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Richard Benevento
Zoning Board of Appeals
Town of Middleton
195 N Main Street
Middleton, MA 01949

December 7, 2023

Ref. T1404

Re: 10 Boston Street, Middleton, MA
40B Comprehensive Permit Application
Civil Engineering Peer Review #3

Dear Mr. Benevento:

On behalf of the Town of Middleton, TEC, Inc. (TEC) has performed an additional civil engineering peer review for the proposed Chapter 40B multi-family residential development at 10 Boston Street (Route 62), Middleton, Massachusetts. The proposed project includes the construction of sixty (60) single-family rental units in a single, four-story multi-family building. Villebridge Development LLC (the "Applicant") submitted the following documents which TEC reviewed for conformance with the Town's Zoning and Stormwater Bylaws, Massachusetts Stormwater Standards, and generally accepted industry standards:

- *Landscape Permit Submission Set*; prepared by Hawk Design, Inc.; dated August 22, 2023, revised November 9, 2023.
- *Illustrative Site Plan* Rendering Sheet; prepared by Hawk Design, Inc.; dated August 22, 2023, revised November 9, 2023.

For consistency, the outstanding original comment numbers have been retained from the most recent civil engineering peer review letter prepared by TEC, dated November 9, 2023. No written response to comments was received from the Applicant for this additional peer review. TEC's original comments are shown in regular font, the Applicant's responses are shown in *italics*, and TEC's supplemental comments are shown in **bold**. Comments were removed if they were previously deemed to be satisfied and/or deferred to the appropriate party of interest.

Upon review of the documents, TEC compiled the following comments for the Board's consideration:

CIVIL ENGINEERING SITE PLAN REVIEW:

Revised civil site plan documents were not provided and thus only comments referring to revisions to Landscaping Plans were reviewed. Response/ revisions relative to comments numbered 1-3, 5, 7-15, 20, 22, 24-29, 31-34, 37 and 38 remain outstanding.

16. TEC 10.12.23: Proposed lighting is indicated on the provided landscape plans, however no photometrics are provided to ensure no light spillage/pollution and conformance with local regulations.

Hancock 10.17.23: A photometric plan will be supplied to the Board by the Landscape Architect by mid-November. We hope this will provide sufficient time for peer review before the December meeting at which landscaping is scheduled to be reviewed.

TEC 11.9.23: Acknowledged. TEC anticipates the comment will be addressed upon review of forthcoming revised documents.

TEC 12.7.23: Comment addressed. Applicant has provided photometrics on the revised lighting plan. The plan does show some light spillage proposed onto Lot 3 to the south via (2) P3 light poles, however TEC understands this area is intended to remain a common parking area for the development of Lots 2 and 3, therefore the spillage would not negatively affect the abutting property. It does appear however, that the (2) light poles providing coverage of this area as shown are proposed to be located on Lot 3 rather than Lot 2. The applicant should confirm the location and if the installation and operation of these light poles will require a cross utility easement over Lot 3. TEC defers to the Board. No further comment.

17. TEC 10.12.23: Lighting plan shows proposed light pole within infiltration system "1P", details on how that would be constructed should be provided.

Hancock 10.17.23: The system can be interrupted with the use of intermittent end caps. Details will be provided to the Board with the next plan submission.

TEC 11.9.23: Acknowledged. TEC anticipates the comment will be addressed upon review of forthcoming revised documents.

TEC 12.7.23: Comment remains. TEC anticipates the detail will be provided within forthcoming revised civil site plans.

18. TEC 10.12.23: The landscape plan shows a proposed tree within infiltration system "2P." There is also a proposed tree at the southwest corner of the site that is proximate to a proposed area drain and pipe connection.

Hancock 10.17.23: The tree locations will be adjusted to avoid the infiltration system by the Landscape Architect by mid-November. We hope this will provide sufficient time for peer review before the December meeting at which landscaping is scheduled to be reviewed.

TEC 11.9.23: Acknowledged. TEC anticipates the comment will be addressed upon review of forthcoming revised documents.

TEC 12.7.23: Comment partially addressed. The tree previously proposed within the infiltration system has been relocated 7.5' outside of the footprint of the system, however the Landscape Architect should confirm the location is suitable for the proposed "Bloodgood London Planetree" species. Research suggests this species of tree is capable of growing outwards to a canopy width of 50'-70' and can have an aggressive, wide root system. At only 7.5' away, will the roots eventually seek out, invade, and potentially damage the infiltration system designed to periodically hold water, especially with impervious surfaces located on the opposite side of the tree? This comment could also be applicable to several other trees proposed within 20' of

both subsurface infiltration systems as well as within 10' of the proposed septic system leach field. TEC defers to the Board and Landscape Architect. No further comment.

19. TEC 10.12.23: The landscape plan proposes plantings within the Boston Street right-of-way adjacent to the proposed entry sign. With regards to ownership of on-going landscape maintenance, TEC suggests proposed landscaping remain outside the public right-of-way.

Hancock 10.17.23: The planting locations will be adjusted to have all planting within the lot.

TEC 11.9.23: Acknowledged. TEC anticipates the comment will be addressed upon review of forthcoming revised documents.

TEC 12.7.23: Addressed, landscaping has been removed from the public right-of-way on the revised landscaping plans. No further comment.

29. The Applicant shall define the location of resident bicycle storage including weather-protection and security.

Hancock: Outdoor, open-air bike racks will be added to the plans and submitted to the Zoning Board with the next plan submission.

TEC: Acknowledged. TEC anticipates the comment will be addressed upon review of forthcoming revised documents.

TEC 12.7.23: The revised landscaping plans and rendering do not appear to depict any bicycle parking/ storage. TEC anticipates the comment will be addressed upon review of forthcoming revised civil site plans.

40. TEC 12.7.23: A pet park is proposed within the footprint of subsurface infiltration system "1P". Applicant should address the potential for migration of waste into the stormwater system and potential overflow to downstream stormwater networks and eventual resource areas. Dog waste is high in nitrogen and phosphorus. It also appears downstream resource areas in the watershed are on the MassDEP Integrated List of Waters and currently are assessed as impaired due to E. Coli and Fecal Coliform. TEC recommends the applicant should, at the very least, enact guidelines for pet owners to pick up pet waste and should incorporate appropriate signage, disposal bag or scoop stations, disposal receptacles, etc. as part of the park design. TEC defers to the Board.

Please do not hesitate to contact me directly if you have any questions concerning our comments at 774-670-3569. Thank you for your attention to these matters.

Respectfully,
TEC, Inc.
*"**T**he **E**ngineering **C**orporation"*

Jared M. Duval, P.E.
Worcester Regional Director

HANCOCK
ASSOCIATES
Surveyors | Engineers | Scientists

December 7, 2023

Richard Benevento
Zoning Board of Appeals
Town of Middleton
195 N Main Street
Middleton, MA 01949

Re: 10 Boston Street, Middleton, MA
40B Comprehensive Permit Application
2nd Supplemental Response to Civil Engineering and Traffic Engineering Peer Review #1

Dear Mr. Benevento:

Hancock Associates is pleased to offer the following 2nd supplemental correspondence in response to the Peer Review memorandum from TEC dated October 12, 2023.

Civil Engineering Site Plan Review

1. Plans as submitted are labeled as "Preliminary", and in the opinion of TEC, do not provide sufficient detail to determine adequacy of the site and stormwater design.

Response: We have advanced with drawings with additional detail and requesting along with supporting information.

2. A waiver has been requested for the requirements of Section 9.5 of the Middleton Zoning Bylaws, "Site Plan Review". The plans as submitted do not meet the following requirements:

   a) Plans shall be submitted on twenty-four-by-thirty-six-inches sheets whereas the plans currently are thirty-by-forty-two-inches. TEC defers to the Board.

Response: We feel the larger sheets allow for ease of review at an appropriate scale without having to break the site into separate sheets.

   b) Plans should provide a locus plan at a scale of one-inch equals to 100 feet, showing the entire project and its relation to existing areas, buildings, and roads for a distance of 1,000 feet from the project boundaries.

Response: The requested 100-scale Locus Plan is included with this submittal.

   c) Plans should indicate snow storage areas.

Response: Snow storage areas have been added to Sheet C-1.

3. A waiver for maximum building height is requested. The allowable height is 35ft (3 stories) – the applicant's proposed building height is 42ft (3 stories). TEC defers to the Board.

4. Per the MA Stormwater BMP Handbook, a minimum of (2) test pits should be conducted within the footprint of each subsurface infiltration system. Several test pits are shown on the plans, however none appear to have been conducted within the footprint of the (2) proposed infiltration systems. Additional test pits in the footprint of the proposed infiltration systems should be conducted to confirm soil classification, infiltration rate, and estimated seasonal high groundwater elevation.

Response: A note has been added to the plans requiring additional soil testing in the areas of the proposed stormwater infiltration systems prior to preparation of Building Permit Plans.

5. (8) test pit locations are indicated on the plans. It appears that test pit results are only provided for (4) test pits. The locations of (2) of the test pits for which results are provided are not indicated on the plans.

Response: The plans have been updated to show just the relevant soil testing locations and logs.

6. The Applicant should provide turning templates showing the ability of fire apparatus to access, circulate, and egress the site through the circulation pattern without leaving the paved surface. This includes a Town of Middleton fire apparatus. The Applicant should coordinate with the Town of Middleton Fire Department for preferred locations of fire lanes (if needed), confirmation of hydrant locations, and sign requirements for fire lanes within the site. TEC defers to local police and fire.

Response: We have produced a Swept Path Analysis and shared it with the Middleton Fire Department. This plan is attached to complete the Zoning Board record.

7. The site layout plans indicate trash will be stored inside the building and trash pickup access will be through the south side of the building from the adjacent parking lot of "Lot 3". Grading of this access should be confirmed as it appears the first 20' of the access path will be greater than 20% until the parking lot is regraded/reconstructed on "Lot 3". The Applicant should provide turning templates showing the ability of dump trucks to access, circulate, and egress the site through the circulation pattern without leaving the paved surface while accessing the location of the trash room. Adequate access for trash removal should be incorporated into the development of "Lot 2". Should the refuge truck need to access the trash room from Lot 3 as depicted, and common ownership of "Lot 2"

and Lot "3" ceases, a cross-access easement may need to be in place to conduct this business.

Response: The Applicant is in the process of preparing the Site Plan Submittal for his abutting retail lot (Lot 3) and expects to be in position to share the development plans with the Board in late December. As the plans for Lot 3 are more fully developed Hancock will generate the requested turning template plan for accessing the Lot 2 trash area.

8. The plan set does not include any construction details.

Response: Preliminary Detail Sheets are included with this submittal.

9. No construction period erosion and sediment controls are indicated on the plans.

Response: A Preliminary Site Preparation & Demolition Plan showing erosion and sediment controls is included with this submittal.

10. No drainage conveyance structure inverts are indicated. No drainage conveyance pipe size, material, length, or slope are indicated. Assuming a minimum of 36" from rim to invert for proposed catch basins to the west of the proposed infiltration systems indicate a potential backflow condition (inverts of catch basins approximately elevation 101.2, 101.5; bottom of chambers elevation 101.5).

Response: Proposed pipe sizes, invert elevations, pipe lengths and slopes have been added to the Preliminary Grading & Drainage Plan. The pipe network was sized for the 25-year storm event per our discussion with the Board at November 16th meeting. Proposed grading of the large parking lot was adjusted accordingly. Refer to the revised Stormwater Report for pipe sizing calculations.

11. The plan set does not provide for details regarding proposed retaining walls. A DMH is proposed in between the retaining walls and detail on the walls should be provided to ensure constructability.

Response: The updated plans submitted herewith remove the eastern walkway/stairway and associated retaining walls.

12. Infiltration system construction details should be provided. Isolator row details should be provided. Infiltration system inlet manholes and manifold details should be provided. The outlet control structure call outs indicate weir elevation but do not indicate orifice size and elevation as included in the HydroCAD model. Outlet control structure details should be provided.

Response: Infiltration system construction details are included in the updated plan set submitted herewith.

13. Plans indicate a minimum offset from infiltration system to subsurface soil absorption system of 25', assumed to be taken from Title 5 for the setback from SAS to dry wells. Per the MA Stormwater BMP handbook, the offset from infiltration BMPs (basins and trenches) to soil absorption systems is 50'. TEC defers to MassDEP as to the superseding regulation. TEC defers to the local Health Department and MassDEP on septic system design.

Response: The Mounding Analysis has been completed and is submitted herewith.

14. Per the standard Stormtech construction details, a minimum of 18" is required from the top of the chambers to the bottom of pavement for adequate structural integrity under parking areas. The current proposed design indicates approximately 16" from the top of the chambers of infiltration system "1P" to the top of pavement along the western side of the system.

Response: The updated plans included with this submittal show revised grading to meet the 18-inch cover requirement.

15. The applicant proposes connecting the new drainage system to the existing drainage network on "Lot 3" via a proposed utility easement. The existing drainage network on Lot "3" is connected to the existing drainage system within MassDOT jurisdiction on South Main Steet (Route 114). A DOT Access Permit may be required for the expanded drainage connection. TEC suggests the applicant and DPW engage MassDOT regarding the proposed expanded drainage system interconnection.

Response: We understand the need for a MassDOT access permit which will require submission of drainage calculations to their satisfaction. We are controlling post development rates to pre-development rates.

16. Proposed lighting is indicated on the provided landscape plans, however no photometrics are provided to ensure no light spillage/pollution and conformance with local regulations.

Response: A photometric plan will be supplied to the Board by the Landscape Architect in January. We hope this will provide sufficient time for peer review before the December meeting at which landscaping is scheduled to be reviewed.

17. Lighting plan shows proposed light pole within infiltration system "1P", details on how that would be constructed should be provided.

Response: The updated plans included with this submittal show the proposed site light pole, and the removal of one (1) infiltration chamber. End caps are shown on the abutting chambers on each side.

18. The landscape plan shows a proposed tree within infiltration system "2P." There is also a proposed tree at the southwest corner of the site that is proximate to a proposed area drain and pipe connection.

Response: The tree locations will be adjusted to avoid the infiltration system by the Landscape Architect by mid-November. We hope this will provide sufficient time for peer review before the December meeting at which landscaping is scheduled to be reviewed..

19. The landscape plan proposes plantings within the Boston Street right-of-way adjacent to the proposed entry sign. With regards to ownership of on-going landscape maintenance, TEC suggests proposed landscaping remain outside the public right-of-way.

Response: The planting locations will be adjusted to have all planting within the lot.

20. Is a cross-access easement to be established between the subdivided lots to allow for residential traffic to utilize the South Main Street parking areas and driveway?

Response: Cross easements will be established upon presentation of a recordable subdivision plan to the Zoning Board later in the process.

21. The Applicant should verify the location of bus stops for resident children with the local school district and ensure the location is easily accessible by a school bus.

Response: The bus stop for resident children with the local school district is located less than 200 feet to the west of the site at the intersection of Boston Street and Pleasant Street. The bus stop is serviced by Route # 8 for the Middleton Elementary Schools and Route # 24 for the Masconomet Middle and High Schools."

22. The Applicant shall provide a dedicated plan for all traffic signage and pavement markings to be installed as part of the project. A sign summary shall also be included which depicts the sign legend, sign size, and sign lettering dimensions in compliance with the *Manual on Uniform Traffic Control Devices (MUTCD)*.

    a) This includes the placement of a stop sign and stop lines along the site driveways at its intersection with Boston Street and South Main Street.

    b) This includes placement of a stop sign and stop lines along the Boston Street Driveway and its intersection with the main drive aisle leading to Lot 3's surface parking.

    c) The Applicant should provide standard details and/or notes that denote the height of traffic signage on-site. Note that the height of some signage will be different than others.

Response: A Preliminary Pavement Marking & Signage Plan is included with this submittal.

23. The proposed site provides for 102 off-street parking spaces. The land use is identified in Bylaw Section 5.1.2. The site would require 120 parking spaces to satisfy the Bylaw. The Applicant has noted a need for relief from parking spaces with 1.7 spaces per unit.

    a) Parking demand calculations published by the Institute of Transportation Engineers (ITE) in the most recent industry standard *Parking Generation, 5th Edition* for Land Use Code (LUC) 221 – Multifamily Housing Mid-Rise denote an average peak parking demand of seventy-nine (45) parking spaces needed for sixty (60) units or sixty-eight (68) parking spaces for ninety (90) bedrooms. Parking demand calculations also note an 85th percentile peak parking demand of eighty-nine (89) parking spaces needed for sixty (60) units or seventy-eight (78) parking spaces for ninety (90) bedrooms. Even under the most limited parking demand combination from the ITE publication would suggest the Applicant's parking spot count would be sufficient to meet demand.

Response: We concur with TEC's finding that adequate parking has been provided.

24. Dimensions are provided for a typical parking space on-site in compliance with the Bylaw. In addition, dimensions for the accessible spaces on-site are in compliance with 521 CMR 23.4.1. The Applicant should revise the plans to show accessible signage at the head of each accessible parking space with the associated 'Van Accessible' plaque.

Response: A Preliminary Pavement Marking & Signage Plan is included with this submittal.

25. The plans should be revised to depict both intersection sight distance and stopping sight distance measurements for both directions at Boston Street and South Main Street. Intersection sight distance measurements should be taken from a point 14.5-feet from the proposed edge of travel way on each mainline roadway. The sheet should denote all areas of clear view and resulting from the sight lines both on the public ROW and land under the control of the Applicant.

Response: Sight Distance Measurements provided by Vanasse & Associates, Inc. are shown on the Preliminary Pavement Marking & Signage Plan included herewith.

26. Concrete sidewalks are provided along Boston Street opposite the site frontage. A proposed sidewalk is shown on-site connecting from the building frontage out to Boston Street and terminating. The location is not ideal for a crosswalk to allow connection to the sidewalk along the northerly side of the roadway. The Applicant

should provide a pedestrian connection along the southerly side of Boston Road connecting to the intersection with South Main Street.

Response: A 5-foot wide cement concrete sidewalk has been added along the site's frontage, this walk can be extended to South Main Street as part of the redevelopment of the adjacent commercial property.

27. The Applicant should provide standard details for all accessible ramp types and crosswalks.

Response: Accessible ramp details are included on the Preliminary Detail Sheets submitted herewith.

28. The plan does not show electric vehicle charging stations on-site. The Applicant should clarify if spaces on-site will be constructed as EV-compatible or EV-ready.

Response: Building permit application plans will comply with the then-applicable building code requirements for EV spaces.

29. The Applicant shall define the location of resident bicycle storage including weather-protection and security.

Response: A location for proposed open-air bike racks has been added to the updated plan set submitted herewith.

MassDEP Stormwater Standards

30. Standard 1 (Untreated discharges): No new stormwater conveyance may discharge untreated stormwater directly to or cause erosion in wetlands or water of the Commonwealth.

    Standard appears to be met. All stormwater runoff from the site is proposed to be discharged to an existing drainage network within South Main Street. See Standard 4 regarding water quality treatment.

Response: We concur with TEC that the standard is met.

31. Standard 2 (Peak rate control and flood prevention): Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for land subject to coastal storm flowage.

    TEC provides the following comments in relation to Standard 2:

    a) The existing watershed analysis map indicates (3) analysis points. The proposed watershed analysis indicates (1) analysis point. The majority of the site runoff has been redirected towards the South Main Street drainage network analysis point, however, there appears to still be a small area of the post development condition which drains towards Boston Street. The watershed maps and analysis should be revised to incorporate the Boston Street analysis point. All (3) analysis points should be indicated in the Stormwater Report discharge rate table. It appears peak flows will likely still be met.

Response: We have revised the watershed maps and HydroCAD Analysis, please refer to the updated Stormwater Report submitted herewith.

    b) The HydroCAD analysis indicates the proposed pipe network to an existing drainage manhole will be constructed within 12" reinforced concrete pipe. The outlet of the existing drainage manhole appears to be an 8" cast iron pipe. The analysis should include the existing pipe to ensure the reduction in flow capacity of the 8" pipe will not negatively impact or cause backflow of the proposed stormwater management system for the development.

Response: The HydroCAD Analysis has been revised to include the existing 8" pipe, an additional subsurface infiltration system (System 3P) has been added to the abutting retail lot (owned by the Applicant) to ensure that the capacity of the existing 8" pipe will not negatively impact the proposed stormwater management system for the residential development. The system will not surcharge above rim elevation in the 25-year storm event.

c) The plans do not indicate size, material, length, slope, or inverts of the proposed pipe network. Some pipes are included in the HydroCAD analysis. All proposed pipes should be modeled to ensure adequate size and flow capacities for the site. TEC recommends adding all structures and pipes to the HydroCAD model.

Response: Proposed pipe sizes, invert elevations, pipe lengths and slopes have been added to the Preliminary Grading & Drainage Plan. The pipe network was sized for the 25-year storm event per our discussion with the Board at November 16th meeting. The revised HydroCAD Analysis includes all structures and pipes.

d) The HydroCAD model and the plan call outs indicate a total of 192 chambers in infiltration system "1P". It appears there are 191 chambers as (1) chamber appears to have been removed for the inlet of the CB in the northeast corner of the proposed parking area. TEC recommends this CB be directed the system manifold DMH in the northeast corner of the system, allowing for 192 total chambers.

Response: The revised plans redirect the outlet pipe from this CB to the infiltration system manifold as recommended. Due to the site light pole (see Comment 17), the system will have 191 chambers instead of 192. The updated HydroCAD analysis being prepared will account for this reduction on 1 infiltration chamber.

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

TEC provides the following comments in relation to Standard 3:

a) Per the plan call out for infiltration system "1P", the bottom of the system is 2' above seasonal high groundwater. The system is also used proposed for peak flow attenuation for storms greater than and equal to the 10-year storm, therefore a mounding analysis should be provided.

Response: A Mounding Analysis has been completed and is submitted herewith.

b) As mentioned prior, additional test pits should be conducted within the footprint of infiltration systems.

Response: A note has been added to the plans requiring additional soil testing in the areas of the proposed stormwater infiltration systems prior to preparation of Building Permit Plans.

c) The checklist indicates that runoff from all impervious areas at the site discharges to infiltration BMPs. There are areas (sidewalks to the north, east, and south of the building; a portion of the driveway draining to Boston Street) which are not conveyed to the proposed infiltration systems. The checklist should be revised.

Response: We have revised the recharge calculations, please refer to the updated Stormwater Report submitted herewith.

d) It appears that required recharge volumes are met.

Response: We concur with TEC' s finding.

33. Standard 4 (80% TSS removal): Stormwater management systems must be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

TEC provides the following comments in relation to Standard 4:

a) It appears that required water quality volumes are met for the (2) infiltration systems.

Response: We concur with TEC' s finding.

b) As mentioned prior, there is a portion of the proposed driveway which discharges to Boston Street. This runoff is not captured and therefore is untreated. The water quality analysis should provide calculations showing that the site averages the required 80% TSS removal for all impervious areas requiring treatment.

Response: Updated TSS removal calculations have been prepared, please refer to the revised Stormwater Report submitted herewith.

c) The proposed parking area catch basin located in the southwest corner of the site is proposed as an inline structure. Per the Stormwater BMP Handbook, all deep sump catch basins should be off-line structures.

Response: The updated plans included herewith show a new drain manhole to take the subject area drain and catch basin off-line.

d) A Long-Term Pollution Prevention Plan should be provided per the stormwater checklist.

Response: A Long-Term Pollution Prevention Plan has been added to the stormwater report submitted herewith.

34. Standard 5 (Higher Potential Pollutant Loads): For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Standard does not apply to this proposed project. The checklist should be revised as it indicates the EPA NPDES MSGP covers the land use.

Response: We concur with TEC's finding.

35. Standard 6 (Critical Areas): Stormwater discharges to a Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or any other critical area require the use of the specific source control and pollution prevention measures and the specific stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A "stormwater discharge," as defined in 314 CMR 3.04(2)(a)1. or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to Zone I or Zone A are prohibited unless essential to the operation of the public water supply.

Standard does not apply to this proposed project.

Response: We concur with TEC's finding.

36. Standard 7 (Redevelopment). A redevelopment project is required to meet Standards 1-6 only to the maximum extent practicable. Remaining standards shall be met, and the project shall improve existing conditions.

Standard does not apply to this proposed project.

Response: We concur with TEC's finding.

37. Standard 8 (Erosion, Sediment Control): A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion,

sedimentation, and pollution prevention plan), must be developed, and implemented.

TEC provides the following comments in relation to the Standard 8:

a) No construction period pollution prevention and erosion and sediment control plan is provided with information as required per the stormwater checklist. The plan should also include any additional information as required by the Middleton local stormwater management regulations.

Response: A Preliminary Site Preparation & Demolition Plan showing erosion and sediment controls is included with this submittal.

b) No construction period controls are indicated on the plans.

Response: A Preliminary Site Preparation & Demolition Plan showing erosion and sediment controls is included with this submittal.

c) The project will be required to obtain coverage under the EPA NPDES CGP as it will disturb over an acre. This will require the development of a SWPPP as indicated on the stormwater checklist. If the project were to be approved, TEC recommends this be added as a condition of approval.

Response: We concur with TEC's finding.

38. Standard 9 (Operation and Maintenance): A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed.

Standard appears to be met. The operation and maintenance plan should be revised to indicate that local police and fire will also be notified of any potential spills per the Middleton local stormwater management regulations. Based on the Massachusetts Stormwater Handbook the operation and maintenance plan should include mosquito control for subsurface infiltration systems.

Response: The O&M Plan has been updated, please refer to the revised Stormwater Report.

39. Standard 10 (Illicit Discharges): All illicit discharges to the stormwater management system are prohibited.

Standard appears to be met. Measures for the prevention of illicit discharges are provided within the Long-Term Operation and Maintenance Plan. No illicit discharge compliance statement is provided, and the report indicates one will be provided prior to discharge of stormwater to post construction BMPs. If the project were to be approved, TEC recommends this be added as a condition of approval.

Response: We concur with TEC's suggestion.

HANCOCK
ASSOCIATES
Surveyors | Engineers | Scientists

Responses to the Traffic Impact Assessment comments were previously provided to the Board by VAI under separate cover.

We look forward to working with TEC and the Board as the process continues.

Sincerely,

Hancock Associates

Acting On Behalf of Villebridge Acquisitions LLC

Fred A. Keylor

Senior Project Manager

Description of Parameters

Length of field:

182 feet

Width of Field:

100 feet

Rate of application:

9,900 GPD over 18,200 s.f. area

9,900 gal = 1,324 c.f.

1,324 c.f. / 18,200 s.f. = 0.07 ft/day

Aquifer hydraulic conductivity:

148 ft/day is used, which is the average hydraulic conductivity of coarse sand per DEP guidelines and is corroborated by onsite soil testing and in-situ percolation testing at 3 min/inch.

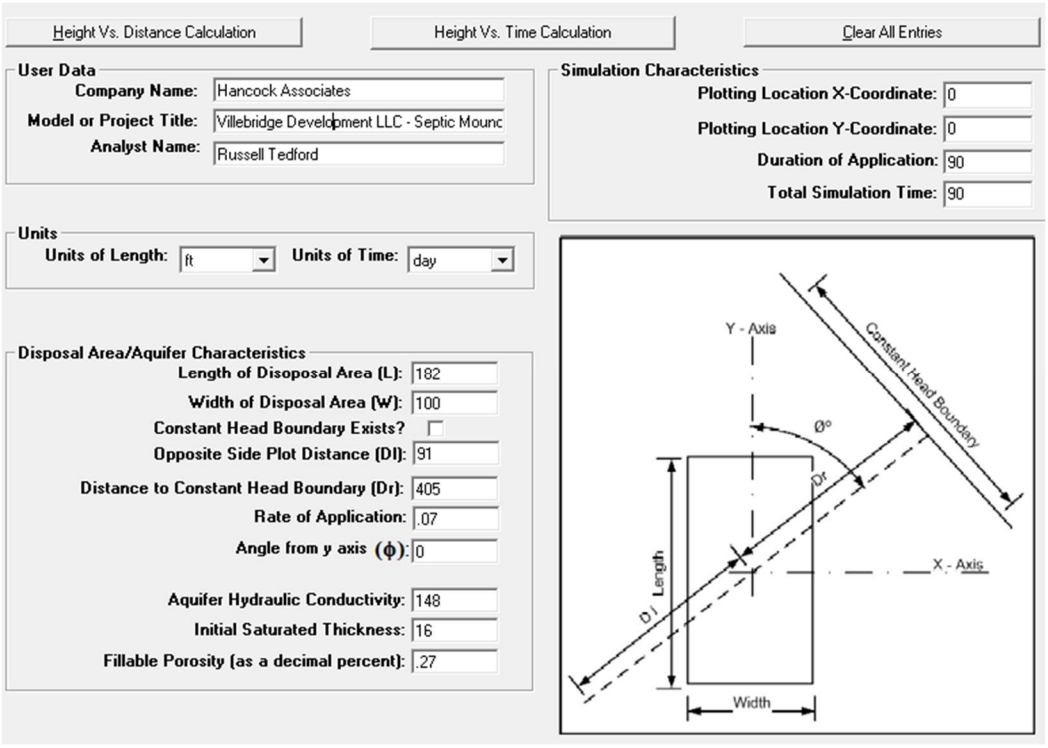
Fillable Porosity:

0.27 was used for coarse sand per DEP guidance.

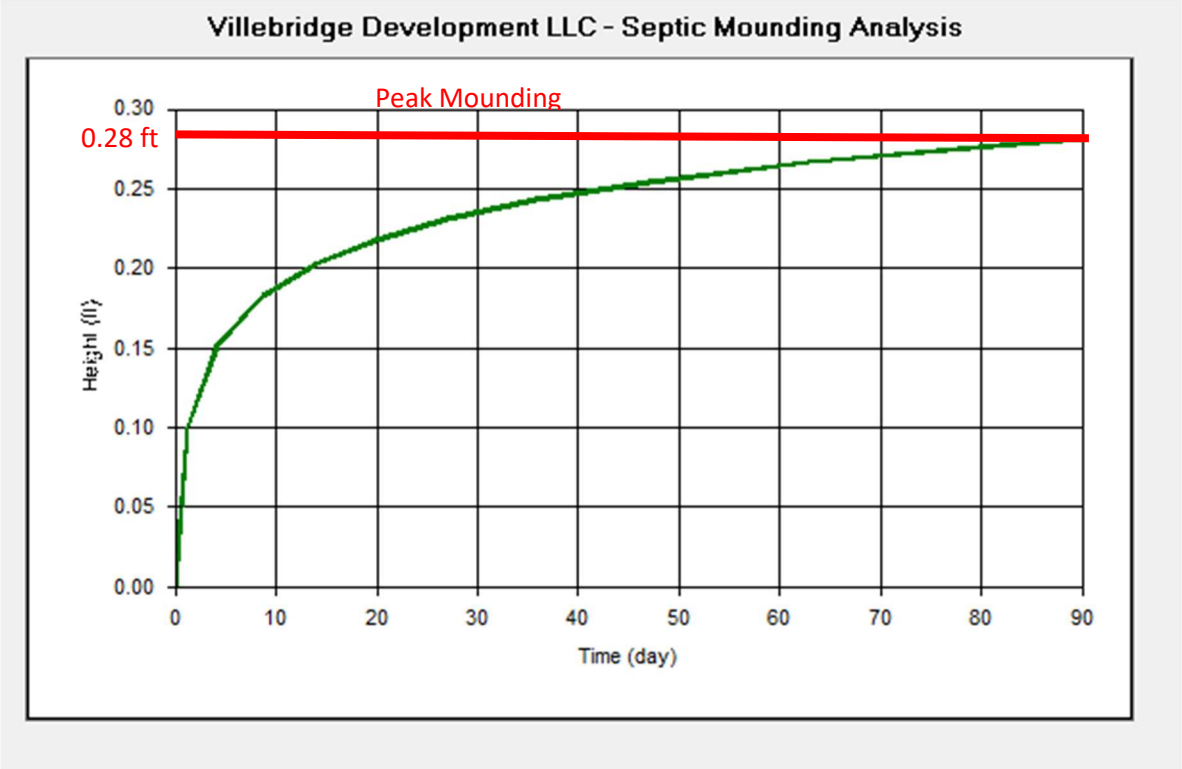
Initial Saturated Thickness:

Official soil testing in the vicinity of the leaching field had not found evidence of groundwater, so the bottom of the test pits was held as the design ESHGW at elevation of 96.0 in OSE-TP-2 which is in located within the footprint of the leaching field. OSE-TP-1 is also located within the footprint of the leaching field and was dug to a depth of 94.8. Both test pits were not dug to refusal and using boring data collected onsite bedrock was encountered at elevation 80.0. For this reasoning we are using a saturated thickness of 16 feet for this analysis.

Input:



Output:

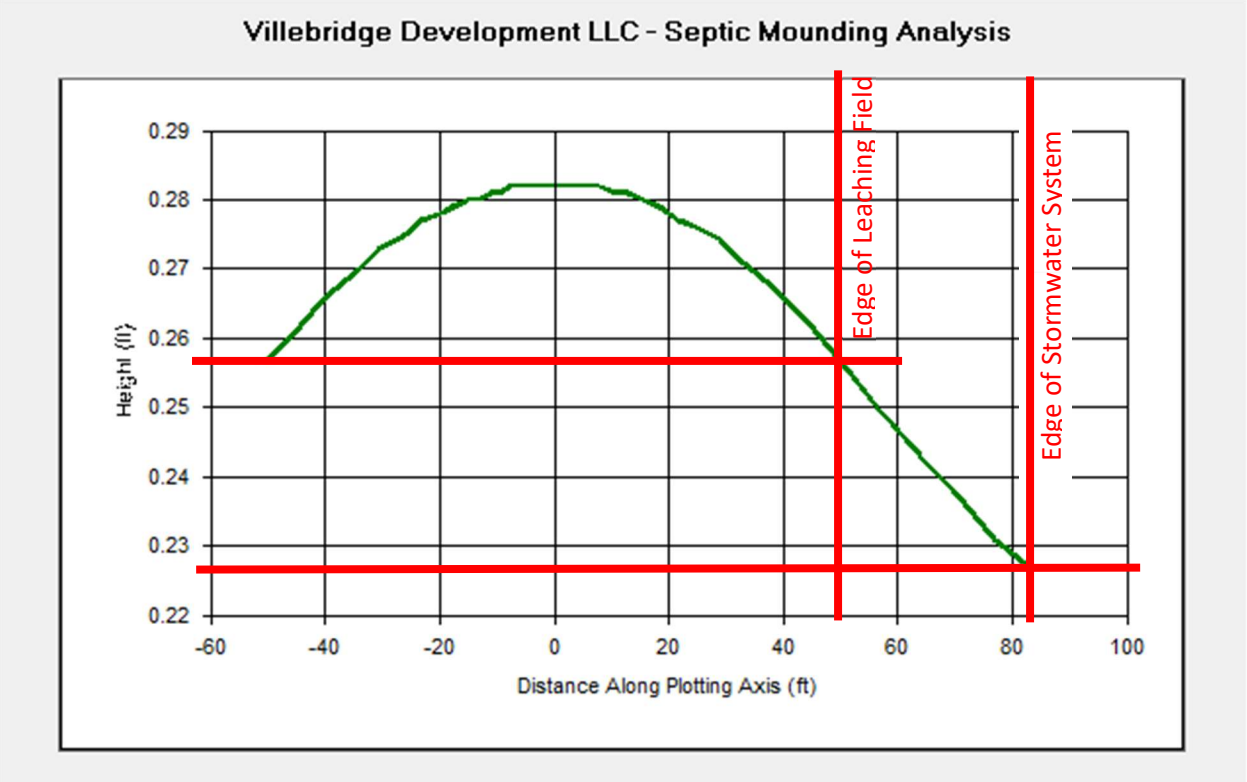


Conclusion:

Peak mounding beneath the system after 90-days of function (per DEP guidelines) is approximately 0.28 feet.

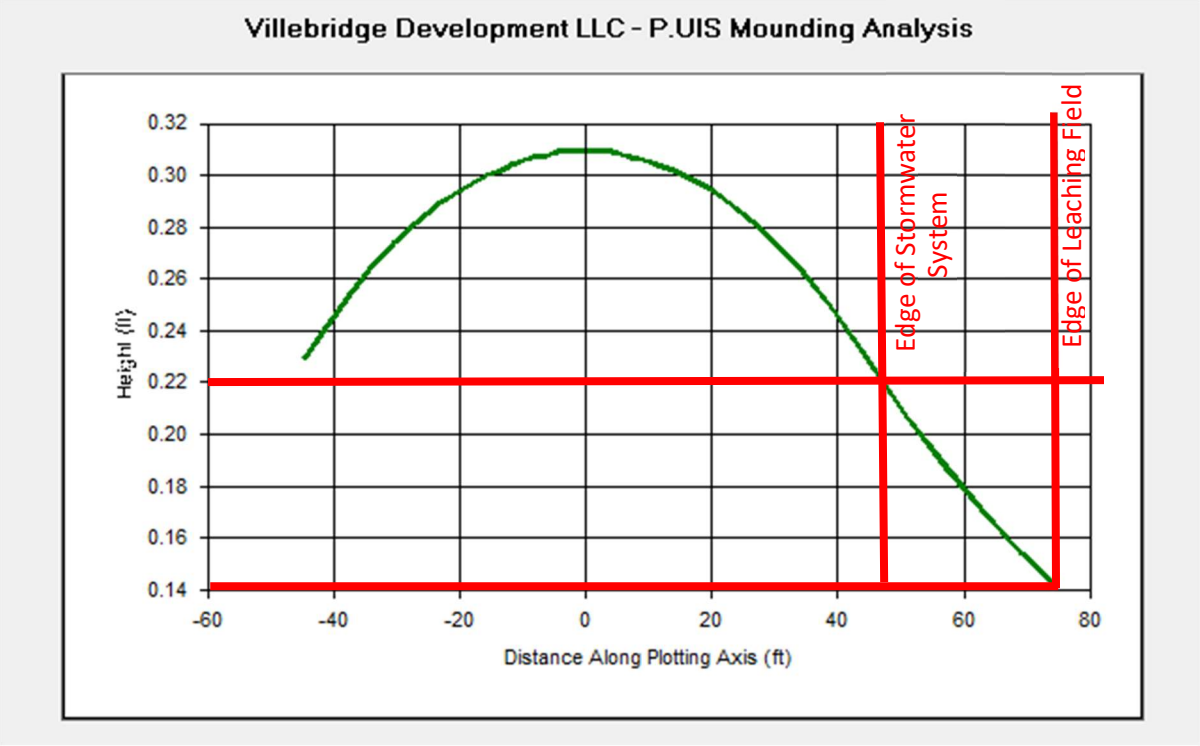
Additionally, the influence of the leaching field on the subsurface stormwater infiltration system and the southerly property line have been evaluated to observe the influence they have between one another.

As shown on the accompanying site plan, the leaching field is 29.8 feet northeast from the subsurface stormwater infiltration system. The input has been adjusted to plot the proposed height of the mound 80 feet from the center of the leaching field (50 feet from the center + 30 feet to the edge of the subsurface stormwater infiltration system). See graph below.



Peak mounding at the edge of the leaching field is shown as 0.26 feet and peak mounding at the edge of the subsurface stormwater infiltration system (P.UIS) caused by the septic leaching field is approximately 0.23 feet.

Analysis was done for P.UIS and how the two groundwater mounds relate and interact with one another. The graph is included here:



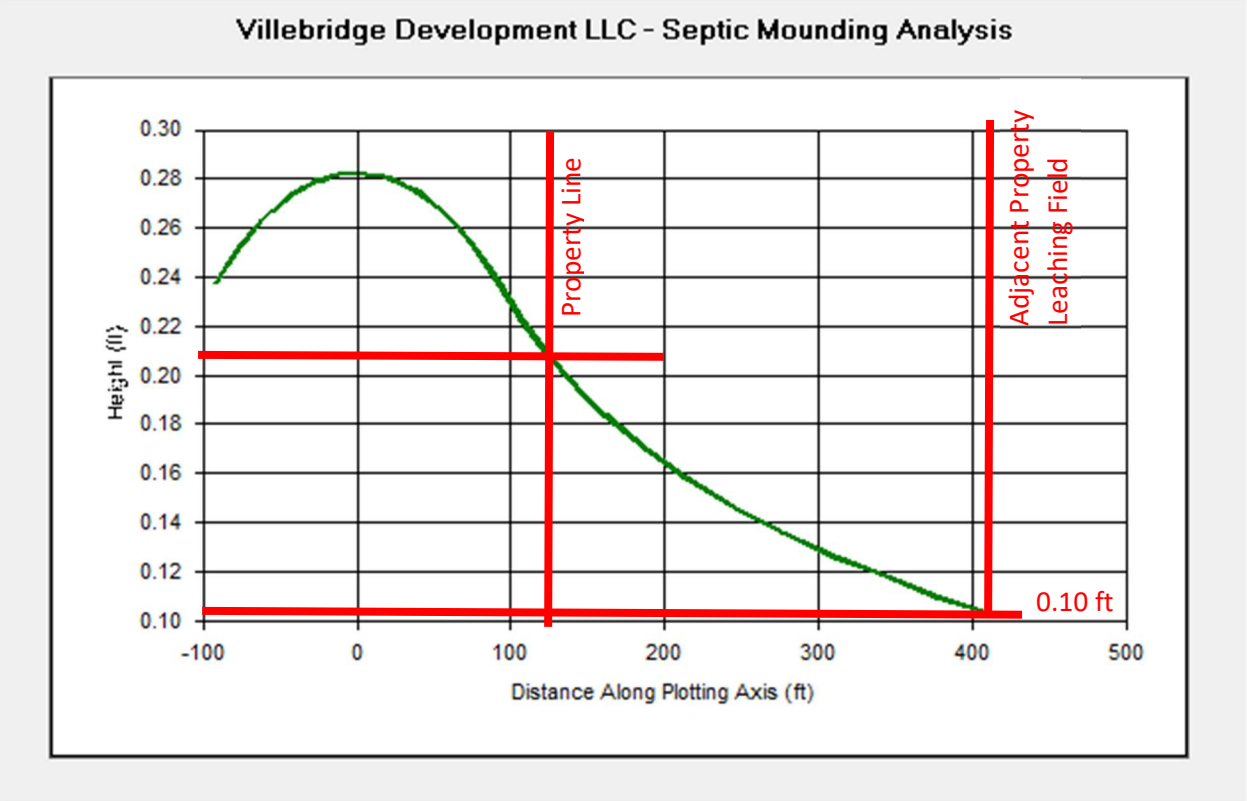
By combining the height of the mound produced at each point (Edge of Stormwater System & Edge of Leaching Field) through addition. The total height of the mound when analyzing both systems is as follows:

Edge of Leaching Field: 0.26 feet + 0.14 feet = 0.40 feet

Edge of Stormwater System: 0.23 feet + 0.22 feet = 0.45 feet

Given these results, the proposed leaching field will have to maintain an offset of 0.45 feet from the estimated seasonal high groundwater level to ensure that the required 4 foot offset is provided during peak mounding.

As shown on the accompanying site plan, the leaching field is 22.9 feet from the southerly property line. The input has been adjusted to plot the proposed height of the mound 114 feet from the center of the leaching field (91 feet from the center + 23 feet to the property line) and to the location of the adjacent property's leaching field, approximately 405 feet . See graph below.



The property in question is the Blue Haven Condominiums. Peak mounding at the property line caused by the septic leaching field is approximately 0.21 feet and at the leaching field is 0.10 feet. The height of this mound can be neglected, the mound produced by the proposed septic leaching field at the property line does not produce seepage or interfere with the leaching field, basement flooding issues, or adversely affect the groundwater levels of the Blue Haven Condominium development.

Boston Street

South Main Street

Rowell Lane

Monument Signage

Property Line, Typ.

Approx. Stormwater Infiltration System Extents

Pet Park

6' Height Solid Privacy Fence

Flowering Tree, Typ.

Resident Amenity Terrace
INCLUDING OUTDOOR KITCHEN, FIRE PIT AND RESIDENT FUNCTION SPACE

Deciduous Tree, Typ.

Proposed Residential Building

Proposed Retail

PROPOSED VARIABLE WIDTH UTILITY EASEMENT

Proposed Commercial

Property Line, Typ.

Approx. Subsurface Leach Field Extents

0 20 40 60 feet

SCALE: 1" = 20'

Base information provided electronically by:
Hancock Associates of Boston, MA

Hawk Design, Inc.
Landscape Architecture
Land Planning
Sagamore, MA
508-833-8800
info@hawkdesigninc.com

HAWK DESIGN, INC. 2023

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Date: 8/22/23

Revisions:

Num.	Date	Description
1.	11/9/23	Per peer review comments

10 Boston Street

Middleton, Massachusetts

Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

Illustrative Site Plan

Scale: 1" = 20'-0"

Sheet: **SK**

10 Boston Street

Middleton, Massachusetts

Landscape Permit Submission Set
Revision #1

LIST OF DRAWINGS:		Set Date
L1.1	Planting Plan	11/9/23
L2.1	Lighting Plan	11/9/23
L2.2	Lighting Specifications	11/9/23
LD1	Planting Specifications	11/9/23
LD2	Planting Details and Plant Schedule	11/9/23

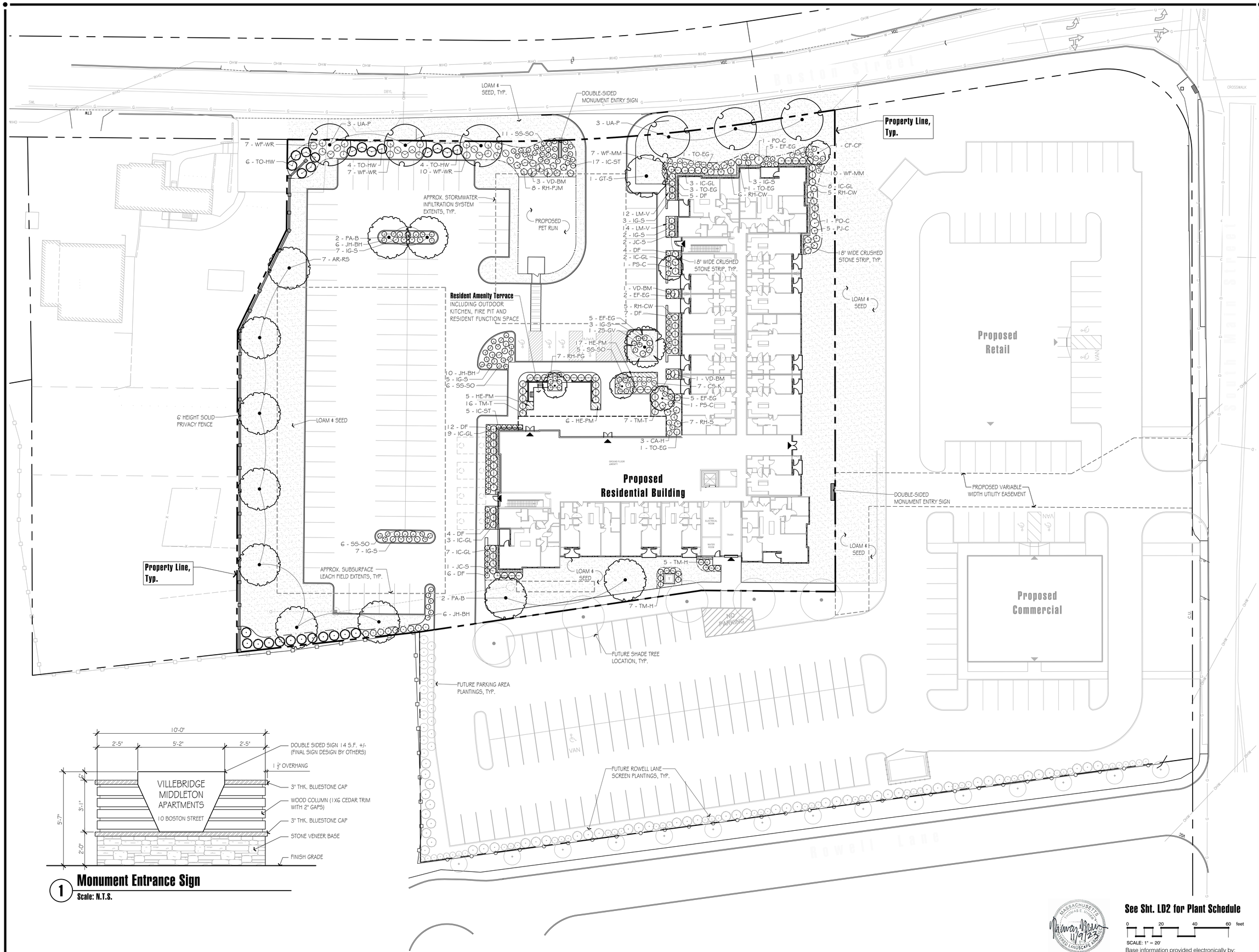
Owner / Applicant:
Villebridge Real Estate Development
1150 Great Plain Avenue #920056
Needham, MA 02492
Phone: 781-343-1239

Civil Engineer:
Hancock Associates
121 E. Berkley Street, 4th floor
Boston, MA 02118
Phone: 617-357-8145

Architect:
The Architectural Team
50 Commandants Way
Chelsea, MA 02150
Phone: 617-889-4402

Prepared By:

Hawk Design, Inc.
Landscape Architecture
Land Planning
Sagamore, MA
508-833-8800
info@hawkdesigninc.com



1 Monument Entrance Sign

Scale: N.T.S.

See Sht. LD2 for Plant Schedule

0 20 40 60 feet

SCALE: 1" = 20'

Base information provided electronically by: Hancock Associates of Boston, MA

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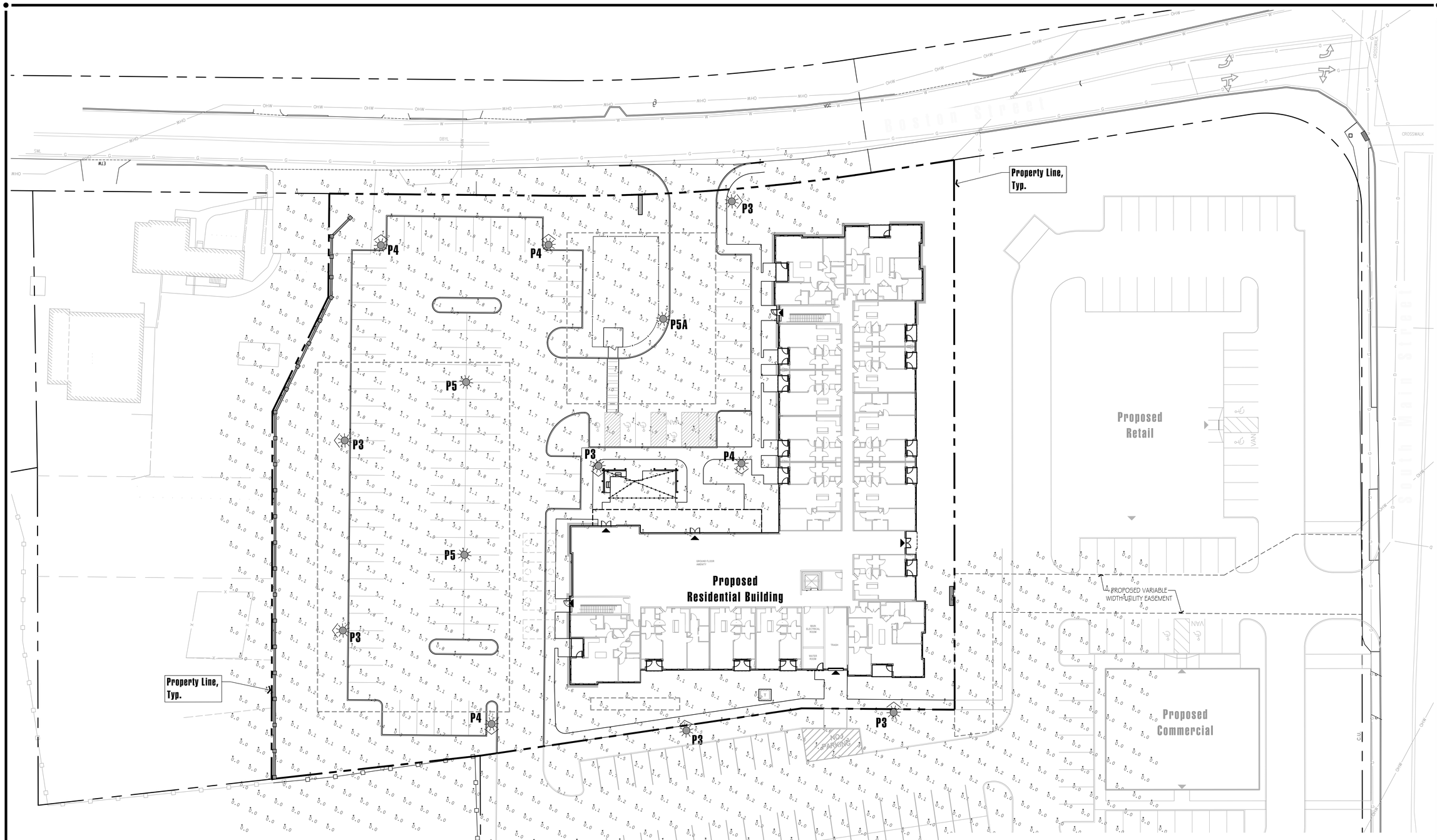
10 Boston Street
Middleton, Massachusetts
Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

Planting Plan

Scale: 1" = 20'-0"

Sheet: L1.1



Lighting Schedule

Symbol / Label	Qty	Label	Arrangement	LLF	Luminaire Lumens	Luminaire Watts
P4	4	ARIA LG 150W-3K-TYPE IV HSS ON 16' HT. POLE	Single	0.970	11378	167.8
P3	6	ARIA LG 150W-3K-TYPE III HSS ON 16' HT. POLE	Single	0.970	12148	168.1
P5	2	ARIA LG 150W-3K-TYPE V ON 13' HT. POLE W/ CONC PEDESTAL	Single	0.970	15648	167.9
P5A	1	ARIA LG 150W-3K-TYPE V ON 16' HT. POLE	Single	0.970		167.9
	115lf	BISTRO STRING LIGHTS				

Hawk Design, Inc.
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Date: 8/22/23

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10 Boston Street

Middleton, Massachusetts

Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

Lighting Plan

Scale: 1" = 20'-0"

Sheet: **L2.1**

MASSACHUSETTS LICENSED LANDSCAPE ARCHITECT 11/9/23

0 20 40 60 feet

SCALE: 1" = 20'

Base information provided electronically by: Hancock Associates of Boston, MA

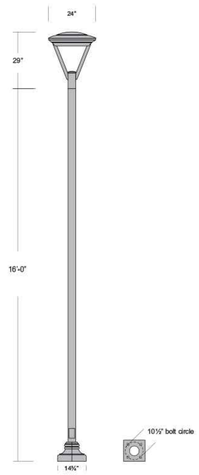
AREA LIGHTING | POLE MOUNT

PROJECT: VILLEBRIDGE MIDDLETON TYPE: P3

ARIA LG SERIES

FEATURES + BENEFITS

- Industry leading LED systems
- High efficiency & energy savings
- Environmentally friendly
- Reliable & low-maintenance
- 5-year limited warranty
- UL Listed electrical components
- Suitable for wet conditions



SPECIFICATIONS

LUMINAIRE: All aluminum construction

LIGHT SOURCE: 150W LED 3000K

DRIVER: Electronic LED Driver, 120V-277V, 480V Available. Dimming Leads Optional 0-10V

DIFFUSER: Injection molded lens

OPTICS: Type III

OPTIONS: House side shield.

ARM: N/A

POLE: 4" OD Straight round aluminum pole .125wall with decorative 2 pc base cover.

ANCHOR BOLTS: (4) ¾" x 24" x 3" hot dipped galvanized anchor bolts.

FINISH: Powder coat. Standard colors are Black, White, Dark Bronze, and Silver.
Custom Colors and RAL Colors Available. Consult Factory
All exposed hardware shall be stainless steel.

CATALOG # *ARIA LG-150W-3K-SMT-TYPE III-HSS/SRAP4-16-AB01-COLOR*

APPROVED BY _____ DATE : _____

ECHO LIGHTING, INC
Designers and Manufacturers of Outdoor Lighting
Ph.: +1-323-890-9008 Email: info@echoltg.com
5618 E. Washington Blvd. Commerce, CA 90040 www.echolighting.com

Post Mount Site Light Type P3

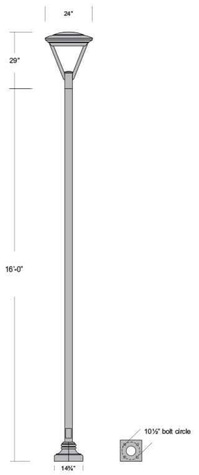
AREA LIGHTING | POLE MOUNT

PROJECT: VILLEBRIDGE MIDDLETON TYPE: P4

ARIA LG SERIES

FEATURES + BENEFITS

- Industry leading LED systems
- High efficiency & energy savings
- Environmentally friendly
- Reliable & low-maintenance
- 5-year limited warranty
- UL Listed electrical components
- Suitable for wet conditions



SPECIFICATIONS

LUMINAIRE: All aluminum construction

LIGHT SOURCE: 150W LED 3000K

DRIVER: Electronic LED Driver, 120V-277V, 480V Available. Dimming Leads Optional 0-10V

DIFFUSER: Injection molded lens

OPTICS: Type IV

OPTIONS: House side shield.

ARM: N/A

POLE: 4" OD Straight round aluminum pole .125wall with decorative 2 pc base cover.

ANCHOR BOLTS: (4) ¾" x 24" x 3" hot dipped galvanized anchor bolts.

FINISH: Powder coat. Standard colors are Black, White, Dark Bronze, and Silver.
Custom Colors and RAL Colors Available. Consult Factory
All exposed hardware shall be stainless steel.

CATALOG # *ARIA LG-150W-3K-SMT-TYPE IV-HSS/SRAP4-16-AB01-COLOR*

APPROVED BY _____ DATE : _____

ECHO LIGHTING, INC
Designers and Manufacturers of Outdoor Lighting
Ph.: +1-323-890-9008 Email: info@echoltg.com
5618 E. Washington Blvd. Commerce, CA 90040 www.echolighting.com

Post Mount Site Light Type P4

AREA LIGHTING | POLE MOUNT

PROJECT: VILLEBRIDGE MIDDLETON TYPE: P5 13FT

ARIA LG SERIES

FEATURES + BENEFITS

- Industry leading LED systems
- High efficiency & energy savings
- Environmentally friendly
- Reliable & low-maintenance
- 5-year limited warranty
- UL Listed electrical components
- Suitable for wet conditions



SPECIFICATIONS

LUMINAIRE: All aluminum construction

LIGHT SOURCE: 150W LED 3000K

DRIVER: Electronic LED Driver, 120V-277V, 480V Available. Dimming Leads Optional 0-10V

DIFFUSER: Injection molded lens

OPTICS: Type V

OPTIONS: N/A

ARM: N/A

POLE: 4" OD Straight round aluminum pole .125wall with decorative 2 pc base cover.

