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April 23, 2024

DELIVERED BY E-MAIL AND HAND DELIVERY

Melanie Bachman
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: PETITION NO. 1609 – TRITEC Americas, LLC notice of election to waive exclusion from Connecticut Siting Council jurisdiction, pursuant to Connecticut General Statutes §16-50k(e), and petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 0.999-megawatt AC solar photovoltaic electric generating facility located at 250 Carter Street, Manchester, Connecticut, and associated electrical interconnection.
Petitioner Responses to Interrogatories from Council.

Dear Attorney Bachman:

On behalf of TRITEC Americas, LLC (“Petitioner”), please accept the enclosed responses to the interrogatories provided by the Connecticut Siting Council (“Council”) on April 2, 2024. The Petitioner submits an original and fifteen hard copies of all necessary documents. Please feel free to contact me if you have any questions.

Very sincerely yours,

Paul R. Michaud

cc: Service List dated January 26, 2024
John F. Sullivan, Attorney for the Town of Manchester
Raymond Welnicki
Rachel and Dana Schnabel
Rosemary Carroll (MARSD)

Petition No. 1609

**TRITEC Americas, LLC
250 Carter Street, Manchester, Connecticut**

**Interrogatories
April 2, 2024**

NOTICE

1. Has TRITEC received any comments since the Petition was submitted to the Council? If yes, summarize the comments and how these comments were addressed.

Response:

Yes. On February 21, 2024, the Town of Manchester Public and Zoning Commission independently conducted a public comment session to collect comments from the Town residents regarding the proposed Project. The Town of Manchester submitted these comments directly to the Siting Council. In addition, twenty-seven Manchester residents, the Town of Bolton, State Representatives Jason Doucette and Steve Wir, the Manchester Legislative Delegation, and the Manchester Planning and Zoning Commission submitted comments to the Council. A table summarizing the comments is attached (See “Exhibit A: Summary of Public Comments”), and Petitioner will address these comments in their pre-written filed testimony.

2. Referencing Petition p. 3, which Town officials were present at the November 14, 2023, video conference? What specific comments did the Town have concerning the proposed project?

Response:

Manchester’s Town Manager, Steve Stephanou, Director of Planning and Economic Development, Gary Anderson, and Director of Public Works, Tim Bockus, attended the video conference. They asked questions regarding tree clearing, wetland impacts, noise, rights-of-way, and potential opportunities for public participation in the petition process.

3. Referencing Petition p. 3, how many abutting property owners and residents attended the November 16, 2023, video conference?

Response:

Four abutters attended the video conference.

PROJECT DEVELOPMENT

4. Referencing Petition p. 4,
 - a. by what mechanism would the energy from the proposed facility provide electricity only to the Town of Manchester?

Response:

Page 4 of the Petition does not state that the proposed Project would provide electricity only to the Town of Manchester. The Petition states that the proposed Project would benefit the Town of Manchester by producing “clean, carbon-free energy for the electric grid, thus reducing the Town’s reliance on fossil fuels and helping to decrease greenhouse gas emissions and combat climate change,” and the proposed Project, “would allow the Town to help meet Connecticut’s law to achieve 100% carbon-free generation by 2040.” See Petition No. 1609, Petition Narrative, 4 (1/24/24).

The proposed Project would help the State and Town reduce fossil fuel reliance and achieve 100% carbon-free generation by replacing electricity from fossil fuels with solar energy. Petitioner sells the solar energy to Eversource, which distributes it to Connecticut residents, including those in Manchester.

- a. would the proposed facility produce energy 24/7? If not, how would the proposed facility provide a stable electricity supply for the electric grid?

Response:

No. The proposed Project would not produce energy 24/7. It would provide a stable electricity supply for the electric grid during the daytime.

- b. what substantial grid improvements would occur near the proposed facility?

Response:

The proposed Project improves the electrical grid by reducing stress on the distribution system. The proposed Project is a distributed generation facility that helps spread generation across the grid, thereby reducing the amount of electricity needed to move across the distribution lines. For example, the Manchester 3A substation will receive electricity from the proposed Project (5 miles away). In contrast, the next closest generation facility in the electric utility sector is the Rainbow Hydroelectric Plant (19 miles away). See U.S. Energy Information Administration, “Electricity Data Browser” (last visited April 18, 2024). This reduction in electricity movement reduces energy losses, delays infrastructure upgrades, and extends distribution lines and overall electric grid lifespans, saving money on maintenance, operating, and electricity costs.

