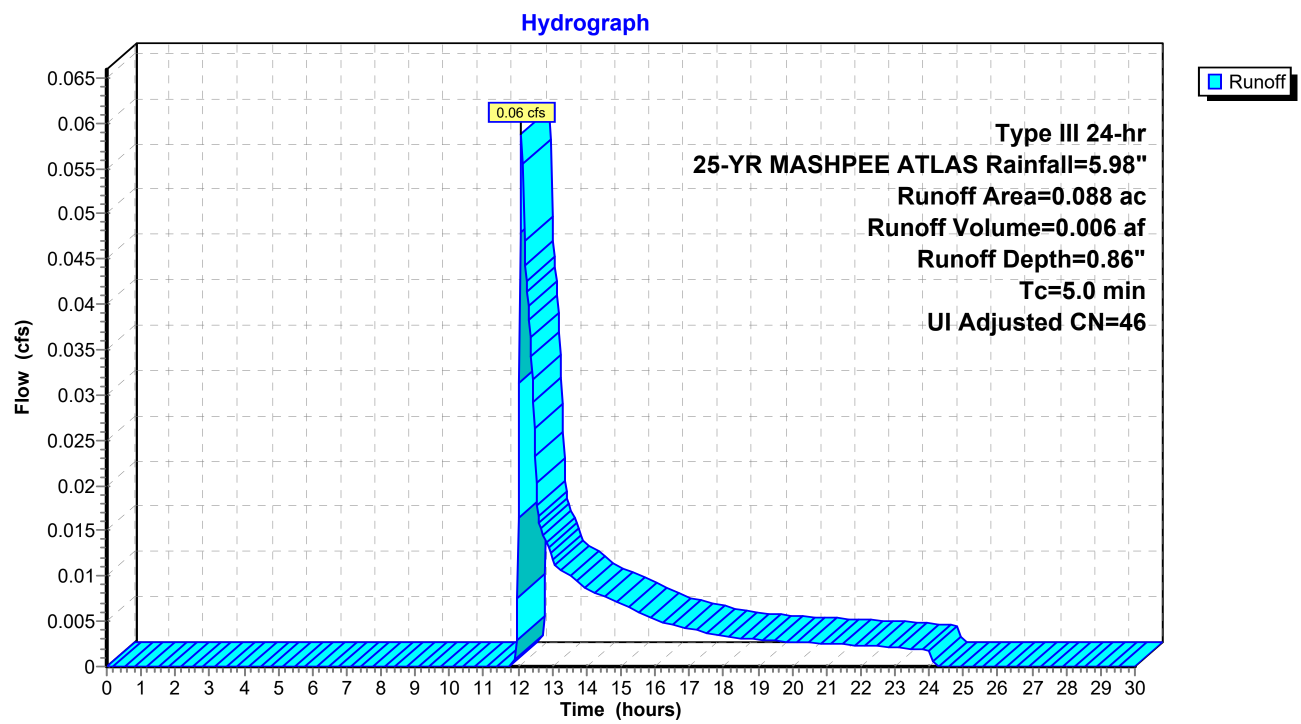
Runoff = 0.06 cfs @ 12.11 hrs, Volume= 0.006 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Adj	Description
0.073	39		>75% Grass cover, Good, HSG A
0.008	98		Unconnected pavement, HSG A
0.007	98		Roofs, HSG A
0.088	49	46	Weighted Average, UI Adjusted
0.073			82.95% Pervious Area
0.015			17.05% Impervious Area
0.008			53.33% Unconnected

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

Subcatchment DA-6: AREAS TO WEST



Summary for Subcatchment DA-7: AREAS TO WEST

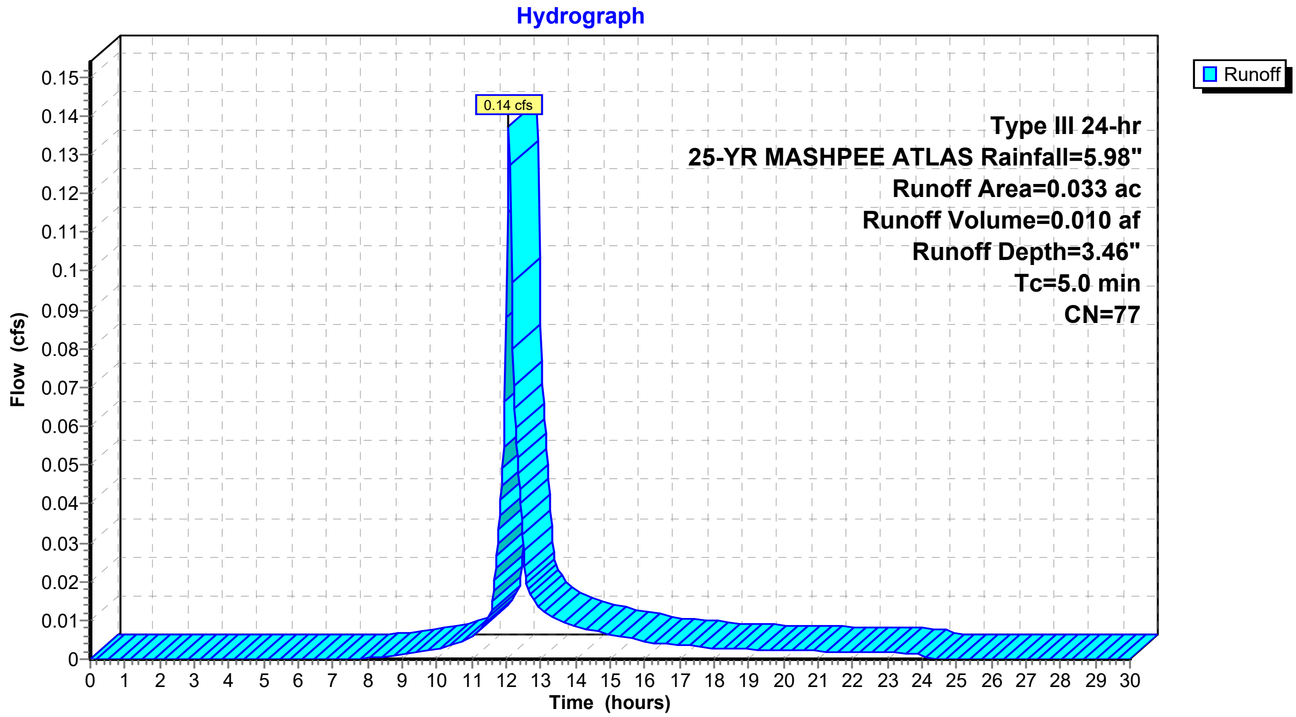
Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.010 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.012	39	>75% Grass cover, Good, HSG A
0.021	98	Unconnected pavement, HSG A
0.033	77	Weighted Average
0.012		36.36% Pervious Area
0.021		63.64% Impervious Area
0.021		100.00% Unconnected

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

Subcatchment DA-7: AREAS TO WEST



Summary for Subcatchment DA-8: AREAS TO WEST

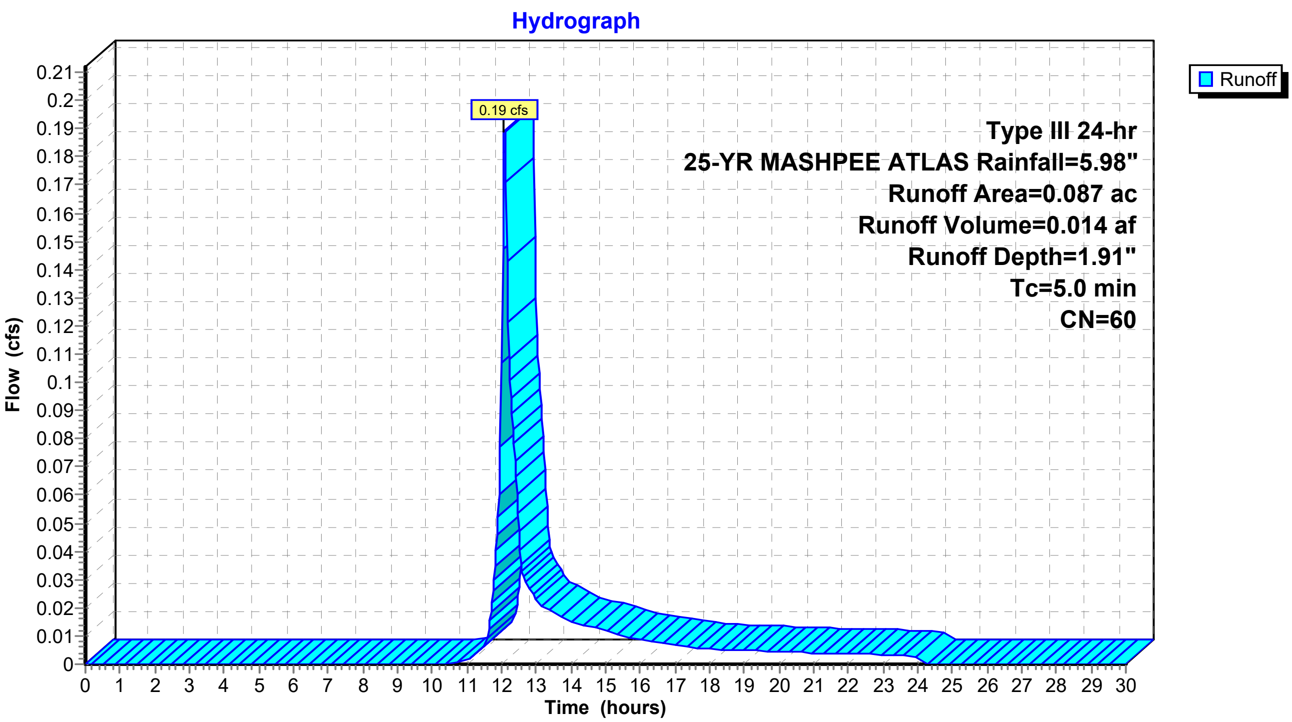
Runoff = 0.19 cfs @ 12.08 hrs, Volume= 0.014 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.056	39	>75% Grass cover, Good, HSG A
0.031	98	Unconnected pavement, HSG A
0.087	60	Weighted Average
0.056		64.37% Pervious Area
0.031		35.63% Impervious Area
0.031		100.00% Unconnected

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

Subcatchment DA-8: AREAS TO WEST



Summary for Subcatchment DA-9: AREAS EAST OF ROAD

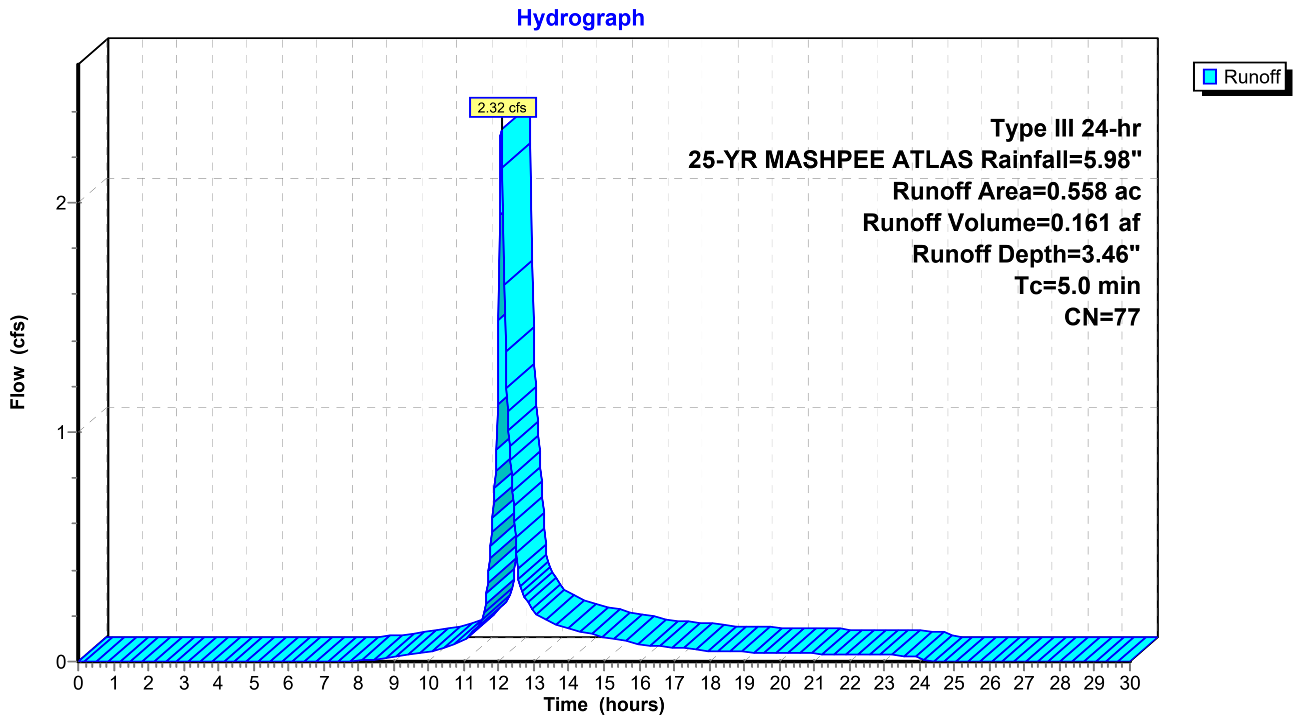
Runoff = 2.32 cfs @ 12.08 hrs, Volume= 0.161 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.194	39	>75% Grass cover, Good, HSG A
0.154	98	Unconnected pavement, HSG A
0.210	98	Roofs, HSG A
0.558	77	Weighted Average
0.194		34.77% Pervious Area
0.364		65.23% Impervious Area
0.154		42.31% Unconnected

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

Subcatchment DA-9: AREAS EAST OF ROAD



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

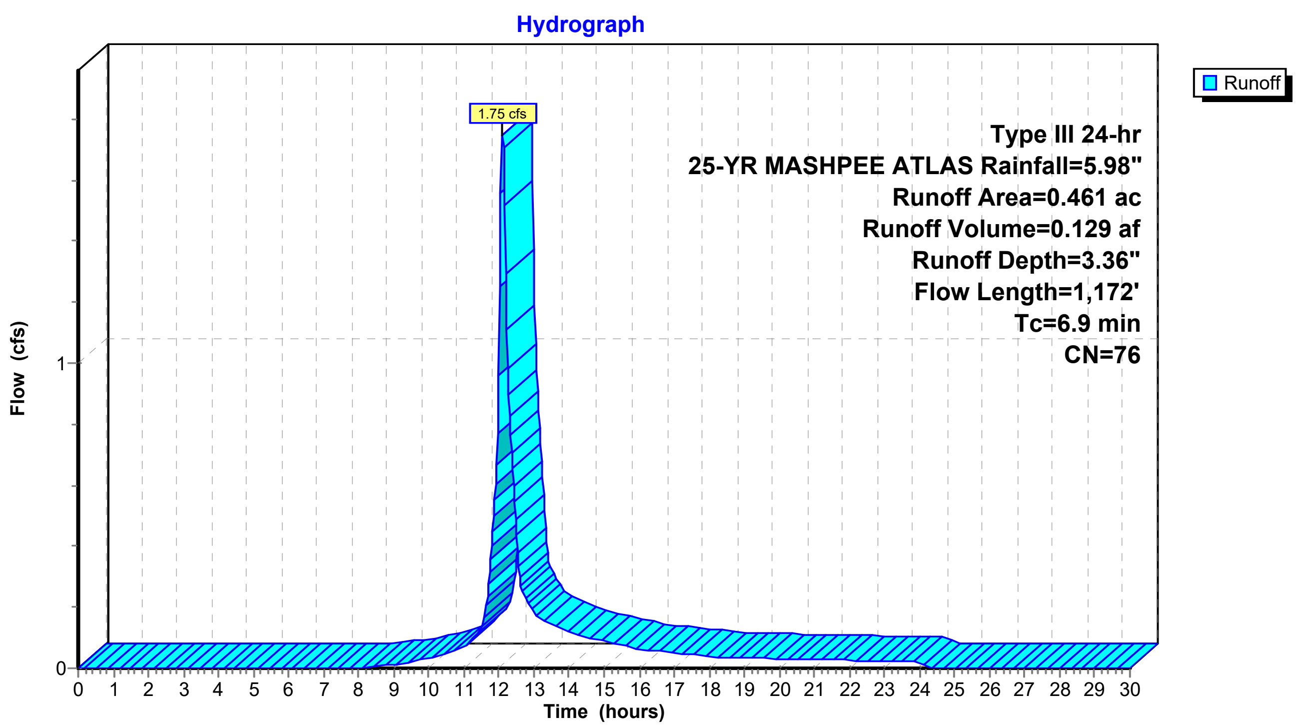
Runoff = 1.75 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3

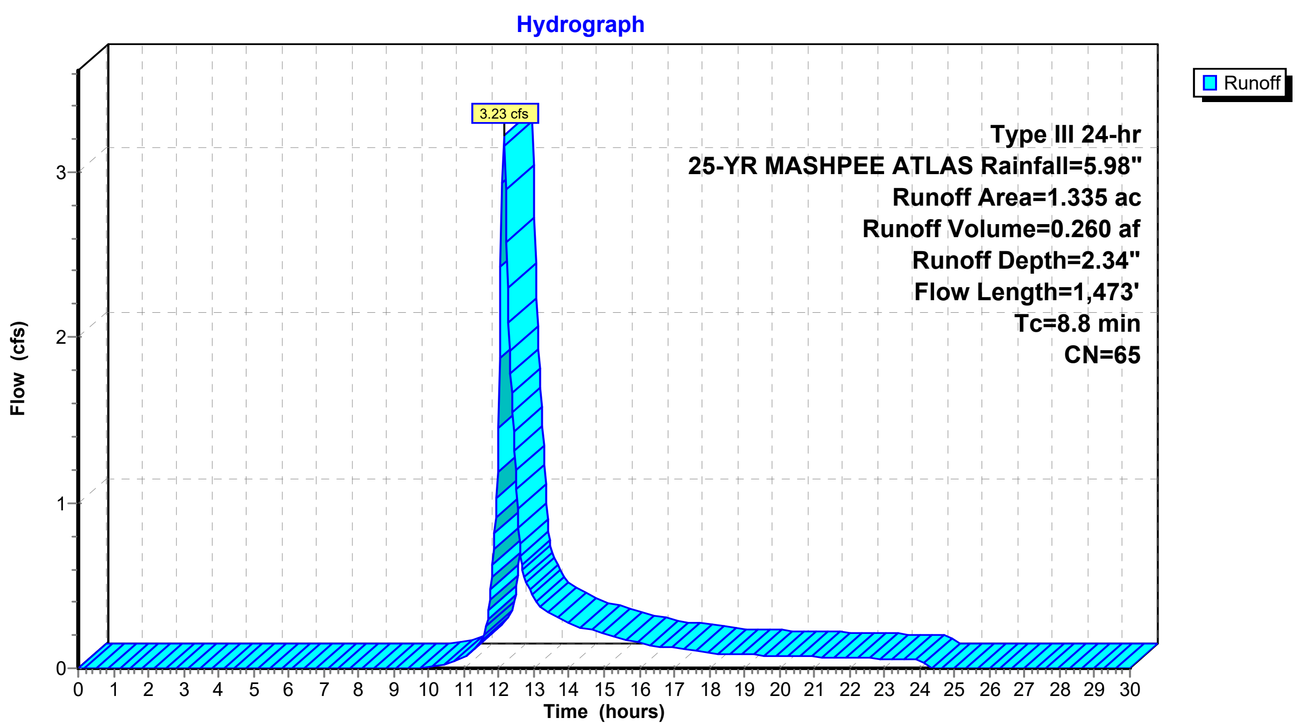
Runoff = 3.23 cfs @ 12.13 hrs, Volume= 0.260 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3



Summary for Subcatchment DA44: North of Quin

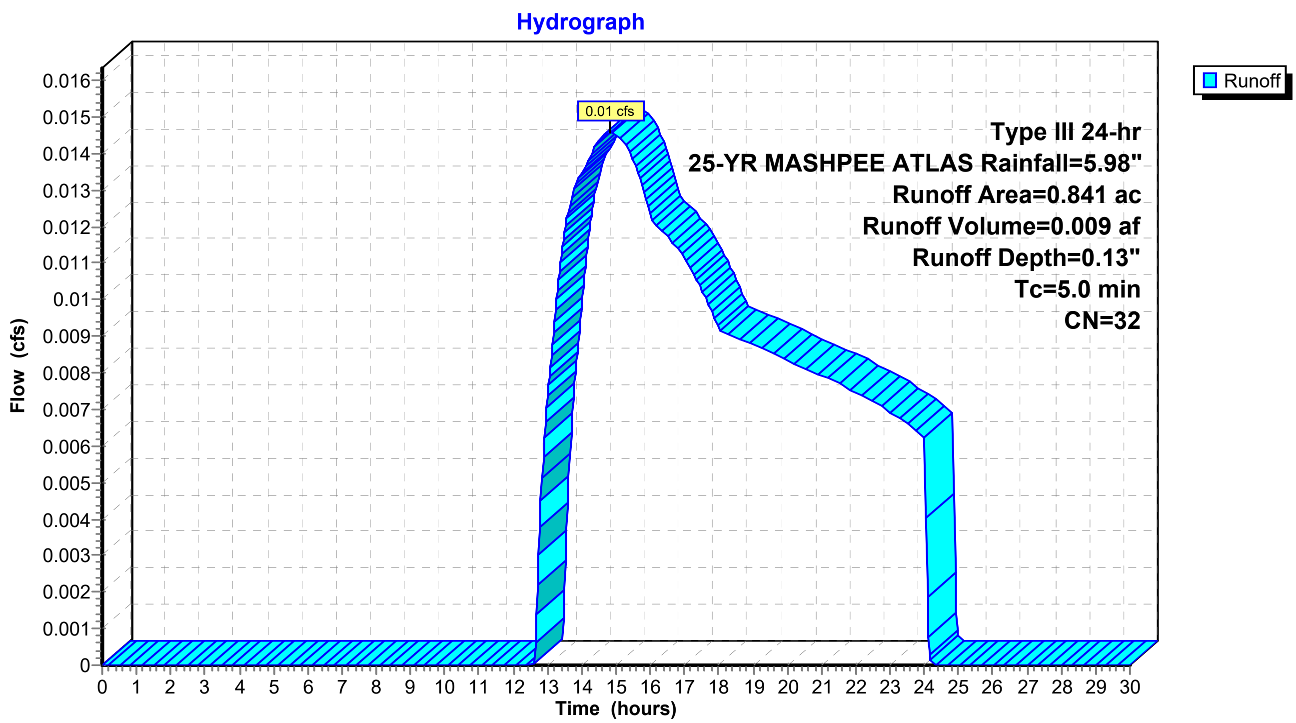
Runoff = 0.01 cfs @ 14.84 hrs, Volume= 0.009 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA44: North of Quin



Summary for Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR

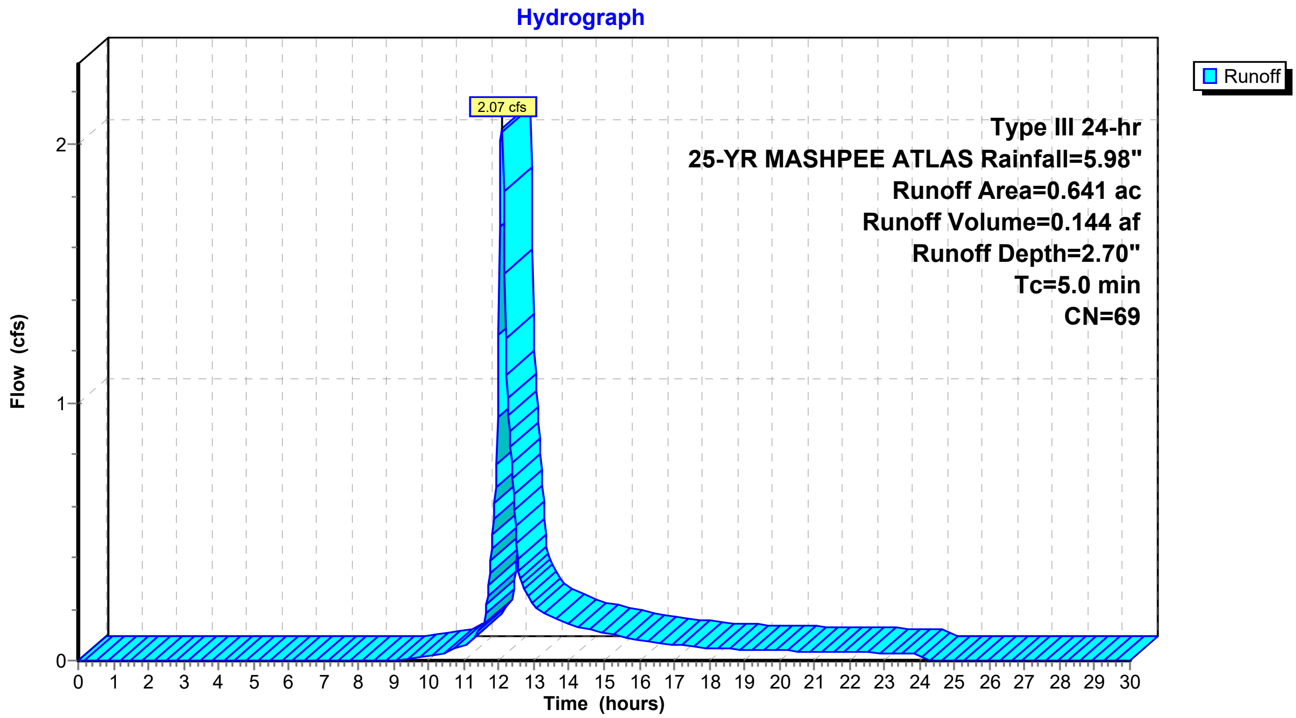
Runoff = 2.07 cfs @ 12.08 hrs, Volume= 0.144 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA77: AREAS TO WETLAND TO EAST

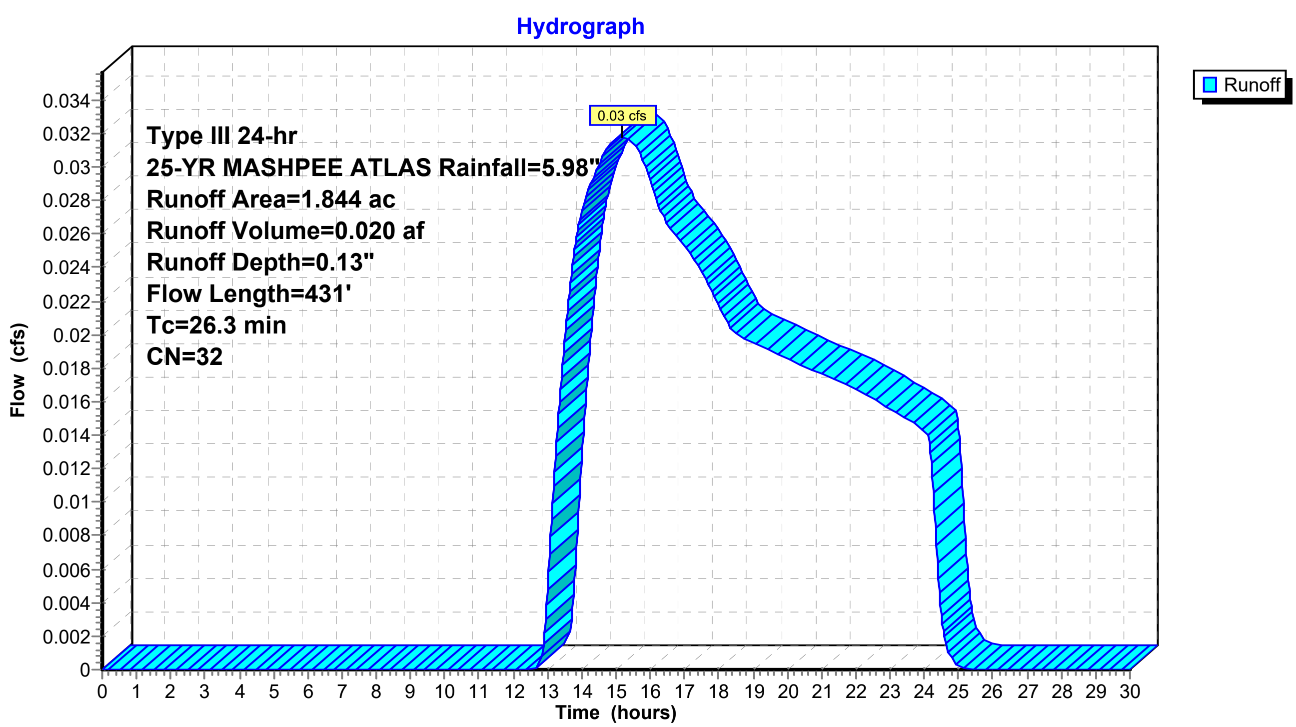
Runoff = 0.03 cfs @ 15.17 hrs, Volume= 0.020 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR MASHPEE ATLAS Rainfall=5.98"

Area (ac)	CN	Description
0.476	39	>75% Grass cover, Good, HSG A
1.201	30	Woods, Good, HSG A
0.167	30	Woods, Good, HSG A
1.844	32	Weighted Average
1.844		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA77: AREAS TO WETLAND TO EAST



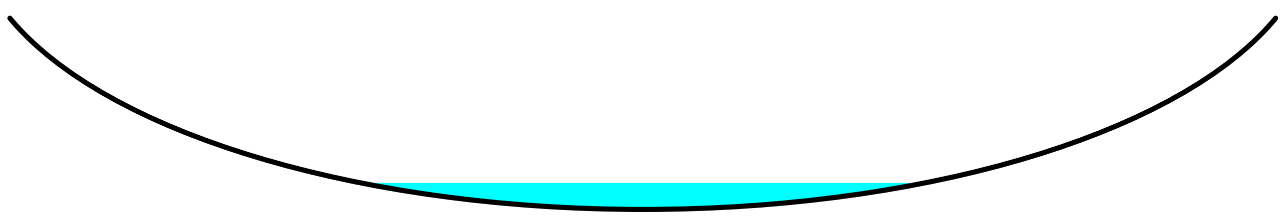
Summary for Reach R1: Tt along stream

Inflow Area = 1.366 ac, 18.52% Impervious, Inflow Depth = 0.90" for 25-YR MASHPEE ATLAS event
Inflow = 1.66 cfs @ 12.11 hrs, Volume= 0.103 af
Outflow = 0.98 cfs @ 12.26 hrs, Volume= 0.103 af, Atten= 41%, Lag= 9.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.71 fps, Min. Travel Time= 12.9 min
Avg. Velocity = 0.25 fps, Avg. Travel Time= 37.3 min

Peak Storage= 762 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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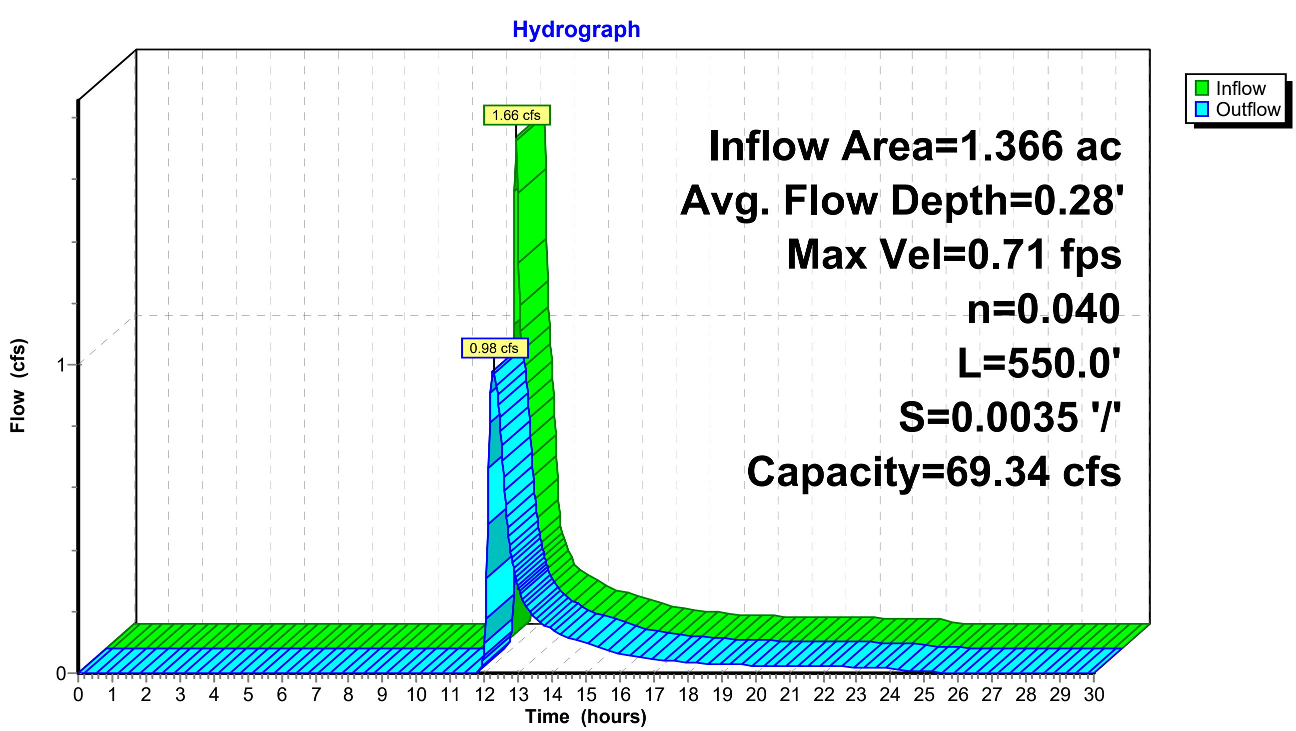
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth > 0.68" for 25-YR MASHPEE ATLAS event
Inflow = 0.71 cfs @ 13.80 hrs, Volume= 0.414 af
Outflow = 0.71 cfs @ 13.96 hrs, Volume= 0.411 af, Atten= 0%, Lag= 9.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.63 fps, Min. Travel Time= 13.7 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 20.9 min

Peak Storage= 580 cf @ 13.96 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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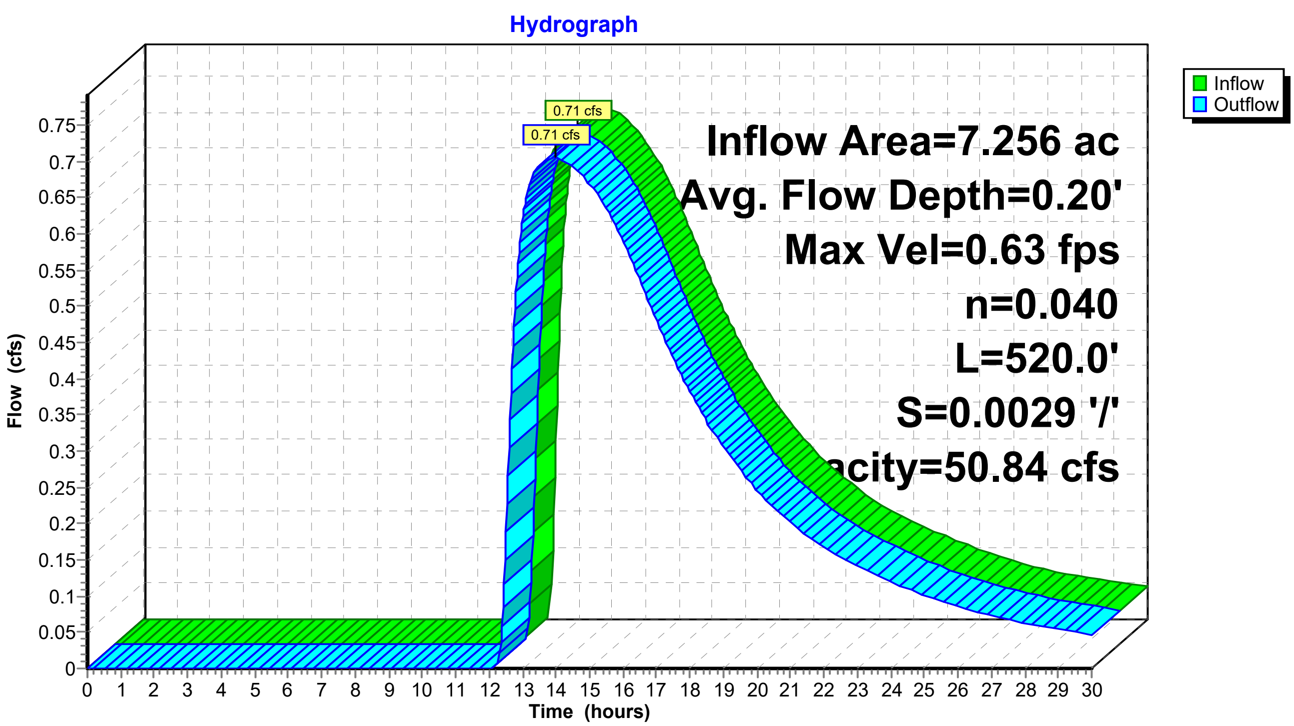
Reach R1A: Tt thru bogs