ANCHOR BOLTS: (4) ¾" x 24" x 3" hot dipped galvanized anchor bolts.

FINISH: Powder coat. Standard colors are Black, White, Dark Bronze, and Silver.
Custom Colors and RAL Colors Available. Consult Factory
All exposed hardware shall be stainless steel.

CATALOG # *NTW-150W-3K-SMT-TYPE V-/SRAP4-13-AB01-COLOR*

APPROVED BY _____ DATE : _____

ECHO LIGHTING, INC
Designers and Manufacturers of Outdoor Lighting
Ph.: +1-323-890-9008 Fax: +1-323-890-1981 Email: info@echoltg.com
5618 E. Washington Blvd. Commerce, CA 90040 www.echolighting.com

Post Mount Site Light Type P5

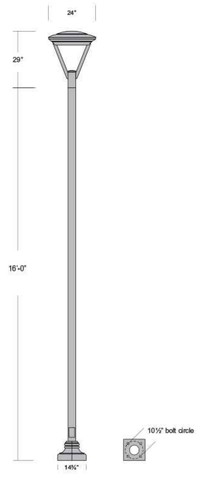
AREA LIGHTING | POLE MOUNT

PROJECT: VILLEBRIDGE MIDDLETON TYPE: P5 16 FT

ARIA LG SERIES

FEATURES + BENEFITS

- Industry leading LED systems
- High efficiency & energy savings
- Environmentally friendly
- Reliable & low-maintenance
- 5-year limited warranty
- UL Listed electrical components
- Suitable for wet conditions



SPECIFICATIONS

LUMINAIRE: All aluminum construction

LIGHT SOURCE: 150W LED 3000K

DRIVER: Electronic LED Driver, 120V-277V, 480V Available. Dimming Leads Optional 0-10V

DIFFUSER: Injection molded lens

OPTICS: Type V

OPTIONS: House side shield.

ARM: N/A

POLE: 4" OD Straight round aluminum pole .125wall with decorative 2 pc base cover.

ANCHOR BOLTS: (4) ¾" x 24" x 3" hot dipped galvanized anchor bolts.

FINISH: Powder coat. Standard colors are Black, White, Dark Bronze, and Silver.
Custom Colors and RAL Colors Available. Consult Factory
All exposed hardware shall be stainless steel.

CATALOG # *ARIA LG-150W-3K-SMT-TYPE V/SRAP4-16-AB01-COLOR*

APPROVED BY _____ DATE : _____

ECHO LIGHTING, INC
Designers and Manufacturers of Outdoor Lighting
Ph.: +1-323-890-9008 Email: info@echoltg.com
5618 E. Washington Blvd. Commerce, CA 90040 www.echolighting.com

Post Mount Site Light Type P5A

Base information provided electronically by:
Hancock Associates of Boston, MA

Hawk Design, Inc.
Landscape Architecture
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Sagamore, MA
508-833-8800
info@hawkdesigninc.com

HAWK DESIGN, INC. 2023

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Date: 8/22/23

Revisions:

Num.	Date	Description
1.	11/9/23	Per peer review comments

10 Boston Street
Middleton, Massachusetts
Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

Lighting Specifications

Scale: N/A

Sheet: L2.2

General Landscape Notes:

1.1) CONTRACTOR REQUIREMENTS:
A) ALL WORK SHALL COMPLY WITH APPLICABLE CODES AND REGULATIONS, FROM ALL FEDERAL, STATE AND LOCAL AUTHORITIES.

B) THE CONTRACTOR SHALL ARRANGE FOR AND OBTAIN ALL PERMITS AND LICENSES REQUIRED FOR THE COMPLETE WORK SPECIFIED HEREIN AND SHOWN ON ALL THE DRAWINGS. THE CONTRACTOR SHALL PAY FOR ANY FEES NOT WAIVED.

1.2) UTILITIES:
A) LANDSCAPE CONTRACTOR IS REQUIRED TO CONTACT THE RELEVANT UTILITY COMPANIES PRIOR TO DOING ANY EXCAVATION ON THE SITE. IF ANY WORK IS TO BE DONE AROUND UNDERGROUND UTILITIES, THE APPROPRIATE AUTHORITY OF THAT UTILITY MUST BE NOTIFIED OF THE IMPENDING WORK.

B) UTILITIES SHALL BE LOCATED AND MARKED PRIOR TO ANY INSTALLATION. ADJUSTMENTS MAY BE NECESSARY IN THE FIELD TO ACCOMMODATE UTILITY LOCATIONS. REPORT ANY CONFLICTS TO THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

C) THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES DONE TO EXISTING UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF SATISFACTORY REPAIR OF ALL DAMAGE IN KIND RESULTING FROM THEIR FAILURE TO COMPLY.

1.3) PROTECTION OF EXISTING WORK: IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM ALL WORK IN A MANNER THAT PROTECTS WORK COMPLETED BY OTHERS, SUCH AS CURBS, UTILITIES, STORM DRAINAGE, FENCES, DRIVEWAY APRONS, DRIVES, VEGETATION, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF SATISFACTORY REPAIR OF ALL DAMAGE IN KIND RESULTING FROM THEIR FAILURE TO COMPLY.

1.4) QUANTITIES: A COMPLETE LIST OF PLANTS INCLUDING A SCHEDULE OF QUANTITIES, SIZES, TYPES, AND NAMES IS INCLUDED IN THIS SET OF DRAWINGS. IN THE EVENT OF DISCREPANCIES BETWEEN QUANTITIES OF PLANT IN THE PLANT LIST AND THE QUANTITIES SHOWN ON THE DRAWINGS, THE PLAN SHALL GOVERN. THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT OF UNLABELED PLANTS IN PLAN FOR CLARIFICATION. THE LANDSCAPE ARCHITECT SHALL BE ALERTED BY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO FINAL BID NEGOTIATION.

1.5) APPLICABLE PLANT MATERIALS STANDARDS: ALL PLANT MATERIALS ARE TO COMPLY WITH THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK AS PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN. PLANTING METHODS WILL BE IN ACCORDANCE WITH SITE-SPECIFIC REQUIREMENTS.

1.6) PLANT HARDINESS: ALL TREES AND SHRUBS SHALL BE NURSERY GROWN WITHIN A USDA PLANT HARDINESS ZONE, WHICH IS THE SAME AS, OR COLDER THAN, THE ZONE IN WHICH THE PROJECT IS LOCATED.

1.7) PLANTING SEASONS: PLANTING SHALL ONLY OCCUR DURING SPECIFIED SEASONS. SPRING SEASON SHALL BE FROM MARCH 1 TO JUNE 15. FALL PLANTING SEASON SHALL BE FROM SEPTEMBER 15 THROUGH NOVEMBER 15. NO PLANTING SHALL OCCUR WHEN THE GROUND IS FROZEN.

1.8) PLANT SUBSTITUTIONS: NO SUBSTITUTIONS OF PRODUCTS, PLANT TYPES OR SIZES SHALL BE MADE WITHOUT THE WRITTEN APPROVAL OF THE LANDSCAPE ARCHITECT. REQUESTS FOR SUBSTITUTION SHALL BE IN WRITING, AND SHALL STATE THE REASON FOR THE SUBSTITUTION REQUEST, THE SUGGESTED ALTERNATIVE AND THE CHANGES IN COST. REQUESTS FOR SUBSTITUTION IN PLANT MATERIALS SHALL STATE THE NAMES OF NURSERIES THAT HAVE BEEN UNABLE TO SUPPLY THE ORIGINALLY SPECIFIED MATERIAL.

1.9) THE LANDSCAPE ARCHITECT SHALL RESERVE THE RIGHT TO INSPECT ALL PLANT MATERIALS AT THE NURSERY, UPON SITE DELIVERY AND DURING INSTALLATION TO INSURE SPECIFICATIONS AND PROCEDURES ARE ADHERED TO.

1.10) MINIMUM SIZES: ALL PLANTS 3' OR GREATER IN HEIGHT OR SPREAD SHALL BE BALLED AND BURLAPPED. SIZES SPECIFIED IN THE PLANT LIST ARE MINIMUMS ON WHICH THE PLANTS ARE TO BE JUDGED.

1.11) DEAD PLANTS: DEAD PLANTS ARE TO BE REMOVED FROM THE SITE IMMEDIATELY, AND REPLACED WITH THE SAME PLANT & SIZE REGARDLESS OF SEASON, WEEKLY FROM THE JOB BY THE CONTRACTOR. THE CONTRACTOR SHALL MAINTAIN AN UPDATED COMPREHENSIVE LIST OF ALL DEAD MATERIALS REMOVED AND PRESENT A COPY OF THE LIST TO THE OWNER AND LANDSCAPE ARCHITECT AT THE END OF EVERY MONTH DURING THE CONTRACT PERIOD.

1.12) PLANT MATERIAL REMOVAL: NO EXISTING TREES SHALL BE REMOVED WITHOUT THE WRITTEN AUTHORIZATION FROM THE LANDSCAPE ARCHITECT EXCEPT WHERE NOTED ON THE PLANS. CONTRACTORS WHO REMOVE EXISTING TREES WITHOUT WRITTEN APPROVAL WILL BE REQUIRED TO MAKE REMEDIES DETERMINED BY THE GOVERNING URBAN FORESTER OR EQUIVALENT AUTHORITY. NO GRUBBING SHALL OCCUR WITHIN EXISTING TREE AREAS UNLESS SPECIFICALLY NOTED ON THE PLANS.

1.13) ALL DISTURBED AREAS NOT TO RECEIVE PLANT MATERIALS ARE TO BE LOAMED AND SEEDED AND BLENDED INTO EXISTING GRADE AND CONDITIONS. SEE SECTION 4.0.

1.14) LEDGE BOULDERS: IF DURING SITE EXCAVATION, LEDGE BOULDERS ARE AVAILABLE, THESE ARE TO BE STOCKPILED FOR USE IN EARTH BERMS IF APPLICABLE, WITH HAWK DESIGN, INC. PRIOR TO INSTALLATION. THIS ITEM WILL ONLY APPLY IF SO SPECIFIED ON DRAWINGS. BOULDERS SIZES TO BE STOCKPILED WILL RANGE FROM TWO TO FIVE FEET IN DIAMETER. SEE APPROPRIATE DETAIL FOR INSTALLATION COORDINATION.

1.15) SLEEVES: LANDSCAPE OR SITE CONTRACTOR SHALL PLACE INDIVIDUAL SLEEVES FOR LIGHTING AND IRRIGATION UNDER ANY PROPOSED WALKWAY OR VEHICULAR ROADWAY PRIOR TO INSTALLATION. COORDINATE SLEEVE LOCATIONS WITH IRRIGATION AND LIGHTING CONTRACTORS PRIOR TO INSTALLATION.

1.16) DO NOT CLOSE OR OBSTRUCT ANY STREET, SIDEWALK, ALLEY OR PASSAGEWAY WITHOUT PRIOR NOTIFICATION AND PERMISSION. CONDUCT OPERATIONS AS TO INTERFERE AS LITTLE AS POSSIBLE WITH THE USE ORDINARILY MADE OF ROADS, DRIVEWAYS, ALLEYS, SIDEWALKS OR OTHER FACILITIES NEAR ENOUGH TO THE WORK TO BE EFFECTED THEREBY.

Planting Materials:

2.1 PLANTING MATERIAL ITEMS IN SECTION 2.0 ARE TO BE INCORPORATED DURING PLANT INSTALLATION UNLESS OTHERWISE DEEMED UNNECESSARY IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS. SEE SECTION 3.1.

MULCH - MULCH WILL BE DOUBLE-SHREDDED PINE BARK MULCH.
- TREES AND SHRUBS SHALL RECEIVE AN EVEN 3" MULCH LAYER.
- GROUNDCOVERS, PERENNIALS AND ANNUALS SHALL RECEIVE AN EVEN 2" MULCH LAYER.

MANURE- TO BE WELL ROTTED, ODORLESS, UNLEACHED COW MANURE, CONTAINING NOT MORE THAN 15% BEDDED MATERIALS SUCH AS STRAW, WOOD CHIPS OR SHAVINGS, AGED NOT LESS THAN TWO YEARS OLD.

HERBICIDE- A PRE-EMERGENCE WEED KILLER IS TO BE USED ON ALL LAWN AND PLANTING AREAS PRIOR TO INSTALLATION AS PER MANUFACTURER'S SPECIFICATIONS. *HERBICIDES ARE NOT TO BE APPLIED IN RESTRICTED CONSERVATION AREAS.

FERTILIZER- ALL TREES AND SHRUBS TO HAVE SLOW RELEASE PACKET OR PELLET PLACED INTO THE PLANT PIT WITH A MINIMUM ANALYSIS OF 10-10-10. ALL GROUNDCOVERS, PERENNIALS AND ANNUALS ARE TO RECIEVE A BROADCAST APPLICATION OF A 14-14-14 FERTILIZER AT 3 LB PR 100 SQ. FT. APPLY AS PER MANUFACTURER'S INSTRUCTIONS. *FERTILIZERS ARE NOT TO BE APPLIED IN RESTRICTED CONSERVATION AREAS.

TOPSOIL- ACCEPTABLE TOPSOIL SHALL BE FERTILE, FRIABLE NATURAL LOAM, UNIFORM IN COMPOSITION, FREE OF STONES, LIMBS, PLANTS AND THIER ROOTS, DEBRIS AND OTHER EXTRANEOUS MATTER OVER ONE INCH IN DIAMETER. THE SOIL SHALL BE CAPABLE OF SUSTAINED PLANT GROWTH AND HAVE A 5% MINIMUM ORGANIC CONTENT. IN SITUATIONS WHICH REQUIRE A CUSTOM TOPSOIL OR STRUCTURAL SOIL, THE SOIL MIXTURE SPECIFICATION WILL BE PROVIDED BY THE LANDSCAPE ARCHITECT.

SOIL AMENDMENTS: APPLY AS NECESSARY ACCORDING TO SOIL TEST RESULTS, AS PER MANUFACTURES SPECIFICATIONS.

ANTI-DESICCANT- "WILT PRUF" NCF OR EQUAL APPLY AS PER MANUFACTURERS' SPECIFICATIONS.

Plant Installation:

3.1) SOIL TESTING: LANDSCAPE CONTRACTOR SHALL PROVIDE A CERTIFIED SOIL ANALYSIS PRIOR TO ANY PLANT INSTALLATION TO DETERMINE ANY NECESSARY AMENDMENTS TO THE EXISTING SOIL CONDITIONS FOR SEEDING AND PLANTING. THE ANALYSIS WILL ALSO BE REQUIRED FOR ESTABLISHING THE FERTILIZER PROGRAM REQUIRED. COORDINATE RESULTS AND PROVIDE WRITTEN RECOMMENDATIONS TO HAWK DESIGN, INC. 15 DAYS PRIOR TO INSTALLATION.

3.2) ALL PLANTS SHALL BE TRANSPORTED TO THE SITE IN COVERED TRUCKS, TARPAULIN COVERS SHALL BE UTILIZED TO PREVENT WIND DAMAGE OF LOAD.

3.3) DELIVER PLANT MATERIALS IMMEDIATELY PRIOR TO PLACEMENT. KEEP PLANT MATERIALS MOIST. DO NOT STORE PLANT MATERIAL ON PAVED AREAS. ROOTS OR BALLS SHALL BE PROTECTED FROM THE SUN OR DRYING WINDS. AS REQUIRED BY TEMPERATURE OR WIND CONDITIONS, APPLY ANTI-DESICCANT EMULSION TO PREVENT DRYING OUT OF PLANT MATERIALS.

3.4) CONDITIONS FOR PLANT REJECTION:
A) REJECT PLANTS WHEN BALL OF EARTH SURROUNDING ROOTS HAS BEEN CRACKED OR BROKEN PREPARATORY TO OR DURING THE PROCESS OF PLANTING.

B) WHEN BURLAP, STAVES AND ROPES REQUIRED IN CONNECTION WITH TRANSPLANTING HAVE BEEN DISPLACED PRIOR TO ACCEPTANCE.

C) WIND DAMAGED PLANT MATERIAL FROM POOR TARPAULIN COVER PROCEDURES ARE SUBJECT TO REJECTION.

3.5) ALL PLANT MATERIAL, WHICH CANNOT BE PLANTED IMMEDIATELY ON DELIVERY, SHALL BE SET ON THE GROUND IN A SHADED LOCATION AND SHALL BE TEMPORARILY PROTECTED WITH SOIL OR OTHER ACCEPTABLE MATERIAL. TEMPORARY WATERING OR IRRIGATION SHALL BE INCORPORATED AND REGULARLY CONDUCTED ON PLANTINGS IN HOLD AREAS.

3.6) IN CASE OF CONFLICTS DURING CONSTRUCTION WITH UTILITIES, ROCK MATERIALS, TREE ROOTS OR OTHER OBSTRUCTIONS FOR THE EXCAVATION OF SHRUB BEDS AND TREE PITS. CONTACT LANDSCAPE ARCHITECT FOR APPROVED ALTERNATE LOCATIONS.

3.7) SOIL PERMABILITY: TEST DRAINAGE OF PLANTING BEDS AND PITS BY FILLING WITH WATER TWICE IN SUCCESSION. CONDITIONS PERMITTING THE RETENTION OF WATER FOR MORE THAN 24 HOURS SHALL BE BROUGHT TO THE ATTENTION OF THE LANDSCAPE ARCHITECT.

3.8) SOIL EXCAVATIONS:
A) EXCAVATE TREE PITS AND SHRUB BEDS TO DEPTHS REQUIRED BY PLANTING DETAILS. ALL PITS SHALL BE CIRCULAR IN OUTLINE, EXCEPT FOR WHOLE BEDS. SEE APPROPRIATE PLANTNG DETAILS.

B) SOIL EXCAVATIONS FOR BALLED & BURLAP AND CONTAINER PLANTINGS MUST BE NO LESS THAN 2X ROOT BALL DIAMETER, SEE PLANTING DETAILS. IF QUESTIONABLE SUBSURFACE SOIL CONDITIONS EXIST SUCH AS POOR DRAINAGE CONDITIONS, RUBBLE OR OBSTRUCTIONS, REPORT TO THE LANDSCAPE ARCHITECT AND CONSTRUCTION MANAGER BEFORE PLANTING.

3.9) GRADING:
A) VERIFY GRADES PRIOR TO PLANTING, THE CONTRACTOR SHALL VERIFY THAT CONSTRUCTED GRADES ARE AS INDICATED ON PLANS. THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT IF ADJUSTMENTS TO PLANT PLACEMENT MAY BE REQUIRED DUE TO FIELD CONDITIONS AND FINAL GRADING.

B) POSITIVE DRAINAGE SHALL BE MAINTAINED AWAY FROM AND AROUND BUILDINGS (REFER TO ENGINEERS GRADING PLANS). REPORT ANY CONFLICTS TO HAWK DESIGN, INC. PRIOR TO INSTALLATION.

C) FINISH GRADE OF PLANTINGS SHALL BE EQUIVALENT TO FORMER EXISTING GRADE OF PLANT IN THE NURSERY.

3.10) BALLED AND BURLAPED (B&B) MATERIALS:
A) CUT WIRE BASKETS ONCE IN THE PLANT PIT AND PEEL WIRE BACK.

B) TAGS AND TWINE ARE TO BE REMOVED AND BURLAP IS TO BE ROLLED BACK ONE-THIRD ON ALL B&B PLANT MATERIAL. ANY SYNTHETIC BURLAP SHALL BE COMPLETELY REMOVED FROM ANY PLANT MATERIAL

Plant Installation Cont'd

3.11) CONTAINER GROWN STOCK: SHALL BE REMOVED FROM CONTAINER BY CUTTING CONTAINER AWAY TO AVOID ROOT DAMAGE TO PLANT ROOT SYSTEM. IF PLANT ROOT IS BOUND, SLICE ROOT BALLS APPROXIMATELY 2" DEEP WITH KNIFE OR SHARP SPADE.

3.12) DO NOT USE MUDDY OR FROZEN SOIL TO BACKFILL PLANTINGS.

3.13) WATERING: THOROUGHLY WATER UNTIL SOIL IS SATURATED AROUND ALL TREES AND SHRUBS AFTER PLANTING AND THROUGHOUT THE TIME PERIOD UNTIL FINAL ACCEPTANCE FROM CLIENT. DURING DRY CONDITIONS, WATER AS REQUIRED TO MAINTAIN PLANTS IN A WILT-FREE CONDITION.

3.14) PRUNING: TREES SHALL BE PRUNED TO BALANCE TOP GROWTH WITH ROOTS AND TO PRESERVE THEIR NATURAL CHARACTER AND TYPICAL GROWTH HABIT. PRUNING SHALL BE RESTRICTED IN GENERAL TO THE SECONDARY BRANCHES AND SUCKER GROWTH. ALL CUTS TO BE FLUSH WITH TRUNK. DO NOT CUT A LEADER. THE LANDSCAPE ARCHITECT WILL REJECT ALL PLANTS DISFIGURED BY POOR PRUNING PRACTICES. ALL PRUNING CUTS SHALL REMAIN UNPAINTED.

3.15) STAKING AND GUYING: ALL TREES TO BE STAKED AND GUYED WITHIN 48 HOURS OF PLANTING. METHODS AND MATERIALS FOR STAKING AND GUYING ARE ILLUSTRATED IN INDIVIDUAL PLANTING DETAILS. NEATLY FLAG ALL GUY WIRES WITH ROT RESISTANCE YELLOW TREE MARKING RIBBON.

3.16) STAKE OUT PLANT LOCATIONS: PRIOR TO PLANTING THE CONTRACTOR SHALL LAYOUT THE EXTENT OF THE PLANT BEDS AND PROPOSED LOCATIONS FOR B&B PLANTS FOR REVIEW BY THE OWNER AND LANDSCAPE ARCHITECT.

3.17) PLANTING FIELD ADJUSTMENTS:
A) THE CONTACTOR IS TO SLIGHTLY ADJUST PLANT LOCATIONS IN THE FIELD AS NECESSARY TO BE CLEAR OF DRAINAGE SWALES AND UTILITES.

B) LARGE GROWING PLANTS ARE NOT TO BE PLANTED IN FRONT OF WINDOWS OR UNDER BUILDING OVERHANGS. NOTIFY THE LANDSCAPE ARCHITECT OF DISCREPANCIES IN PLANTING PLAN VS. FIELD CONDITIONS.

C) SHRUBS PLANTED NEAR HVAC UNITS ARE TO BE LOCATED SO THAT SHRUBS AT MATURITY WILL MAINTAIN ONE FOOT (1') AIRSPACE BETWEEN THE UNIT AND THE PLANT. ANY PLANTING SHOWN ADJACENT TO CONDENSER UNITS SHALL BE PLANTED TO SCREEN THE UNITS. SHOULD THE CONDENSER UNITS BE INSTALLED IN LOCATIONS DIFFERENT FROM THOSE SHOWN ON THE PLAN, IT WILL BE THE CONTRACTORS RESPONSIBILITY TO NOTIFY THE LANDSCAPE ARCHITECT AND INSTALL THE MATERIAL AROUND THE CONDENSERS AND ADJUST THE OTHER PLANTING ACCORDINGLY.

3.18) PLANT BED EDGES/LINES: GROUPS OF SHRUBS, PERENNIALS AND GROUNDCOVERS SHALL BE PLACED IN A CONTINUOUS MULCH BED WITH SMOOTH CONTINUOUS LINES. ALL MULCHED BED EDGES SHALL BE CURVILINEAR IN SHAPE, FOLLOWING THE CONTOUR OF THE PLANT MASS. TREES LOCATED WITHIN 4 FEET OF PLANT BEDS SHALL SHARE THE SAME MULCH BEDS.

3.19) A.D.A. - THE AMERICAN WITH DISABILITIES ACT STANDARDS REQUIRE THAT A 7 FOOT VERTICAL CLEARANCE BE MAINTAINED FROM TREE BRANCHES TO FINISHED GRADE WHERE PEDESTRIANS SIDEWALKS AND/OR TRAILS ARE LOCATED. THE CONTRACTOR IS TO ADJUST TREE PLANTINGS IN FIELD TO SLIGHTLY MINIMIZE BRANCH OVERHANG AND COMPLY WITH THE A.D.A. ACT.

3.20) TREE SPACING MINIMUMS: TREES SHALL BE LOCATED A MINIMUM OF 4 FEET FROM RETAINING WALLS AND WALKS WITHIN THE PROJECT. IF A CONFLICT ARISES BETWEEN ACTUAL SIZE OF AREA AND PLANS, THE CONTRACTOR SHALL CONTACT THE LANDSCAPE ARCHITECT FOR RESOLUTION. FAILURE TO MAKE SUCH CONFLICTS KNOWN TO LANDSCAPE ARCHITECT WILL RESULT IN CONTRACTOR'S LIABILITY TO RELOCATE MATERIALS.

Seeding and Sodding:

4.1) SEEDING OF LAWN AREAS: GRASS SEED APPLICATION SHALL BE SPREAD AT THE RATE OF 5 LBS. PER 1,000 SQUARE FEET, SEEDING SHALL BE ACCOMPLISHED BY MEANS OF A HYDRO-SEEDING PROCESS.

4.2) WATERING OF SEEDED AREAS: 24 HOURS AFTER HYDRO SEEDING, THE CONTRACTOR SHALL WATER THE SEEDED AREA LIGHTLY AND SUFFICIENTLY TO A DEPTH OF TWO INCHES (2") 2 TIMES A DAY (BETWEEN THE HOURS OF 7 PM AND 7 AM), UNTIL THE SEEDS ARE ESTABLISHED.

4.3) SEEDED AREA PROTECTION: THE CONTRACTOR SHALL ERECT SUITABLE SIGNS AND BARRICADES NOTIFYING THE PUBLIC TO KEEP OFF THE SEEDED AREAS UNTIL WELL ESTABLISHED. ANY TRAFFIC DAMAGE AND VANDALISM THAT MAY OCCUR PRIOR TO FINAL ACCEPTANCE OF THE WORK SHALL BE REPAIRED AND RESEEDED AT THE OWNERS EXPENSE. ANY DISTURBED OR DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED IN ACCORDANCE WITH THE SPECIFICATIONS AT THE CONTRACTOR'S EXPENSE.

4.4) LAYING OF SOD: A KENTUCKY BLUEGRASS SOD MIX - BY LOCAL SOURCE AS SELECTED BY CONTRACTOR, SHALL BE FRESHLY CUT FROM THE SAME FIELD WITH 1/2 -3/4 INCHES OF SOIL. SOD SHALL BE LAID IMMEDIATELY WITH ANY STORED SOD BEING UNROLLED GRASS SIDE UP AND KEPT WATERED. LAY COURSES TIGHTLY TOGETHER WITHOUT OVERLAPPING WITH THE JOINTS STAGGERED. AFTER SODDING IS COMPLETE, ROLL LIGHTLY. THE CONTRACTOR SHALL WATER THE SODDED AREAS TO A DEPTH OF AT LEAST SIX INCHES AFTER THE SODDING PROCESS. OWNER SHALL THEN BE RESPONSIBLE FOR WATERING. THE FREQUENCY SHALL BE DETERMINED BY RAIN FALL AND WINDS WITH THE UPPER TWO OR THREE INCHES OF SOIL NOT DRYING OUT MARKEDLY.

4.5) SODDED AREA: INSPECTION AND ACCEPTANCE: FOUR WEEKS AFTER CONTRACTOR COMPLETES INSTALLATION, LANDSCAPE ARCHITECT SHALL INSPECT THE LAWN TO DETERMINE THE ACCEPTABILITY OF THE INSTALLATION. SODDED AREAS FAILING TO SHOW ADEQUATE ROOTING INTO THE SUBSOIL, OVERLAPPING, COURSE SEPARATION, UNEVENNESS OF THE SURFACE, UNEVEN COURSE COLOR AND EXCESSIVE BROADLEAF WEED CONTENT SHALL BE REPLACED. THE COST SHALL BE BORNE BY THE CONTRACTOR EXCEPT WHERE VANDALISM OR NEGLECT ON THE PART OF OTHERS NOT UNDER THE CONTRACTORS CONTROL HAS RESULTED IN DAMAGE.

4.6) FINAL APPROVAL: SEEDED AND SODDED AREAS WILL RECEIVE FINAL APPROVAL IF COVERAGE IS FULL AND CONSISTENT, FREE OF BARE SPOTS AND WEED FREE. WHEN GRASS IS CUT AT 2" HEIGHT NO SOIL SHOULD BE VISIBLE. SOD AREAS MUST HAVE RECEIVED A MINIMUM OF TWO MOWINGS. AREAS SODDED AFTER NOVEMBER 1ST WILL BE ACCEPTED THE FOLLOWING SPRING - ONE MONTH AFTER THE START OF THE GROWING SEASON, IF THE ABOVE CRITERIA HAS BEEN MET.

Maintenance:

5.1) MAINTENANCE DURING INSTALLATION: MAINTENANCE OPERATIONS SHALL BEGIN IMMEDIATELY AFTER EACH PLANT IS PLANTED AND SHALL CONTINUE AS REQUIRED UNTIL FINAL ACCEPTANCE AND THEN FOR THE GUARANTEE PERIOD. PLANTS SHALL BE KEPT IN A HEALTHY, GROWING CONDITION BY WATERING, PRUNING, SPRAYING, WEEDING AND ANY OTHER NECESSARY OPERATIONS OF MAINTENANCE. PLANT SAUCERS AND BEDS SHALL BE KEPT FREE OF WEEDS, GRASS AND OTHER UNDESIRED VEGETATION. PLANTS SHALL BE INSPECTED AT LEAST ONCE PER WEEK BY THE CONTRACTOR DURING THE INSTALLATION PERIOD AND ANY NEEDED MAINTENANCE IS TO BE PERFORMED PROMPTLY.

5.2) GRASS AND WEED CONTROL: THE CONTRACTOR SHALL BE RESPONSIBLE FOR MOWING ALL GRASS AROUND LANDSCAPE BEDS AND INDIVIDUAL TREES AND SHRUBS UNTIL FINAL ACCEPTANCE. WEED CONTROL AREAS SHALL INCLUDE ALL LANDSCAPE BEDS AND THE AREA WITHIN 2 FEET OF THE OUTER EDGE OF THE MULCH AREA OR INDIVIDUAL TREE/SHRUBS.

5.3) THE CONTRACTOR SHALL WATER, FERTILIZE, WEED, CULTIVATE, REMULCH, SPRAY TO CONTROL INSECT INFESTATION AND DISEASE AND PERFORM ANY OTHER GOOD HORTICULTURAL PRACTICE NECESSARY TO MAINTAIN THE PLANTS IN A LIVING HEALTHY CONDITION UPON THE TIME FOR TERMINATION OF HIS RESPONSIBILITY FOR CARE AS SET OUT HEREIN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLANTS THROUGHOUT LIFE OF THE CONTRACT.

5.4) ALL PLANTS STOLEN, DAMAGED OR DESTROYED BY FIRE, AUTOMOBILES, VANDALISM OR ANY OTHER CAUSE, WITH THE EXCEPTION OF PLANTS DAMAGED OR DESTROYED BY THE OWNERS MAINTENANCE OPERATIONS, SHALL BE REPLACED BY THE OWNER PRIOR TO THE DATE OF FINAL ACCEPTANCE.

5.5) LANDSCAPE CONTRACTOR SHALL PREPARE MAINTENANCE SPECIFICATIONS AND SCHEDULE ANNUAL CARE OF ALL PLANTED AND LAWN AREAS INCLUDING FERTILIZING, WEEDING, MULCHING, BED EDGING, PRUNING AND PEST PREVENTION AND TREATMENT.

Plant Material Guarantee:

*CONTRACTOR SHALL GUARANTEE IN WRITING ALL PLANT MATERIAL AND LANDSCAPE IMPROVEMENTS FOR A PERIOD OF ONE YEAR. THE GUARANTEE IS TO INCLUDE THE FOLLOWING:

6.1) INSPECTIONS: PERFORM PERIODIC INSPECTIONS DURING GUARANTEE PERIOD WITH RESULTING WRITTEN REPORTS TO OWNER, PROJECT ADMINISTRATOR AND LANDSCAPE ARCHITECT STATING CONDITIONS AND RECOMMEND MAINTENANCE MODIFICATIONS. THE CONTRACTOR MUST CONTACT THE OWNER AND LANDSCAPE ARCHITECT AT LEAST 10 DAYS IN ADVANCE TO SCHEDULE ACCEPTANCE INSPECTION(S).

6.2) REMOVAL AND REPLACEMENT OF PLANTS PROVIDED BY CONTRACTOR TO BE DONE WITHIN THIRTY DAYS OF NOTIFICATION BY OWNER OF THEIR UNSATISFACTORY CONDITION DURING GROWING SEASONS. REPLACEMENT MATERIALS MUST BE EQUAL IN TYPE AND SIZE PER THE PROJECT'S PLANT LIST.

6.3) WHEN REPLACEMENT PLANT SPECIES IS EITHER NOT READILY AVAILABLE OR NO LONGER SUITABLE TO EXISTING SITE CONDITIONS WRITTEN NOTICE RECOMMENDATION OF SUBSTITUTION TO BE PROVIDED TO THE OWNER AND LANDSCAPE ARCHITECT WITHIN FIFTEEN DAYS FOR APPROVAL.

6.4) REMOVAL OF TREE'S SUPPORTS AND DEAD LIMBS PRIOR TO END OF GUARANTEE INSPECTION PERIOD.

6.5) CONTINUE WITH MAINTENANCE, SEE SECTION 5.0

6.6) GUARANTEE SHALL BEGIN UPON DATE OF FINAL ACCEPTANCE FROM OWNER AND WILL CONTINUE FOR ONE YEAR.

Site Cleanup:

7.1) SITE WORK CONDITIONS: EXCESS WASTE MATERIAL SHALL BE REMOVED DAILY WHEN PLANTING IN AN AREA HAS BEEN COMPLETED, THE AREA SHALL BE CLEARED OF ALL DEBRIS, SOIL PILES AND CONTAINERS DAILY. WHERE EXISTING GRASS AREAS HAVE BEEN DAMAGED OR SCARRED DURING PLANTING OPERATIONS, THE CONTRACTOR SHALL RESTORE DISTURBED AREAS TO THEIR ORIGINAL CONDITIONS AT HIS EXPENSE.

7.2) CLEAN PAVED AREAS UTILIZED FOR HAULING OR EQUIPMENT STORAGE AT END OF EACH WORKDAY.

7.3) MAINTAIN VEHICLES AND EQUIPMENT IN CLEAN CONDITION TO PREVENT SOILING OF ROADS, WALKS OR OTHER PAVED OR SURFACED AREAS.

7.4) REMOVE PROTECTIVE BARRIERS AND WARNING SIGNS AT TERMINATION OF LAWN ESTABLISHMENT.

Irrigation Notes:

8.1) ALL IRRIGATION SYSTEM COMPONENTS SHALL BE SUPPLIED BY REGIONALLY AUTHORIZED DISTRIBUTORS TO PROVIDE SINGLE SOURCE RESPONSIBILITY FOR WARRANTY SERVICE AND OPERATIONS TO CONFORM TO SPECIFICATIONS IN ALL RESPECTS.

8.2) THE CONTRACTOR IS TO SUBMIT PLANS PREPARED BY A IRRIGATION SPECIALIST TO THE LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO INSTALLATION.

8.3) ALL LINE VOLTAGE TO CONTROLLER AND ASSOCIATED BREAKER, CONDUIT ETC TO BE PERFORMED BY A LICENSED ELECTRICIAN.

8.4) ALL WIRES FOR RAIN SENSOR TO BE RUN IN SCHEDULE 40 PVC CONDUIT FOR APPLICATIONS IN EXPOSED AREAS UNLESS OTHERWISE DIRECTED BY THE LANDSCAPE ARCHITECT.

8.5) SLEEVES TO BE COORDINATED, LOCATED AND INSTALLED UNDER ALL HARDSCAPE FEATURES SUCH AS WALKS, WALLS AND DRIVEWAYS. THE CONTRACTOR IS TO IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT OF ALL CONFLICT AND DISCREPANCIES.

8.6) CONTRACTOR WILL REVIEW WITH CLIENT ALL IRRIGATION PROCEDURES AND PROCESSES (i.e. TIMERS, ZONES AND ALL OTHER ITEMS INVOLVED W/ THE IRRIGATION SYSTEM) AND PROVIDE NECESSARY DOCUMENTATION FOR OPERATION OF IRRIGATION SYSTEM.

8.7) THE CONTRACOR IS TO PROVIDE WIRES FOR FUTURE EXPANSION IN 16" DIAMETER VALVE BOX AS DIRECTED BY THE LANDSCAPE ARCHITECT OR CLIENT.

8.8) UNLESS INDICATED OTHERWISE, ALL PLANT BEDS ARE TO BE IRRIGATED WITH DRIP IRRIGATION, ALL LAWN AREAS TO BE IRRIGATED WITH SPRAY HEADS. MODELS/TYPES T..B.D. AND VERIFIED BY LANDSCAPE ARCHITECT AND IRRIGATION CONTRACTOR

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HAWK DESIGN, INC. 2023

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Date: 8/22/23

Revisions:

Num.	Date	Description
1.	11/9/23	Per peer review comments

10 Boston Street
Middleton, Massachusetts
Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

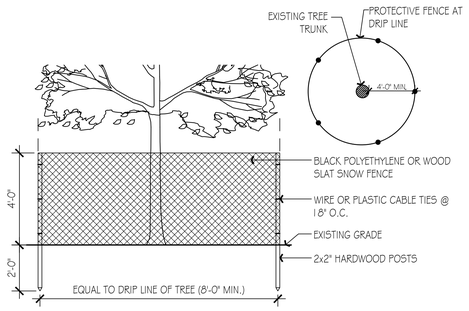
Planting Specifications

Scale: N/A

Sheet: LD1

MASSACHUSETTS
TIMOTHY E. CHESTNUT
11/9/23
REGISTERED LANDSCAPE ARCHITECT

Base information provided electronically by:
Hancock Associates of Boston, MA



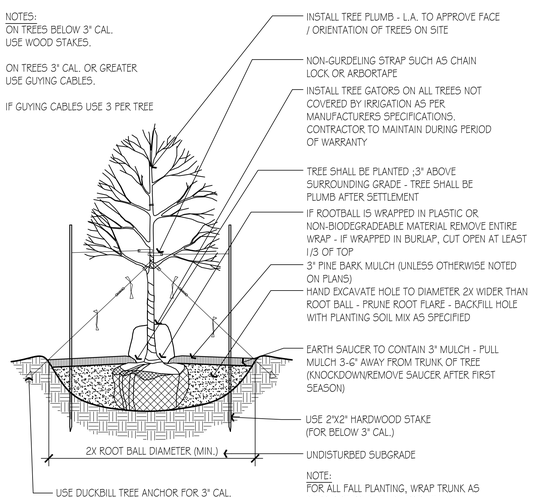
NOTES:
1. PROTECTIVE FENCE TO REMAIN UNTIL CONSTRUCTION IS COMPLETE.
2. NO TREE SHALL BE REMOVED UNLESS SPECIFICALLY TAGGED FOR REMOVAL BY THE LANDSCAPE ARCHITECT.
3. CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE TREES THAT ARE TO REMAIN.
4. DO NOT NAIL BOARDS OR FENCING TO TREES DURING CONSTRUCTION.
5. ANY EXCAVATING WITHIN DRIPLINE MUST BE APPROVED BY LANDSCAPE ARCHITECT AND MUST BE HAND-DUG. CONTRACTOR SHALL NOT CUT ANY ROOTS AND/OR BRANCHES UNLESS APPROVED BY LANDSCAPE ARCHITECT.
6. ROOTS EXPOSED AND/OR DAMAGED DURING GRADING & CONSTRUCTION OPERATIONS SHALL BE CUT OFF CLEANLY INSIDE THE EXPOSED OR DAMAGED AREA AND TOPSOIL BE PLACED OVER THE ROOTS IMMEDIATELY. FEEDER ROOTS SHALL NOT BE CUT IN AN AREA INSIDE DRIP LINE OF THE TREE BRANCHES.
7. ROOTS GREATER THAN 1" DIAMETER SHALL NOT BE CUT UNLESS OTHERWISE APPROVED BY THE LANDSCAPE ARCHITECT.
8. STOCKPILED MATERIALS OR UNNECESSARY VEHICULAR TRAFFIC SHALL NOT BE ALLOWED OVER ANY TREE ROOT SYSTEM.
9. INSPECT FENCE ON WEEKLY BASIS AND REPAIR DAMAGE IMMEDIATELY.

1 Tree Protection
Scale: N.T.S.

NOTES:
ON TREES BELOW 3" CAL.
USE WOOD STAKES.

ON TREES 3" CAL. OR GREATER
USE GUYING CABLES.

IF GUYING CABLES USE 3 PER TREE



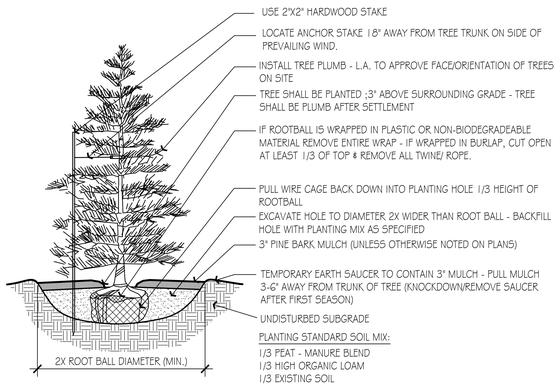
INSTALL TREE PLUMB - L.A. TO APPROVE FACE / ORIENTATION OF TREES ON SITE
NON-GURDELING STRAP SUCH AS CHAIN LOCK OR ARBORTAPE
INSTALL TREE GATORS ON ALL TREES NOT COVERED BY IRRIGATION AS PER MANUFACTURERS SPECIFICATIONS. CONTRACTOR TO MAINTAIN DURING PERIOD OF WARRANTY
TREE SHALL BE PLANTED 3" ABOVE SURROUNDING GRADE - TREE SHALL BE PLUMB AFTER SETTLEMENT
IF ROOTBALL IS WRAPPED IN PLASTIC OR NON-BIODEGRADEABLE MATERIAL REMOVE ENTIRE WRAP - IF WRAPPED IN BURLAP, CUT OPEN AT LEAST 1/3 OF TOP
3" PINE BARK MULCH (UNLESS OTHERWISE NOTED ON PLANS)
HAND EXCAVATE HOLE TO DIAMETER 2X WIDER THAN ROOT BALL - PRUNE ROOT FLARE - BACKFILL HOLE WITH PLANTING SOIL MIX AS SPECIFIED
EARTH SAUCER TO CONTAIN 3" MULCH - PULL MULCH 3-6" AWAY FROM TRUNK OF TREE (KNOCKDOWN/REMOVE SAUCER AFTER FIRST SEASON)
USE 2"X2" HARDWOOD STAKE (FOR BELOW 3" CAL.)
UNDISTURBED SUBGRADE
USE DUCKBILL TREE ANCHOR FOR 3" CAL. OR GREATER

NOTE:
FOR ALL FALL PLANTING, WRAP TRUNK AS SPECIFIED TO 2ND LOWEST BRANCH - REMOVE THE FOLLOWING SPRING

ALL TREES SHALL BE FLOODED TWICE DURING THE FIRST 24 HOURS AFTER PLANTING

PLANTING SOIL MIX:
1/3 PEAT - BLEND MANURE
1/3 HIGH ORGANIC LOAM
1/3 EX. SOIL

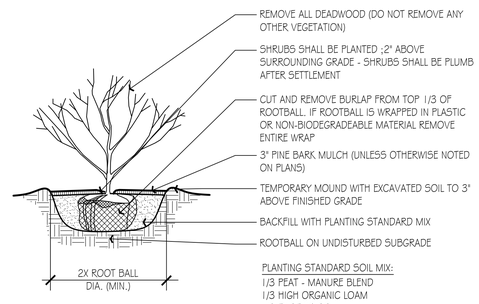
2 Deciduous Tree Planting
Scale: N.T.S.



USE 2"X2" HARDWOOD STAKE
LOCATE ANCHOR STAKE 18" AWAY FROM TREE TRUNK ON SIDE OF PREVAILING WIND.
INSTALL TREE PLUMB - L.A. TO APPROVE FACE/ORIENTATION OF TREES ON SITE
TREE SHALL BE PLANTED 3" ABOVE SURROUNDING GRADE - TREE SHALL BE PLUMB AFTER SETTLEMENT
IF ROOTBALL IS WRAPPED IN PLASTIC OR NON-BIODEGRADEABLE MATERIAL REMOVE ENTIRE WRAP - IF WRAPPED IN BURLAP, CUT OPEN AT LEAST 1/3 OF TOP & REMOVE ALL TWINE/ ROPE.
PULL WIRE CAGE BACK DOWN INTO PLANTING HOLE 1/3 HEIGHT OF ROOTBALL
EXCAVATE HOLE TO DIAMETER 2X WIDER THAN ROOT BALL - BACKFILL HOLE WITH PLANTING MIX AS SPECIFIED
3" PINE BARK MULCH (UNLESS OTHERWISE NOTED ON PLANS)
TEMPORARY EARTH SAUCER TO CONTAIN 3" MULCH - PULL MULCH 3-6" AWAY FROM TRUNK OF TREE (KNOCKDOWN/REMOVE SAUCER AFTER FIRST SEASON)
UNDISTURBED SUBGRADE

PLANTING STANDARD SOIL MIX:
1/3 PEAT - MANURE BLEND
1/3 HIGH ORGANIC LOAM
1/3 EXISTING SOIL

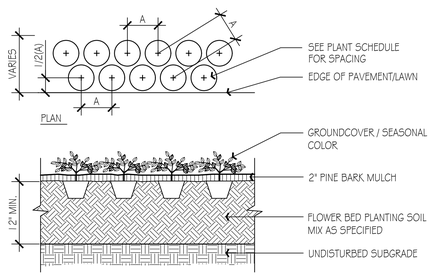
3 Coniferous Tree Planting
Scale: N.T.S.



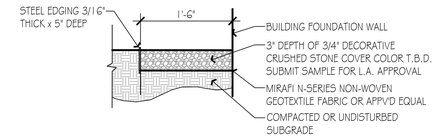
REMOVE ALL DEADWOOD (DO NOT REMOVE ANY OTHER VEGETATION)
SHRUBS SHALL BE PLANTED 2" ABOVE SURROUNDING GRADE - SHRUBS SHALL BE PLUMB AFTER SETTLEMENT
CUT AND REMOVE BURLAP FROM TOP 1/3 OF ROOTBALL. IF ROOTBALL IS WRAPPED IN PLASTIC OR NON-BIODEGRADEABLE MATERIAL REMOVE ENTIRE WRAP
3" PINE BARK MULCH (UNLESS OTHERWISE NOTED ON PLANS)
TEMPORARY MOUND WITH EXCAVATED SOIL TO 3" ABOVE FINISHED GRADE
BACKFILL WITH PLANTING STANDARD MIX
ROOTBALL ON UNDISTURBED SUBGRADE

PLANTING STANDARD SOIL MIX:
1/3 PEAT - MANURE BLEND
1/3 HIGH ORGANIC LOAM
1/3 EXISTING SOIL

4 Shrub Planting
Scale: N.T.S.



5 Perennial, Groundcover & Seasonal Color Planting
Scale: N.T.S.



6 Metal Edged Crushed Stone Fire Protection Strip
Scale: N.T.S.

SCHEDULE OF TOPSOILS & ADDITIVES

LOCATION	DEPTH	DESCRIPTION
GENERAL PLANTING BEDS	12"	1/3 PEAT - MANURE BLEND 1/3 HIGH ORGANIC LOAM 1/3 EXISTING SOIL
FLOWER BEDS	12"	SCREENED LOAM 1/3 PEAT - MANURE BLEND LIME - PELATIZED OR GROUND (50 LB. PER 100 SF.) GROUND BONE MEAL (50 LB. PER 100 SF.) 10-10-10 INORGANIC FERTILIZER (50 LB. PER 5000 SF.)
LAWNS - SOD & SEED	6"	6" SCREENED LOAM
PITS/TREE WELLS "STANDARD MIX" FOR BACKFILL	12"	1/3 PEAT - MANURE BLEND 1/3 HIGH ORGANIC LOAM 1/3 EXISTING SOIL

PLANT SCHEDULE

CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	CAL	PLANT SIZE
TREES						
AR-RS	7	Acer rubrum 'Red Sunset'	Red Sunset Red Maple	B & B	3-3.5" CAL.	
GT-S	1	Gleditsia triacanthos inermis 'Shademaster'	Shademaster Honey Locust	B & B	3-3.5" CAL.	
PA-B	4	Platanus x acerifolia 'Bloodgood'	Bloodgood London Plane Tree	B & B	3-3.5" CAL.	
UA-P	6	Ulmus americana 'Princeton'	Princeton American Elm	B & B	3-3.5" CAL.	
ZS-GV	1	Zelkova serrata 'Green Vase'	Green Vase Sawleaf Zelkova	B & B	3-3.5" CAL.	
EVERGREEN TREES						
TO-HW	26	Thuja occidentalis 'Hetz Wintergreen'	Hetz Wintergreen Arborvitae	B & B		7-8` HT.
FLOWERING TREES						
CF-CP	1	Cornus florida 'Cherokee Princess'	Cherokee Princess Dogwood	B & B	2-2.5"-CAL.	
PS-C	4	Prunus sargentii 'Columnaris'	Columnar Sargent Cherry	B & B	2-2.5"-CAL.	
SHRUBS						
CA-H	3	Clethra alnifolia 'Hummingbird'	Hummingbird Summersweet	Cont.		18-24" HT.
CS-K	7	Cornus sericea 'Kelseyi'	Kelsey's Dwarf Red Twig Dogwood	Cont.		18-24" HT.
DF	38	Deschampsia flexuosa	Wavy Hair Grass	2 GAL		
EF-EG	17	Euonymus fortunei `Emerald Gaiety`	Emerald Gaiety Euonymus	Cont.		18-24" HT.
IC-GL	32	Ilex crenata `Green Lustre`	Green Luster Japanese Holly	B & B		2-2.5` HT.
IC-ST	22	Ilex crenata `Soft Touch`	Soft Touch Japanese Holly	Cont.		18-24" SPD.
IG-S	30	Ilex glabra 'Shamrock'	Shamrock Inkberry Holly	Cont.		2-2.5` HT.
JC-S	3	Juniperus chinensis `Spartan`	Spartan Juniper	B & B		4-4.5` HT
JH-BH	22	Juniperus horizontalis 'Bar Harbor'	Bar Harbor Creeping Juniper	Cont.		18-24" SPD.
PJ-C	5	Pieris japonica 'Cavatine'	Cavatine Japanese Pieris	Cont.		2-2.5` HT.
PO-C	2	Physocarpus opulifolius 'Coppertina'	Coppertina Ninebark	B & B		3-3.5` HT.
RH-CW	16	Rhododendron x `Cunningham`s White`	Cunningham White Rhododendron	B & B		2-2.5` HT.
RH-PG	7	Rhododendron x 'Purple Gem'	Purple Gem Rhododendron	Cont.		18-24" SPD.
RH-PJM	8	Rhododendron x 'P.J.M.'	PJM Rhododendron	B & B		2-2.5` HT.
RH-S	7	Rhododendron x 'Scintillation'	Scintillation Rhododendron	B & B		2-2.5` HT.
SS-SO	28	Schizachyrium scoparium 'Standing Ovation'	Standing Ovation Little Bluestem	2 GAL		
TM-H	12	Taxus x media 'Hicksii'	Hicks Yew	B & B		4-4.5` HT
TM-T	23	Taxus x media 'Tauntonii'	Taunton's Anglo-Japanese Yew	B & B		2-2.5` SPD.
TO-EG	15	Thuja occidentalis 'Smaragd'	Emerald Green Arborvitae	B & B		6-7` HT.
VD-BM	5	Viburnum dentatum 'Blue Muffin'	Blue Muffin Arrowwood Viburnum	B & B		4-4.5` HT
WF-MM	17	Weigela florida 'My Monet'	My Monet Weigela	Cont.		15-18" SPD.
WF-WR	24	Weigela florida 'Wine & Roses'	Wine & Roses Weigela	B & B		2-2.5` HT.
PERENNIALS / GROUND COVERS						
HE-PM	28	Hemerocallis x 'Pardon Me'	Pardon Me Daylily	4 QT.		
LM-V	26	Liriope muscari 'Variegata'	Variegated Lilyturf	4 QT.		

Base information provided electronically by:
Hancock Associates of Boston, MA

Hawk Design, Inc.
Landscape Architecture
Land Planning
Sagamore, MA
508-833-8800
info@hawkdesigninc.com

HAWK DESIGN, INC. 2023

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Date: 8/22/23

Revisions:

Num.	Date	Description
1.	11/9/23	Per peer review comments

10 Boston Street
Middleton, Massachusetts
Prepared for: Villebridge Development LLC of Needham, MA

Drawn By: BNL | Checked By: TEM

Planting Details and Plant Schedule

Scale: As Noted

Sheet: **LD2**

MIDDLETON POND

FIRE DEPT.

1000 FOOT RADIUS

PLEASANT STREET

MAPLE STREET (ROUTE 62)

BOSTON STREET (ROUTE 62)

MIDDLETON MEMORIAL HALL

PROPOSED SITE

SOUTH MAIN STREET (ROUTE 114)

1000 FOOT RADIUS

100 0 50 100 200
HORIZONTAL GRAPHIC SCALE IN FEET

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 E. BERKELEY ST., 4TH FL., BOSTON, MA 02118
VOICE (617) 357-9145, FAX (617) 357-9495
WWW.HANCOCKASSOCIATES.COM

COMMONWEALTH OF MASSACHUSETTS
JOSEPH D. PEZNOLA
CIVIL
No. 38117
REGISTERED PROFESSIONAL ENGINEER

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE:	11/09/23	SCALE:	1"=100'
DRAWN BY:	CMK	DESIGNED BY:	FAK
CHECKED BY:	DTW	APPROVED BY:	JP

LOCUS PLAN

PLOT DATE: Dec 06, 2023 7:17 am
O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\

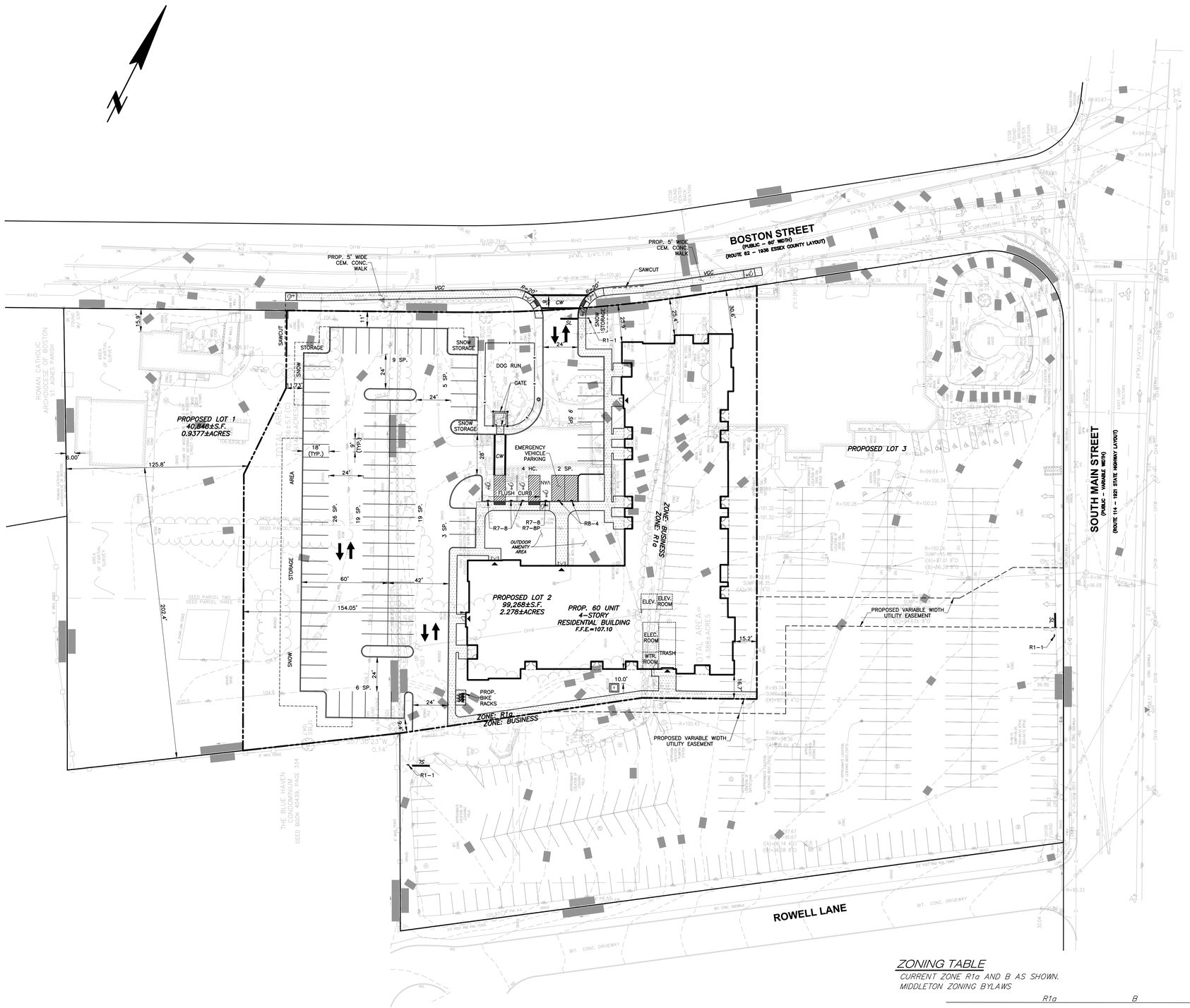
DWG: 25912sp29r2 12-07-2023.dwg

LAYOUT: C-0 Locus (2023 100sc)

SHEET: C-0

PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/6/2023 7:16 AM Plotted: Dec 06, 2023 7:17:39am
Tab: C-0 Locus (2023 100sc) Plot Style: 100C-Grn.ctb Plotted By: Christopher Green



PROP. LEGEND

- PROPOSED PROPERTY LINE/PROPOSED 40B LOT
- CW — PROPOSED CROSS WALK
- CURBING
- DIRECTION OF TRAVEL
- CEMENT CONC. PAD/WALK (ASPHALT WALK OPTION)
- TRAFFIC SIGNS MOUNTED ON A P–5 POST
- T — TRANSFORMER
- SL — STOP LINE

NOTE:
1. LOT 2 IS BEING SUBMITTED FOR 40B MULTIFAMILY HOUSING APPROVAL
2. LOT 3 IS A STAND-ALONE BUSINESS ZONED LOT TO BE DEVELOPED AS ALLOWED UNDER THE BUSINESS (B) ZONING DISTRICT. LOT 3 IS NOT PART OF THE 40B APPLICATION.
3. LOT 1 IS AN EXISTING DEVELOPED RESIDENTIAL LOT WITH NON-CONFORMING FRONT AND SIDE YARD SETBACKS. PROPOSED SUBDIVISION WILL CONTINUE TO MEET ZONING FOR LOT AREA AND ALL OTHER DIMENSIONAL REQUIREMENTS.