5. Referencing Petition p. 5,
 - a. describe how the westward sloping topography benefits the site layout.

Response:

The westward sloping topography allows the proposed Project Site to be constructed with minimal impact on the natural grades.

- b. describe how the absence of biological and hydrological conflicts was determined.

Response:

Petitioner worked with numerous consults, experts, and state and federal agencies to complete the Environmental Assessment and determine that there are no biological or hydrological conflicts if the proposed Project were to move forward, and that any potential biological or hydrological impacts found on the proposed Site could be mitigated through the appropriate measures.

- c. describe how the site will be “preserved.”

Response:

The proposed Project Site would only disturb 7.8 acres of the 41.08-acre Host Parcel, preserving 33.8 acres (over 80%).

6. What alternative site locations were examined, if any?

Response:

Petitioner analyzed multiple site locations in proximity of the proposed Project Site, but none were feasible due to issues including, but not limited to, interconnection, wetlands, and proximity to housing developments. Petitioner selected the proposed Site because it is a large, isolated parcel (approximately 41.08 acres) surrounded by trees. Petitioner will use only approximately 7.8 acres (about 19%) of the entire Host Parcel. The remaining 33.8 acres (over 80%) will remain intact.

7. Referencing Petition p. 6, identify all permits necessary for construction and operation and which entity will hold the permit(s).

Response:

The proposed Project will require a General Stormwater Permit from DEEP, building and electrical permits from the Town of Manchester, and a utility interconnection agreement and easement with Eversource Energy. Petitioner will hold all permits.

8. Referring to Petition p. 11, when will the project be bid into the NRES Program? Would the total capacity of the facility be supplied to the NRES Program? If the project were to be bid into the program and selected, what distressed municipalities would benefit from the project?

Response:

Petitioner submitted the proposed Project into the NRES Program auction held in February 2024. The total capacity of the proposed Project would be supplied to the NRES Program. The distressed municipalities benefiting from the proposed Project would be the Town of Plymouth and the City of Meriden.

9. If the facility is not selected in the NRES Program, would TRITEC withdraw this Petition?

Response:

No. Petitioner would resubmit the proposed Project in the NRES Program, sell electricity wholesale under Eversource Rate 980, or pursue another revenue mechanism.

10. If the facility operates beyond the terms of the NRES Agreement, will TRITEC decommission the facility or seek other revenue mechanisms for the power produced by the facility?

Response:

This will depend on the market conditions.

11. If TRITEC transfers the facility to another entity, would TRITEC provide the Council with a written agreement as to the entity responsible for any outstanding conditions of the Declaratory Ruling and quarterly assessment charges under CGS §16-50v(b)(2) that may be associated with this facility, including contact information for the individual acting on behalf of the transferee?

Response:

Yes. Petitioner would provide the Council with a written agreement.

PROPOSED SITE

12. Submit a map depicting the boundaries of the solar facility site and the boundaries of the host parcel(s). Under Regulations of Connecticut State Agencies (RCSA) §16-50j-2a(29), “**Site**” means a contiguous parcel of property with specified boundaries, including, but not limited to, the leased area, right-of-way, access, and easements on which a facility and associated equipment is located, shall be located, or is proposed to be located.

Response:

Please refer to the “Overall Site Plan” (Sheet 2.10 in Exhibit B) for the map depicting the boundaries of the proposed Project and the host parcel.

13. What is the length of the lease agreement with the property owner? Describe options for a lease extension, if any.

Response:

The lease agreement will be 21 years long, with options to extend for two one-year periods and two five-year periods.

14. In the lease agreement with the property owner, are there any provisions related to decommissioning or Site restoration at the end of the project's useful life? If so, please describe and/or provide any such provisions.

Response:

Yes. The lease includes the following provisions:

Decommissioning. At the termination or expiration of the Lease, whether as to the entire Property or only as to part, the Lessee shall cease commercial operation of the Solar Energy Project on the Property or the part as to which the Lease has terminated or expired. Lessee shall, as soon as practicable after that and at its sole cost and expense, remove all above-ground and below-ground Solar Energy Projects, excluding the portion of foundations that are below a depth of two feet below grade from the natural surface of the Property or of the portion as to which this Lease was terminated, infrastructure and underground conduit that cannot be removed without damage to the Property, and dispose of such removed components per applicable law (the "Decommissioning Obligations"). Lessee shall leave the Property in substantially the same condition as before the Effective Date (except for removing trees and foliage permitted hereunder) and shall restore the soil surface to a condition reasonably similar to its original condition, reasonable wear and tear, and casualty excepted. The lessee shall post a decommissioning performance bond to secure the performance of its obligations under Section 13.13. The provisions of this section shall not affect any continuing rights or obligations that under the terms of this Lease survive the Term or any termination or expiration of this Lease. The provisions of this section shall survive any termination or expiration of this Lease.