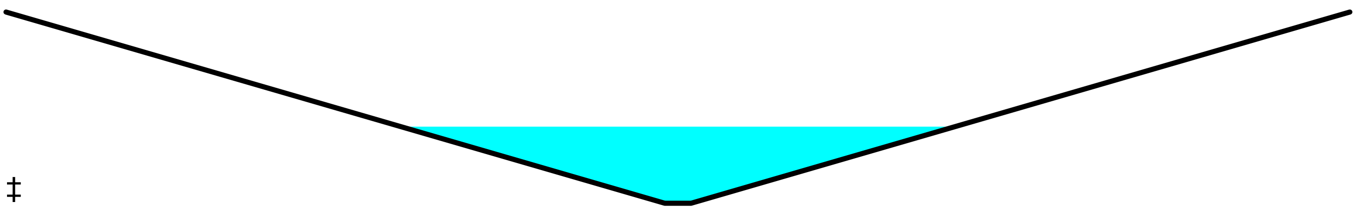
Summary for Reach R2: Tt thru da77

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 1.53" for 25-YR MASHPEE ATLAS event
Inflow = 5.13 cfs @ 12.12 hrs, Volume= 0.359 af
Outflow = 4.73 cfs @ 12.16 hrs, Volume= 0.359 af, Atten= 8%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 1.07 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 8.7 min

Peak Storage= 925 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 0.50' Flow Area= 26.0 sf, Capacity= 50.53 cfs

2.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 100.0 '/' Top Width= 102.00'
Length= 210.0' Slope= 0.0095 '/'
Inlet Invert= 17.00', Outlet Invert= 15.00'



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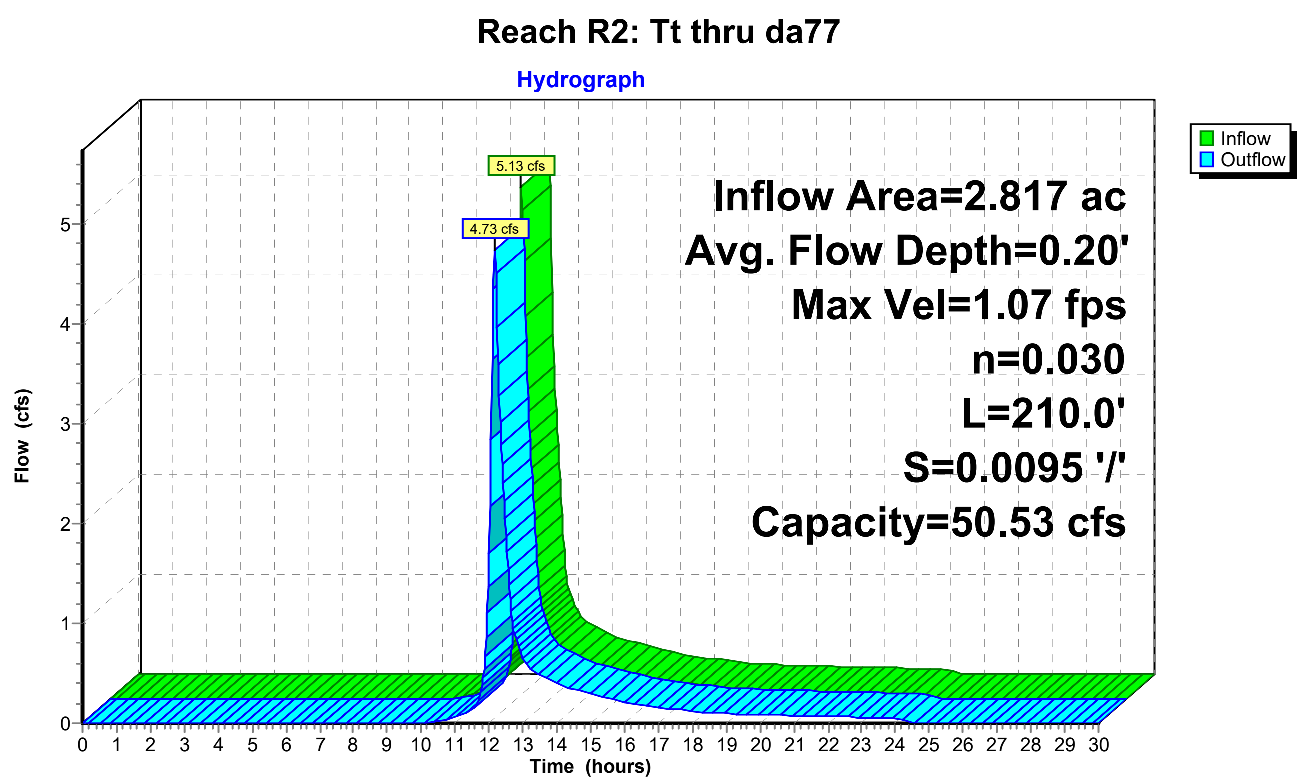


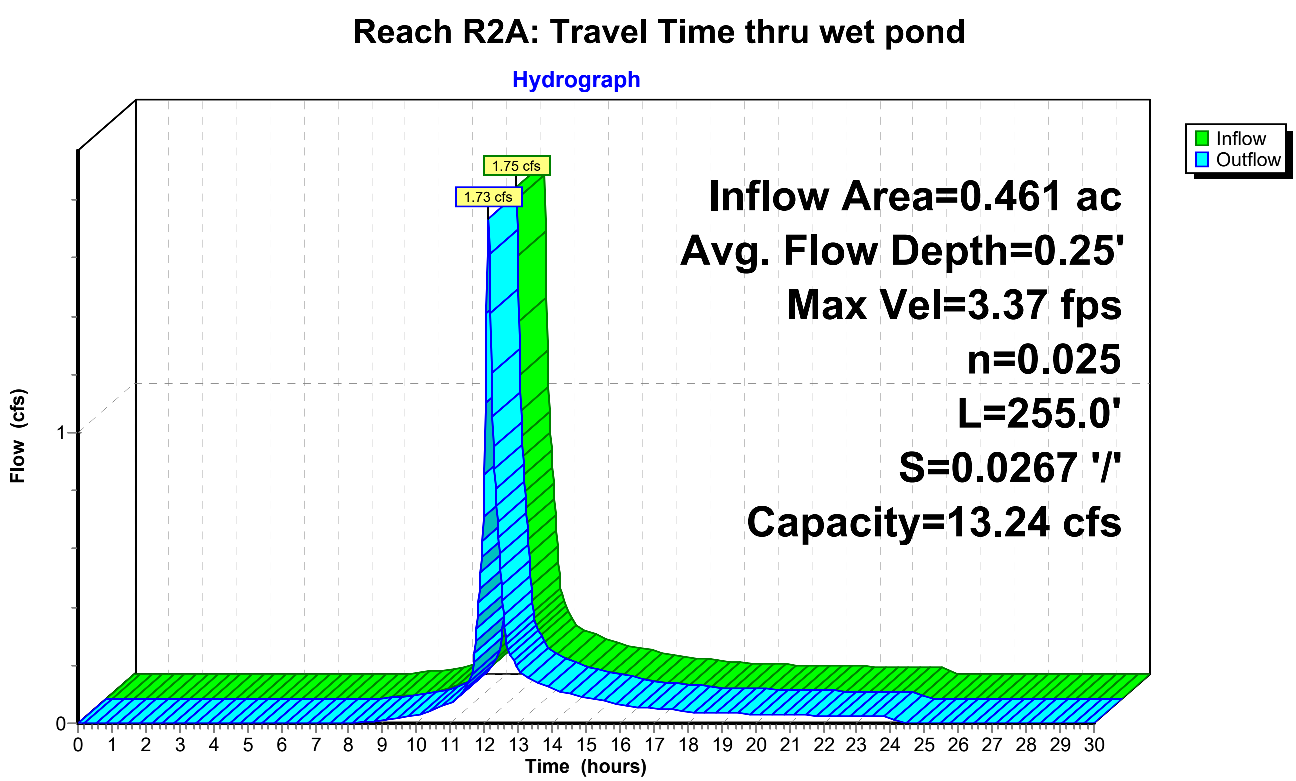
Summary for Reach R2A: Travel Time thru wet pond

Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 3.36" for 25-YR MASHPEE ATLAS event
Inflow = 1.75 cfs @ 12.10 hrs, Volume= 0.129 af
Outflow = 1.73 cfs @ 12.12 hrs, Volume= 0.129 af, Atten= 1%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 3.37 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 4.6 min

Peak Storage= 131 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'



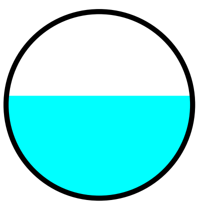
Summary for Reach R3: 18" CPP

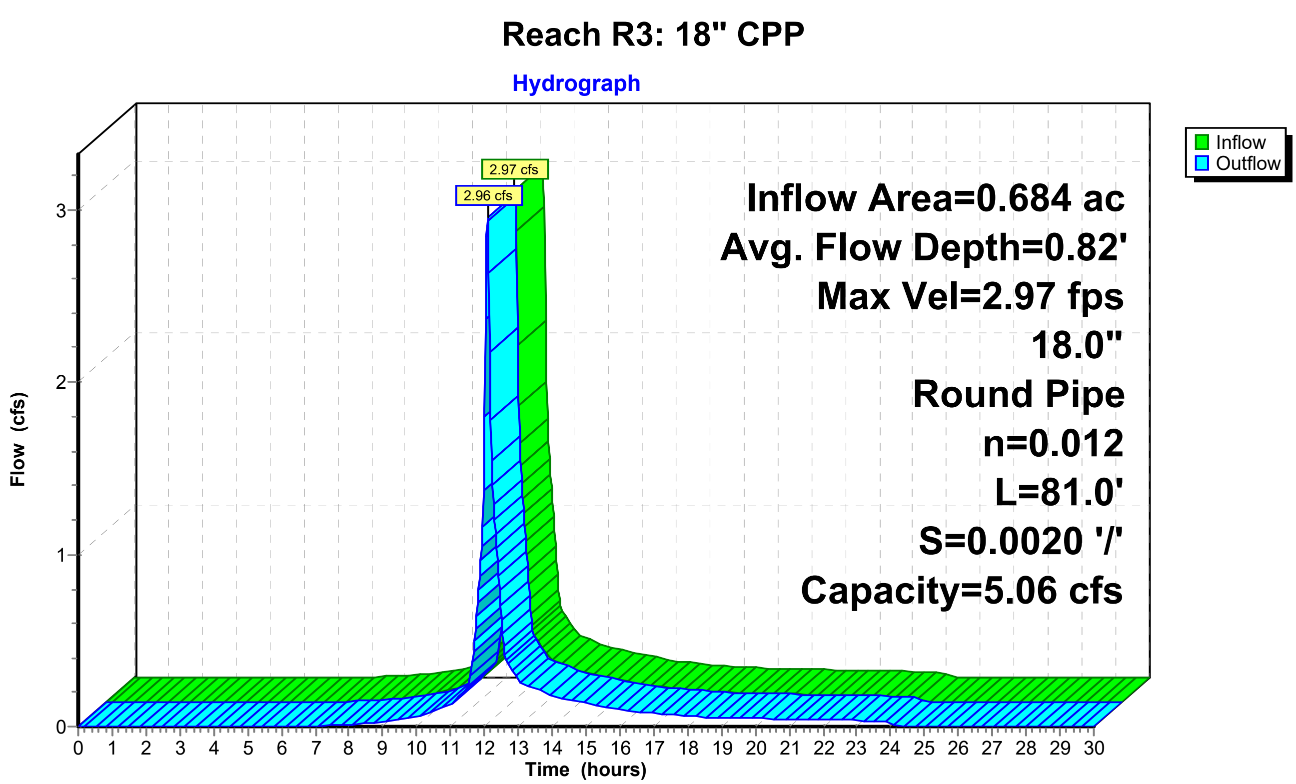
Inflow Area = 0.684 ac, 66.67% Impervious, Inflow Depth = 3.61" for 25-YR MASHPEE ATLAS event
Inflow = 2.97 cfs @ 12.07 hrs, Volume= 0.206 af
Outflow = 2.96 cfs @ 12.08 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.97 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 1.3 min

Peak Storage= 81 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.06 cfs

18.0" Round Pipe
n= 0.012
Length= 81.0' Slope= 0.0020 '/'
Inlet Invert= 15.06', Outlet Invert= 14.90'





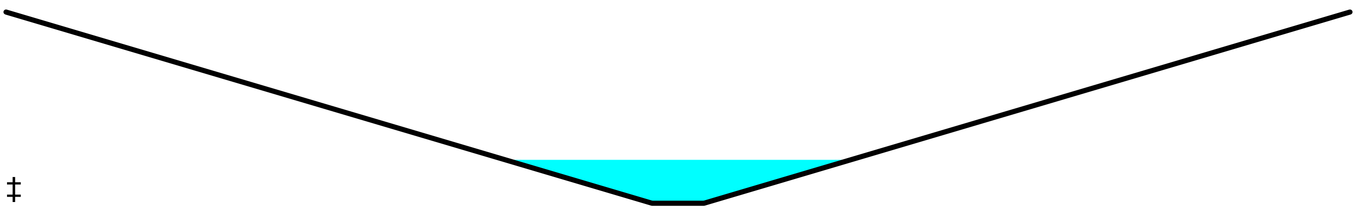
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 1.86" for 25-YR MASHPEE ATLAS event
Inflow = 2.02 cfs @ 12.08 hrs, Volume= 0.099 af
Outflow = 1.93 cfs @ 12.11 hrs, Volume= 0.099 af, Atten= 4%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.23 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 5.3 min

Peak Storage= 213 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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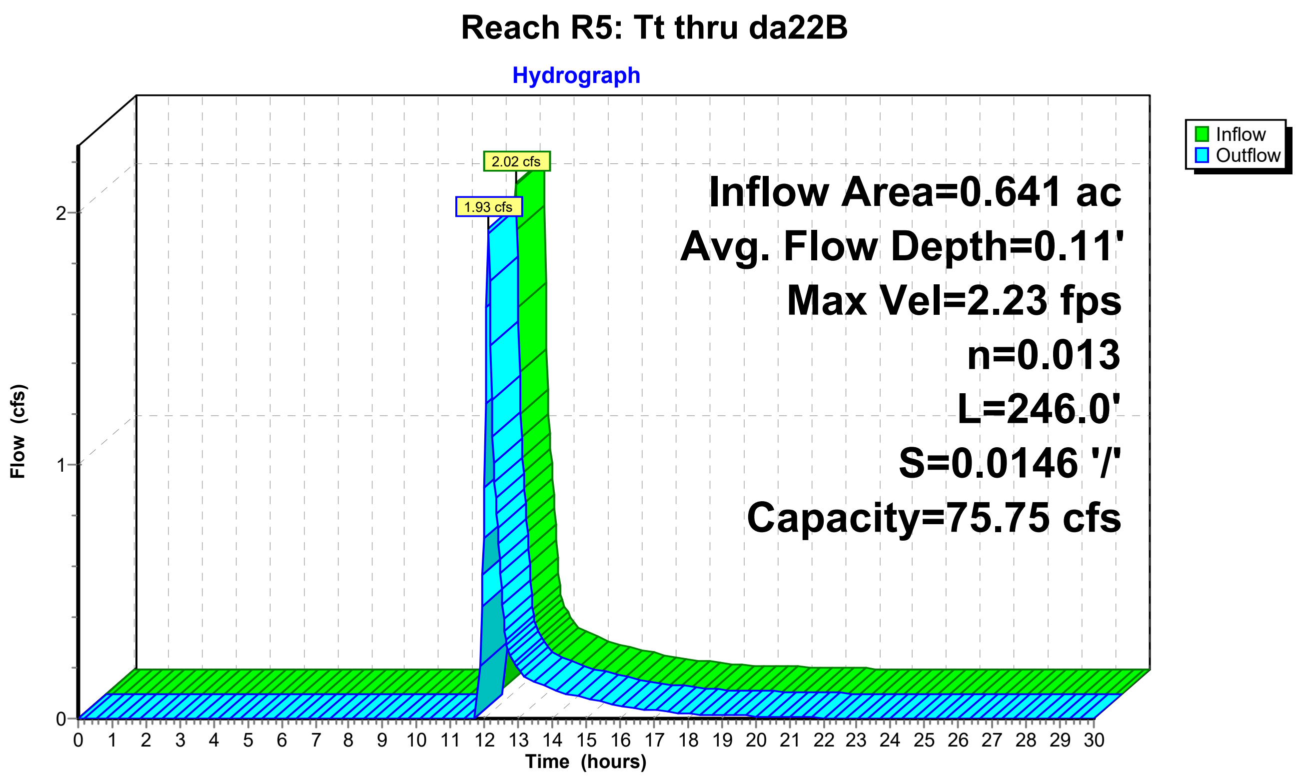
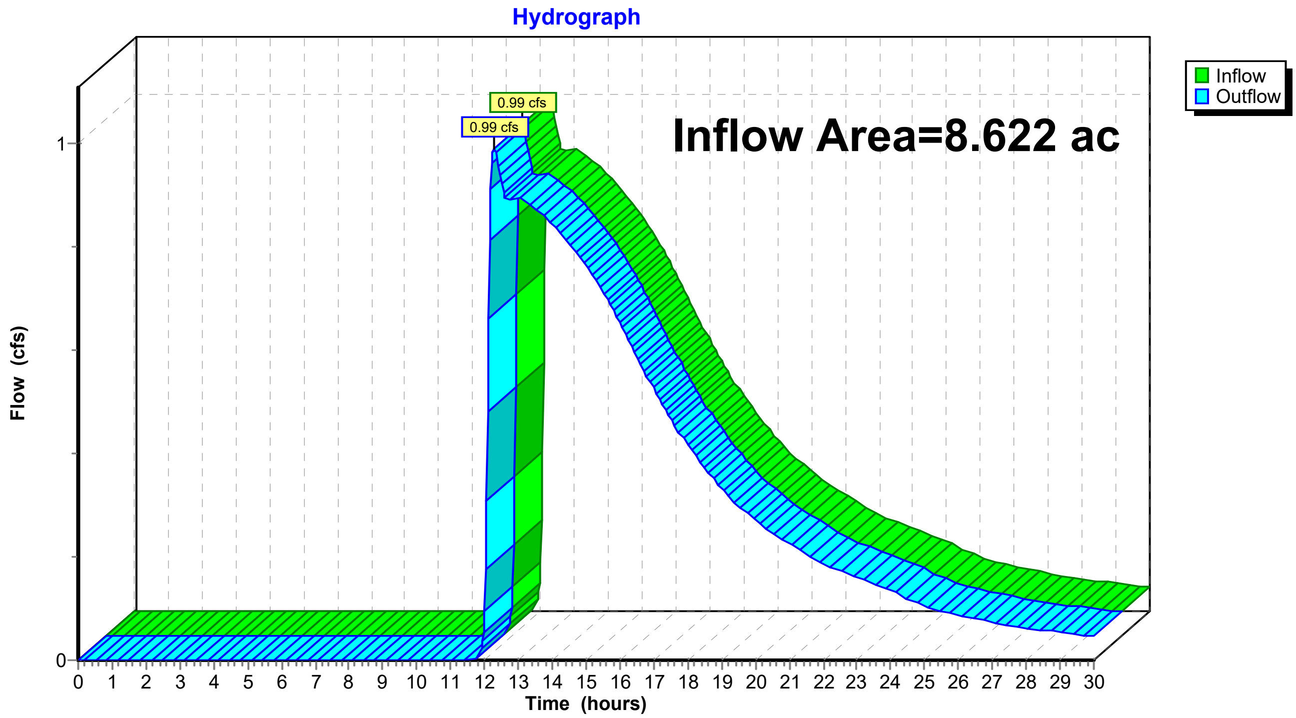


Summary for Reach SP#1: Study Point Combined Flows

Inflow Area = 8.622 ac, 31.29% Impervious, Inflow Depth > 0.72" for 25-YR MASHPEE ATLAS event
Inflow = 0.99 cfs @ 12.28 hrs, Volume= 0.514 af
Outflow = 0.99 cfs @ 12.28 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3

Reach SP#1: Study Point Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 2.70" for 25-YR MASHPEE ATLAS event
Inflow = 2.07 cfs @ 12.08 hrs, Volume= 0.144 af
Outflow = 2.05 cfs @ 12.08 hrs, Volume= 0.144 af, Atten= 1%, Lag= 0.4 min
Discarded = 0.03 cfs @ 10.68 hrs, Volume= 0.045 af
Primary = 2.02 cfs @ 12.08 hrs, Volume= 0.099 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 20.72' @ 12.09 hrs Surf.Area= 810 sf Storage= 490 cf

Plug-Flow detention time= 59.6 min calculated for 0.144 af (100% of inflow)
Center-of-Mass det. time= 59.8 min (899.7 - 839.8)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder**x 2 707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder**x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		794 cf	Total Available Storage

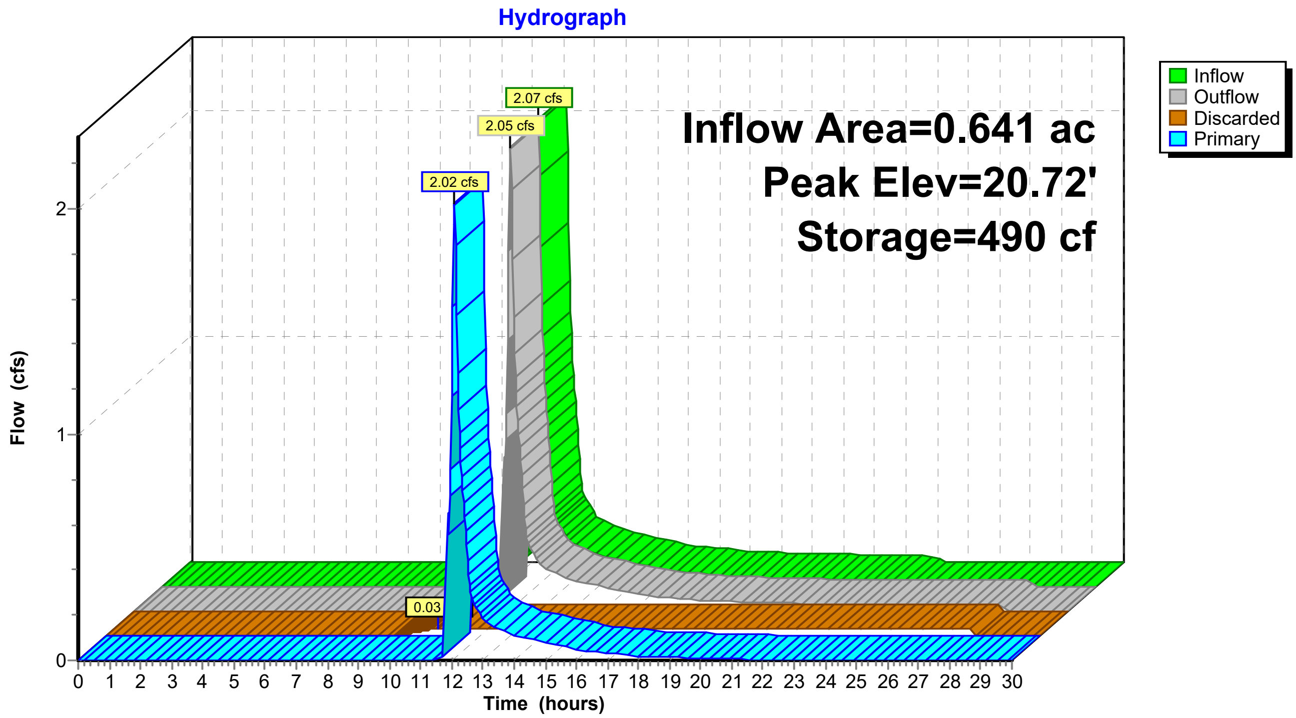
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 10.68 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.00 cfs @ 12.08 hrs HW=20.72' TW=20.69' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.00 cfs @ 0.68 fps)

Pond 1P: LB's


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=0.641 ac
Peak Elev=20.72'
Storage=490 cf
2.07 cfs
2.05 cfs
2.02 cfs
0.03
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area =	0.841 ac,	0.00% Impervious,	Inflow Depth = 0.13"	for 25-YR MASHPEE ATLAS event	
Inflow =	0.01 cfs @	14.84 hrs,	Volume=	0.009 af	
Outflow =	0.01 cfs @	15.88 hrs,	Volume=	0.009 af,	Atten= 12%, Lag= 62.3 min
Discarded =	0.01 cfs @	15.88 hrs,	Volume=	0.009 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.32' @ 15.88 hrs Surf.Area= 229 sf Storage= 35 cf

Plug-Flow detention time= 35.6 min calculated for 0.009 af (100% of inflow)
Center-of-Mass det. time= 35.6 min (1,099.6 - 1,063.9)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

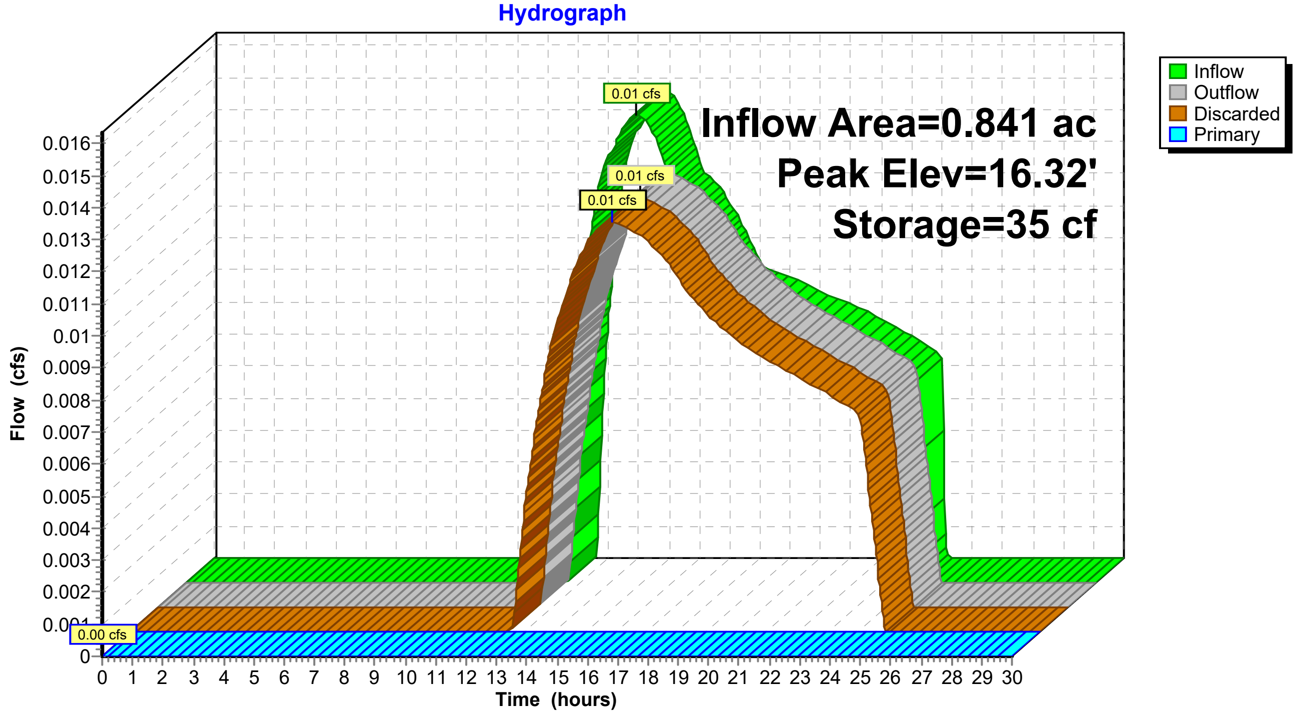
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	7,467	4,103	4,469

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.58'	**50.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 15.88 hrs HW=16.32' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3A-P: Pond 3A

Inflow Area = 0.109 ac, 21.10% Impervious, Inflow Depth = 2.34" for 25-YR MASHPEE ATLAS event
Inflow = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af
Outflow = 0.24 cfs @ 12.15 hrs, Volume= 0.021 af, Atten= 21%, Lag= 4.4 min
Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.014 af
Primary = 0.22 cfs @ 12.15 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.54' @ 12.15 hrs Surf.Area= 605 sf Storage= 206 cf

Plug-Flow detention time= 115.3 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 115.3 min (964.7 - 849.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	520 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

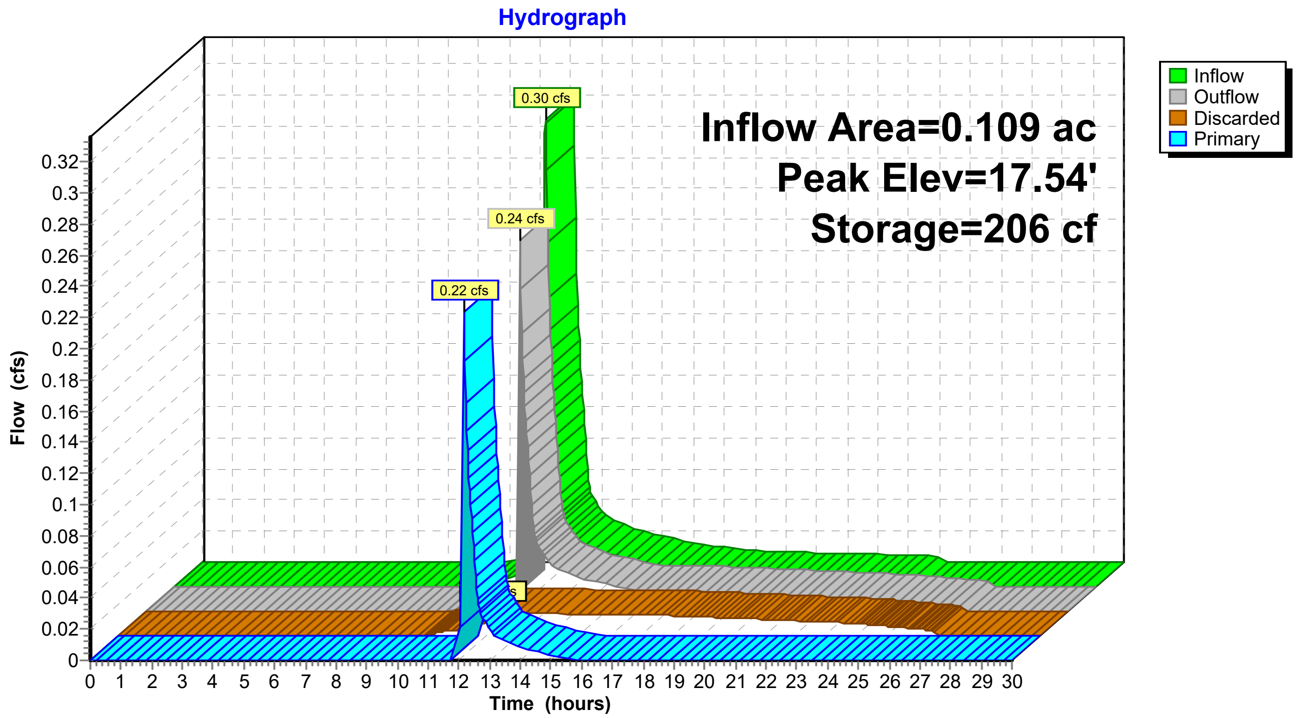
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	144	0	0
17.50	594	185	185
18.00	749	336	520

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	17.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=17.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.22 cfs @ 12.15 hrs HW=17.54' TW=14.86' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.22 cfs @ 0.62 fps)

Pond 3A-P: Pond 3A



Summary for Pond 3P: Wet Pond

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth = 0.84" for 25-YR MASHPEE ATLAS event
Inflow = 9.98 cfs @ 12.20 hrs, Volume= 0.505 af
Outflow = 0.71 cfs @ 13.80 hrs, Volume= 0.414 af, Atten= 93%, Lag= 95.8 min
Primary = 0.71 cfs @ 13.80 hrs, Volume= 0.414 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 14.98' @ 13.80 hrs Surf.Area= 20,373 sf Storage= 14,406 cf

Plug-Flow detention time= 289.0 min calculated for 0.413 af (82% of inflow)
Center-of-Mass det. time= 252.5 min (1,039.3 - 786.8)

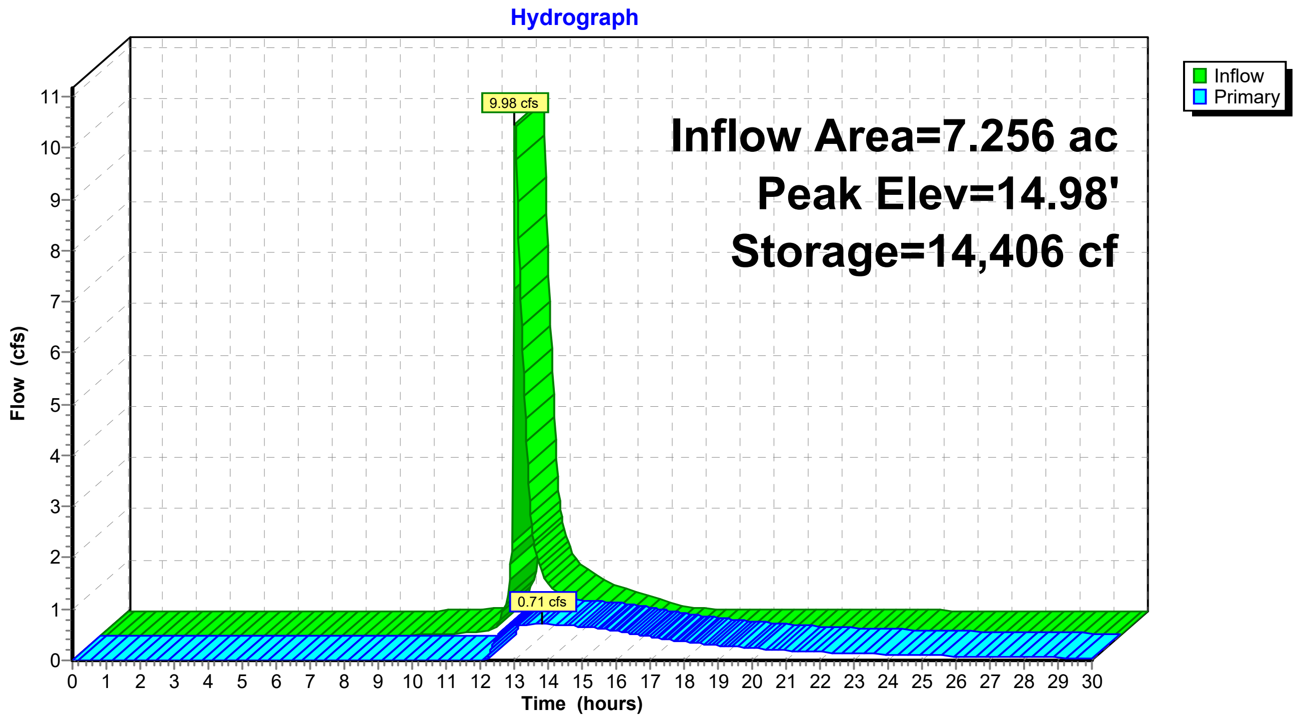
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	38,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,319	1,337	1,338
15.00	20,594	13,565	14,904
16.00	25,633	23,114	38,017