LOT 2 PARKING SUMMARY

REQUIRED RESIDENT PARKING:
60 DWELLING UNITS X 2 SPACES/UNIT = 120 SPACES

* PROVIDED: 96 STANDARD SPACES
4 HC ACCESSIBLE SPACES
100 SPACES

* REQUIRES A WAIVER

RESERVED EMERGENCY VEHICLE PARKING : 2 SPACES

ZONING TABLE

CURRENT ZONE R1a AND B AS SHOWN.
MIDDLETON ZONING BYLAWS

	R1a	B	PROPOSED 40B LOT 2 (R1a & B)
MIN. LOT AREA	20,000 SQ. FT.	40,000 SQ. FT.	99,268± SQ. FT.
MIN. LOT WIDTH	125 FT.	100 FT.	325± FT.
MIN. FRONTAGE	100 FT.	100 FT.	326.59 FT.
MAX. LOT COVERAGE BY BUILDINGS	25 %	35 %	24.4± %
MAXIMUM BUILDING HEIGHT	35 FT. (3 STORIES)	35 FT.(3 STORIES)	42' FT. (3 STORIES)**
FRONT YARD	25 FT.	30 FT.	25.4± FT.**
SIDE YARD	15 FT.	25 FT. (35 FT IF YARD ABUTS R DISTRICT)	15.2± FT. LEFT SIDE YARD**
			154.05± FT. RIGHT SIDE YARD
REAR YARD	15 FT.	35 FT.	16.7± FT **.
MIN. OPEN SPACE	N/A	25 %	33.9± %

* EXISTING NON–CONFORMING
** REQUIRES A WAIVER

SUMMARY OF REQUESTED ZONING WAIVERS FOR MULT-FAMILY HOUSING LOT 2

LOT 2 WAIVERS

MULTI FAMILY USE R1a AND B ZONES: 60 UNITS
FRONT YARD SETBACK B ZONE: 25.4± FT VERSUS 30 FT
REAR YARD SETBACK B ZONE: 16.7± FT VERSUS 35 FT
SIDE YARD SETBACK B ZONE: 15.2± FT. VERSUS 25 FT. FOR LEFT SIDE YARD
BUILDING HEIGHT R1a AND B ZONES: 42 FT/ 3 STORIES VERSUS 35 FT/ 3 STORIES
PARKING: 100 SPACES VERSUS 120 SPACES

ANY ADDITIONAL WAIVERS NOT SPECIFICALLY LISTED ABOVE BUT SHOWN ON THE PLAN.

30 0 15 30 60
HORIZONTAL GRAPHIC SCALE IN FEET

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
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COMMONWEALTH OF MASSACHUSETTS
JOSEPH D. PIZZOLA
CIVIL
No. 38117
REGISTERED PROFESSIONAL ENGINEER

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION
1	FAK	JP	11/09/23	RESPONSE TO PEER REVIEW # 1
2	FAK	JP	12/07/23	RESPONSE TO PEER REVIEW # 2

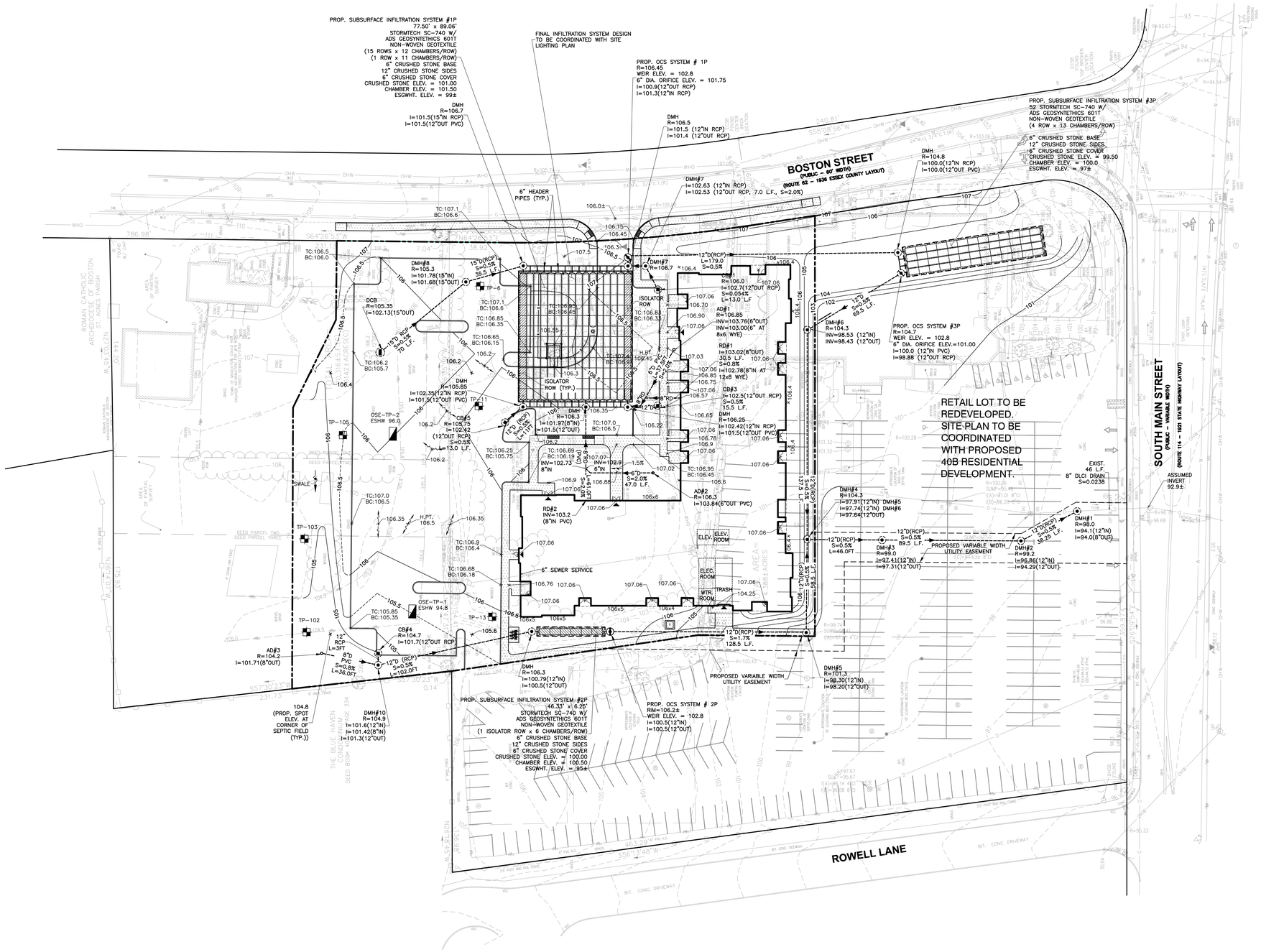
DATE: 08/22/23 | SCALE: 1"=30'
DRAWN BY: CMK | DESIGNED BY: FAK
CHECKED BY: DTW | APPROVED BY: JP

PRELIMINARY SITE LAYOUT PLAN

PLOT DATE: Dec 07, 2023 2:22 pm
O:\Civil 3D Projects\25912 – Lots – Middleton\Dwg\DWG\

DWG: 25912sp29r2 12–07–2023.dwg
LAYOUT: C–1 Layout
SHEET: C–1
PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lots - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved:12/7/2023 2:15 PM Plotted: Dec 07, 2023 2:22:44pm
Tab: C-1 Layout Plot Style: 1000C.ctb Plotted By: Chi M. Kwan


PROP. SUBSURFACE INFILTRATION SYSTEM #1P
77.50' x 89.06'
STORMTECH SC-740 W/
ADS GEOSYNTHETHICS 60IT
NON-WOVEN GEOTEXTILE
(15 ROWS x 12 CHAMBERS/ROW)
(1 ROW x 11 CHAMBERS/ROW)
6" CRUSHED STONE BASE
12" CRUSHED STONE SIDES
6" CRUSHED STONE COVER
CRUSHED STONE ELEV. = 101.00
CHAMBER ELEV. = 101.50
ESGWHT. ELEV. = 99±
FINAL INFILTRATION SYSTEM DESIGN TO BE COORDINATED WITH SITE LIGHTING PLAN
PROP. OCS SYSTEM # 1P
R=106.45
WEIR ELEV. = 102.8
6" DIA. ORIFICE ELEV. = 101.75
I=100.9(12"OUT RCP)
I=101.3(12"IN RCP)
DMH
R=106.7
I=101.5(15"N RCP)
I=101.5(12"OUT PVC)
DMH
R=106.5
I=101.5 (12"IN RCP)
I=101.4 (12"OUT RCP)
BOSTON STREET
(PUBLIC - 80' WIDTH)
(ROUTE 62 - 1938 ESSEX COUNTY LAYOUT)
DMH
R=104.8
I=100.0(12"IN RCP)
I=100.0(12"OUT PVC)
PROP. SUBSURFACE INFILTRATION SYSTEM #3P
52 STORMTECH SC-740 W/
ADS GEOSYNTHETHICS 60IT
NON-WOVEN GEOTEXTILE
(4 ROW x 13 CHAMBERS/ROW)
6" CRUSHED STONE BASE
12" CRUSHED STONE SIDES
6" CRUSHED STONE COVER
CRUSHED STONE ELEV. = 99.50
CHAMBER ELEV. = 100.0
ESGWHT. ELEV. = 97±
6" HEADER PIPES (TYP.)
DMH#7
R=106.7
I=102.63 (12"IN RCP)
I=102.53 (12"OUT RCP, 7.0 L.F., S=2.0%)
DMH#8
R=105.3
I=101.78(15"IN)
I=101.68(15"OUT)
DCB
R=105.35
I=102.13(15"OUT)
TP-6
TP-11
TP-105
TP-103
TP-102
TP-13
OSE-TP-2
ESHW 96.0
OSE-TP-1
ESHW 94.8
ISOLATOR ROW
ISOLATOR ROW (TYP.)
CB#1
R=106.0
I=102.7(12"OUT RCP)
S=0.054%
L=13.0 LF
AD#1
R=106.85
INV=103.76(6"OUT)
INV=103.00(6" AT 8x6 WYE)
RD#1
I=103.02(8"OUT)
30.5 L.F. 107.06
S=0.85
I=102.78(8"IN AT 12x8 WYE)
CB#3
S=102.5(12"OUT RCP)
S=0.5%
15.5 L.F.
DMH
R=106.25
I=102.42(12"IN RCP)
I=101.5(12"OUT PVC)
CB#5
R=105.75
I=102.42
(12"OUT RCP)
S=0.5%
L=13.0 L.F.
DMH
R=106.3
I=101.97(8"IN)
I=101.5(12"OUT)
AD#2
R=106.3
I=103.84(6"OUT PVC)
RD#2
INV=103.2
(8"IN PVC)
6" SEWER SERVICE
ELEC. ROOM
TRASH
WTR. ROOM
CB#4
R=104.7
I=101.7(12"OUT RCP)
AD#3
R=104.2
I=101.71(8"OUT)
DMH
R=106.3
I=100.79(12"IN)
I=100.5(12"OUT)
DMH#6
R=104.3
INV=98.53 (12"IN)
INV=98.43 (12"OUT)
PROP. OCS SYSTEM #3P
R=104.7
WEIR ELEV. = 102.8
6" DIA. ORIFICE ELEV.=101.00
I=100.0 (12"N PVC)
I=98.88 (12"OUT RCP)
RETAIL LOT TO BE REDEVELOPED. SITE PLAN TO BE COORDINATED WITH PROPOSED 40B RESIDENTIAL DEVELOPMENT.
SOUTH MAIN STREET
(PUBLIC - VARIABLE WIDTH)
(ROUTE 114 - 1921 STATE HIGHWAY LAYOUT)
ASSUMED INVERT 92.9±
EXIST. 46 L.F. 8" DLCI DRAIN S=0.0238
DMH#4
R=104.3
I=97.91(12"IN) DMH#5
I=97.74(12"IN) DMH#6
I=97.64(12"OUT)
DMH#1
R=98.0
I=94.1(12"IN)
I=94.0(8"OUT)
DMH#3
R=99.0
I=97.41(12"IN)
I=97.31(12"OUT)
DMH#2
R=99.2
I=96.86(12"N)
I=94.29(12"OUT)
PROPOSED VARIABLE WIDTH UTILITY EASEMENT
DMH#5
R=101.3
I=98.30(12"IN)
I=98.20(12"OUT)
PROP. SUBSURFACE INFILTRATION SYSTEM #2P
46.33' x 6.25'
STORMTECH SC-740 W/
ADS GEOSYNTHETHICS 60IT
NON-WOVEN GEOTEXTILE
(1 ISOLATOR ROW x 6 CHAMBERS/ROW)
6" CRUSHED STONE BASE
12" CRUSHED STONE SIDES
6" CRUSHED STONE COVER
CRUSHED STONE ELEV. = 100.00
CHAMBER ELEV. = 100.50
ESGWHT. ELEV. = 95±
PROP. OCS SYSTEM # 2P
RIM=106.24
WEIR ELEV. = 102.8
I=100.5(12"IN)
I=100.5(12"OUT)
104.8
(PROP. SPOT ELEV. AT CORNER OF SEPTIC FIELD (TYP.))
DMH#10
R=104.9
I=101.6(12"IN)
I=101.42(8"IN)
I=101.3(12"OUT)
ROWELL LANE
ROMAN CATHOLIC ARCHDIOCESE OF BOSTON ST. AGNES PARISH
THE BLUE HAVEN CONDOMINIUM
DEED BOOK 34
DEED PARCEL TWO
DEED PARCEL THREE
AREA OF PARTIAL SURVEY
TOWN OF MIDDLETON ROAD LAYOUT (STREET SURVEY)
KNOWLEDGE CORNER
SWALE
PROPOSED VARIABLE WIDTH UTILITY EASEMENT
6" SEWER SERVICE
AREA = 4.1885± ACRES
S57°30'20"W 0.14
S56°13'48"W 40.5
S56°13'48"W 47.0
S56°13'48"W 58.5
S56°13'48"W 89.5
S56°13'48"W 128.5
S57°30'20"W 786.95
S64°26'56"W 240.81
S57°30'20"W 564.26
S57°30'20"W 318.5
S57°30'20"W 38.5
S57°30'20"W 7.04
N 64°26'56" E 240.81
N 57°30'20" E 786.95
N 57°30'20" E 564.26
N 57°30'20" E 318.5
N 57°30'20" E 38.5
N 57°30'20" E 7.04
BT. CONC. SIDEWALK
BT. CONC. DRIVEWAY
STONE WALL
WOODS
WETLAND
WETLAND BUFFER ZONE
100' WETLAND BUFFER ZONE
50' WETLAND BUFFER ZONE
FOUND MONUMENT
FOUND PIPE
FOUND DRILL HOLE
SET DRILL HOLE
SET MONUMENT
SET PIPE
SET CAPPED REBAR
SET REBAR
SET NAIL
SET PK NAIL
SET PK NAIL FLUSH
SET MAG NAIL
SET MAG NAIL FLUSH
SET TACK
SET TACK FLUSH
SET CHISEL MARK
SET CHISEL MARK FLUSH
SET CROSS
SET CROSS FLUSH
SET DRILL HOLE FLUSH
SET PIPE FLUSH
SET REBAR FLUSH
SET MONUMENT FLUSH
SET CAPPED REBAR FLUSH
SET NAIL FLUSH
SET PK NAIL FLUSH
SET MAG NAIL FLUSH
SET TACK FLUSH
SET CHISEL MARK FLUSH

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: OSE-TP-1 (Hole #) 7/5/2022 (Date) AM (Time) 60's Overcast (Weather) (Latitude) (Longitude)

1. Land Use: Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) None (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3% (Slope (%))
Description of Location: 18 Boston Street
2. Soil Parent Material: Ablation Till (Landform) Ground Moraine (Position on Landscape (SU, SH, BS, FS, TS, Plain)) Plain
3. Distances from: Open Water Body > 100 feet; Drainage Way > 10 feet; Wetlands > 100 feet; Property Line > 10 feet; Drinking Water Well > 100 feet; Other ____ feet
4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☒ Yes ☐ No If yes: 122" Depth to Weeping in Hole 122" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features: Depth	Color	Percent	Coarse Fragments % by Volume: Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-17	Fill				Cnc : Dpl:						
17-20	Ab	Gravelly Medium-Coarse Sand	10 YR 3/2		Cnc : Dpl:			> 5%	Single Grain	Loose	
20-35	Bw	Gravelly Medium-Coarse Sand	10 YR 5/6		Cnc : Dpl:			> 5%	Single Grain	Loose	
35-132+	C	Gravelly Medium-Coarse Sand	2.5Y 5/4		Cnc : Dpl:			>5%	Single Grain	Loose	
					Cnc : Dpl:						

Deep Observation Hole Number: OSE-TP-2 (Hole #) 7/5/2022 (Date) AM (Time) 60's Overcast (Weather) (Latitude) (Longitude)

1. Land Use: Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3% (Slope (%))
Description of Location: 18 Boston Street
2. Soil Parent Material: Ablation Till (Landform) Ground Moraine (Position on Landscape (SU, SH, BS, FS, TS, Plain)) Plain
3. Distances from: Open Water Body > 100 feet; Drainage Way > 10 feet; Wetlands > 100 feet; Property Line > 10 feet; Drinking Water Well > 100 feet; Other ____ feet
4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features: Depth	Color	Percent	Coarse Fragments % by Volume: Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-20	Fill				Cnc : Dpl:						
20-25	Ab	Fine Loamy Sand	10 YR 3/3		Cnc : Dpl:				Massive	Friable	
25-37	Bw	Fine Loamy Sand	10 YR 5/6		Cnc : Dpl:		10%	>5%	Massive	Friable	
37-113+	C	Medium Loamy Sand	2.5 Y 6/3		Cnc : Dpl:		10%	>5%	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Middleton
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Site Information

Stigliano, Inc. (Owner Name)
18 Boston Street (Street Address or Lot #)
Middleton (City/Town) MA (State) 01949 (Zip Code)
(Contact Person (if different from Owner)) (Telephone Number)

B. Test Results

	7/5/2022 (Date) AM (Time)	7/5/2022 (Date) AM (Time)
Observation Hole #	OSE-TP-1	OSE-TP-2
Depth of Perc	51"-69"	73"-91"
Start Pre-Soak	8:16 AM	8:55 AM
End Pre-Soak	8:31 AM	9:10 AM
Time at 12"	8:31 AM	9:10 AM
Time at 9"	8:40 AM	9:16 AM
Time at 6"	8:49 AM	9:25 AM
Time (9"-6")	9 minutes	9 minutes
Rate (Min./inch)	3 mpi	3 mpi
	Test Passed: ☒ Test Failed: ☐	Test Passed: ☒ Test Failed: ☐

Raymond Willis, P.E. (Test Performed By:)
Paul Blain, MassDEP (Board of Health Witness)
Comments:

SEPTIC SYSTEM COMPUTATIONS:

90 BEDROOM @ 110 GPD = 9,900 GPD
PERCOLATION RATE = 4 MPI
LOADING RATE 0.74 GPD/S.F.
SYSTEM SIZING 9,900/0.74 = 13,379 S.F.

USE 2x2 TRENCH IN PRESSURE DISTRIBUTION SYSTEM
LENGTH = 13,379 S.F./6 S.F./L.F.
= 2,230 L.F.

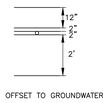
MAX LENGTH = 100 L.F.

2,230 / 100 = 23 TRENCHES
6 FT. SPACING RESERVE BETWEEN

(2' x 23) = 46 L.F.
(6' x 22) = 132 L.F.
4 L.F.
182 L.F.

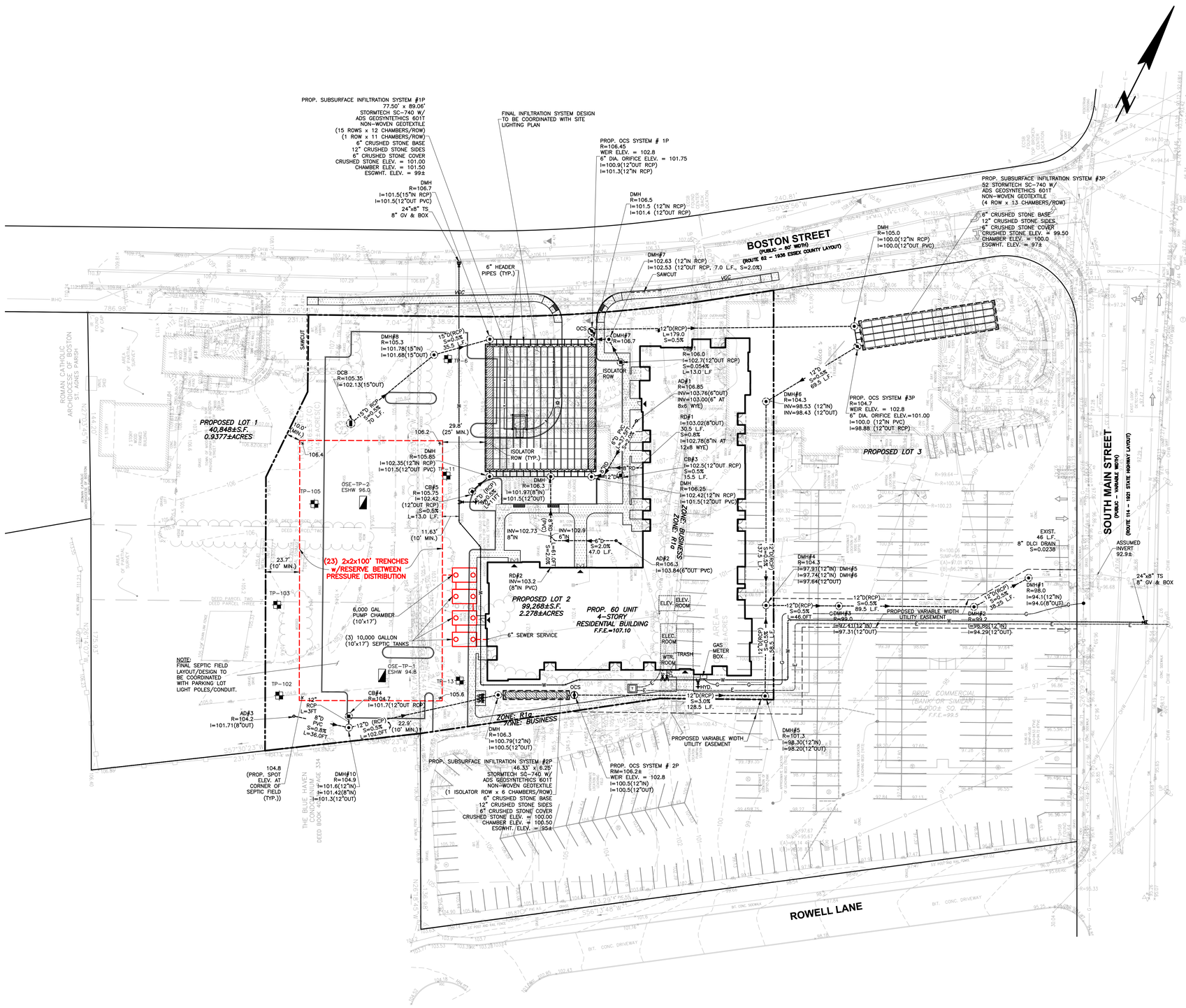
SYSTEM SIZE = 100' x 182'

ESHW = 96.0
BOTTOM TRENCH = 101.5
TOP PEASTONE/B.O = 103.8
MIN. COVER = 104.8
MAX. COVER = 106.8



MIN. OFFSET TO GROUNDWATER = 5.3'

NOTES:
1. TEST PITS OSE-TP-1 AND OSE-TP-2 AND ASSOCIATED PERCOLATION TESTS WERE PERFORMED BY ONSITE ENGINEERING, INC. IN JULY OF 2022.
2. TEST PITS TP-6, TP-11, TP-13, TP-102, TP-103 AND TP-105 WERE PERFORMED BY GZA GEOENVIRONMENTAL, INC. IN APRIL AND MAY OF 2022.
3. SEE SHEET C-4 FOR GZA TEST PIT LOGS.
4. ADDITIONAL SOIL TESTING TO BE PERFORMED WITHIN THE AREAS OF THE TWO PROPOSED STORMWATER INFILTRATION SYSTEMS PRIOR TO PREPARATION OF BUILDING PERMIT/CONSTRUCTION DRAWINGS. INFILTRATION SYSTEM DESIGNS WILL BE ADJUSTED AS REQUIRED BASED ON THIS ADDITIONAL SOIL TESTING.



MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 E. BERKELEY ST., 4TH FL., BOSTON, MA 02118
VOICE (617) 357-8145, FAX (617) 357-9495
WWW.HANCOCKASSOCIATES.COM

LEGEND

- W — WATER
- F — FIRE SERVICE
- DS — DOMESTIC SERVICE
- HYD. — HYDRANT
- D — DRAIN
- CB — CATCH BASIN
- DMH — DRAIN MANHOLE
- OCS — OUTLET CONTROL STRUCTURE
- RD — ROOF DRAIN
- PROPOSED PROPERTY LINE
- TP — TEST PIT

COMMONWEALTH OF MASSACHUSETTS
JOSEPH D. PEZNOLA
CIVIL
No. 38117
REGISTERED PROFESSIONAL ENGINEER

30 0 15 30 60
HORIZONTAL GRAPHIC SCALE IN FEET

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION
1	FAK	JP	12/07/23	RESPONSE TO PEER REVIEW # 2

DATE: 08/22/23 SCALE: 1"=30'
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: DTW APPROVED BY: JP

PRELIMINARY UTILITY PLAN

PLOT DATE: Dec 07, 2023 2:23 pm
O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\

DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C-3 Utility
SHEET: C-3
PROJECT NO.: 25912

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-6
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. Juan Diego Lopez
Weather 50's-60's, Sunny

Excavation Equipment
Contractor Cryan Landscaping Contractors, Inc.
Operator Paulino Chamorro
Make CAT Model 308
Capacity 0.5 CY Reach 15 FT

Date 4/5/2022
Ground Elev. 105
Time Started 1148
Time Completed 1220

Depth	Soil Description (STRATUM DESCRIPTION - USDA FIELD CLASSIFICATION)	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Moist, bn, SILT and f-c SAND, tr f-c Gravel, tr Roots.					
1'	(TOPSOIL) 1'	S-1	ND	E/M	3A,2B	1,2
2'	Moist, light bn, f-c SAND, sm(+) Silt, sm f-c Gravel, tr Boulders/Cobbles, tr(-) Roots.			E/M	0	
3'		S-2	ND	M	3A,1B	
4'	(Silty, Gravelly SAND - USDA SANDY LOAM) 4.3'			M	0	3
5'	Moist, bn, f-c SAND, sm f-c Gravel, lt Silt, tr Boulders.			M	0	
6'	(SAND/GRAVEL - USDA LOAMY SAND) 6.4'	S-3	ND	M	2A	
7'	Moist to wet, bn, f-c GRAVEL and f-c SAND, lt(-) Silt.			M	0	4
8'	(SAND/GRAVEL - USDA LOAMY SAND) 8.4'		ND	M/D	1A	5
9'	Bottom of test pit at 8.4 feet.				0	
10'	(Excavator bucket refusal on apparent nested Boulders or Bedrock)					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Falling head infiltration test performed by GZA at approximately 4.3 feet bgs.
4. Noted orange staining in the soil at approximately 6 feet below ground surface (bgs) and water seeping in from excavation sidewalls at 7.8 feet bgs.
5. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket.

Test Pit Plan: 15' × 3', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)
30 min	7.8

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-11
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. Juan Diego Lopez
Weather 50's, Sunny

Excavation Equipment
Contractor Cryan Landscaping Contractors, Inc.
Operator Paulino Chamorro
Make CAT Model 308
Capacity 0.5 CY Reach 15 FT

Date 4/5/2022
Ground Elev. 103.5
Time Started 1115
Time Completed 1145

Depth	Soil Description (STRATUM DESCRIPTION)	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Moist, dk bn SILT, sm f-c Sand, tr f-c Gravel, tr Roots.					
1'	(TOPSOIL) 5'	S-1	ND	E	2A	1,2
2'	Moist, bn, f-c SAND and f-c GRAVEL, sm Silt, tr Boulders/Cobbles, tr Roots	S-2	ND	E	2A, 2B	
3'	(FILL) 3'				0	
4'	Moist, bn, f-m SAND and SILT.	S-3	ND	M	1A, 3B, 1C	3
5'	(SAND/SILT) 5.7'				0	
6'	Wet, bn/gr, SILT, sm(-) f-m Sand.				0	
7'	(Sandy SILT) 8'	S-4	ND	D	3A	
8'	Bottom of test pit at 8 feet.				0	4
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Orange staining noted in the soil at approximately 3.5 feet below ground surface (bgs).
4. Water noted seeping in from the excavation sidewalls at about 4.5 feet bgs.
5. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket.

Test Pit Plan: 15' × 3', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)
30 min	4.5

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-13
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. Juan Diego Lopez
Weather 50's, Sunny

Excavation Equipment
Contractor Cryan Landscaping Contractors, Inc.
Operator Paulino Chamorro
Make CAT Model 308
Capacity 0.5 CY Reach 15 FT

Date 4/5/2022
Ground Elev. 103
Time Started 0920
Time Completed 0950

Depth	Soil Description (STRATUM DESCRIPTION - USDA FIELD CLASSIFICATION)	Sample No.	Field Test Data	Excav. Effort	Boulders: Count/ Class	Note No.
0	Moist, bn/dark bn, f-c SAND and f-c GRAVEL, sm Silt, tr Boulders/Cobbles, tr Brick, tr Roots.					
1'	(FILL / TOPSOIL) 1.5'	S-1	0.1 ppm	M	3A, 1B	1,2
2'	Moist, bn, f-c SAND, tr Silt, tr f Gravel, tr Boulders/Cobbles. 2.25'			M	0	
3'	(FILL)	S-2	0.1 ppm	M	2A, 1B	
4'	Damp, bn, f-c SAND and f-c GRAVEL, sm Silt, tr(-) Roots. 4.0'	S-3	ND	M	2A, 1B	
5'	(FILL)			M	0	3
6'	Damp to wet, gr, f-c GRAVEL and f-c SAND, lt Silt, tr Boulders/Cobbles. 5.6'	S-4	ND	D	1A, 1B	4
7'	(SAND/GRAVEL)					
8'	Bottom of test pit at 5.6 feet.					
9'	(Excavator bucket refusal on apparent nested Boulders or Bedrock)					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Orange staining noted in the soil at approximately 4.2 feet below ground surface (bgs).
4. Water noted seeping in from the excavation sidewalls at about 5 feet bgs.
5. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket.

Test Pit Plan: 8' × 3', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water (feet)
30 min	5 ft

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-102
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. M. Ostrowski
Weather Partly Sunny, 40s - 50s

Excavation Equipment
Contractor Cryan Landscapinig Contractors, Inc.
Operator Hassler Lopez
Make CAT Model 308
Capacity ~0.5 c.y. Reach 15 ±ft.

Date 5/3/2022
Ground Elev. 105
Time Started 0943
Time Completed 1015

Depth	Soil Description (STRATUM DESCRIPTION - USDA FIELD CLASSIFICATION)	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, black, f-c GRAVEL and f-c SAND, lt Silt. (RECYCLED ASPHALT) 0.5'	S-1	ND	M	1A	1, 2
1'	Dry, bn, f-c GRAVEL and f-c SAND, lt Boulders/Cobbles, tr(+) Silt.	S-2	0.1			
2'	(FILL - USDA LOAMY SAND) 1.3'			M	3A, 2B	3
3'	Dry, bn/dark bn, f-c SAND, sm f-c Gravel, sm(-) Silt, tr to lt Asphalt, tr Boulders/Cobbles. (FILL - USDA LOAMY SAND) 3'	S-3	ND	M	2A	
4'	Moist, bn/orange, SILT, sm f-c Sand, tr Boulders/Cobbles. 3.3'	S-4	ND	M/D	3A	
5'	(BURIED SUBSOIL - USDA LOAM)			M/D	2A	
6'	Dry to wet, bn, f-c GRAVEL and f-c SAND, tr to lt Boulders/Cobbles, tr Silt.	S-5	0.1	M/D	2A	
7'	(SAND/GRAVEL - USDA SANDY) 7.5'			M/D	2A	
8'	Bottom of test pit at 7.5 feet below ground surface.			D	1A	4
9'						
10'						
11'						
12'						
13'						
14'						
15						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Buried asphalt approximately 3 inches thick from approximately 1.7 to 2 feet below ground surface (bgs).
4. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket.

Test Pit Plan: 12' × 2.5', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
5 min.	6.5'

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-103
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. M. Ostrowski
Weather Partly Sunny, 40s - 50s

Excavation Equipment
Contractor Cryan Landscapinig Contractors, Inc.
Operator Hassler Lopez
Make CAT Model 308
Capacity ~0.5 c.y. Reach 15 ±ft.

Date 5/3/2022
Ground Elev. 105
Time Started 1020
Time Completed 1510

Depth	Soil Description (STRATUM DESCRIPTION - USDA FIELD CLASSIFICATION)	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark bn, SILT, sm f-c Sand, lt f-c Gravel, tr(-) Roots. (TOPSOIL - USDA LOAM) 0.5'	S-1	ND	E	1A	1, 2
1'	Dry, bn/orange, f-c SAND and SILT, lt f-c Gravel, tr Cobbles/Boulders. (SUBSOIL - USDA LOAM) 1.3'	S-2	ND	E/M	3A	
2'				M	6A	
3'				M/D	8A	
4'	Dry, light bn, f-c SAND, sm f-c Gravel, sm Silt, lt to sm Boulders/Cobbles.			D	6A	
5'	(SAND/GRAVEL - USDA SAND)	S-3	ND	D	5A	
6'				M/D	4A	
7'				D	3A	
8'	8.3'			D	0	3, 4
9'	Bottom of test pit at 8.3 feet below ground surface.					
10'						
11'						
12'						
13'						
14'						
15						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Falling head permeability test by Onsite Engineering, Inc. (OEI) in the same S-3 material.
4. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket. The ground surface was filled over with topsoil and reseeded upon completion.

Test Pit Plan: 20' × 2.5', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
3	7.8'

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

GZA GeoEnvironmental, Inc. *Engineers/Scientists*
249 Vanderbilt Avenue
Norwood, MA 02062

Due-Diligence Geotechnical Evaluation
Proposed Development
10 & 18 Boston St. & 49 South Main St.
Middleton, Massachusetts

Test Pit No. TP-105
Page No. 1 of 1
File No. 01.0175595.10
Checked By: MAR/MJO

GZA Rep. M. Ostrowski
Weather Partly Sunny, 40s - 50s

Excavation Equipment
Contractor Cryan Landscapinig Contractors, Inc.
Operator Hassler Lopez
Make CAT Model 308
Capacity ~0.5 c.y. Reach 15 ±ft.

Date 5/3/2022
Ground Elev. 105.5
Time Started 1145
Time Completed 1515

Depth	Soil Description (STRATUM DESCRIPTION - USDA FIELD CLASSIFICATION)	Sample No.	PID Reading (ppm)	Excav. Effort	Boulders: Count/ Class	Note No.
0	Dry, dark bn, Clayey SILT, sm f-c Sand, lt f-c Gravel, tr Roots, tr Boulders/Cobbles. (TOPSOIL - USDA LOAM) 0.7'	S-1	ND	E		1, 2
1'	Moist, bn/orange, SILT, sm f-c Sand, tr f-c Gravel, tr to lt Boulders/Cobbles. (FILL - USDA LOAM) 1.6'	S-2	ND	E/M		
2'	Dry, bn, f-c GRAVEL and f-c SAND, lt Cobbles/Boulders, tr Silt.					
3'	(SAND/GRAVEL - USDA SAND) 3.3'	S-3	ND	M		3
4'				M	5B, 20A, 1C	
5'	Dry to wet, bn/light bn, f-c SAND and f-c GRAVEL, lt Silt, lt to sm Cobbles/Boulders. (SAND/GRAVEL - USDA LOAMY SAND)	S-4	0.1	M/D		
6'				M/D		
7'	7.7'			M/D		4
8'	Bottom of test pit at 7.7 feet below ground surface.					
9'						
10'						
11'						
12'						
13'						
14'						
15						
16'						

Notes:
1. Ground surface elevation estimated from topography shown on a plan prepared by Hancock Associates, Inc. entitled "Existing Conditions Plan of Land in Middleton, MA," dated 5/26/2022.
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv).
3. Falling head permeability test by Onsite Engineering, Inc. (OEI) in the 5-3 material at approximately 3.3 feet below ground surface (bgs).
4. Test pit backfilled with excavated spoils placed in approximately 1-foot-thick lifts each tamped with the excavator bucket. The ground surface was filled over with topsoil and reseeded upon completion.

Test Pit Plan: 17' × 3', NORTH

Boulder Class — Letter Designation / Size Range Classification: A 6" - 12"; B 18" - 36"; C 36" and Larger
Excavation Effort: E—Easy; M—Moderate; D—Difficult

Proportions Used: TRACE (TR) 0 - 10%; LITTLE (LT) 10 - 20%; SOME (SM) 20 - 35%; AND 35 - 50%

Abbreviations: F = Fine; M = Medium; C = Coarse; V = Very; F/M = Fine to medium; F/C = Fine to coarse; GR = Gray; BN = Brown; YEL = Yellow

GROUNDWATER: (+) Encountered; ( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water
	7.1'

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MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 E. BERKELEY ST., 4TH FL., BOSTON, MA 02118
VOICE (617) 357-8145, FAX (617) 357-9495
WWW.HANCOCKASSOCIATES.COM

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 11/09/23 SCALE: AS NOTED
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: DTW APPROVED BY: JP

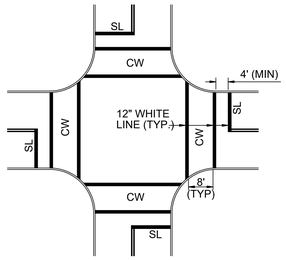
GZA TEST PIT LOGS

PLOT DATE: Dec 07, 2023 2:24 pm
O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\

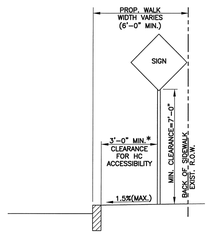
DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C-4 GZA TP
SHEET: C-4
PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/7/2023 2:15 PM Plotted: Dec 07, 2023 2:24:40pm
Tab: C-4 GZA TP Plot Style: ggSOC.ctb Plotted By: Chi M. Kwan





MASSDOT TYPICAL CROSSWALK MARKINGS
(NOT TO SCALE)



TRAFFIC SIGN
(NOT TO SCALE)

PROP. LEGEND

- PROPOSED PROPERTY LINE/PROPOSED 40B LOT
- CW — PROPOSED CROSS WALK
- CURBING
- DIRECTION OF TRAVEL
- CEMENT CONC. PAD/WALK (ASPHALT WALK OPTION)
- TRAFFIC SIGNS MOUNTED ON A P-5 POST
- T — TRANSFORMER
- SL — STOP LINE

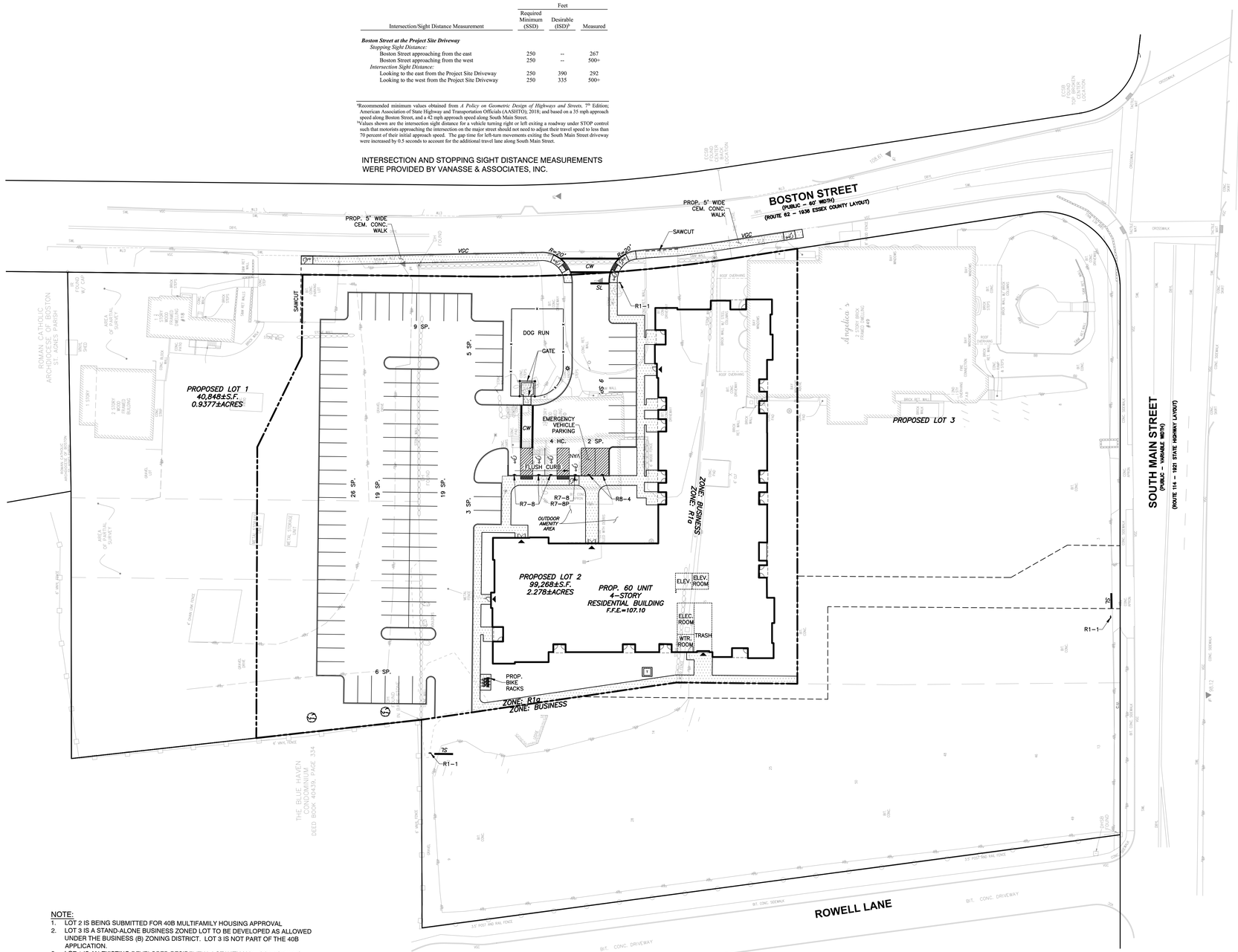
SIGHT DISTANCE MEASUREMENTS

BOSTON STREET AT SITE DRIVEWAY STOPPING SIGHT DISTANCE:

Intersection/Sight Distance Measurement	Feet: Required Minimum (SSD)	Feet: Desirable (ISD)[b]	Feet: Measured
Boston Street at the Project Site Driveway			
Stopping Sight Distance:			
Boston Street approaching from the east	250	--	267
Boston Street approaching from the west	250	--	500+
Intersection Sight Distance:			
Looking to the east from the Project Site Driveway	250	390	292
Looking to the west from the Project Site Driveway	250	335	500+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018; and based on a 35 mph approach speed along Boston Street, and a 42 mph approach speed along South Main Street.
[b]Values shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed. The gap time for left-turn movements exiting the South Main Street driveway were increased by 0.5 seconds to account for the additional travel lane along South Main Street.

INTERSECTION AND STOPPING SIGHT DISTANCE MEASUREMENTS WERE PROVIDED BY VANASSE & ASSOCIATES, INC.



NOTE:
1. LOT 2 IS BEING SUBMITTED FOR 40B MULTIFAMILY HOUSING APPROVAL
2. LOT 3 IS A STAND-ALONE BUSINESS ZONED LOT TO BE DEVELOPED AS ALLOWED UNDER THE BUSINESS (B) ZONING DISTRICT. LOT 3 IS NOT PART OF THE 40B APPLICATION.
3. LOT 1 IS AN EXISTING DEVELOPED RESIDENTIAL LOT WITH NON-CONFORMING FRONT AND SIDE YARD SETBACKS. PROPOSED SUBDIVISION WILL CONTINUE TO MEET ZONING FOR LOT AREA AND ALL OTHER DIMENSIONAL REQUIREMENTS.

30 0 15 30 60
HORIZONTAL GRAPHIC SCALE IN FEET

NOTE:
1. ALL SIGNS AND PAVEMENT MARKINGS SHALL CONFORM TO THE APPLICABLE SPECIFICATIONS OF THE MANUAL OF THE UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN: WIDTH	SIZE OF SIGN: HEIGHT	TEXT	BACKROUND	LETTERING	No. OF SIGNS REQUIRED
R1-1	30"	30"	STOP	RED	WHITE	3
R7-8	12"	18"	RESERVED PARKING	WHITE	GREEN WITH BLUE & WHITE LOGO	4
R7-8A	8"	9"	VAN ACCESSIBLE	WHITE	GREEN	1
R8-4	30"	24"	EMERGENCY PARKING ONLY	WHITE	BLACK	2

TRAFFIC SIGNS
(NOT TO SCALE)

SIGHT DISTANCE MEASUREMENTS

SOUTH MAIN STREET AT SITE DRIVEWAY STOPPING SIGHT DISTANCE:

Intersection/Sight Distance Measurement	Feet: Required Minimum (SSD)	Feet: Desirable (ISD)[b]	Feet: Measured
South Main Street at the Project Site Driveway			
Stopping Sight Distance:			
South Main Street approaching from the north	325	--	351
South Main Street approaching from the south	325	--	500+
Intersection Sight Distance:			
Looking to the north from the Project Site Driveway	325	405	405
Looking to the south from the Project Site Driveway	325	495	500+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2018; and based on a 35 mph approach speed along Boston Street, and a 42 mph approach speed along South Main Street.
[b]Values shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed. The gap time for left-turn movements exiting the South Main Street driveway were increased by 0.5 seconds to account for the additional travel lane along South Main Street.

INTERSECTION AND STOPPING SIGHT DISTANCE MEASUREMENTS WERE PROVIDED BY VANASSE & ASSOCIATES, INC.

PAVEMENT MARKING NOTES:

1. PARKING STALL STRIPING SHALL BE 4" WIDE WHITE LINES.
2. CROSSWALKS AND STOP LINES SHALL BE 12" WIDE WHITE LINES.
3. ACCESSIBLE PARKING STALL MARKINGS TO FOLLOW DETAILS ON SHEET C-7.

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 E. BERKELEY ST., 4TH FL., BOSTON, MA 02118
VOICE (617) 357-8145, FAX (617) 357-9495
WWW.HANCOCKASSOCIATES.COM

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE:	11/09/23	SCALE:	1"=30'
DRAWN BY:	CMK	DESIGNED BY:	FAK
CHECKED BY:	DTW	APPROVED BY:	JP

PRELIMINARY PAVEMENT MARKING & SIGNAGE PLAN

PLOT DATE: Dec 07, 2023 2:25 pm
O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\

DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C-5 Signage
SHEET: C-5
PROJECT NO.: 25912

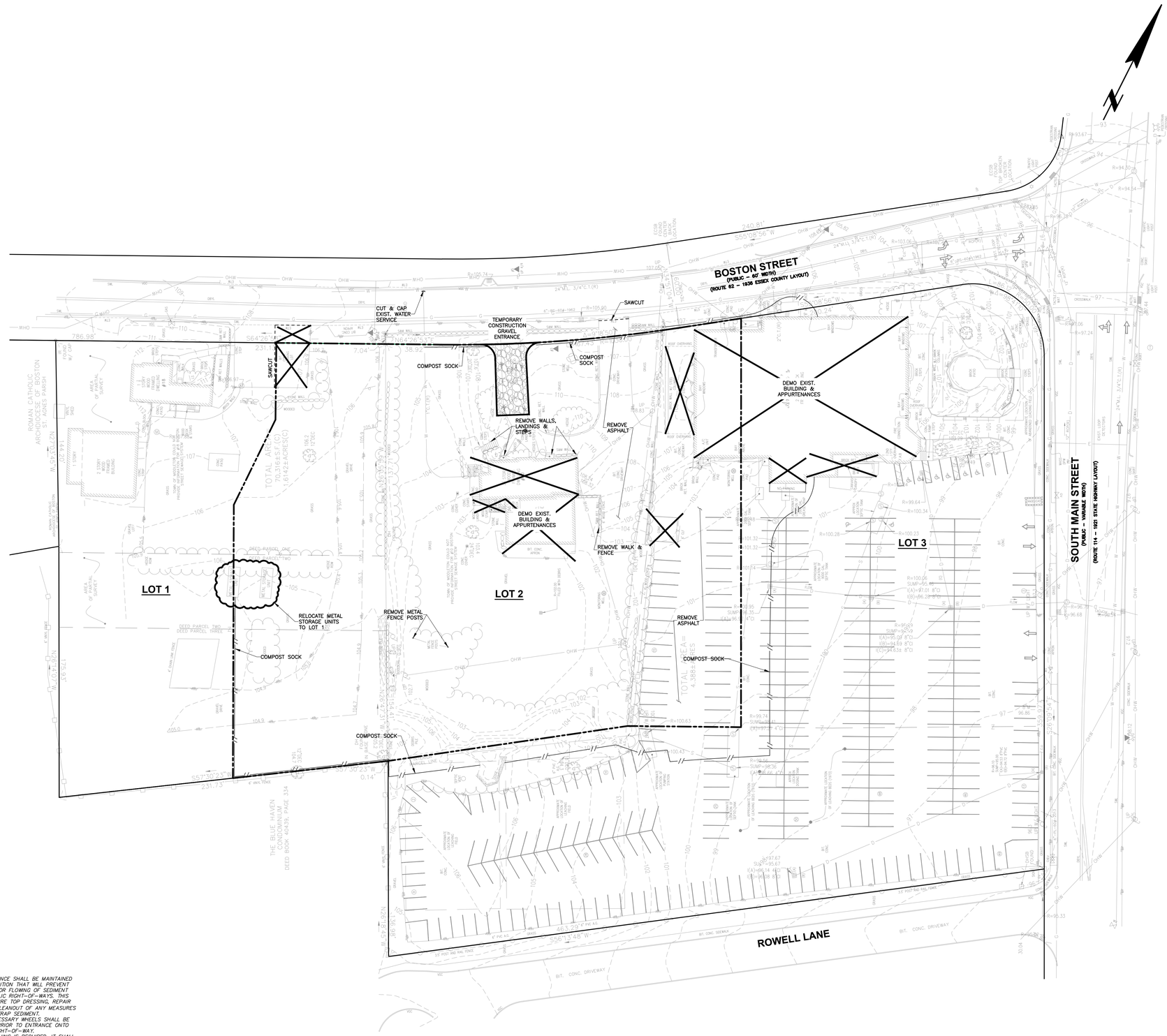
File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/7/2023 2:15 PM Plotted: Dec 07, 2023 2:25:18pm
Tab: C-5 Signage Plot Style: JPSOC.ctb Plotted By: Chi M. Kwan

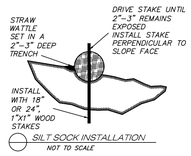
EROSION & SEDIMENT CONTROL NOTES

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE AS SET FORTH IN THE MOST CURRENT STATE SEDIMENT AND EROSION CONTROL MANUAL.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE LEFT IN AN UNTREATED OR UNVEGETATED CONDITION FOR A MINIMUM TIME. AREAS SHALL BE PERMANENTLY STABILIZED WITHIN 15 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 30 DAYS OF INITIAL DISTURBANCE OF THE SOIL. IF THE DISTURBANCE IS WITHIN 100 FEET OF A STREAM OR POND, THE AREA SHALL BE STABILIZED WITHIN 7 DAYS OR PRIOR TO ANY STORM EVENT (THIS WOULD INCLUDE WETLANDS).
3. SEDIMENT BARRIERS (SILT FENCE, STRAW BARRIERS, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF THE CONTRIBUTING DRAINAGE AREA ABOVE THEM. MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL AREAS WITH SLOPES GREATER THAN 15% AFTER OCTOBER 1ST THE SAME APPLIES FOR ALL SLOPES GREATER THAN 8%.
4. INSTALL SILTATION BARRIER AT TOE OF SLOPE TO FILTER SILT FROM RUNOFF. SEE SILTATION BARRIER DETAILS FOR PROPER INSTALLATION. SILTATION BARRIER WILL REMAIN IN PLACE PER NOTE #5.
5. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSITION. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE STABILIZED BY TURF.
6. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN TWO TO ONE (2:1).
7. TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINAL GRADED SHALL BE COMPLETED 45 DAYS PRIOR TO THE FIRST KILLING FROST TO PROTECT FROM SPRING RUNOFF PROBLEMS.
8. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS.

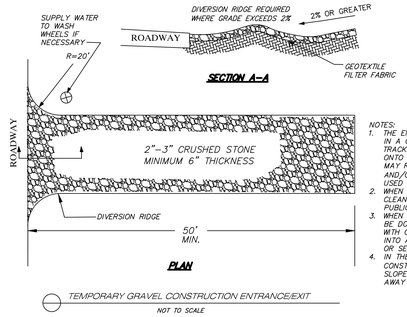
GENERAL CONSTRUCTION NOTES:

1. CONTRACTOR TO COORDINATE WITH ALL AFFECTED UTILITY COMPANIES PRIOR TO COMMENCEMENT OF WORK.
2. REFER TO PLANS & SPECIFICATIONS BY ARCHITECT FOR REQUIREMENTS RELATED TO DEMOLITION OF THE EXISTING BUILDING.
3. REMOVE ALL EXISTING SEPTIC SYSTEM STRUCTURES ON LOT 2.
4. REMOVE ALL EXISTING DRAINAGE STRUCTURES ON LOT 2.
5. REMOVE ALL ASPHALT AND CEMENT CONCRETE PAVEMENT, AND ALL CURBING ON LOT 2.





SILT SOCK INSTALLATION
NOT TO SCALE



NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
4. IN THE DIRECTION OF TRAVEL, THE CONSTRUCTION ENTRANCE/EXIT SHALL SLOPE DOWN TOWARDS THE SITE AND AWAY FROM THE ROADWAY.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT
NOT TO SCALE

NOTE:
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30 0 15 30 60
HORIZONTAL GRAPHIC SCALE IN FEET

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION
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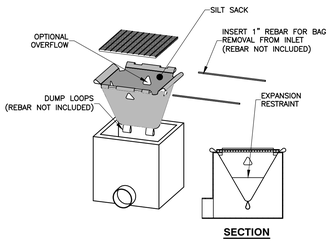
DATE: 11/09/23 SCALE: 1"=30'
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: DTW APPROVED BY: JP

PRELIMINARY SITE PREPARATION & DEMOLITION PLAN

PLOT DATE: Dec 07, 2023 2:25 pm
O:\Civil 3D Projects\25912 – Lars – Middleton\Eng\DWG\

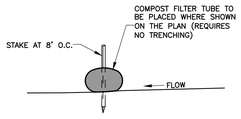
DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C–6 Site Prep
SHEET: **C–6**
PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/7/2023 2:15 PM Plotted: Dec 07, 2023 2:25 41pm
Tab: C-6 Site Prep Plot Style: 50SC.ctb Plotted By: Chi M. Kwan



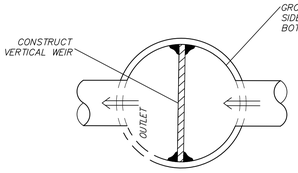
SILK SACK DETAIL

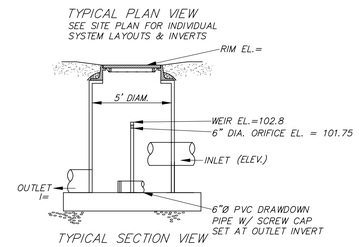
(NOT TO SCALE)



COMPOST FILTER TUBE

(NOT TO SCALE)

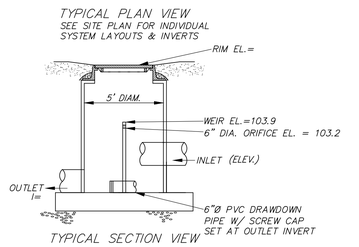




NOTE: 1. SEE DRAIN MANHOLE DETAIL FOR STANDARD MANHOLE CONSTRUCTION SPEC'S
2. SEE PLAN FOR INVERT ELEVATIONS

OUTLET CONTROL STRUCTURE - SYSTEM # 1P

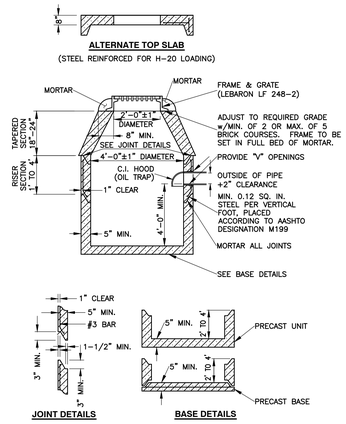
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NOTE: 1. SEE DRAIN MANHOLE DETAIL FOR STANDARD MANHOLE CONSTRUCTION SPEC'S
2. SEE PLAN FOR INVERT ELEVATIONS

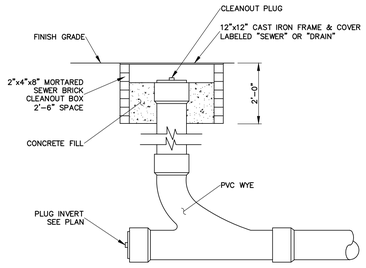
OUTLET CONTROL STRUCTURE - SYSTEM # 2P

(NOT TO SCALE)



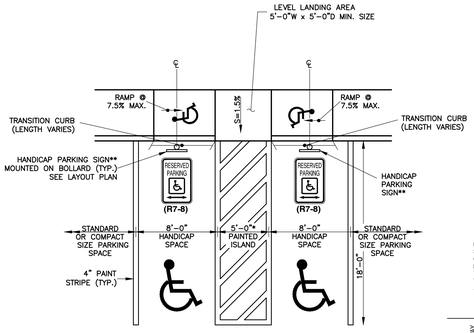
CATCH BASIN

(NOT TO SCALE)



CLEANOUT

(NOT TO SCALE)



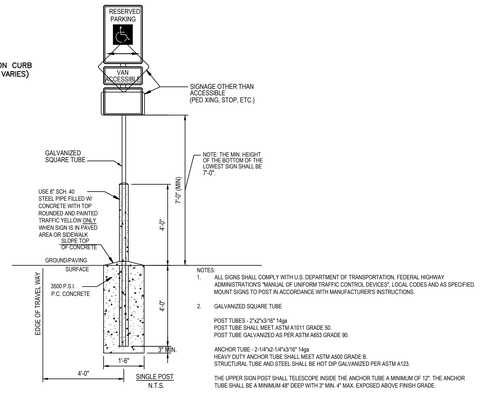
* 8'-0" ACCESS AISLE ADJACENT TO VAN SPACE
** SIGN FOR VAN SPACE TO READ "VAN ACCESSIBLE" BELOW DOUBLE ARROW AT BOTTOM.