15. Does the lease agreement with the property owner contain provisions for agricultural co-uses at the site? If yes, describe the co-uses.

Response:

Yes. The lease agreement specifies that the Host Parcel will continue to be used for commercial maple syrup processes.

16. If agricultural co-uses are implemented at the site, who would be responsible for responding to concerns and/or complaints related to these agricultural co-uses? How would contact information be provided?

Response:

All concerns and/or complaints about these agricultural co-uses can be directed to Petitioner's legal counsel, Michaud Law Group, LLC.

17. Referencing Petition p. 12, how does the property owner access the host parcel to conduct maple sugaring activities? Is there existing access off Carter Street and through the wetlands to the interior of the host parcel?

Response:

The farmer accesses the proposed Project Site by parking in the pull-off area along Carter Street and walks onto the Host Parcel to tap the maple trees and collect the sap. The maple sugaring takes place off-site at Rosson Maple Farm.

18. Referencing Petition Appendix D, a site layout different from the currently proposed site layout is shown in Figure 1, Sheet SP-1. What were the reasons for the re-design of the site? Did the revised layout result in a reduced capacity?

Response:

Figure 1 in Appendix D is a previous iteration of the potential site plan that evolved to minimize the proposed Project's capacity and the overall impact on the site.

ENERGY OUTPUT

19. Referencing Petition p. 9, what electrical loss assumptions have been factored into the facility's output?

Response:

The annual loss of 0.5% per year is the median solar panel degradation rate. This degradation rate is industry-standard.

20. Was a shade study conducted? Would shading from adjacent forested areas interfere with energy production at the site?

Response:

No shade study was conducted; however, the adjacent forested areas will not interfere with energy production at the site due to the proposed Project's location and the heights of the adjacent trees.

PROPOSED FACILITY AND ASSOCIATED EQUIPMENT

21. Referencing Petition Exhibit G, p. 2,
a. to what approximate depth would the tracker support posts be driven into the ground?

Response:

The approximate depth of the embedment will be 9' to 12'.

b. How many tracker unit motors will be installed?

Response:

Petitioner would install approximately 25 – 30 tracker unit motors.

c. what is the lifespan of the tracker motors?

Response:

The expected life span is thirty years.

d. How are the tracker motors powered?

Response:

Tracker motors are powered by a low-voltage auxiliary panel located at the equipment pad.

e. at what height above grade are the tracker motors located?

Response:

Tracker motors are an integral portion of the racking system and are the same height as the slew beams (approximately 5' above grade).

22. What are the approximate dimensions of the transformer and switchgear installed on the concrete pad adjacent to the proposed access drive? What equipment and approximate dimensions would be installed on the adjacent small concrete pad?

Response:

The proposed Project Site requires one electrical pad and one transformer vault. The pad will be 10' by 20', and the transformer vault will be 6' x 7'.

23. Referencing Petition Exhibit G, p. 2, are the eight inverters mounted on concrete pads or posts?

Response:

The proposed inverters will be mounted on posts.

24. Petition Appendix E contains specification sheets for two different solar panels. Which solar panels would be installed at the site? What solar panel output was used to calculate the generation capacity of the proposed facility?

Response:

The panels to be installed at the proposed Project Site will be the Trina-Solar Vertex TSM-DEG19C.20 models.

25. Referencing Petition p. 8, define “premium modules.”

Response:

The module manufacturers use the term “premium modules” to grade and warranty the equipment.

26. Why are string inverters proposed rather than a single, centralized inverter?

Response:

String inverters were the basis of the design for maximum efficiency and longevity of the proposed Project. They allow for continued operation of the array without disruption during routine maintenance.