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**8.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Primary	15.75'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.71 cfs @ 13.80 hrs HW=14.98' TW=14.40' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.71 cfs @ 2.19 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Summary for Pond 4P: Pond 4

Inflow Area = 0.132 ac, 50.76% Impervious, Inflow Depth = 3.76" for 25-YR MASHPEE ATLAS event
Inflow = 0.60 cfs @ 12.07 hrs, Volume= 0.041 af
Outflow = 0.60 cfs @ 12.08 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.016 af
Primary = 0.58 cfs @ 12.08 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.03' @ 12.08 hrs Surf.Area= 465 sf Storage= 242 cf

Plug-Flow detention time= 112.5 min calculated for 0.040 af (98% of inflow)
Center-of-Mass det. time= 99.7 min (913.0 - 813.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	253 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

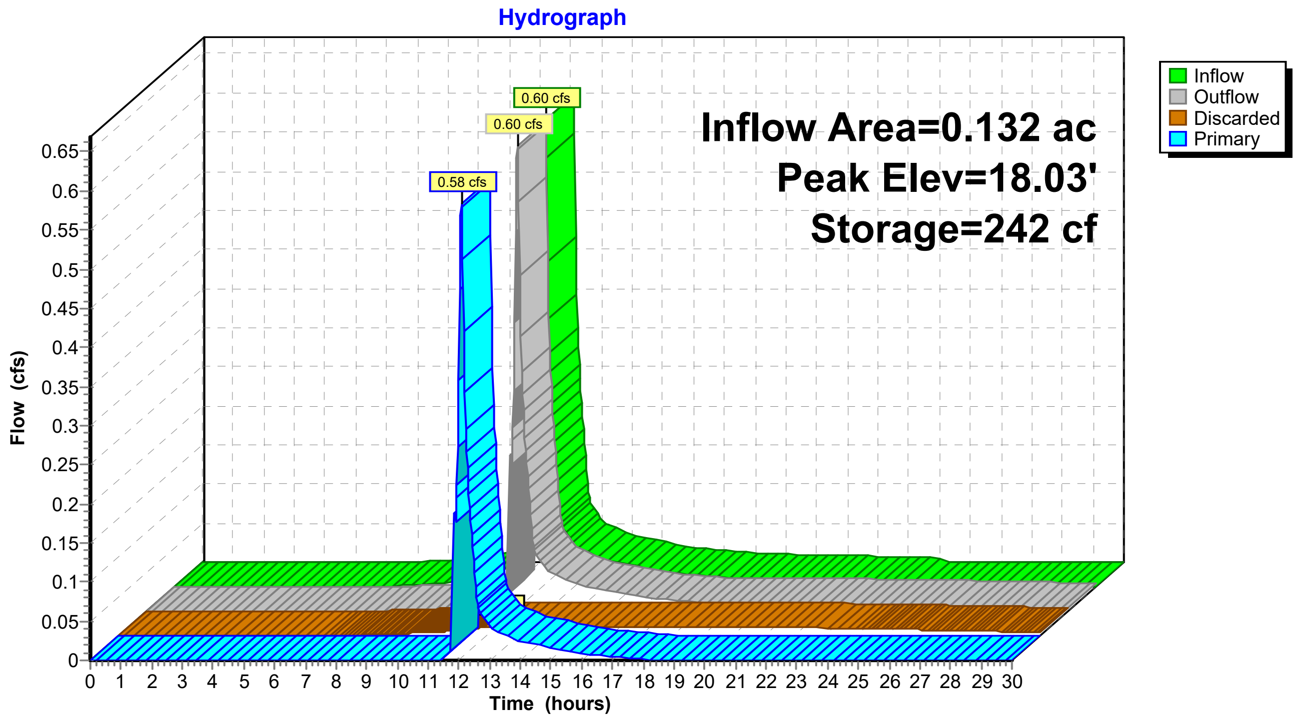
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	10	0	0
18.00	450	230	230
18.05	478	23	253

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=18.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.58 cfs @ 12.08 hrs HW=18.03' TW=14.79' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.58 cfs @ 0.54 fps)

Pond 4P: Pond 4



Summary for Pond 5P: Pond 5

Inflow Area = 0.124 ac, 58.87% Impervious, Inflow Depth = 3.17" for 25-YR MASHPEE ATLAS event
Inflow = 0.47 cfs @ 12.08 hrs, Volume= 0.033 af
Outflow = 0.47 cfs @ 12.08 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.02 cfs @ 12.08 hrs, Volume= 0.018 af
Primary = 0.46 cfs @ 12.08 hrs, Volume= 0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 19.02' @ 12.08 hrs Surf.Area= 320 sf Storage= 234 cf

Plug-Flow detention time= 110.6 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 109.3 min (937.4 - 828.0)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	244 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

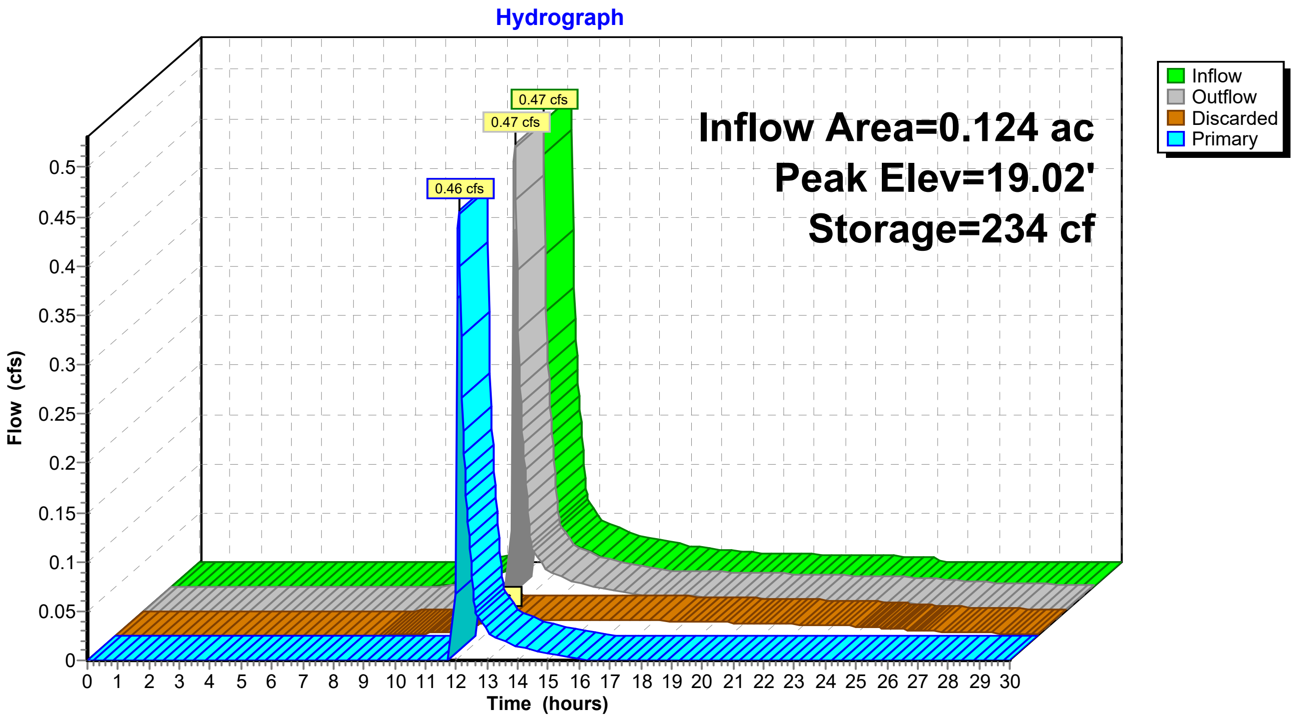
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	1	0	0
18.00	86	44	44
19.00	282	184	228
19.05	366	16	244

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.08 hrs HW=19.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.45 cfs @ 12.08 hrs HW=19.02' TW=14.79' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.45 cfs @ 0.50 fps)

Pond 5P: Pond 5



Summary for Pond 6P: Pond 6

Inflow Area = 0.088 ac, 17.05% Impervious, Inflow Depth = 0.86" for 25-YR MASHPEE ATLAS event
Inflow = 0.06 cfs @ 12.11 hrs, Volume= 0.006 af
Outflow = 0.01 cfs @ 13.03 hrs, Volume= 0.006 af, Atten= 80%, Lag= 55.3 min
Discarded = 0.01 cfs @ 13.03 hrs, Volume= 0.006 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.64' @ 13.03 hrs Surf.Area= 208 sf Storage= 67 cf

Plug-Flow detention time= 66.6 min calculated for 0.006 af (100% of inflow)
Center-of-Mass det. time= 66.5 min (978.1 - 911.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

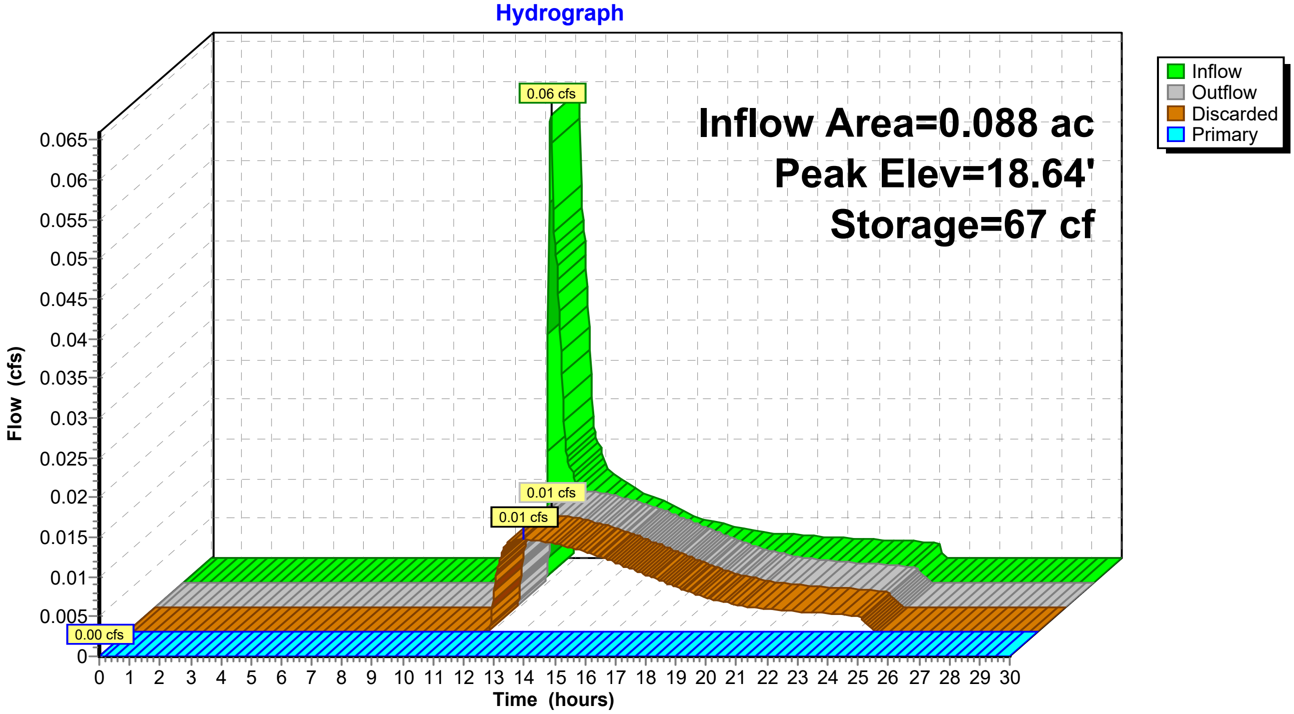
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	1	0	0
19.00	326	164	164
19.05	394	18	182

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	**2.410 in/hr Exfiltration over Surface area from 17.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 13.03 hrs HW=18.64' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 6



Summary for Pond 7P: Pond 7

Inflow Area =	0.033 ac,	63.64% Impervious, Inflow Depth = 3.46"	for 25-YR MASHPEE ATLAS event	
Inflow =	0.14 cfs @	12.08 hrs, Volume=	0.010 af	
Outflow =	0.14 cfs @	12.08 hrs, Volume=	0.010 af,	Atten= 0%, Lag= 0.3 min
Discarded =	0.01 cfs @	12.08 hrs, Volume=	0.006 af	
Primary =	0.13 cfs @	12.08 hrs, Volume=	0.003 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.02' @ 12.08 hrs Surf.Area= 144 sf Storage= 82 cf

Plug-Flow detention time= 87.7 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 87.7 min (908.5 - 820.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	87 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

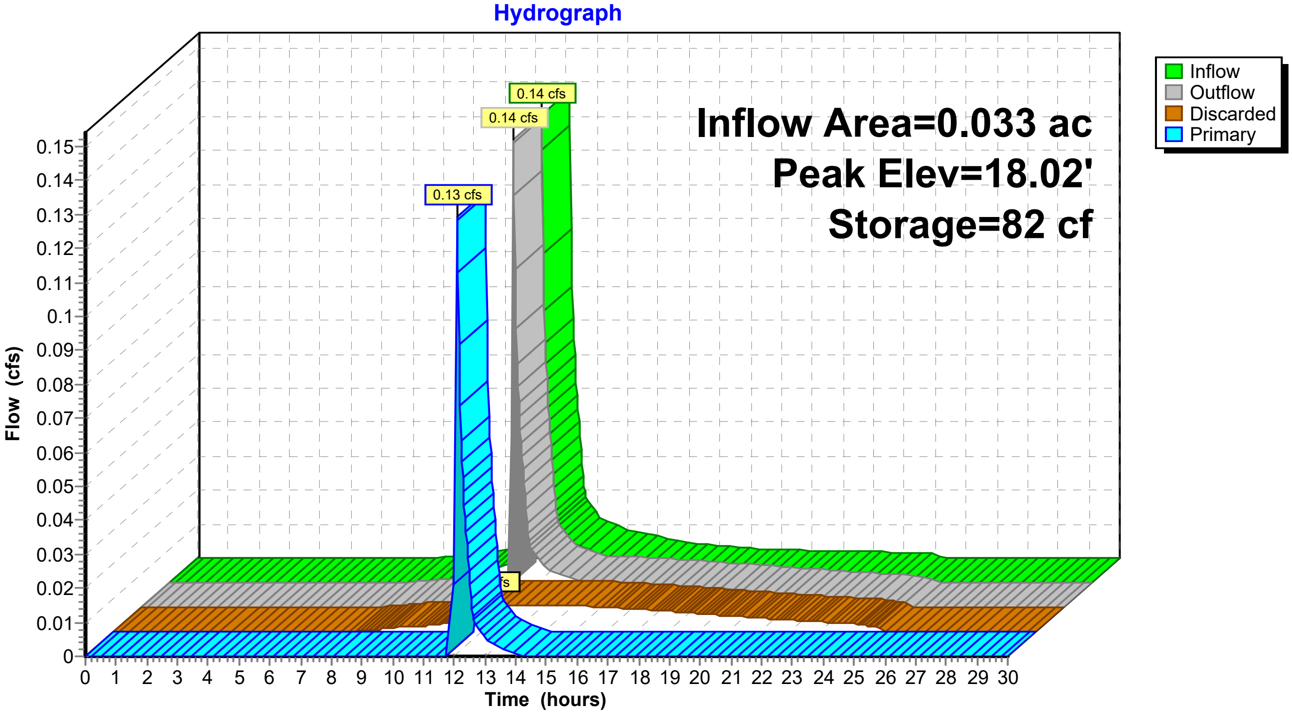
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	23	0	0
18.00	137	80	80
18.05	159	7	87

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=18.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.13 cfs @ 12.08 hrs HW=18.02' TW=14.79' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.41 fps)

Pond 7P: Pond 7



Summary for Pond 8P: Pond 8

Inflow Area = 0.087 ac, 35.63% Impervious, Inflow Depth = 1.91" for 25-YR MASHPEE ATLAS event
Inflow = 0.19 cfs @ 12.08 hrs, Volume= 0.014 af
Outflow = 0.03 cfs @ 12.67 hrs, Volume= 0.014 af, Atten= 84%, Lag= 35.4 min
Discarded = 0.03 cfs @ 12.67 hrs, Volume= 0.014 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.36' @ 12.67 hrs Surf.Area= 539 sf Storage= 173 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.5 min (907.6 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	622 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

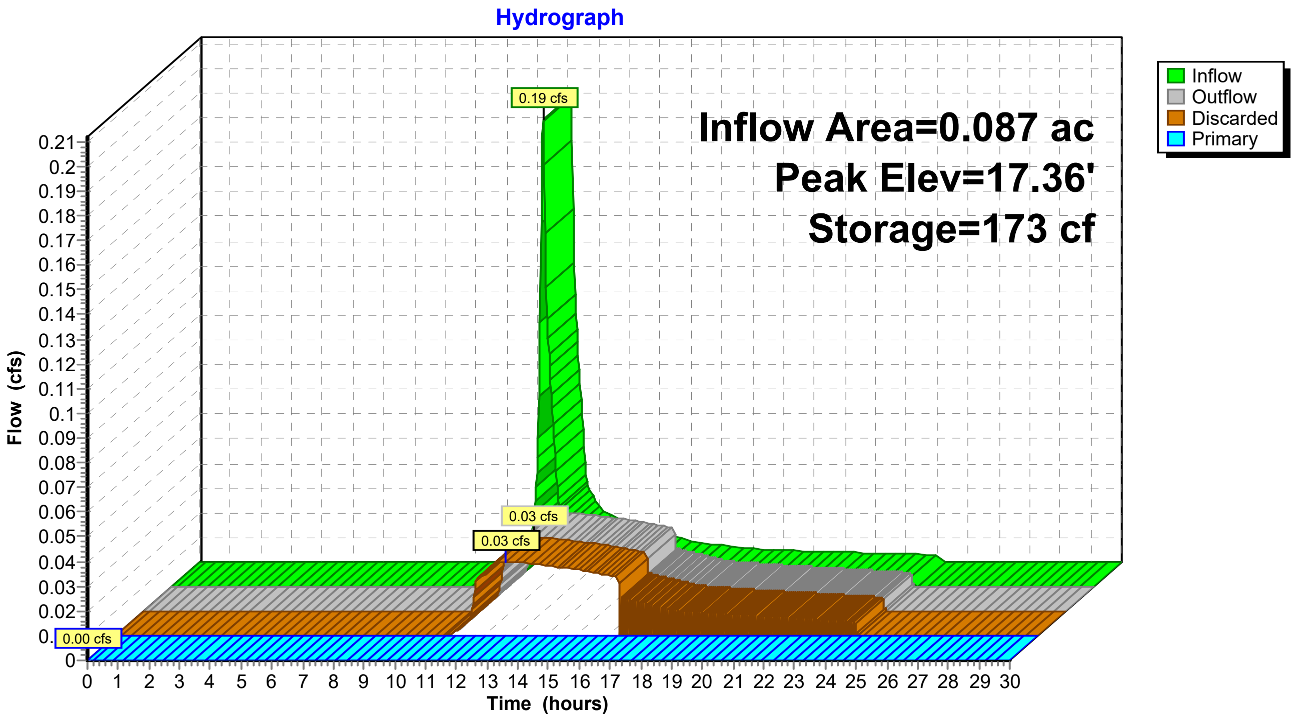
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	426	0	0
18.00	741	584	584
18.05	791	38	622

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.03 cfs @ 12.67 hrs HW=17.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Pond 8



Summary for Pond FB1: Forebay 1

Inflow Area = 1.040 ac, 55.00% Impervious, Inflow Depth = 2.97" for 25-YR MASHPEE ATLAS event
Inflow = 3.65 cfs @ 12.08 hrs, Volume= 0.257 af
Outflow = 3.31 cfs @ 12.12 hrs, Volume= 0.257 af, Atten= 9%, Lag= 2.5 min
Discarded = 0.09 cfs @ 12.06 hrs, Volume= 0.136 af
Primary = 3.22 cfs @ 12.12 hrs, Volume= 0.121 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.71' @ 12.12 hrs Surf.Area= 2,154 sf Storage= 2,435 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 149.0 min (976.4 - 827.4)

Volume	Invert	Avail.Storage	Storage Description
#1	14.90'	3,175 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

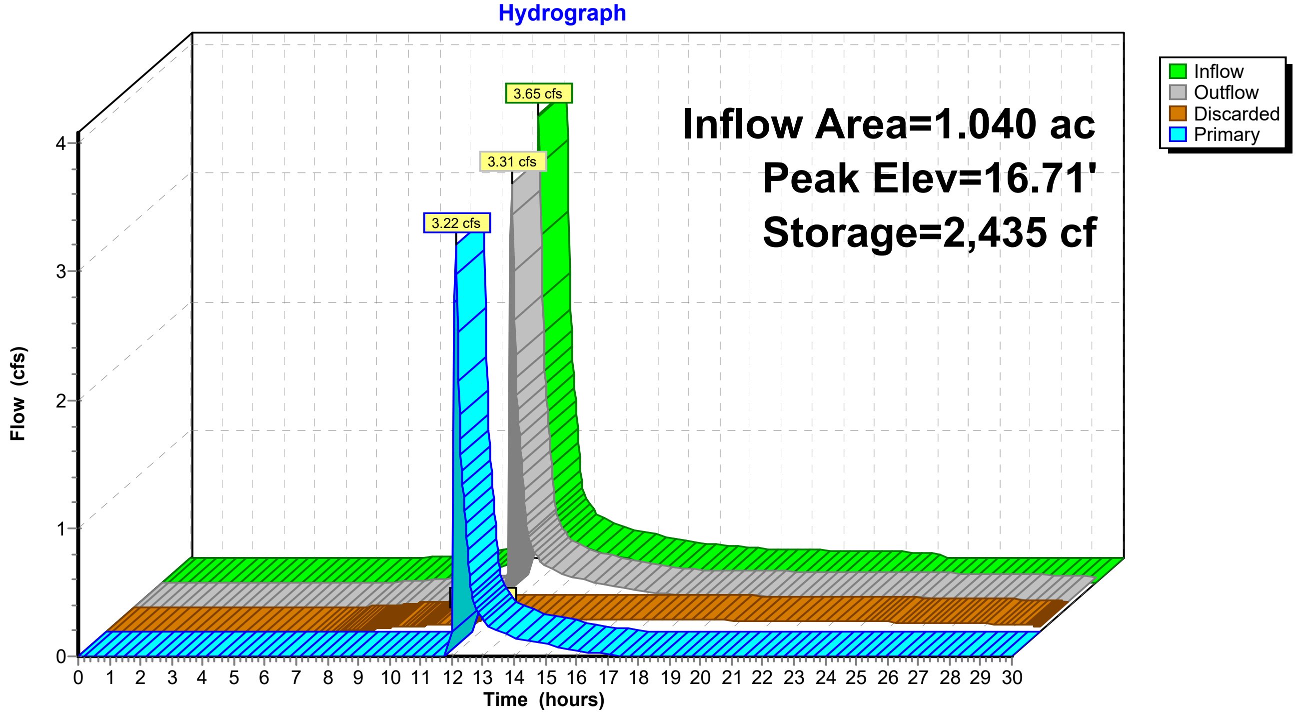
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.90	661	0	0
15.00	996	83	83
16.00	1,406	1,201	1,284
16.50	1,633	760	2,044
17.00	2,893	1,132	3,175

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.90'	**2.410 in/hr Exfiltration over Surface area from 14.80' - 16.50'** Excluded Surface area = 0 sf
#2	Primary	16.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.09 cfs @ 12.06 hrs HW=16.60' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.17 cfs @ 12.12 hrs HW=16.70' TW=16.03' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.17 cfs @ 1.55 fps)

Pond FB1: Forebay 1



Summary for Pond FB3: Forebay 3

Inflow Area = 6.795 ac, 31.67% Impervious, Inflow Depth = 1.41" for 25-YR MASHPEE ATLAS event
Inflow = 11.38 cfs @ 12.12 hrs, Volume= 0.798 af
Outflow = 9.15 cfs @ 12.21 hrs, Volume= 0.798 af, Atten= 20%, Lag= 5.1 min
Discarded = 0.39 cfs @ 12.21 hrs, Volume= 0.423 af
Primary = 8.76 cfs @ 12.21 hrs, Volume= 0.376 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.20' @ 12.21 hrs Surf.Area= 6,981 sf Storage= 6,855 cf

Plug-Flow detention time= 96.5 min calculated for 0.797 af (100% of inflow)
Center-of-Mass det. time= 96.5 min (928.6 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	10,961 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

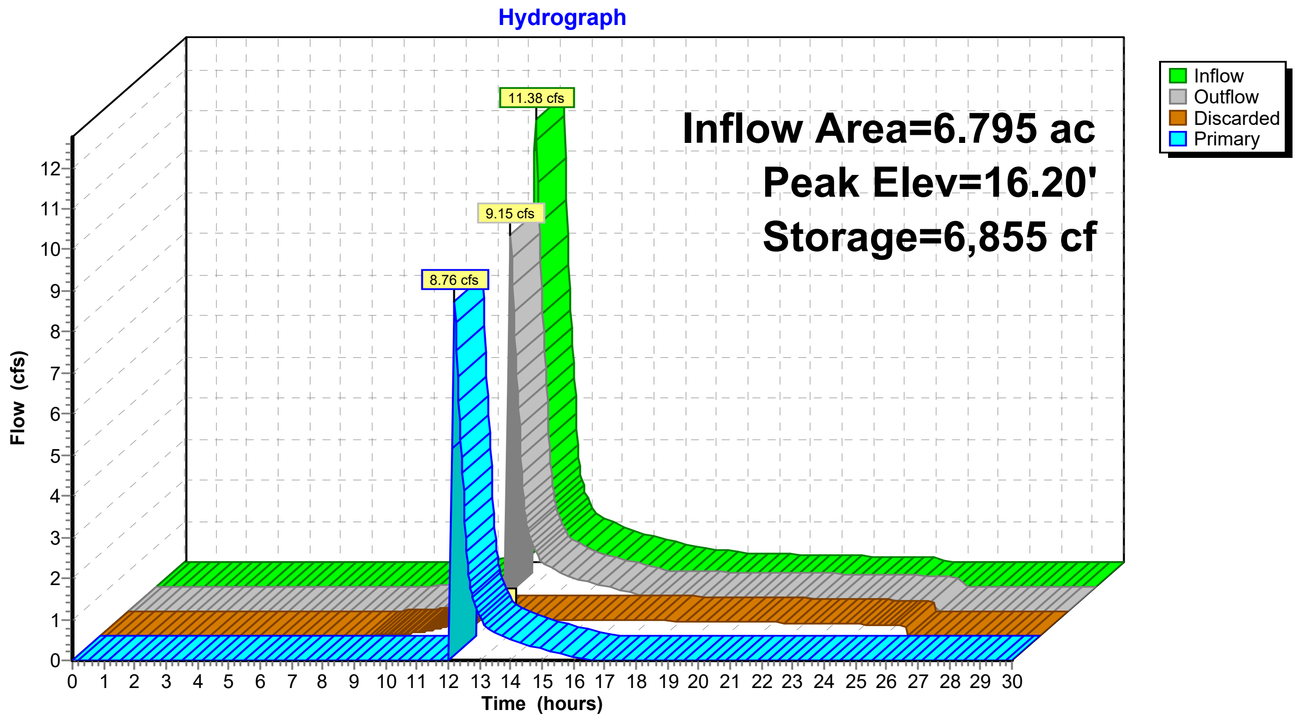
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.00	4,358	0	0
16.00	6,677	5,518	5,518
16.75	7,840	5,444	10,961

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.00'	**2.410 in/hr Exfiltration over Surface area from 14.90' - 16.75'** Excluded Surface area = 0 sf
#2	Primary	16.00'	**10.0' long Sharp-Crested Rectangular Weir X 3.00** 2 End Contraction(s) 0.7' Crest Height

Discarded OutFlow Max=0.39 cfs @ 12.21 hrs HW=16.20' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=8.74 cfs @ 12.21 hrs HW=16.20' TW=14.39' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.74 cfs @ 1.50 fps)

Pond FB3: Forebay 3



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentDA-12: AREAS TO WETLAND Runoff Area=0.793 ac 2.90% Impervious Runoff Depth=1.47"
Tc=5.0 min UI Adjusted CN=45 Runoff=1.14 cfs 0.097 af

SubcatchmentDA-1A: AREA TO CB'S 3 Runoff Area=0.252 ac 59.92% Impervious Runoff Depth=4.47"
Tc=5.0 min CN=74 Runoff=1.36 cfs 0.094 af

SubcatchmentDA-1B: AREA TO CB'S 1 Runoff Area=0.432 ac 70.60% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=81 Runoff=2.70 cfs 0.189 af

SubcatchmentDA-1C: AREA TO FB1 Runoff Area=0.356 ac 32.58% Impervious Runoff Depth=2.75"
Tc=5.0 min CN=58 Runoff=1.14 cfs 0.082 af

SubcatchmentDA-2: END OF ROAD TO Runoff Area=0.536 ac 58.02% Impervious Runoff Depth=4.36"
Flow Length=250' Tc=6.2 min CN=73 Runoff=2.71 cfs 0.195 af

SubcatchmentDA-3: AREAS TO WEST Runoff Area=0.109 ac 21.10% Impervious Runoff Depth=3.49"
Tc=5.0 min UI Adjusted CN=65 Runoff=0.45 cfs 0.032 af

SubcatchmentDA-4: AREAS TO WEST Runoff Area=0.132 ac 50.76% Impervious Runoff Depth=5.15"
Tc=5.0 min CN=80 Runoff=0.81 cfs 0.057 af

SubcatchmentDA-5: AREAS TO WEST Runoff Area=0.124 ac 58.87% Impervious Runoff Depth=4.47"
Tc=5.0 min CN=74 Runoff=0.67 cfs 0.046 af

SubcatchmentDA-6: AREAS TO WEST Runoff Area=0.088 ac 17.05% Impervious Runoff Depth=1.57"
Tc=5.0 min UI Adjusted CN=46 Runoff=0.14 cfs 0.011 af

SubcatchmentDA-7: AREAS TO WEST Runoff Area=0.033 ac 63.64% Impervious Runoff Depth=4.81"
Tc=5.0 min CN=77 Runoff=0.19 cfs 0.013 af

SubcatchmentDA-8: AREAS TO WEST Runoff Area=0.087 ac 35.63% Impervious Runoff Depth=2.96"
Tc=5.0 min CN=60 Runoff=0.30 cfs 0.021 af

SubcatchmentDA-9: AREAS EAST OF Runoff Area=0.558 ac 65.23% Impervious Runoff Depth=4.81"
Tc=5.0 min CN=77 Runoff=3.22 cfs 0.224 af

SubcatchmentDA22A: QUIN AVE SOUTH Runoff Area=0.461 ac 63.56% Impervious Runoff Depth=4.70"
Flow Length=1,172' Tc=6.9 min CN=76 Runoff=2.44 cfs 0.180 af

SubcatchmentDA22B: QUIN AVE WEST Runoff Area=1.335 ac 43.37% Impervious Runoff Depth=3.49"
Flow Length=1,473' Tc=8.8 min CN=65 Runoff=4.91 cfs 0.388 af

SubcatchmentDA44: North of Quin Runoff Area=0.841 ac 0.00% Impervious Runoff Depth=0.43"
Tc=5.0 min CN=32 Runoff=0.11 cfs 0.030 af

SubcatchmentDA55: AREAS TO CB'S AT Runoff Area=0.641 ac 50.86% Impervious Runoff Depth=3.92"
Tc=5.0 min CN=69 Runoff=3.02 cfs 0.209 af

Subcatchment DA77: AREAS TO WETLAND Runoff Area=1.844 ac 0.00% Impervious Runoff Depth=0.43"
Flow Length=431' Tc=26.3 min CN=32 Runoff=0.18 cfs 0.066 af

Reach R1: Tt along stream Avg. Flow Depth=0.39' Max Vel=0.89 fps Inflow=3.18 cfs 0.184 af
n=0.040 L=550.0' S=0.0035 '/' Capacity=69.34 cfs Outflow=2.06 cfs 0.184 af

Reach R1A: Tt thru bogs Avg. Flow Depth=0.28' Max Vel=0.78 fps Inflow=1.29 cfs 0.829 af
n=0.040 L=520.0' S=0.0029 '/' Capacity=50.84 cfs Outflow=1.29 cfs 0.826 af

Reach R2: Tt thru da77 Avg. Flow Depth=0.24' Max Vel=1.19 fps Inflow=7.71 cfs 0.550 af
n=0.030 L=210.0' S=0.0095 '/' Capacity=50.53 cfs Outflow=7.21 cfs 0.550 af

Reach R2A: Travel Time thru wet pond Avg. Flow Depth=0.31' Max Vel=3.77 fps Inflow=2.44 cfs 0.180 af
n=0.025 L=255.0' S=0.0267 '/' Capacity=13.24 cfs Outflow=2.41 cfs 0.180 af

Reach R3: 18" CPP Avg. Flow Depth=1.01' Max Vel=3.18 fps Inflow=4.06 cfs 0.283 af
18.0" Round Pipe n=0.012 L=81.0' S=0.0020 '/' Capacity=5.06 cfs Outflow=4.04 cfs 0.283 af

Reach R5: Tt thru da22B Avg. Flow Depth=0.13' Max Vel=2.46 fps Inflow=2.97 cfs 0.162 af
n=0.013 L=246.0' S=0.0146 '/' Capacity=75.75 cfs Outflow=2.88 cfs 0.162 af

Reach SP#1: Study Point Combined Flows Inflow=2.09 cfs 1.010 af
Outflow=2.09 cfs 1.010 af

Pond 1P: LB's Peak Elev=20.74' Storage=508 cf Inflow=3.02 cfs 0.209 af
Discarded=0.03 cfs 0.047 af Primary=2.97 cfs 0.162 af Outflow=3.00 cfs 0.209 af

Pond 2P: Natural Low Area Peak Elev=16.90' Storage=293 cf Inflow=0.11 cfs 0.030 af
Discarded=0.04 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.030 af

Pond 3A-P: Pond 3A Peak Elev=17.56' Storage=218 cf Inflow=0.45 cfs 0.032 af
Discarded=0.01 cfs 0.016 af Primary=0.43 cfs 0.016 af Outflow=0.45 cfs 0.032 af

Pond 3P: Wet Pond Peak Elev=15.48' Storage=25,458 cf Inflow=18.30 cfs 0.934 af
Outflow=1.29 cfs 0.829 af

Pond 4P: Pond 4 Peak Elev=18.03' Storage=245 cf Inflow=0.81 cfs 0.057 af
Discarded=0.01 cfs 0.017 af Primary=0.80 cfs 0.039 af Outflow=0.81 cfs 0.055 af

Pond 5P: Pond 5 Peak Elev=19.03' Storage=236 cf Inflow=0.67 cfs 0.046 af
Discarded=0.02 cfs 0.020 af Primary=0.65 cfs 0.026 af Outflow=0.67 cfs 0.046 af

Pond 6P: Pond 6 Peak Elev=19.00' Storage=163 cf Inflow=0.14 cfs 0.011 af
Discarded=0.02 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.011 af

Pond 7P: Pond 7 Peak Elev=18.02' Storage=83 cf Inflow=0.19 cfs 0.013 af
Discarded=0.01 cfs 0.008 af Primary=0.18 cfs 0.006 af Outflow=0.19 cfs 0.013 af

Pond 8P: Pond 8 Peak Elev=17.63' Storage=331 cf Inflow=0.30 cfs 0.021 af
Discarded=0.03 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.021 af