NOTE:
R7-8 SIGNS SHALL BE MOUNTED AT A HEIGHT OF NO LESS THAN 5 FEET AND NOT MORE THAN 8 FEET TO THE TOP OF THE SIGN.

ADA REQUIREMENTS:
1. WALKS SHALL NOT EXCEED 5% SLOPE.
2. WALKS CROSS SLOPE SHALL NOT EXCEED 2%.
3. HANDICAP SPACES SHALL NOT EXCEED 2% IN ANY DIRECTION

TYPICAL HANDICAP PARKING LAYOUT PLAN

SCALE : 1"=6'



NOTES:
1. ALL SIGNS SHALL COMPLY WITH U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION'S "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES", LOCAL CODES AND AS SPECIFIED. MOUNT SIGNS TO POST IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. GALVANIZED SQUARE TUBE

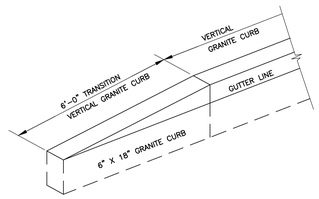
POST TUBES - 2"x2"x3/16" 14ga
POST TUBE SHALL MEET ASTM A1011 GRADE 50.
POST TUBE GALVANIZED AS PER ASTM A653 GRADE 90.

ANCHOR TUBE - 2-1/4"x2-1/4"x3/16" 14ga
HEAVY DUTY ANCHOR TUBE SHALL MEET ASTM A500 GRADE B.
STRUCTURAL TUBE AND STEEL SHALL BE HOT DIP GALVANIZED PER ASTM A123.

THE UPPER SIGN POST SHALL TELESCOPE INSIDE THE ANCHOR TUBE A MINIMUM OF 12". THE ANCHOR TUBE SHALL BE A MINIMUM 48" DEEP WITH 2" MIN. 4" MAX. EXPOSED ABOVE FINISH GRADE.

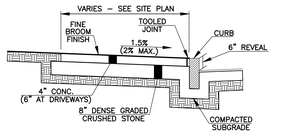
SIGN MOUNTING DETAIL

(NOT TO SCALE)



CURB TRANSITION DETAIL

(NOT TO SCALE)



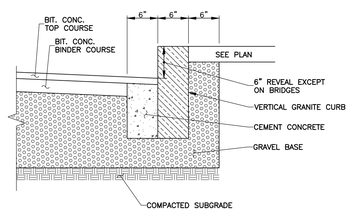
NOTES:

1.) CONTROL JOINTS EVERY 6' MIN.

2.) PREMOLDED JOINT FILLER EVERY 30' AND AT ALL POLES AND OTHER STRUCTURES.

CEMENT CONCRETE WALK

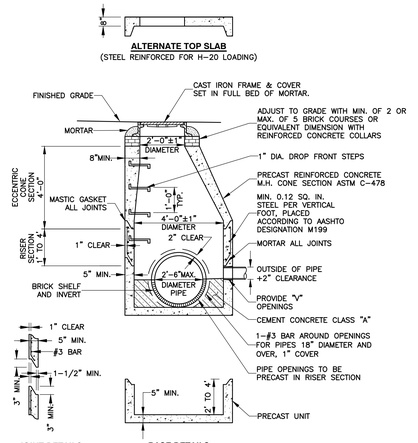
(NOT TO SCALE)



*PROCEDURE DESCRIBED HEREIN IS APPLICABLE ONLY IF CURB IS TO BE SET AFTER BASE AND/OR BINDER COURSES ARE IN PLACE. OTHERWISE CEMENT CONCRETE WILL BE ELIMINATED AND GRAVEL BROUGHT UP TO BOTTOM OF BASE COURSE. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE SPECIFICATIONS.

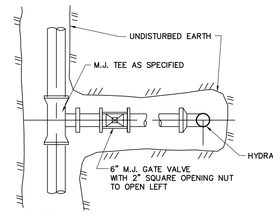
VERTICAL GRANITE CURB

(NOT TO SCALE)

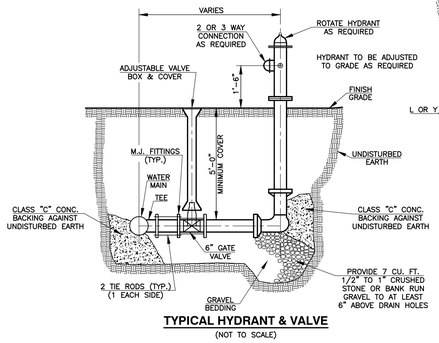


DRAIN MANHOLE

(NOT TO SCALE)



NOTE:
USE MEGA-LUG RESTRAINTS IN LIEU OF THRUST BLOCK & TIE RODS.

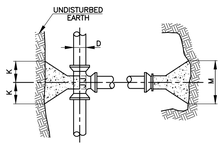


TYPICAL HYDRANT & VALVE

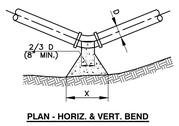
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THRUST BLOCK SCHEDULE TABLE OF MINIMUM BEARING AREA IN SQ. IN. AGAINST UNDISTURBED SOIL FOR 4" DIA. PIPE			
SOIL BEARING CAPACITY(PSF)	90 DEGREE BEND	TEE	45 DEGREE BEND
1000	945	674	516
1500	630	450	344
2000	473	337	258
3000	315	225	172

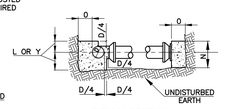
NOTE:
FOR FITTINGS W/LESS THAN 45° DEFLECTION USE BEARING AREA FOR 45° BEND BASED ON INTERNAL PRESSURE OF 80 PSI



PLAN - TEE & PLUG



PLAN - HORIZ. & VERT. BEND



TYPICAL SECTION TEES, BENDS & PLUGS

SIZE OF BRANCH	J	K	L	M	N	O
4" THRU 8"	10"	10"	1'-0"	2'-0"	1'-6"	10"
10" THRU 16"	1'-0"	1'-6"	1'-8"	3'-10"	2'-10"	1'-8"
24"	1'-4"	2'-0"	2'-6"	5'-0"	3'-6"	1'-8"

TEES & PLUGS

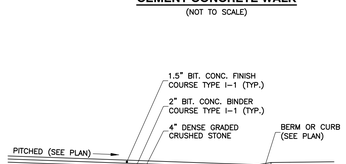
90° & 45° BENDS		22-1/2 & 11-1/4			
D	4" TO 8"	10" TO 16"	24"	4" TO 8"	10" TO 16"	24"
X	1'-8"	3'-4"	5'-6"	1'-4"	2'-0"	3'-6"
Y	1'-2"	1'-8"	2'-4"	1'-0"	1'-2"	2'-4"

BENDS

THRUST BLOCK DETAILS

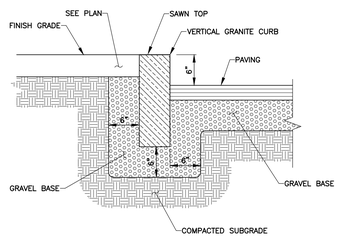
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CEMENT CONCRETE: 3,000 PSI AT 28 DAYS



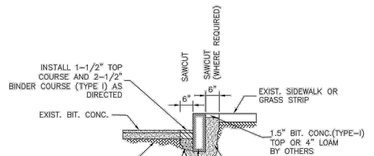
FULL DEPTH PAVEMENT SECTION

(NOT TO SCALE)



CURB SETTING DETAIL

(NOT TO SCALE)



PER FOOT PRICE INCLUDES PAYMENT FOR SAWCUT, EXCAVATION, INSTALLATION OF GRANITE CURBING, CEMENT CONCRETE, GRAVEL, AND ANY INCIDENTAL WORK AS REQUIRED.

GRANITE CURB TYPE VA-4

SCALE : N/A

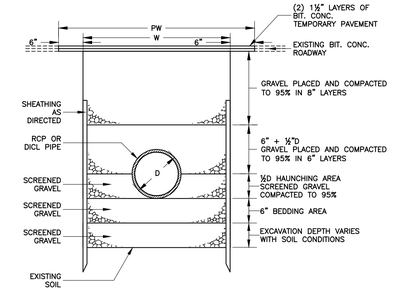
FOR USE WITHIN BOSTON STREET

TOWN OF MIDDLETON
DEPARTMENT OF PUBLIC WORKS
195 North Main Street, Middleton, MA 01949
Phone: 978-777-0407 — Fax: 978-774-0716

Vertical Granite Curb

VERTICAL GRANITE CURB (VA-4)

(NOT TO SCALE)



W = MAXIMUM TRENCH WIDTH
PW = MAXIMUM PAVING WIDTH = W+1'-0"
D = OUTSIDE DIAMETER
UNSHEATHED TRENCH: W = D+2'(3'-0" MIN.)
SHEATHED TRENCH: W = D+2'+SHEATHING WIDTH:
4'-2"MIN. W/O WALERS
5'-0" MIN. W/ WALERS
TRENCH BOX OR HYDRAULIC SHORING:
W = D+2' + [WALL SHIELD WIDTH ± 8"] + 1' FOR TRENCH BOX

TRENCH DETAIL FOR RCP OR DICL PIPE

(NOT TO SCALE)

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

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Land Surveyors

Wetland Scientists

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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

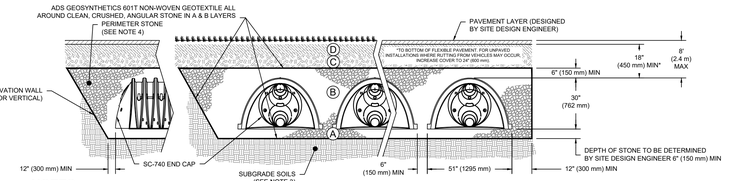
DATE: 11/09/23 SCALE: AS NOTED
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: DTW APPROVED BY: JP

PRELIMINARY DETAILS

PLOT DATE: Dec 07, 2023 2:26 pm
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DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C-7 Details
SHEET: C-7
PROJECT NO.: 25912

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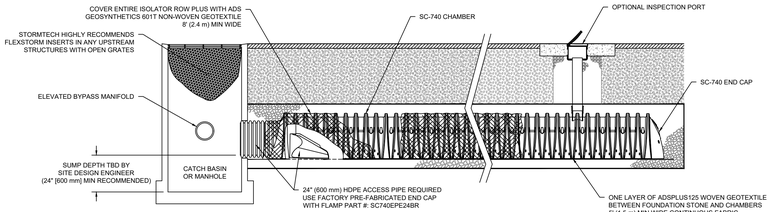


NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

STORMTECH SC-740 CROSS SECTION

(NOT TO SCALE)



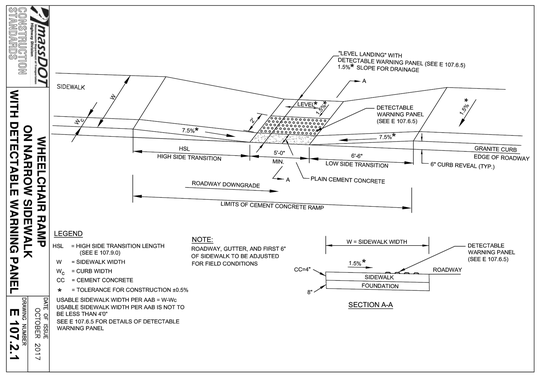
SC-740 ISOLATOR ROW PLUS DETAIL

(NOT TO SCALE)

PRELIMINARY INFILTRATION SYSTEM TABLE

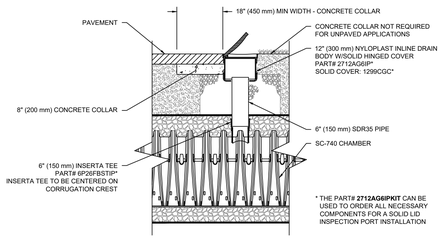
SYSTEM	CHAMBERS	# OF ROWS	CHAMBERS PER ROW	FIELD WIDTH (FT)	FIELD LENGTH (FT)	CHAMBER INVERT	STONE INVERT	ESHGWT ** ELEVATION
1P	191 SC-740 1	15 1	12 11*	77.5 FT	89.06 FT	101.0	101.5	99±
2P	6 SC-740	1	6	6.25 FT	46.33 FT	100.0	100.5	95±
3P	52 SC-740	4	13	20.5 FT	96.18 FT	100.0	99.5	97±

* 1 CHAMBER TO BE REMOVED TO ACCOMMODATE SITE LIGHT POLE.
** TO BE CONFIRMED WITH ADDITIONAL SOIL TESTING PRIOR TO PREPARATION OF BUILDING PERMIT/CONSTRUCTION DRAWINGS.



MASSDOT DETAIL - WHEELCHAIR RAMP WITH FLUSH CURB

(NOT TO SCALE)



SC-740 6" (150 mm) INSPECTION PORT DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

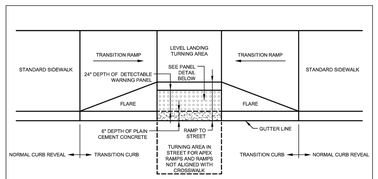
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

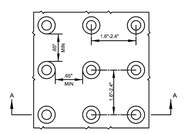
STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

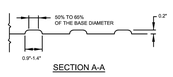
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



TYPICAL INSTALLATION



DETAIL OF DETECTABLE WARNING PANEL



SECTION A-A

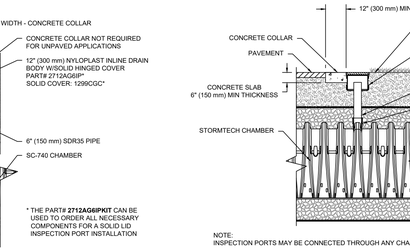
NOTE:

PANELS MAY BE CONCRETE PRECAST OR CAST IN PLACE OR OTHER SUITABLE MATERIAL PERMANENTLY APPLIED TO THE RAMP. DETECTABLE WARNING SURFACES SHALL CONTRAST VISUALLY WITH ADJACENT WALKING SURFACES EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT.

massDOT Highway Division CONSTRUCTION STANDARDS	DETECTABLE WARNING PANEL FOR WHEELCHAIR RAMPS AND STANDARD RAMP TERMINOLOGY	DATE OF ISSUE OCTOBER 2017
		DRAWING NUMBER E 107.6.5

MASSDOT DETAIL - DETECTABLE WARNING PANEL

(NOT TO SCALE)



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER)

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

massDOT CONSTRUCTION STANDARDS	CURB TRANSITION LENGTH FOR WHEELCHAIR RAMPS	DATE OF ISSUE OCTOBER 2017
		DRAWING NUMBER E 107.9.0

ROADWAY PROFILE GRADE	* HIGH SIDE TRANSITION LENGTH
%	ENGLISH UNITS
=0%	6'-6"
>0% TO 1%	7'-8"
>1% TO 2%	9'-0"
>2% TO 3%	11'-0"
>3% TO 4%	14'-0"
>4% TO 5%	15'-0" Max

NOTE:

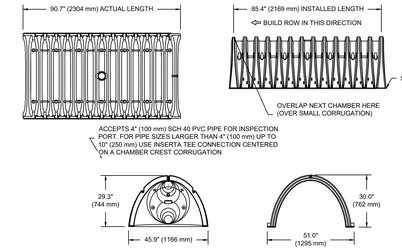
★ BASED ON A DESIGN SLOPE OF 7.5% AND A REVEAL OF 6".

MASSDOT DETAIL - CURB TRANSITION LENGTH

(NOT TO SCALE)

SC-740 TECHNICAL SPECIFICATION

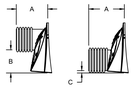
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



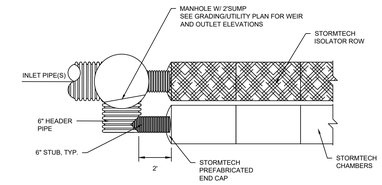
STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL



STORMTECH CHAMBERS - MANIFOLD

(NOT TO SCALE)

MIDDLETON
10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:
VILLEBRIDGE DEVELOPMENT LLC.
1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES
Civil Engineers
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Wetland Scientists
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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION
1	FAK	JP	12/07/23	RESPONSE TO PEER REVIEW # 2

DATE: 11/09/23 SCALE: AS NOTED
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: DTW APPROVED BY: JP

PRELIMINARY DETAILS

PLOT DATE: Dec 07, 2023 2:26 pm
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DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: C-8 Details
SHEET: C-8
PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/7/2023 2:15 PM Plotted: Dec 07, 2023 2:26:24pm
Tab: C-8 Details Plot Style: 10GCC.ctb Plotted By: Chin M. Kwan

HANCOCK ASSOCIATES

Preliminary Stormwater Report

In Support of

Chapter 40B Filing

for

Villebridge Development LLC
Parcel ID # 0025-0000-0067 (18 Boston Street)
Parcel ID # 0025-0000-0066 (10 Boston Street)
Parcel ID # 0025-0000-0065 (49 S. Main Street)

Middleton, MA

Prepared By:
Hancock Associates
#25912

COMMONWEALTH OF MASSACHUSETTS
JOSEPH D. PEZNOLA
CIVIL
No. 38117
REGISTERED PROFESSIONAL ENGINEER

Prepared For:
VILLEBRIDGE DEVELOPMENT LLC.

Original Submission: 8/22/2023

Updated: 12/7/2023

185 Centre Street | Danvers, MA 01923 | V: 978-777-3050 | F: 978-774-7816 | HancockAssociates.com

BOSTON, CHELMSFORD, DANVERS, MARLBOROUGH, NEWBURYPORT, PRINCETON, MA | SALEM, NH

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Standard 8: Construction Period Pollution Prevention and Erosion & Sedimentation Control 6
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Appendix 2: MassDEP Stormwater Checklist
Appendix 3: NOAA Rainfall Data
Appendix 4: NRCS Web Soil Survey
Appendix 5: Existing and Proposed Watersheds
Appendix 6: Hydrocad Output
Appendix 7: Recharge and Drawdown Calculations
Appendix 8: Water Quality Volume Calculations
Appendix 9: Operations and Maintenance Log

Introduction

VILLEBRIDGE DEVELOPMENT LLC. proposes to construct affordable housing units on one of the subdivided lots originating from the combination of 10 & 18 Boston Street and 49 South Main Street, Middleton, MA. Associated improvements will include paved vehicular and pedestrian areas, recreational areas, landscaped areas, stormwater management systems, and utility services. The project area is currently comprised of a building, paved vehicular areas, and some gravel and vegetation. The project area is accessed by Boston Street, and consists of 2.28± acres and is bounded by Boston Street to the west, Rowell Lane to the east, and South Main Street to the north.

The project is not considered a redevelopment project under MassDEP Stormwater **Standard 7**. The project will fully comply with Mass DEP Stormwater Requirements.

- Existing Impervious Area = 37,931 SF
- Proposed Impervious Area = 65,568 SF
- Increase in Impervious Area = 27,637 SF

The proposed stormwater management system will include deep sump catch basins, subsurface infiltration systems, outlet control structures, drain manholes, and area drains. The following report describes the system's compliance with the Massachusetts Stormwater Handbook and Middleton's Stormwater Standards.

Standard 1: No New Untreated Discharges

The Massachusetts Stormwater Handbook states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosions in wetlands or waters of the Commonwealth. The project does not include new stormwater conveyances.

All new stormwater runoff requiring treatment will be treated through three subsurface infiltration systems before being discharged to the existing 12" drain outfall on South Main Street.

Standard 2: Peak Rate Attenuation

The Massachusetts Stormwater Handbook states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. A summary of the existing and proposed discharge rates follows. The proposed condition discharge rates of runoff are at or below the existing rates to the same discharge points. Please see refer to Appendix 5 (Existing and Proposed Watersheds) and Appendix 6 (HydroCAD Output) for more information.

The following tables summarizes that the post-development discharge rates will not exceed the pre-development discharge rates for three analysis points (South Main Street, Rowell Lane, and Boston Street):

South Main Street

	Pre- Rate (CFS)	Post – Rate (CFS)
2-year storm	1.51 CFS	0.81 CFS
10-year storm	3.54 CFS	1.88 CFS
25-year storm	4.91 CFS	2.58 CFS
100-year storm	7.09 CFS	3.78 CFS

Rowell Lane

	Pre- Rate (CFS)	Post – Rate (CFS)
2-year storm	0.72 CFS	0 CFS
10-year storm	1.29 CFS	0 CFS
25-year storm	1.65 CFS	0 CFS
100-year storm	2.19 CFS	0 CFS

Boston Street

	Pre- Rate (CFS)	Post – Rate (CFS)
2-year storm	0.56 CFS	0.03 CFS
10-year storm	1.10 CFS	0.08 CFS
25-year storm	1.43 CFS	0.10 CFS
100-year storm	1.96 CFS	0.15 CFS

Runoff attenuated for the 2-, 10-, 25- and 100-year storms are based on Type III 24-hour storm period rainfall data provided through NOAA ATLAS 14 precipitation frequencies (see Appendix 3).

Rational Design for 25 Year Storm for Pipe Sizing

Given that the HydroCAD model utilizes dynamic routing, surcharge will occur in some proposed pipes that are upstream of the infiltration systems. The infiltration systems are serving their purpose by "holding back" stormwater and reducing outgoing flow. However, surcharging of upstream pipes is a result of that mechanism. These pipes will not surcharge under free flow conditions. We ask that in this case rational design acceptability be defined as no surcharging over rim elevations.

The existing 8" lateral to South Main Street will also surcharge but the rim elevation. An additional infiltration system (3P) was added on the abutting lot to limit flow to this pipe. However complete elimination of pipe surcharge could not be achieved. Again, we ask that rational design acceptability be defined as no surcharging over rim elevations.

Standard 3: Recharge

The Massachusetts Stormwater Handbook states that loss of annual recharge to groundwater shall be eliminated or minimized. The annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type.

Recharge volumes are provided for watersheds P1's and P3's impervious areas. For these calculations, all of the project areas are considered to be Hydrologic Soil Group B based on the findings from the USGS web soil survey.

Post Development Watershed Impervious & Pervious Areas

Watershed	**Impervious Area (SF)**	**Pervious Area (SF)**	**Notes**
P1-A1	11499	0	P1's Impervious Areas total to 54878 S.F. and recharged through Inf. Sys. 1P. We will
P1-A2	13615	0	
P1-B	0	1341	

P1-C	2280	677	not count the recharge gained from Inf. Sys. 3P, as that is outside the bounds of the residential lot footprint.
P1-D	0	141	
P1-E	2568	760	
P1-F	14022	5436	
P1-G	10894	3665	
P2	466	599	P2's Impervious Area is not recharged
P3-A	7951	457	P3's Impervious = 7951 S.F. (sent to Inf. Sys. 2P)
P3-B	0	9734	
P4	2273	10890	P4's Impervious Area not recharged
Total	**65568**	33700	Use 65568 S.F. to calculate target recharge

The required recharge volume is 0.35" multiplied by the area of impervious surfaces in P1, P2, P3 and P4.

For post-development Watershed P1's, P2, P3's, and P4:

Required Recharge Volume, HSG B=
Target Depth * Impervious Area = [(0.35"/12) SF] * [65568 SF] = 1,912.4 CF

We will show that the recharge volume provided by Watershed P1's and P3's impervious area is sufficient to meet the recharge requirements of 1,912.4 CF.

For post-development Watershed P1 Areas (A1, A2, B, C, D, E, F & G):

The recharge volume is provided below the orifice (elevation 101.75) within the outlet control structure.

The calculations shown is for 192 SC-740 Chambers, but since we only have 191 Chambers, we will subtract the recharge volume of 1 chamber w/stones, which is 23.5 CF.

Recharge volume = 2822.2 CF (for 192 chambers) minus 23.5 CF (for 1 less chamber)
Total recharge volume provided by Watershed P1 Areas = 2798.7 CF.

The Massachusetts Stormwater Handbook states that the recharge volume must drain within 72 hours. The "drawdown" calculation assumes a Rawl's Rate of 1.02 inches per hour, corresponding to hydrologic soil group B.

For Watershed P1 Areas, a drawdown time of 2.8 hours was calculated for Infiltration System 1P, which is less than 72 hours, so the requirement is met.

For post-development Watershed P3 Areas (A & B):

The recharge volume is provided below the weir (elevation 102.8) within the outlet control structure.

The calculations shown is for 6 SC-740 Chambers.

Total recharge volume provided by Watershed P3 Areas = 370.8 CF.

The Massachusetts Stormwater Handbook states that the recharge volume must drain within 72 hours. The following "drawdown" calculation assumes a Rawl's Rate of 1.02 inches per hour, corresponding to hydrologic soil group B.

For Watershed P3 Areas, a drawdown time of 9.5 hours was calculated for Infiltration System 2P, which is less than 72 hours, so the requirement is met.

Overall, post-development total recharge:

Overall, total recharge provided for Watersheds P1's, P2, P3's and P4 = 2798.7 CF + 370.8 CF
= 3169.5 CF

Since this total (3169.5 CF) is greater than the target post-development recharge volume of 1,912.4 CF, this requirement is met.

Standard 4: Water Quality

The Massachusetts Stormwater Handbook states that systems shall be designed to remove 80% of the average annual post-development construction load of Total Suspended Solids (TSS). The treatment BMP's have been sized to provide at least 80% TSS removal and measures will be taken for long-term pollution prevention.

Stormwater runoff from roof areas will be treated for at least 80% TSS removal via StormTech Isolator rows (or approved equal). The treatment train computation is as follows:

Table 1: Treatment Train Calculation for Roofs

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
StormTech Isolator Row from Infiltration System # 1P	0.84	1	0.84	0.16
StormTech Infiltration System #3P	0.80	0.16	0.128	0.032
Total TSS Removal = 0.84 + 0.128 = 0.968 or **96.8%**				

Stormwater runoff from all other impervious areas like curbs, walks, parking lot areas that passes through catch basins with deep sumps and hoods and then to the StormTech Isolator row will have an even higher TSS removal rate. The treatment train computation is as follows:

Table 2: Treatment Train Calculation for Proposed Impervious Areas other than Roofs

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Catch Basins with Deep Sumps and Hoods	0.25	1	0.25	0.75
StormTech Isolator Row from Infiltration System # 1P or #2P	0.84	0.75	0.63	0.12
Total TSS Removal = 0.25 + 0.63 = 0.88 or **88%**				

The following calculation shows the weighted TSS removal rate is a little greater that 82% for the proposed development.For post development watersheds:

Watershed	**Impervious Area (SF)**	**Type**	**TSS Removal**	**Area Treated (SF)**
P1-A1	11499	Roof	96.8%	11131.0
P1-A2	13615	Roof	96.8%	13179.3
P1-B	0	n/a	0%	0
P1-C	2280	Pavement/Curb	88%	2006.4
P1-D	0	n/a	0%	0
P1-E	2568	Pavement/Curb	88%	2259.84
P1-F	14022	Pavement/Curb	88%	12339.36
P1-G	10894	Pavement/Curb	88%	9586.72
P2	466	Pavement/Curb	De minimis impervious area	0
P3-A	7951	Pavement/Curb	88%	6996.88
P3-B	0	n/a	0%	0
P4	2273	Pavement/Curb	Not treated	0
			Total	57499.55 SF

Weighted TSS Removal % = 57499.55 / Total Impervious
= 57499.55 / 65568
= 87.69%

For proposed Watershed P1 Areas
Target WQV = (0.50 inches of runoff) x (1 ft/12 in) x (54,878 SF of impervious area in Watershed P1)
Target WQV = 2286.6 CF

For proposed Watershed P2 Area
Target WQV = (0.50 inches of runoff) x (1ft/12 in) x (466 SF of impervious area in Watershed P2)
Target WQV = 19.42 CF

For proposed Watershed P3 Areas
Target WQV = (0.50 inches of runoff) x (1ft/12 in) x (7951 SF of impervious area in Watershed P3)
Target WQV = 331.29 CF

For proposed Watershed P4 Area
Target WQV = (0.50 inches of runoff) x (1ft/12 in) x (2273 SF of impervious area in Watershed P2)
Target WQV = 94.71 CF

Total Target WQV = (2286.6 + 19.42 + 331.29 + 94.71) = 2732.02 CF

Since the weighted TSS Removal Rate is 87.69%, and the total recharge volume is 3169.5 CF (see Standard 3), we obtain (87.69% x 3169.5 CF) or 2779.33 CF of WQV.

Since 2779.33 CF is greater than 2732.02 CF (Target WQV), Standard 4 is also met.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The proposed project is not a Land Use with Higher Potential Pollutant Load (LUHPPL). Standard 5 does not apply, but a Stormwater Pollution Prevention Plan will be submitted prior to the discharge of stormwater to post-construction stormwater BMPs.

Standard 6: Critical Area

The proposed project is not within a Critical Area. Standard 6 does not apply.

Standard 7: Redevelopment

The proposed project is not a redevelopment because there is an increase in impervious area after proposed conditions.

Standard 8: Construction Period Pollution Prevention and Erosion & Sedimentation Control

Best management practices (BMP) for erosion and sedimentation control are staked straw bales, filter fences, wattles, hydro seeding, and phased development. Many stormwater BMP technologies (e.g., infiltration technologies) are not designed to handle the high concentrations of sediments typically found in construction runoff and must be protected from construction-related sediment loadings. Construction BMP's **must** be maintained. In developing the proposed project certain measures will be implemented to minimize impacts erosion and sedimentation could have on surrounding areas. This section addresses items that involve proper construction techniques, close surveillance of workmanship, and immediate response to emergency situations. The developer must be prepared to provide whatever reasonable measures are necessary to protect the environment during construction and to stabilize all disturbed areas as soon as construction ends. Construction period pollution prevention and erosion and sediment control shall meet the requirements for the 2022 EPA Construction General Permit for all projects requiring coverage under the CGP.

Pre-Construction

1. The contractor shall have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials shall include, but are not limited to straw bales, silt fence, wattles and crushed stone.
2. The contractor is responsible for erosion control on site and shall utilize erosion control measures where needed, regardless of whether the measures are specified on the plan or in the order of conditions.

Preliminary Site Work

1. Excavated materials should be stockpiled, separating the topsoil for future use on the site. Erosion control shall be utilized along the down slope side of the piles and side slopes shall not exceed 2:1.
2. If intense rainfall is anticipated, the installation of supplemental straw bale dikes, silt fences, or armored dikes shall be considered.
3. Unsuitable excavated material shall be removed from the site.
4. Construction entrance shall be installed.
5. Existing catch basins shall be protected with silt sacks.

Ongoing Site Work

1. Erosion control measures shall be regularly inspected and replaced as needed.
2. Dewatering shall be done in a manner so as not to transmit silt, sand or particulate matter to the receiving water or existing drainage system.

Landscaping

1. Landscaping shall occur as soon as possible to provide permanent stabilization of disturbed surfaces.
2. If the season or adverse weather conditions do not allow the establishment of vegetation, temporary mulching with straw, wood chips weighted with snow fence or branches, or other methods shall be provided.
3. A minimum of 4 inches of topsoil shall be placed and its surface smoothed to the specified grades.
4. The use of herbicides is strongly discouraged.
5. Hydro seeding is encouraged for steep slopes. Application rates on slopes greater than 3:1 shall have a minimum seeding rate of 5-lbs/1000 SF. A latex or fiber tackifier shall be used on these slopes at a minimum rate of 50 lbs. of tackifier per 500 gallons of water used.

Standard 9: Operations and Maintenance Plan

The information provided herein is intended to provide the base information for operation and maintenance of the site in perpetuity subject to updates and revisions as required at a future date. As such all future property owners must be notified in writing of this plan and be provided with a copy of this plan, a complete set of the design drawings and/or a completed as-built plan showing all the drainage features as they were constructed, which are considered part of this document. Please see the attached Operations and Maintenance Log (Appendix VII).

Stormwater management system owner: VILLEBRIDGE DEVELOPMENT LLC.
The party responsible for operation and maintenance: VILLEBRIDGE DEVELOPMENT LLC.

Preliminary Stormwater Operation and Maintenance Budget
Quarterly Inspection and Maintenance x $2,500 per visit = $10,000 annually

Illicit Discharge - Practices to Minimize Storm Water Contamination

- All waste materials will be collected and stored in a securely lidded metal dumpster.
- All trash and debris from the site will be deposited in the dumpster. The dumpster will be emptied on a regular schedule prior to being over full.
- All personnel will be instructed regarding the correct procedure for waste disposal.
- Good housekeeping and spill control practices will be followed to minimize storm water contamination from petroleum products, paints, and cleaning products.
- All site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Spill kits will be provided with any activity that could provide contamination.
- All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewers, but will be properly disposed according to the manufacturer's instructions.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm sewers will be reported to the Massachusetts Department of Environmental Protection Northeast Regional Office at 1-888-304-1133.
- Local police and fire department will be notified of any potential spills per Middleton local stormwater management regulations.

Deep Sump Hooded Catch Basins

Inspect deep sump catch basins four times per year including the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or when the depth of deposits is greater than or equal to one half the depth of the sump. Vacuum trucks are to be used to remove trapped sediment and supernatant.

Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Any contaminated materials must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.00, and handled as hazardous waste. MassDEP regulations prohibit landfills from accepting materials that contain free draining liquids.

Isolator Row & Outlet Control Structures

The isolator row shall be inspected after every major storm for the first few months to ensure it is stabilized and functioning properly. If necessary, corrective action shall be taken until the system functions properly. Inspectors should note how long water remains standing in the inspection port after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging. Thereafter, inspect the isolator row at least twice per year. Outlet control structures should be cleaned as required for proper function.

Roof Drain Leaders

Routine roof inspections shall be performed two times per year. The roof shall be kept clean and free of debris, and the roof drainage systems shall be kept clear. Gutters and downspouts shall be cleaned at least twice per year, or more frequently as necessary.

Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

Subsurface Infiltration Systems & Mosquito Vector Control

Mosquito control should be implemented for all subsurface infiltration systems per manufacturer guidelines. Recommended maintenance includes removing unplanned vegetation, inspect inflow and outflow culverts for sediment accumulation, inspect filters, screens, inspect for erosion, and low channel flow, clear overflow risers from clogs or as needed. Maintenance activities should be conducted twice a year and after heavy rainstorms.

Initial Post-Construction Inspection

During the initial period of vegetation establishment pruning and weeding are required twice in first year by contractor or owner. Any dead vegetation/plantings found after the first year will be replaced. Proper mulching is mandatory and regular watering may be required initially to ensure proper establishment of new vegetation.

Long-Term Maintenance

The planted areas shall be inspected on a semi-annual basis and any litter removed. Weeds and invasive plant species shall be removed by hand. Maintain planted areas adjacent to pavement to prevent soil washout. Immediately clean any soil deposits on pavement. Leaf litter and other detritus shall be removed twice per year. If needed to maintain aesthetic appearance, perennial plantings may be trimmed at the end of the growing season.

Trees and shrubs shall be inspected twice per year to evaluate health and attended to as necessary. Seeded ground cover or grass areas shall not receive mulching. Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming. Plant alternative mixtures of grass species in the event of unsuccessful establishment. The grass vegetation should not be cut to a height less than four inches.

Pesticide/Herbicide Usage

No pesticides are to be used unless a single spot treatment is required for a specific control application.

Standard 10: Prohibition of Illicit Discharges

No illicit discharges currently exist, and no future illicit discharges will be allowed including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, soil, or grease. Prior to discharge of stormwater to post construction BMPs, a no illicit discharge statement will be submitted by the owner.

APPENDIX

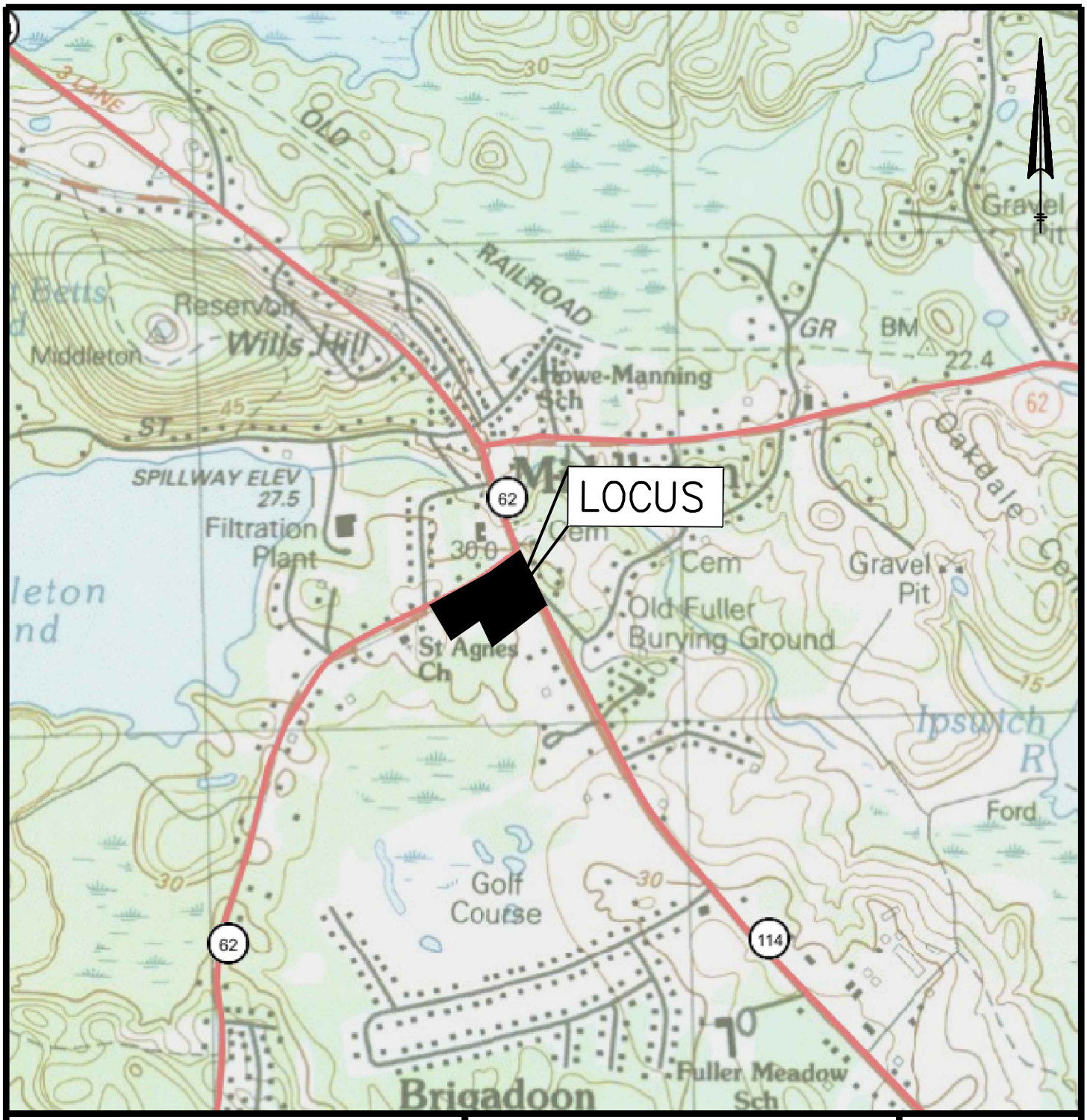
HANCOCK ASSOCIATES

Villebridge Development LLC, Middleton, MA
Original Submission: 8/22/2023 (Updated 12/7/2023)

A.1

LOCUS MAP

Project #25912



USGS LOCUS MAP

MIDDLETON
10 & 18 BOSTON STREET
49 SOUTH MAIN STREET
MIDDLETON, MA 01949

HANCOCK ASSOCIATES

121 E. BERKELEY ST., BOSTON, MA. 02118
VOICE (617) 357-8145, FAX (617) 357-9495

DATE:	08/22/23
SCALE:	1"=1,000'
DESIGN:	CMK
DRAWN:	CMK
LAYOUT:	*LOCUS*
JOB NO.:	25912

PLOT DATE: Aug 18, 2023 DWG: Locus Map.dwg

A.2

Mass DEP Stormwater Checklist

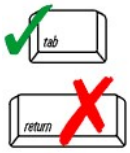
Project #25912

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

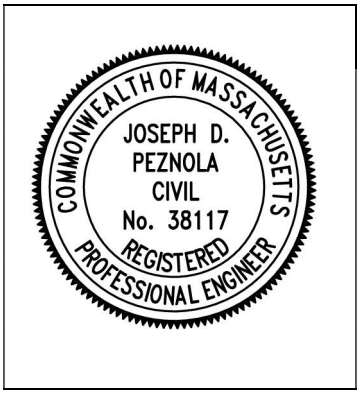
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Joseph D. Peznola 12/7/23

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Subsurface Infiltration System

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

A.3

NOAA Rainfall Data

General Information
Homepage
Progress Reports
FAQ
Glossary

Precipitation Frequency
Data Server
GIS Grids
Maps
Time Series
Temporals
Documents

Probable Maximum Precipitation
Documents

Miscellaneous
Publications
Storm Analysis
Record Precipitation

Contact Us
Inquiries

USA.gov

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: MA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

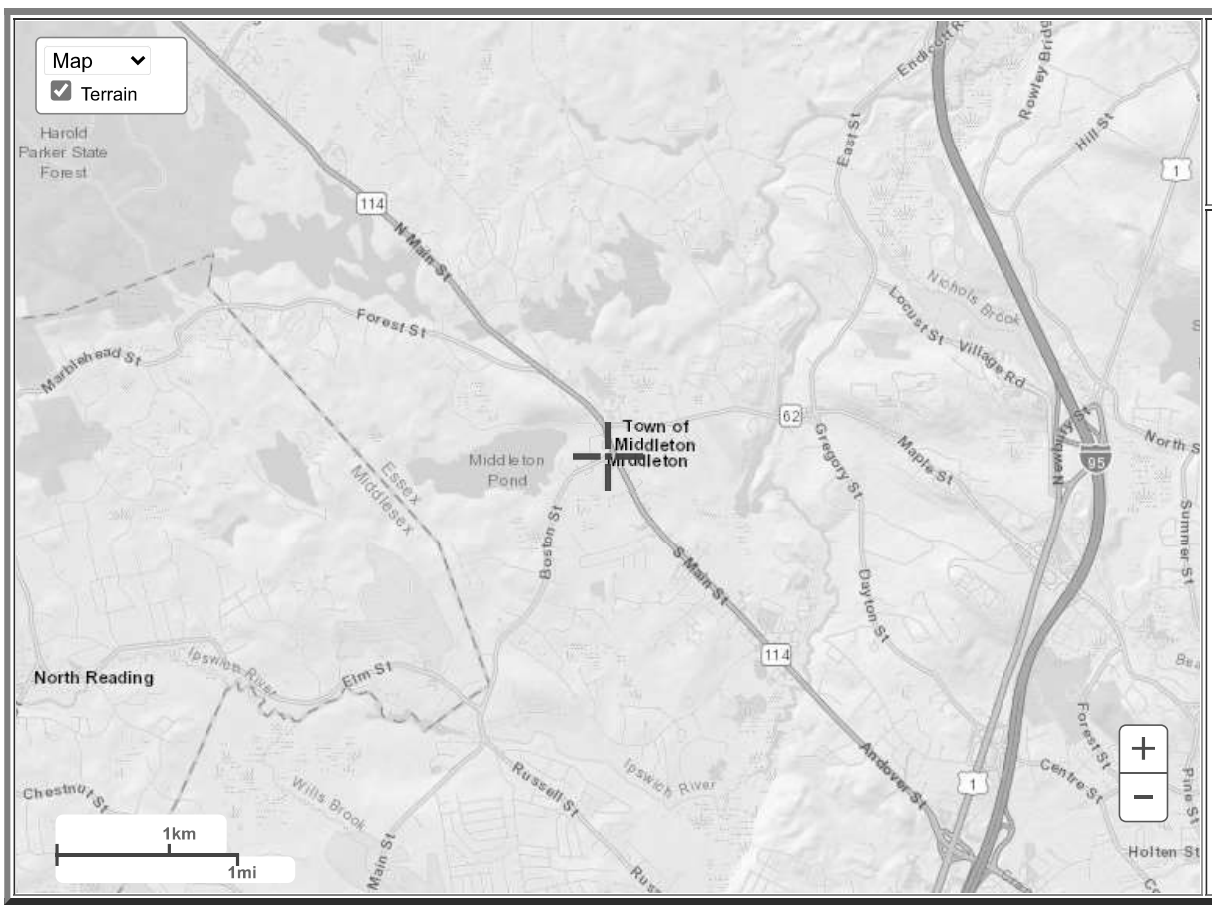
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: Longitude: Submit

b) By station (list of MA stations): Select station

c) By address 49 S Main Street, Middleton, MA, 019

2) Use map:



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Middleton, Massachusetts, USA*
Latitude: 42.5924°
Longitude: -71.0152°
Elevation: 105 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 10, Version 3

PF tabular PF graphical Supplementary information Print page

PDS-based 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	**0.312** (0.243-0.389)	**0.374** (0.291-0.467)	**0.476** (0.369-0.594)	**0.560** (0.432-0.705)	**0.676** (0.505-0.890)	**0.763** (0.559-1.03)	**0.855** (0.609-1.20)	**0.960** (0.646-1.37)	**1.11** (0.720-1.64)	**1.24** (0.783-1.86)
10-min	**0.442** (0.344-0.550)	**0.530** (0.413-0.661)	**0.674** (0.523-0.844)	**0.793** (0.612-0.998)	**0.958** (0.716-1.26)	**1.08** (0.793-1.46)	**1.21** (0.863-1.69)	**1.36** (0.917-1.94)	**1.58** (1.02-2.33)	**1.75** (1.11-2.64)
15-min	**0.520** (0.405-0.648)	**0.623** (0.485-0.778)	**0.792** (0.614-0.991)	**0.933** (0.719-1.17)	**1.13** (0.842-1.48)	**1.27** (0.932-1.71)	**1.43** (1.02-1.99)	**1.60** (1.08-2.28)	**1.85** (1.20-2.74)	**2.06** (1.30-3.10)
30-min	**0.715** (0.557-0.891)	**0.858** (0.668-1.07)	**1.09** (0.847-1.37)	**1.28** (0.991-1.62)	**1.55** (1.16-2.04)	**1.75** (1.28-2.36)	**1.96** (1.40-2.74)	**2.20** (1.48-3.14)	**2.55** (1.65-3.77)	**2.84** (1.80-4.28)
60-min	**0.911** (0.710-1.14)	**1.09** (0.850-1.36)	**1.39** (1.08-1.74)	**1.64** (1.26-2.06)	**1.98** (1.48-2.60)	**2.23** (1.63-3.00)	**2.50** (1.78-3.49)	**2.80** (1.89-4.00)	**3.25** (2.10-4.80)	**3.62** (2.29-5.45)
2-hr	**1.17** (0.922-1.45)	**1.43** (1.12-1.77)	**1.84** (1.44-2.29)	**2.18** (1.70-2.73)	**2.65** (2.00-3.48)	**3.00** (2.22-4.04)	**3.38** (2.44-4.74)	**3.84** (2.59-5.44)	**4.53** (2.95-6.66)	**5.13** (3.26-7.68)
3-hr	**1.36** (1.07-1.68)	**1.66** (1.31-2.05)	**2.15** (1.69-2.67)	**2.56** (2.00-3.19)	**3.13** (2.37-4.10)	**3.54** (2.64-4.75)	**4.00** (2.90-5.60)	**4.56** (3.08-6.44)	**5.42** (3.53-7.93)	**6.16** (3.92-9.19)
6-hr	**1.75** (1.39-2.14)	**2.14** (1.70-2.63)	**2.79** (2.21-3.43)	**3.33** (2.62-4.12)	**4.06** (3.11-5.29)	**4.61** (3.46-6.15)	**5.20** (3.80-7.26)	**5.94** (4.04-8.35)	**7.10** (4.64-10.3)	**8.10** (5.17-12.0)
12-hr	**2.22** (1.78-2.70)	**2.72** (2.18-3.31)	**3.54** (2.83-4.33)	**4.22** (3.36-5.19)	**5.16** (3.97-6.67)	**5.85** (4.41-7.75)	**6.61** (4.86-9.14)	**7.54** (5.15-10.5)	**8.99** (5.89-13.0)	**10.2** (6.55-15.1)
24-hr	**2.66** (2.16-3.22)	**3.30** (2.67-3.99)	**4.35** (3.50-5.28)	**5.22** (4.18-6.37)	**6.41** (4.98-8.25)	**7.29** (5.54-9.62)	**8.26** (6.12-11.4)	**9.47** (6.50-13.1)	**11.4** (7.48-16.3)	**13.0** (8.37-19.1)
2-day	**3.03** (2.48-3.64)	**3.83** (3.13-4.61)	**5.14** (4.18-6.20)	**6.23** (5.03-7.55)	**7.72** (6.05-9.91)	**8.81** (6.77-11.6)	**10.0** (7.52-13.9)	**11.6** (8.00-16.0)	**14.2** (9.34-20.2)	**16.4** (10.6-23.8)
3-day	**3.33** (2.73-3.98)	**4.19** (3.44-5.02)	**5.60** (4.57-6.72)	**6.77** (5.49-8.17)	**8.38** (6.59-10.7)	**9.54** (7.36-12.5)	**10.9** (8.17-14.9)	**12.6** (8.68-17.2)	**15.4** (10.1-21.8)	**17.8** (11.5-25.8)
4-day	**3.61** (2.97-4.30)	**4.50** (3.70-5.37)	**5.95** (4.87-7.12)	**7.15** (5.82-8.61)	**8.81** (6.95-11.2)	**10.0** (7.75-13.1)	**11.4** (8.58-15.6)	**13.1** (9.09-18.0)	**16.0** (10.6-22.7)	**18.6** (12.0-26.8)
7-day	**4.37** (3.63-5.19)	**5.29** (4.39-6.28)	**6.80** (5.61-8.09)	**8.04** (6.59-9.63)	**9.76** (7.74-12.3)	**11.0** (8.56-14.3)	**12.4** (9.38-16.9)	**14.2** (9.88-19.3)	**17.2** (11.4-24.1)	**19.8** (12.8-28.3)
10-day	**5.06** (4.22-5.98)	**6.00** (5.00-7.10)	**7.54** (6.26-8.96)	**8.82** (7.27-10.5)	**10.6** (8.42-13.3)	**11.9** (9.24-15.3)	**13.3** (10.1-17.9)	**15.1** (10.5-20.5)	**18.0** (12.0-25.2)	**20.5** (13.3-29.3)
20-day	**7.00** (5.88-8.21)	**8.03** (6.74-9.43)	**9.71** (8.12-11.4)	**11.1** (9.23-13.2)	**13.0** (10.4-16.1)	**14.5** (11.3-18.3)	**16.0** (12.0-21.0)	**17.8** (12.5-23.9)	**20.4** (13.6-28.3)	**22.5** (14.7-32.0)
30-day	**8.60** (7.27-10.1)	**9.70** (8.20-11.4)	**11.5** (9.68-13.5)	**13.0** (10.9-15.4)	**15.1** (12.1-18.5)	**16.6** (13.0-20.8)	**18.2** (13.6-23.6)	**20.0** (14.1-26.6)	**22.3** (15.0-30.9)	**24.2** (15.8-34.2)
45-day	**10.6** (9.05-12.4)	**11.8** (10.0-13.8)	**13.8** (11.6-16.1)	**15.4** (12.9-18.1)	**17.6** (14.1-21.4)	**19.3** (15.0-23.9)	**21.0** (15.6-26.8)	**22.6** (16.0-30.1)	**24.8** (16.7-34.1)	**26.4** (17.2-37.2)
60-day	**12.4** (10.6-14.4)	**13.6** (11.6-15.8)	**15.7** (13.3-18.2)	**17.3** (14.6-20.3)	**19.6** (15.8-23.8)	**21.5** (16.8-26.5)	**23.2** (17.3-29.5)	**24.9** (17.7-32.9)	**26.9** (18.2-36.9)	**28.4** (18.5-39.8)

[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.

A.4

NRCS Web Soil Survey

Project #25912

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Essex County, Massachusetts, Southern Part



August 18, 2023

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,730 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil 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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 19, Sep 9, 2022

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
420B	Canton fine sandy loam, 3 to 8 percent slopes	3.9	57.3%
602	Urban land	2.9	42.7%
Totals for Area of Interest		**6.8**	**100.0%**

Map Unit Descriptions

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

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

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

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

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Essex County, Massachusetts, Southern Part

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 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: All areas are prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

602—Urban land

Map Unit Setting

National map unit symbol: vkjv
Frost-free period: 145 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Urban Land

Setting

Parent material: Excavated, filled, and made land

Minor Components

Udorthents

Percent of map unit: 7 percent
Hydric soil rating: No

Hollis

Percent of map unit: 5 percent

Whitman

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

Whately variant

Percent of map unit: 1 percent
Landform: Glacial lakes (relict)
Hydric soil rating: Yes

Maybid

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Swansea

Percent of map unit: 1 percent
Landform: Bogs
Hydric soil rating: Yes

Scarboro

Percent of map unit: 1 percent
Landform: Terraces
Hydric soil rating: Yes

Freetown

Percent of map unit: 1 percent
Landform: Bogs
Hydric soil rating: Yes

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HANCOCK ASSOCIATES

Villebridge Development LLC, Middleton, MA
Original Submission: 8/22/2023 (Updated 12/7/2023)

A.5

Existing and Proposed Watersheds

Project #25912

BOSTON STREET
(PUBLIC – 60' WIDTH)
(ROUTE 62 – 1936 ESSEX COUNTY LAYOUT)

SOUTH MAIN STREET
(PUBLIC – VARIABLE WIDTH)
(ROUTE 114 – 1921 STATE HIGHWAY LAYOUT)

ROWELL LANE

E2
EXISTING WATERSHED E2
IMPERVIOUS = 8,559 S.F.
PERVIOUS = 5,237 S.F.
Tc=8.9 MIN

E1
EXISTING WATERSHED E1
IMPERVIOUS = 24,622 S.F.
PERVIOUS = 41,244 S.F.
Tc=13.9 MIN

E3
EXISTING WATERSHED E3
IMPERVIOUS = 4,750 S.F.
PERVIOUS = 14,856 S.F.
Tc=23.0 MIN

TIME OF CONCENTRATION PATH

EXISTING IMPERVIOUS (GRAY)

37,931 ± SF

EXISTING PERVIOUS (GREEN)

61,337 ± SF

TOTAL LOT AREA

99,268 ± SF

20 0 10 20 40
HORIZONTAL GRAPHIC SCALE IN FEET

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 E. BERKELEY ST., 4TH FL., BOSTON, MA 02118
VOICE (617) 357-8145, FAX (617) 357-9495
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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE:	08/22/23	SCALE:	1"=20'
DRAWN BY:	CMK	DESIGNED BY:	FAK
CHECKED BY:	FAK	APPROVED BY:	JP

EXISTING WATERSHED ANALYSIS

PLOT DATE: Dec 06, 2023 7:25 am
O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\

DWG:	25912sp29r2 12-07-2023.dwg
LAYOUT:	EX-WSHD
SHEET:	**EW-1**
PROJECT NO.:	25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg, Saved 12/6/2023 7:16 AM, Plotted: Dec 06, 2023 7:25:43am
Tab: EX-WSHD Plot Style: HancDC.ctb, Plotted By: Chi M. Kwan

BOSTON STREET
(PUBLIC – 60' WIDTH)
(ROUTE 62 – 1936 ESSEX COUNTY LAYOUT)

SOUTH MAIN STREET
(PUBLIC – VARIABLE WIDTH)
(ROUTE 114 – 1921 STATE HIGHWAY LAYOUT)

ROWELL LANE

PROPERTY LINE

P1-F
PROPOSED WATERSHED P1-F
IMPERVIOUS = 14022 S.F.
PERVIOUS = 5436 S.F.
Tc=6.0 MIN

P1-G
PROPOSED WATERSHED P1-G
IMPERVIOUS = 10894 S.F.
PERVIOUS = 3665 S.F.
Tc=6.0 MIN

P1-E
PROPOSED WATERSHED P1-E
PERVIOUS = 1341 S.F.
Tc=6.0 MIN

P1-C
PROPOSED WATERSHED P1-C
IMPERVIOUS = 2280 S.F.
PERVIOUS = 677 S.F.
Tc=6.0 MIN

P1-D
Tc=6.0 MIN

P1-A1
PROPOSED WATERSHED P1-A1
IMPERVIOUS = 11499 S.F.
Tc=6.0 MIN

P1-B
PROPOSED WATERSHED P1-B
PERVIOUS = 1341 S.F.
Tc=6.0 MIN

P1-A2
PROPOSED WATERSHED P1-A2
IMPERVIOUS = 13615 S.F.
Tc=6.0 MIN

P2
PROPOSED WATERSHED P2
IMPERVIOUS = 466 S.F.
PERVIOUS = 599 S.F.
Tc=6 MIN

P3-A
PROPOSED WATERSHED P3-A
IMPERVIOUS =7951 S.F.
PERVIOUS = 457 S.F.
Tc=6.0 MIN

P3-B
PROPOSED WATERSHED P3-B
IMPERVIOUS =0 S.F.
PERVIOUS = 9734 S.F.
Tc=6.0 MIN

P4
PROPOSED WATERSHED P4
IMPERVIOUS =2273 S.F.
Tc=6.0 MIN

PROPOSED WATERSHED P4
IMPERVIOUS = 10890 S.F.
PERVIOUS = 0 S.F.
Tc=6.0 MIN

TIME OF CONCENTRATION PATH

A1 2.75'
A2 10.7
A3 36.55'
A4 50.0'
A5 12.1'
A6 50.0'
A7 35.7'

PROPOSED VARIABLE WIDTH UTILITY EASEMENT

PROPOSED VARIABLE WIDTH UTILITY EASEMENT

PROPOSED NON-FAST FOOD CONVENIENCE RETAIL/RESTAURANT FOOD & BEVERAGE
1 STORY - 14,400S.F. (INCL. 2,400S.F. DRIVE-THRU)
+ 850S.F. NORTH PATIO
+ 1,000S.F. SOUTH PATIO
67 PARKING SPACES (4.6 RATIO)

PROPOSED FAST-CASUAL RESTAURANT WITH COUNTER SERVICE W/DRIVE-THRU (15-17 VEHICLES)
1 STORY - 4,000S.F.
+ 400S.F. PATIO
41 PARKING SPACES (10.25 RATIO)

GAS METER BOX

AREA = 1.1 ACRES

PROPOSED IMPERVIOUS (GRAY)

65,568 ± SF

27,637 SF INCREASE OF IMPERVIOUS AREA

PROPOSED PERVIOUS (GREEN)

33,700 ± SF

20 0 10 20 40
HORIZONTAL GRAPHIC SCALE IN FEET

MIDDLETON

10 & 18 Boston Street &
49 South Main Street
Middleton, Massachusetts 01949

PREPARED FOR:

VILLEBRIDGE DEVELOPMENT LLC.