ELECTRICAL INTERCONNECTION

27. Referencing Petition p. 7, has the Eversource System Impact Study been completed? What was the result?

Response:

The Eversource System Impact Study is still underway, but Eversource did provide draft results for the study. Pending any changes to the final System Impact Study results, the proposed Project can connect to the Manchester 3A substation via the 23kV 3A03 feeder and new three-phase service consisting of a recloser and primary meter.

28. Are any off-site upgrades required for the electrical distribution system?

Response:

Based on the draft System Impact Study results, the proposed Project would not cause any voltage or thermal loading issues during minimum and maximum loading when operating at 100% power factor. Additionally, the proposed Project would not result in any tap changes on the substation transformers or cause flicker, or rapid voltage change violations. Therefore, the only required upgrades are a new three-phase service consisting of a primary meter and recloser.

29. Does the interconnection require a review from ISO-NE?

Response:

No.

30. Will the interconnection provide energy to a substation? If yes, which one?

Response:

Yes. Substation, “3A Manchester.”

31. Referencing Petition Site Plan 2.11, six proposed utility poles are shown; however, five are described in Petition Exhibit G, p. 3. Clarify.

Response:

Five utility poles are required: three Eversource-owned poles and two customer-owned poles. The plans have been revised accordingly and are attached herein. See “Exhibit B: Revised Civil Plan Drawing Set.”

32. Referencing Petition Site Plan 2.11, what equipment would be installed on each utility pole? Can the number of poles be reduced by consolidating equipment?

Response:

The electric distribution company owns and operates the equipment on the utility poles. This equipment will consist of a manual disconnect switch (GOAB), a recloser, and a primary meter. This is the minimum amount based on the system design and Utility requirements.

33. Referencing Petition Exhibit G, pp. 3-4, it states that Eversource does not pad-mount their equipment. Explain.

Response:

Eversource Energy dictates the exact details of the interconnection and equipment. Typically, Eversource does not pad-mount its equipment for solar projects; therefore, pole-mount equipment is shown on the Site Plans.

PUBLIC SAFETY

34. Referencing Petition p. 11, how does the project comply with industry Best Management Practices for Electric and Magnetic Fields?

Response:

Petitioner is unaware of any best management practices for electric and magnetic fields at solar facilities like those in the proposed project. The Council’s “Best Management Practices for Electric and Magnetic Fields” addresses “engineering practices for proposed electric transmission lines with a design capacity of 69kV or more,” the proposed Project will interconnect to a distribution line with a design capacity of 23kV. See Connecticut Siting Council, “Best Management Practices for Electric and Magnetic Fields” (Feb. 20, 2014) 2.

35. Would training be provided for local emergency responders regarding site operation and safety in the event of a fire or other emergency at the site?

Response:

Training can be provided to local emergency responders in the facility's operation.

36. Can emergency personnel operate manual facility shut-off switches? If yes, in what location(s)?

Response:

Yes. There are multiple means of isolating and shutting off the facility's power. The first is the manual disconnect switch located on the Utility pole. The second is the automatic means on the second utility pole, and the third is the main breaker at the equipment pad.

37. In the event of a brush or electrical fire, how are potential electric hazards that could be encountered by emergency response personnel mitigated? What media and/or specialized equipment would be necessary to extinguish a solar panel/electrical component fire?

Response:

In the event of a fire or emergency, the proposed Project will be able to be shut down by emergency responders via a physical disconnect switch that will be appropriately labeled under the requirements of the National Electric Code. Petitioner is unaware of any specific media and/or specialized equipment needed to extinguish a fire within the proposed Project. Generally speaking, electrical fires are allowed to burn out, with water being used only in the surrounding areas to prevent the spread of any fire beyond the affected area.

38. What is the distance of the nearest municipal fire hydrant to the proposed facility? What alternative water sources are available to the fire department? How would water be brought to the site in a fire?

Response:

The nearest municipal fire hydrant is located on the corner of Carter Street and Amanda Drive, approximately 0.25 miles northwest of the proposed Site entrance. The local fire department determines what water source to use and how to bring water to a fire. Upon completion of the proposed Project, Petitioner will work with the local fire department and introduce them to the proposed Project to address any contingencies at the proposed Site.

39. Would firewater or other runoff from a solar panel/electrical fire be considered hazardous and require cleanup by a hazardous materials response contractor?

Response:

Most fire departments are advised not to put water on a solar system fire. Water can be used to keep adjacent equipment cool if significant heat is generated and is of concern. If water happens to come in contact with the solar panels, there is no evidence that it becomes a hazardous material. The submitted TCLP report reflects that the solar panels are not hazardous materials.