Pond FB1: Forebay 1 Peak Elev=16.77' Storage=2,579 cf Inflow=5.18 cfs 0.365 af
Discarded=0.09 cfs 0.146 af Primary=4.89 cfs 0.214 af Outflow=4.98 cfs 0.360 af

Pond FB3: Forebay 3 Peak Elev=16.29' Storage=7,519 cf Inflow=16.96 cfs 1.248 af
Discarded=0.40 cfs 0.494 af Primary=16.00 cfs 0.754 af Outflow=16.40 cfs 1.248 af

Total Runoff Area = 8.622 ac Runoff Volume = 1.935 af Average Runoff Depth = 2.69"
68.71% Pervious = 5.924 ac 31.29% Impervious = 2.698 ac

Summary for Subcatchment DA-12: AREAS TO WETLAND TO WEST

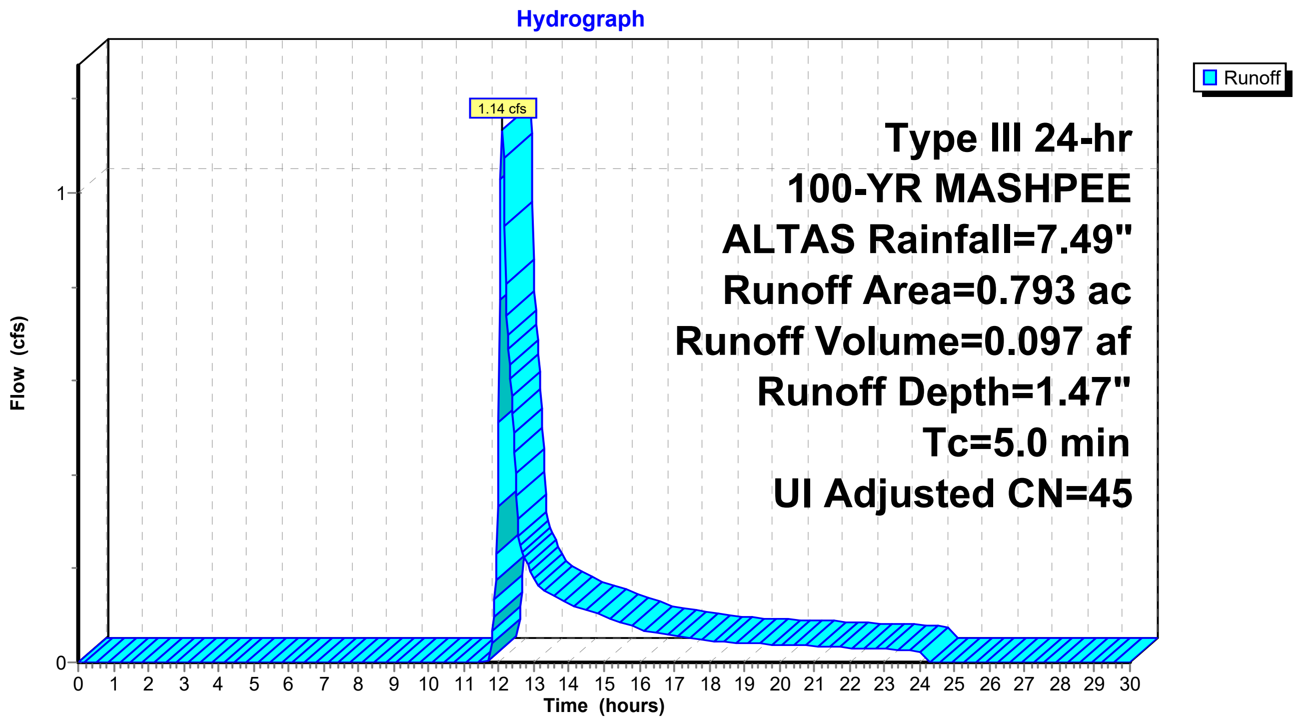
Runoff = 1.14 cfs @ 12.09 hrs, Volume= 0.097 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Adj	Description
0.090	39		>75% Grass cover, Good, HSG A
0.318	30		Woods, Good, HSG A
0.023	76		Gravel roads, HSG A
0.023	98		Unconnected pavement, HSG B
0.317	55		Woods, Good, HSG B
0.022	85		Gravel roads, HSG B
0.793	46	45	Weighted Average, UI Adjusted
0.770			97.10% Pervious Area
0.023			2.90% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-12: AREAS TO WETLAND TO WEST



Summary for Subcatchment DA-1A: AREA TO CB'S 3 AND 4

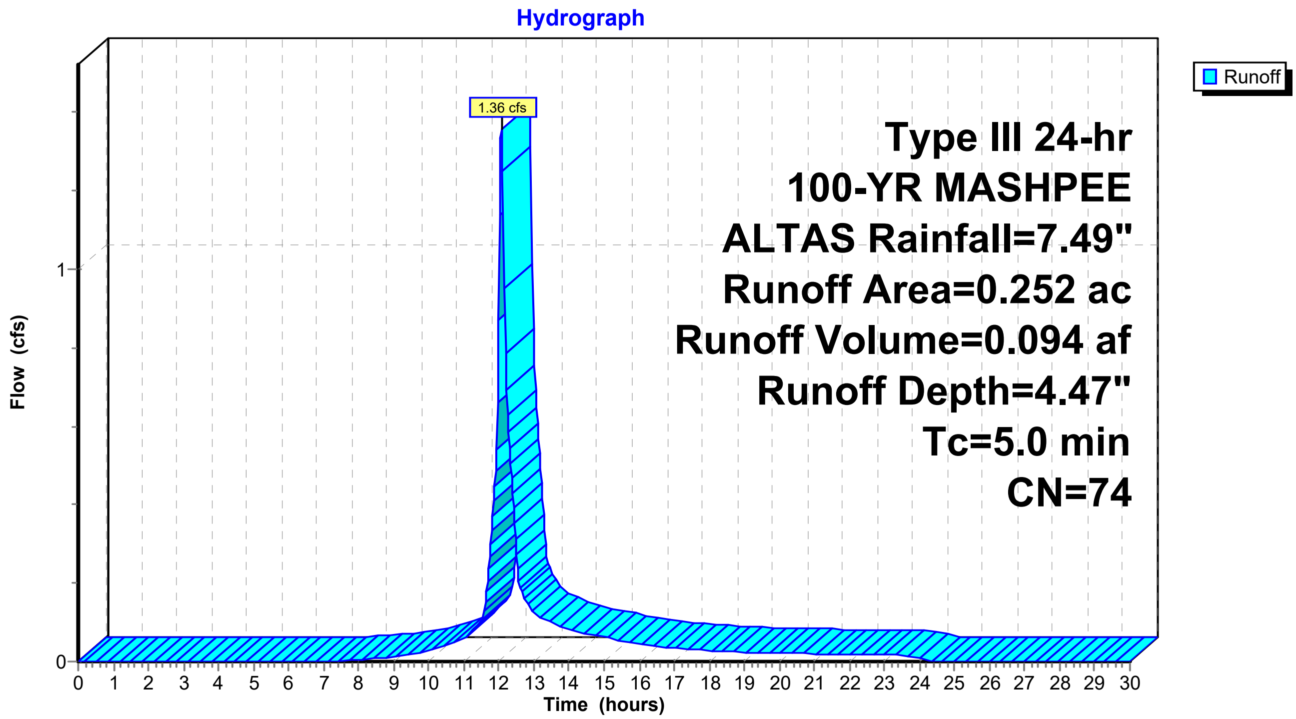
Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.094 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.101	39	>75% Grass cover, Good, HSG A
0.109	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.252	74	Weighted Average
0.101		40.08% Pervious Area
0.151		59.92% Impervious Area
0.109		72.19% Unconnected

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

Subcatchment DA-1A: AREA TO CB'S 3 AND 4



Summary for Subcatchment DA-1B: AREA TO CB'S 1 AND 2

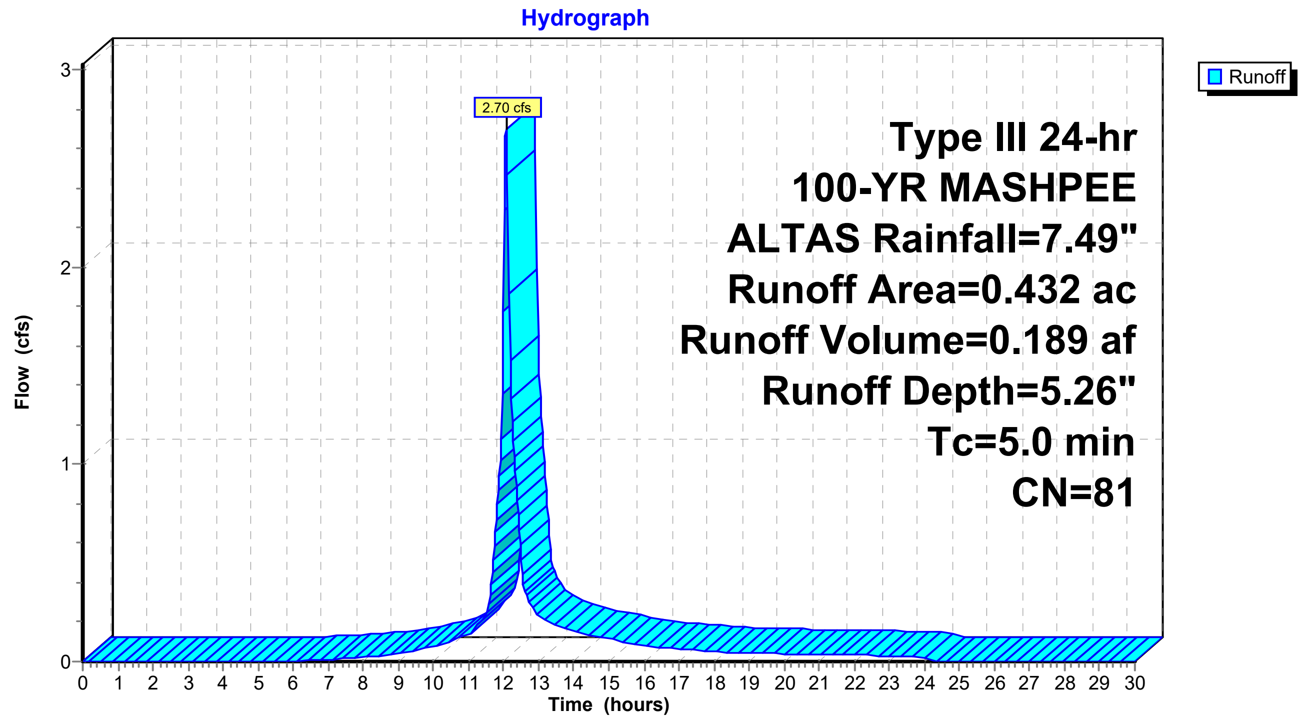
Runoff = 2.70 cfs @ 12.07 hrs, Volume= 0.189 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.137	98	Unconnected pavement, HSG A
0.127	39	Pasture/grassland/range, Good, HSG A
0.168	98	Roofs, HSG A
0.432	81	Weighted Average
0.127		29.40% Pervious Area
0.305		70.60% Impervious Area
0.137		44.92% Unconnected

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

Subcatchment DA-1B: AREA TO CB'S 1 AND 2



Summary for Subcatchment DA-1C: AREA TO FB1

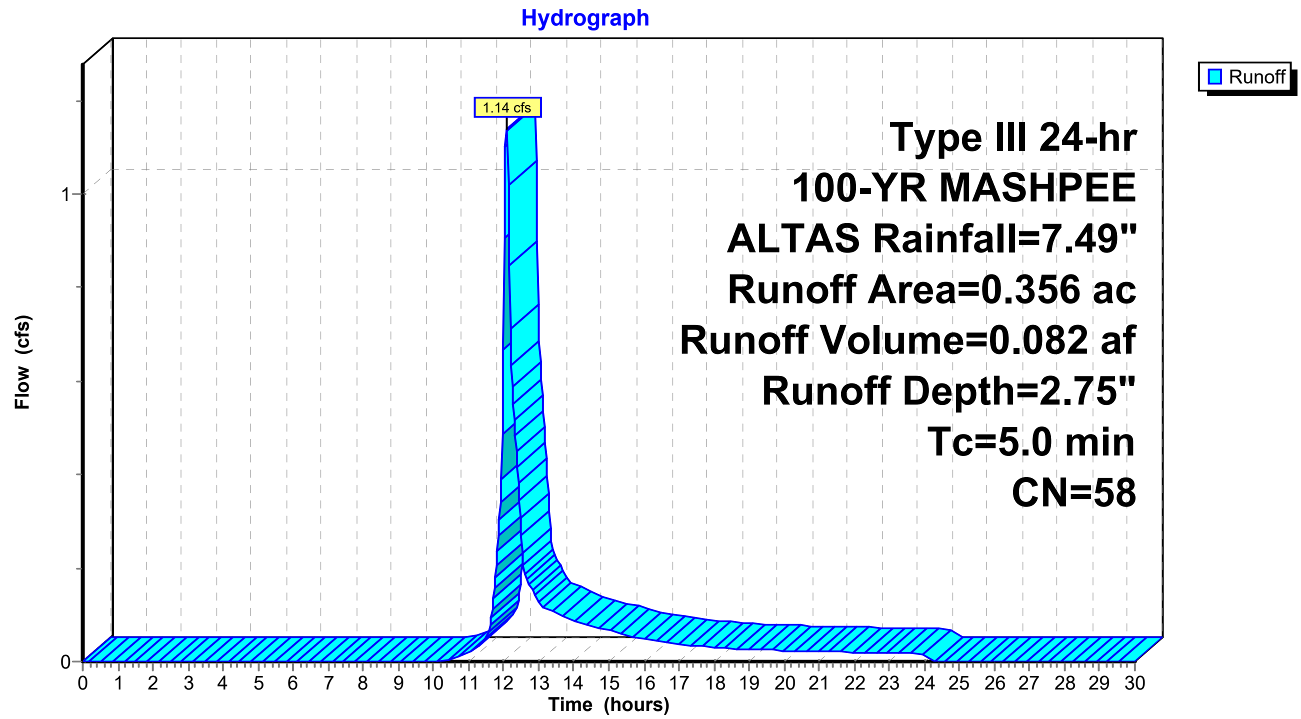
Runoff = 1.14 cfs @ 12.08 hrs, Volume= 0.082 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.240	39	>75% Grass cover, Good, HSG A
0.074	98	Unconnected pavement, HSG A
0.042	98	Roofs, HSG B
0.356	58	Weighted Average
0.240		67.42% Pervious Area
0.116		32.58% Impervious Area
0.074		63.79% Unconnected

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

Subcatchment DA-1C: AREA TO FB1



Summary for Subcatchment DA-2: END OF ROAD TO THE EAST

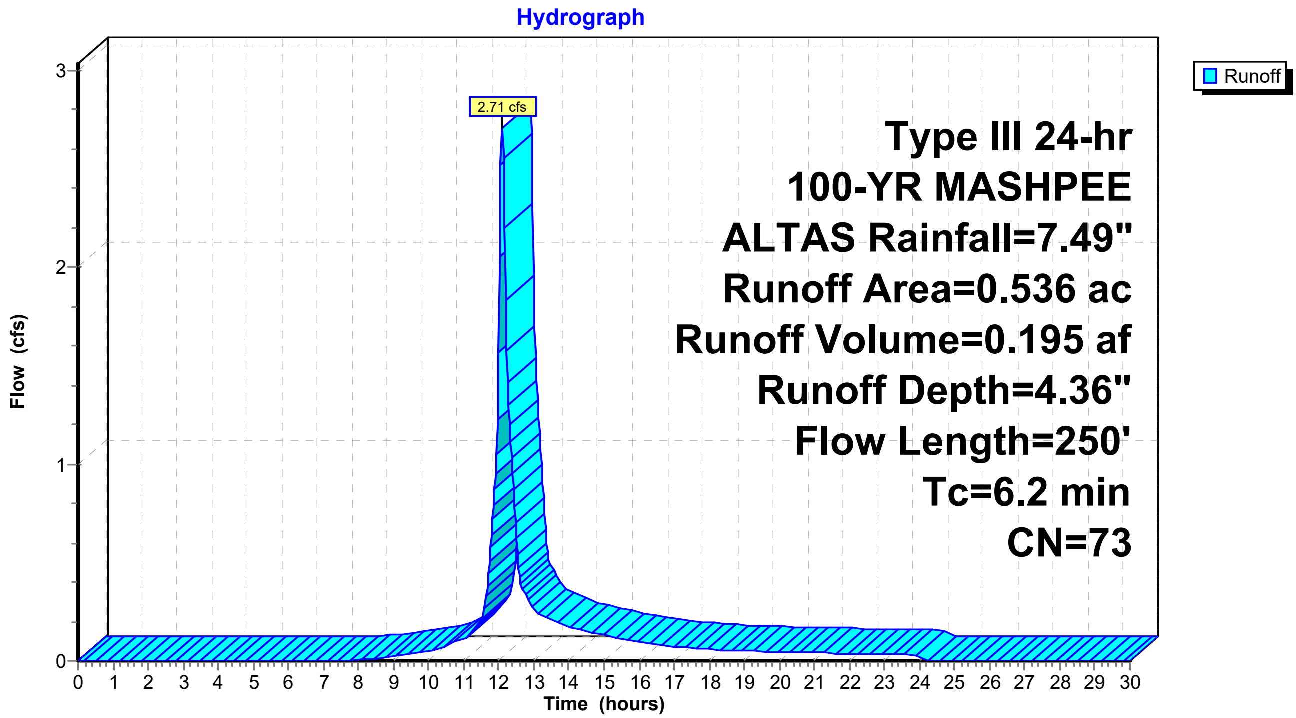
Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.195 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.225	39	>75% Grass cover, Good, HSG A
0.181	98	Unconnected pavement, HSG A
0.130	98	Roofs, HSG A
0.536	73	Weighted Average
0.225		41.98% Pervious Area
0.311		58.02% Impervious Area
0.181		58.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	30	0.0200	0.10		**Sheet Flow, LAWN** Grass: Dense n= 0.240 P2= 3.55"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow, ROAD** Paved Kv= 20.3 fps
0.5	140	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
6.2	250	Total			

Subcatchment DA-2: END OF ROAD TO THE EAST



Summary for Subcatchment DA-3: AREAS TO WEST

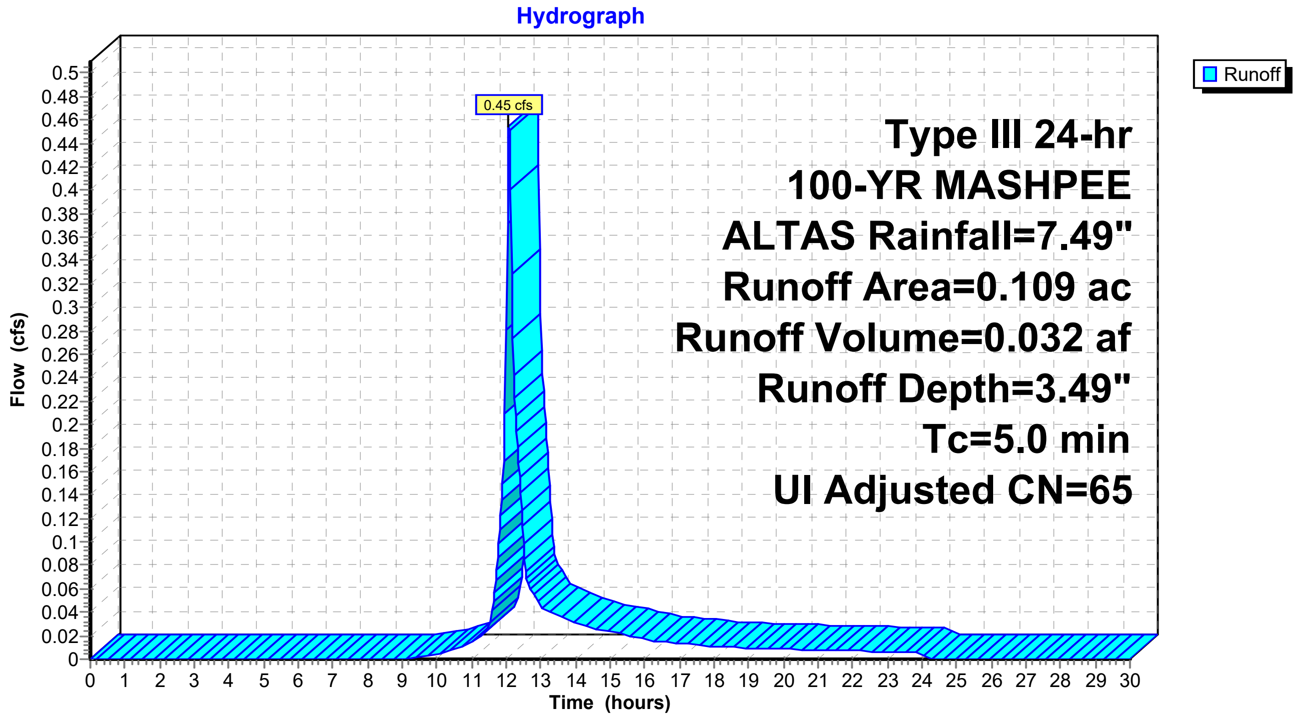
Runoff = 0.45 cfs @ 12.08 hrs, Volume= 0.032 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Adj	Description
0.086	61		>75% Grass cover, Good, HSG B
0.023	98		Unconnected pavement, HSG B
0.109	69	65	Weighted Average, UI Adjusted
0.086			78.90% Pervious Area
0.023			21.10% Impervious Area
0.023			100.00% Unconnected

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

Subcatchment DA-3: AREAS TO WEST



Summary for Subcatchment DA-4: AREAS TO WEST

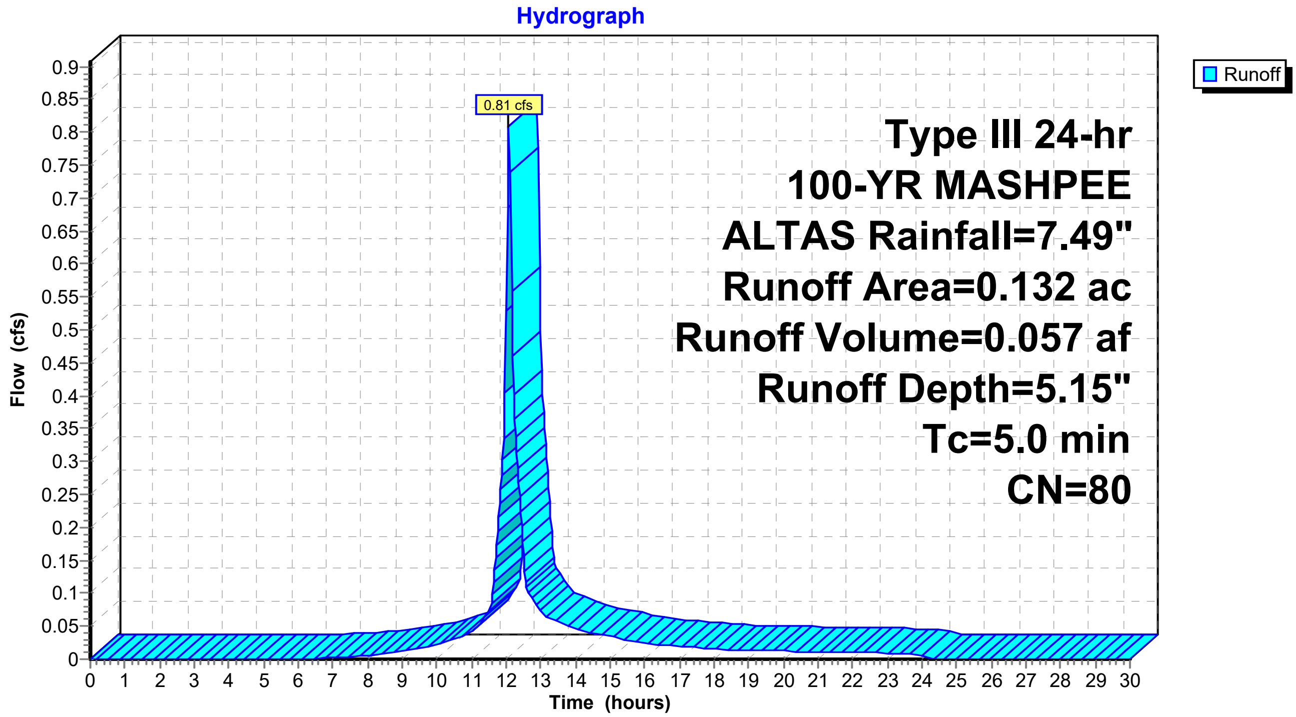
Runoff = 0.81 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.065	61	>75% Grass cover, Good, HSG B
0.067	98	Unconnected pavement, HSG B
0.132	80	Weighted Average
0.065		49.24% Pervious Area
0.067		50.76% Impervious Area
0.067		100.00% Unconnected

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

Subcatchment DA-4: AREAS TO WEST



Summary for Subcatchment DA-5: AREAS TO WEST

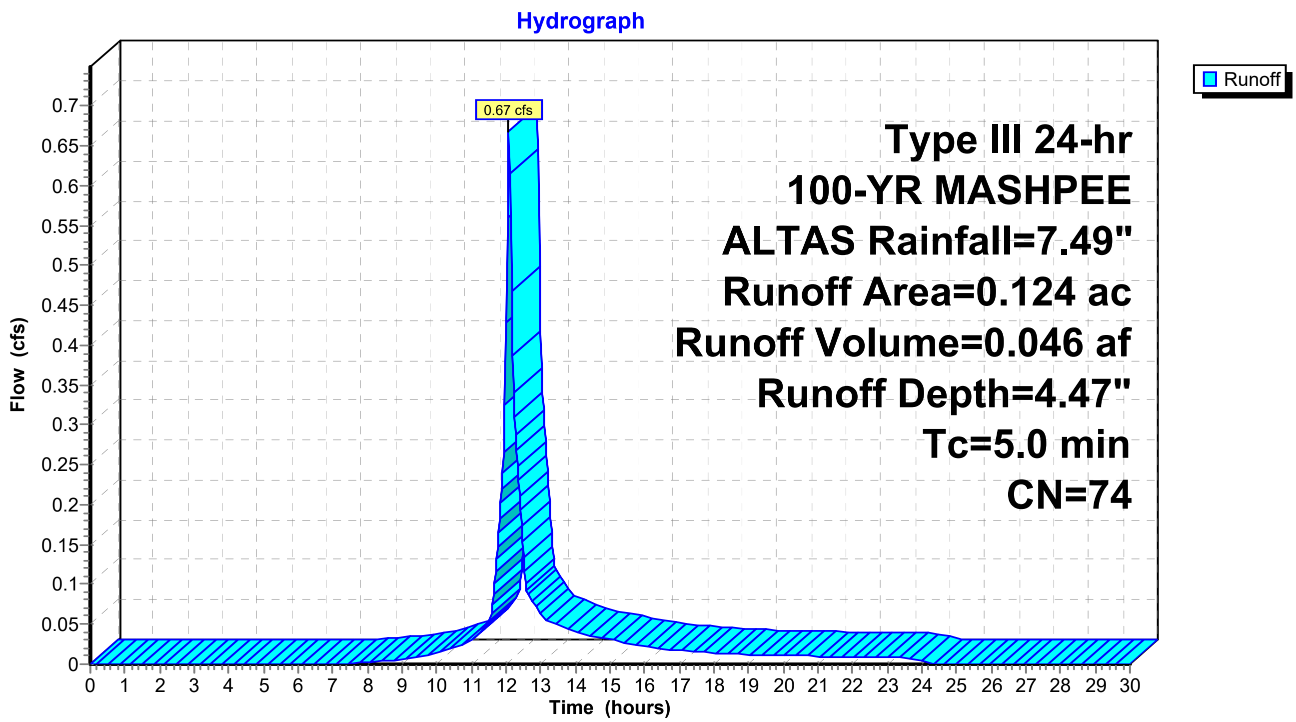
Runoff = 0.67 cfs @ 12.07 hrs, Volume= 0.046 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.051	39	>75% Grass cover, Good, HSG A
0.073	98	Unconnected pavement, HSG A
0.124	74	Weighted Average
0.051		41.13% Pervious Area
0.073		58.87% Impervious Area
0.073		100.00% Unconnected

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

Subcatchment DA-5: AREAS TO WEST



Summary for Subcatchment DA-6: AREAS TO WEST

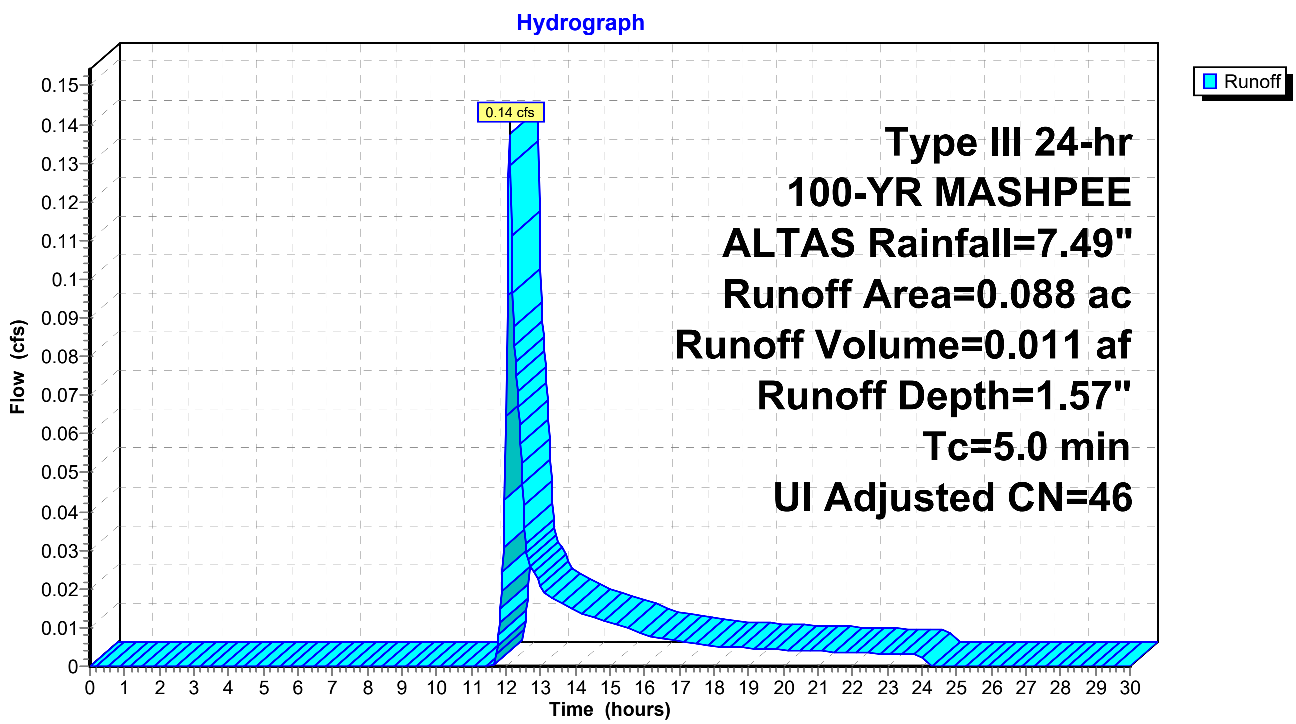
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Adj	Description
0.073	39		>75% Grass cover, Good, HSG A
0.008	98		Unconnected pavement, HSG A
0.007	98		Roofs, HSG A
0.088	49	46	Weighted Average, UI Adjusted
0.073			82.95% Pervious Area
0.015			17.05% Impervious Area
0.008			53.33% Unconnected

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

Subcatchment DA-6: AREAS TO WEST



Summary for Subcatchment DA-7: AREAS TO WEST

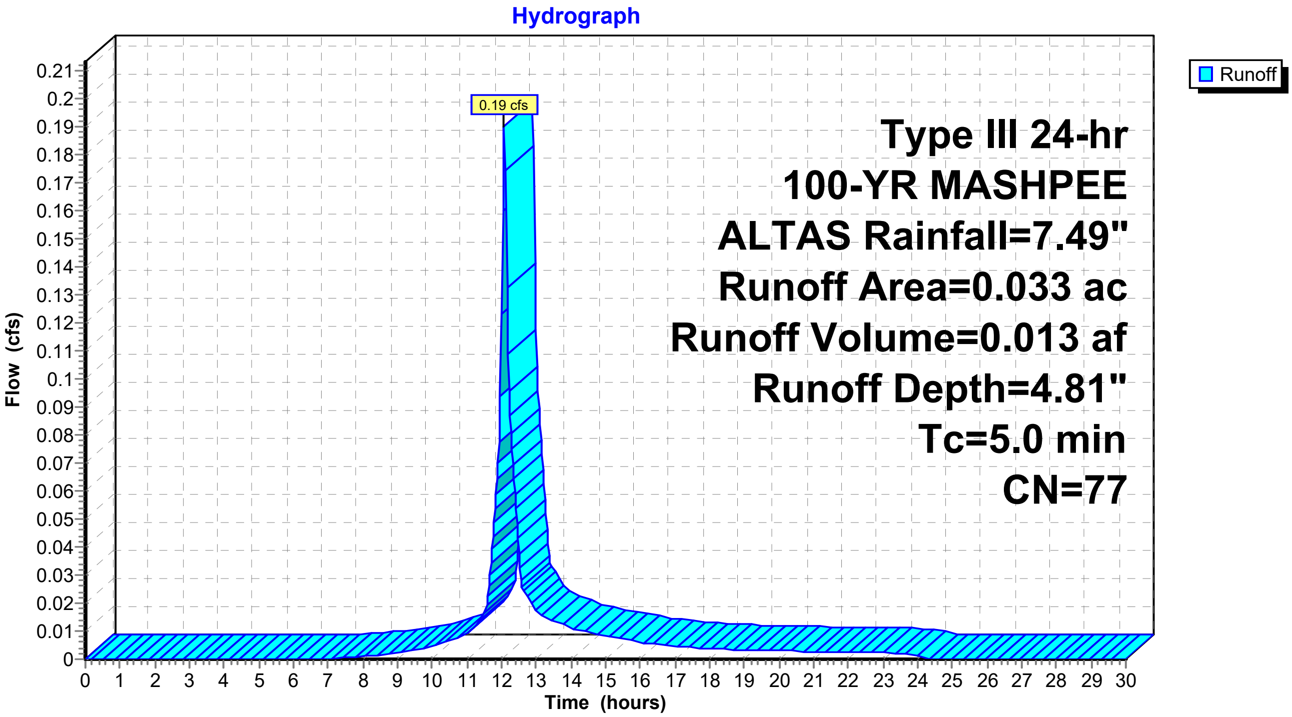
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.013 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.012	39	>75% Grass cover, Good, HSG A
0.021	98	Unconnected pavement, HSG A
0.033	77	Weighted Average
0.012		36.36% Pervious Area
0.021		63.64% Impervious Area
0.021		100.00% Unconnected