1150 Great Plain Avenue
Needham, Massachusetts 02492

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NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 08/22/23 SCALE: 1"=20'
DRAWN BY: CMK DESIGNED BY: FAK
CHECKED BY: FAK APPROVED BY: JP

PROPOSED WATERSHED ANALYSIS

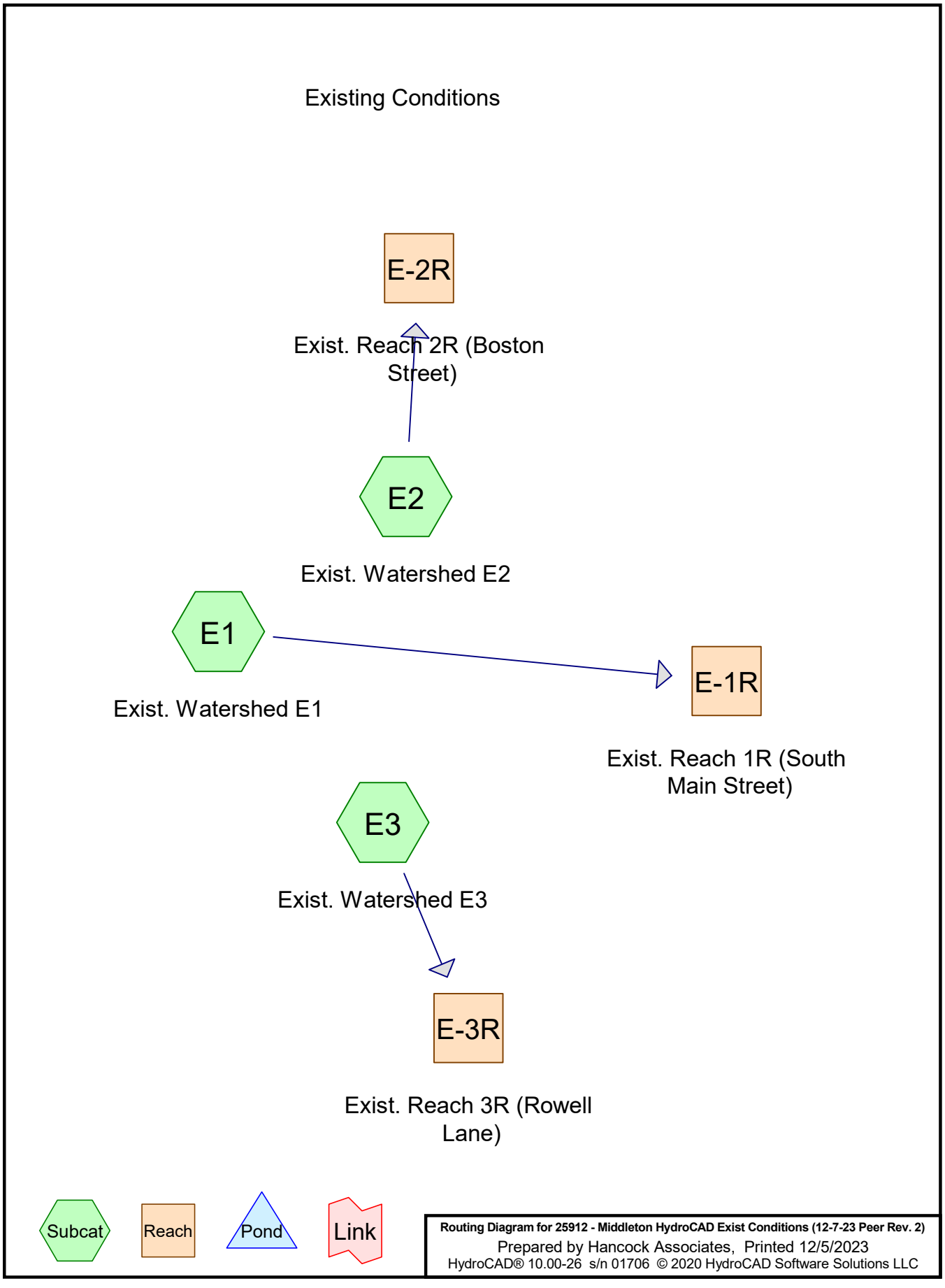
PLOT DATE: Dec 06, 2023 7:26 am
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DWG: 25912sp29r2 12-07-2023.dwg
LAYOUT: PR-WSHD
SHEET: **PW-1**
PROJECT NO.: 25912

File Name: O:\Civil 3D Projects\25912 - Lars - Middleton\Eng\DWG\25912sp29r2 12-07-2023.dwg Saved 12/6/2023 7:16 AM Plotted: Dec 06, 2023 7:26:53am
Tab: PR-WSHD Plot Style: HancockAssociates.ctb Plotted By: CMK Kwan

A.6

HydroCAD Output


Existing Conditions
E-2R
Exist. Reach 2R (Boston Street)
E2
Exist. Watershed E2
E1
Exist. Watershed E1
E-1R
Exist. Reach 1R (South Main Street)
E3
Exist. Watershed E3
E-3R
Exist. Reach 3R (Rowell Lane)
Subcat
Reach
Pond
Link
Routing Diagram for 25912 - Middleton HydroCAD Exist Conditions (12-7-23 Peer Rev. 2)
Prepared by Hancock Associates, Printed 12/5/2023
HydroCAD® 10.00-26 s/n 01706 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
51,231	61	>75% Grass cover, Good, HSG B (E1, E2, E3)
48,037	98	Impervious (Roof, drives, walks, walls, pads) (E1, E2, E3)
99,268	**79**	**TOTAL AREA**

Summary for Subcatchment E1: Exist. Watershed E1

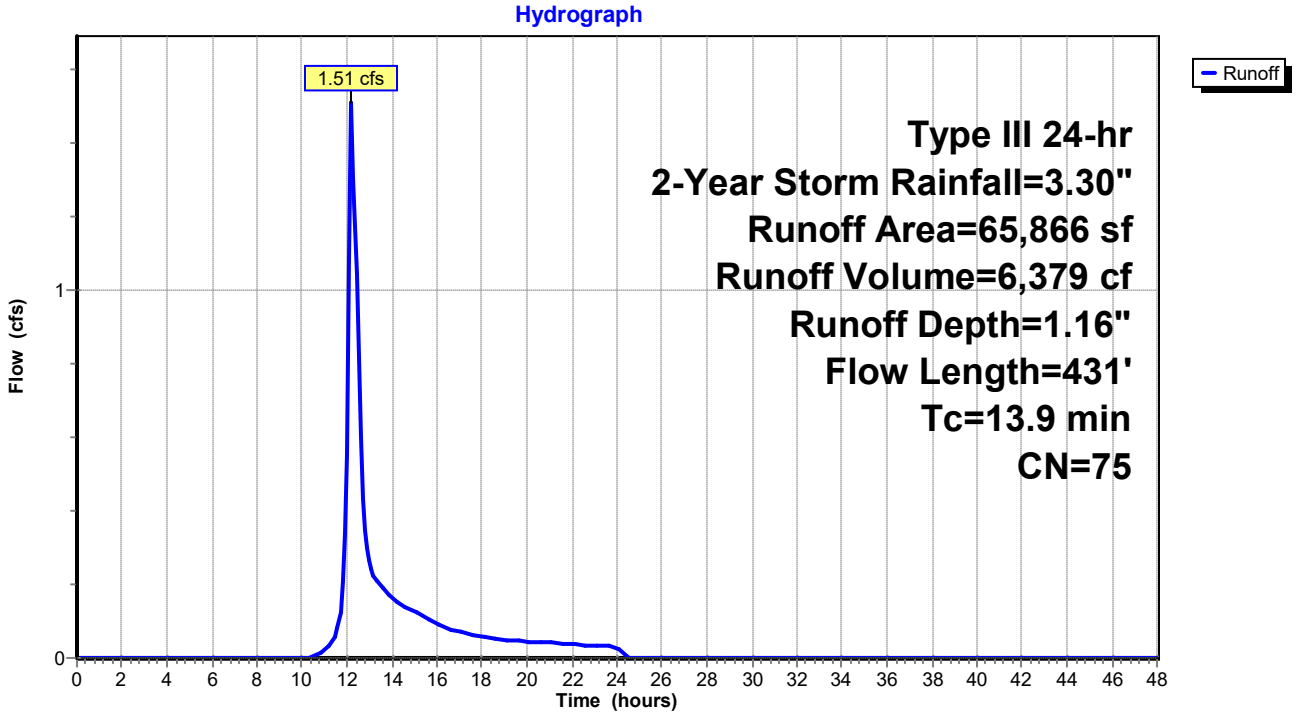
Runoff = 1.51 cfs @ 12.22 hrs, Volume= 6,379 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

	Area (sf)	CN	Description
*	24,622	98	Impervious (Roof, drives, walks, walls, pads)
	41,244	61	>75% Grass cover, Good, HSG B
	65,866	75	Weighted Average
	41,244		62.62% Pervious Area
	24,622		37.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.03		**Sheet Flow, 1A to 1B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	4	0.0270	0.83		**Sheet Flow, 1B to 1C** Smooth surfaces n= 0.011 P2= 3.30"
2.1	16	0.0220	0.12		**Sheet Flow, 1C to 1D** Grass: Short n= 0.150 P2= 3.30"
0.5	29	0.0190	1.07		**Sheet Flow, 1D to 1E** Smooth surfaces n= 0.011 P2= 3.30"
0.5	16	0.0050	0.56		**Sheet Flow, 1E to 1F** Smooth surfaces n= 0.011 P2= 3.30"
4.5	19	0.0350	0.07		**Sheet Flow, 1F to 1G** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	13	0.0210	0.12		**Sheet Flow, 1G to 1H** Grass: Short n= 0.150 P2= 3.30"
0.3	25	0.0400	1.40		**Shallow Concentrated Flow, 1H to 1I** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0398	1.40		**Shallow Concentrated Flow, 1I to 1J** Short Grass Pasture Kv= 7.0 fps
1.1	41	0.0073	0.60		**Shallow Concentrated Flow, 1J to 1K** Short Grass Pasture Kv= 7.0 fps
0.6	46	0.0073	1.38		**Shallow Concentrated Flow, 1K to 1L** Unpaved Kv= 16.1 fps
0.6	49	0.0073	1.38		**Shallow Concentrated Flow, 1L to 1M** Unpaved Kv= 16.1 fps
0.1	14	0.0787	4.52		**Shallow Concentrated Flow, 1M to 1N** Unpaved Kv= 16.1 fps
0.3	43	0.0254	2.57		**Shallow Concentrated Flow, 1N to 1O** Unpaved Kv= 16.1 fps
0.5	29	0.0374	0.97		**Shallow Concentrated Flow, 1O to 1P** Woodland Kv= 5.0 fps
0.2	40	0.0185	2.76		**Shallow Concentrated Flow, 1P to 1Q** Paved Kv= 20.3 fps
13.9	431	Total			

Subcatchment E1: Exist. Watershed E1



Summary for Subcatchment E2: Exist. Watershed E2

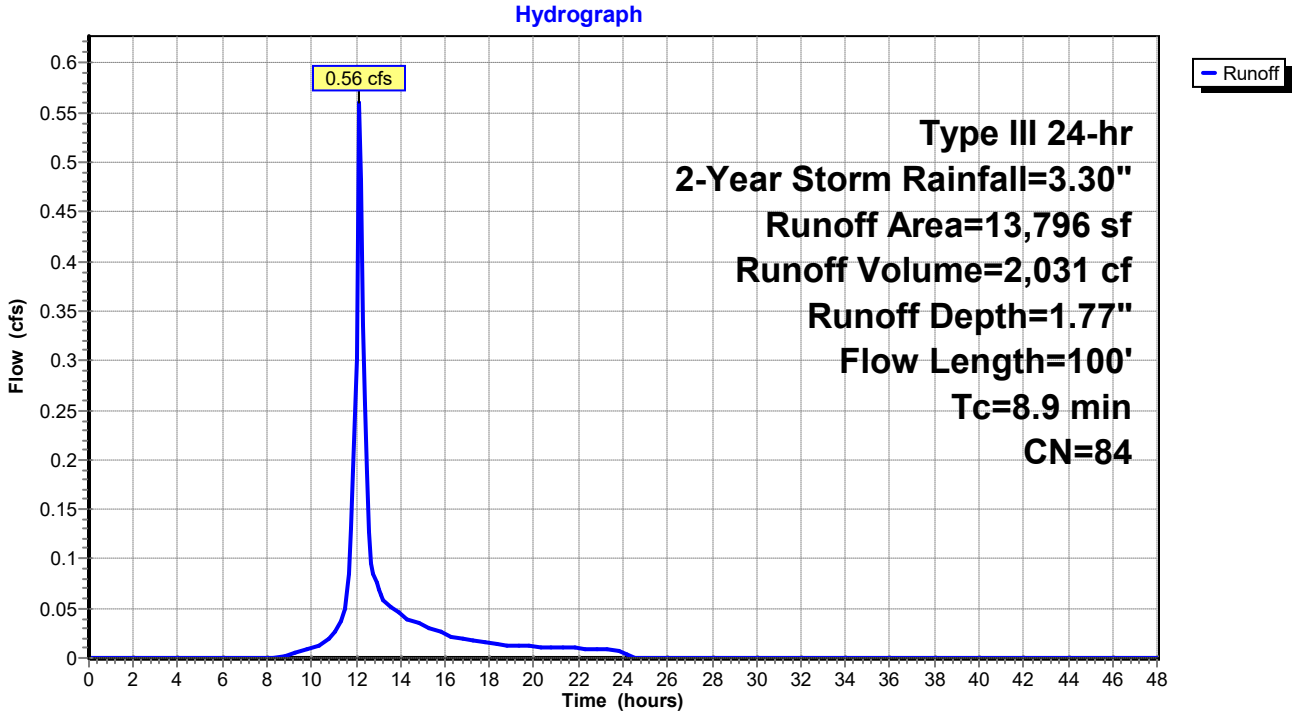
Runoff = 0.56 cfs @ 12.13 hrs, Volume= 2,031 cf, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

	Area (sf)	CN	Description
*	8,559	98	Impervious (Roof, drives, walks, walls, pads)
	5,237	61	>75% Grass cover, Good, HSG B
	13,796	84	Weighted Average
	5,237		37.96% Pervious Area
	8,559		62.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0440	1.34		**Sheet Flow, 2A to 2B** Smooth surfaces n= 0.011 P2= 3.30"
0.0	3	0.0590	1.07		**Sheet Flow, 2B to 2C** Smooth surfaces n= 0.011 P2= 3.30"
2.8	27	0.0310	0.16		**Sheet Flow, 2C to 2D** Grass: Short n= 0.150 P2= 3.30"
2.0	21	0.0470	0.18		**Sheet Flow, 2D to 2E** Grass: Short n= 0.150 P2= 3.30"
2.1	16	0.0240	0.13		**Sheet Flow, 2E to 2F** Grass: Short n= 0.150 P2= 3.30"
1.8	16	0.0322	0.14		**Sheet Flow, 2F to 2G** Grass: Short n= 0.150 P2= 3.30"
8.9	100	Total			

Subcatchment E2: Exist. Watershed E2



Summary for Subcatchment E3: Exist. Watershed E3

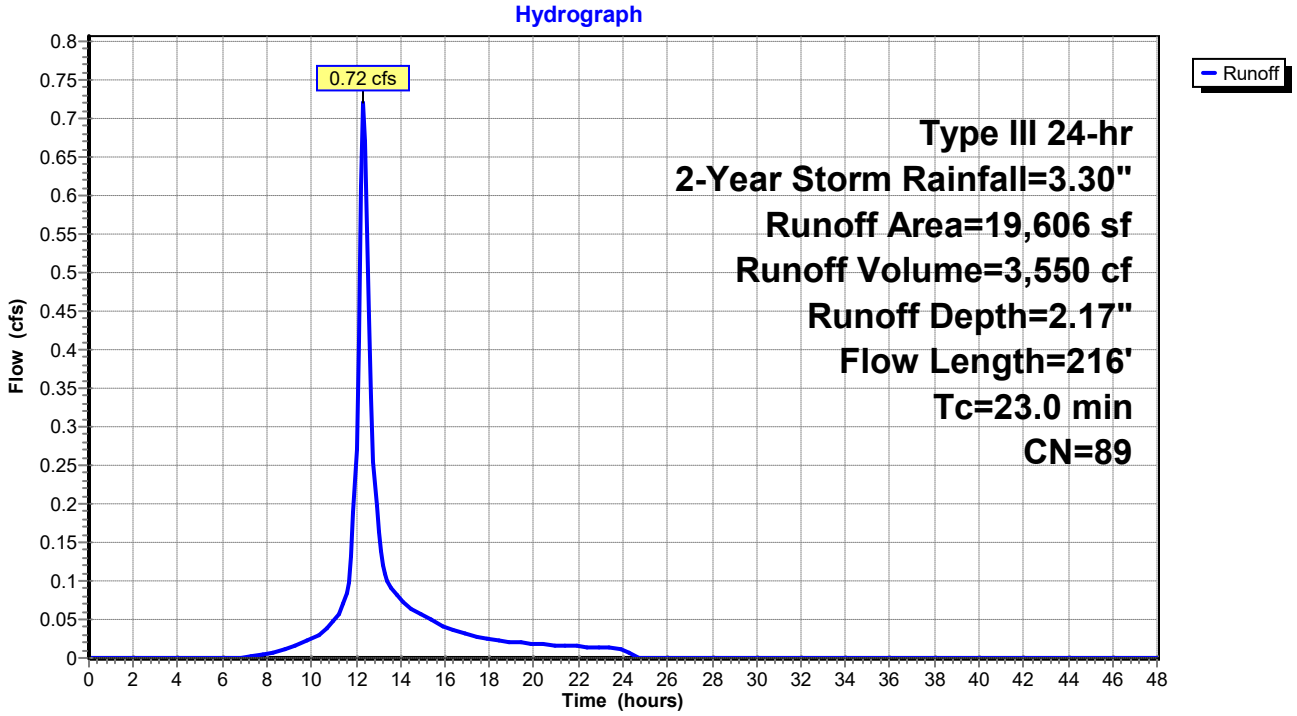
Runoff = 0.72 cfs @ 12.32 hrs, Volume= 3,550 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

	Area (sf)	CN	Description
*	14,856	98	Impervious (Roof, drives, walks, walls, pads)
	4,750	61	>75% Grass cover, Good, HSG B
	19,606	89	Weighted Average
	4,750		24.23% Pervious Area
	14,856		75.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	32	0.0150	0.12		**Sheet Flow, 3A to 3B** Grass: Short n= 0.150 P2= 3.30"
3.9	31	0.0180	0.13		**Sheet Flow, 3B to 3C** Grass: Short n= 0.150 P2= 3.30"
11.5	18	0.0030	0.03		**Sheet Flow, 3C to 3D** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	34	0.0120	0.92		**Sheet Flow, 3D to 3E** Smooth surfaces n= 0.011 P2= 3.30"
0.4	38	0.0053	1.48		**Shallow Concentrated Flow, 3E to 3F** Paved Kv= 20.3 fps
0.3	26	0.0038	1.25		**Shallow Concentrated Flow, 3F to 3G** Paved Kv= 20.3 fps
1.9	37	0.0022	0.33		**Shallow Concentrated Flow, 3G to 3H** Short Grass Pasture Kv= 7.0 fps
23.0	216	Total			

Subcatchment E3: Exist. Watershed E3

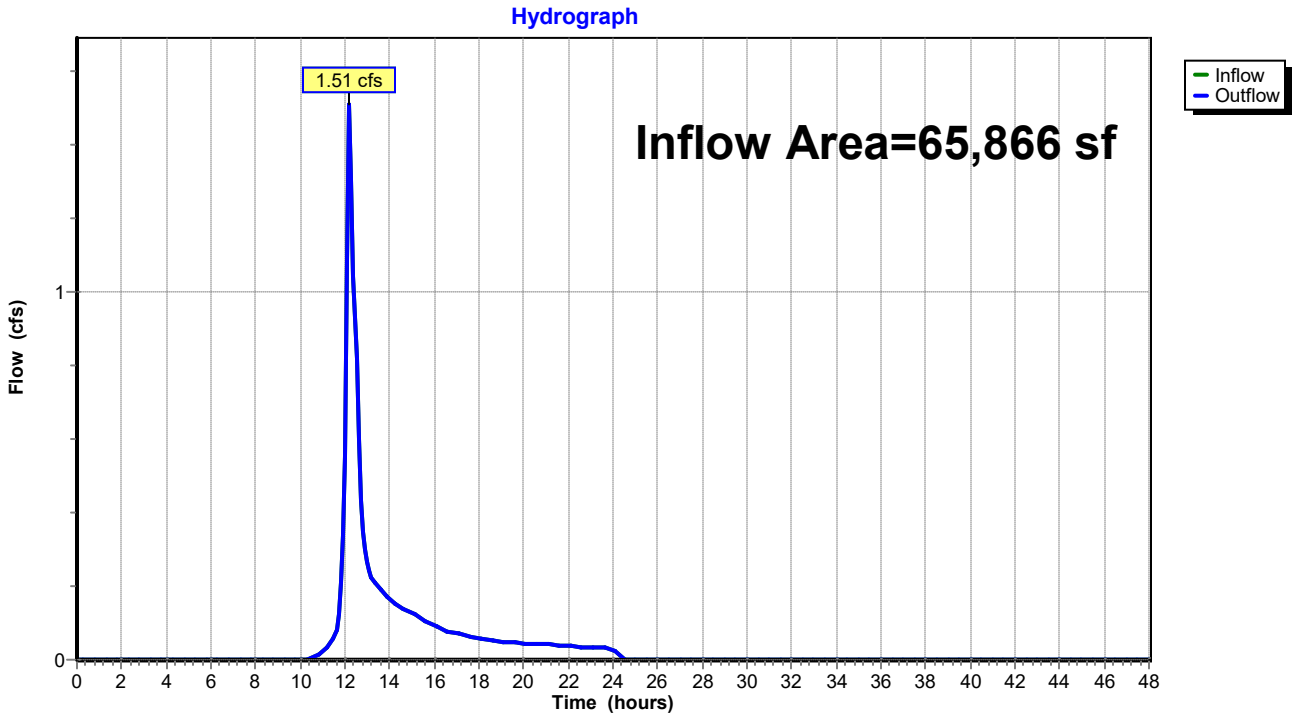


Summary for Reach E-1R: Exist. Reach 1R (South Main Street)

Inflow Area = 65,866 sf, 37.38% Impervious, Inflow Depth = 1.16" for 2-Year Storm event
Inflow = 1.51 cfs @ 12.22 hrs, Volume= 6,379 cf
Outflow = 1.51 cfs @ 12.22 hrs, Volume= 6,379 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-1R: Exist. Reach 1R (South Main Street)

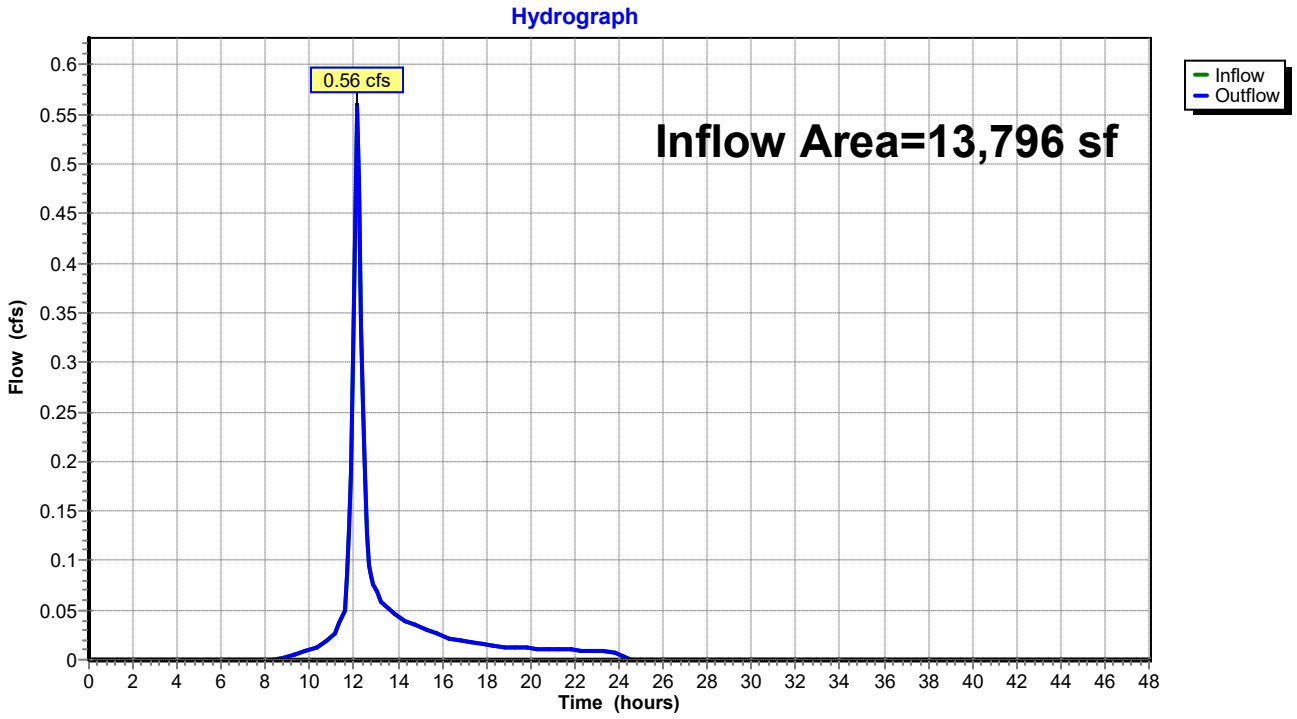


Summary for Reach E-2R: Exist. Reach 2R (Boston Street)

Inflow Area = 13,796 sf, 62.04% Impervious, Inflow Depth = 1.77" for 2-Year Storm event
Inflow = 0.56 cfs @ 12.13 hrs, Volume= 2,031 cf
Outflow = 0.56 cfs @ 12.13 hrs, Volume= 2,031 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-2R: Exist. Reach 2R (Boston Street)

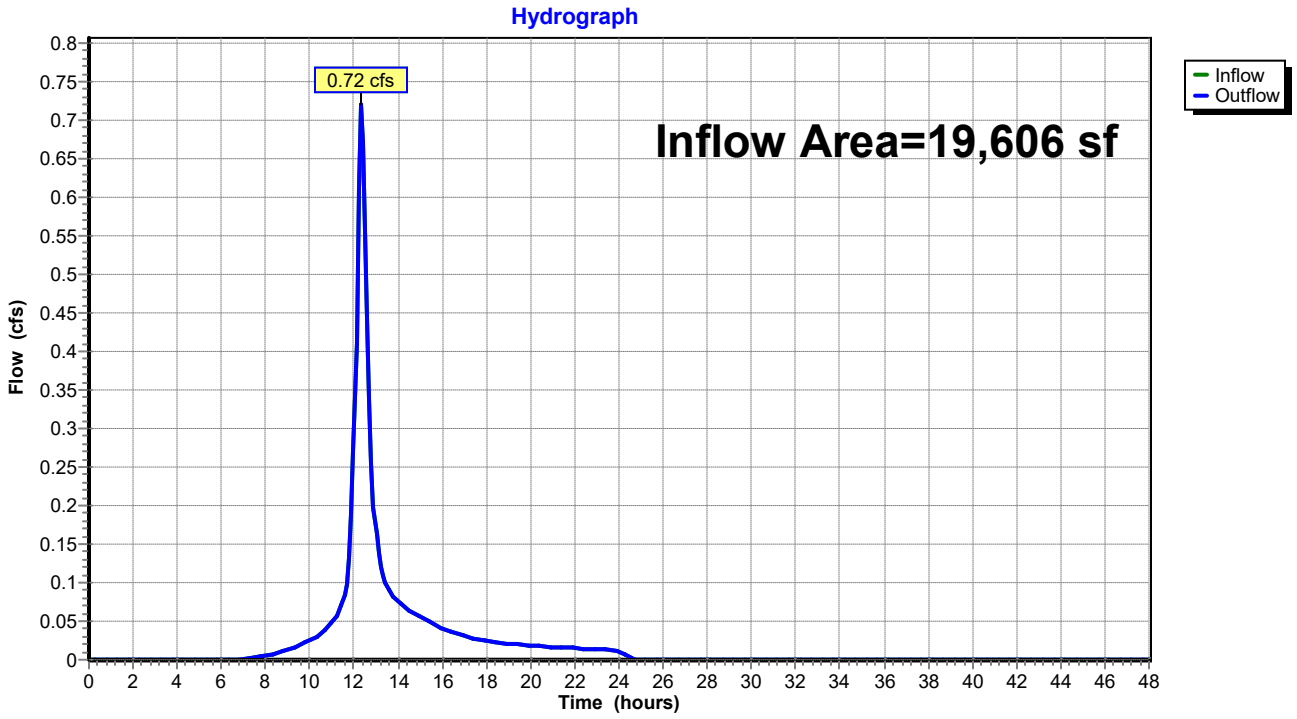


Summary for Reach E-3R: Exist. Reach 3R (Rowell Lane)

Inflow Area = 19,606 sf, 75.77% Impervious, Inflow Depth = 2.17" for 2-Year Storm event
Inflow = 0.72 cfs @ 12.32 hrs, Volume= 3,550 cf
Outflow = 0.72 cfs @ 12.32 hrs, Volume= 3,550 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-3R: Exist. Reach 3R (Rowell Lane)



Summary for Subcatchment E1: Exist. Watershed E1

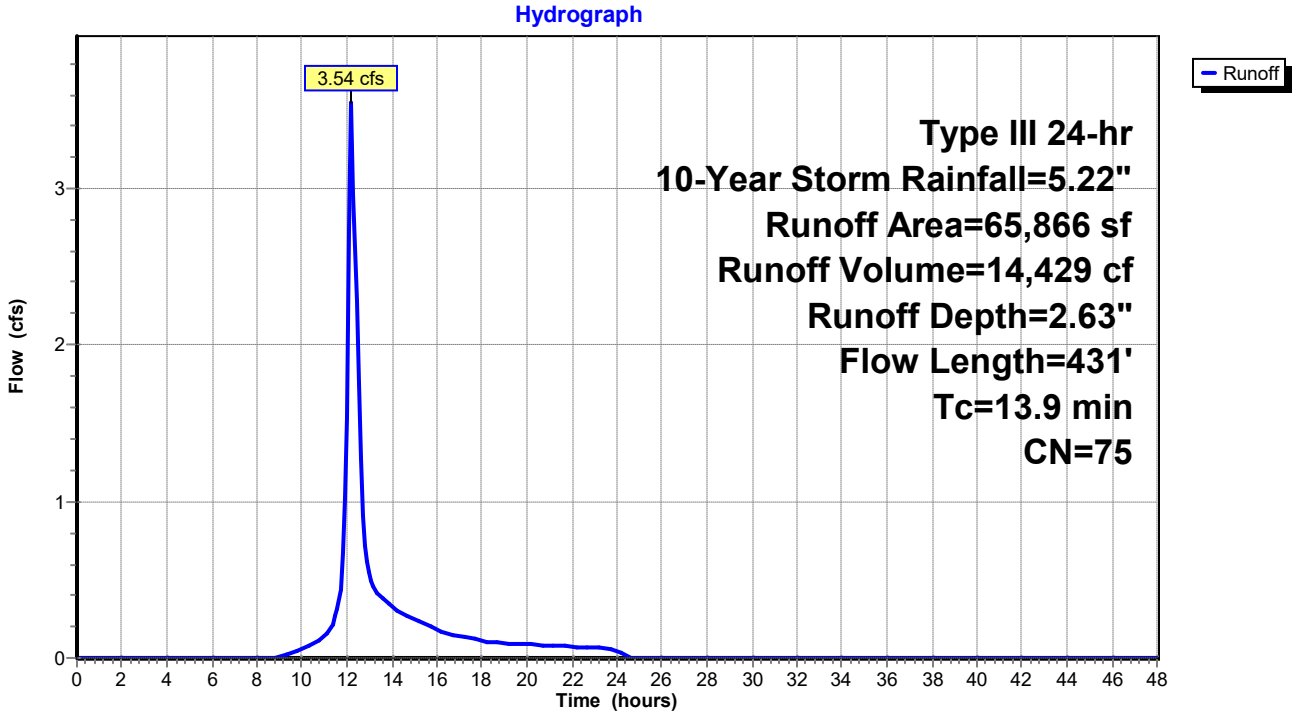
Runoff = 3.54 cfs @ 12.21 hrs, Volume= 14,429 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

	Area (sf)	CN	Description
*	24,622	98	Impervious (Roof, drives, walks, walls, pads)
	41,244	61	>75% Grass cover, Good, HSG B
	65,866	75	Weighted Average
	41,244		62.62% Pervious Area
	24,622		37.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.03		**Sheet Flow, 1A to 1B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	4	0.0270	0.83		**Sheet Flow, 1B to 1C** Smooth surfaces n= 0.011 P2= 3.30"
2.1	16	0.0220	0.12		**Sheet Flow, 1C to 1D** Grass: Short n= 0.150 P2= 3.30"
0.5	29	0.0190	1.07		**Sheet Flow, 1D to 1E** Smooth surfaces n= 0.011 P2= 3.30"
0.5	16	0.0050	0.56		**Sheet Flow, 1E to 1F** Smooth surfaces n= 0.011 P2= 3.30"
4.5	19	0.0350	0.07		**Sheet Flow, 1F to 1G** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	13	0.0210	0.12		**Sheet Flow, 1G to 1H** Grass: Short n= 0.150 P2= 3.30"
0.3	25	0.0400	1.40		**Shallow Concentrated Flow, 1H to 1I** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0398	1.40		**Shallow Concentrated Flow, 1I to 1J** Short Grass Pasture Kv= 7.0 fps
1.1	41	0.0073	0.60		**Shallow Concentrated Flow, 1J to 1K** Short Grass Pasture Kv= 7.0 fps
0.6	46	0.0073	1.38		**Shallow Concentrated Flow, 1K to 1L** Unpaved Kv= 16.1 fps
0.6	49	0.0073	1.38		**Shallow Concentrated Flow, 1L to 1M** Unpaved Kv= 16.1 fps
0.1	14	0.0787	4.52		**Shallow Concentrated Flow, 1M to 1N** Unpaved Kv= 16.1 fps
0.3	43	0.0254	2.57		**Shallow Concentrated Flow, 1N to 1O** Unpaved Kv= 16.1 fps
0.5	29	0.0374	0.97		**Shallow Concentrated Flow, 1O to 1P** Woodland Kv= 5.0 fps
0.2	40	0.0185	2.76		**Shallow Concentrated Flow, 1P to 1Q** Paved Kv= 20.3 fps
13.9	431	Total			

Subcatchment E1: Exist. Watershed E1



Summary for Subcatchment E2: Exist. Watershed E2

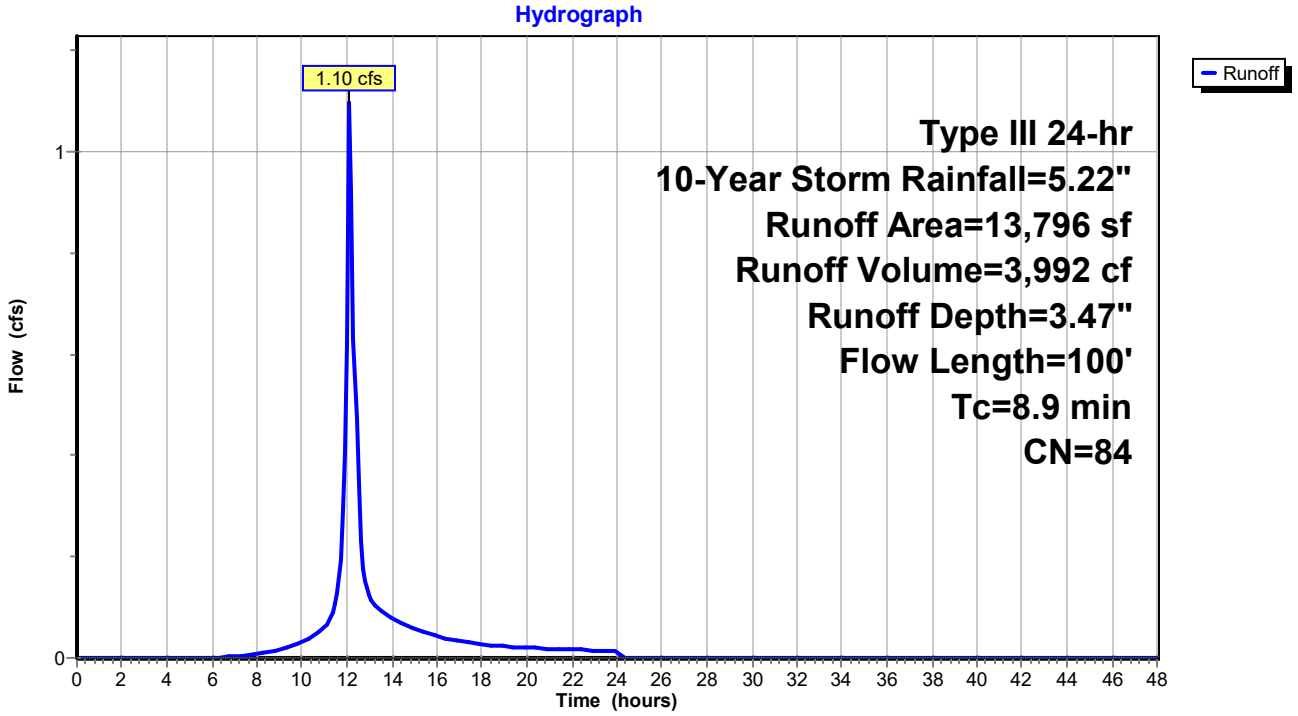
Runoff = 1.10 cfs @ 12.12 hrs, Volume= 3,992 cf, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

	Area (sf)	CN	Description
*	8,559	98	Impervious (Roof, drives, walks, walls, pads)
	5,237	61	>75% Grass cover, Good, HSG B
	13,796	84	Weighted Average
	5,237		37.96% Pervious Area
	8,559		62.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0440	1.34		**Sheet Flow, 2A to 2B** Smooth surfaces n= 0.011 P2= 3.30"
0.0	3	0.0590	1.07		**Sheet Flow, 2B to 2C** Smooth surfaces n= 0.011 P2= 3.30"
2.8	27	0.0310	0.16		**Sheet Flow, 2C to 2D** Grass: Short n= 0.150 P2= 3.30"
2.0	21	0.0470	0.18		**Sheet Flow, 2D to 2E** Grass: Short n= 0.150 P2= 3.30"
2.1	16	0.0240	0.13		**Sheet Flow, 2E to 2F** Grass: Short n= 0.150 P2= 3.30"
1.8	16	0.0322	0.14		**Sheet Flow, 2F to 2G** Grass: Short n= 0.150 P2= 3.30"
8.9	100	Total			

Subcatchment E2: Exist. Watershed E2



Summary for Subcatchment E3: Exist. Watershed E3

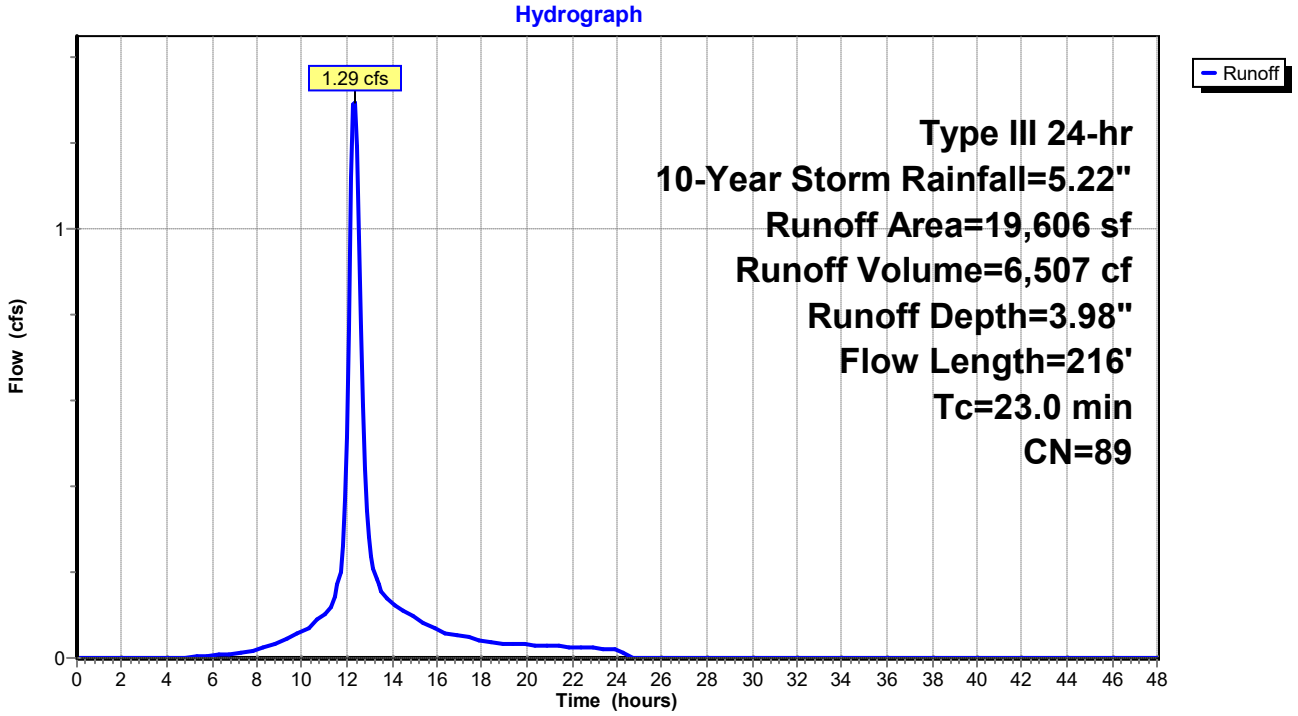
Runoff = 1.29 cfs @ 12.31 hrs, Volume= 6,507 cf, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

	Area (sf)	CN	Description
*	14,856	98	Impervious (Roof, drives, walks, walls, pads)
	4,750	61	>75% Grass cover, Good, HSG B
	19,606	89	Weighted Average
	4,750		24.23% Pervious Area
	14,856		75.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	32	0.0150	0.12		**Sheet Flow, 3A to 3B** Grass: Short n= 0.150 P2= 3.30"
3.9	31	0.0180	0.13		**Sheet Flow, 3B to 3C** Grass: Short n= 0.150 P2= 3.30"
11.5	18	0.0030	0.03		**Sheet Flow, 3C to 3D** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	34	0.0120	0.92		**Sheet Flow, 3D to 3E** Smooth surfaces n= 0.011 P2= 3.30"
0.4	38	0.0053	1.48		**Shallow Concentrated Flow, 3E to 3F** Paved Kv= 20.3 fps
0.3	26	0.0038	1.25		**Shallow Concentrated Flow, 3F to 3G** Paved Kv= 20.3 fps
1.9	37	0.0022	0.33		**Shallow Concentrated Flow, 3G to 3H** Short Grass Pasture Kv= 7.0 fps
23.0	216	Total			

Subcatchment E3: Exist. Watershed E3

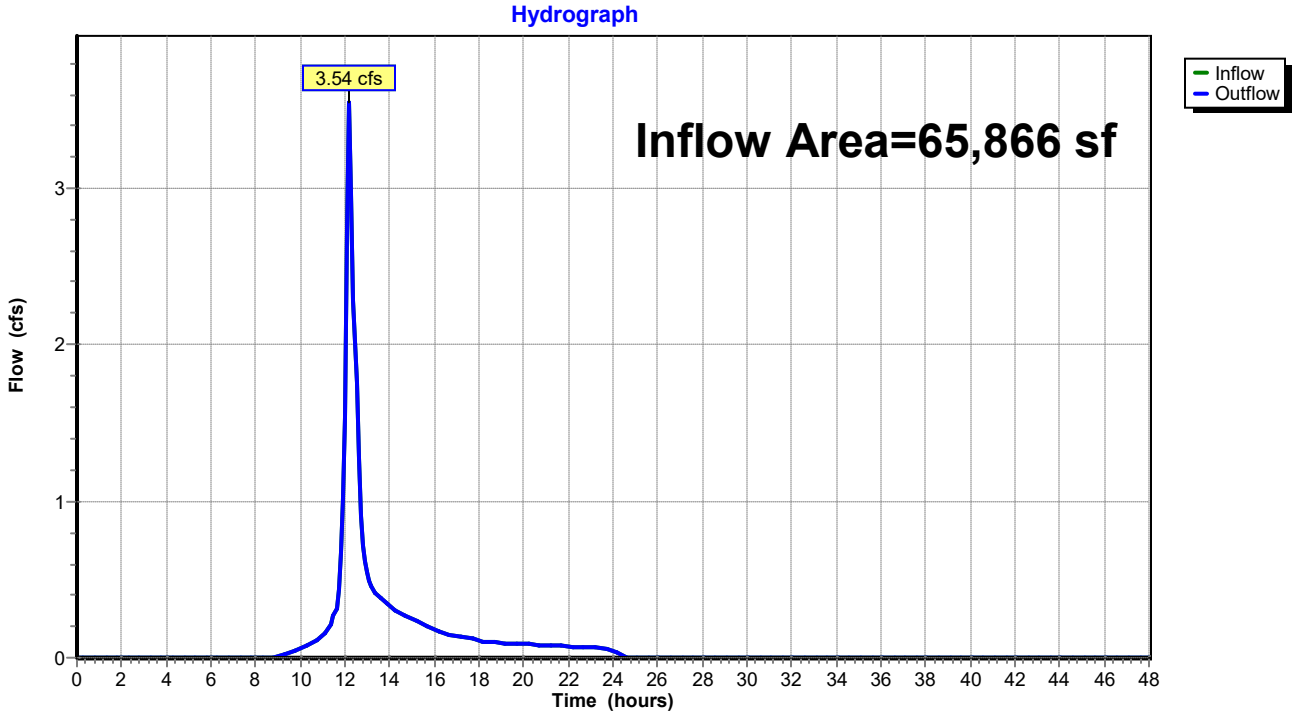


Summary for Reach E-1R: Exist. Reach 1R (South Main Street)

Inflow Area = 65,866 sf, 37.38% Impervious, Inflow Depth = 2.63" for 10-Year Storm event
Inflow = 3.54 cfs @ 12.21 hrs, Volume= 14,429 cf
Outflow = 3.54 cfs @ 12.21 hrs, Volume= 14,429 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-1R: Exist. Reach 1R (South Main Street)

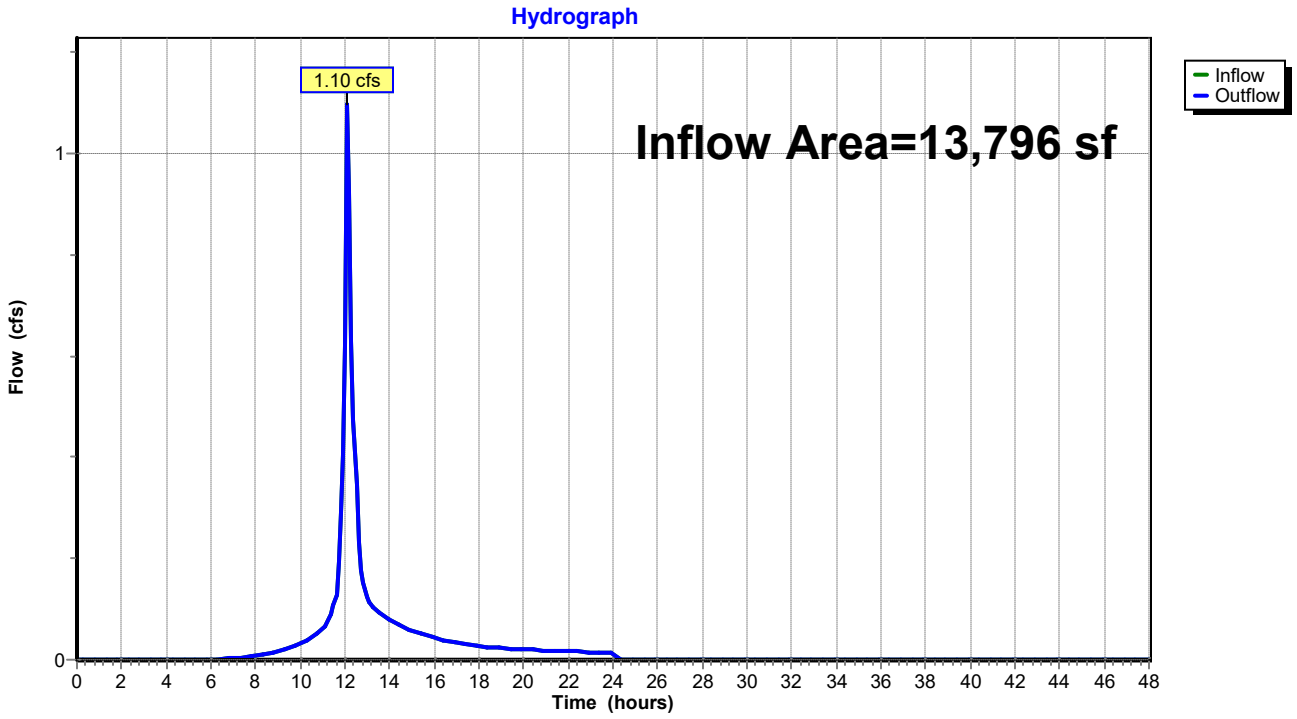


Summary for Reach E-2R: Exist. Reach 2R (Boston Street)

Inflow Area = 13,796 sf, 62.04% Impervious, Inflow Depth = 3.47" for 10-Year Storm event
Inflow = 1.10 cfs @ 12.12 hrs, Volume= 3,992 cf
Outflow = 1.10 cfs @ 12.12 hrs, Volume= 3,992 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-2R: Exist. Reach 2R (Boston Street)

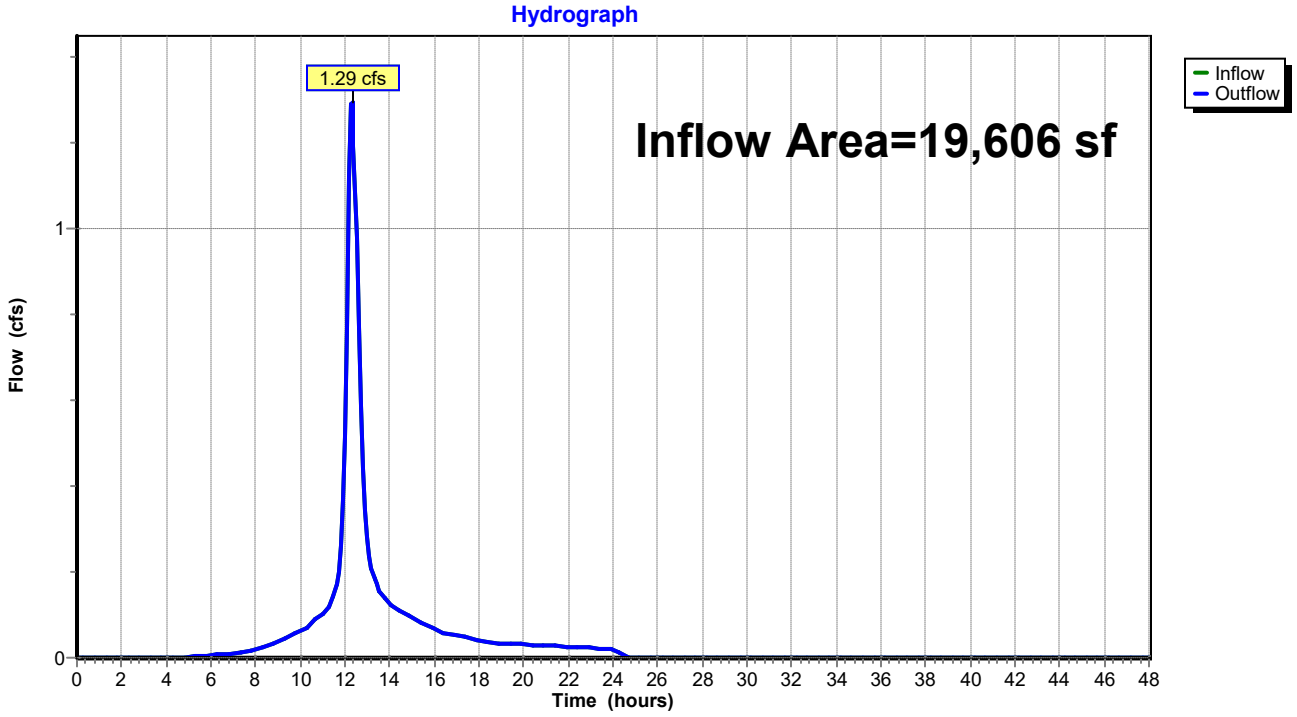


Summary for Reach E-3R: Exist. Reach 3R (Rowell Lane)

Inflow Area = 19,606 sf, 75.77% Impervious, Inflow Depth = 3.98" for 10-Year Storm event
Inflow = 1.29 cfs @ 12.31 hrs, Volume= 6,507 cf
Outflow = 1.29 cfs @ 12.31 hrs, Volume= 6,507 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-3R: Exist. Reach 3R (Rowell Lane)



Summary for Subcatchment E1: Exist. Watershed E1

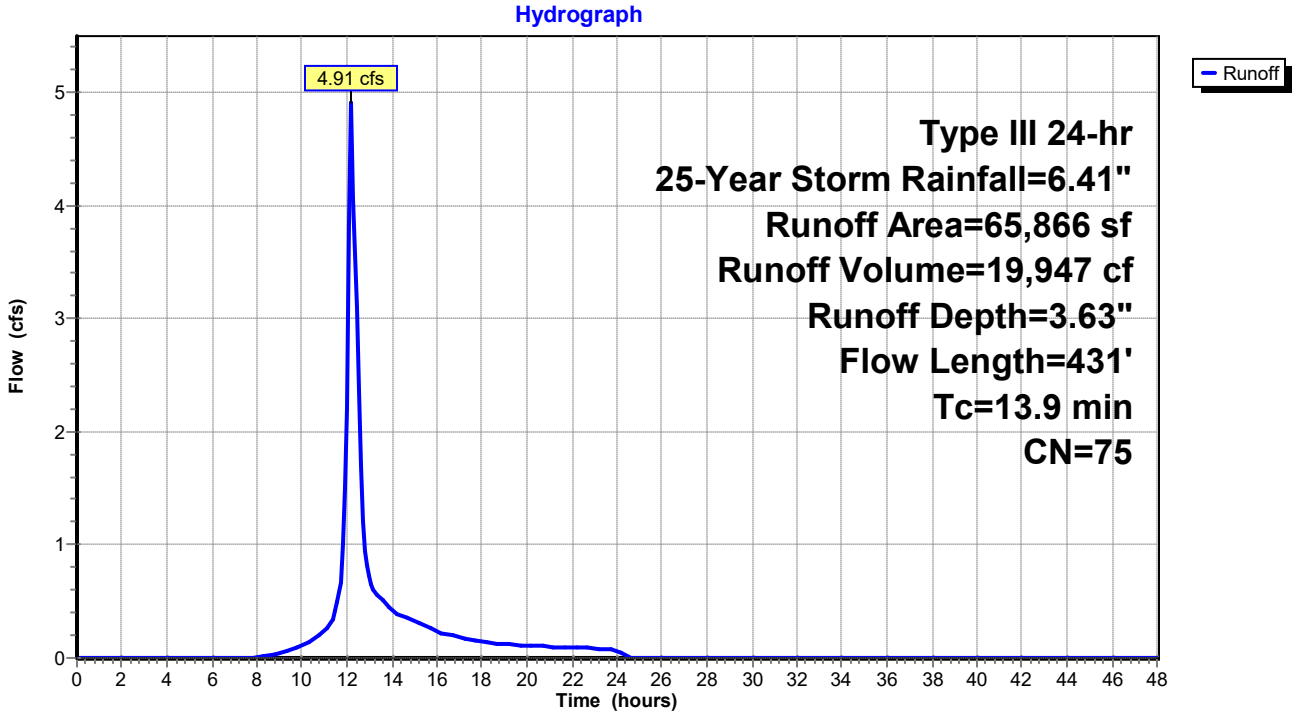
Runoff = 4.91 cfs @ 12.21 hrs, Volume= 19,947 cf, Depth= 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