40. How would the fire be contained if a brush or electrical fire occurred at the proposed facility? What protections are in place to ensure a fire does not impact the host parcel's natural gas pipelines within the easement?

Response:

In the event of a fire or emergency, the proposed Project will be able to be shut down by emergency responders via a physical disconnect switch that will be appropriately labeled under the requirements of the National Electric Code. Petitioner is unaware of any specific media and/or specialized equipment needed to extinguish a fire within the proposed Project. Generally speaking, electrical fires are allowed to burn themselves out, with water being used only in the surrounding areas to prevent the spread of any fire beyond the affected area.

41. Provide an Emergency Response Plan for the proposed facility.

Response:

Petitioner respectfully requests that the Council submit an Emergency Response Plan, a condition in the Council's Final Decision because the final design of the proposed Project depends on several factors, including any potential changes made by the Council or DEEP through their respective permitting processes.

42. Referencing Petition p. 9, does the transformer have a containment system and/or a low oil level alarm in the event of an insulating mineral oil leak? Can the SCADA system detect an insulating mineral oil leak? Is the mineral oil biodegradable?

Response:

No. Transformers manufactured today use mineral oil. Mineral oil presents no danger to the environment and is biodegradable. SCADA cannot sense a leak of fluid.

43. Would installing racking posts affect well water quality from construction impacts, such as vibrations and well water sedimentation?

Response:

Based on the CT Department of Health Public Water Supply Map, there do not appear to be any wells downstream of the proposed solar facility. Vibrations from the installation of racking posts are not anticipated to cause any sedimentation release and should result in no disruption to well water flow and water quality. The contractor shall follow the guidelines of the Soil Erosion and Sediment Control Plan for this project, which will minimize the potential impacts on the groundwater and surface water quality for the proposed Site and its surrounding areas.

44. What is the noise profile of the selected transformer?

Response:

The specific transformer model for the proposed Project will be based on availability during construction. Per NEMA TR-1, the average decibel rating for a self-cooled, two-

winding 1,500-2,000 kVA transformer, which is anticipated for the proposed Project, will produce a noise level of 61 dB at a distance of 1 meter. This data has been used in the sound-level calculations submitted in conjunction with these responses to interrogatories. See “Exhibit C: Revised Sections of Environmental Assessment.”

45. Referencing Petition Exhibit G, p. 19, submit a detailed sound level calculation worksheet or a sound study that accounts for noise levels from the proposed eight inverters and transformers at the nearest abutting property line.

Response:

Sound level calculations have been submitted in conjunction with these responses to interrogatories. See “Exhibit C: Revised Sections of Environmental Assessment.”

ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

46. Referencing Petition p. 4, what specific CT DEEP and US Army Corps of Engineers requirements will be followed?

Response:

The CT DEEP 2024 Connecticut Soil Erosion and Sediment Control Guidelines, 2024 Connecticut Stormwater Quality Manual, CT DEEP Inland Fisheries Division Stream Crossing guidelines, and US Army Corps of Engineers requirements for stream crossing have been followed in the design of the proposed stream crossing. Since the drainage area at the proposed stream crossing is less than 1 square mile (0.017 square miles), the proposed culvert has been designed to pass the 50-year flood frequency per US Army Corps of Engineers requirements. The 100-year flood frequency was verified to confirm that flood waters will not overtop the proposed access drive.

47. Referencing Petition Site Plan 2.31, Note 1, is the preliminary design of the Project at least 50 percent complete? If not, would construction comply with the *Connecticut Soil Erosion and Sediment Control Guidelines* and *Connecticut Stormwater Quality Manual*, effective March 30, 2024?

Response:

Design and construction will comply with the 2024 Connecticut Soil Erosion and Sediment Control Guidelines and the 2024 Connecticut Stormwater Quality Manual. The notes on the plans have been updated and are attached herein. See “Exhibit B: Revised Civil Plan Drawing Set.”

48. Referencing Petition Exhibit G, p. 12, describe the Stream Crossing Best Management Practices to be employed at the site.