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

Subcatchment DA-7: AREAS TO WEST



Summary for Subcatchment DA-8: AREAS TO WEST

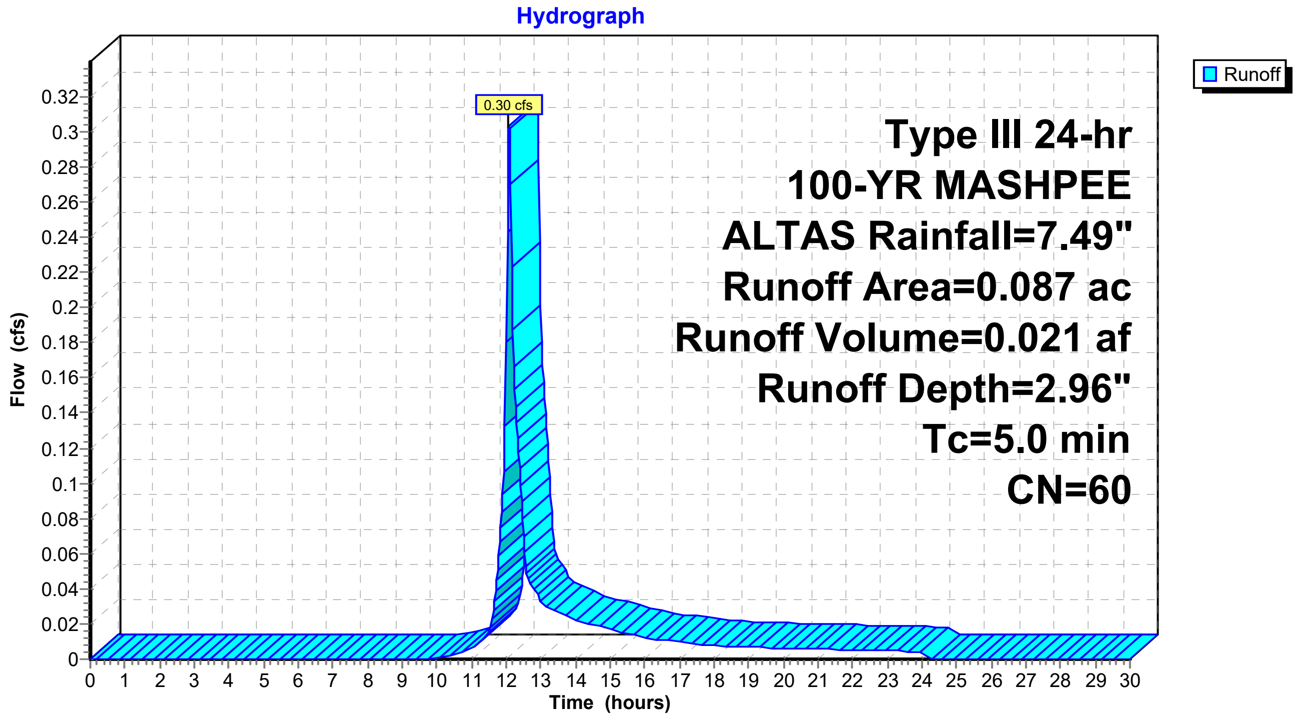
Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.056	39	>75% Grass cover, Good, HSG A
0.031	98	Unconnected pavement, HSG A
0.087	60	Weighted Average
0.056		64.37% Pervious Area
0.031		35.63% Impervious Area
0.031		100.00% Unconnected

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

Subcatchment DA-8: AREAS TO WEST



Summary for Subcatchment DA-9: AREAS EAST OF ROAD

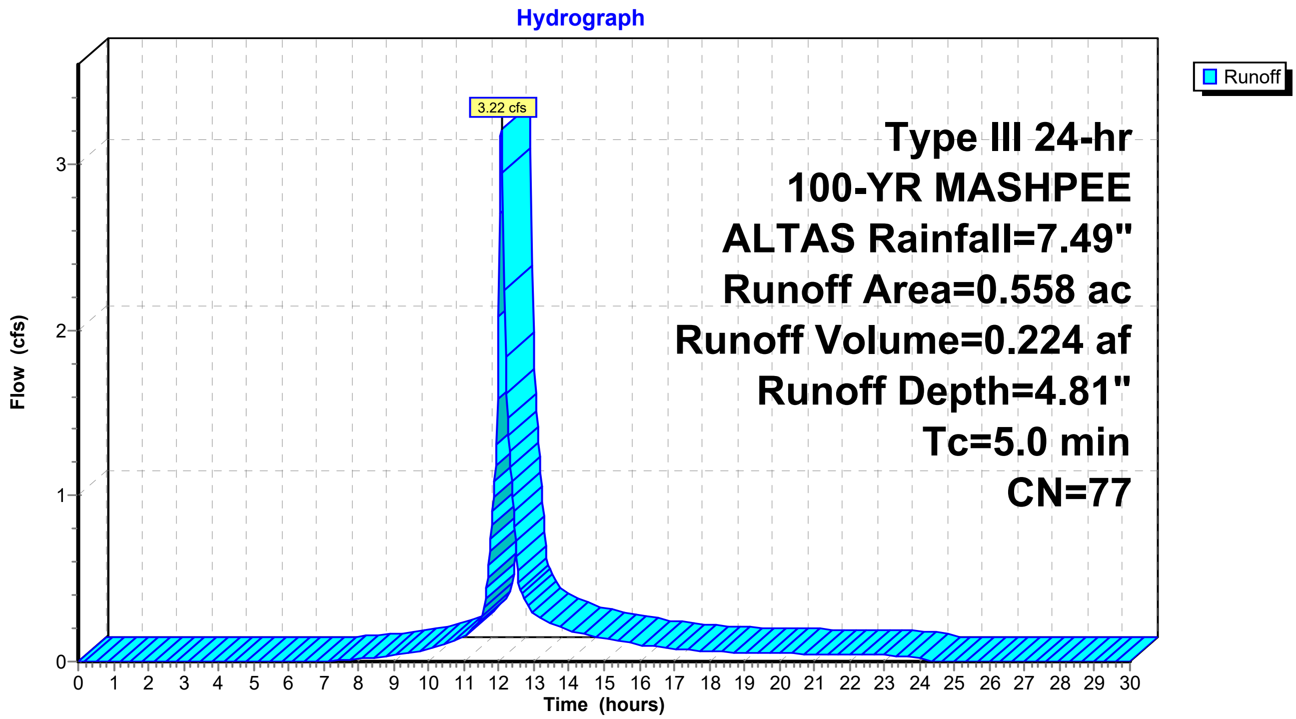
Runoff = 3.22 cfs @ 12.07 hrs, Volume= 0.224 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.194	39	>75% Grass cover, Good, HSG A
0.154	98	Unconnected pavement, HSG A
0.210	98	Roofs, HSG A
0.558	77	Weighted Average
0.194		34.77% Pervious Area
0.364		65.23% Impervious Area
0.154		42.31% Unconnected

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

Subcatchment DA-9: AREAS EAST OF ROAD



Summary for Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND

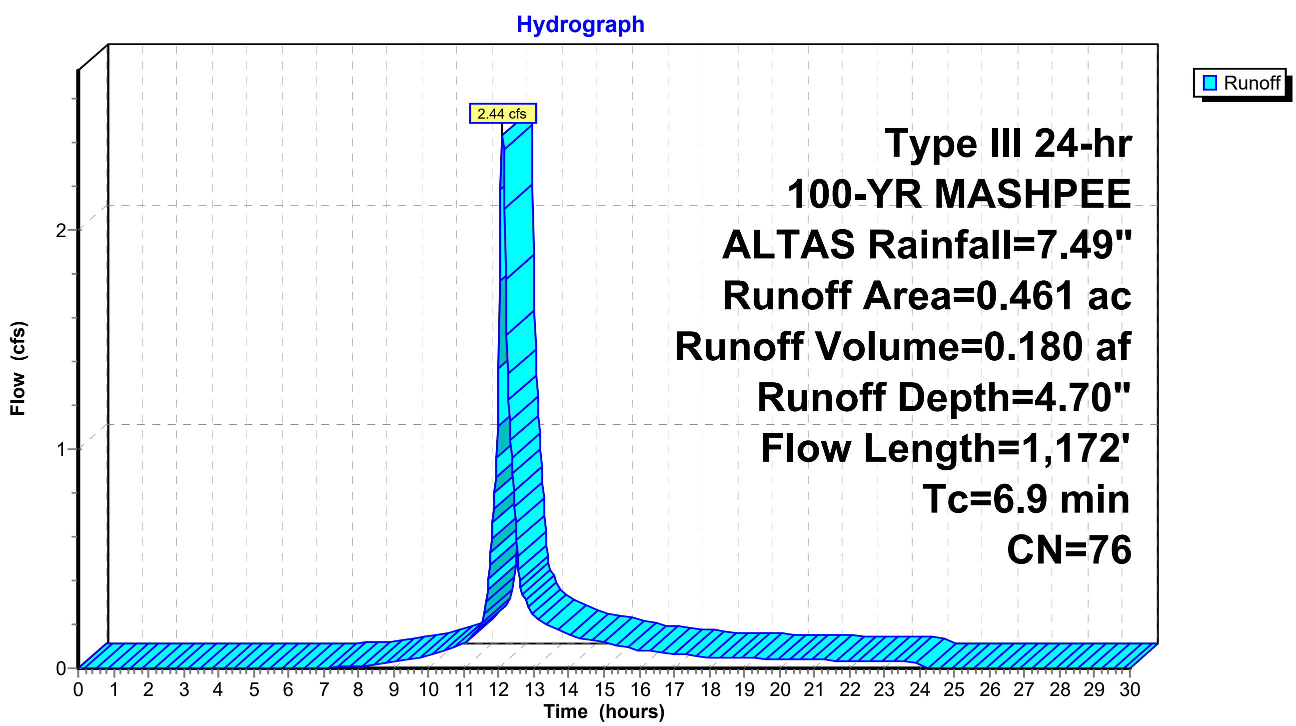
Runoff = 2.44 cfs @ 12.10 hrs, Volume= 0.180 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.293	98	Unconnected pavement, HSG A
0.168	39	>75% Grass cover, Good, HSG A
0.461	76	Weighted Average
0.168		36.44% Pervious Area
0.293		63.56% Impervious Area
0.293		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
6.0	1,122	0.0236	3.12		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
6.9	1,172	Total			

Subcatchment DA22A: QUIN AVE SOUTH AREA TO WET POND



Summary for Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3

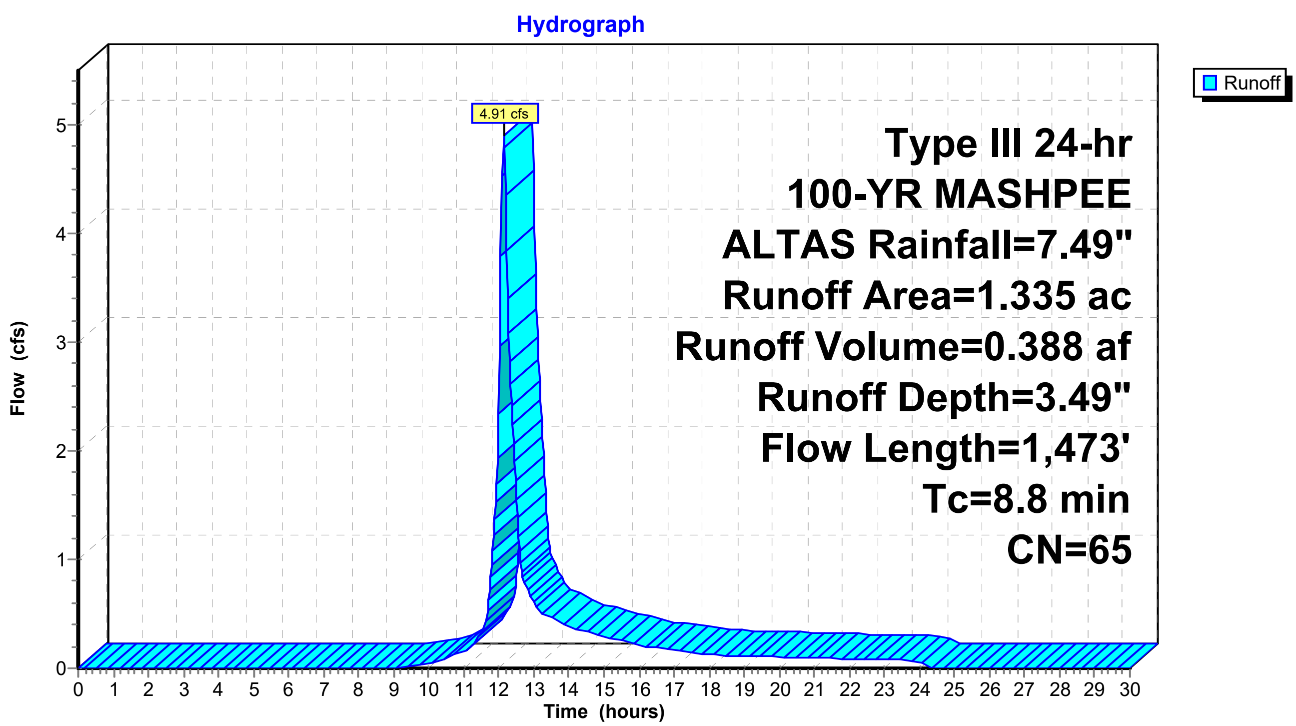
Runoff = 4.91 cfs @ 12.13 hrs, Volume= 0.388 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.579	98	Unconnected pavement, HSG A
0.756	39	>75% Grass cover, Good, HSG A
1.335	65	Weighted Average
0.756		56.63% Pervious Area
0.579		43.37% Impervious Area
0.579		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.96		**Sheet Flow, A** Smooth surfaces n= 0.011 P2= 3.55"
7.9	1,423	0.0220	3.01		**Shallow Concentrated Flow, B** Paved Kv= 20.3 fps
8.8	1,473	Total			

Subcatchment DA22B: QUIN AVE WEST AND NORTH AREA TO FOREBAY 3



Summary for Subcatchment DA44: North of Quin

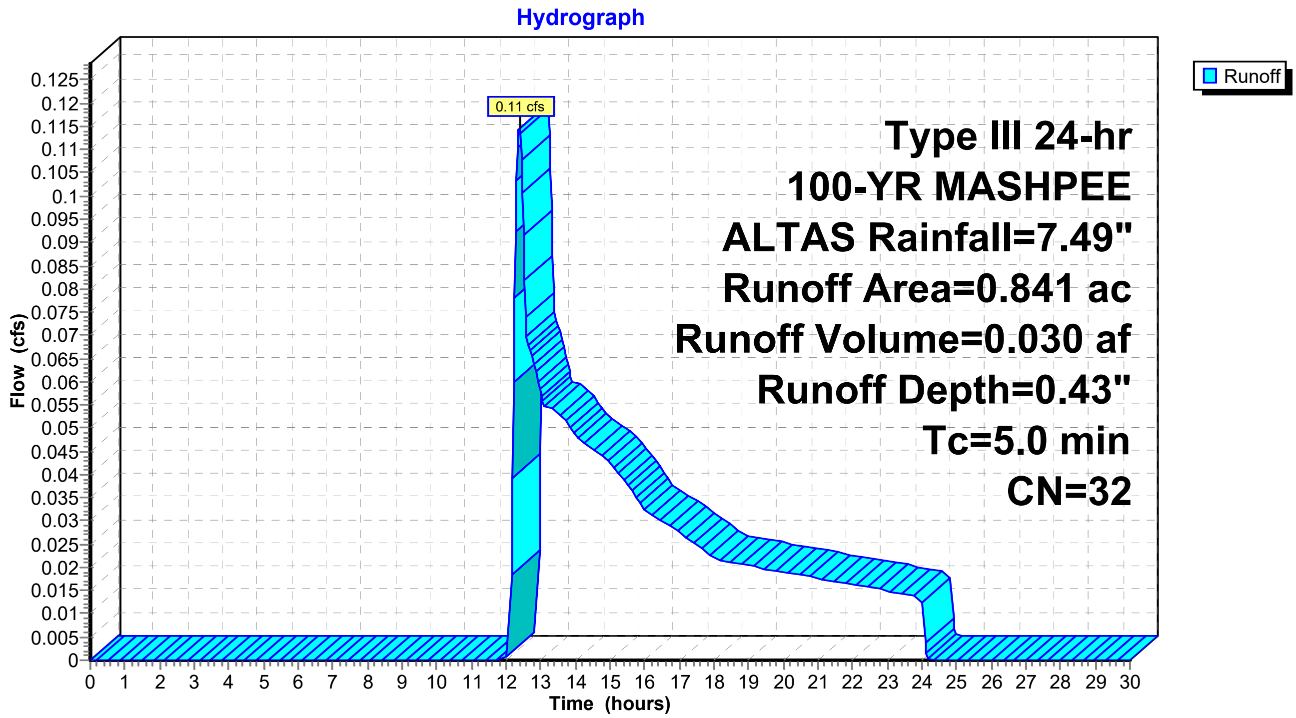
Runoff = 0.11 cfs @ 12.38 hrs, Volume= 0.030 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.841	32	Woods/grass comb., Good, HSG A
0.841		100.00% Pervious Area

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

Subcatchment DA44: North of Quin



Summary for Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR

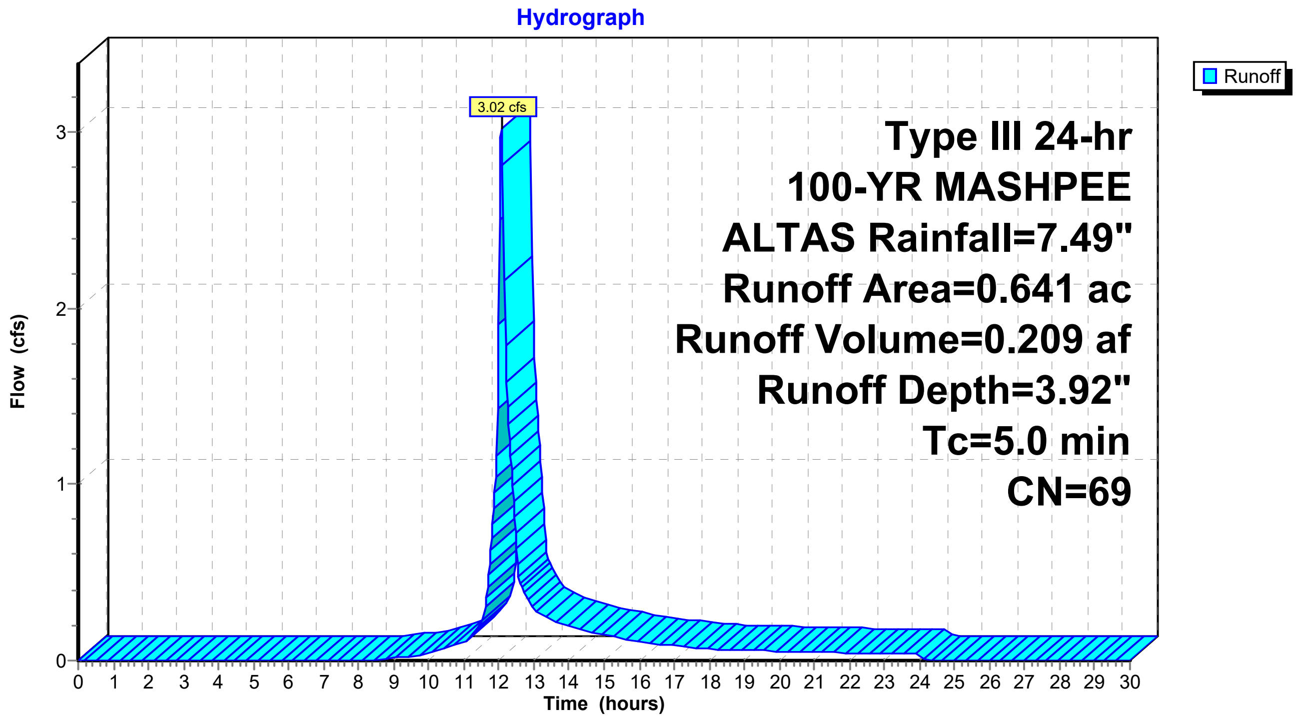
Runoff = 3.02 cfs @ 12.08 hrs, Volume= 0.209 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.326	98	Paved parking, HSG A
0.315	39	Pasture/grassland/range, Good, HSG A
0.641	69	Weighted Average
0.315		49.14% Pervious Area
0.326		50.86% Impervious Area

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

Subcatchment DA55: AREAS TO CB'S AT WILLOWBEND DR



Summary for Subcatchment DA77: AREAS TO WETLAND TO EAST

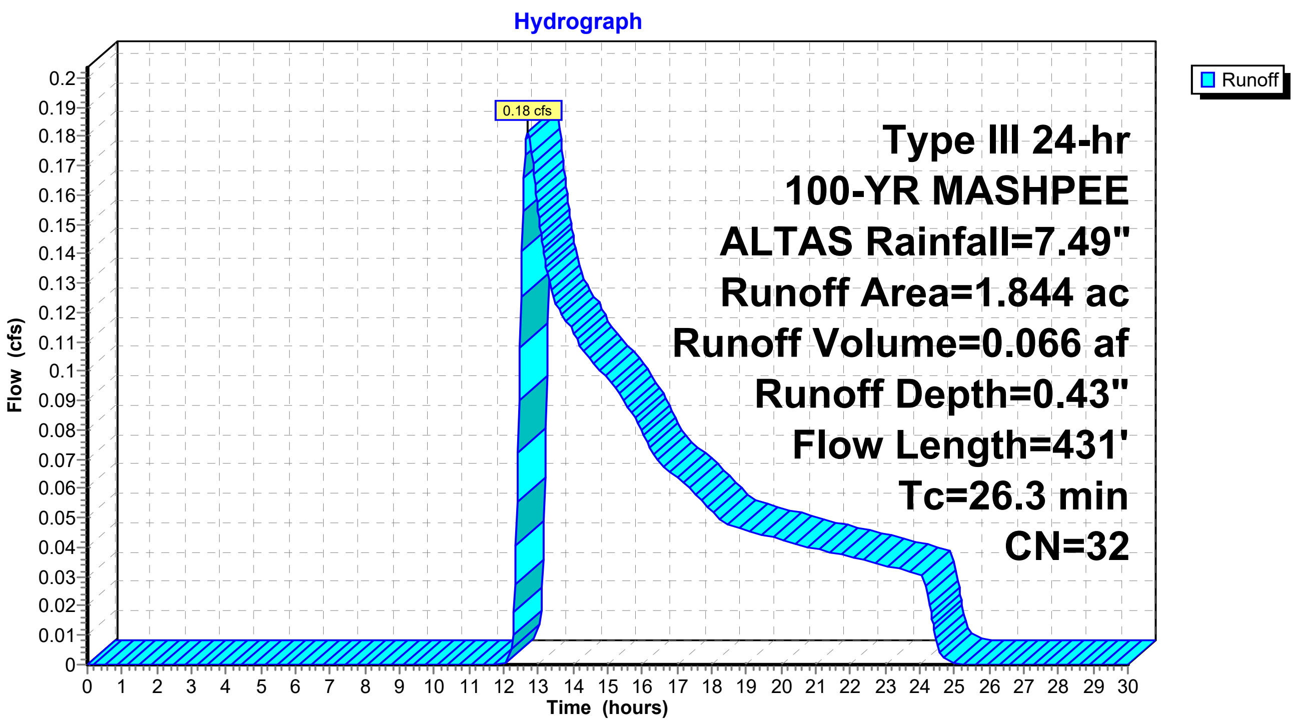
Runoff = 0.18 cfs @ 12.71 hrs, Volume= 0.066 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR MASHPEE ALTAS Rainfall=7.49"

Area (ac)	CN	Description
0.476	39	>75% Grass cover, Good, HSG A
1.201	30	Woods, Good, HSG A
0.167	30	Woods, Good, HSG A
1.844	32	Weighted Average
1.844		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0480	0.10		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.55"
18.0	381	0.0050	0.35		**Shallow Concentrated Flow, B** Woodland Kv= 5.0 fps
26.3	431	Total			

Subcatchment DA77: AREAS TO WETLAND TO EAST



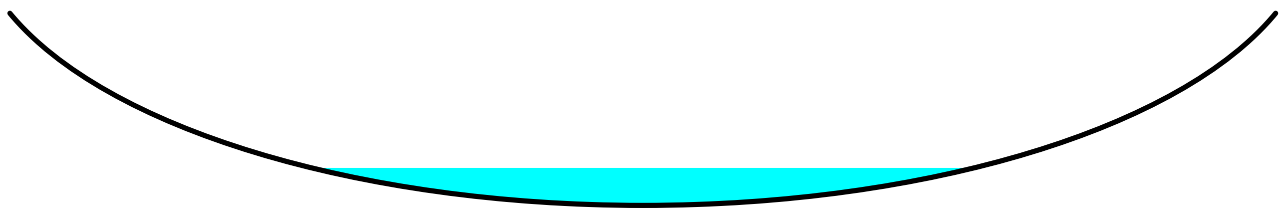
Summary for Reach R1: Tt along stream

Inflow Area = 1.366 ac, 18.52% Impervious, Inflow Depth = 1.61" for 100-YR MASHPEE ALTAS event
Inflow = 3.18 cfs @ 12.09 hrs, Volume= 0.184 af
Outflow = 2.06 cfs @ 12.18 hrs, Volume= 0.184 af, Atten= 35%, Lag= 5.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.89 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 32.6 min

Peak Storage= 1,273 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 2.00' Flow Area= 26.7 sf, Capacity= 69.34 cfs

20.00' x 2.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0035 '/'
Inlet Invert= 14.60', Outlet Invert= 12.70'



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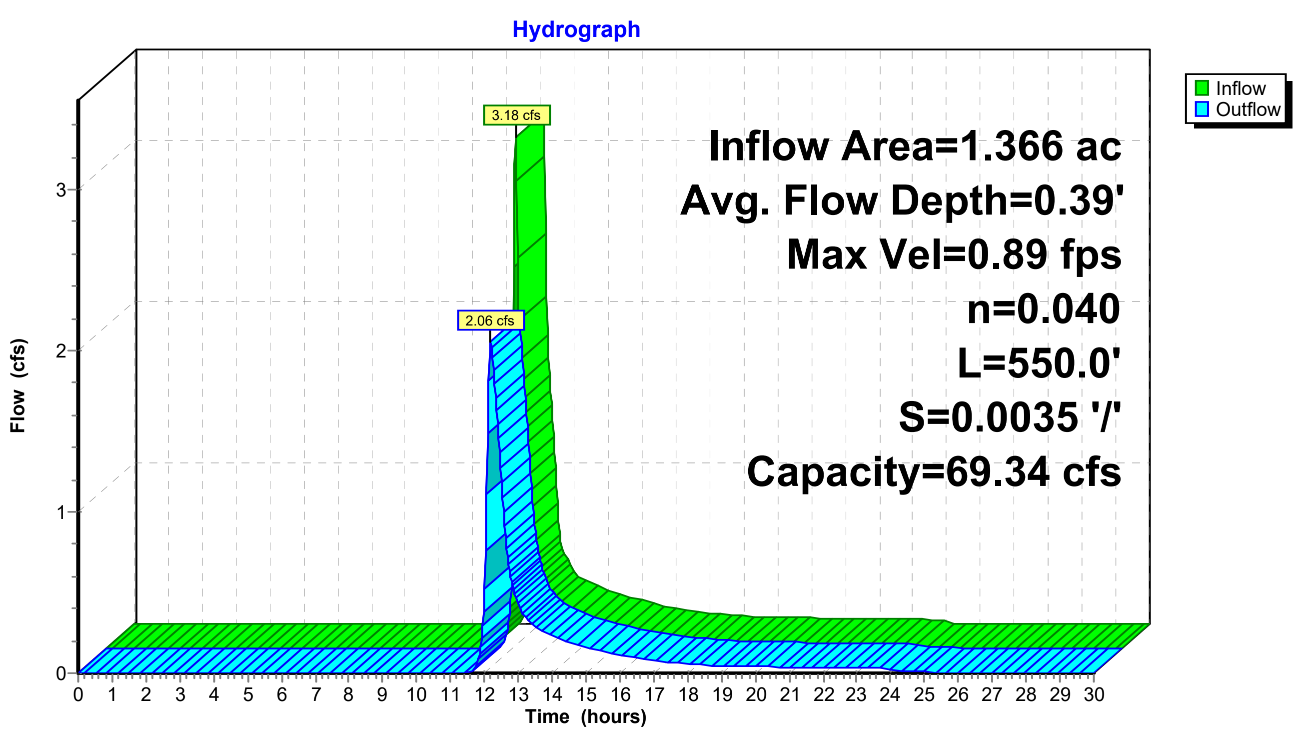
Reach R1: Tt along stream



Summary for Reach R1A: Tt thru bogs

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth > 1.37" for 100-YR MASHPEE ALTAS event
Inflow = 1.29 cfs @ 13.68 hrs, Volume= 0.829 af
Outflow = 1.29 cfs @ 13.81 hrs, Volume= 0.826 af, Atten= 0%, Lag= 7.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 0.78 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 16.4 min

Peak Storage= 862 cf @ 13.81 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 50.84 cfs

5.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 520.0' Slope= 0.0029 '/'
Inlet Invert= 14.20', Outlet Invert= 12.70'

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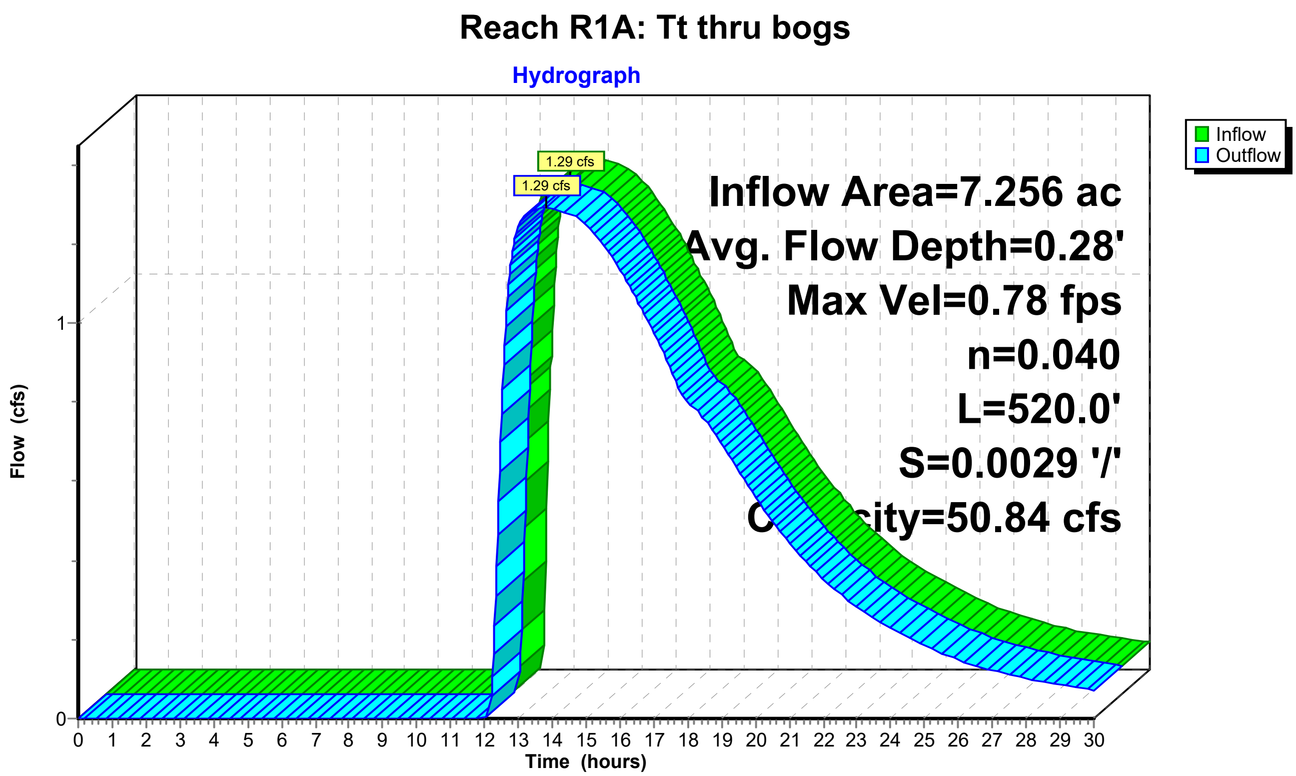


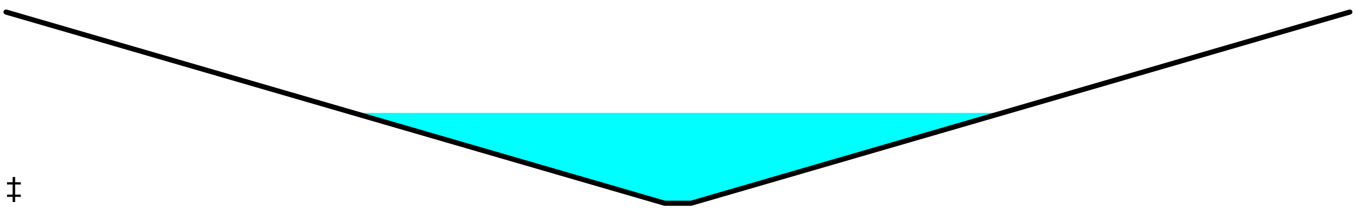
Summary for Reach R2: Tt thru da77

Inflow Area = 2.817 ac, 32.13% Impervious, Inflow Depth = 2.34" for 100-YR MASHPEE ALTAS event
Inflow = 7.71 cfs @ 12.12 hrs, Volume= 0.550 af
Outflow = 7.21 cfs @ 12.16 hrs, Volume= 0.550 af, Atten= 6%, Lag= 2.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 1.19 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 8.0 min

Peak Storage= 1,269 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 0.50' Flow Area= 26.0 sf, Capacity= 50.53 cfs

2.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 100.0 '/' Top Width= 102.00'
Length= 210.0' Slope= 0.0095 '/'
Inlet Invert= 17.00', Outlet Invert= 15.00'



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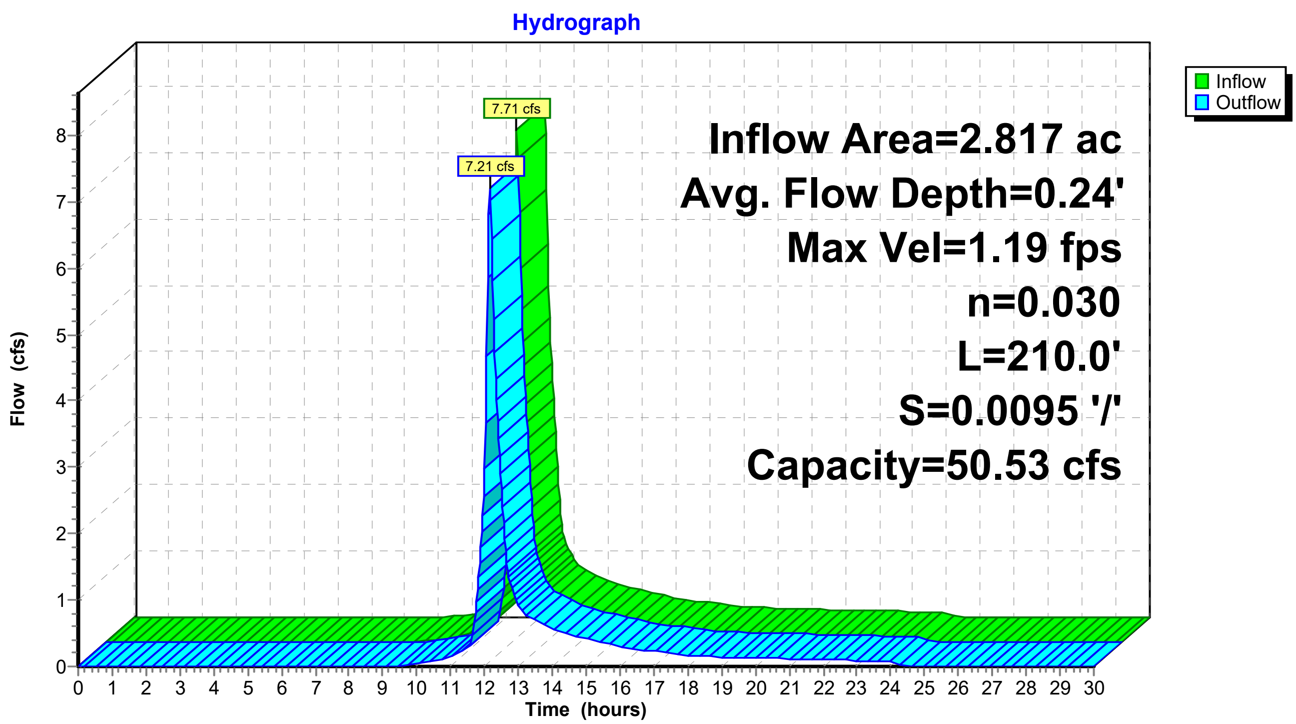
Reach R2: Tt thru da77