	Area (sf)	CN	Description
*	24,622	98	Impervious (Roof, drives, walks, walls, pads)
	41,244	61	>75% Grass cover, Good, HSG B
	65,866	75	Weighted Average
	41,244		62.62% Pervious Area
	24,622		37.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.03		**Sheet Flow, 1A to 1B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	4	0.0270	0.83		**Sheet Flow, 1B to 1C** Smooth surfaces n= 0.011 P2= 3.30"
2.1	16	0.0220	0.12		**Sheet Flow, 1C to 1D** Grass: Short n= 0.150 P2= 3.30"
0.5	29	0.0190	1.07		**Sheet Flow, 1D to 1E** Smooth surfaces n= 0.011 P2= 3.30"
0.5	16	0.0050	0.56		**Sheet Flow, 1E to 1F** Smooth surfaces n= 0.011 P2= 3.30"
4.5	19	0.0350	0.07		**Sheet Flow, 1F to 1G** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	13	0.0210	0.12		**Sheet Flow, 1G to 1H** Grass: Short n= 0.150 P2= 3.30"
0.3	25	0.0400	1.40		**Shallow Concentrated Flow, 1H to 1I** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0398	1.40		**Shallow Concentrated Flow, 1I to 1J** Short Grass Pasture Kv= 7.0 fps
1.1	41	0.0073	0.60		**Shallow Concentrated Flow, 1J to 1K** Short Grass Pasture Kv= 7.0 fps
0.6	46	0.0073	1.38		**Shallow Concentrated Flow, 1K to 1L** Unpaved Kv= 16.1 fps
0.6	49	0.0073	1.38		**Shallow Concentrated Flow, 1L to 1M** Unpaved Kv= 16.1 fps
0.1	14	0.0787	4.52		**Shallow Concentrated Flow, 1M to 1N** Unpaved Kv= 16.1 fps
0.3	43	0.0254	2.57		**Shallow Concentrated Flow, 1N to 1O** Unpaved Kv= 16.1 fps
0.5	29	0.0374	0.97		**Shallow Concentrated Flow, 1O to 1P** Woodland Kv= 5.0 fps
0.2	40	0.0185	2.76		**Shallow Concentrated Flow, 1P to 1Q** Paved Kv= 20.3 fps
13.9	431	Total			

Subcatchment E1: Exist. Watershed E1



Summary for Subcatchment E2: Exist. Watershed E2

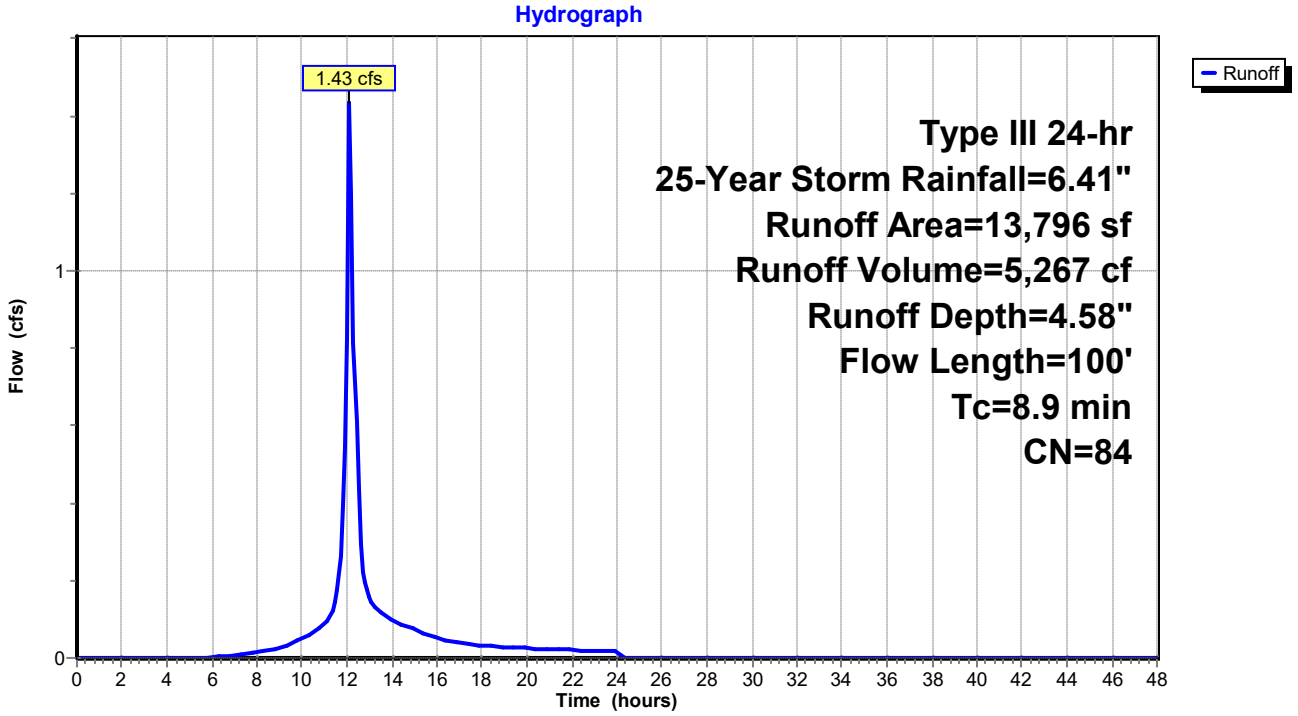
Runoff = 1.43 cfs @ 12.12 hrs, Volume= 5,267 cf, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

	Area (sf)	CN	Description
*	8,559	98	Impervious (Roof, drives, walks, walls, pads)
	5,237	61	>75% Grass cover, Good, HSG B
	13,796	84	Weighted Average
	5,237		37.96% Pervious Area
	8,559		62.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0440	1.34		**Sheet Flow, 2A to 2B** Smooth surfaces n= 0.011 P2= 3.30"
0.0	3	0.0590	1.07		**Sheet Flow, 2B to 2C** Smooth surfaces n= 0.011 P2= 3.30"
2.8	27	0.0310	0.16		**Sheet Flow, 2C to 2D** Grass: Short n= 0.150 P2= 3.30"
2.0	21	0.0470	0.18		**Sheet Flow, 2D to 2E** Grass: Short n= 0.150 P2= 3.30"
2.1	16	0.0240	0.13		**Sheet Flow, 2E to 2F** Grass: Short n= 0.150 P2= 3.30"
1.8	16	0.0322	0.14		**Sheet Flow, 2F to 2G** Grass: Short n= 0.150 P2= 3.30"
8.9	100	Total			

Subcatchment E2: Exist. Watershed E2



Summary for Subcatchment E3: Exist. Watershed E3

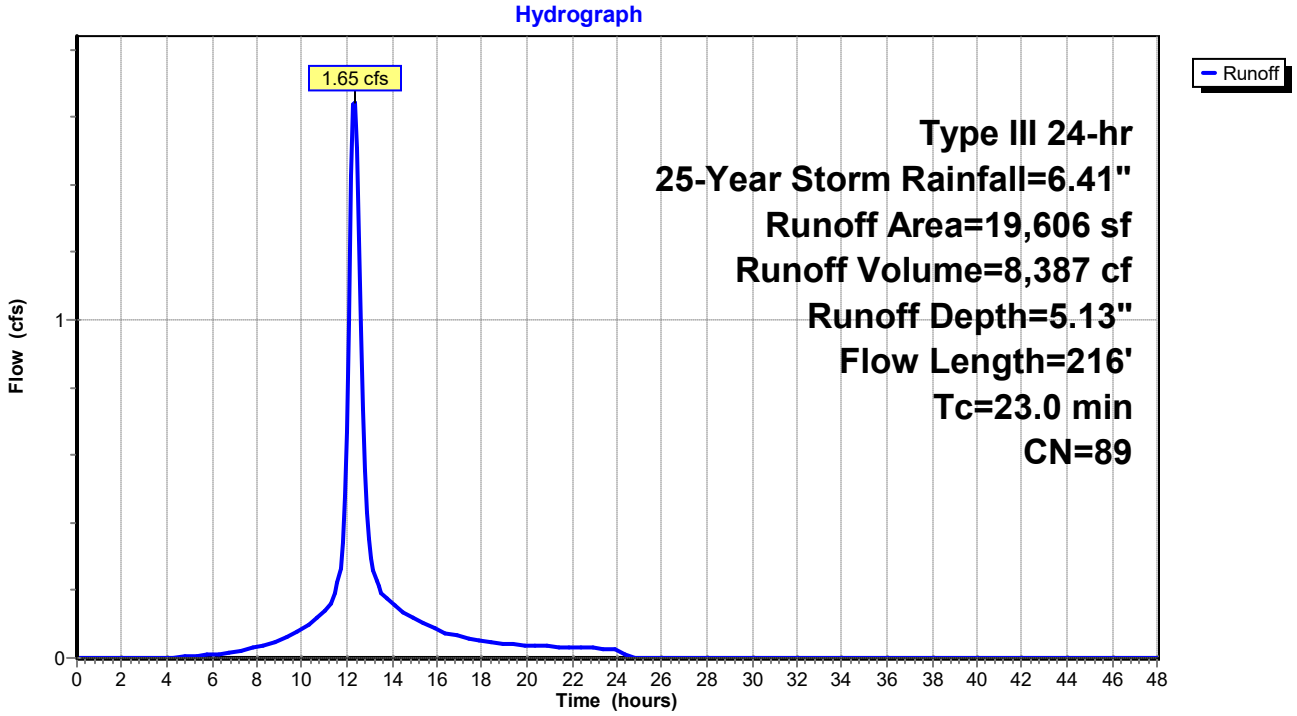
Runoff = 1.65 cfs @ 12.31 hrs, Volume= 8,387 cf, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

	Area (sf)	CN	Description
*	14,856	98	Impervious (Roof, drives, walks, walls, pads)
	4,750	61	>75% Grass cover, Good, HSG B
	19,606	89	Weighted Average
	4,750		24.23% Pervious Area
	14,856		75.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	32	0.0150	0.12		**Sheet Flow, 3A to 3B** Grass: Short n= 0.150 P2= 3.30"
3.9	31	0.0180	0.13		**Sheet Flow, 3B to 3C** Grass: Short n= 0.150 P2= 3.30"
11.5	18	0.0030	0.03		**Sheet Flow, 3C to 3D** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	34	0.0120	0.92		**Sheet Flow, 3D to 3E** Smooth surfaces n= 0.011 P2= 3.30"
0.4	38	0.0053	1.48		**Shallow Concentrated Flow, 3E to 3F** Paved Kv= 20.3 fps
0.3	26	0.0038	1.25		**Shallow Concentrated Flow, 3F to 3G** Paved Kv= 20.3 fps
1.9	37	0.0022	0.33		**Shallow Concentrated Flow, 3G to 3H** Short Grass Pasture Kv= 7.0 fps
23.0	216	Total			

Subcatchment E3: Exist. Watershed E3

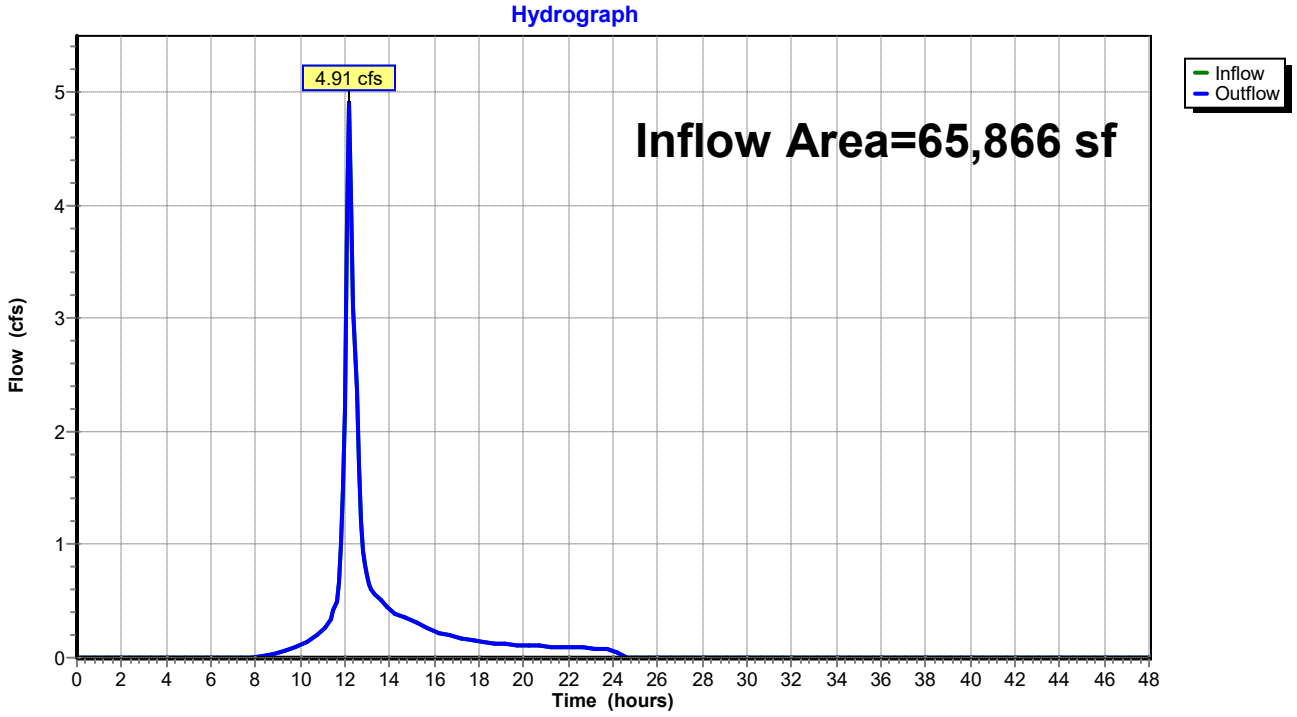


Summary for Reach E-1R: Exist. Reach 1R (South Main Street)

Inflow Area = 65,866 sf, 37.38% Impervious, Inflow Depth = 3.63" for 25-Year Storm event
Inflow = 4.91 cfs @ 12.21 hrs, Volume= 19,947 cf
Outflow = 4.91 cfs @ 12.21 hrs, Volume= 19,947 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-1R: Exist. Reach 1R (South Main Street)

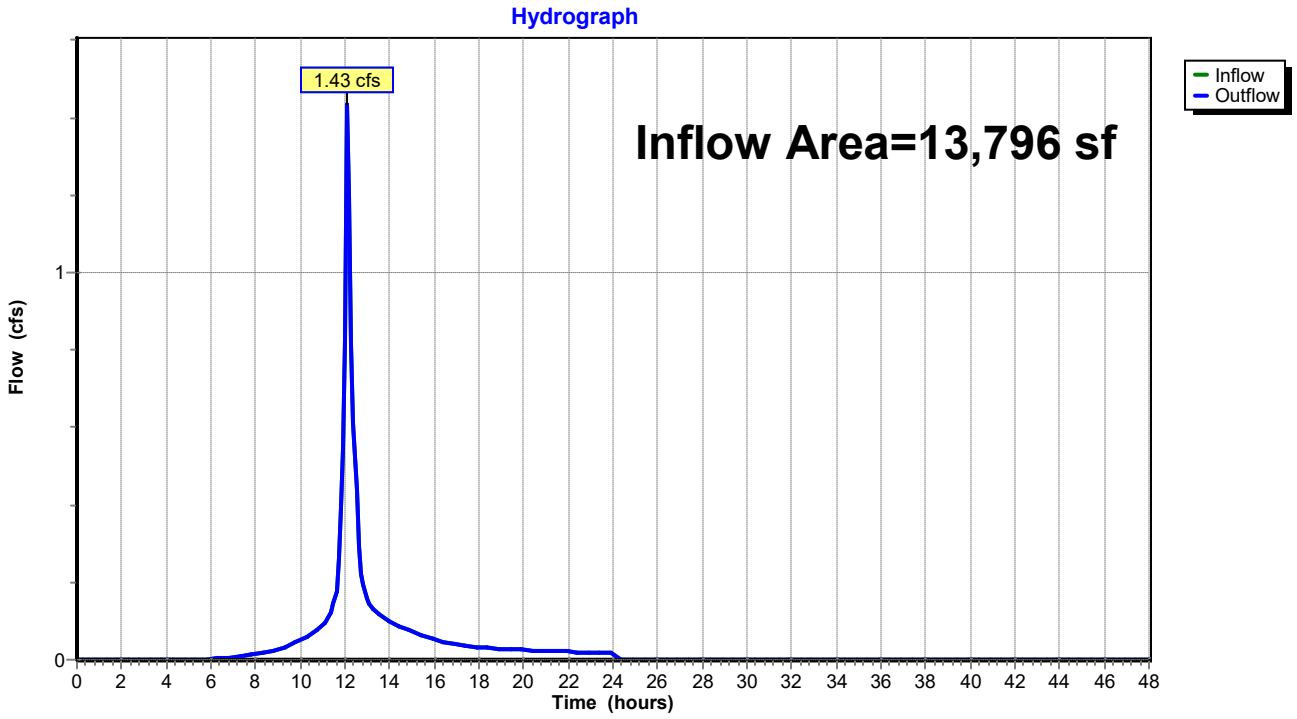


Summary for Reach E-2R: Exist. Reach 2R (Boston Street)

Inflow Area = 13,796 sf, 62.04% Impervious, Inflow Depth = 4.58" for 25-Year Storm event
Inflow = 1.43 cfs @ 12.12 hrs, Volume= 5,267 cf
Outflow = 1.43 cfs @ 12.12 hrs, Volume= 5,267 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-2R: Exist. Reach 2R (Boston Street)

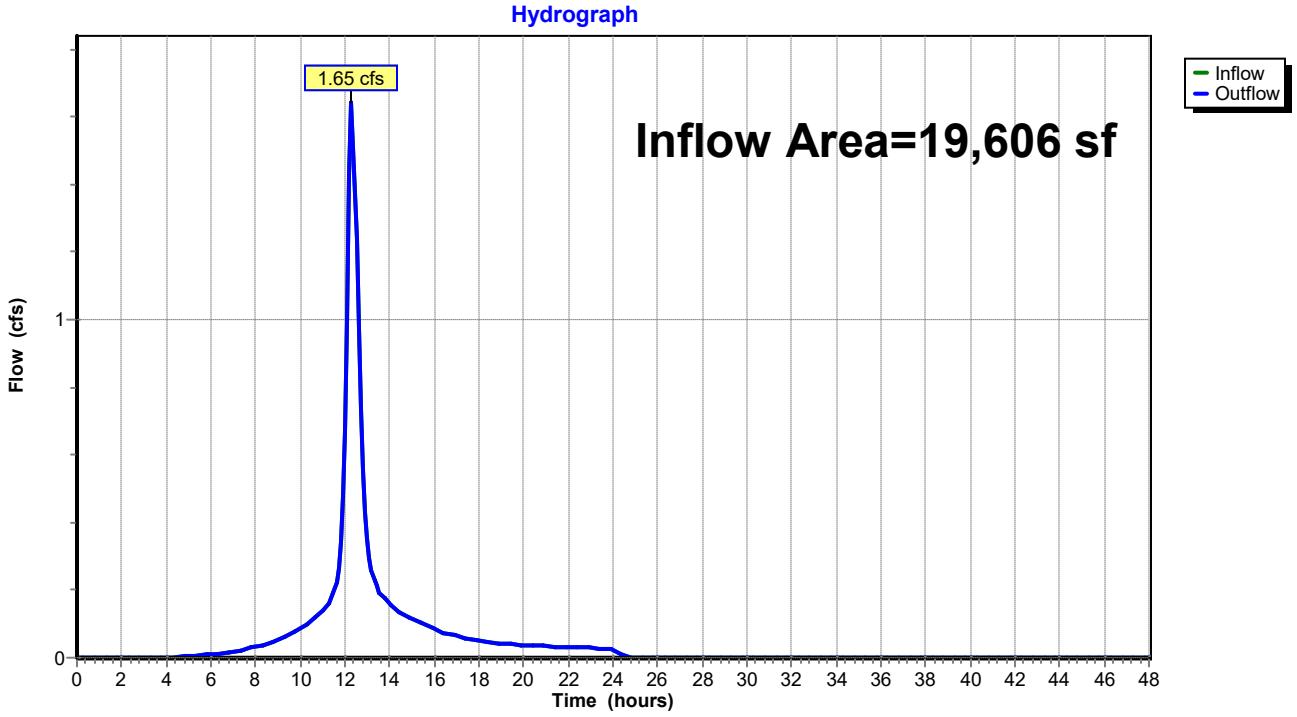


Summary for Reach E-3R: Exist. Reach 3R (Rowell Lane)

Inflow Area = 19,606 sf, 75.77% Impervious, Inflow Depth = 5.13" for 25-Year Storm event
Inflow = 1.65 cfs @ 12.31 hrs, Volume= 8,387 cf
Outflow = 1.65 cfs @ 12.31 hrs, Volume= 8,387 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-3R: Exist. Reach 3R (Rowell Lane)



Summary for Subcatchment E1: Exist. Watershed E1

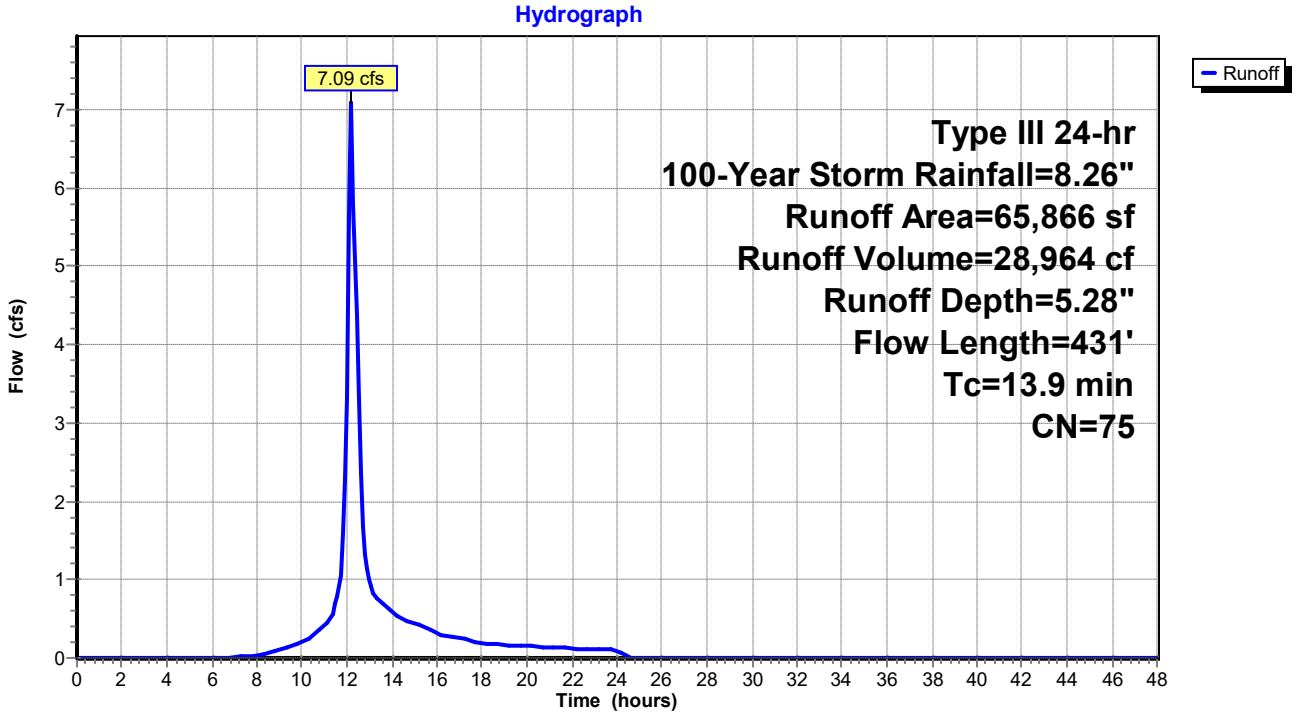
Runoff = 7.09 cfs @ 12.20 hrs, Volume= 28,964 cf, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

	Area (sf)	CN	Description
*	24,622	98	Impervious (Roof, drives, walks, walls, pads)
	41,244	61	>75% Grass cover, Good, HSG B
	65,866	75	Weighted Average
	41,244		62.62% Pervious Area
	24,622		37.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	22	0.0200	1.03		**Sheet Flow, 1A to 1B** Smooth surfaces n= 0.011 P2= 3.30"
0.1	4	0.0270	0.83		**Sheet Flow, 1B to 1C** Smooth surfaces n= 0.011 P2= 3.30"
2.1	16	0.0220	0.12		**Sheet Flow, 1C to 1D** Grass: Short n= 0.150 P2= 3.30"
0.5	29	0.0190	1.07		**Sheet Flow, 1D to 1E** Smooth surfaces n= 0.011 P2= 3.30"
0.5	16	0.0050	0.56		**Sheet Flow, 1E to 1F** Smooth surfaces n= 0.011 P2= 3.30"
4.5	19	0.0350	0.07		**Sheet Flow, 1F to 1G** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	13	0.0210	0.12		**Sheet Flow, 1G to 1H** Grass: Short n= 0.150 P2= 3.30"
0.3	25	0.0400	1.40		**Shallow Concentrated Flow, 1H to 1I** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0398	1.40		**Shallow Concentrated Flow, 1I to 1J** Short Grass Pasture Kv= 7.0 fps
1.1	41	0.0073	0.60		**Shallow Concentrated Flow, 1J to 1K** Short Grass Pasture Kv= 7.0 fps
0.6	46	0.0073	1.38		**Shallow Concentrated Flow, 1K to 1L** Unpaved Kv= 16.1 fps
0.6	49	0.0073	1.38		**Shallow Concentrated Flow, 1L to 1M** Unpaved Kv= 16.1 fps
0.1	14	0.0787	4.52		**Shallow Concentrated Flow, 1M to 1N** Unpaved Kv= 16.1 fps
0.3	43	0.0254	2.57		**Shallow Concentrated Flow, 1N to 1O** Unpaved Kv= 16.1 fps
0.5	29	0.0374	0.97		**Shallow Concentrated Flow, 1O to 1P** Woodland Kv= 5.0 fps
0.2	40	0.0185	2.76		**Shallow Concentrated Flow, 1P to 1Q** Paved Kv= 20.3 fps
13.9	431	Total			

Subcatchment E1: Exist. Watershed E1



Summary for Subcatchment E2: Exist. Watershed E2

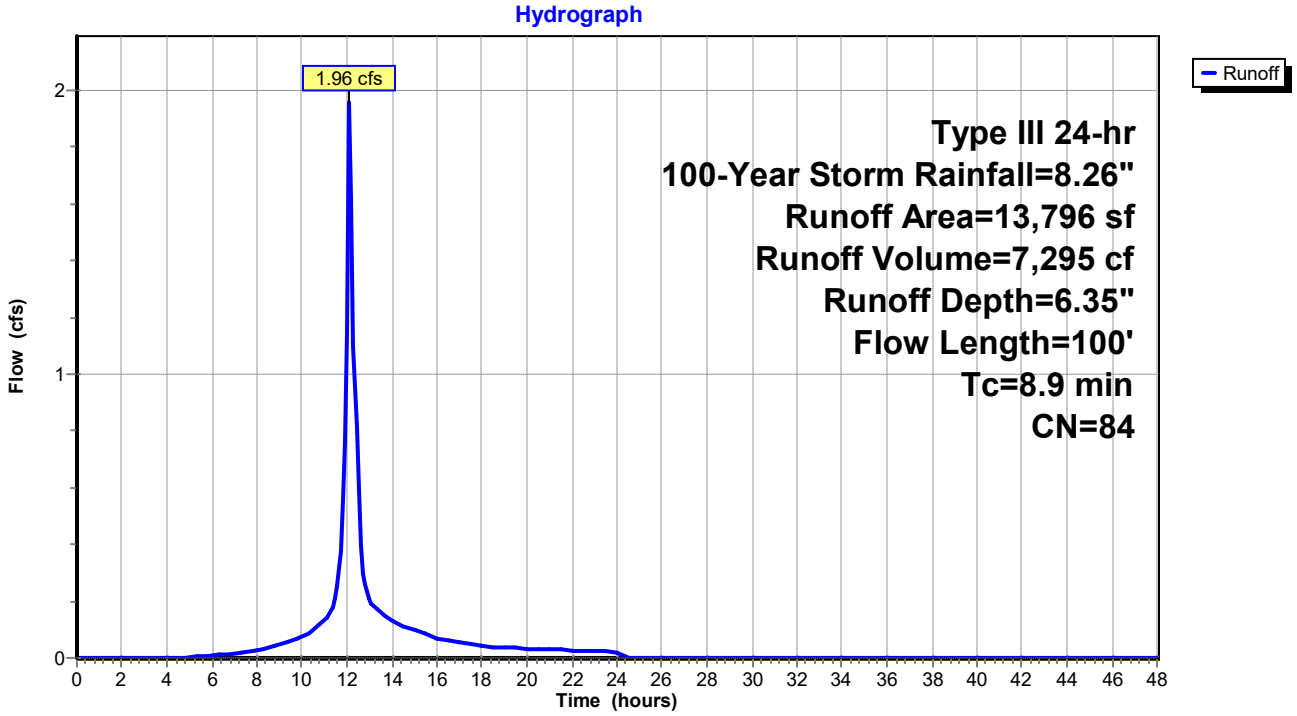
Runoff = 1.96 cfs @ 12.12 hrs, Volume= 7,295 cf, Depth= 6.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

	Area (sf)	CN	Description
*	8,559	98	Impervious (Roof, drives, walks, walls, pads)
	5,237	61	>75% Grass cover, Good, HSG B
	13,796	84	Weighted Average
	5,237		37.96% Pervious Area
	8,559		62.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	17	0.0440	1.34		**Sheet Flow, 2A to 2B** Smooth surfaces n= 0.011 P2= 3.30"
0.0	3	0.0590	1.07		**Sheet Flow, 2B to 2C** Smooth surfaces n= 0.011 P2= 3.30"
2.8	27	0.0310	0.16		**Sheet Flow, 2C to 2D** Grass: Short n= 0.150 P2= 3.30"
2.0	21	0.0470	0.18		**Sheet Flow, 2D to 2E** Grass: Short n= 0.150 P2= 3.30"
2.1	16	0.0240	0.13		**Sheet Flow, 2E to 2F** Grass: Short n= 0.150 P2= 3.30"
1.8	16	0.0322	0.14		**Sheet Flow, 2F to 2G** Grass: Short n= 0.150 P2= 3.30"
8.9	100	Total			

Subcatchment E2: Exist. Watershed E2



Summary for Subcatchment E3: Exist. Watershed E3

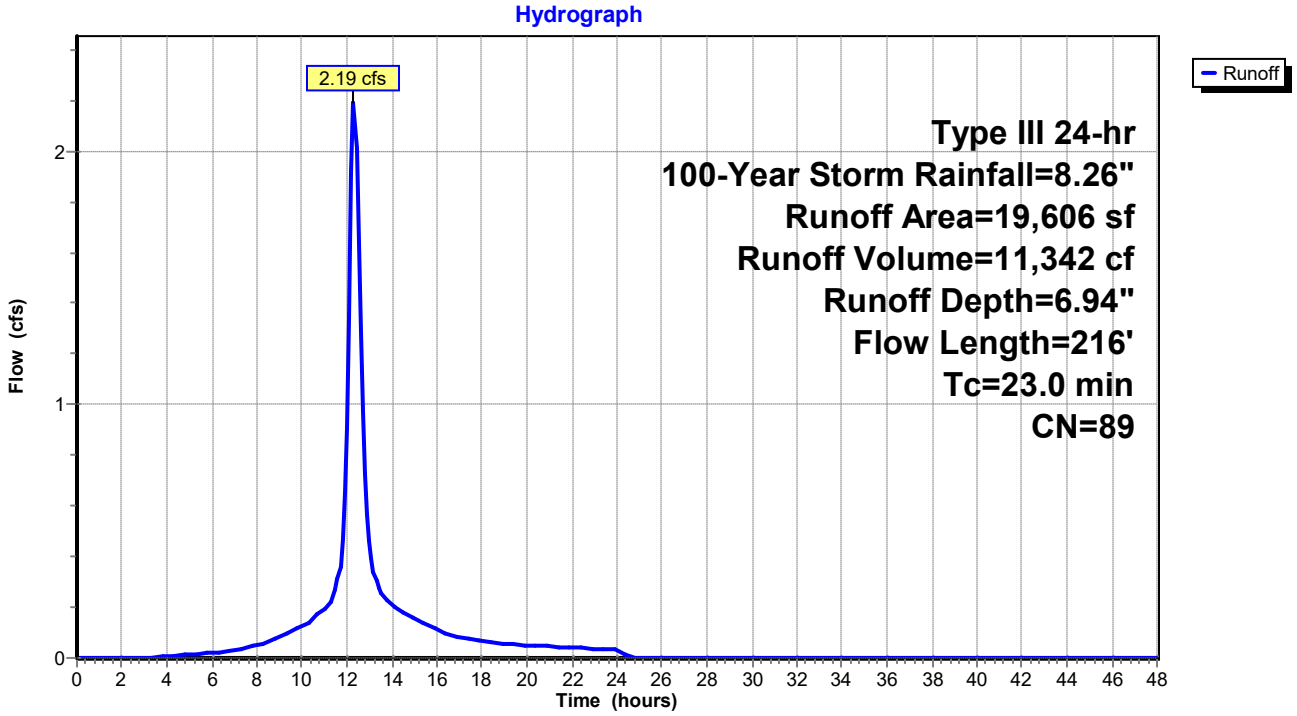
Runoff = 2.19 cfs @ 12.31 hrs, Volume= 11,342 cf, Depth= 6.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

	Area (sf)	CN	Description
*	14,856	98	Impervious (Roof, drives, walks, walls, pads)
	4,750	61	>75% Grass cover, Good, HSG B
	19,606	89	Weighted Average
	4,750		24.23% Pervious Area
	14,856		75.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	32	0.0150	0.12		**Sheet Flow, 3A to 3B** Grass: Short n= 0.150 P2= 3.30"
3.9	31	0.0180	0.13		**Sheet Flow, 3B to 3C** Grass: Short n= 0.150 P2= 3.30"
11.5	18	0.0030	0.03		**Sheet Flow, 3C to 3D** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	34	0.0120	0.92		**Sheet Flow, 3D to 3E** Smooth surfaces n= 0.011 P2= 3.30"
0.4	38	0.0053	1.48		**Shallow Concentrated Flow, 3E to 3F** Paved Kv= 20.3 fps
0.3	26	0.0038	1.25		**Shallow Concentrated Flow, 3F to 3G** Paved Kv= 20.3 fps
1.9	37	0.0022	0.33		**Shallow Concentrated Flow, 3G to 3H** Short Grass Pasture Kv= 7.0 fps
23.0	216	Total			

Subcatchment E3: Exist. Watershed E3

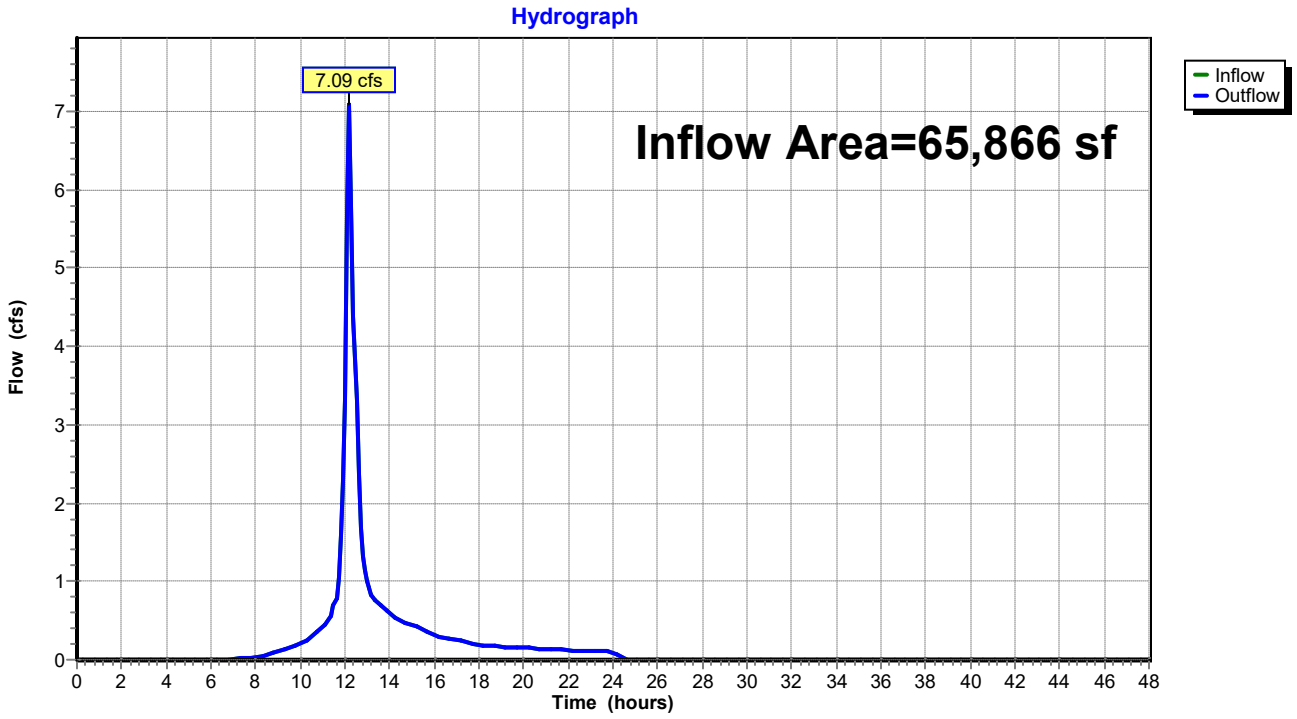


Summary for Reach E-1R: Exist. Reach 1R (South Main Street)

Inflow Area = 65,866 sf, 37.38% Impervious, Inflow Depth = 5.28" for 100-Year Storm event
Inflow = 7.09 cfs @ 12.20 hrs, Volume= 28,964 cf
Outflow = 7.09 cfs @ 12.20 hrs, Volume= 28,964 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-1R: Exist. Reach 1R (South Main Street)

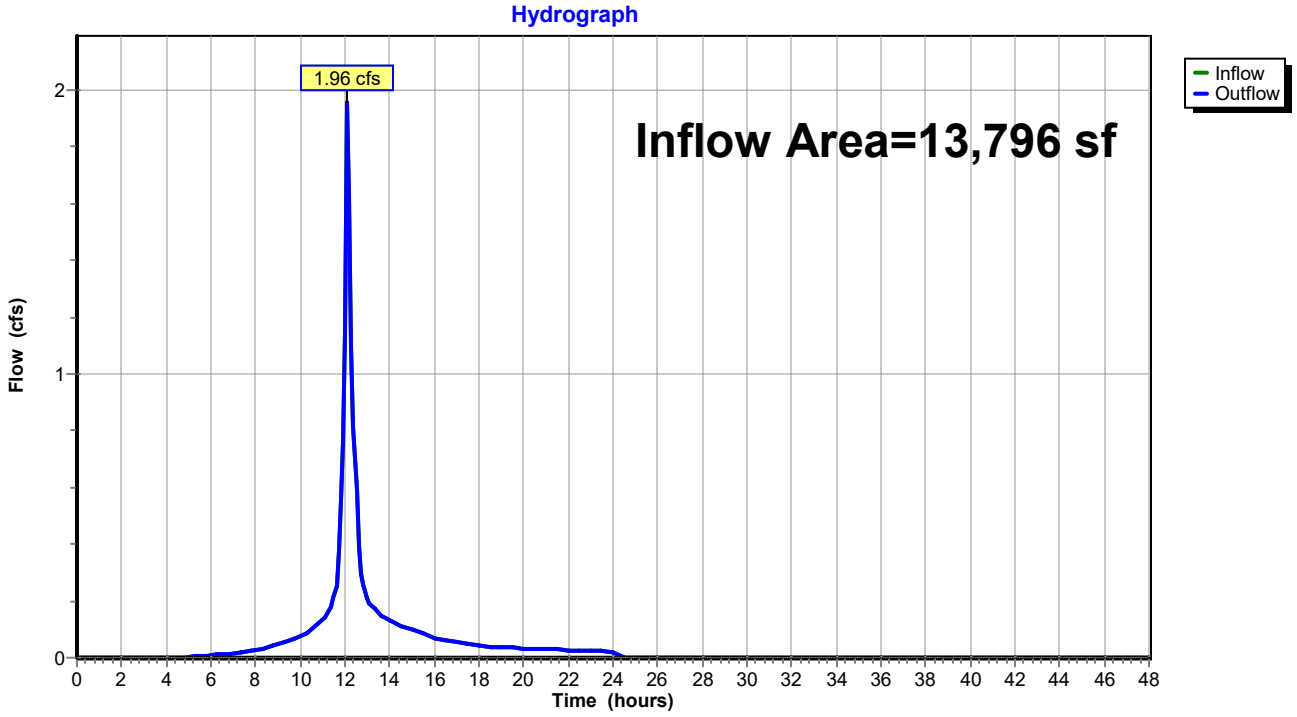


Summary for Reach E-2R: Exist. Reach 2R (Boston Street)

Inflow Area = 13,796 sf, 62.04% Impervious, Inflow Depth = 6.35" for 100-Year Storm event
Inflow = 1.96 cfs @ 12.12 hrs, Volume= 7,295 cf
Outflow = 1.96 cfs @ 12.12 hrs, Volume= 7,295 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-2R: Exist. Reach 2R (Boston Street)

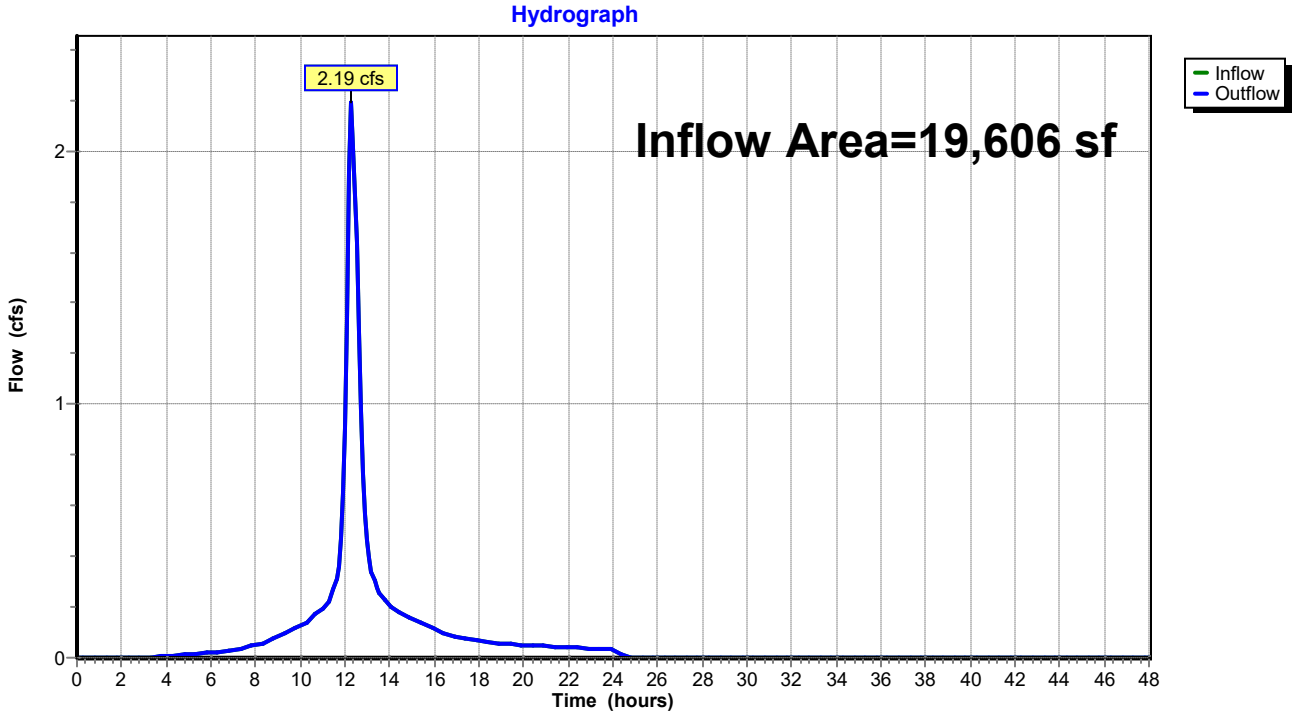


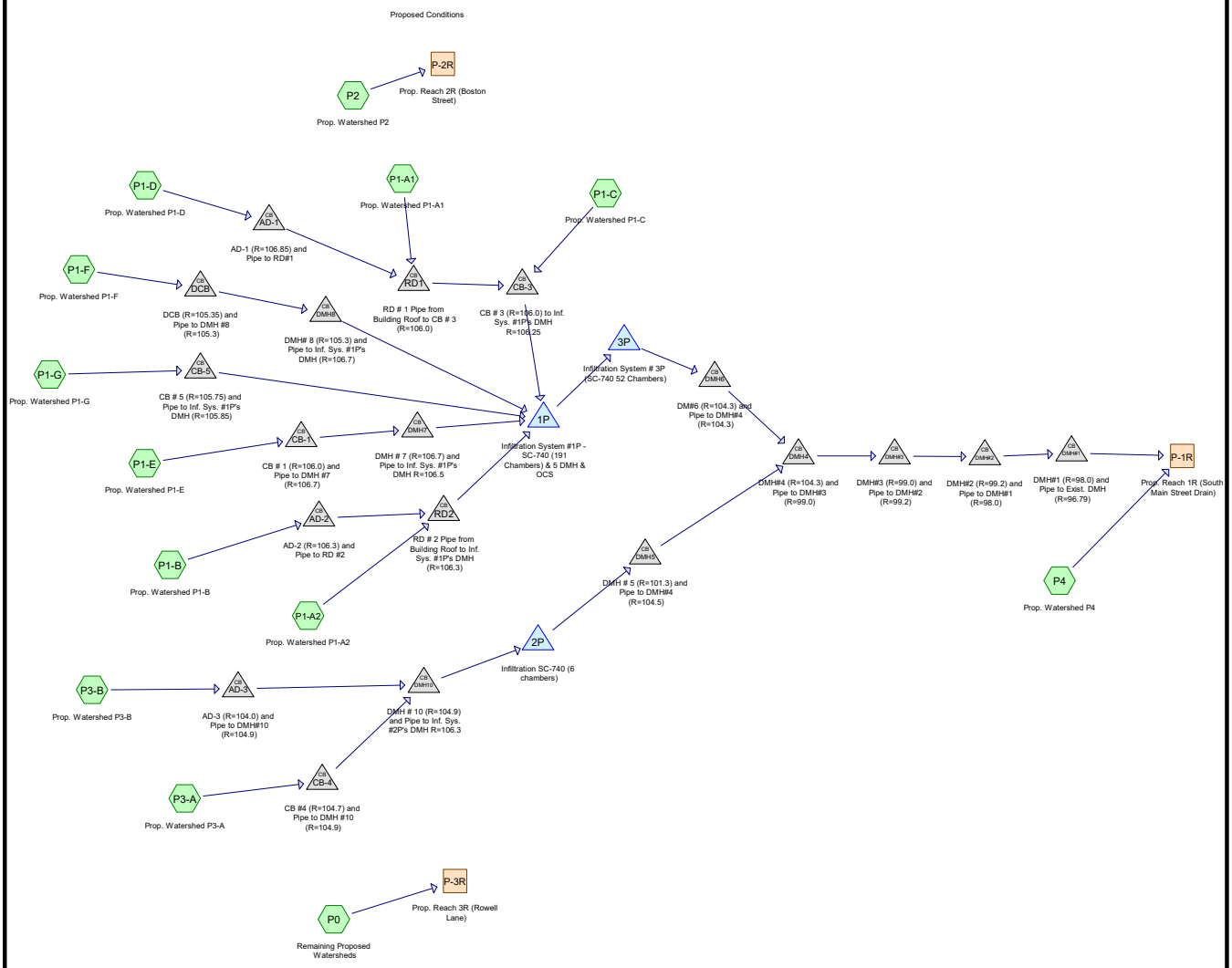
Summary for Reach E-3R: Exist. Reach 3R (Rowell Lane)

Inflow Area = 19,606 sf, 75.77% Impervious, Inflow Depth = 6.94" for 100-Year Storm event
Inflow = 2.19 cfs @ 12.31 hrs, Volume= 11,342 cf
Outflow = 2.19 cfs @ 12.31 hrs, Volume= 11,342 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach E-3R: Exist. Reach 3R (Rowell Lane)





Routing Diagram for 25912 - Middleton HydroCAD Proposed Conditions (12-7-23 Peer Rev. 2)

Prepared by Hancock Associates, Printed 12/6/2023

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
33,700	61	>75% Grass cover, Good, HSG B (P1-B, P1-C, P1-D, P1-E, P1-F, P1-G, P2, P3-A, P3-B, P4)
15,538	98	Paved parking, HSG B (P1-C, P1-E, P2, P3-A, P4)
24,916	98	Unconnected pavement, HSG B (P1-F, P1-G)
25,114	98	Unconnected roofs, HSG B (P1-A1, P1-A2)

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
99,268	HSG B	P1-A1, P1-A2, P1-B, P1-C, P1-D, P1-E, P1-F, P1-G, P2, P3-A, P3-B, P4
0	HSG C	
0	HSG D	
0	Other	

Summary for Subcatchment P0: Remaining Proposed Watersheds

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

	Area (sf)	CN	Description
*	0	98	No other proposed watersheds unaccounted for

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

Summary for Subcatchment P1-A1: Prop. Watershed P1-A1

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 2,938 cf, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
11,499	98	Unconnected roofs, HSG B
11,499		100.00% Impervious Area
11,499		100.00% Unconnected

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

Summary for Subcatchment P1-A2: Prop. Watershed P1-A2

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 3,479 cf, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
13,615	98	Unconnected roofs, HSG B
13,615		100.00% Impervious Area
13,615		100.00% Unconnected

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

Summary for Subcatchment P1-B: Prop. Watershed P1-B

Runoff = 0.01 cfs @ 12.14 hrs, Volume= 54 cf, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
1,341	61	>75% Grass cover, Good, HSG B
1,341		100.00% Pervious Area

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

Summary for Subcatchment P1-C: Prop. Watershed P1-C

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 557 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
2,280	98	Paved parking, HSG B
677	61	>75% Grass cover, Good, HSG B
2,957	90	Weighted Average
677		22.89% Pervious Area
2,280		77.11% Impervious Area

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

Summary for Subcatchment P1-D: Prop. Watershed P1-D

Runoff = 0.00 cfs @ 12.14 hrs, Volume= 6 cf, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
141	61	>75% Grass cover, Good, HSG B
141		100.00% Pervious Area

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

Summary for Subcatchment P1-E: Prop. Watershed P1-E

Runoff = 0.19 cfs @ 12.10 hrs, Volume= 627 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
2,568	98	Paved parking, HSG B
760	61	>75% Grass cover, Good, HSG B
3,328	90	Weighted Average
760		22.84% Pervious Area
2,568		77.16% Impervious Area

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

Summary for Subcatchment P1-F: Prop. Watershed P1-F

Runoff = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
5,436	61	>75% Grass cover, Good, HSG B
14,022	98	Unconnected pavement, HSG B
19,458	88	Weighted Average
5,436		27.94% Pervious Area
14,022		72.06% Impervious Area
14,022		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-F Watershed**

Summary for Subcatchment P1-G: Prop. Watershed P1-G

Runoff = 0.79 cfs @ 12.10 hrs, Volume= 2,635 cf, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
3,665	61	>75% Grass cover, Good, HSG B
10,894	98	Unconnected pavement, HSG B
14,559	89	Weighted Average
3,665		25.17% Pervious Area
10,894		74.83% Impervious Area
10,894		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-G Watershed**

Summary for Subcatchment P2: Prop. Watershed P2

Runoff = 0.03 cfs @ 12.11 hrs, Volume= 114 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
466	98	Paved parking, HSG B
599	61	>75% Grass cover, Good, HSG B
1,065	77	Weighted Average
599		56.24% Pervious Area
466		43.76% Impervious Area

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

Summary for Subcatchment P3-A: Prop. Watershed P3-A

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 1,994 cf, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
7,951	98	Paved parking, HSG B
457	61	>75% Grass cover, Good, HSG B
8,408	96	Weighted Average
457		5.44% Pervious Area
7,951		94.56% Impervious Area

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

Summary for Subcatchment P3-B: Prop. Watershed P3-B

Runoff = 0.08 cfs @ 12.14 hrs, Volume= 393 cf, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
9,734	61	>75% Grass cover, Good, HSG B
9,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	3	0.0360	0.11		**Sheet Flow, A1 to A2** Grass: Short n= 0.150 P2= 3.30"
1.2	11	0.0467	0.16		**Sheet Flow, A2 to A3** Grass: Short n= 0.150 P2= 3.30"
0.9	37	0.0101	0.70		**Shallow Concentrated Flow, A3 to A4** Short Grass Pasture Kv= 7.0 fps
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, A4 to A5** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	1.50		**Shallow Concentrated Flow, A5 to A6** Grassed Waterway Kv= 15.0 fps
0.6	50	0.0100	1.50		**Shallow Concentrated Flow, A6 to A7** Grassed Waterway Kv= 15.0 fps
0.4	36	0.0100	1.50		**Shallow Concentrated Flow, A7 to A8** Grassed Waterway Kv= 15.0 fps
1.1					**Direct Entry, Use minimum Tc of 6 min since Tc calculated is 4.9**
6.0	199	Total			

Summary for Subcatchment P4: Prop. Watershed P4

Runoff = 0.21 cfs @ 12.12 hrs, Volume= 811 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Storm Rainfall=3.30"

Area (sf)	CN	Description
2,273	98	Paved parking, HSG B
10,890	61	>75% Grass cover, Good, HSG B
13,163	67	Weighted Average
10,890		82.73% Pervious Area
2,273		17.27% Impervious Area

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

Summary for Reach P-1R: Prop. Reach 1R (South Main Street Drain)

Inflow Area = 98,203 sf, 66.29% Impervious, Inflow Depth > 0.32" for 2-Year Storm event
Inflow = 0.81 cfs @ 12.14 hrs, Volume= 2,642 cf
Outflow = 0.81 cfs @ 12.14 hrs, Volume= 2,642 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-2R: Prop. Reach 2R (Boston Street)

Inflow Area = 1,065 sf, 43.76% Impervious, Inflow Depth > 1.28" for 2-Year Storm event
Inflow = 0.03 cfs @ 12.11 hrs, Volume= 114 cf
Outflow = 0.03 cfs @ 12.11 hrs, Volume= 114 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-3R: Prop. Reach 3R (Rowell Lane)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth > 2.45" for 2-Year Storm event
Inflow = 3.90 cfs @ 12.10 hrs, Volume= 13,678 cf
Outflow = 0.59 cfs @ 12.63 hrs, Volume= 12,752 cf, Atten= 85%, Lag= 32.2 min
Discarded = 0.16 cfs @ 10.30 hrs, Volume= 9,255 cf
Primary = 0.43 cfs @ 12.63 hrs, Volume= 3,497 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.20' @ 12.63 hrs Surf.Area= 6,865 sf Storage= 5,574 cf

Plug-Flow detention time= 175.2 min calculated for 12,752 cf (93% of inflow)
Center-of-Mass det. time= 139.0 min (924.2 - 785.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	101.00'	3,904 cf	**49.00'W x 89.06'L x 3.50'H Field A** 15,273 cf Overall - 5,513 cf Embedded = 9,760 cf x 40.0% Voids
#2A	101.50'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 10 Rows
#3B	101.00'	400 cf	**5.25'W x 81.94'L x 3.50'H Field B** 1,506 cf Overall - 505 cf Embedded = 1,000 cf x 40.0% Voids
#4B	101.50'	505 cf	**ADS_StormTech SC-740 +Cap** x 11 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#5C	101.00'	1,796 cf	**23.25'W x 89.06'L x 3.50'H Field C** 7,247 cf Overall - 2,756 cf Embedded = 4,491 cf x 40.0% Voids
#6C	101.50'	2,756 cf	**ADS_StormTech SC-740 +Cap** x 60 Inside #5 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 60 Chambers in 5 Rows
#7	99.85'	118 cf	**5.00'D x 6.00'H DMH R=105.85** -Impervious
#8	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#9	100.25'	118 cf	**5.00'D x 6.00'H DMH R=106.25** -Impervious
#10	100.70'	118 cf	**5.00'D x 6.00'H DMH R=106.7** -Impervious
#11	100.50'	118 cf	**5.00'D x 6.00'H DMH R=106.5** -Impervious
#12	100.95'	108 cf	**5.00'D x 5.50'H OCS # 1 - R=106.45** -Impervious
		15,572 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	101.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	100.90'	**12.0" Round Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** L= 179.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.90' / 100.00' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	101.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.16 cfs @ 10.30 hrs HW=101.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.43 cfs @ 12.63 hrs HW=102.20' TW=100.05' (Dynamic Tailwater)
└**2=Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** (Passes 0.43 cfs of 2.44 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 0.43 cfs @ 2.29 fps)

Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

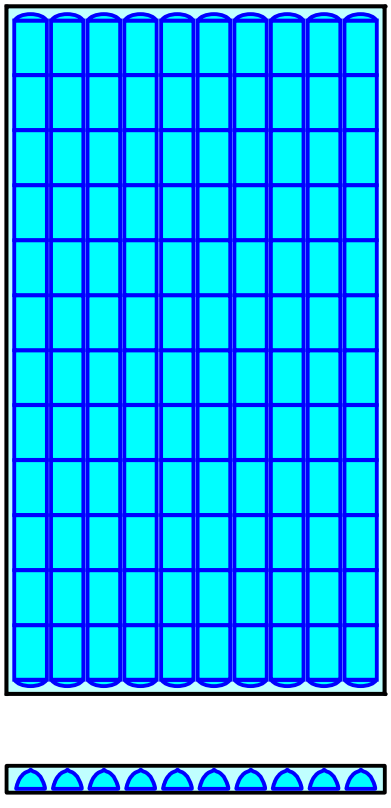
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

120 Chambers x 45.9 cf = 5,512.8 cf Chamber Storage

15,273.2 cf Field - 5,512.8 cf Chambers = 9,760.4 cf Stone x 40.0% Voids = 3,904.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,417.0 cf = 0.216 af
Overall Storage Efficiency = 61.7%
Overall System Size = 89.06' x 49.00' x 3.50'

120 Chambers
565.7 cy Field
361.5 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field B

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

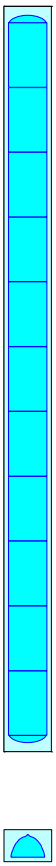
11 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 79.94' Row Length +12.0" End Stone x 2 = 81.94' Base Length
1 Rows x 51.0" Wide + 6.0" Side Stone x 2 = 5.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

11 Chambers x 45.9 cf = 505.3 cf Chamber Storage

1,505.6 cf Field - 505.3 cf Chambers = 1,000.2 cf Stone x 40.0% Voids = 400.1 cf Stone Storage

Chamber Storage + Stone Storage = 905.4 cf = 0.021 af
Overall Storage Efficiency = 60.1%
Overall System Size = 81.94' x 5.25' x 3.50'

11 Chambers
55.8 cy Field
37.0 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field C

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

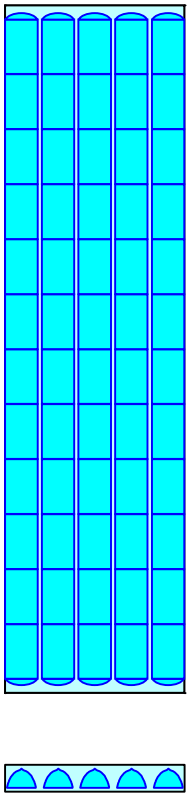
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 = 23.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

60 Chambers x 45.9 cf = 2,756.4 cf Chamber Storage

7,247.0 cf Field - 2,756.4 cf Chambers = 4,490.6 cf Stone x 40.0% Voids = 1,796.2 cf Stone Storage

Chamber Storage + Stone Storage = 4,552.6 cf = 0.105 af
Overall Storage Efficiency = 62.8%
Overall System Size = 89.06' x 23.25' x 3.50'

60 Chambers
268.4 cy Field
166.3 cy Stone



Summary for Pond 2P: Infiltration SC-740 (6 chambers)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 1.58" for 2-Year Storm event
Inflow = 0.63 cfs @ 12.10 hrs, Volume= 2,388 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,776 cf, Atten= 5%, Lag= 2.4 min
Discarded = 0.01 cfs @ 6.50 hrs, Volume= 496 cf
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,280 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.90' @ 12.10 hrs Surf.Area= 313 sf Storage= 629 cf

Plug-Flow detention time= 136.4 min calculated for 1,776 cf (74% of inflow)
Center-of-Mass det. time= 43.7 min (839.2 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	295 cf	**6.25'W x 46.34'L x 3.50'H Field A** 1,014 cf Overall - 276 cf Embedded = 738 cf x 40.0% Voids
#2A	100.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#4	99.70'	154 cf	**5.50'D x 6.50'H OCS # 2P R=106.3**
		843 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	99.70'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	101.80'	**12.0" Round Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** L= 128.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.80' / 98.30' S= 0.0272 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 6.50 hrs HW=100.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=102.90' TW=98.65' (Dynamic Tailwater)
└**2=Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** (Passes 0.52 cfs of 2.93 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 1.04 fps)

Pond 2P: Infiltration SC-740 (6 chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

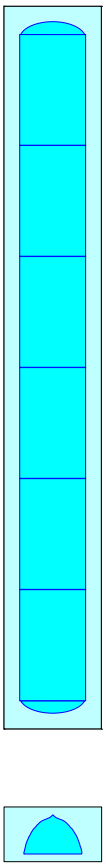
6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,013.6 cf Field - 275.6 cf Chambers = 738.0 cf Stone x 40.0% Voids = 295.2 cf Stone Storage

Chamber Storage + Stone Storage = 570.8 cf = 0.013 af
Overall Storage Efficiency = 56.3%
Overall System Size = 46.34' x 6.25' x 3.50'

6 Chambers
37.5 cy Field
27.3 cy Stone



Summary for Pond 3P: Infiltration System # 3P (SC-740 52 Chambers)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 0.63" for 2-Year Storm event
Inflow = 0.43 cfs @ 12.63 hrs, Volume= 3,497 cf
Outflow = 0.14 cfs @ 15.01 hrs, Volume= 2,548 cf, Atten= 68%, Lag= 142.3 min
Discarded = 0.05 cfs @ 12.30 hrs, Volume= 1,997 cf
Primary = 0.09 cfs @ 15.01 hrs, Volume= 551 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 101.18' @ 15.01 hrs Surf.Area= 1,972 sf Storage= 2,255 cf

Plug-Flow detention time= 259.0 min calculated for 2,538 cf (73% of inflow)
Center-of-Mass det. time= 223.4 min (1,050.8 - 827.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	99.50'	1,805 cf	**20.50'W x 96.18'L x 3.50'H Field A** 6,901 cf Overall - 2,389 cf Embedded = 4,512 cf x 40.0% Voids
#2A	100.00'	2,389 cf	**ADS_StormTech SC-740 +Cap** x 52 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 52 Chambers in 4 Rows
#3	99.70'	119 cf	**5.50'D x 5.00'H OCS # 3P** -Impervious
		4,312 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	98.88'	**12.0" Round Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** L= 69.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.88' / 98.53' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf
#2	Discarded	99.50'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	101.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 12.30 hrs HW=99.60' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.09 cfs @ 15.01 hrs HW=101.18' TW=98.61' (Dynamic Tailwater)
└**1=Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** (Passes 0.09 cfs of 3.85 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.43 fps)

Pond 3P: Infiltration System # 3P (SC-740 52 Chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

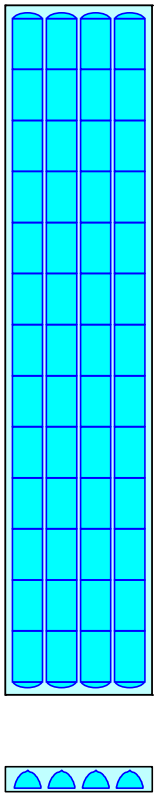
13 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 94.18' Row Length +12.0" End Stone x 2 = 96.18' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

52 Chambers x 45.9 cf = 2,388.9 cf Chamber Storage

6,900.7 cf Field - 2,388.9 cf Chambers = 4,511.8 cf Stone x 40.0% Voids = 1,804.7 cf Stone Storage

Chamber Storage + Stone Storage = 4,193.6 cf = 0.096 af
Overall Storage Efficiency = 60.8%
Overall System Size = 96.18' x 20.50' x 3.50'

52 Chambers
255.6 cy Field
167.1 cy Stone



Summary for Pond AD-1: AD-1 (R=106.85) and Pipe to RD#1

Inflow Area = 141 sf, 0.00% Impervious, Inflow Depth > 0.49" for 2-Year Storm event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 6 cf
Outflow = 0.00 cfs @ 12.14 hrs, Volume= 6 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 12.14 hrs, Volume= 6 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.79' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.76'	**6.0" Round Culvert from Area Drain # 1 to Roof Drain** L= 37.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.76' / 103.00' S= 0.0203 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=103.78' TW=103.55' (Dynamic Tailwater)
1=Culvert from Area Drain # 1 to Roof Drain (Outlet Controls 0.00 cfs @ 0.52 fps)

Summary for Pond AD-2: AD-2 (R=106.3) and Pipe to RD #2

Inflow Area = 1,341 sf, 0.00% Impervious, Inflow Depth > 0.49" for 2-Year Storm event
Inflow = 0.01 cfs @ 12.14 hrs, Volume= 54 cf
Outflow = 0.01 cfs @ 12.14 hrs, Volume= 54 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.14 hrs, Volume= 54 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.93' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.84'	**6.0" Round Culvert from Area Drain # 2 to Roof Drain # 2** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.84' / 102.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.01 cfs @ 12.14 hrs HW=103.92' TW=103.77' (Dynamic Tailwater)
1=Culvert from Area Drain # 2 to Roof Drain # 2 (Outlet Controls 0.01 cfs @ 0.81 fps)

Summary for Pond AD-3: AD-3 (R=104.0) and Pipe to DMH#10 (R=104.9)

Inflow Area = 9,734 sf, 0.00% Impervious, Inflow Depth > 0.49" for 2-Year Storm event
Inflow = 0.08 cfs @ 12.14 hrs, Volume= 393 cf
Outflow = 0.08 cfs @ 12.14 hrs, Volume= 393 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.14 hrs, Volume= 393 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.98' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.71'	**8.0" Round Culvert from Area Drain # 3 to DMH # 10 (R=104.9)** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.71' / 101.42' S= 0.0081 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=102.66' TW=102.95' (Dynamic Tailwater)
1=Culvert from Area Drain # 3 to DMH # 10 (R=104.9) (Controls 0.00 cfs)

Summary for Pond CB-1: CB # 1 (R=106.0) and Pipe to DMH #7 (R=106.7)

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 2.26" for 2-Year Storm event
Inflow = 0.19 cfs @ 12.10 hrs, Volume= 627 cf
Outflow = 0.19 cfs @ 12.10 hrs, Volume= 627 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.10 hrs, Volume= 627 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.96' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.70'	**12.0" Round 13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.70' / 102.63' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.10 hrs HW=102.96' TW=102.75' (Dynamic Tailwater)
↑**1=13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** (Barrel Controls 0.19 cfs @ 1.71 fps)

Summary for Pond CB-3: CB # 3 (R=106.0) to Inf. Sys. #1P's DMH R=106.25

Inflow Area = 14,597 sf, 94.40% Impervious, Inflow Depth > 2.88" for 2-Year Storm event
Inflow = 0.96 cfs @ 12.09 hrs, Volume= 3,501 cf
Outflow = 0.96 cfs @ 12.09 hrs, Volume= 3,501 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.96 cfs @ 12.09 hrs, Volume= 3,501 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.13' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.50'	**12.0" Round Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** L= 15.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.50' / 102.42' S= 0.0052 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.09 hrs HW=103.12' TW=101.79' (Dynamic Tailwater)
↑—**1=Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** (Barrel Controls 0.94 cfs @ 2.63 fps)

Summary for Pond CB-4: CB #4 (R=104.7) and Pipe to DMH #10 (R=104.9)

Inflow Area = 8,408 sf, 94.56% Impervious, Inflow Depth > 2.85" for 2-Year Storm event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 1,994 cf
Outflow = 0.56 cfs @ 12.09 hrs, Volume= 1,994 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.09 hrs, Volume= 1,994 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.98' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.70'	**12.0" Round 3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9)** L= 3.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.70' / 101.60' S= 0.0333 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=102.50' TW=102.94' (Dynamic Tailwater)
1=3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9) (Controls 0.00 cfs)

Summary for Pond CB-5: CB # 5 (R=105.75) and Pipe to Inf. Sys. #1P's DMH (R=105.85)

Inflow Area = 14,559 sf, 74.83% Impervious, Inflow Depth > 2.17" for 2-Year Storm event
Inflow = 0.79 cfs @ 12.10 hrs, Volume= 2,635 cf
Outflow = 0.79 cfs @ 12.10 hrs, Volume= 2,635 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.10 hrs, Volume= 2,635 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.98' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.42'	**12.0" Round 11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.42' / 102.35' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.10 hrs HW=102.98' TW=101.80' (Dynamic Tailwater)
↑**1=11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** (Barrel Controls 0.79 cfs @ 2.51 fps)

Summary for Pond DCB: DCB (R=105.35) and Pipe to DMH #8 (R=105.3)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 2.09" for 2-Year Storm event
Inflow = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf
Outflow = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.73' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.13'	**15.0" Round Pipe from DCB (R=105.35) to DMH (R=105.3)** L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.13' / 101.78' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=1.02 cfs @ 12.10 hrs HW=102.73' TW=102.27' (Dynamic Tailwater)
↑**1=Pipe from DCB (R=105.35) to DMH (R=105.3)** (Outlet Controls 1.02 cfs @ 2.57 fps)

Summary for Pond DMH#1: DMH#1 (R=98.0) and Pipe to Exist. DMH (R=96.79)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 0.26" for 2-Year Storm event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 94.48' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**8.0" Round Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79)** L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.00' / 92.90' S= 0.0239 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=94.43' TW=0.00' (Dynamic Tailwater)
1=Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79) (Inlet Controls 0.52 cfs @ 2.22 fps)

Summary for Pond DMH#2: DMH#2 (R=99.2) and Pipe to DMH#1 (R=98.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 0.26" for 2-Year Storm event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 94.80' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.29'	**12.0" Round Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0)** L= 38.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.29' / 94.10' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=94.74' TW=94.43' (Dynamic Tailwater)
1=Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0) (Barrel Controls 0.52 cfs @ 2.25 fps)

Summary for Pond DMH#3: DMH#3 (R=99.0) and Pipe to DMH#2 (R=99.2)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 0.26" for 2-Year Storm event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 97.82' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.31'	**12.0" Round Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2)** L= 89.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.31' / 96.86' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=97.76' TW=94.74' (Dynamic Tailwater)
1=Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2) (Barrel Controls 0.52 cfs @ 2.27 fps)

Summary for Pond DMH10: DMH # 10 (R=104.9) and Pipe to Inf. Sys. #2P's DMH R=106.3

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 1.58" for 2-Year Storm event
Inflow = 0.63 cfs @ 12.10 hrs, Volume= 2,388 cf
Outflow = 0.63 cfs @ 12.10 hrs, Volume= 2,388 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.10 hrs, Volume= 2,388 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.01' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.30'	**12.0" Round Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3)** L= 102.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.30' / 100.79' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

Primary OutFlow Max=0.63 cfs @ 12.10 hrs HW=102.96' TW=102.90' (Dynamic Tailwater)
1=Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3) (Outlet Controls 0.63 cfs @ 0.81 fps)

Summary for Pond DMH4: DMH#4 (R=104.3) and Pipe to DMH#3 (R=99.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 0.26" for 2-Year Storm event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,831 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.15' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.64'	**12.0" Round Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** L= 46.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.64' / 97.41' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=98.09' TW=97.76' (Dynamic Tailwater)
↑—**1=Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** (Outlet Controls 0.52 cfs @ 2.24 fps)

Summary for Pond DMH5: DMH # 5 (R=101.3) and Pipe to DMH#4 (R=104.5)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 0.85" for 2-Year Storm event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 1,280 cf
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 1,280 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.14 hrs, Volume= 1,280 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.71' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.20'	**12.0" Round Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5)** L= 58.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.20' / 97.91' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=98.65' TW=98.09' (Dynamic Tailwater)
1=Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5) (Barrel Controls 0.52 cfs @ 2.26 fps)

Summary for Pond DMH6: DM#6 (R=104.3) and Pipe to DMH#4 (R=104.3)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 0.10" for 2-Year Storm event
Inflow = 0.09 cfs @ 15.01 hrs, Volume= 551 cf
Outflow = 0.09 cfs @ 15.01 hrs, Volume= 551 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.09 cfs @ 15.01 hrs, Volume= 551 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.61' @ 15.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.43'	**12.0" Round Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3)** L= 137.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.43' / 97.74' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 15.01 hrs HW=98.61' TW=97.85' (Dynamic Tailwater)
↑**1=Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3)** (Barrel Controls 0.09 cfs @ 1.36 fps)

Summary for Pond DMH7: DMH # 7 (R=106.7) and Pipe to Inf. Sys. #1P's DMH R=106.5

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 2.26" for 2-Year Storm event
Inflow = 0.19 cfs @ 12.10 hrs, Volume= 627 cf
Outflow = 0.19 cfs @ 12.10 hrs, Volume= 627 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.10 hrs, Volume= 627 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.75' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.53'	**12.0" Round Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.53' / 102.39' S= 0.0200 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.10 hrs HW=102.75' TW=101.80' (Dynamic Tailwater)
↑**1=Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55** (Barrel Controls 0.19 cfs @ 2.24 fps)

Summary for Pond DMH8: DMH# 8 (R=105.3) and Pipe to Inf. Sys. #1P's DMH (R=106.7)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 2.09" for 2-Year Storm event
Inflow = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf
Outflow = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.10 hrs, Volume= 3,382 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.27' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.68'	**15.0" Round Culvert from DMH (R=105.3) to DMH (R=106.7)** L= 35.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.68' / 101.50' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=1.02 cfs @ 12.10 hrs HW=102.27' TW=101.80' (Dynamic Tailwater)
↑—**1=Culvert from DMH (R=105.3) to DMH (R=106.7)** (Barrel Controls 1.02 cfs @ 2.63 fps)

Summary for Pond RD1: RD # 1 Pipe from Building Roof to CB # 3 (R=106.0)

Inflow Area = 11,640 sf, 98.79% Impervious, Inflow Depth > 3.03" for 2-Year Storm event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 2,944 cf
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 2,944 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.09 hrs, Volume= 2,944 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.61' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.02'	**8.0" Round Pipe from half of Building # 1 to CB # 3** L= 30.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.02' / 102.78' S= 0.0079 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.77 cfs @ 12.09 hrs HW=103.61' TW=103.12' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to CB # 3 (Barrel Controls 0.77 cfs @ 3.18 fps)

Summary for Pond RD2: RD # 2 Pipe from Building Roof to Inf. Sys. #1P's DMH (R=106.3)

Inflow Area = 14,956 sf, 91.03% Impervious, Inflow Depth > 2.83" for 2-Year Storm event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 3,533 cf
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 3,533 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.09 hrs, Volume= 3,533 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.84' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.20'	**8.0" Round Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3)** L= 61.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.20' / 101.97' S= 0.0202 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.93 cfs @ 12.09 hrs HW=103.84' TW=101.79' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3) (Inlet Controls 0.93 cfs @ 2.71 fps)

Summary for Subcatchment P0: Remaining Proposed Watersheds

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

	Area (sf)	CN	Description
*	0	98	No other proposed watersheds unaccounted for

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

Summary for Subcatchment P1-A1: Prop. Watershed P1-A1

Runoff = 1.26 cfs @ 12.09 hrs, Volume= 4,773 cf, Depth> 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
11,499	98	Unconnected roofs, HSG B
11,499		100.00% Impervious Area
11,499		100.00% Unconnected

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

Summary for Subcatchment P1-A2: Prop. Watershed P1-A2

Runoff = 1.49 cfs @ 12.09 hrs, Volume= 5,651 cf, Depth> 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
13,615	98	Unconnected roofs, HSG B
13,615		100.00% Impervious Area
13,615		100.00% Unconnected

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

Summary for Subcatchment P1-B: Prop. Watershed P1-B

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 168 cf, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
1,341	61	>75% Grass cover, Good, HSG B
1,341		100.00% Pervious Area

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

Summary for Subcatchment P1-C: Prop. Watershed P1-C

Runoff = 0.29 cfs @ 12.10 hrs, Volume= 1,007 cf, Depth> 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
2,280	98	Paved parking, HSG B
677	61	>75% Grass cover, Good, HSG B
2,957	90	Weighted Average
677		22.89% Pervious Area
2,280		77.11% Impervious Area

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

Summary for Subcatchment P1-D: Prop. Watershed P1-D

Runoff = 0.00 cfs @ 12.11 hrs, Volume= 18 cf, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
141	61	>75% Grass cover, Good, HSG B
141		100.00% Pervious Area

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

Summary for Subcatchment P1-E: Prop. Watershed P1-E

Runoff = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf, Depth> 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
2,568	98	Paved parking, HSG B
760	61	>75% Grass cover, Good, HSG B
3,328	90	Weighted Average
760		22.84% Pervious Area
2,568		77.16% Impervious Area

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

Summary for Subcatchment P1-F: Prop. Watershed P1-F

Runoff = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
5,436	61	>75% Grass cover, Good, HSG B
14,022	98	Unconnected pavement, HSG B
19,458	88	Weighted Average
5,436		27.94% Pervious Area
14,022		72.06% Impervious Area
14,022		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-F Watershed**

Summary for Subcatchment P1-G: Prop. Watershed P1-G

Runoff = 1.41 cfs @ 12.10 hrs, Volume= 4,830 cf, Depth> 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
3,665	61	>75% Grass cover, Good, HSG B
10,894	98	Unconnected pavement, HSG B
14,559	89	Weighted Average
3,665		25.17% Pervious Area
10,894		74.83% Impervious Area
10,894		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-G Watershed**

Summary for Subcatchment P2: Prop. Watershed P2

Runoff = 0.08 cfs @ 12.10 hrs, Volume= 249 cf, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
466	98	Paved parking, HSG B
599	61	>75% Grass cover, Good, HSG B
1,065	77	Weighted Average
599		56.24% Pervious Area
466		43.76% Impervious Area

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

Summary for Subcatchment P3-A: Prop. Watershed P3-A

Runoff = 0.90 cfs @ 12.09 hrs, Volume= 3,328 cf, Depth> 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
7,951	98	Paved parking, HSG B
457	61	>75% Grass cover, Good, HSG B
8,408	96	Weighted Average
457		5.44% Pervious Area
7,951		94.56% Impervious Area

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

Summary for Subcatchment P3-B: Prop. Watershed P3-B

Runoff = 0.34 cfs @ 12.11 hrs, Volume= 1,218 cf, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
9,734	61	>75% Grass cover, Good, HSG B
9,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	3	0.0360	0.11		**Sheet Flow, A1 to A2** Grass: Short n= 0.150 P2= 3.30"
1.2	11	0.0467	0.16		**Sheet Flow, A2 to A3** Grass: Short n= 0.150 P2= 3.30"
0.9	37	0.0101	0.70		**Shallow Concentrated Flow, A3 to A4** Short Grass Pasture Kv= 7.0 fps
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, A4 to A5** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	1.50		**Shallow Concentrated Flow, A5 to A6** Grassed Waterway Kv= 15.0 fps
0.6	50	0.0100	1.50		**Shallow Concentrated Flow, A6 to A7** Grassed Waterway Kv= 15.0 fps
0.4	36	0.0100	1.50		**Shallow Concentrated Flow, A7 to A8** Grassed Waterway Kv= 15.0 fps
1.1					**Direct Entry, Use minimum Tc of 6 min since Tc calculated is 4.9**
6.0	199	Total			

Summary for Subcatchment P4: Prop. Watershed P4

Runoff = 0.64 cfs @ 12.11 hrs, Volume= 2,146 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Storm Rainfall=5.22"

Area (sf)	CN	Description
2,273	98	Paved parking, HSG B
10,890	61	>75% Grass cover, Good, HSG B
13,163	67	Weighted Average
10,890		82.73% Pervious Area
2,273		17.27% Impervious Area

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

Summary for Reach P-1R: Prop. Reach 1R (South Main Street Drain)

Inflow Area = 98,203 sf, 66.29% Impervious, Inflow Depth > 1.67" for 10-Year Storm event
Inflow = 1.88 cfs @ 12.10 hrs, Volume= 13,637 cf
Outflow = 1.88 cfs @ 12.10 hrs, Volume= 13,637 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-2R: Prop. Reach 2R (Boston Street)

Inflow Area = 1,065 sf, 43.76% Impervious, Inflow Depth > 2.81" for 10-Year Storm event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 249 cf
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 249 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-3R: Prop. Reach 3R (Rowell Lane)

Inflow	=	0.00 cfs @	0.00 hrs,	Volume=	0 cf
Outflow	=	0.00 cfs @	0.00 hrs,	Volume=	0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth > 4.28" for 10-Year Storm event
Inflow = 6.68 cfs @ 12.10 hrs, Volume= 23,866 cf
Outflow = 2.01 cfs @ 12.44 hrs, Volume= 21,737 cf, Atten= 70%, Lag= 20.7 min
Discarded = 0.16 cfs @ 8.70 hrs, Volume= 10,291 cf
Primary = 1.85 cfs @ 12.44 hrs, Volume= 11,446 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.95' @ 12.44 hrs Surf.Area= 6,865 sf Storage= 9,574 cf

Plug-Flow detention time= 140.3 min calculated for 21,647 cf (91% of inflow)
Center-of-Mass det. time= 96.1 min (869.9 - 773.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	101.00'	3,904 cf	**49.00'W x 89.06'L x 3.50'H Field A** 15,273 cf Overall - 5,513 cf Embedded = 9,760 cf x 40.0% Voids
#2A	101.50'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 10 Rows
#3B	101.00'	400 cf	**5.25'W x 81.94'L x 3.50'H Field B** 1,506 cf Overall - 505 cf Embedded = 1,000 cf x 40.0% Voids
#4B	101.50'	505 cf	**ADS_StormTech SC-740 +Cap** x 11 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#5C	101.00'	1,796 cf	**23.25'W x 89.06'L x 3.50'H Field C** 7,247 cf Overall - 2,756 cf Embedded = 4,491 cf x 40.0% Voids
#6C	101.50'	2,756 cf	**ADS_StormTech SC-740 +Cap** x 60 Inside #5 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 60 Chambers in 5 Rows
#7	99.85'	118 cf	**5.00'D x 6.00'H DMH R=105.85** -Impervious
#8	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#9	100.25'	118 cf	**5.00'D x 6.00'H DMH R=106.25** -Impervious
#10	100.70'	118 cf	**5.00'D x 6.00'H DMH R=106.7** -Impervious
#11	100.50'	118 cf	**5.00'D x 6.00'H DMH R=106.5** -Impervious
#12	100.95'	108 cf	**5.00'D x 5.50'H OCS # 1 - R=106.45** -Impervious
		15,572 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	101.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	100.90'	**12.0" Round Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** L= 179.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.90' / 100.00' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	101.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.16 cfs @ 8.70 hrs HW=101.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=1.78 cfs @ 12.44 hrs HW=102.94' TW=100.74' (Dynamic Tailwater)
└**2=Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** (Passes 1.78 cfs of 2.93 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.86 cfs @ 1.23 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.92 cfs @ 4.67 fps)

Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

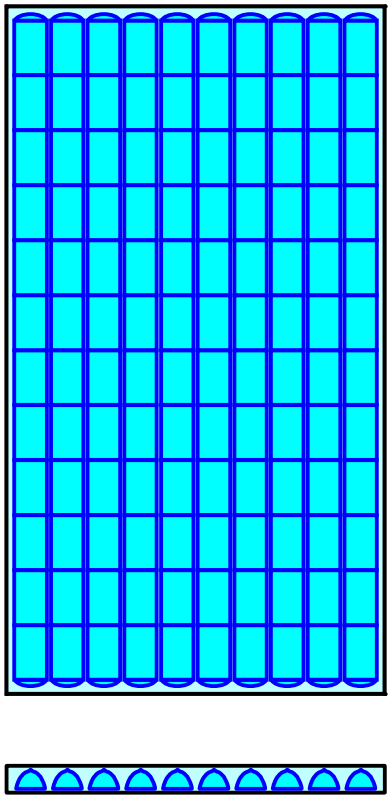
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

120 Chambers x 45.9 cf = 5,512.8 cf Chamber Storage

15,273.2 cf Field - 5,512.8 cf Chambers = 9,760.4 cf Stone x 40.0% Voids = 3,904.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,417.0 cf = 0.216 af
Overall Storage Efficiency = 61.7%
Overall System Size = 89.06' x 49.00' x 3.50'

120 Chambers
565.7 cy Field
361.5 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field B

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

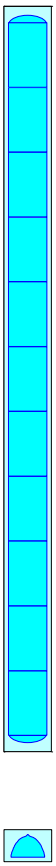
11 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 79.94' Row Length +12.0" End Stone x 2 = 81.94' Base Length
1 Rows x 51.0" Wide + 6.0" Side Stone x 2 = 5.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

11 Chambers x 45.9 cf = 505.3 cf Chamber Storage

1,505.6 cf Field - 505.3 cf Chambers = 1,000.2 cf Stone x 40.0% Voids = 400.1 cf Stone Storage

Chamber Storage + Stone Storage = 905.4 cf = 0.021 af
Overall Storage Efficiency = 60.1%
Overall System Size = 81.94' x 5.25' x 3.50'

11 Chambers
55.8 cy Field
37.0 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field C

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

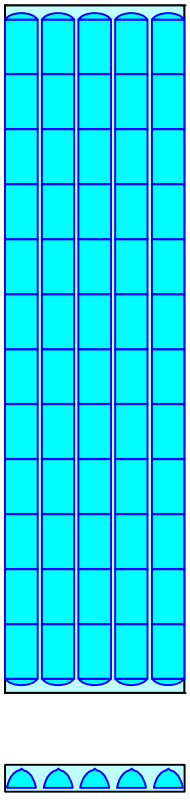
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 = 23.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

60 Chambers x 45.9 cf = 2,756.4 cf Chamber Storage

7,247.0 cf Field - 2,756.4 cf Chambers = 4,490.6 cf Stone x 40.0% Voids = 1,796.2 cf Stone Storage

Chamber Storage + Stone Storage = 4,552.6 cf = 0.105 af
Overall Storage Efficiency = 62.8%
Overall System Size = 89.06' x 23.25' x 3.50'

60 Chambers
268.4 cy Field
166.3 cy Stone



Summary for Pond 2P: Infiltration SC-740 (6 chambers)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 3.01" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 4,546 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 3,933 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.01 cfs @ 3.90 hrs, Volume= 548 cf
Primary = 1.25 cfs @ 12.10 hrs, Volume= 3,386 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.98' @ 12.10 hrs Surf.Area= 313 sf Storage= 641 cf

Plug-Flow detention time= 92.7 min calculated for 3,933 cf (87% of inflow)
Center-of-Mass det. time= 30.5 min (820.4 - 789.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	295 cf	**6.25'W x 46.34'L x 3.50'H Field A** 1,014 cf Overall - 276 cf Embedded = 738 cf x 40.0% Voids
#2A	100.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#4	99.70'	154 cf	**5.50'D x 6.50'H OCS # 2P R=106.3**
		843 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	99.70'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	101.80'	**12.0" Round Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** L= 128.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.80' / 98.30' S= 0.0272 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 3.90 hrs HW=100.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=102.98' TW=98.92' (Dynamic Tailwater)
↑**2=Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** (Passes 1.23 cfs of 3.12 cfs potential flow)
↑**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.23 cfs @ 1.38 fps)

Pond 2P: Infiltration SC-740 (6 chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

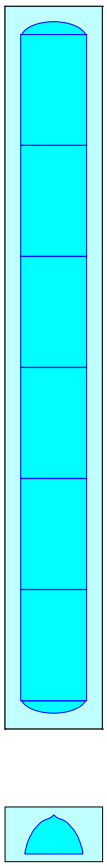
6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,013.6 cf Field - 275.6 cf Chambers = 738.0 cf Stone x 40.0% Voids = 295.2 cf Stone Storage

Chamber Storage + Stone Storage = 570.8 cf = 0.013 af
Overall Storage Efficiency = 56.3%
Overall System Size = 46.34' x 6.25' x 3.50'

6 Chambers
37.5 cy Field
27.3 cy Stone



Summary for Pond 3P: Infiltration System # 3P (SC-740 52 Chambers)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 2.05" for 10-Year Storm event
Inflow = 1.85 cfs @ 12.44 hrs, Volume= 11,446 cf
Outflow = 0.77 cfs @ 13.45 hrs, Volume= 10,150 cf, Atten= 59%, Lag= 60.6 min
Discarded = 0.05 cfs @ 12.00 hrs, Volume= 2,045 cf
Primary = 0.72 cfs @ 13.45 hrs, Volume= 8,105 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 101.83' @ 13.45 hrs Surf.Area= 1,972 sf Storage= 3,159 cf

Plug-Flow detention time= 98.2 min calculated for 10,107 cf (88% of inflow)
Center-of-Mass det. time= 75.3 min (911.5 - 836.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	99.50'	1,805 cf	**20.50'W x 96.18'L x 3.50'H Field A** 6,901 cf Overall - 2,389 cf Embedded = 4,512 cf x 40.0% Voids
#2A	100.00'	2,389 cf	**ADS_StormTech SC-740 +Cap** x 52 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 52 Chambers in 4 Rows
#3	99.70'	119 cf	**5.50'D x 5.00'H OCS # 3P** -Impervious
		4,312 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	98.88'	**12.0" Round Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** L= 69.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.88' / 98.53' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf
#2	Discarded	99.50'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	101.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 12.00 hrs HW=99.56' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.72 cfs @ 13.45 hrs HW=101.83' TW=98.97' (Dynamic Tailwater)
└**1=Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** (Passes 0.72 cfs of 4.55 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 0.72 cfs @ 3.66 fps)

Pond 3P: Infiltration System # 3P (SC-740 52 Chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

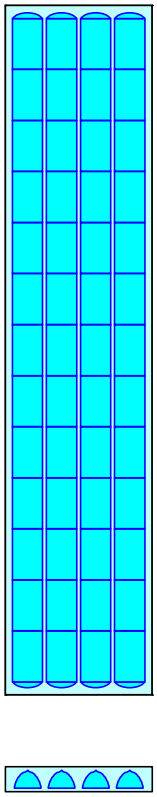
13 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 94.18' Row Length +12.0" End Stone x 2 = 96.18' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

52 Chambers x 45.9 cf = 2,388.9 cf Chamber Storage

6,900.7 cf Field - 2,388.9 cf Chambers = 4,511.8 cf Stone x 40.0% Voids = 1,804.7 cf Stone Storage

Chamber Storage + Stone Storage = 4,193.6 cf = 0.096 af
Overall Storage Efficiency = 60.8%
Overall System Size = 96.18' x 20.50' x 3.50'

52 Chambers
255.6 cy Field
167.1 cy Stone



Summary for Pond AD-1: AD-1 (R=106.85) and Pipe to RD#1

Inflow Area = 141 sf, 0.00% Impervious, Inflow Depth > 1.50" for 10-Year Storm event
Inflow = 0.00 cfs @ 12.11 hrs, Volume= 18 cf
Outflow = 0.00 cfs @ 12.11 hrs, Volume= 18 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 12.11 hrs, Volume= 18 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.99' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.76'	**6.0" Round Culvert from Area Drain # 1 to Roof Drain** L= 37.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.76' / 103.00' S= 0.0203 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.03 cfs @ 12.11 hrs HW=103.97' TW=103.94' (Dynamic Tailwater)
1=Culvert from Area Drain # 1 to Roof Drain (Outlet Controls 0.03 cfs @ 0.56 fps)

Summary for Pond AD-2: AD-2 (R=106.3) and Pipe to RD #2

Inflow Area = 1,341 sf, 0.00% Impervious, Inflow Depth > 1.50" for 10-Year Storm event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 168 cf
Outflow = 0.05 cfs @ 12.11 hrs, Volume= 168 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.11 hrs, Volume= 168 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.37' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.84'	**6.0" Round Culvert from Area Drain # 2 to Roof Drain # 2** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.84' / 102.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.09 cfs @ 12.11 hrs HW=104.32' TW=104.30' (Dynamic Tailwater)
1=Culvert from Area Drain # 2 to Roof Drain # 2 (Outlet Controls 0.09 cfs @ 0.60 fps)

Summary for Pond AD-3: AD-3 (R=104.0) and Pipe to DMH#10 (R=104.9)

Inflow Area = 9,734 sf, 0.00% Impervious, Inflow Depth > 1.50" for 10-Year Storm event
Inflow = 0.34 cfs @ 12.11 hrs, Volume= 1,218 cf
Outflow = 0.34 cfs @ 12.11 hrs, Volume= 1,218 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.34 cfs @ 12.11 hrs, Volume= 1,218 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.20' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.71'	**8.0" Round Culvert from Area Drain # 3 to DMH # 10 (R=104.9)** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.71' / 101.42' S= 0.0081 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.04 cfs @ 12.11 hrs HW=103.19' TW=103.19' (Dynamic Tailwater)
1=Culvert from Area Drain # 3 to DMH # 10 (R=104.9) (Outlet Controls 0.04 cfs @ 0.11 fps)

Summary for Pond CB-1: CB # 1 (R=106.0) and Pipe to DMH #7 (R=106.7)

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 4.09" for 10-Year Storm event
Inflow = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf
Outflow = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.05' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.70'	**12.0" Round 13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.70' / 102.63' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.10 hrs HW=103.05' TW=102.83' (Dynamic Tailwater)
↑—**1=13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** (Barrel Controls 0.32 cfs @ 1.99 fps)

Summary for Pond CB-3: CB # 3 (R=106.0) to Inf. Sys. #1P's DMH R=106.25

Inflow Area = 14,597 sf, 94.40% Impervious, Inflow Depth > 4.77" for 10-Year Storm event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 5,798 cf
Outflow = 1.55 cfs @ 12.09 hrs, Volume= 5,798 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.55 cfs @ 12.09 hrs, Volume= 5,798 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.33' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.50'	**12.0" Round Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** L= 15.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.50' / 102.42' S= 0.0052 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.52 cfs @ 12.09 hrs HW=103.32' TW=102.40' (Dynamic Tailwater)
↑**1=Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** (Barrel Controls 1.52 cfs @ 2.99 fps)

Summary for Pond CB-4: CB #4 (R=104.7) and Pipe to DMH #10 (R=104.9)

Inflow Area = 8,408 sf, 94.56% Impervious, Inflow Depth > 4.75" for 10-Year Storm event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 3,328 cf
Outflow = 0.90 cfs @ 12.09 hrs, Volume= 3,328 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.09 hrs, Volume= 3,328 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.21' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.70'	**12.0" Round 3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9)** L= 3.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.70' / 101.60' S= 0.0333 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.09 hrs HW=103.20' TW=103.20' (Dynamic Tailwater)
↑—**1=3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9)** (Inlet Controls 0.27 cfs @ 0.35 fps)

Summary for Pond CB-5: CB # 5 (R=105.75) and Pipe to Inf. Sys. #1P's DMH (R=105.85)

Inflow Area = 14,559 sf, 74.83% Impervious, Inflow Depth > 3.98" for 10-Year Storm event
Inflow = 1.41 cfs @ 12.10 hrs, Volume= 4,830 cf
Outflow = 1.41 cfs @ 12.10 hrs, Volume= 4,830 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.41 cfs @ 12.10 hrs, Volume= 4,830 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.20' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.42'	**12.0" Round 11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.42' / 102.35' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.39 cfs @ 12.10 hrs HW=103.20' TW=102.41' (Dynamic Tailwater)
↑**1=11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** (Barrel Controls 1.39 cfs @ 2.93 fps)

Summary for Pond DCB: DCB (R=105.35) and Pipe to DMH #8 (R=105.3)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 3.88" for 10-Year Storm event
Inflow = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf
Outflow = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.98' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.13'	**15.0" Round Pipe from DCB (R=105.35) to DMH (R=105.3)** L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.13' / 101.78' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=1.51 cfs @ 12.10 hrs HW=102.98' TW=102.65' (Dynamic Tailwater)
↑—**1=Pipe from DCB (R=105.35) to DMH (R=105.3)** (Outlet Controls 1.51 cfs @ 2.42 fps)

Summary for Pond DMH#1: DMH#1 (R=98.0) and Pipe to Exist. DMH (R=96.79)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 1.62" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 94.88' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**8.0" Round Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79)** L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.00' / 92.90' S= 0.0239 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=94.87' TW=0.00' (Dynamic Tailwater)
1=Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79) (Inlet Controls 1.23 cfs @ 3.53 fps)

Summary for Pond DMH#2: DMH#2 (R=99.2) and Pipe to DMH#1 (R=98.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 1.62" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 95.13' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.29'	**12.0" Round Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0)** L= 38.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.29' / 94.10' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=95.12' TW=94.87' (Dynamic Tailwater)
1=Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0) (Outlet Controls 1.23 cfs @ 2.39 fps)

Summary for Pond DMH#3: DMH#3 (R=99.0) and Pipe to DMH#2 (R=99.2)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 1.62" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.04' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.31'	**12.0" Round Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2)** L= 89.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.31' / 96.86' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=98.03' TW=95.12' (Dynamic Tailwater)
1=Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2) (Barrel Controls 1.23 cfs @ 2.84 fps)

Summary for Pond DMH10: DMH # 10 (R=104.9) and Pipe to Inf. Sys. #2P's DMH R=106.3

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 3.01" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 4,546 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 4,546 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 4,546 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.21' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.30'	**12.0" Round Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3)** L= 102.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.30' / 100.79' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.10 hrs HW=103.20' TW=102.98' (Dynamic Tailwater)
1=Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3) (Outlet Controls 1.24 cfs @ 1.58 fps)

Summary for Pond DMH4: DMH#4 (R=104.3) and Pipe to DMH#3 (R=99.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 1.62" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 11,491 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.40' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.64'	**12.0" Round Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** L= 46.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.64' / 97.41' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=98.39' TW=98.03' (Dynamic Tailwater)
1=Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0) (Outlet Controls 1.23 cfs @ 2.69 fps)

Summary for Pond DMH5: DMH # 5 (R=101.3) and Pipe to DMH#4 (R=104.5)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 2.24" for 10-Year Storm event
Inflow = 1.25 cfs @ 12.10 hrs, Volume= 3,386 cf
Outflow = 1.25 cfs @ 12.10 hrs, Volume= 3,386 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.10 hrs, Volume= 3,386 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.93' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.20'	**12.0" Round Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5)** L= 58.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.20' / 97.91' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.10 hrs HW=98.92' TW=98.39' (Dynamic Tailwater)
1=Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5) (Barrel Controls 1.23 cfs @ 2.83 fps)

Summary for Pond DMH6: DM#6 (R=104.3) and Pipe to DMH#4 (R=104.3)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 1.45" for 10-Year Storm event
Inflow = 0.72 cfs @ 13.45 hrs, Volume= 8,105 cf
Outflow = 0.72 cfs @ 13.45 hrs, Volume= 8,105 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 13.45 hrs, Volume= 8,105 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.97' @ 13.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.43'	**12.0" Round Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3)** L= 137.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.43' / 97.74' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.72 cfs @ 13.45 hrs HW=98.97' TW=98.22' (Dynamic Tailwater)
1=Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3) (Outlet Controls 0.72 cfs @ 2.39 fps)

Summary for Pond DMH7: DMH # 7 (R=106.7) and Pipe to Inf. Sys. #1P's DMH R=106.5

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 4.09" for 10-Year Storm event
Inflow = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf
Outflow = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.10 hrs, Volume= 1,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.95' @ 12.43 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.53'	**12.0" Round Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.53' / 102.39' S= 0.0200 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.10 hrs HW=102.83' TW=102.41' (Dynamic Tailwater)
1=Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55 (Barrel Controls 0.32 cfs @ 2.51 fps)

Summary for Pond DMH8: DMH# 8 (R=105.3) and Pipe to Inf. Sys. #1P's DMH (R=106.7)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 3.88" for 10-Year Storm event
Inflow = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf
Outflow = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.85 cfs @ 12.10 hrs, Volume= 6,286 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.96' @ 12.43 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.68'	**15.0" Round Culvert from DMH (R=105.3) to DMH (R=106.7)** L= 35.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.68' / 101.50' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=1.83 cfs @ 12.10 hrs HW=102.65' TW=102.41' (Dynamic Tailwater)
↑—**1=Culvert from DMH (R=105.3) to DMH (R=106.7)** (Outlet Controls 1.83 cfs @ 2.48 fps)

Summary for Pond RD1: RD # 1 Pipe from Building Roof to CB # 3 (R=106.0)

Inflow Area = 11,640 sf, 98.79% Impervious, Inflow Depth > 4.94" for 10-Year Storm event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 4,791 cf
Outflow = 1.26 cfs @ 12.09 hrs, Volume= 4,791 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.26 cfs @ 12.09 hrs, Volume= 4,791 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.99' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.02'	**8.0" Round Pipe from half of Building # 1 to CB # 3** L= 30.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.02' / 102.78' S= 0.0079 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.24 cfs @ 12.09 hrs HW=103.97' TW=103.32' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to CB # 3 (Barrel Controls 1.24 cfs @ 3.54 fps)

Summary for Pond RD2: RD # 2 Pipe from Building Roof to Inf. Sys. #1P's DMH (R=106.3)

Inflow Area = 14,956 sf, 91.03% Impervious, Inflow Depth > 4.67" for 10-Year Storm event
Inflow = 1.53 cfs @ 12.09 hrs, Volume= 5,819 cf
Outflow = 1.53 cfs @ 12.09 hrs, Volume= 5,819 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.53 cfs @ 12.09 hrs, Volume= 5,819 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.37' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.20'	**8.0" Round Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3)** L= 61.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.20' / 101.97' S= 0.0202 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.51 cfs @ 12.09 hrs HW=104.34' TW=102.40' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3) (Inlet Controls 1.51 cfs @ 4.33 fps)

Summary for Subcatchment P0: Remaining Proposed Watersheds

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

	Area (sf)	CN	Description
*	0	98	No other proposed watersheds unaccounted for

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

Summary for Subcatchment P1-A1: Prop. Watershed P1-A1

Runoff = 1.55 cfs @ 12.09 hrs, Volume= 5,911 cf, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
11,499	98	Unconnected roofs, HSG B
11,499		100.00% Impervious Area
11,499		100.00% Unconnected

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

Summary for Subcatchment P1-A2: Prop. Watershed P1-A2

Runoff = 1.83 cfs @ 12.09 hrs, Volume= 6,999 cf, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
13,615	98	Unconnected roofs, HSG B
13,615		100.00% Impervious Area
13,615		100.00% Unconnected

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

Summary for Subcatchment P1-B: Prop. Watershed P1-B

Runoff = 0.08 cfs @ 12.11 hrs, Volume= 255 cf, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
1,341	61	>75% Grass cover, Good, HSG B
1,341		100.00% Pervious Area

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

Summary for Subcatchment P1-C: Prop. Watershed P1-C

Runoff = 0.37 cfs @ 12.10 hrs, Volume= 1,292 cf, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
2,280	98	Paved parking, HSG B
677	61	>75% Grass cover, Good, HSG B
2,957	90	Weighted Average
677		22.89% Pervious Area
2,280		77.11% Impervious Area

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

Summary for Subcatchment P1-D: Prop. Watershed P1-D

Runoff = 0.01 cfs @ 12.11 hrs, Volume= 27 cf, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
141	61	>75% Grass cover, Good, HSG B
141		100.00% Pervious Area

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

Summary for Subcatchment P1-E: Prop. Watershed P1-E

Runoff = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
2,568	98	Paved parking, HSG B
760	61	>75% Grass cover, Good, HSG B
3,328	90	Weighted Average
760		22.84% Pervious Area
2,568		77.16% Impervious Area

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

Summary for Subcatchment P1-F: Prop. Watershed P1-F

Runoff = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
5,436	61	>75% Grass cover, Good, HSG B
14,022	98	Unconnected pavement, HSG B
19,458	88	Weighted Average
5,436		27.94% Pervious Area
14,022		72.06% Impervious Area
14,022		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-F Watershed**

Summary for Subcatchment P1-G: Prop. Watershed P1-G

Runoff = 1.79 cfs @ 12.10 hrs, Volume= 6,225 cf, Depth> 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
3,665	61	>75% Grass cover, Good, HSG B
10,894	98	Unconnected pavement, HSG B
14,559	89	Weighted Average
3,665		25.17% Pervious Area
10,894		74.83% Impervious Area
10,894		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-G Watershed**

Summary for Subcatchment P2: Prop. Watershed P2

Runoff = 0.10 cfs @ 12.10 hrs, Volume= 341 cf, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
466	98	Paved parking, HSG B
599	61	>75% Grass cover, Good, HSG B
1,065	77	Weighted Average
599		56.24% Pervious Area
466		43.76% Impervious Area

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

Summary for Subcatchment P3-A: Prop. Watershed P3-A

Runoff = 1.12 cfs @ 12.09 hrs, Volume= 4,157 cf, Depth> 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
7,951	98	Paved parking, HSG B
457	61	>75% Grass cover, Good, HSG B
8,408	96	Weighted Average
457		5.44% Pervious Area
7,951		94.56% Impervious Area

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

Summary for Subcatchment P3-B: Prop. Watershed P3-B

Runoff = 0.55 cfs @ 12.11 hrs, Volume= 1,852 cf, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
9,734	61	>75% Grass cover, Good, HSG B
9,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	3	0.0360	0.11		**Sheet Flow, A1 to A2** Grass: Short n= 0.150 P2= 3.30"
1.2	11	0.0467	0.16		**Sheet Flow, A2 to A3** Grass: Short n= 0.150 P2= 3.30"
0.9	37	0.0101	0.70		**Shallow Concentrated Flow, A3 to A4** Short Grass Pasture Kv= 7.0 fps
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, A4 to A5** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	1.50		**Shallow Concentrated Flow, A5 to A6** Grassed Waterway Kv= 15.0 fps
0.6	50	0.0100	1.50		**Shallow Concentrated Flow, A6 to A7** Grassed Waterway Kv= 15.0 fps
0.4	36	0.0100	1.50		**Shallow Concentrated Flow, A7 to A8** Grassed Waterway Kv= 15.0 fps
1.1					**Direct Entry, Use minimum Tc of 6 min since Tc calculated is 4.9**
6.0	199	Total			

Summary for Subcatchment P4: Prop. Watershed P4

Runoff = 0.94 cfs @ 12.10 hrs, Volume= 3,117 cf, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Storm Rainfall=6.41"

Area (sf)	CN	Description
2,273	98	Paved parking, HSG B
10,890	61	>75% Grass cover, Good, HSG B
13,163	67	Weighted Average
10,890		82.73% Pervious Area
2,273		17.27% Impervious Area

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

Summary for Reach P-1R: Prop. Reach 1R (South Main Street Drain)

Inflow Area = 98,203 sf, 66.29% Impervious, Inflow Depth > 2.60" for 25-Year Storm event
Inflow = 2.58 cfs @ 12.10 hrs, Volume= 21,286 cf
Outflow = 2.58 cfs @ 12.10 hrs, Volume= 21,286 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-2R: Prop. Reach 2R (Boston Street)

Inflow Area = 1,065 sf, 43.76% Impervious, Inflow Depth > 3.84" for 25-Year Storm event
Inflow = 0.10 cfs @ 12.10 hrs, Volume= 341 cf
Outflow = 0.10 cfs @ 12.10 hrs, Volume= 341 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-3R: Prop. Reach 3R (Rowell Lane)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth > 5.44" for 25-Year Storm event
Inflow = 8.40 cfs @ 12.10 hrs, Volume= 30,303 cf
Outflow = 3.49 cfs @ 12.25 hrs, Volume= 27,690 cf, Atten= 58%, Lag= 9.0 min
Discarded = 0.16 cfs @ 8.00 hrs, Volume= 10,792 cf
Primary = 3.33 cfs @ 12.25 hrs, Volume= 16,897 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.28' @ 12.42 hrs Surf.Area= 6,865 sf Storage= 11,188 cf

Plug-Flow detention time= 128.6 min calculated for 27,575 cf (91% of inflow)
Center-of-Mass det. time= 85.5 min (854.6 - 769.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	101.00'	3,904 cf	**49.00'W x 89.06'L x 3.50'H Field A** 15,273 cf Overall - 5,513 cf Embedded = 9,760 cf x 40.0% Voids
#2A	101.50'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 10 Rows
#3B	101.00'	400 cf	**5.25'W x 81.94'L x 3.50'H Field B** 1,506 cf Overall - 505 cf Embedded = 1,000 cf x 40.0% Voids
#4B	101.50'	505 cf	**ADS_StormTech SC-740 +Cap** x 11 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#5C	101.00'	1,796 cf	**23.25'W x 89.06'L x 3.50'H Field C** 7,247 cf Overall - 2,756 cf Embedded = 4,491 cf x 40.0% Voids
#6C	101.50'	2,756 cf	**ADS_StormTech SC-740 +Cap** x 60 Inside #5 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 60 Chambers in 5 Rows
#7	99.85'	118 cf	**5.00'D x 6.00'H DMH R=105.85** -Impervious
#8	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#9	100.25'	118 cf	**5.00'D x 6.00'H DMH R=106.25** -Impervious
#10	100.70'	118 cf	**5.00'D x 6.00'H DMH R=106.7** -Impervious
#11	100.50'	118 cf	**5.00'D x 6.00'H DMH R=106.5** -Impervious
#12	100.95'	108 cf	**5.00'D x 5.50'H OCS # 1 - R=106.45** -Impervious
		15,572 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	101.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	100.90'	**12.0" Round Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** L= 179.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.90' / 100.00' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	101.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.16 cfs @ 8.00 hrs HW=101.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=3.13 cfs @ 12.25 hrs HW=103.21' TW=100.84' (Dynamic Tailwater)
└**2=Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** (Barrel Controls 3.13 cfs @ 3.98 fps)
  ├**3=Sharp-Crested Rectangular Weir** (Passes < 4.28 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 1.04 cfs potential flow)

Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

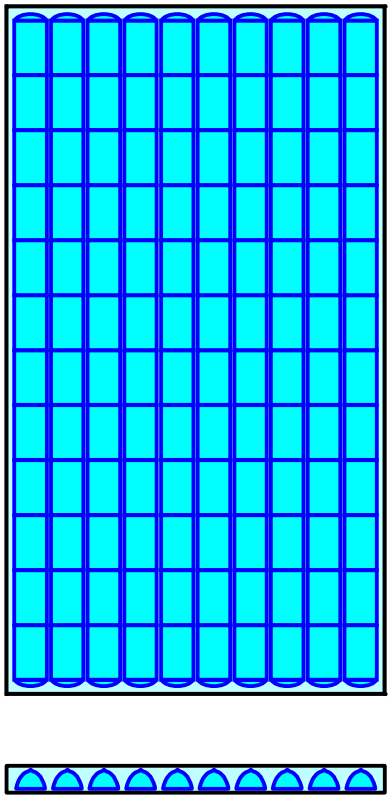
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

120 Chambers x 45.9 cf = 5,512.8 cf Chamber Storage

15,273.2 cf Field - 5,512.8 cf Chambers = 9,760.4 cf Stone x 40.0% Voids = 3,904.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,417.0 cf = 0.216 af
Overall Storage Efficiency = 61.7%
Overall System Size = 89.06' x 49.00' x 3.50'

120 Chambers
565.7 cy Field
361.5 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field B

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

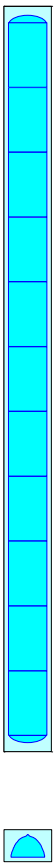
11 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 79.94' Row Length +12.0" End Stone x 2 = 81.94' Base Length
1 Rows x 51.0" Wide + 6.0" Side Stone x 2 = 5.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

11 Chambers x 45.9 cf = 505.3 cf Chamber Storage

1,505.6 cf Field - 505.3 cf Chambers = 1,000.2 cf Stone x 40.0% Voids = 400.1 cf Stone Storage

Chamber Storage + Stone Storage = 905.4 cf = 0.021 af
Overall Storage Efficiency = 60.1%
Overall System Size = 81.94' x 5.25' x 3.50'

11 Chambers
55.8 cy Field
37.0 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field C

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

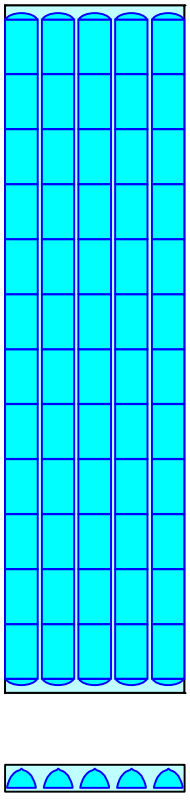
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 = 23.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

60 Chambers x 45.9 cf = 2,756.4 cf Chamber Storage

7,247.0 cf Field - 2,756.4 cf Chambers = 4,490.6 cf Stone x 40.0% Voids = 1,796.2 cf Stone Storage

Chamber Storage + Stone Storage = 4,552.6 cf = 0.105 af
Overall Storage Efficiency = 62.8%
Overall System Size = 89.06' x 23.25' x 3.50'

60 Chambers
268.4 cy Field
166.3 cy Stone



Summary for Pond 2P: Infiltration SC-740 (6 chambers)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 3.97" for 25-Year Storm event
Inflow = 1.66 cfs @ 12.10 hrs, Volume= 6,009 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 5,396 cf, Atten= 1%, Lag= 0.2 min
Discarded = 0.01 cfs @ 3.80 hrs, Volume= 566 cf
Primary = 1.64 cfs @ 12.10 hrs, Volume= 4,830 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.02' @ 12.10 hrs Surf.Area= 313 sf Storage= 647 cf

Plug-Flow detention time= 78.3 min calculated for 5,396 cf (90% of inflow)
Center-of-Mass det. time= 27.5 min (814.6 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	295 cf	**6.25'W x 46.34'L x 3.50'H Field A** 1,014 cf Overall - 276 cf Embedded = 738 cf x 40.0% Voids
#2A	100.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#4	99.70'	154 cf	**5.50'D x 6.50'H OCS # 2P R=106.3**
		843 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	99.70'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	101.80'	**12.0" Round Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** L= 128.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.80' / 98.30' S= 0.0272 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 3.80 hrs HW=100.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.62 cfs @ 12.10 hrs HW=103.02' TW=99.06' (Dynamic Tailwater)
↑**2=Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** (Passes 1.62 cfs of 3.20 cfs potential flow)
↑**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.62 cfs @ 1.52 fps)

Pond 2P: Infiltration SC-740 (6 chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

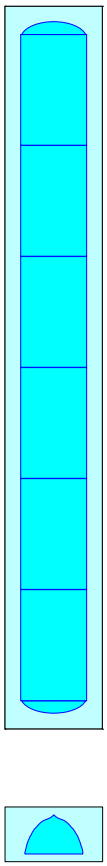
6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,013.6 cf Field - 275.6 cf Chambers = 738.0 cf Stone x 40.0% Voids = 295.2 cf Stone Storage

Chamber Storage + Stone Storage = 570.8 cf = 0.013 af
Overall Storage Efficiency = 56.3%
Overall System Size = 46.34' x 6.25' x 3.50'

6 Chambers
37.5 cy Field
27.3 cy Stone



Summary for Pond 3P: Infiltration System # 3P (SC-740 52 Chambers)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 3.03" for 25-Year Storm event
Inflow = 3.33 cfs @ 12.25 hrs, Volume= 16,897 cf
Outflow = 1.22 cfs @ 12.92 hrs, Volume= 15,418 cf, Atten= 63%, Lag= 40.4 min
Discarded = 0.05 cfs @ 11.90 hrs, Volume= 2,079 cf
Primary = 1.17 cfs @ 12.92 hrs, Volume= 13,339 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.78' @ 12.92 hrs Surf.Area= 1,972 sf Storage= 4,095 cf