Summary for Reach R2A: Travel Time thru wet pond

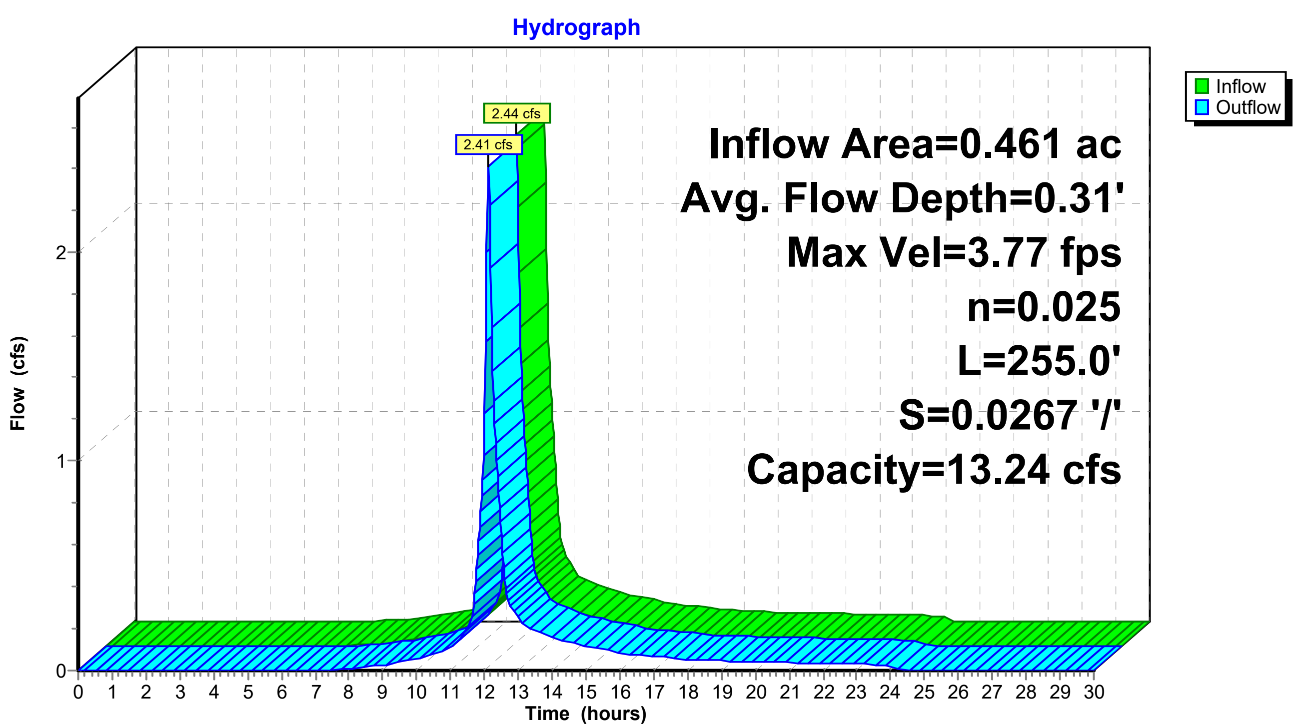
Inflow Area = 0.461 ac, 63.56% Impervious, Inflow Depth = 4.70" for 100-YR MASHPEE ALTAS event
Inflow = 2.44 cfs @ 12.10 hrs, Volume= 0.180 af
Outflow = 2.41 cfs @ 12.11 hrs, Volume= 0.180 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 3.77 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 4.2 min

Peak Storage= 163 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 2.1 sf, Capacity= 13.24 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 0.1 '/' Top Width= 2.20'
Length= 255.0' Slope= 0.0267 '/'
Inlet Invert= 21.00', Outlet Invert= 14.20'

Reach R2A: Travel Time thru wet pond



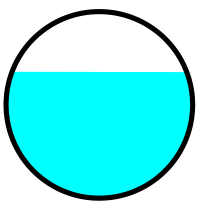
Summary for Reach R3: 18" CPP

Inflow Area = 0.684 ac, 66.67% Impervious, Inflow Depth = 4.97" for 100-YR MASHPEE ALTAS event
Inflow = 4.06 cfs @ 12.07 hrs, Volume= 0.283 af
Outflow = 4.04 cfs @ 12.08 hrs, Volume= 0.283 af, Atten= 0%, Lag= 0.4 min

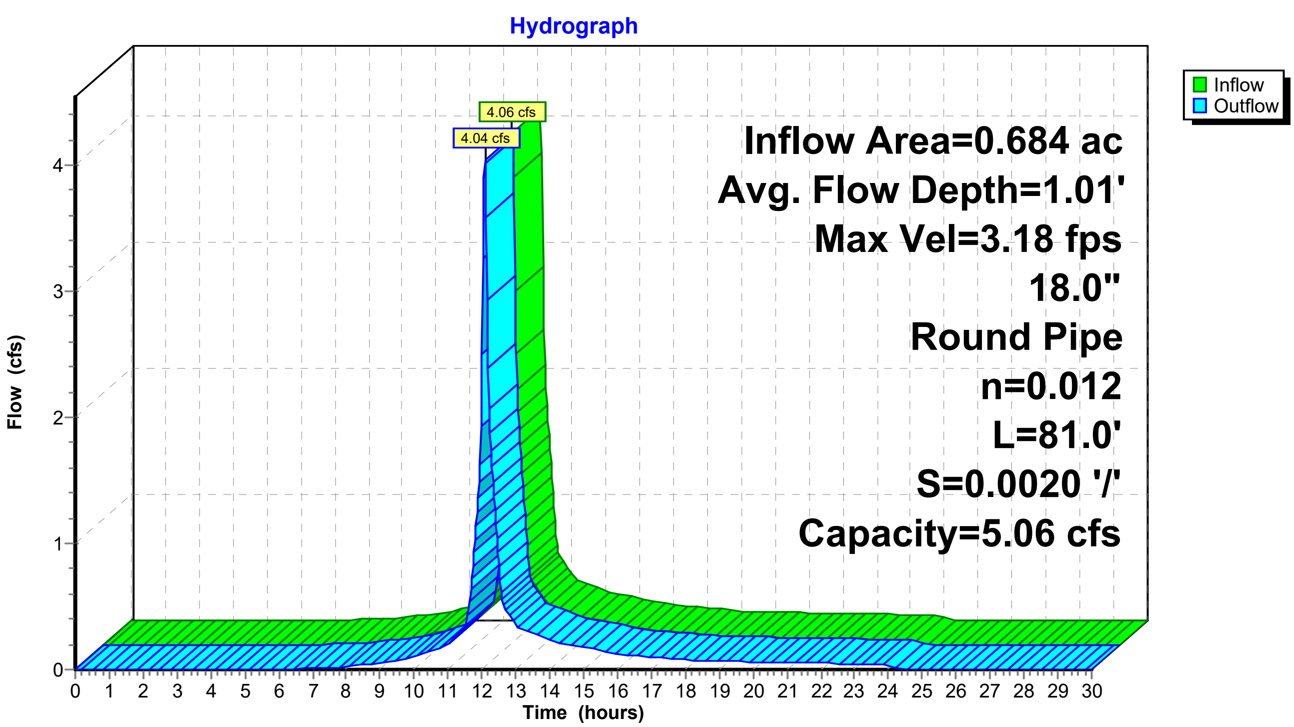
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 3.18 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 1.2 min

Peak Storage= 103 cf @ 12.08 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.06 cfs

18.0" Round Pipe
n= 0.012
Length= 81.0' Slope= 0.0020 '/'
Inlet Invert= 15.06', Outlet Invert= 14.90'



Reach R3: 18" CPP



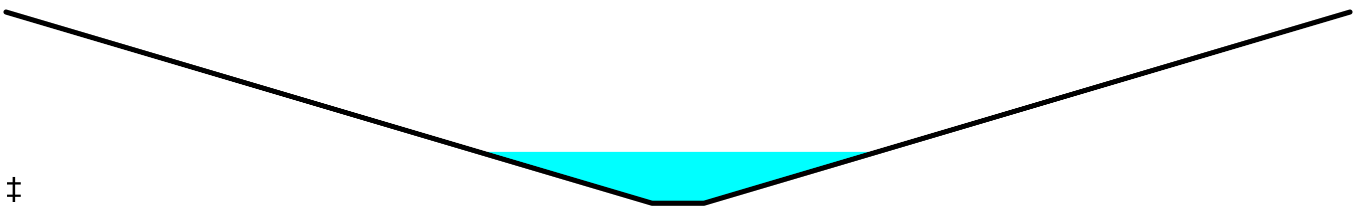
Summary for Reach R5: Tt thru da22B

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 3.04" for 100-YR MASHPEE ALTAS event
Inflow = 2.97 cfs @ 12.08 hrs, Volume= 0.162 af
Outflow = 2.88 cfs @ 12.10 hrs, Volume= 0.162 af, Atten= 3%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Max. Velocity= 2.46 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 4.7 min

Peak Storage= 287 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 13.5 sf, Capacity= 75.75 cfs

2.00' x 0.50' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 50.0 '/' Top Width= 52.00'
Length= 246.0' Slope= 0.0146 '/'
Inlet Invert= 20.58', Outlet Invert= 17.00'



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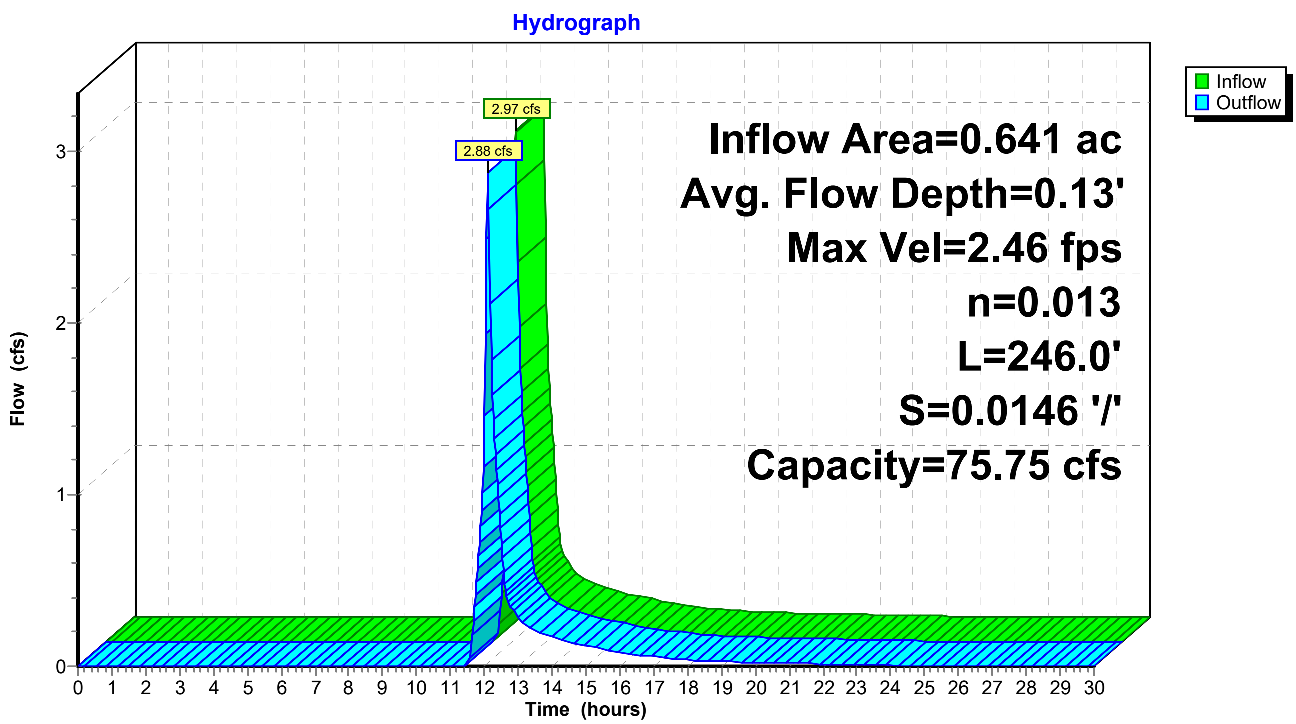
Reach R5: Tt thru da22B

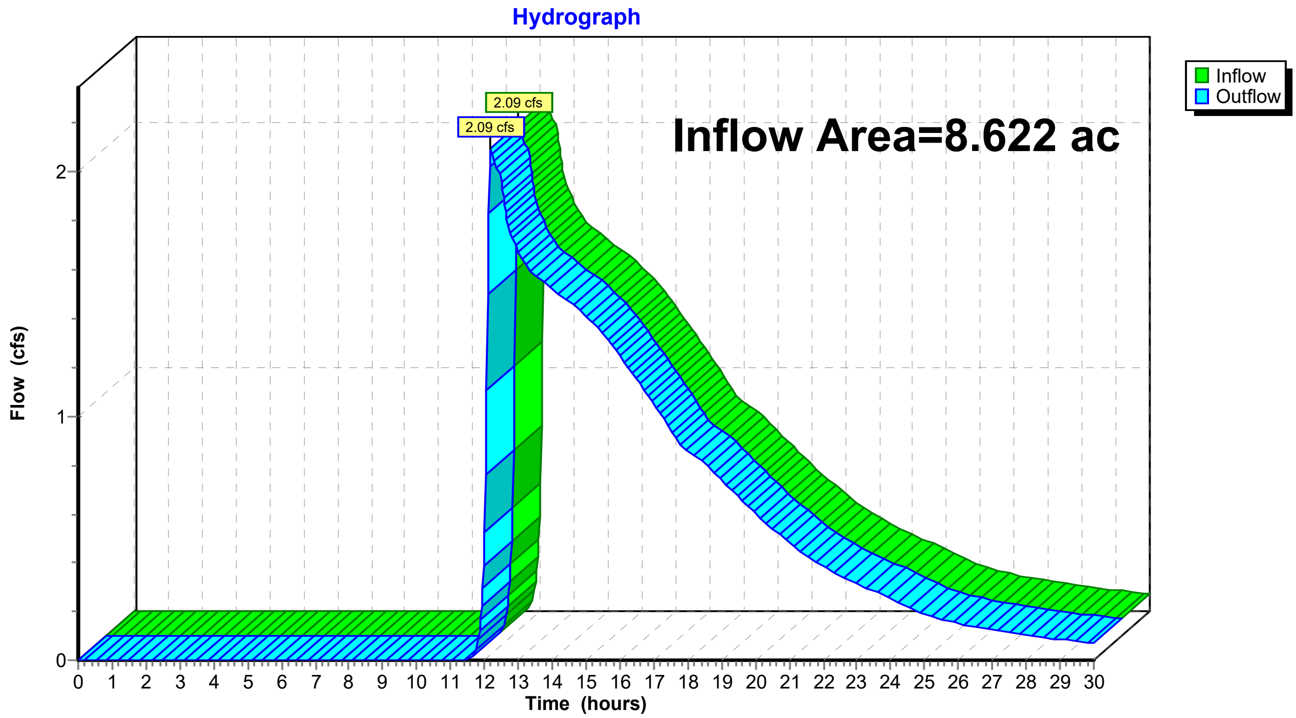


Summary for Reach SP#1: Study Point Combined Flows

Inflow Area = 8.622 ac, 31.29% Impervious, Inflow Depth > 1.41" for 100-YR MASHPEE ALTAS event
Inflow = 2.09 cfs @ 12.19 hrs, Volume= 1.010 af
Outflow = 2.09 cfs @ 12.19 hrs, Volume= 1.010 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3

Reach SP#1: Study Point Combined Flows



Summary for Pond 1P: LB's

Inflow Area = 0.641 ac, 50.86% Impervious, Inflow Depth = 3.92" for 100-YR MASHPEE ALTAS event
Inflow = 3.02 cfs @ 12.08 hrs, Volume= 0.209 af
Outflow = 3.00 cfs @ 12.08 hrs, Volume= 0.209 af, Atten= 1%, Lag= 0.3 min
Discarded = 0.03 cfs @ 9.90 hrs, Volume= 0.047 af
Primary = 2.97 cfs @ 12.08 hrs, Volume= 0.162 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 20.74' @ 12.09 hrs Surf.Area= 888 sf Storage= 508 cf

Plug-Flow detention time= 43.0 min calculated for 0.209 af (100% of inflow)
Center-of-Mass det. time= 43.2 min (872.2 - 829.0)

Volume	Invert	Avail.Storage	Storage Description
#1	13.50'	192 cf	**10.00'D x 4.50'H Vertical Cone/Cylinder** x 2
			707 cf Overall - 226 cf Embedded = 481 cf x 40.0% Voids
#2	14.00'	226 cf	**6.00'D x 4.00'H Vertical Cone/Cylinder** x 2 Inside #1
#3	20.50'	376 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		794 cf	Total Available Storage

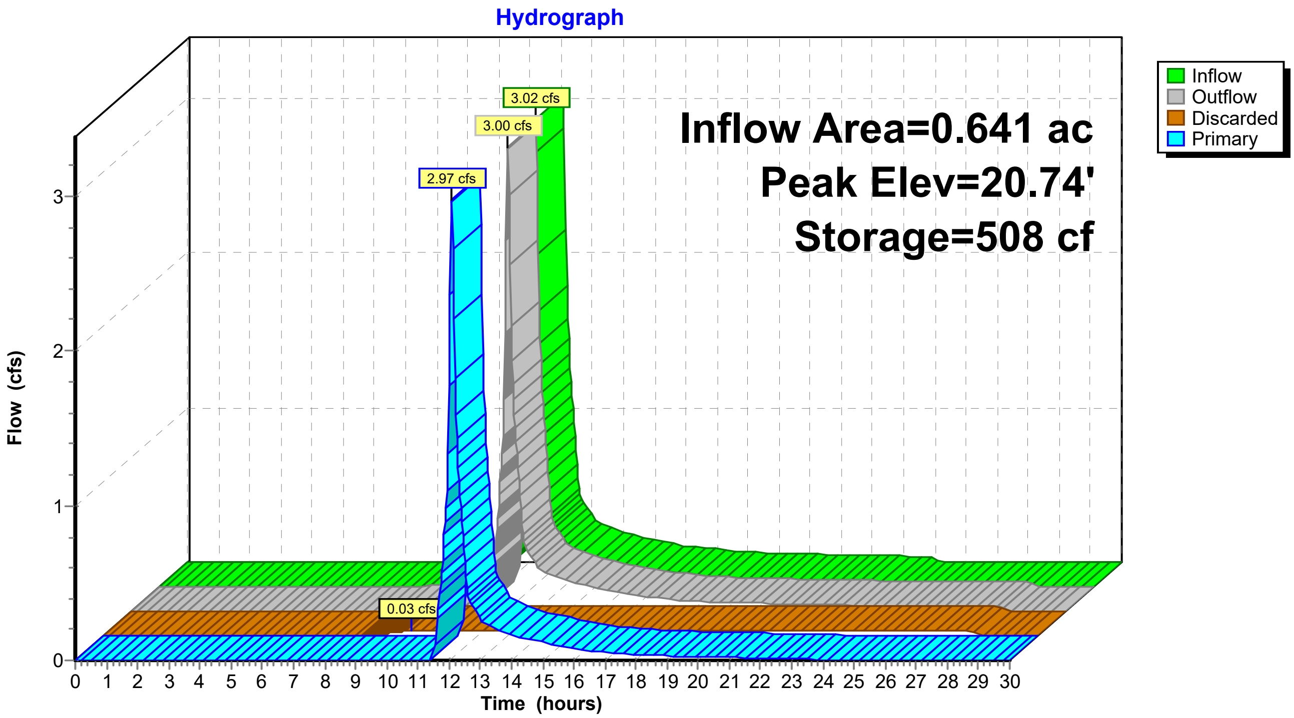
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	4	0	0
21.00	1,500	376	376

Device	Routing	Invert	Outlet Devices
#1	Discarded	13.50'	**8.270 in/hr Exfiltration over Surface area from 13.49' - 18.00'**
			Excluded Surface area = 0 sf
#2	Primary	20.58'	**179.0 deg x 6.0' long Sharp-Crested Vee/Trap Weir**
			Cv= 2.46 (C= 3.08)

Discarded OutFlow Max=0.03 cfs @ 9.90 hrs HW=13.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.94 cfs @ 12.08 hrs HW=20.74' TW=20.71' (Dynamic Tailwater)
└─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.94 cfs @ 0.74 fps)

Pond 1P: LB's


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=0.641 ac
Peak Elev=20.74'
Storage=508 cf
3.02 cfs
3.00 cfs
2.97 cfs
0.03 cfs
Flow (cfs)
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 2P: Natural Low Area

Inflow Area =	0.841 ac,	0.00% Impervious, Inflow Depth = 0.43"	for 100-YR MASHPEE ALTAS event	
Inflow =	0.11 cfs @	12.38 hrs, Volume=	0.030 af	
Outflow =	0.04 cfs @	15.61 hrs, Volume=	0.030 af,	Atten= 68%, Lag= 193.5 min
Discarded =	0.04 cfs @	15.61 hrs, Volume=	0.030 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.90' @ 15.61 hrs Surf.Area= 661 sf Storage= 293 cf

Plug-Flow detention time= 105.3 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 105.3 min (1,084.6 - 979.3)

Volume	Invert	Avail.Storage	Storage Description
#1	16.01'	4,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

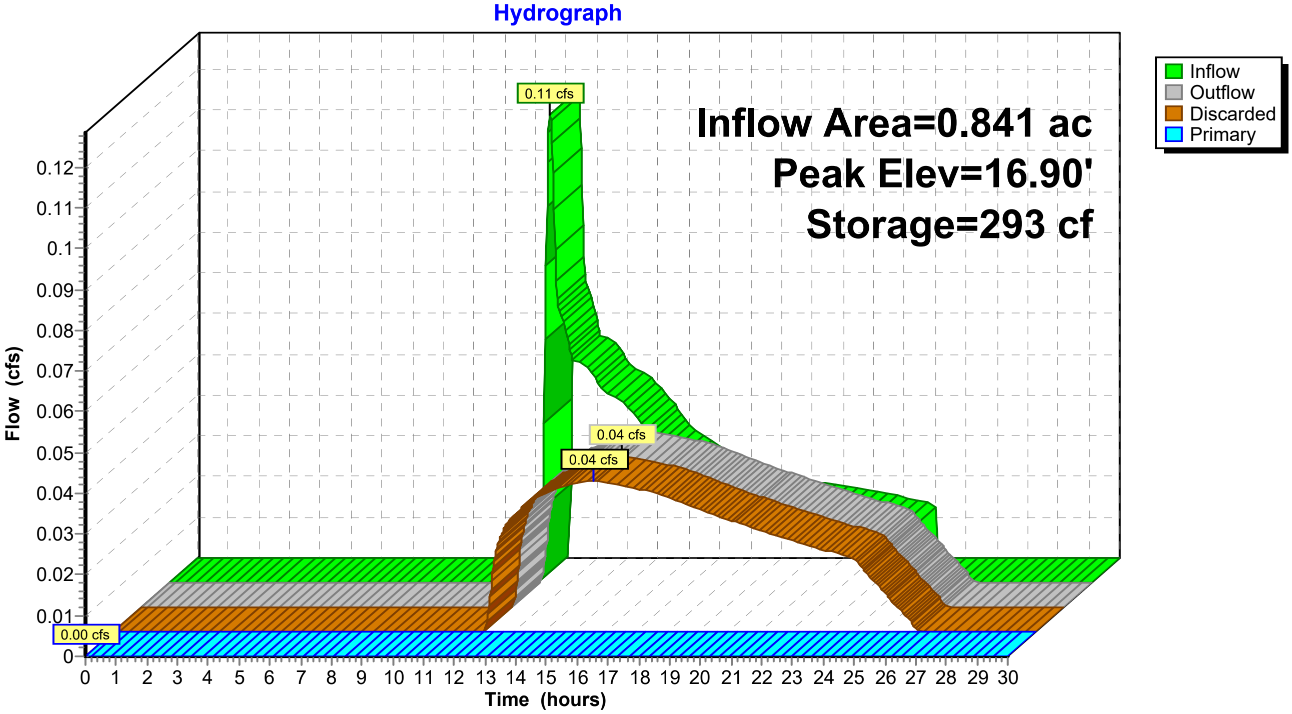
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.01	1	0	0
17.00	739	366	366
18.00	7,467	4,103	4,469

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.01'	**2.410 in/hr Exfiltration over Surface area from 15.90' - 17.70'** Excluded Surface area = 0 sf
#2	Primary	17.58'	**50.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.04 cfs @ 15.61 hrs HW=16.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.01' TW=17.00' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Natural Low Area



Summary for Pond 3A-P: Pond 3A

Inflow Area = 0.109 ac, 21.10% Impervious, Inflow Depth = 3.49" for 100-YR MASHPEE ALTAS event
Inflow = 0.45 cfs @ 12.08 hrs, Volume= 0.032 af
Outflow = 0.45 cfs @ 12.09 hrs, Volume= 0.032 af, Atten= 1%, Lag= 1.0 min
Discarded = 0.01 cfs @ 12.09 hrs, Volume= 0.016 af
Primary = 0.43 cfs @ 12.09 hrs, Volume= 0.016 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.56' @ 12.09 hrs Surf.Area= 611 sf Storage= 218 cf

Plug-Flow detention time= 92.4 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 92.5 min (930.1 - 837.6)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	520 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

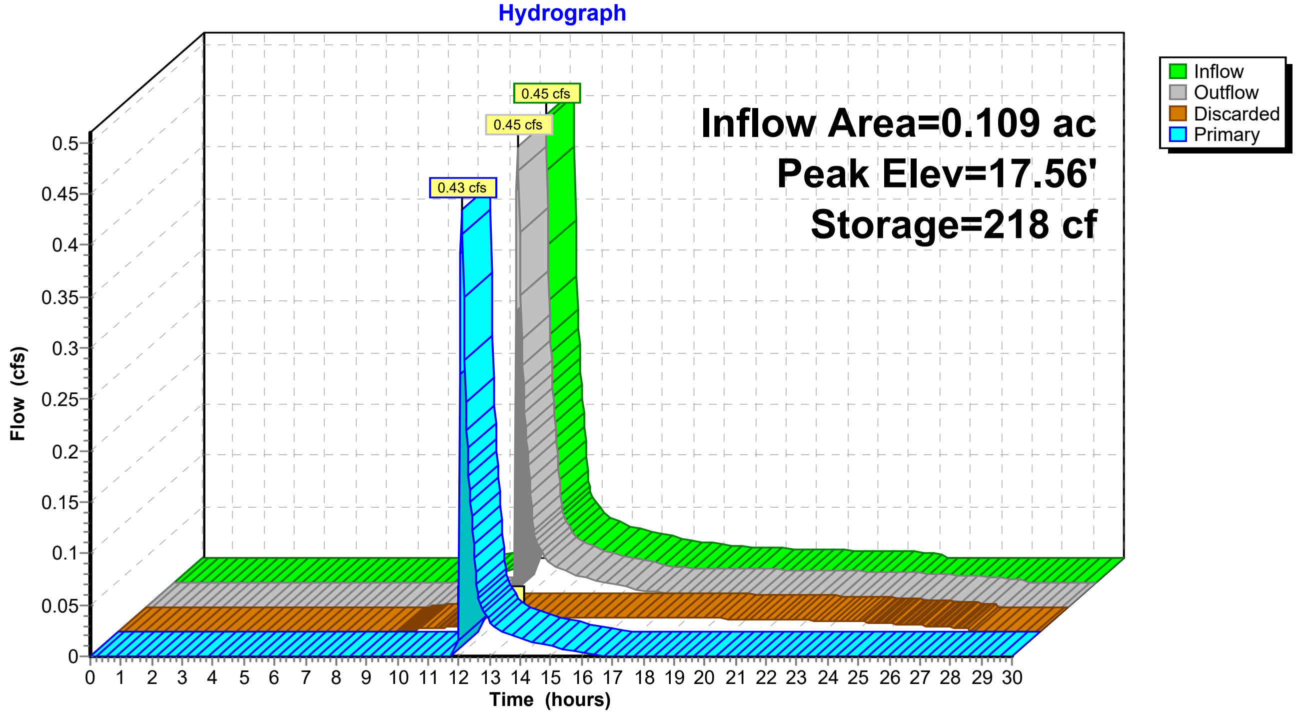
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	144	0	0
17.50	594	185	185
18.00	749	336	520

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	17.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=17.56' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.43 cfs @ 12.09 hrs HW=17.56' TW=14.94' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 0.78 fps)

Pond 3A-P: Pond 3A



Summary for Pond 3P: Wet Pond

Inflow Area = 7.256 ac, 33.70% Impervious, Inflow Depth = 1.55" for 100-YR MASHPEE ALTAS event
Inflow = 18.30 cfs @ 12.14 hrs, Volume= 0.934 af
Outflow = 1.29 cfs @ 13.68 hrs, Volume= 0.829 af, Atten= 93%, Lag= 92.4 min
Primary = 1.29 cfs @ 13.68 hrs, Volume= 0.829 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 15.48' @ 13.68 hrs Surf.Area= 23,032 sf Storage= 25,458 cf

Plug-Flow detention time= 280.0 min calculated for 0.829 af (89% of inflow)
Center-of-Mass det. time= 251.6 min (1,037.0 - 785.3)

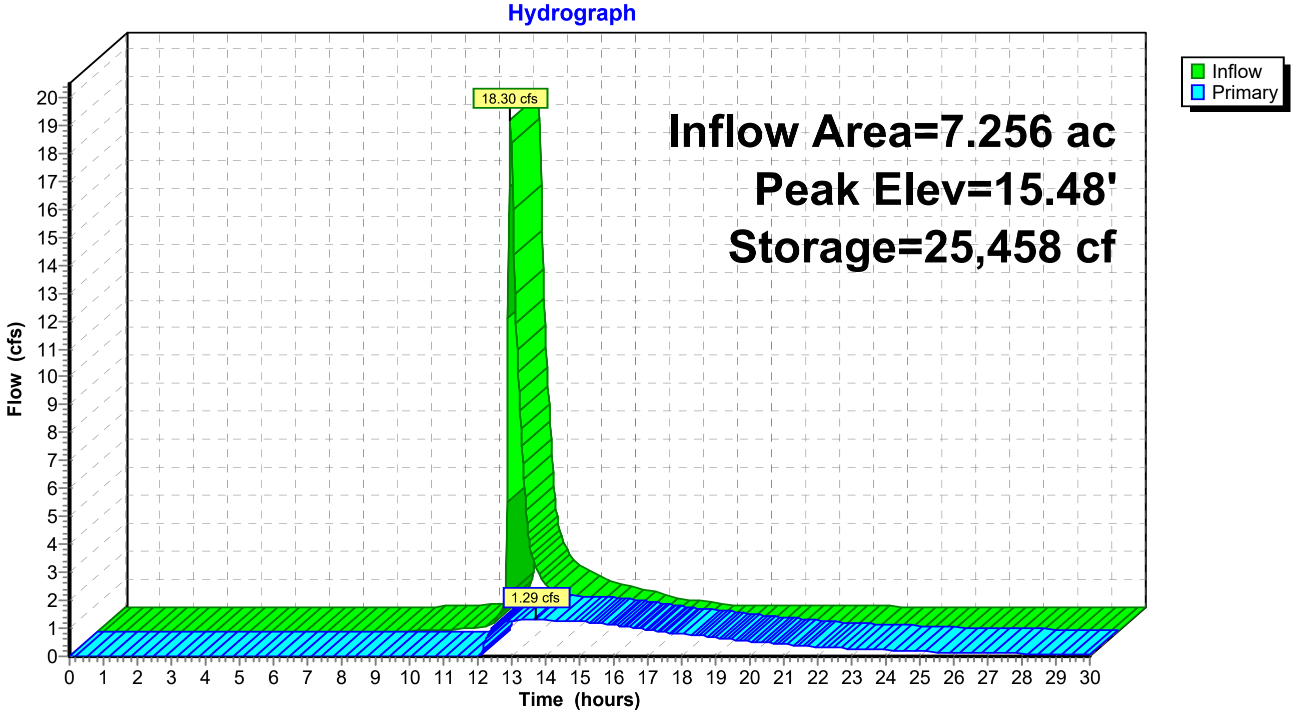
Volume	Invert	Avail.Storage	Storage Description
#1	13.97'	38,017 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.97	1	0	0
14.00	56	1	1
14.20	13,319	1,337	1,338
15.00	20,594	13,565	14,904
16.00	25,633	23,114	38,017

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**8.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.20' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Primary	15.75'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.29 cfs @ 13.68 hrs HW=15.48' TW=14.48' (Dynamic Tailwater)
├─**1=Culvert** (Inlet Controls 1.29 cfs @ 3.71 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Wet Pond



Summary for Pond 4P: Pond 4

Inflow Area = 0.132 ac, 50.76% Impervious, Inflow Depth = 5.15" for 100-YR MASHPEE ALTAS event
Inflow = 0.81 cfs @ 12.07 hrs, Volume= 0.057 af
Outflow = 0.81 cfs @ 12.08 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 0.017 af
Primary = 0.80 cfs @ 12.08 hrs, Volume= 0.039 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.03' @ 12.08 hrs Surf.Area= 469 sf Storage= 245 cf

Plug-Flow detention time= 88.8 min calculated for 0.055 af (98% of inflow)
Center-of-Mass det. time= 75.9 min (880.3 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	253 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

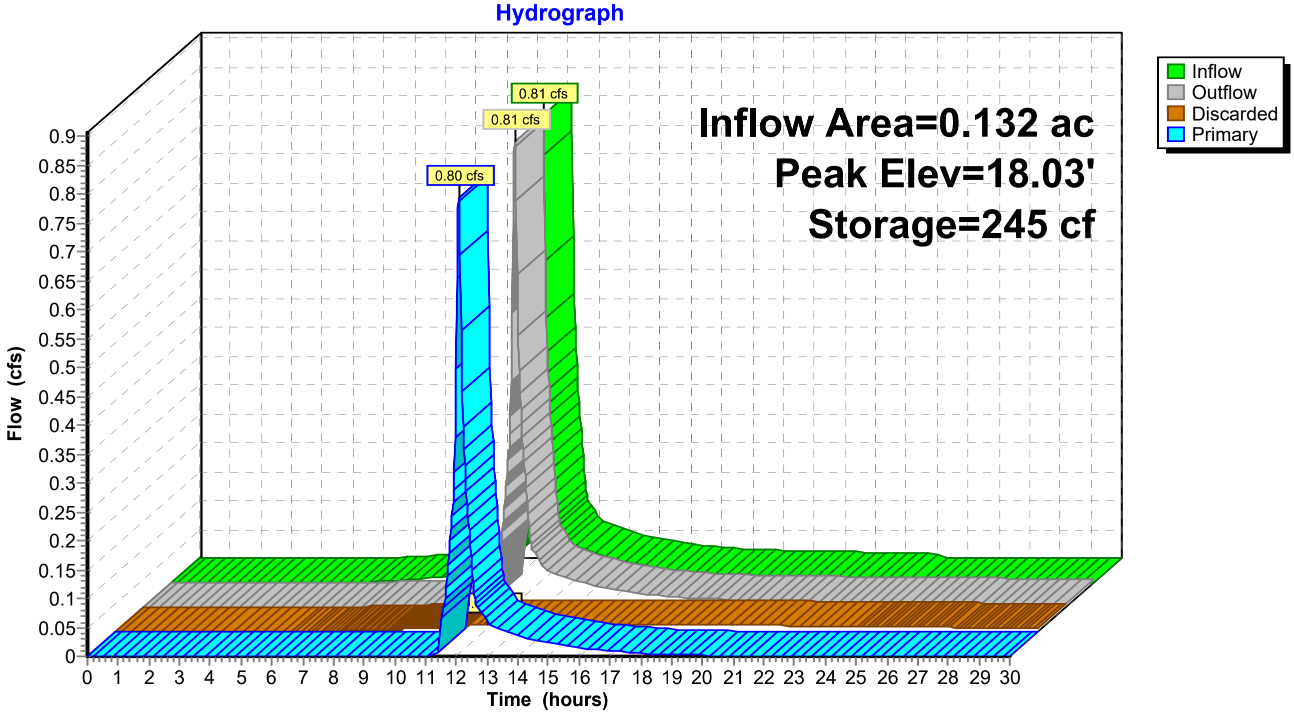
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	10	0	0
18.00	450	230	230
18.05	478	23	253