Plug-Flow detention time= 79.7 min calculated for 15,418 cf (91% of inflow)
Center-of-Mass det. time= 56.8 min (893.7 - 836.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	99.50'	1,805 cf	**20.50'W x 96.18'L x 3.50'H Field A** 6,901 cf Overall - 2,389 cf Embedded = 4,512 cf x 40.0% Voids
#2A	100.00'	2,389 cf	**ADS_StormTech SC-740 +Cap** x 52 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 52 Chambers in 4 Rows
#3	99.70'	119 cf	**5.50'D x 5.00'H OCS # 3P** -Impervious
		4,312 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	98.88'	**12.0" Round Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** L= 69.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.88' / 98.53' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf
#2	Discarded	99.50'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	101.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 11.90 hrs HW=99.63' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.17 cfs @ 12.92 hrs HW=102.78' TW=99.17' (Dynamic Tailwater)
└**1=Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** (Passes 1.17 cfs of 5.41 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 1.17 cfs @ 5.96 fps)

Pond 3P: Infiltration System # 3P (SC-740 52 Chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

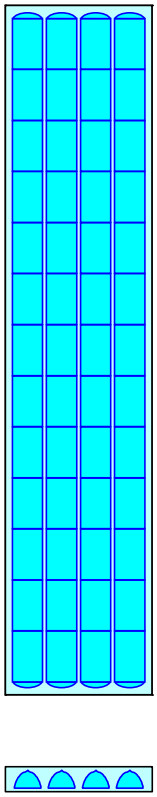
13 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 94.18' Row Length +12.0" End Stone x 2 = 96.18' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

52 Chambers x 45.9 cf = 2,388.9 cf Chamber Storage

6,900.7 cf Field - 2,388.9 cf Chambers = 4,511.8 cf Stone x 40.0% Voids = 1,804.7 cf Stone Storage

Chamber Storage + Stone Storage = 4,193.6 cf = 0.096 af
Overall Storage Efficiency = 60.8%
Overall System Size = 96.18' x 20.50' x 3.50'

52 Chambers
255.6 cy Field
167.1 cy Stone



Summary for Pond AD-1: AD-1 (R=106.85) and Pipe to RD#1

Inflow Area = 141 sf, 0.00% Impervious, Inflow Depth > 2.28" for 25-Year Storm event
Inflow = 0.01 cfs @ 12.11 hrs, Volume= 27 cf
Outflow = 0.01 cfs @ 12.11 hrs, Volume= 27 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.11 hrs, Volume= 27 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.27' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.76'	**6.0" Round Culvert from Area Drain # 1 to Roof Drain** L= 37.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.76' / 103.00' S= 0.0203 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=104.23' TW=104.26' (Dynamic Tailwater)
1=Culvert from Area Drain # 1 to Roof Drain (Controls 0.00 cfs)

Summary for Pond AD-2: AD-2 (R=106.3) and Pipe to RD #2

Inflow Area = 1,341 sf, 0.00% Impervious, Inflow Depth > 2.28" for 25-Year Storm event
Inflow = 0.08 cfs @ 12.11 hrs, Volume= 255 cf
Outflow = 0.08 cfs @ 12.11 hrs, Volume= 255 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.11 hrs, Volume= 255 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.82' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.84'	**6.0" Round Culvert from Area Drain # 2 to Roof Drain # 2** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.84' / 102.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.09 cfs @ 12.11 hrs HW=104.77' TW=104.75' (Dynamic Tailwater)
1=Culvert from Area Drain # 2 to Roof Drain # 2 (Outlet Controls 0.09 cfs @ 0.45 fps)

Summary for Pond AD-3: AD-3 (R=104.0) and Pipe to DMH#10 (R=104.9)

Inflow Area = 9,734 sf, 0.00% Impervious, Inflow Depth > 2.28" for 25-Year Storm event
Inflow = 0.55 cfs @ 12.11 hrs, Volume= 1,852 cf
Outflow = 0.55 cfs @ 12.11 hrs, Volume= 1,852 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.11 hrs, Volume= 1,852 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.47' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.71'	**8.0" Round Culvert from Area Drain # 3 to DMH # 10 (R=104.9)** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.71' / 101.42' S= 0.0081 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.39 cfs @ 12.11 hrs HW=103.45' TW=103.40' (Dynamic Tailwater)
1=Culvert from Area Drain # 3 to DMH # 10 (R=104.9) (Outlet Controls 0.39 cfs @ 1.13 fps)

Summary for Pond CB-1: CB # 1 (R=106.0) and Pipe to DMH #7 (R=106.7)

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 5.24" for 25-Year Storm event
Inflow = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf
Outflow = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.28' @ 12.51 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.70'	**12.0" Round 13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.70' / 102.63' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.10 hrs HW=103.09' TW=102.94' (Dynamic Tailwater)
↑—**1=13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** (Outlet Controls 0.38 cfs @ 1.99 fps)

Summary for Pond CB-3: CB # 3 (R=106.0) to Inf. Sys. #1P's DMH R=106.25

Inflow Area = 14,597 sf, 94.40% Impervious, Inflow Depth > 5.94" for 25-Year Storm event
Inflow = 1.92 cfs @ 12.09 hrs, Volume= 7,230 cf
Outflow = 1.92 cfs @ 12.09 hrs, Volume= 7,230 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.92 cfs @ 12.09 hrs, Volume= 7,230 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.46' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.50'	**12.0" Round Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** L= 15.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.50' / 102.42' S= 0.0052 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.89 cfs @ 12.09 hrs HW=103.44' TW=102.81' (Dynamic Tailwater)
1=Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25) (Barrel Controls 1.89 cfs @ 3.18 fps)

Summary for Pond CB-4: CB #4 (R=104.7) and Pipe to DMH #10 (R=104.9)

Inflow Area = 8,408 sf, 94.56% Impervious, Inflow Depth > 5.93" for 25-Year Storm event
Inflow = 1.12 cfs @ 12.09 hrs, Volume= 4,157 cf
Outflow = 1.12 cfs @ 12.09 hrs, Volume= 4,157 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.09 hrs, Volume= 4,157 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.45' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.70'	**12.0" Round 3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9)** L= 3.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.70' / 101.60' S= 0.0333 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.09 hrs HW=103.43' TW=103.40' (Dynamic Tailwater)
1=3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9) (Inlet Controls 0.65 cfs @ 0.83 fps)

Summary for Pond CB-5: CB # 5 (R=105.75) and Pipe to Inf. Sys. #1P's DMH (R=105.85)

Inflow Area = 14,559 sf, 74.83% Impervious, Inflow Depth > 5.13" for 25-Year Storm event
Inflow = 1.79 cfs @ 12.10 hrs, Volume= 6,225 cf
Outflow = 1.79 cfs @ 12.10 hrs, Volume= 6,225 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.79 cfs @ 12.10 hrs, Volume= 6,225 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.33' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.42'	**12.0" Round 11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.42' / 102.35' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.77 cfs @ 12.10 hrs HW=103.32' TW=102.82' (Dynamic Tailwater)
↑**1=11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** (Barrel Controls 1.77 cfs @ 3.13 fps)

Summary for Pond DCB: DCB (R=105.35) and Pipe to DMH #8 (R=105.3)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 5.02" for 25-Year Storm event
Inflow = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf
Outflow = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.32' @ 12.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.13'	**15.0" Round Pipe from DCB (R=105.35) to DMH (R=105.3)** L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.13' / 101.78' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=1.42 cfs @ 12.10 hrs HW=103.16' TW=103.00' (Dynamic Tailwater)
1=Pipe from DCB (R=105.35) to DMH (R=105.3) (Outlet Controls 1.42 cfs @ 1.77 fps)

Summary for Pond DMH#1: DMH#1 (R=98.0) and Pipe to Exist. DMH (R=96.79)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 2.56" for 25-Year Storm event
Inflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 95.28' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**8.0" Round Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79)** L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.00' / 92.90' S= 0.0239 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=1.62 cfs @ 12.10 hrs HW=95.27' TW=0.00' (Dynamic Tailwater)
1=Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79) (Inlet Controls 1.62 cfs @ 4.65 fps)

Summary for Pond DMH#2: DMH#2 (R=99.2) and Pipe to DMH#1 (R=98.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 2.56" for 25-Year Storm event
Inflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 95.49' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.29'	**12.0" Round Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0)** L= 38.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.29' / 94.10' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.63 cfs @ 12.10 hrs HW=95.48' TW=95.27' (Dynamic Tailwater)
1=Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0) (Outlet Controls 1.63 cfs @ 2.21 fps)

Summary for Pond DMH#3: DMH#3 (R=99.0) and Pipe to DMH#2 (R=99.2)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 2.56" for 25-Year Storm event
Inflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.17' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.31'	**12.0" Round Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2)** L= 89.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.31' / 96.86' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.62 cfs @ 12.10 hrs HW=98.17' TW=95.48' (Dynamic Tailwater)
1=Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2) (Barrel Controls 1.62 cfs @ 3.04 fps)

Summary for Pond DMH10: DMH # 10 (R=104.9) and Pipe to Inf. Sys. #2P's DMH R=106.3

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 3.97" for 25-Year Storm event
Inflow = 1.66 cfs @ 12.10 hrs, Volume= 6,009 cf
Outflow = 1.66 cfs @ 12.10 hrs, Volume= 6,009 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.66 cfs @ 12.10 hrs, Volume= 6,009 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.42' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.30'	**12.0" Round Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3)** L= 102.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.30' / 100.79' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

Primary OutFlow Max=1.65 cfs @ 12.10 hrs HW=103.41' TW=103.02' (Dynamic Tailwater)
1=Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3) (Outlet Controls 1.65 cfs @ 2.11 fps)

Summary for Pond DMH4: DMH#4 (R=104.3) and Pipe to DMH#3 (R=99.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 2.56" for 25-Year Storm event
Inflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.10 hrs, Volume= 18,169 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.56' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.64'	**12.0" Round Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** L= 46.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.64' / 97.41' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.62 cfs @ 12.10 hrs HW=98.55' TW=98.17' (Dynamic Tailwater)
1=Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0) (Outlet Controls 1.62 cfs @ 2.84 fps)

Summary for Pond DMH5: DMH # 5 (R=101.3) and Pipe to DMH#4 (R=104.5)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 3.20" for 25-Year Storm event
Inflow = 1.64 cfs @ 12.10 hrs, Volume= 4,830 cf
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 4,830 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.64 cfs @ 12.10 hrs, Volume= 4,830 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 99.06' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.20'	**12.0" Round Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5)** L= 58.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.20' / 97.91' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.62 cfs @ 12.10 hrs HW=99.06' TW=98.55' (Dynamic Tailwater)
1=Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5) (Barrel Controls 1.62 cfs @ 3.03 fps)

Summary for Pond DMH6: DM#6 (R=104.3) and Pipe to DMH#4 (R=104.3)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 2.39" for 25-Year Storm event
Inflow = 1.17 cfs @ 12.92 hrs, Volume= 13,339 cf
Outflow = 1.17 cfs @ 12.92 hrs, Volume= 13,339 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.92 hrs, Volume= 13,339 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 99.17' @ 12.87 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.43'	**12.0" Round Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3)** L= 137.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.43' / 97.74' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.17 cfs @ 12.92 hrs HW=99.17' TW=98.44' (Dynamic Tailwater)
1=Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3) (Outlet Controls 1.17 cfs @ 2.63 fps)

Summary for Pond DMH7: DMH # 7 (R=106.7) and Pipe to Inf. Sys. #1P's DMH R=106.5

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 5.24" for 25-Year Storm event
Inflow = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf
Outflow = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.10 hrs, Volume= 1,454 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.26' @ 12.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.53'	**12.0" Round Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.53' / 102.39' S= 0.0200 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.43 cfs @ 12.10 hrs HW=102.94' TW=102.82' (Dynamic Tailwater)
1=Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55 (Outlet Controls 0.43 cfs @ 2.05 fps)

Summary for Pond DMH8: DMH# 8 (R=105.3) and Pipe to Inf. Sys. #1P's DMH (R=106.7)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 5.02" for 25-Year Storm event
Inflow = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf
Outflow = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.10 hrs, Volume= 8,139 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.29' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.68'	**15.0" Round Culvert from DMH (R=105.3) to DMH (R=106.7)** L= 35.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.68' / 101.50' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=2.34 cfs @ 12.10 hrs HW=103.00' TW=102.82' (Dynamic Tailwater)
↑—**1=Culvert from DMH (R=105.3) to DMH (R=106.7)** (Outlet Controls 2.34 cfs @ 2.24 fps)

Summary for Pond RD1: RD # 1 Pipe from Building Roof to CB # 3 (R=106.0)

Inflow Area = 11,640 sf, 98.79% Impervious, Inflow Depth > 6.12" for 25-Year Storm event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 5,938 cf
Outflow = 1.55 cfs @ 12.09 hrs, Volume= 5,938 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.55 cfs @ 12.09 hrs, Volume= 5,938 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.31' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.02'	**8.0" Round Pipe from half of Building # 1 to CB # 3** L= 30.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.02' / 102.78' S= 0.0079 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.53 cfs @ 12.09 hrs HW=104.27' TW=103.44' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to CB # 3 (Inlet Controls 1.53 cfs @ 4.39 fps)

Summary for Pond RD2: RD # 2 Pipe from Building Roof to Inf. Sys. #1P's DMH (R=106.3)

Inflow Area = 14,956 sf, 91.03% Impervious, Inflow Depth > 5.82" for 25-Year Storm event
Inflow = 1.90 cfs @ 12.09 hrs, Volume= 7,254 cf
Outflow = 1.90 cfs @ 12.09 hrs, Volume= 7,254 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.90 cfs @ 12.09 hrs, Volume= 7,254 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.82' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.20'	**8.0" Round Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3)** L= 61.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.20' / 101.97' S= 0.0202 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.87 cfs @ 12.09 hrs HW=104.78' TW=102.81' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3) (Inlet Controls 1.87 cfs @ 5.37 fps)

Summary for Subcatchment P0: Remaining Proposed Watersheds

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

	Area (sf)	CN	Description
*	0	98	No other proposed watersheds unaccounted for

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

Summary for Subcatchment P1-A1: Prop. Watershed P1-A1

Runoff = 1.99 cfs @ 12.09 hrs, Volume= 7,682 cf, Depth> 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
11,499	98	Unconnected roofs, HSG B
11,499		100.00% Impervious Area
11,499		100.00% Unconnected

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

Summary for Subcatchment P1-A2: Prop. Watershed P1-A2

Runoff = 2.36 cfs @ 12.09 hrs, Volume= 9,096 cf, Depth> 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
13,615	98	Unconnected roofs, HSG B
13,615		100.00% Impervious Area
13,615		100.00% Unconnected

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

Summary for Subcatchment P1-B: Prop. Watershed P1-B

Runoff = 0.12 cfs @ 12.10 hrs, Volume= 407 cf, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
1,341	61	>75% Grass cover, Good, HSG B
1,341		100.00% Pervious Area

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

Summary for Subcatchment P1-C: Prop. Watershed P1-C

Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,739 cf, Depth> 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
2,280	98	Paved parking, HSG B
677	61	>75% Grass cover, Good, HSG B
2,957	90	Weighted Average
677		22.89% Pervious Area
2,280		77.11% Impervious Area

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

Summary for Subcatchment P1-D: Prop. Watershed P1-D

Runoff = 0.01 cfs @ 12.10 hrs, Volume= 43 cf, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
141	61	>75% Grass cover, Good, HSG B
141		100.00% Pervious Area

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

Summary for Subcatchment P1-E: Prop. Watershed P1-E

Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf, Depth> 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
2,568	98	Paved parking, HSG B
760	61	>75% Grass cover, Good, HSG B
3,328	90	Weighted Average
760		22.84% Pervious Area
2,568		77.16% Impervious Area

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

Summary for Subcatchment P1-F: Prop. Watershed P1-F

Runoff = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf, Depth> 6.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
5,436	61	>75% Grass cover, Good, HSG B
14,022	98	Unconnected pavement, HSG B
19,458	88	Weighted Average
5,436		27.94% Pervious Area
14,022		72.06% Impervious Area
14,022		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-F Watershed**

Summary for Subcatchment P1-G: Prop. Watershed P1-G

Runoff = 2.38 cfs @ 12.10 hrs, Volume= 8,419 cf, Depth> 6.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
3,665	61	>75% Grass cover, Good, HSG B
10,894	98	Unconnected pavement, HSG B
14,559	89	Weighted Average
3,665		25.17% Pervious Area
10,894		74.83% Impervious Area
10,894		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Tc for P1-G Watershed**

Summary for Subcatchment P2: Prop. Watershed P2

Runoff = 0.15 cfs @ 12.10 hrs, Volume= 489 cf, Depth> 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
466	98	Paved parking, HSG B
599	61	>75% Grass cover, Good, HSG B
1,065	77	Weighted Average
599		56.24% Pervious Area
466		43.76% Impervious Area

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

Summary for Subcatchment P3-A: Prop. Watershed P3-A

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 5,449 cf, Depth> 7.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
7,951	98	Paved parking, HSG B
457	61	>75% Grass cover, Good, HSG B
8,408	96	Weighted Average
457		5.44% Pervious Area
7,951		94.56% Impervious Area

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

Summary for Subcatchment P3-B: Prop. Watershed P3-B

Runoff = 0.89 cfs @ 12.10 hrs, Volume= 2,954 cf, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
9,734	61	>75% Grass cover, Good, HSG B
9,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	3	0.0360	0.11		**Sheet Flow, A1 to A2** Grass: Short n= 0.150 P2= 3.30"
1.2	11	0.0467	0.16		**Sheet Flow, A2 to A3** Grass: Short n= 0.150 P2= 3.30"
0.9	37	0.0101	0.70		**Shallow Concentrated Flow, A3 to A4** Short Grass Pasture Kv= 7.0 fps
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, A4 to A5** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0100	1.50		**Shallow Concentrated Flow, A5 to A6** Grassed Waterway Kv= 15.0 fps
0.6	50	0.0100	1.50		**Shallow Concentrated Flow, A6 to A7** Grassed Waterway Kv= 15.0 fps
0.4	36	0.0100	1.50		**Shallow Concentrated Flow, A7 to A8** Grassed Waterway Kv= 15.0 fps
1.1					**Direct Entry, Use minimum Tc of 6 min since Tc calculated is 4.9**
6.0	199	Total			

Summary for Subcatchment P4: Prop. Watershed P4

Runoff = 1.44 cfs @ 12.10 hrs, Volume= 4,756 cf, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Storm Rainfall=8.26"

Area (sf)	CN	Description
2,273	98	Paved parking, HSG B
10,890	61	>75% Grass cover, Good, HSG B
13,163	67	Weighted Average
10,890		82.73% Pervious Area
2,273		17.27% Impervious Area

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

Summary for Reach P-1R: Prop. Reach 1R (South Main Street Drain)

Inflow Area = 98,203 sf, 66.29% Impervious, Inflow Depth > 4.14" for 100-Year Storm event
Inflow = 3.78 cfs @ 12.49 hrs, Volume= 33,889 cf
Outflow = 3.78 cfs @ 12.49 hrs, Volume= 33,889 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-2R: Prop. Reach 2R (Boston Street)

Inflow Area = 1,065 sf, 43.76% Impervious, Inflow Depth > 5.51" for 100-Year Storm event
Inflow = 0.15 cfs @ 12.10 hrs, Volume= 489 cf
Outflow = 0.15 cfs @ 12.10 hrs, Volume= 489 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Reach P-3R: Prop. Reach 3R (Rowell Lane)

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2

Summary for Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth > 7.25" for 100-Year Storm event
Inflow = 11.06 cfs @ 12.09 hrs, Volume= 40,401 cf
Outflow = 3.62 cfs @ 12.14 hrs, Volume= 37,296 cf, Atten= 67%, Lag= 3.0 min
Discarded = 0.16 cfs @ 6.70 hrs, Volume= 11,431 cf
Primary = 3.46 cfs @ 12.14 hrs, Volume= 25,865 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.49' @ 12.48 hrs Surf.Area= 6,865 sf Storage= 15,340 cf

Plug-Flow detention time= 121.8 min calculated for 37,296 cf (92% of inflow)
Center-of-Mass det. time= 81.1 min (844.7 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	101.00'	3,904 cf	**49.00'W x 89.06'L x 3.50'H Field A** 15,273 cf Overall - 5,513 cf Embedded = 9,760 cf x 40.0% Voids
#2A	101.50'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 10 Rows
#3B	101.00'	400 cf	**5.25'W x 81.94'L x 3.50'H Field B** 1,506 cf Overall - 505 cf Embedded = 1,000 cf x 40.0% Voids
#4B	101.50'	505 cf	**ADS_StormTech SC-740 +Cap** x 11 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#5C	101.00'	1,796 cf	**23.25'W x 89.06'L x 3.50'H Field C** 7,247 cf Overall - 2,756 cf Embedded = 4,491 cf x 40.0% Voids
#6C	101.50'	2,756 cf	**ADS_StormTech SC-740 +Cap** x 60 Inside #5 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 60 Chambers in 5 Rows
#7	99.85'	118 cf	**5.00'D x 6.00'H DMH R=105.85** -Impervious
#8	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#9	100.25'	118 cf	**5.00'D x 6.00'H DMH R=106.25** -Impervious
#10	100.70'	118 cf	**5.00'D x 6.00'H DMH R=106.7** -Impervious
#11	100.50'	118 cf	**5.00'D x 6.00'H DMH R=106.5** -Impervious
#12	100.95'	108 cf	**5.00'D x 5.50'H OCS # 1 - R=106.45** -Impervious
		15,572 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	101.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	100.90'	**12.0" Round Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** L= 179.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 100.90' / 100.00' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	101.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.16 cfs @ 6.70 hrs HW=101.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=3.27 cfs @ 12.14 hrs HW=103.66' TW=101.25' (Dynamic Tailwater)
└**2=Culvert from OCS # 1 (R=106.45) to INF. SYS. 3P (14 CHAMBERS)** (Outlet Controls 3.27 cfs @ 4.16 fps)
  ├**3=Sharp-Crested Rectangular Weir** (Passes < 13.12 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 1.22 cfs potential flow)

Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

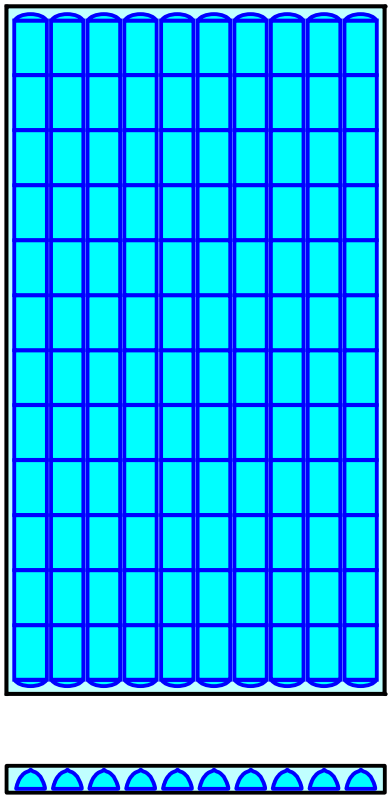
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

120 Chambers x 45.9 cf = 5,512.8 cf Chamber Storage

15,273.2 cf Field - 5,512.8 cf Chambers = 9,760.4 cf Stone x 40.0% Voids = 3,904.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,417.0 cf = 0.216 af
Overall Storage Efficiency = 61.7%
Overall System Size = 89.06' x 49.00' x 3.50'

120 Chambers
565.7 cy Field
361.5 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field B

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

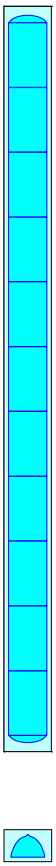
11 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 79.94' Row Length +12.0" End Stone x 2 = 81.94' Base Length
1 Rows x 51.0" Wide + 6.0" Side Stone x 2 = 5.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

11 Chambers x 45.9 cf = 505.3 cf Chamber Storage

1,505.6 cf Field - 505.3 cf Chambers = 1,000.2 cf Stone x 40.0% Voids = 400.1 cf Stone Storage

Chamber Storage + Stone Storage = 905.4 cf = 0.021 af
Overall Storage Efficiency = 60.1%
Overall System Size = 81.94' x 5.25' x 3.50'

11 Chambers
55.8 cy Field
37.0 cy Stone



Pond 1P: Infiltration System #1P - SC-740 (191 Chambers) & 5 DMH & OCS - Chamber Wizard Field C

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

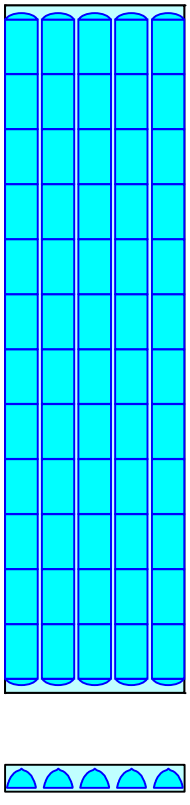
12 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 87.06' Row Length +12.0" End Stone x 2 = 89.06' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 = 23.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

60 Chambers x 45.9 cf = 2,756.4 cf Chamber Storage

7,247.0 cf Field - 2,756.4 cf Chambers = 4,490.6 cf Stone x 40.0% Voids = 1,796.2 cf Stone Storage

Chamber Storage + Stone Storage = 4,552.6 cf = 0.105 af
Overall Storage Efficiency = 62.8%
Overall System Size = 89.06' x 23.25' x 3.50'

60 Chambers
268.4 cy Field
166.3 cy Stone



Summary for Pond 2P: Infiltration SC-740 (6 chambers)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 5.56" for 100-Year Storm event
Inflow = 2.34 cfs @ 12.10 hrs, Volume= 8,403 cf
Outflow = 2.32 cfs @ 12.10 hrs, Volume= 7,790 cf, Atten= 1%, Lag= 0.2 min
Discarded = 0.01 cfs @ 2.40 hrs, Volume= 584 cf
Primary = 2.31 cfs @ 12.10 hrs, Volume= 7,206 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.07' @ 12.10 hrs Surf.Area= 313 sf Storage= 656 cf

Plug-Flow detention time= 63.2 min calculated for 7,790 cf (93% of inflow)
Center-of-Mass det. time= 24.0 min (807.3 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	295 cf	**6.25'W x 46.34'L x 3.50'H Field A** 1,014 cf Overall - 276 cf Embedded = 738 cf x 40.0% Voids
#2A	100.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
#3	100.30'	118 cf	**5.00'D x 6.00'H DMH R=106.3** -Impervious
#4	99.70'	154 cf	**5.50'D x 6.50'H OCS # 2P R=106.3**
		843 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	99.70'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	101.80'	**12.0" Round Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** L= 128.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.80' / 98.30' S= 0.0272 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#3	Device 2	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.01 cfs @ 2.40 hrs HW=100.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.30 cfs @ 12.10 hrs HW=103.07' TW=99.31' (Dynamic Tailwater)
└**2=Culvert from Inf. Sys # 2P to DMH#5(R=101.3)** (Passes 2.30 cfs of 3.32 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.30 cfs @ 1.71 fps)

Pond 2P: Infiltration SC-740 (6 chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

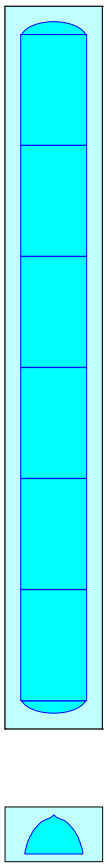
6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

1,013.6 cf Field - 275.6 cf Chambers = 738.0 cf Stone x 40.0% Voids = 295.2 cf Stone Storage

Chamber Storage + Stone Storage = 570.8 cf = 0.013 af
Overall Storage Efficiency = 56.3%
Overall System Size = 46.34' x 6.25' x 3.50'

6 Chambers
37.5 cy Field
27.3 cy Stone



Summary for Pond 3P: Infiltration System # 3P (SC-740 52 Chambers)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth > 4.64" for 100-Year Storm event
Inflow = 3.46 cfs @ 12.14 hrs, Volume= 25,865 cf
Outflow = 2.93 cfs @ 12.52 hrs, Volume= 24,106 cf, Atten= 15%, Lag= 22.3 min
Discarded = 0.05 cfs @ 11.40 hrs, Volume= 2,178 cf
Primary = 2.88 cfs @ 12.52 hrs, Volume= 21,928 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.42' @ 12.70 hrs Surf.Area= 1,972 sf Storage= 4,282 cf

Plug-Flow detention time= 60.9 min calculated for 24,106 cf (93% of inflow)
Center-of-Mass det. time= 38.9 min (881.0 - 842.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	99.50'	1,805 cf	**20.50'W x 96.18'L x 3.50'H Field A** 6,901 cf Overall - 2,389 cf Embedded = 4,512 cf x 40.0% Voids
#2A	100.00'	2,389 cf	**ADS_StormTech SC-740 +Cap** x 52 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 52 Chambers in 4 Rows
#3	99.70'	119 cf	**5.50'D x 5.00'H OCS # 3P** -Impervious
		4,312 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	98.88'	**12.0" Round Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** L= 69.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.88' / 98.53' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf
#2	Discarded	99.50'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	102.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	101.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 11.40 hrs HW=99.56' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=2.78 cfs @ 12.52 hrs HW=103.01' TW=101.23' (Dynamic Tailwater)
└**1=Culvert from Inf. Sys. 3P to DMH#6 (R=104.4)** (Passes 2.78 cfs of 4.00 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.53 cfs @ 1.49 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.25 cfs @ 6.38 fps)

Pond 3P: Infiltration System # 3P (SC-740 52 Chambers) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

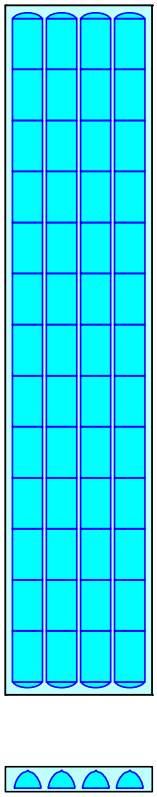
13 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 94.18' Row Length +12.0" End Stone x 2 = 96.18' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

52 Chambers x 45.9 cf = 2,388.9 cf Chamber Storage

6,900.7 cf Field - 2,388.9 cf Chambers = 4,511.8 cf Stone x 40.0% Voids = 1,804.7 cf Stone Storage

Chamber Storage + Stone Storage = 4,193.6 cf = 0.096 af
Overall Storage Efficiency = 60.8%
Overall System Size = 96.18' x 20.50' x 3.50'

52 Chambers
255.6 cy Field
167.1 cy Stone



Summary for Pond AD-1: AD-1 (R=106.85) and Pipe to RD#1

Inflow Area = 141 sf, 0.00% Impervious, Inflow Depth > 3.64" for 100-Year Storm event
Inflow = 0.01 cfs @ 12.10 hrs, Volume= 43 cf
Outflow = 0.01 cfs @ 12.10 hrs, Volume= 43 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.10 hrs, Volume= 43 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.83' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.76'	**6.0" Round Culvert from Area Drain # 1 to Roof Drain** L= 37.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.76' / 103.00' S= 0.0203 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=104.80' TW=105.04' (Dynamic Tailwater)
1=Culvert from Area Drain # 1 to Roof Drain (Controls 0.00 cfs)

Summary for Pond AD-2: AD-2 (R=106.3) and Pipe to RD #2

Inflow Area = 1,341 sf, 0.00% Impervious, Inflow Depth > 3.64" for 100-Year Storm event
Inflow = 0.12 cfs @ 12.10 hrs, Volume= 407 cf
Outflow = 0.12 cfs @ 12.10 hrs, Volume= 407 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.10 hrs, Volume= 407 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 105.96' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.84'	**6.0" Round Culvert from Area Drain # 2 to Roof Drain # 2** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.84' / 102.90' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=105.90' TW=106.39' (Dynamic Tailwater)
1=Culvert from Area Drain # 2 to Roof Drain # 2 (Controls 0.00 cfs)

Summary for Pond AD-3: AD-3 (R=104.0) and Pipe to DMH#10 (R=104.9)

Inflow Area = 9,734 sf, 0.00% Impervious, Inflow Depth > 3.64" for 100-Year Storm event
Inflow = 0.89 cfs @ 12.10 hrs, Volume= 2,954 cf
Outflow = 0.89 cfs @ 12.10 hrs, Volume= 2,954 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.10 hrs, Volume= 2,954 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.09' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.71'	**8.0" Round Culvert from Area Drain # 3 to DMH # 10 (R=104.9)** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.71' / 101.42' S= 0.0081 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.78 cfs @ 12.10 hrs HW=104.06' TW=103.84' (Dynamic Tailwater)
1=Culvert from Area Drain # 3 to DMH # 10 (R=104.9) (Outlet Controls 0.78 cfs @ 2.22 fps)

Summary for Pond CB-1: CB # 1 (R=106.0) and Pipe to DMH #7 (R=106.7)

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 7.06" for 100-Year Storm event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.50' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.70'	**12.0" Round 13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.70' / 102.63' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=103.18' TW=103.42' (Dynamic Tailwater)
↑—**1=13 FT Culvert from CB # 1 to DMH # 7 (R=106.7)** (Controls 0.00 cfs)

Summary for Pond CB-3: CB # 3 (R=106.0) to Inf. Sys. #1P's DMH R=106.25

Inflow Area = 14,597 sf, 94.40% Impervious, Inflow Depth > 7.78" for 100-Year Storm event
Inflow = 2.50 cfs @ 12.09 hrs, Volume= 9,464 cf
Outflow = 2.50 cfs @ 12.09 hrs, Volume= 9,464 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.50 cfs @ 12.09 hrs, Volume= 9,464 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.51' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.50'	**12.0" Round Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25)** L= 15.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.50' / 102.42' S= 0.0052 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=2.50 cfs @ 12.09 hrs HW=103.83' TW=103.39' (Dynamic Tailwater)
1=Pipe from CB (R=106.0) to Inf. Sys. 1P's DMH (R=106.25) (Inlet Controls 2.50 cfs @ 3.18 fps)

Summary for Pond CB-4: CB #4 (R=104.7) and Pipe to DMH #10 (R=104.9)

Inflow Area = 8,408 sf, 94.56% Impervious, Inflow Depth > 7.78" for 100-Year Storm event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 5,449 cf
Outflow = 1.45 cfs @ 12.09 hrs, Volume= 5,449 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.45 cfs @ 12.09 hrs, Volume= 5,449 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.94' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.70'	**12.0" Round 3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9)** L= 3.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.70' / 101.60' S= 0.0333 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.03 cfs @ 12.09 hrs HW=103.91' TW=103.83' (Dynamic Tailwater)
1=3 FT Culvert from CB # 4 (R=104.7) to DMH # 10 (R=104.9) (Inlet Controls 1.03 cfs @ 1.31 fps)

Summary for Pond CB-5: CB # 5 (R=105.75) and Pipe to Inf. Sys. #1P's DMH (R=105.85)

Inflow Area = 14,559 sf, 74.83% Impervious, Inflow Depth > 6.94" for 100-Year Storm event
Inflow = 2.38 cfs @ 12.10 hrs, Volume= 8,419 cf
Outflow = 2.38 cfs @ 12.10 hrs, Volume= 8,419 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.10 hrs, Volume= 8,419 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.51' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.42'	**12.0" Round 11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** L= 13.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.42' / 102.35' S= 0.0054 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=2.38 cfs @ 12.10 hrs HW=103.79' TW=103.40' (Dynamic Tailwater)
↑**1=11 FT Culvert from CB # 5 to Inf. Sys. #1P's DMH (R=105.85)** (Inlet Controls 2.38 cfs @ 3.03 fps)

Summary for Pond DCB: DCB (R=105.35) and Pipe to DMH #8 (R=105.3)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 6.82" for 100-Year Storm event
Inflow = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf
Outflow = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.51' @ 12.57 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.13'	**15.0" Round Pipe from DCB (R=105.35) to DMH (R=105.3)** L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.13' / 101.78' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=103.56' TW=103.68' (Dynamic Tailwater)
1=Pipe from DCB (R=105.35) to DMH (R=105.3) (Controls 0.00 cfs)

Summary for Pond DMH#1: DMH#1 (R=98.0) and Pipe to Exist. DMH (R=96.79)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 4.11" for 100-Year Storm event
Inflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf
Outflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 98.90' @ 12.50 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**8.0" Round Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79)** L= 46.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.00' / 92.90' S= 0.0239 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf

Primary OutFlow Max=3.38 cfs @ 12.50 hrs HW=98.84' TW=0.00' (Dynamic Tailwater)
1=Culvert from DMH # 1 (R=98.0) to Exist. DMH (R=96.79) (Barrel Controls 3.38 cfs @ 9.70 fps)

Summary for Pond DMH#2: DMH#2 (R=99.2) and Pipe to DMH#1 (R=98.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 4.11" for 100-Year Storm event
Inflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf
Outflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 100.12' @ 12.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	94.29'	**12.0" Round Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0)** L= 38.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.29' / 94.10' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=3.91 cfs @ 12.50 hrs HW=100.03' TW=98.84' (Dynamic Tailwater)
1=Culvert from DMH # 2 (R=99.2) to DMH #1 (R=98.0) (Outlet Controls 3.91 cfs @ 4.98 fps)

Summary for Pond DMH#3: DMH#3 (R=99.0) and Pipe to DMH#2 (R=99.2)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 4.11" for 100-Year Storm event
Inflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf
Outflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 100.41' @ 12.59 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.31'	**12.0" Round Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2)** L= 89.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.31' / 96.86' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.50 hrs HW=99.42' TW=100.03' (Dynamic Tailwater)
1=Culvert from DMH # 3 (R=99.0) to DMH #2 (R=99.2) (Controls 0.00 cfs)

Summary for Pond DMH10: DMH # 10 (R=104.9) and Pipe to Inf. Sys. #2P's DMH R=106.3

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 5.56" for 100-Year Storm event
Inflow = 2.34 cfs @ 12.10 hrs, Volume= 8,403 cf
Outflow = 2.34 cfs @ 12.10 hrs, Volume= 8,403 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.34 cfs @ 12.10 hrs, Volume= 8,403 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 103.87' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.30'	**12.0" Round Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3)** L= 102.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.30' / 100.79' S= 0.0050 '/' Cc= 0.900 n= 0.015, Flow Area= 0.79 sf

Primary OutFlow Max=2.32 cfs @ 12.10 hrs HW=103.85' TW=103.07' (Dynamic Tailwater)
1=Culvert from DMH # 10 (R=104.9) to Inf. Sys. P2's DMH (R=106.3) (Outlet Controls 2.32 cfs @ 2.96 fps)

Summary for Pond DMH4: DMH#4 (R=104.3) and Pipe to DMH#3 (R=99.0)

Inflow Area = 85,040 sf, 73.88% Impervious, Inflow Depth > 4.11" for 100-Year Storm event
Inflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf
Outflow = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.50 hrs, Volume= 29,133 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 101.70' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	97.64'	**12.0" Round Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** L= 46.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.64' / 97.41' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=3.64 cfs @ 12.50 hrs HW=100.56' TW=99.42' (Dynamic Tailwater)
↑—**1=Culvert from DMH # 4 (R=104.3) to DMH #3 (R=99.0)** (Outlet Controls 3.64 cfs @ 4.63 fps)

Summary for Pond DMH5: DMH # 5 (R=101.3) and Pipe to DMH#4 (R=104.5)

Inflow Area = 18,142 sf, 43.83% Impervious, Inflow Depth > 4.77" for 100-Year Storm event
Inflow = 2.31 cfs @ 12.10 hrs, Volume= 7,206 cf
Outflow = 2.31 cfs @ 12.10 hrs, Volume= 7,206 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.31 cfs @ 12.10 hrs, Volume= 7,206 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 101.10' @ 12.69 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.20'	**12.0" Round Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5)** L= 58.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.20' / 97.91' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=2.04 cfs @ 12.10 hrs HW=99.31' TW=98.87' (Dynamic Tailwater)
1=Culvert from DMH # 5 (R=101.3) to DMH #4 (R=104.5) (Outlet Controls 2.04 cfs @ 2.91 fps)

Summary for Pond DMH6: DM#6 (R=104.3) and Pipe to DMH#4 (R=104.3)

Inflow Area = 66,898 sf, 82.03% Impervious, Inflow Depth = 3.93" for 100-Year Storm event
Inflow = 2.88 cfs @ 12.52 hrs, Volume= 21,928 cf
Outflow = 2.88 cfs @ 12.52 hrs, Volume= 21,928 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.88 cfs @ 12.52 hrs, Volume= 21,928 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 102.10' @ 12.69 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.43'	**12.0" Round Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3)** L= 137.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 98.43' / 97.74' S= 0.0050 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=1.70 cfs @ 12.52 hrs HW=101.23' TW=100.71' (Dynamic Tailwater)
1=Culvert from DMH # 6 (R=104.3) to DMH #4 (R=104.3) (Outlet Controls 1.70 cfs @ 2.17 fps)

Summary for Pond DMH7: DMH # 7 (R=106.7) and Pipe to Inf. Sys. #1P's DMH R=106.5

Inflow Area = 3,328 sf, 77.16% Impervious, Inflow Depth > 7.06" for 100-Year Storm event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,958 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.49' @ 12.50 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	102.53'	**12.0" Round Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.53' / 102.39' S= 0.0200 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf

Primary OutFlow Max=0.56 cfs @ 12.09 hrs HW=103.42' TW=103.40' (Dynamic Tailwater)
1=Culvert from DMH # 7 (R=106.7) to Inf. Sys. P1's DMH R=106.55 (Outlet Controls 0.56 cfs @ 1.00 fps)

Summary for Pond DMH8: DMH# 8 (R=105.3) and Pipe to Inf. Sys. #1P's DMH (R=106.7)

Inflow Area = 19,458 sf, 72.06% Impervious, Inflow Depth > 6.82" for 100-Year Storm event
Inflow = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf
Outflow = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.15 cfs @ 12.10 hrs, Volume= 11,058 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 104.50' @ 12.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	101.68'	**15.0" Round Culvert from DMH (R=105.3) to DMH (R=106.7)** L= 35.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 101.68' / 101.50' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.23 sf

Primary OutFlow Max=3.11 cfs @ 12.10 hrs HW=103.68' TW=103.40' (Dynamic Tailwater)
↑—**1=Culvert from DMH (R=105.3) to DMH (R=106.7)** (Inlet Controls 3.11 cfs @ 2.54 fps)

Summary for Pond RD1: RD # 1 Pipe from Building Roof to CB # 3 (R=106.0)

Inflow Area = 11,640 sf, 98.79% Impervious, Inflow Depth > 7.96" for 100-Year Storm event
Inflow = 2.01 cfs @ 12.09 hrs, Volume= 7,725 cf
Outflow = 2.01 cfs @ 12.09 hrs, Volume= 7,725 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.01 cfs @ 12.09 hrs, Volume= 7,725 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 105.08' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.02'	**8.0" Round Pipe from half of Building # 1 to CB # 3** L= 30.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.02' / 102.78' S= 0.0079 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.83 cfs @ 12.09 hrs HW=105.02' TW=103.83' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to CB # 3 (Inlet Controls 1.83 cfs @ 5.26 fps)

Summary for Pond RD2: RD # 2 Pipe from Building Roof to Inf. Sys. #1P's DMH (R=106.3)

Inflow Area = 14,956 sf, 91.03% Impervious, Inflow Depth > 7.62" for 100-Year Storm event
Inflow = 2.48 cfs @ 12.09 hrs, Volume= 9,503 cf
Outflow = 2.48 cfs @ 12.09 hrs, Volume= 9,503 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.48 cfs @ 12.09 hrs, Volume= 9,503 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 106.45' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	103.20'	**8.0" Round Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3)** L= 61.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.20' / 101.97' S= 0.0202 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=2.45 cfs @ 12.09 hrs HW=106.34' TW=103.39' (Dynamic Tailwater)
1=Pipe from half of Building # 1 to Inf. Sys. P1's DMH (R=106.3) (Outlet Controls 2.45 cfs @ 7.02 fps)

A.7

Recharge Volume and Drawdown Calculations

H.W.Moore
CIVIL ENGINEERING | LAND PLANNING

Middleton Project # 25912

DATE: 8/18/23
REVISED: 12/7/23

STANDARD #3

INFILTRATION SYSTEM 1 CALCULATIONS

INFILTRATION SYSTEM STORAGE VOLUME

SC-740 CHAMBER VOLUME

	OUTLET ORIFICE INVERT	I_W	=	101.75	ft.
	BOTTOM INVERT CHAMBERS	I_C	=	101.5	ft.
	STORMWATER DEPTH	D_C	=	0.3	ft.
	VOLUME PER CHAMBER	V_C	=	6.6	cf.
	NUMER OF ROWS	R_C	=	16	
	CHAMBERS PER ROW	C_C	=	12	
$N_C = (R_C * C_C)$	NUMBER OF CHAMBERS	N_C	=	192	
$V_{CHAMBERS} = (V_C * N_C)$	TOTAL VOLUME OF CHAMBERS BELOW OUTLET	$V_{CHAMBERS}$	=	1263.9	cf.

STONE VOLUME

	STONE BOTTOM INVERT	I_S	=	101.0	ft.
$D_S = I_W - I_S$	STONE STORMWATER DEPTH	D_S		0.75	
	STONE WIDTH	W_S	=	77.5	ft.
	STONE LENGTH	L_S	=	88.8	ft.
	% VOIDS	VOIDS	=	40%	
$V_{STONE} = [(W_S * L_S * (I_W - I_S)) - V_{CHAMBERS}] * VOIDS$	STONE VOLUME	V_{stone}	=	1558.3	cf.

TOTAL VOLUME BELOW INVERT

$V_{TOTAL} = V_{CHAMBERS} + V_{STONE}$	**TOTAL STORAGE VOLUME**	V_{TOTAL}	=	**2822.2**	cf.

BOTTOM AREA

$A_{bottom} = W_S * L_S$	BOTTOM SURFACE AREA	A_{bottom}	=	**6879.7**	sf.

REQUIRED RECHARGE VOLUME

STATIC METHOD

	SOIL TYPE		=	B	
	RECHARGE DEPTH	F	=	0.35	in.
	IMPERVIOUS AREA	A_{IMP}	=	**1.30**	ac.
	% IMPERVIOUS AREA CAPTURED		=	100%	
$Rv = (F * A_{imp})$	RECHARGE STORAGE VOLUME	Rv	=	**1651.7**	cf.

2822.2 cf. >>> 1651.7 cf.

STANDARD 3 SATISFIED

72 HOUR DRAWDOWN

	SOIL TYPE		=	B	
	RAWLS RATE	K	=	1.02	in/hr
	REQUIRED RECHARGE VOLUME	Rv	=	1651.7	cf.
	BOTTOM AREA	A_{bottom}	=	6879.7	sf.
$T_D = (Rv) / (K * A_{bottom})$	DRAWDOWN TIME	T_D	=	**2.8**	hr.

2.8 hr. <<< 72.0 hr.

72 DRAWDOWN SATISFIED

STANDARD #3

INFILTRATION SYSTEM 1 CALCULATIONS

INFILTRATION SYSTEM STORAGE VOLUME

SC-740 CHAMBER VOLUME

	OUTLET ORIFICE INVERT	I_W	=	101.75	ft.
	BOTTOM INVERT CHAMBERS	I_C	=	101.5	ft.
	STORMWATER DEPTH	D_C	=	0.3	ft.
	VOLUME PER CHAMBER	V_C	=	6.6	cf.
	NUMER OF ROWS	R_C	=	1	
	CHAMBERS PER ROW	C_C	=	1	
$N_C = (R_C * C_C)$	NUMBER OF CHAMBERS	N_C	=	1	
$V_{CHAMBERS} = (V_C * N_C)$	TOTAL VOLUME OF CHAMBERS BELOW OUTLET	$V_{CHAMBERS}$	=	6.6	cf.

STONE VOLUME

	STONE BOTTOM INVERT	I_S	=	101.0	ft.
$D_S = I_W - I_S$	STONE STORMWATER DEPTH	D_S		0.75	
	STONE WIDTH	W_S	=	6.3	ft.
	STONE LENGTH	L_S	=	10.5	ft.
	% VOIDS	VOIDS	=	40%	
$V_{STONE} = [(W_S * L_S * (I_W - I_S)) - V_{CHAMBERS}] * VOIDS$	STONE VOLUME	V_{stone}	=	17.0	cf.

TOTAL VOLUME BELOW INVERT

$V_{TOTAL} = V_{CHAMBERS} + V_{STONE}$

	TOTAL STORAGE VOLUME	$*V_{TOTAL}$	=	**23.5**	cf.

* Volume to subtract for one less chamber in Infiltration System # 1P

BOTTOM AREA

$A_{bottom} = W_S * L_S$

	BOTTOM SURFACE AREA	A_{bottom}	=	**65.3**	sf.

REQUIRED RECHARGE VOLUME

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Middleton Project # 25912

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DATE: 8/18/23
REVISED: 12/7/23

STANDARD #3

INFILTRATION SYSTEM 2 CALCULATIONS

INFILTRATION SYSTEM STORAGE VOLUME

SC-740 CHAMBER VOLUME

	OUTLET ORIFICE INVERT	I_W	=	102.80	ft.
	BOTTOM INVERT CHAMBERS	I_C	=	100.5	ft.
	STORMWATER DEPTH	D_C	=	2.3	ft.
	VOLUME PER CHAMBER	V_C	=	45.5	cf.
	NUMER OF ROWS	R_C	=	1	
	CHAMBERS PER ROW	C_C	=	6	
$N_C = (R_C * C_C)$	NUMBER OF CHAMBERS	N_C	=	6	
$V_{CHAMBERS} = (V_C * N_C)$	TOTAL VOLUME OF CHAMBERS BELOW OUTLET	$V_{CHAMBERS}$	=	272.7	cf.

STONE VOLUME

	STONE BOTTOM INVERT	I_S	=	101.0	ft.
$D_S = I_W - I_S$	STONE STORMWATER DEPTH	D_S		1.80	
	STONE WIDTH	W_S	=	6.3	ft.
	STONE LENGTH	L_S	=	46.1	ft.
	% VOIDS	VOIDS	=	40%	
$V_{STONE} = [(W_S * L_S * (I_W - I_S)) - V_{CHAMBERS}] * VOIDS$	STONE VOLUME	V_{stone}	=	98.1	cf.

TOTAL VOLUME BELOW INVERT

$V_{TOTAL} = V_{CHAMBERS} + V_{STONE}$	**TOTAL STORAGE VOLUME**	V_{TOTAL}	=	**370.8**	cf.

BOTTOM AREA

$A_{bottom} = W_S * L_S$	BOTTOM SURFACE AREA	A_{bottom}	=	**287.8**	sf.

REQUIRED RECHARGE VOLUME

STATIC METHOD

	SOIL TYPE		=	B	
	RECHARGE DEPTH	F	=	0.35	in.
	IMPERVIOUS AREA	A_{IMP}	=	**0.18**	ac.
	% IMPERVIOUS AREA CAPTURED		=	100%	
$Rv = (F * A_{imp})$	RECHARGE STORAGE VOLUME	Rv	=	**231.2**	cf.

370.8 cf. >>> 231.2 cf.

STANDARD 3 SATISFIED

72 HOUR DRAWDOWN

	SOIL TYPE		=	B	
	RAWLS RATE	K	=	1.02	in/hr
	REQUIRED RECHARGE VOLUME	Rv	=	231.2	cf.
	BOTTOM AREA	A_{bottom}	=	287.8	sf.
$T_D = (Rv) / (K * A_{bottom})$	DRAWDOWN TIME	T_D	=	**9.5**	hr.

9.5 hr. <<< 72.0 hr.

72 DRAWDOWN SATISFIED

A.8

Water Quality Volume Calculation

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STORMWATER MANAGEMENT STANDARDS

STANDARD # 4

WATER QUALITY VOLUME (WQV)

TOTAL PROPOSED IMPERVIOUS AREA = 54878.00 sf.

[ ] CRITICAL AREA

WQV = **1.00** inch runoff x TOTAL IMPERVIOUS AREA

[X] OTHER AREA

WQV = **0.50** inch runoff x TOTAL IMPERVIOUS AREA

0.50 x **54878.00** = 2,286.6 cf.

TOTAL WATER QUALITY VOLUME REQUIRED = **2286.6** **cf.**

WATER QUALITY VOLUME

INFILTRATION SYSTEM 1 = **2798.7** cf.

TOTAL WATER QUALITY VOLUME PROVIDED = **2798.7** **cf.**

2798.7 cf **>>>** **2286.6 cf** **STANDARD #4 SATISFIED**

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STORMWATER MANAGEMENT STANDARDS

STANDARD # 4

WATER QUALITY VOLUME (WQV)

TOTAL PROPOSED IMPERVIOUS AREA = 7951.00 sf.

[ ] CRITICAL AREA

WQV = **1.00** inch runoff x TOTAL IMPERVIOUS AREA

[X] OTHER AREA

WQV = **0.50** inch runoff x TOTAL IMPERVIOUS AREA

0.50 x **7951.00** = 331.3 cf.

TOTAL WATER QUALITY VOLUME REQUIRED = **331.3** **cf.**

WATER QUALITY VOLUME

INFILTRATION SYSTEM 2 = **370.8** cf.

TOTAL WATER QUALITY VOLUME PROVIDED = **370.8** **cf.**

370.8 cf **>>>** **331.3 cf** **STANDARD #4 SATISFIED**

DE MINIMIS STORMWATER DISCHARGES FOR PURPOSES OF STANDARD 4

The 80% TSS removal rate must be achieved at each outlet discharging to a receiving wetland. The only exception to this is when the discharge is considered to be *de minimis*.[1]

The stormwater discharge from an individual outlet is considered *de minimis* when all the following conditions are satisfied:

- Physical site conditions preclude installation of a TSS treatment practice prior to discharge (e.g., lack of space between a wetland and a road, lack of head differential).

  The small watershed (P2) is very small and inconvenient to place a BMP device to route the discharge to the infiltration system, so this condition is satisfied.

- The discharge is less than or equal to 1 CFS for the runoff associated with the 2-year 24-hour storm.

  According to the hydrograph created in HydroCAD, the peak flow is 0.03 CFS for the 2-year 24-hours storm for (P2) watershed, so this condition is satisfied.

- 80% TSS removal is achieved on an average weighted basis from the site as a whole using the weighted average method described below. This will require more than 80% TSS removal at some stormwater outlets to compensate for the outlets that achieve less than 80% TSS removal and achieve an overall weighted average reduction in TSS of 80% or more across the entire site.

  Correct, the rest of the areas except for watershed (P4) has achieved an overall TSS removal rate of 87.69% across the entire site, so this condition is satisfied.

- The stormwater outlets where additional controls are used to achieve more than 80% TSS removal must discharge to the same reach of the same wetland or water body as the outlets that achieve less than 80% TSS removal. A discharge is not *de minimus* if stormwater from an outlet discharging untreated or partially treated stormwater is discharged to one wetland or water body and stormwater that achieves more than 80% TSS removal is discharged to another wetland or water body.

  Additional controls are used on the other watersheds to achieve more than 80% TSS removal. The discharge points, Boston St, Rowell Lane, and S. Main Street all share the same wetland/water body as the outlets, so this condition is satisfied.

[1] MassDEP and MassHighway recognize that it may be difficult to meet the 80% TSS removal rate at each outlet along a MassHighway redevelopment or add-a-lane project. For redevelopment projects, MassHighway and MassDEP have identified a "macro" approach that allows MassHighway to propose more than 80% TSS at some points along the portion of a roadway within a subwatershed to compensate for those locations within the same subwatershed where, because of right-of way constraints, it is not possible to achieve 80% TSS removal. Information on this approach is contained in the 2004 MassHighway Handbook for Roads and Bridges. MassDEP and MassHighway intend to develop a similar approach for add-a-lane projects when the MassHighway Handbook is revised. MassDEP and MassHighway intend to work together to revise the MassHighway Handbook in light of the 2008 changes to the Stormwater Management Standards.

- Controls are placed at the outlet to prevent erosion or scour of the wetland/stream channel and bank.

  Compost sock are to be placed alongside the temporary construction gravel, so this condition is satisfied.

- Standard 2 (Peak rate attenuation) and Standard 3 (recharge) must be achieved on a site-wide basis.

  Post-development flow rates at the proposed reaches are all lower than the existing flow rates, so this condition is satisfied.

- Source control and pollution prevention measures that mitigate the impact of the untreated or partially treated discharges are identified in the Pollution Prevention Plan required by Standard 4 and fully implemented (e.g., such as street sweeping).

  Temporary construction gravel entrance tracking bed is listed on the Site Preparation and Demo Plan, so this condition is satisfied.

- The size of the drainage area contributing runoff to the untreated outlet has been reduced to the maximum extent practicable.

  The site has been graded to the maximum extent practicable to reduce the small watershed (P2), so this condition is satisfied.

If all these conditions are met, the discharge is considered *de minimus*. In that event, the Weighted Average Method described below must be used to determine if the 80% TSS removal rate is achieved on a site-wide basis for purposes of design.

$$Weighted\ Average\% = \frac{(Area_1)(TSS_1\%) + (Area_2)(TSS_2\%) + (Area_n)(TSS_n\%))}{(Area_1 + Area_2 + Area_n)}$$ ***Equation (1)***

Area = size, expressed in acres, square feet, or other units
TSS% = Assigned TSS removal rate, expressed as % (e.g. 25%)

Weights must be based on the size of each drainage area.

Weighted Average =
(11499*96.8% + 13615*96.8% + 2280*88% + 2568*88%+14022*88%+466*0+7951*88%+2273*80)
(11499 + 13615 + 2280 + 2568 + 14022+466+7951+2273)

Weighted Average % = 87.69% TSS Removal Site Wide

A.9

Operations and Maintenance Log

Villebridge Development LLC

Operations and Maintenance Log

Inspections for Year:_____

Structural Best Management Practice	Action	Date Completed	Completed By	Comments
Deep Sump Hooded Catch Basin– Inspect/clean four times per year. Clean when sump is 33% full.	Inspect/ Clean			
	Inspect/ Clean			
	Inspect/ Clean			
	Inspect/ Clean			
	Inspect/ Clean			
Infiltration Chambers Inspect twice a year – spring and fall. Clean as required (if sediment is observed in infiltration units or there is standing water) and control mosquito per manufacturer's guidelines for cleaning media filters.	Inspect/Clean			
	Inspect/Clean			
Roof Drain Leaders – Inspect/clean twice per year.	Inspect/Clean			
	Inspect/Clean			
Parking Lot/Paved areas sweeping and debris – inspect four times a year. Sweep paved areas and remove litter in Spring and Fall after fallen leaves.	Inspect/Clean			
Vegetated Areas Maintenance – Inspect twice per year. Maintain as required.	Inspect			
	Inspect			
Spills – report local police and fire of any potential spills per Middleton By-Law § 204-21.	Report			