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**1.020 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=18.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.78 cfs @ 12.08 hrs HW=18.03' TW=14.92' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.78 cfs @ 0.60 fps)

Pond 4P: Pond 4



Summary for Pond 5P: Pond 5

Inflow Area = 0.124 ac, 58.87% Impervious, Inflow Depth = 4.47" for 100-YR MASHPEE ALTAS event
Inflow = 0.67 cfs @ 12.07 hrs, Volume= 0.046 af
Outflow = 0.67 cfs @ 12.08 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.2 min
Discarded = 0.02 cfs @ 12.08 hrs, Volume= 0.020 af
Primary = 0.65 cfs @ 12.08 hrs, Volume= 0.026 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 19.03' @ 12.08 hrs Surf.Area= 331 sf Storage= 236 cf

Plug-Flow detention time= 89.8 min calculated for 0.046 af (100% of inflow)
Center-of-Mass det. time= 87.2 min (905.3 - 818.1)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	244 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

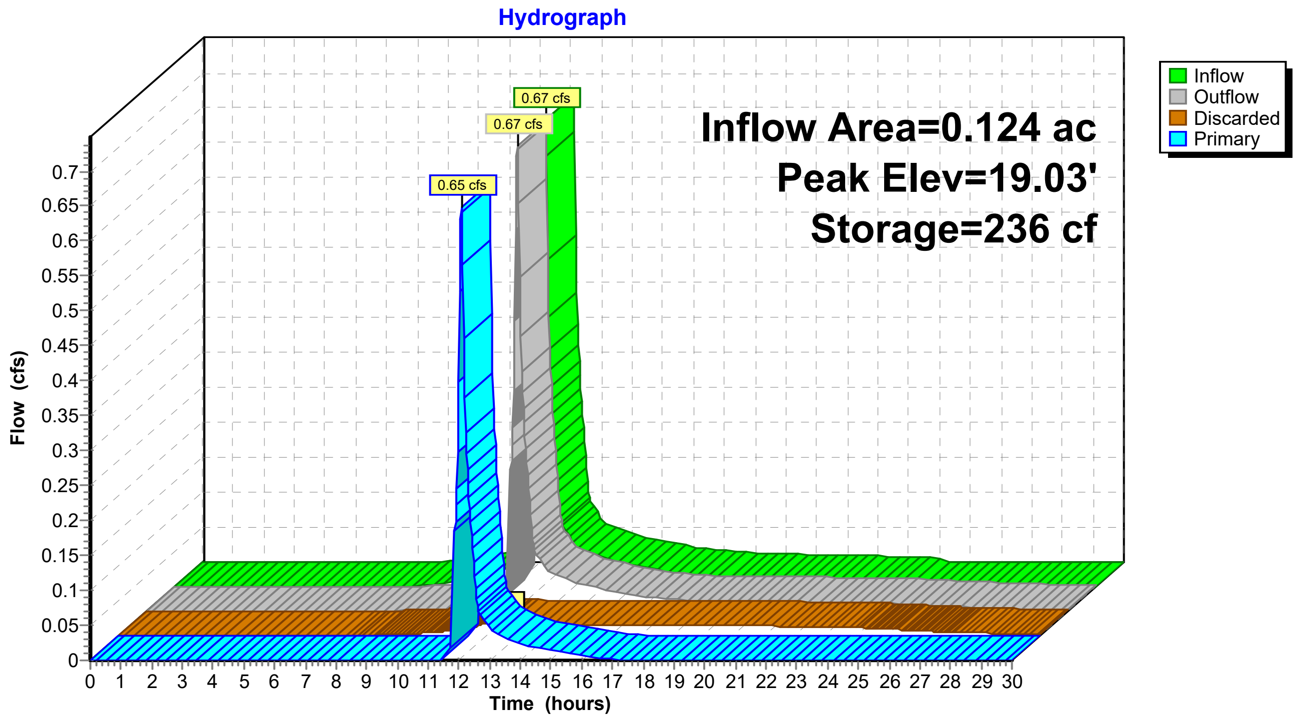
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	1	0	0
18.00	86	44	44
19.00	282	184	228
19.05	366	16	244

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.08 hrs HW=19.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.64 cfs @ 12.08 hrs HW=19.03' TW=14.92' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.64 cfs @ 0.56 fps)

Pond 5P: Pond 5



Summary for Pond 6P: Pond 6

Inflow Area =	0.088 ac,	17.05% Impervious, Inflow Depth = 1.57"	for 100-YR MASHPEE ALTAS event	
Inflow =	0.14 cfs @	12.09 hrs, Volume=	0.011 af	
Outflow =	0.02 cfs @	13.24 hrs, Volume=	0.011 af,	Atten= 87%, Lag= 68.6 min
Discarded =	0.02 cfs @	13.24 hrs, Volume=	0.011 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 19.00' @ 13.24 hrs Surf.Area= 326 sf Storage= 163 cf

Plug-Flow detention time= 110.0 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 110.0 min (997.7 - 887.7)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

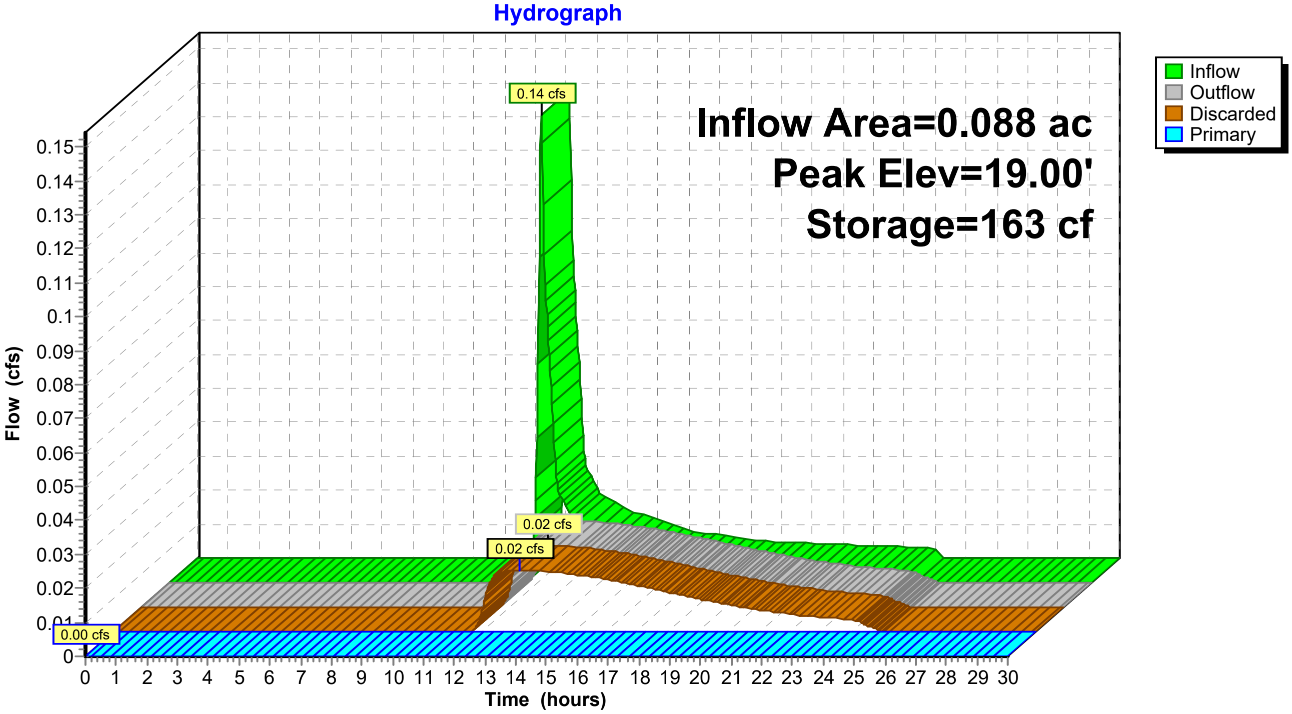
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	1	0	0
19.00	326	164	164
19.05	394	18	182

Device	Routing	Invert	Outlet Devices
#1	Discarded	18.00'	**2.410 in/hr Exfiltration over Surface area from 17.90' - 19.05'** Excluded Surface area = 0 sf
#2	Primary	19.00'	**40.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 13.24 hrs HW=19.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 6



Summary for Pond 7P: Pond 7

Inflow Area = 0.033 ac, 63.64% Impervious, Inflow Depth = 4.81" for 100-YR MASHPEE ALTAS event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.013 af
Outflow = 0.19 cfs @ 12.07 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.008 af
Primary = 0.18 cfs @ 12.07 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 18.02' @ 12.07 hrs Surf.Area= 146 sf Storage= 83 cf

Plug-Flow detention time= 75.6 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 75.6 min (887.0 - 811.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	87 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

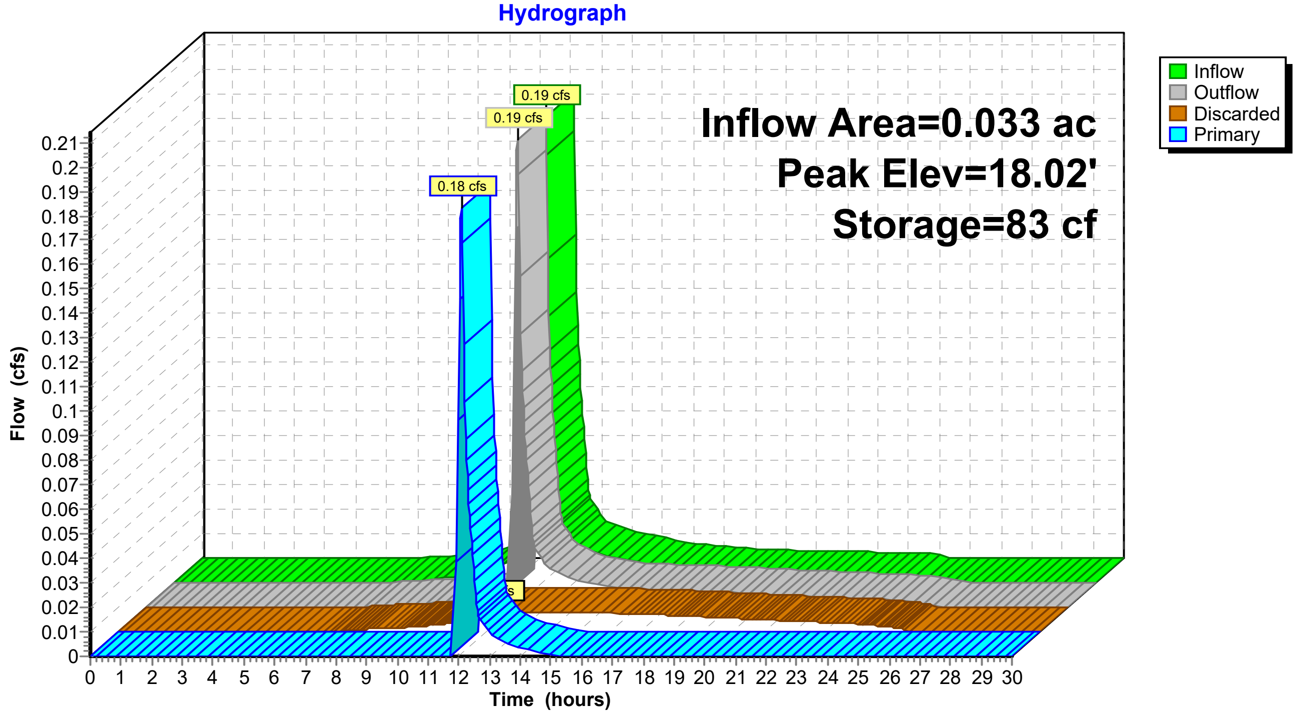
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	23	0	0
18.00	137	80	80
18.05	159	7	87

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.05'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=18.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.18 cfs @ 12.07 hrs HW=18.02' TW=14.92' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.18 cfs @ 0.46 fps)

Pond 7P: Pond 7



Summary for Pond 8P: Pond 8

Inflow Area = 0.087 ac, 35.63% Impervious, Inflow Depth = 2.96" for 100-YR MASHPEE ALTAS event
Inflow = 0.30 cfs @ 12.08 hrs, Volume= 0.021 af
Outflow = 0.03 cfs @ 12.95 hrs, Volume= 0.021 af, Atten= 89%, Lag= 52.0 min
Discarded = 0.03 cfs @ 12.95 hrs, Volume= 0.021 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 17.63' @ 12.95 hrs Surf.Area= 624 sf Storage= 331 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 88.4 min (937.2 - 848.8)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	622 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

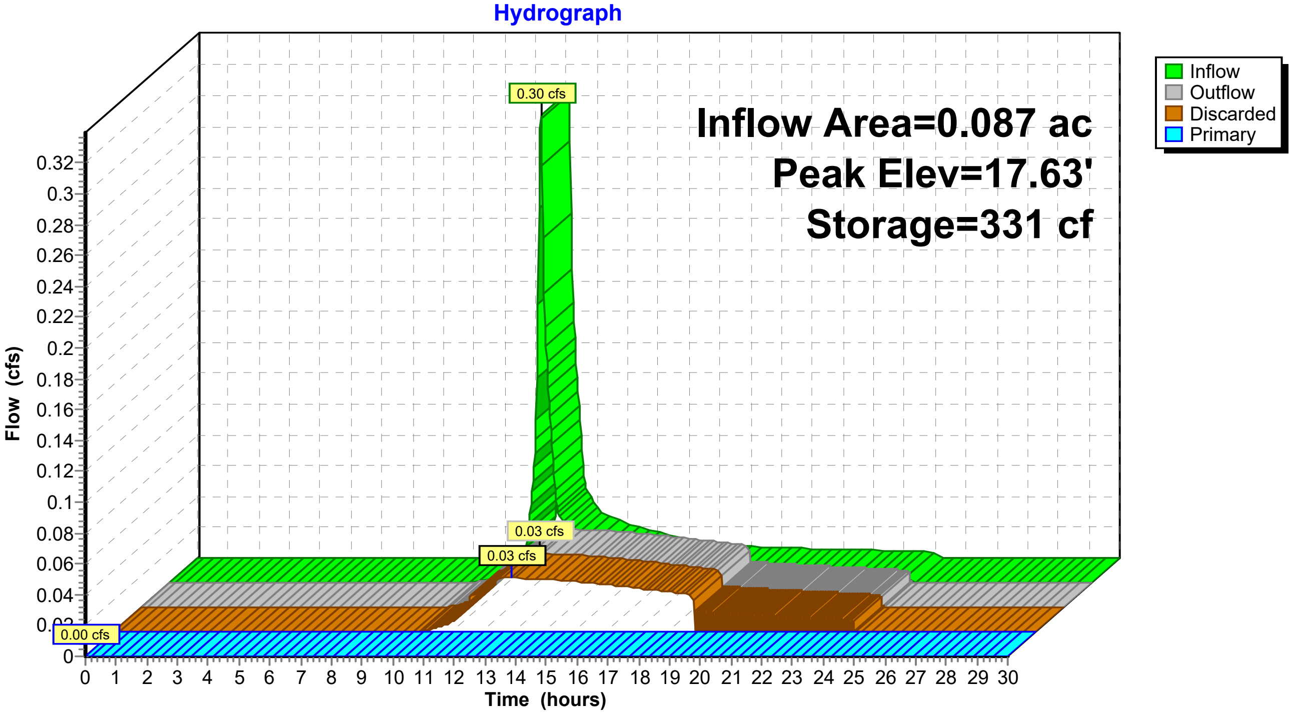
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
17.00	426	0	0
18.00	741	584	584
18.05	791	38	622

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**2.410 in/hr Exfiltration over Surface area from 16.90' - 18.00'** Excluded Surface area = 0 sf
#2	Primary	18.00'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.03 cfs @ 12.95 hrs HW=17.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' TW=14.60' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Pond 8



Summary for Pond FB1: Forebay 1

Inflow Area =	1.040 ac, 55.00% Impervious,	Inflow Depth = 4.21"	for 100-YR MASHPEE ALTAS event	
Inflow =	5.18 cfs @	12.08 hrs, Volume=	0.365 af	
Outflow =	4.98 cfs @	12.10 hrs, Volume=	0.360 af,	Atten= 4%, Lag= 1.4 min
Discarded =	0.09 cfs @	11.91 hrs, Volume=	0.146 af	
Primary =	4.89 cfs @	12.10 hrs, Volume=	0.214 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.77' @ 12.10 hrs Surf.Area= 2,316 sf Storage= 2,579 cf

Plug-Flow detention time= 115.6 min calculated for 0.359 af (98% of inflow)
Center-of-Mass det. time= 107.3 min (925.6 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	14.90'	3,175 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

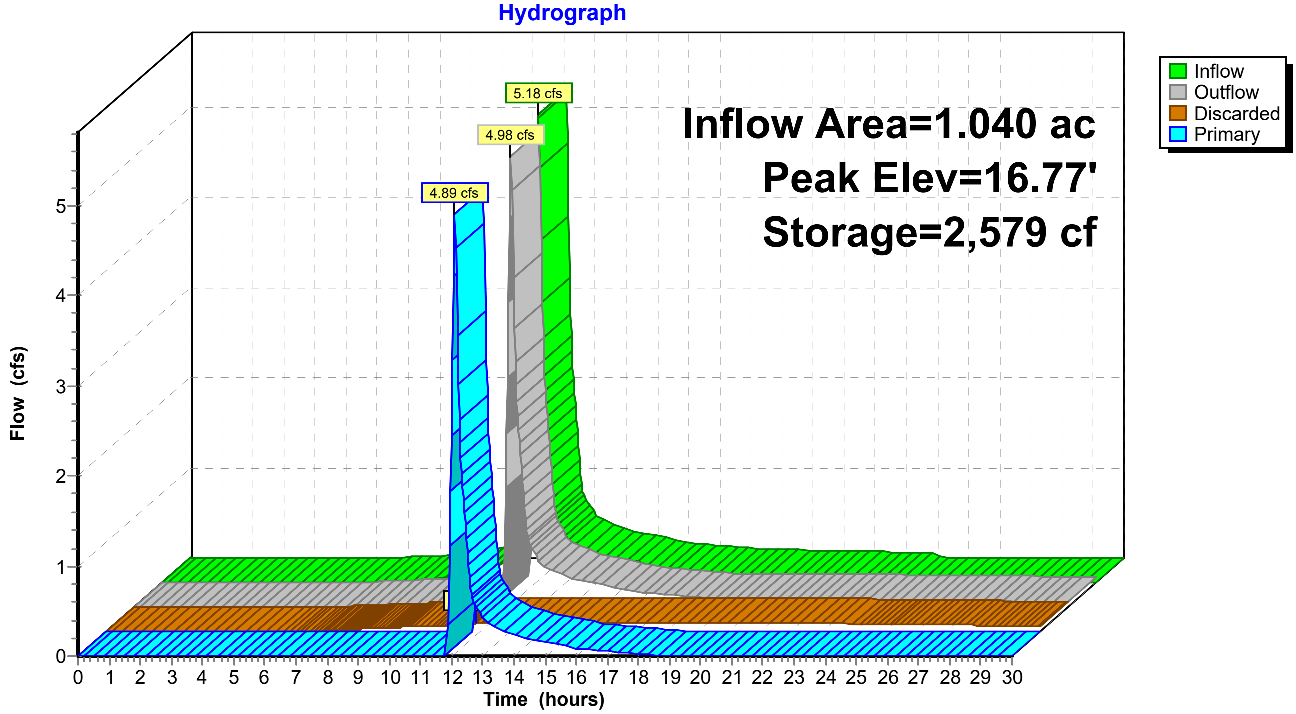
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.90	661	0	0
15.00	996	83	83
16.00	1,406	1,201	1,284
16.50	1,633	760	2,044
17.00	2,893	1,132	3,175

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.90'	**2.410 in/hr Exfiltration over Surface area from 14.80' - 16.50'** Excluded Surface area = 0 sf
#2	Primary	16.50'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.09 cfs @ 11.91 hrs HW=16.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=4.81 cfs @ 12.10 hrs HW=16.77' TW=16.27' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.81 cfs @ 1.80 fps)

Pond FB1: Forebay 1



Summary for Pond FB3: Forebay 3

Inflow Area = 6.795 ac, 31.67% Impervious, Inflow Depth = 2.20" for 100-YR MASHPEE ALTAS event
Inflow = 16.96 cfs @ 12.11 hrs, Volume= 1.248 af
Outflow = 16.40 cfs @ 12.14 hrs, Volume= 1.248 af, Atten= 3%, Lag= 1.7 min
Discarded = 0.40 cfs @ 12.14 hrs, Volume= 0.494 af
Primary = 16.00 cfs @ 12.14 hrs, Volume= 0.754 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 16.29' @ 12.14 hrs Surf.Area= 7,127 sf Storage= 7,519 cf

Plug-Flow detention time= 76.2 min calculated for 1.247 af (100% of inflow)
Center-of-Mass det. time= 76.3 min (903.7 - 827.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	10,961 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

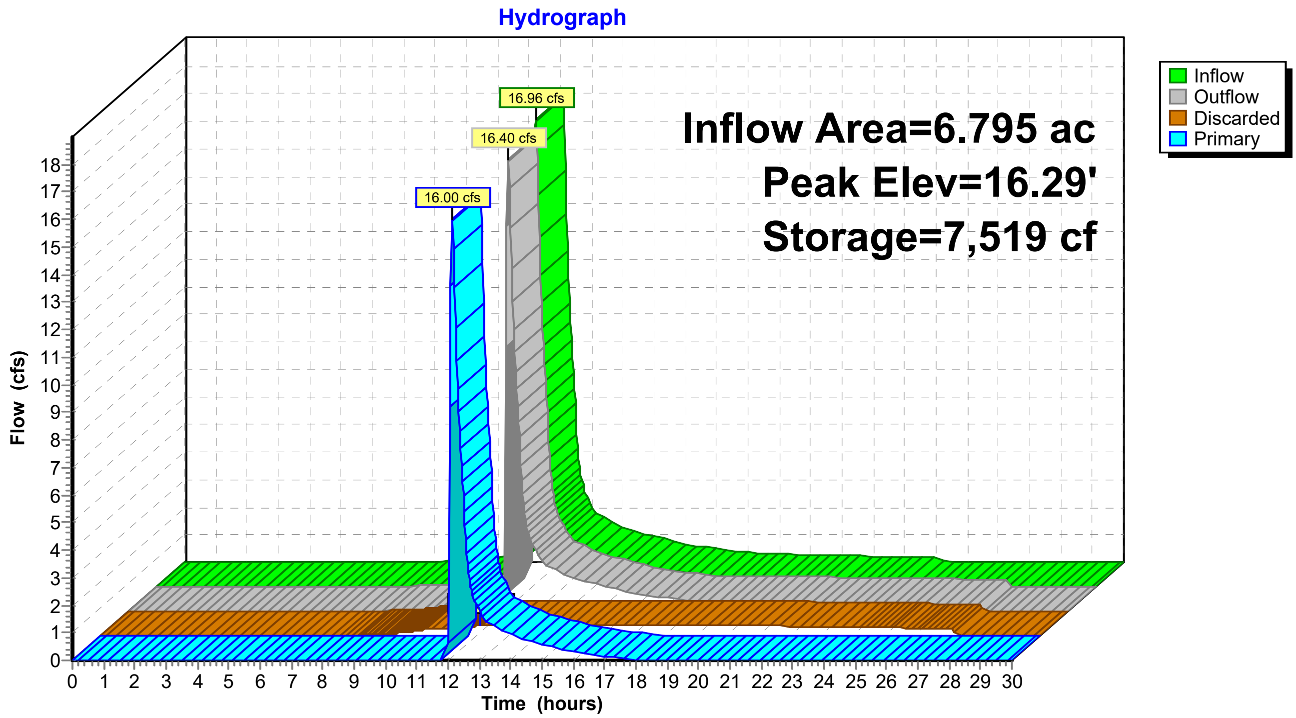
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.00	4,358	0	0
16.00	6,677	5,518	5,518
16.75	7,840	5,444	10,961

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.00'	**2.410 in/hr Exfiltration over Surface area from 14.90' - 16.75'** Excluded Surface area = 0 sf
#2	Primary	16.00'	**10.0' long Sharp-Crested Rectangular Weir X 3.00** 2 End Contraction(s) 0.7' Crest Height

Discarded OutFlow Max=0.40 cfs @ 12.14 hrs HW=16.29' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=15.87 cfs @ 12.14 hrs HW=16.29' TW=14.61' (Dynamic Tailwater)
└─**2=Sharp-Crested Rectangular Weir** (Weir Controls 15.87 cfs @ 1.84 fps)

Pond FB3: Forebay 3



APPENDIX E

GROUNDWATER RECHARGE & WATER QUALITY

- GROUNDWATER RECHARGE VOLUME CALCULATIONS
- WATER QUALITY TREATMENT VOLUME CALCULATIONS
- TSS REMOVAL CALCULATION WORKSHEET

GROUNDWATER RECHARGE VOLUME CALCULATIONS

(MADEP Standard 3)

Most site soils within area of proposed impervious cover are HSG B. Therefore, the volume to recharge is 0.35 inches x impervious areas.

The northwestern quarter of the site soils within area of proposed impervious cover are HSG D. Therefore, the volume to recharge is 0.10 inches x impervious areas.

Note: The proposed building roof areas are considered clean under MDEP SWM Policy and are not included in the recharge calculations

For A soils areas in subcatchments 5, 6, 7, 8, and 9, the impervious area is 35,241 sf total.

Recharge Volume = 0.60” x total impervious area

= 0.60” x 35,241 sf x 1/12 ft/in.

= 1,762 cf

For B soils areas in subcatchments 1A, 1B, 1C, and 4, the impervious area is 14,560 sf total.

Recharge Volume = 0.35” x total impervious area

= 0.35” x 14,560 sf x 1/12 ft/in.

= 425 cf

Total required Recharge Volume = 2,027 cf

The BMPs used for recharge and quantity control for post-development site runoff are Forebays 1 and 3, as well as SWM basins 3 through 8.

For A soils, using Basins 5, 6, 7, and 8 and Forebay 3, the total area for recharge is 8147 sf.

Using Rawls Rate of 2.41 in/hour for A soils, the recharge volume is:

8147 sf x 2.41 in/hour x 12 hours = 19634 cf.

For B soils, using Basins 3A and 4, and Forebay 1, the total area for recharge = 2,303 sf

Using Rawls Rate of 1.02 in/hour for B soils, the recharge volume is:

2303 sf x 1.02 in/hour x 12 hours = 207 cf

Therefore, total Volume of Recharge which is provided:

= 21661 cf > 2,187 cf/ Design Reqmts met

The Volume of Recharge well exceeds the required amount of recharge.

WATER QUALITY TREATMENT VOLUME CALCULATIONS

(MADEP Standard 4-6)

The site is in an area defined as a Critical Area. Therefore, the Water Quality Treatment must address the first one (1) inch of runoff over the total impervious area. The following table identifies the impervious areas in each Drainage Area, the required Water Quality Volume (WQV), and the proposed WQV. The proposed building roof areas are considered clean under MDEP SWM Policy and are not included in the WQV calculations.

The combined BMP treatments are designed in accordance with the MDEP sizing requirements and provide the Water Quality Volume requirements.

WATER QUALITY VOLUME CALCULATIONS
CRANBERRY POINT, 275 QUINAQUISSET AVE, MASHPEE MA
1/16/2023
BAXTER NYE ENGINEERING

VOLUME CALCULATIONS PREPARED IN ACCORDANCE WITH THE
MASSACHUSETTS DEP STORMWATER MANAGEMENT POLICY

WATER QUALITY VOLUME (WQV) TO BE TREATED:
USING 1.0" OVER IMPERVIOUS AREA RULE:
1.O INCHES OF RUNOFF x TOTAL IMPERVIOUS AREA OF POST-DEVELOPED
SITE FOR DISCHARGE TO CRITICAL AREAS (NOT INCLUDING NON-METAL ROOF AREAS)

WATER QUALITY VOLUME (WQV) TO BE TREATED:

SUBAREA	AREA (SF)	1" WQV (FT)	WQV VOL REQD (CF)	WQV VOL PROVIDED (CF)	AT ELEVATION
DA-1A, B, C	11,825	0.083	985	2,044	16.5 (FOREBAY 1)
DA-3	993	0.083	83	185	17.5 (POND 3A)
DA-4	1,742	0.083	145	230	18 (POND 4)
DA-5	2,380	0.083	198	228	19 (POND 5)
DA-6	819	0.083	68	164	19 (POND 6)
DA-7	753	0.083	63	80	18 (POND 7)
DA-8	1,281	0.083	107	584	18 (POND 8)
DA-9, 22B	48,086	0.083	4007	5,518	16 (FOREBAY 3) *

* Forebay 3 is sized to treat additional offsite runoff from a portion of Quinaquisset Ave (DA22B).
This additional volume treats an additional 3/4" of runoff from Quinaquisset Ave.

DA-22B	25,221	0.060		1,511	

TSS REMOVAL CALCULATION WORKSHEET

Cranberry Point at Willowbend
275 Quinaquisset Avenue, Mashpee MA
Project # 2014-009 Quin
1/16/2023

TSS REMOVAL CALCULATION WORKSHEET

A BMP	B TSS Removal Rate	C Starting TSS Load *	D Amount Removed (BxC)	E Remaining Load (C-D)
Deep Sump Catch Basins	25%	1.00	0.25	0.75
Sediment Forebay	25%	0.75	0.19	0.56
				(44% pre-treatment TSS)
Wet Basin	80%	0.56	0.45	0.11
		Total TSS Removed =	**0.89**	89%

*Equals remaining load from previous BMP (E)

APPENDIX F

REFERENCES:

1) MASSACHUSETTS HIGHWAY DRAINAGE MANUAL – DOT
2) MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION – Stormwater Management (MDEP SWM) Volumes One and Two
3) SCS TR55 – URBAN HYDROLOGY FOR SMALL WATERSHEDS – 2nd Edition, June 1986
4) "CONTROLLING URBAN RUNOFF"; By Department of Environmental Programs – Metropolitan Washington Council of Governments (MWCOG); 1987
5) STANDARD HANDBOOK FOR CIVIL ENGINEERS - Merritt; Third Edition
6) SOIL SURVEY OF BARNSTABLE COUNTY, MASSACHUSETTS

SOURCES OF FIELD DATA:

1) Survey of existing conditions from a plan prepared by Baxter Nye Engineering & Surveying.

APPENDIX G

EQUATIONS:

1. RATIONAL METHOD: $Q = c(i \bullet i_f)A$

   Q is quantity of flow (cfs)
   c is the runoff coefficient
   i is the rainfall intensity (in/hr)
   i_f is the rainfall intensity factor
   for: $0 < tc < 10$ min, $i_f = 1.02$
   for: $10 < tc < 40$ min, $i_f = 1.06$
   for: $40 < tc < 150$ min, $i_f = 0.99$
   A is the drainage area (acres)

2. MANNINGS EQUATION: $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

   Q is quantity of flow (cfs)
   R is the hydraulic radius (ft)
   S is the slope (ft/ft)
   A is the cross sectional area (sq. ft.)

3. CONTINUITY EQUATION: $Q = VA$

   Q is quantity of flow (cfs)
   V is the velocity (fps)
   A is the cross sectional area (sq. ft.)

4. CULVERT INLET CONTROL: $HW = d_n + \left(\frac{(1 + k_e)(V_u^2)}{2g}\right)$

5. CULVERT OUTLET CONTROL: $HW = H + h_0 - LS_0$

   $H = S_f L + \left(\frac{(1 + k_e)(V_f^2)}{2g}\right)$

   $h_0 = TW$ or $\frac{(D + d_c)}{2}$ (whichever is greater)

6. HYDRAULIC GRADE LINE:

Structure loss coefficients:

	0d	45d	90d
Inlet	.50	1.10	1.50
Manhole	.15	.75	1.00

7. INLET CAPACITY: Weir Eq.: $H = \left[\frac{Q}{3P}\right]^{2/3}$

Q is quantity of flow (cfs)

P is the perimeter (ft)

- use only the perimeter of the grate subject to flow
- if inlet is a sump and there is no curb opening then reduce the available perimeter by 25% for clogging

H is the discharge head (ft)

H is taken at a distance from the curb of ½ of inlet width

GENERAL NOTES:

1. VERIFY ALL LOCAL CODES, ENERGY TYPES, AND SITE CONDITIONS PRIOR TO CONSTRUCTION.
2. REVIEW SELECTED MECHANICAL SYSTEMS WITH OWNER PRIOR TO CONSTRUCTION
   REVIEW SUB-CONTRACTORS LOCATIONS OF WATER HEATER AND HVAC UNIT(S) WITH THE OWNER PRIOR TO CONSTRUCTION.
   VERIFY LOCAL BUILDING CODE REQUIREMENTS AND MANUFACTURER REQUIREMENTS FOR ATTIC AND GARAGE LOCATIONS.
   HVAC EQUIPMENT IN THE ATTIC SPACE SHALL BE ACCESSIBLE BY AN OPENING LARGER THAN THE LARGEST PIECE OF EQUIPMENT (TO ALLOW REMOVAL OF THE EQUIPMENT) AND IN NO CASE LESS THAN 22"x30"
3. REFER TO SUBMITTALS FOR STRUCTURAL ELEMENTS.
4. DIMENSIONS ARE TO FACE OF STUD U.N.O.
5. REFER TO ELEVATION DRAWINGS FOR EXTERIOR MATERIAL LOCATIONS.
6. REFER TO INTERIOR DESIGN DRAWINGS FOR DIMENSIONS AND CONFIGURATION OF CABINETRY AND MILLWORK.
7. INSULATE AROUND ALL BATHS AND UTILITY ROOMS
8. PROVIDE SMOKE DETECTORS AS REQUIRED BY CODE.
9. PROVIDE DOORBELLS, TRANSFORMER, AND CHIME.
10. ALL CLOSETS TO HAVE SOLID-WOOD SHELVING WITH ROD

DOOR SCHEDULE

MARK	PR	SIZE W	SIZE H	QTY	NOTES
01		3' - 0"	8' - 0"	2	
03			8' - 0"	1	
04		2' - 6"	7' - 0"	4	
05		2' - 8"	7' - 0"	2	
06	Pair	1' - 6"	8' - 0"	1	
10	Pair	1' - 4"	7' - 0"	1	
11		4' - 0"	8' - 0"	1	
26		2' - 6"	8' - 0"	5	
27		2' - 8"	8' - 0"	4	

WINDOW SCHEDULE

MARK	SIZE W	SIZE H	QTY	NOTES
A	1' - 8"	4' - 6"	1	DOUBLE HUNG
B	2' - 0"	4' - 6"	2	DOUBLE HUNG
C	2' - 0"	6' - 0"	5	DOUBLE HUNG
D	3' - 6"	5' - 6"	7	DOUBLE-HUNG W/ MUNTINS
DD	1' - 6"	5' - 6"	2	CASEMENT WINDOW W/ MUNTINS
E	3' - 0"	6' - 0"	2	DOUBLE HUNG
G	2' - 0"	3' - 0"	3	CASEMENT WINDOW W/ MUNTINS

HEATED AREAS	
LEVEL 1	1,525 SF
LEVEL 2	1,037 SF
TOTAL	2,562 SF

OTHER AREAS	
BACK PORCH	314 SF
BASEMENT	1,546 SF
CART GARAGE	78 SF
FRONT PORCH	285 SF
GARAGE	264 SF

DOOR NOTES:

DOOR BASIS OF DESIGN:
SIMPSON DOOR CO.

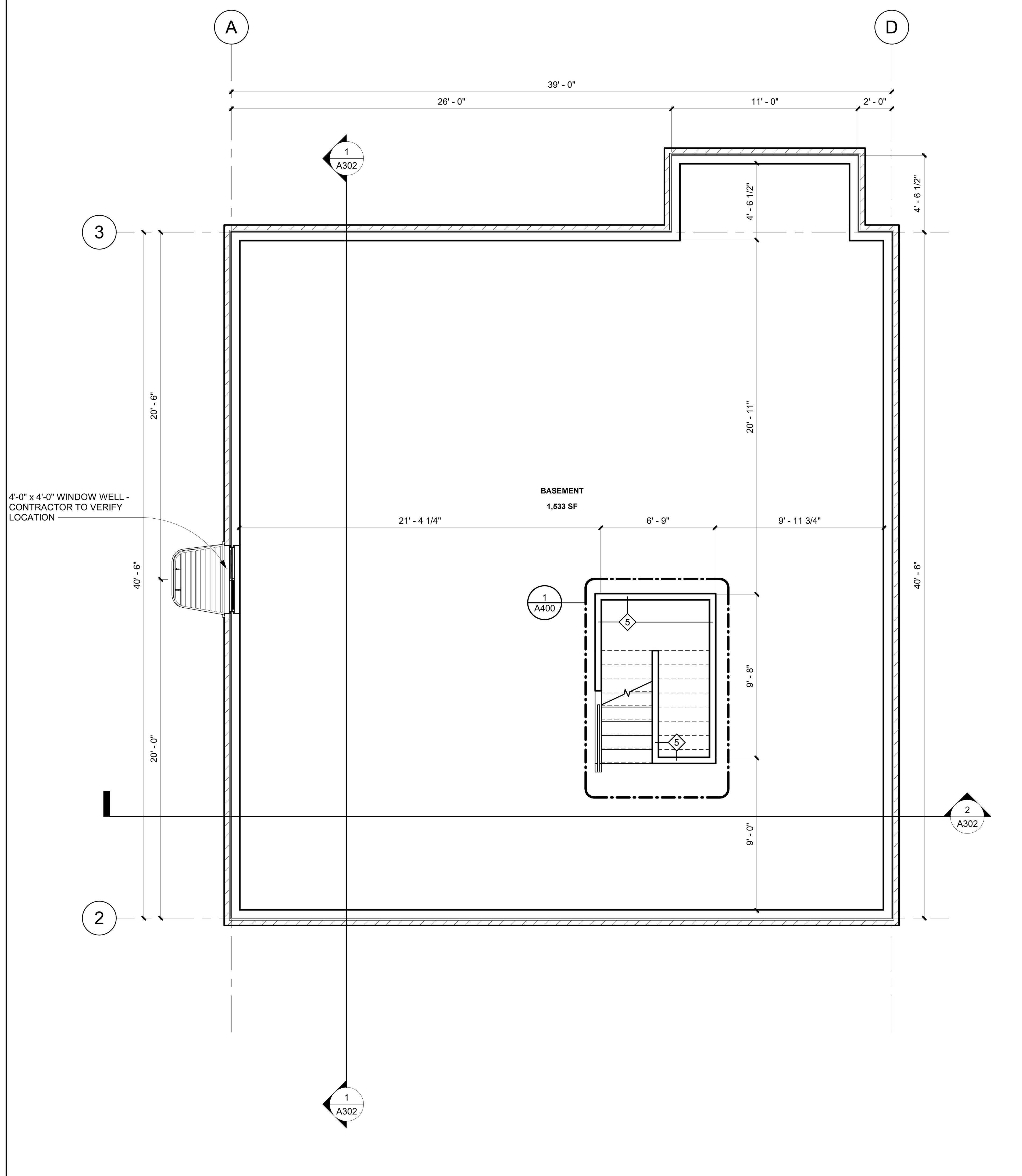
REFER TO ELEVATIONS FOR EXTERIOR CONDITIONS AT HEAD, JAMB, AND SILL

WINDOW NOTES:

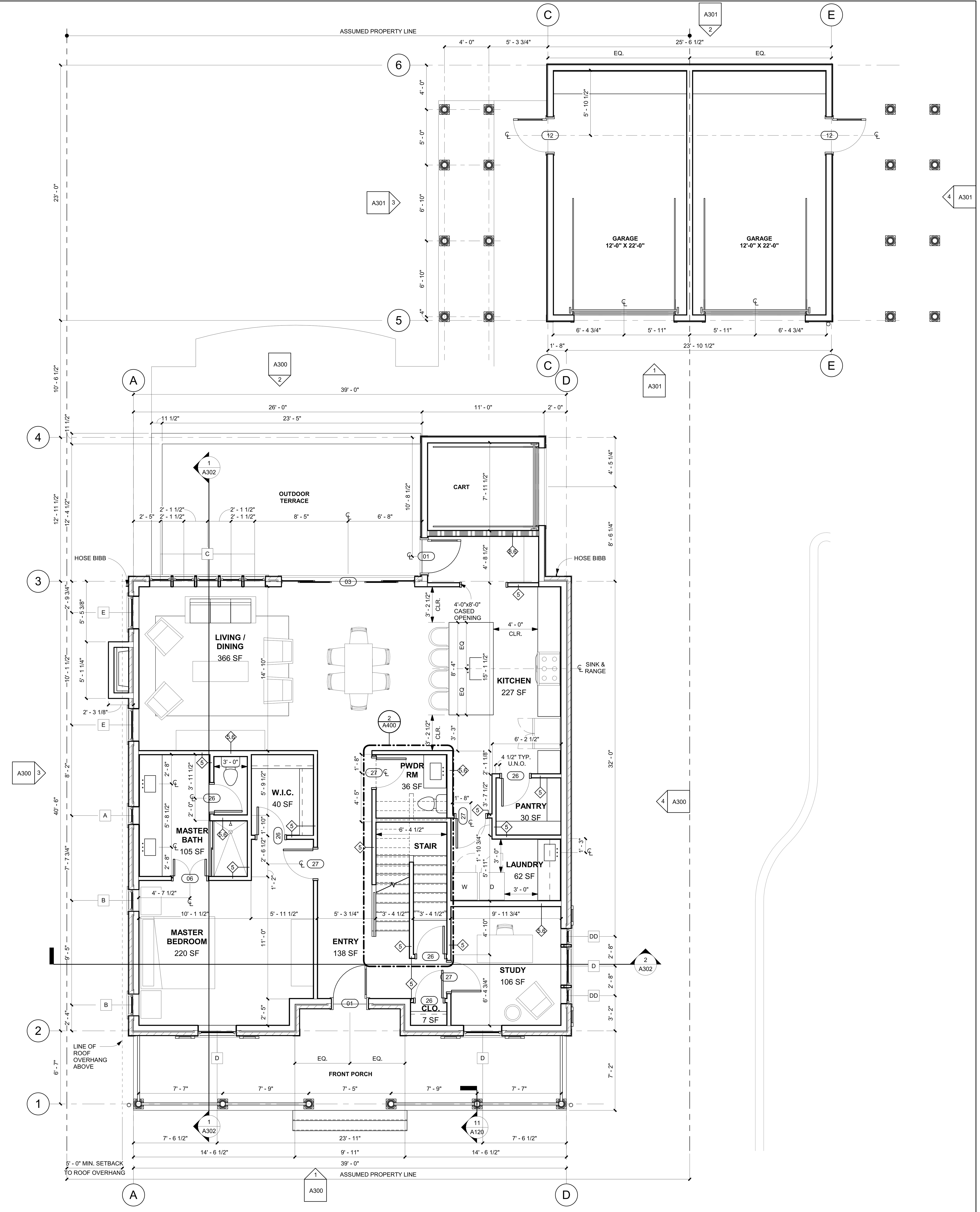
WINDOW BASIS OF DESIGN:
MATHEWS BROTHERS - SPENCER WALCOTT SERIES
MUST MAINTAIN MIN. R. VALUE OF 0.19

REFER TO ELEVATIONS FOR EXTERIOR CONDITIONS AT HEAD, JAMB, AND SILL

WINDOW SILL SHALL BE MIN. 2'-0" A.F.F.



1 BASEMENT LEVEL
A111 1/4" = 1'-0"



2 LEVEL 1
A111 1/4" = 1'-0"

RABUN ARCHITECTS
260 Peachtree St. NW, Suite 600
Atlanta, Georgia 30303
Ph: 404-522-9455

UNIT OPTION - 1
CRANBERRY POINT
QUINAQUISSET AVE, MASHPEE, MA

NOT FOR CONSTRUCTION

REVISIONS

No	Date	Description

DRAWING TITLE

FLOOR PLAN - BASEMENT & LEVEL 1

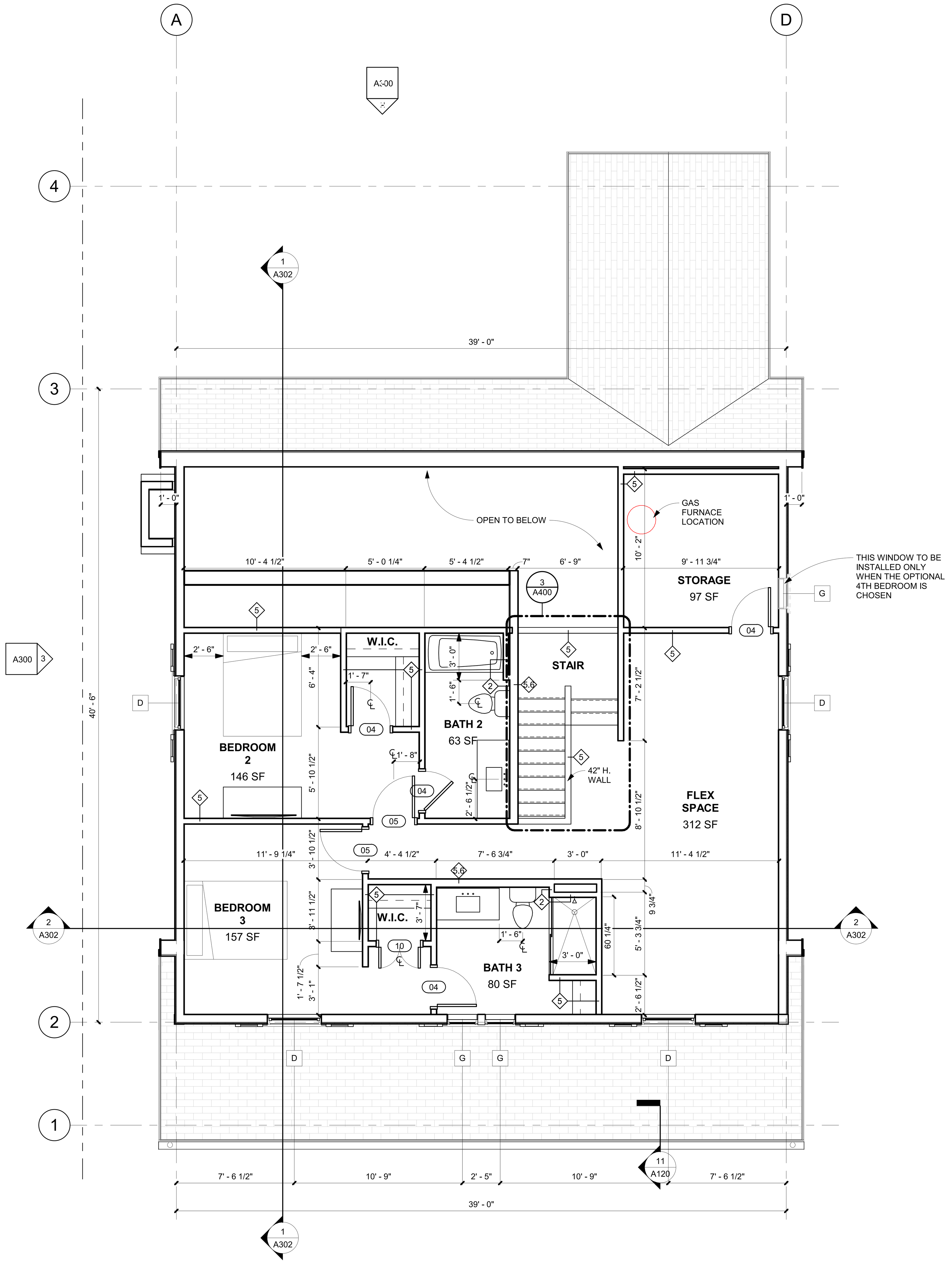
PROJECT NUMBER

21140

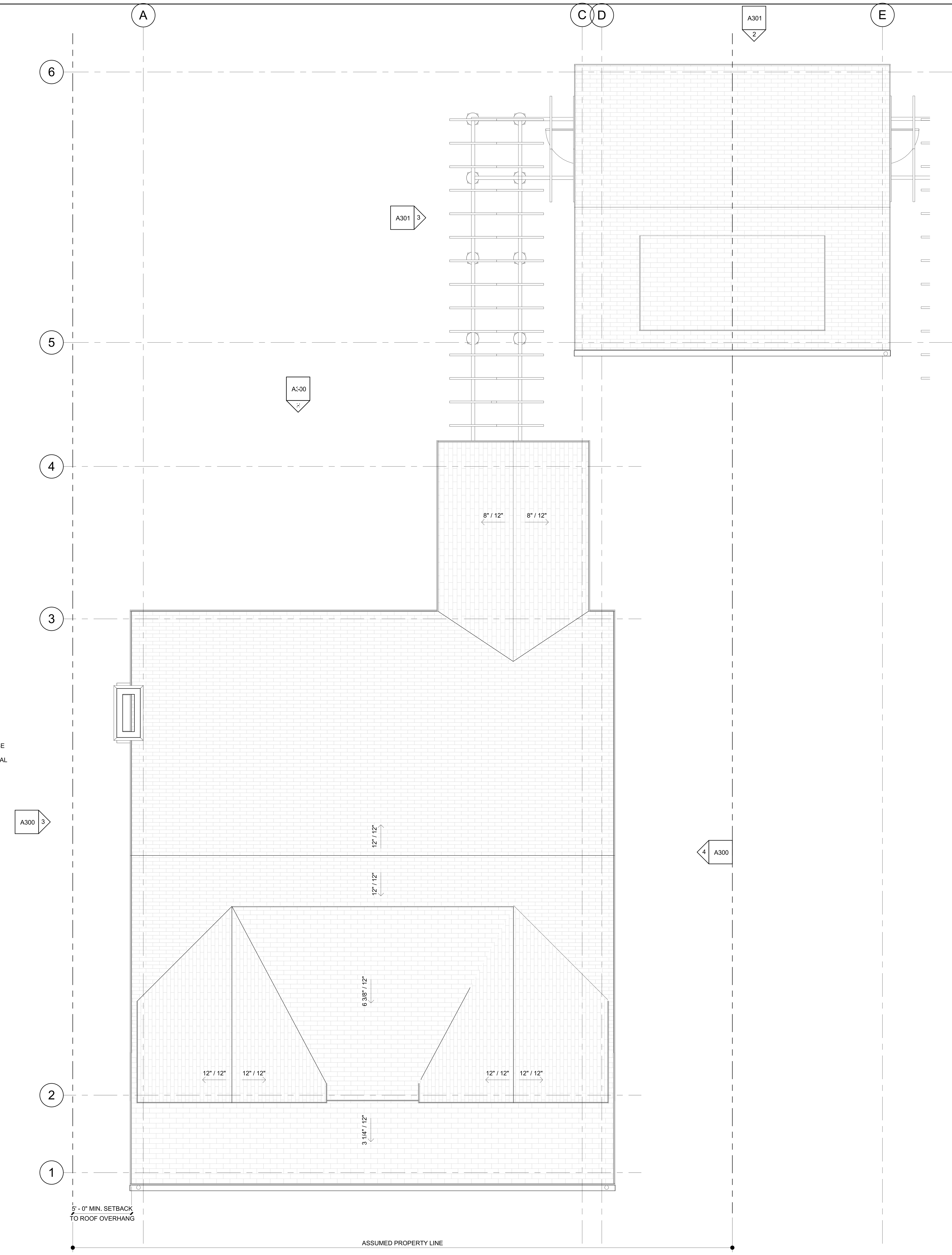
DATE

01/03/23

A111



1 A112 LEVEL 2
1/4" = 1'-0"



2 A112 ROOF PLAN
1/4" = 1'-0"

RABUN ARCHITECTS
260 Peachtree St. NW, Suite 600
Atlanta, Georgia 30303
Ph: 404-522-9455

UNIT OPTION - 1

CRANBERRY POINT
QUINAQUISSET AVE, MASHPEE, MA

NOT FOR CONSTRUCTION

REVISIONS

No	Date	Description

DRAWING TITLE

FLOOR PLAN - LEVEL 2 & ROOF

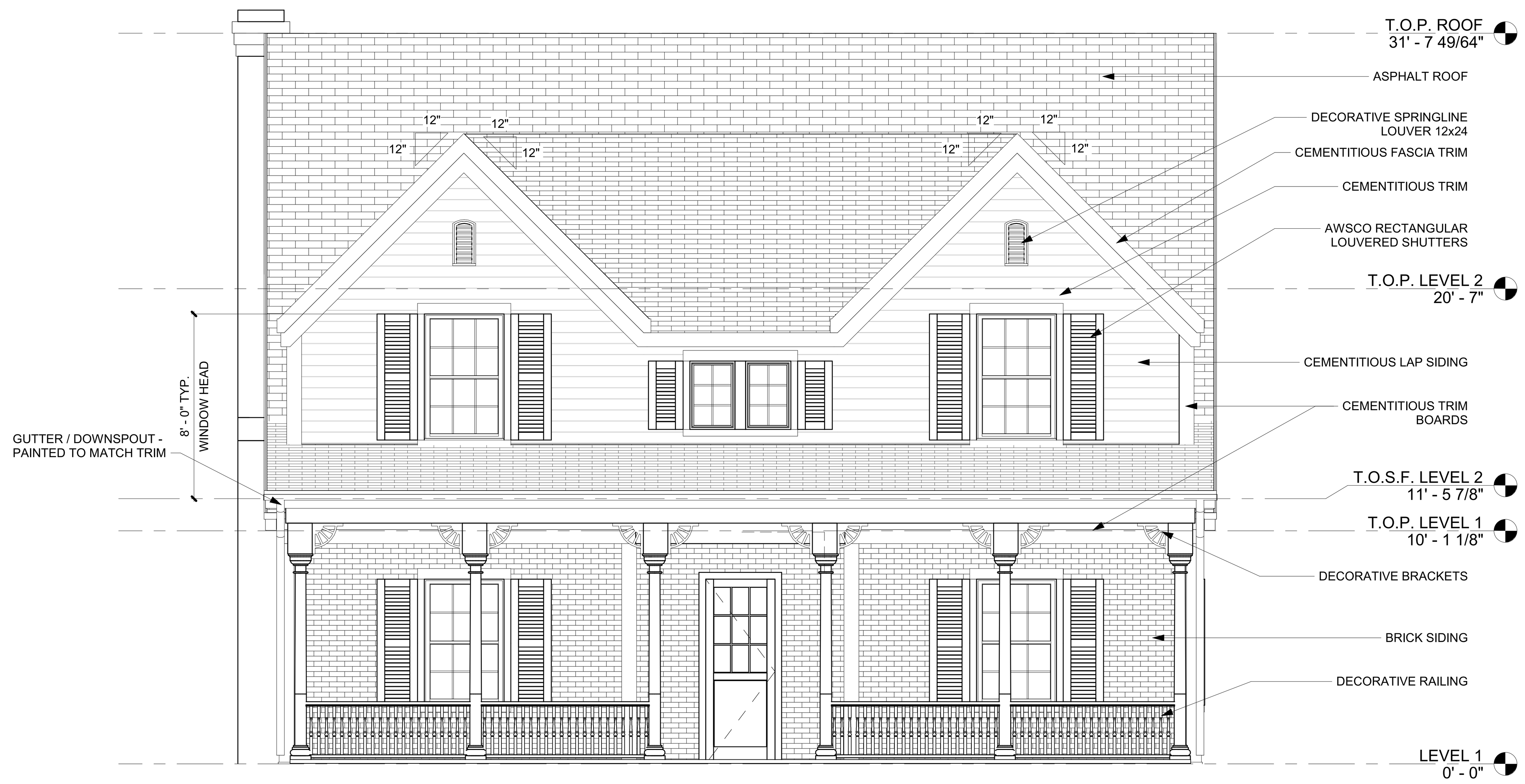
PROJECT NUMBER

21140

DATE

01/03/23

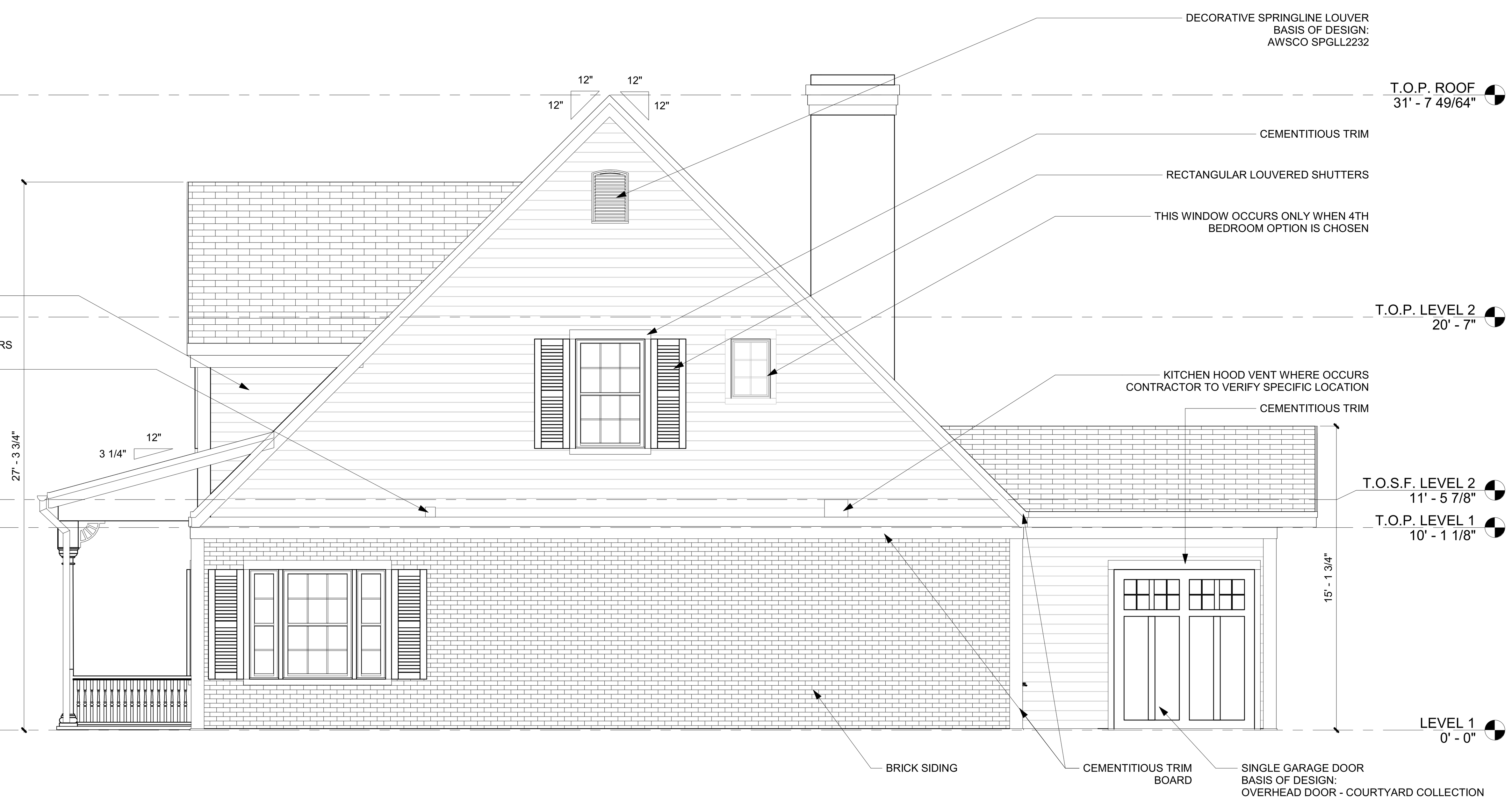
A112



1 FRONT ELEVATION
A300 1/4" = 1'-0"

2 REAR ELEVATION
A300 1/4" = 1'-0"

3 LEFT SIDE ELEVATION
A300 1/4" = 1'-0"



4 RIGHT SIDE ELEVATION
A300 1/4" = 1'-0"

RABUN ARCHITECTS
260 Peachtree St. NW, Suite 600
Atlanta, Georgia 30303
Ph: 404-522-9455

UNIT OPTION - 1

CRANBERRY POINT
QUINAQUISSET AVE, MASHPEE, MA

NOT FOR CONSTRUCTION

REVISIONS

No	Date	Description

DRAWING TITLE

EXTERIOR ELEVATIONS

PROJECT NUMBER

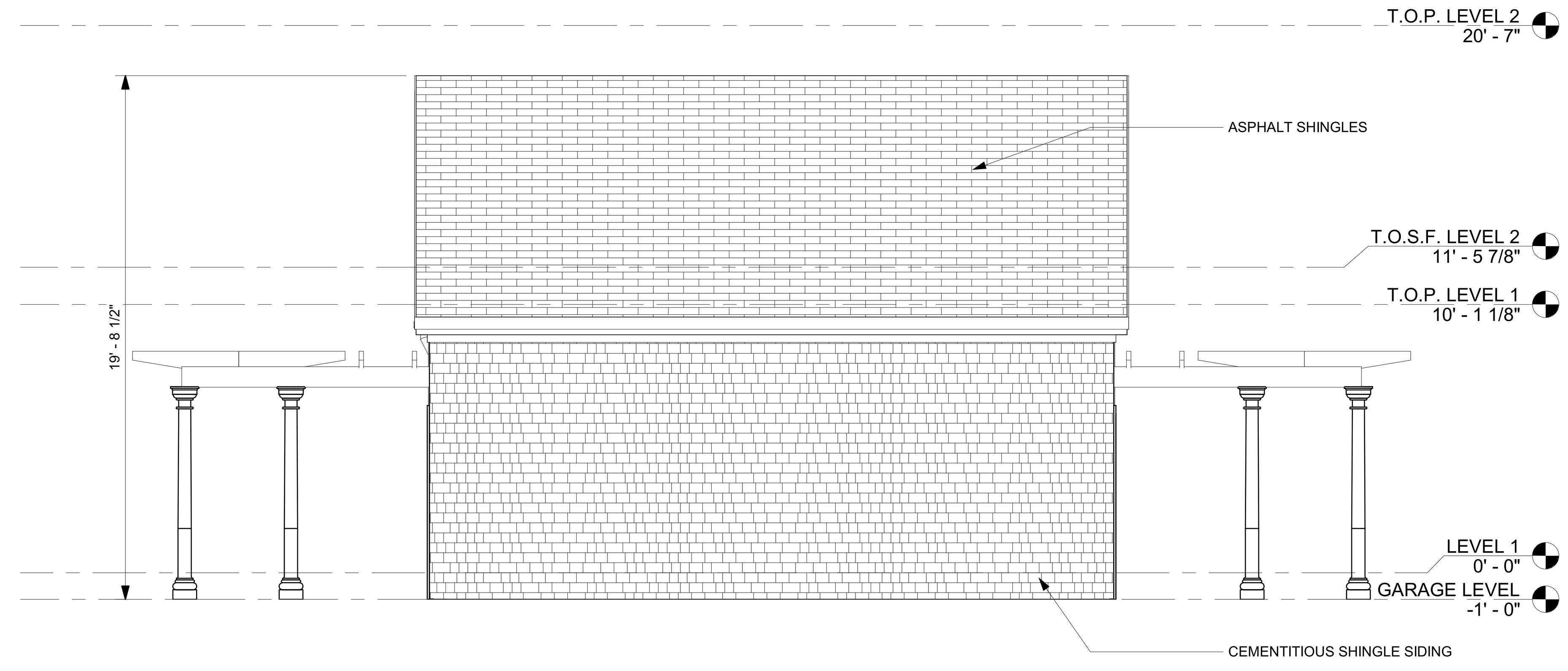
21140

DATE

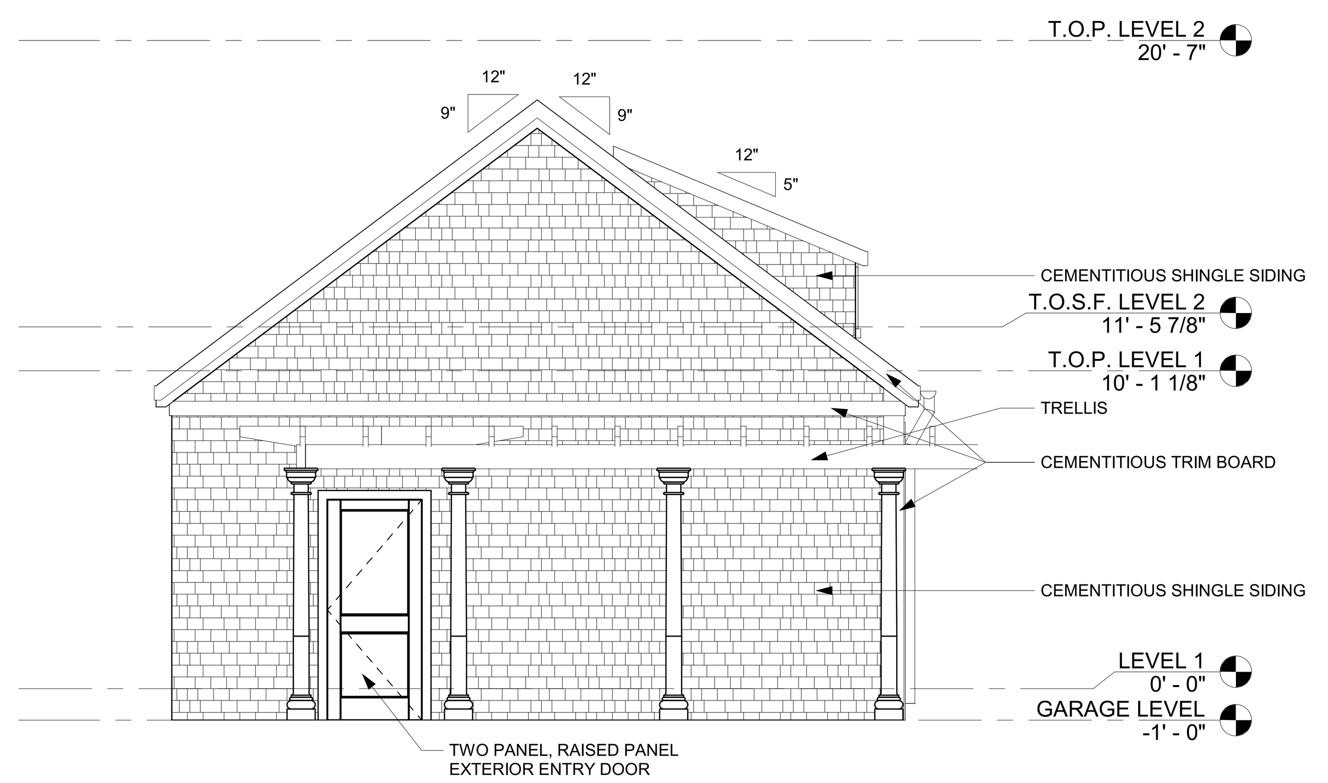
01/03/23

A300

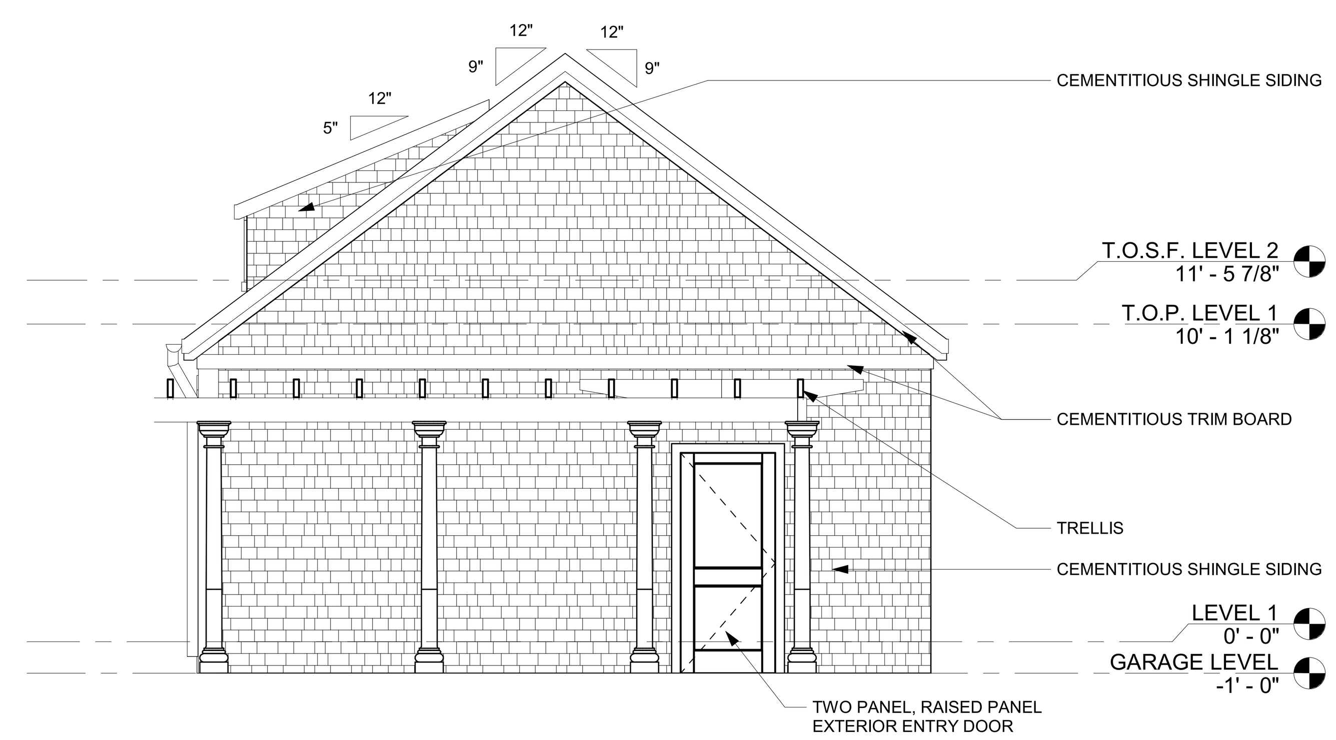
1 A301 FRONT ELEVATION
1/4" = 1'-0"



2 A301 REAR ELEVATION
1/4" = 1'-0"



3 A301 LEFT SIDE ELEVATION
1/4" = 1'-0"



4 A301 RIGHT SIDE ELEVATION
1/4" = 1'-0"

RABUN
ARCHITECTS
260 Peachtree St. NW, Suite 600
Atlanta, Georgia 30303
Ph: 404-522-9455

UNIT OPTION - 1

CRANBERRY POINT
QUINAQUISSET AVE, MASHPEE, MA

NOT FOR CONSTRUCTION

REVISIONS

No	Date	Description

DRAWING TITLE

EXTERIOR ELEVATIONS - GARAGE

PROJECT NUMBER

21140

DATE

01/03/23

A301

LISCIOTTI DEVELOPMENT

April 6, 2023

VIA EMAIL

Evan Lehrer, MPA
Town Planner
Town of Mashpee
16 Great Neck Road North
Mashpee, MA 02649
elehrer@mashpeema.gov

Re: 413 Nathan Ellis Highway, Mashpee MA 02649 – (Assessor's Map 72, Parcel 56A)

Dear Mr. Lehrer,

Please accept this letter as written request for release of the $21,300 in funds being held by the Town of Mashpee related to the completion of the Sherwin Williams Retail Store located at 413 Nathan Ellis Highway, Mashpee, MA 02649.

Please let me know if you require any additional information to process this request.

Sincerely,

Chad D. Brubaker