Response:

The CT DEEP 2024 Connecticut Soil Erosion and Sediment Control Guidelines, 2024 Connecticut Stormwater Quality Manual, CT DEEP Inland Fisheries Division Stream Crossing guidelines, and US Army Corps of Engineers requirements for stream crossing

have been followed in the design of the proposed stream crossing. Since the drainage area at the proposed stream crossing is less than 1 square mile (0.017 square miles), the proposed culvert has been designed to pass the 50-year flood frequency per US Army Corps of Engineers requirements. The 100-year flood frequency was verified to confirm that flood waters will not overtop the proposed access drive. The proposed culvert is designed with 12 inches of embedment within the streambed to provide a natural bottom substrate within the culvert. The proposed culvert matches the gradient and alignment of the existing stream, and the length of the culvert has been kept as short as possible based on the surrounding topography.

49. Referencing Petition Exhibit G, p. 12, does the proposed 42-inch diameter high-density polyethylene pipe conform to the DEEP Inland Fisheries Division Stream Crossing Guidelines? Explain.

Response:

The proposed 42-inch diameter HDPE pipe stream crossing design conforms to the DEEP Inland Fisheries Division Stream Crossing Guidelines.

50. Can an open bottom culvert be installed at the proposed stream crossing?

Response:

An open-bottom culvert was considered during the design process. Ultimately, the 42-inch pipe was proposed as it conforms to CT DEEP and US Army Corps of Engineers requirements for stream crossings and is more cost-effective.

51. Referencing Petition Exhibit G, p. 12, how was it determined the primary function of the stream is solely water conveyance? What other attributes were assessed?

Response:

Water conveyance was not determined to be the “sole” function of the stream as the stream also supports geomorphic, physiochemical, and biologic functions. Exhibit G, Page 12, states that the “main function and value” of the stream is water conveyance. This determination was made as the system is confined to a defined sloping channel instead of a depression or flat. Water conveyance functions support many other subsequent functions, such as transporting sediment to create streambeds, influencing channel shape and size, regulating temperature and oxygen levels, and supporting aquatic and riparian organisms. The assessment and conclusions are based on the 2012 USEPA and USFWS publication titled Function-Based Framework for Stream Assessment & Restoration Projects.

52. Do wildlife and plant species typically use wetlands and watercourses as travel corridors? If yes, how will the proposed stream crossing affect movement?

Response:

As seen by tracks and game trails during site investigations, wildlife species use the wetland and watercourse system as a travel corridor. The proposed crossing will not adversely affect wildlife species traveling parallel within the stream or perpendicular across the stream. The proposed crossing is large enough to allow small mammals and herpetofauna to travel

through the opening and continue their parallel course. Large mammals traveling parallel through the stream will likely have to exit the streambed and walk around the crossing before reentering the stream. However, large mammals will expend less energy completing this task than small mammals or herpetofauna would. As such, they are minorly inconvenienced rather than adversely affected. Perpendicular travel across the stream will be improved. Existing game trials indicate that wildlife frequently crosses the stream. However, they must climb down and up the stream bank to do so. The proposed crossing will create an easier path of travel.

53. Referencing Petition Site Plan 3.01—Fence Detail, can the bottom of the perimeter fence fabric be raised to six inches above grade to allow for small wildlife movement?

Response:

The details have been revised accordingly to provide a six-inch gap for small wildlife movement and are attached herein. See “Exhibit B: Revised Civil Plan Drawing Set.”

54. What agricultural activities are contemplated for the site, if any?

Response:

Currently, agricultural activities include tapping maple trees for sap and syrup production. Petitioner intends to increase and expand agricultural activities while developing the proposed Project and is analyzing all agricultural opportunities.

55. Referencing Petition p. 5, it states the project site does not contain prime farmland soils; however, Petition Exhibit G, p. 18, states it contains some prime farmland soils. Clarify.

Response:

Per the Prime Farmland Map, Figure 8 in Appendix A, no prime farmland areas are within the proposed Project Area. Approximately 4.1 acres within the proposed Project Area are considered “farmland of statewide importance.” Petition Exhibit G, p. 18, has been revised accordingly. See “Exhibit C: Revised Sections of Environmental Assessment.”

56. Has the Phase IA Cultural Resources Assessment Survey been submitted to the State Historic Preservation Office for comment? If yes, provide a copy of their response, if available.

Response:

A copy of the SHPO response letter is included herein. See “Exhibit D: SHPO Response Letter.”

57. Has TRITEC applied for a General Permit for the Discharge of Stormwater and Dewatering Wastewater from Construction Activities to DEEP? If yes, what is the status of such a permit?

Response:

The CTDEEP Stormwater General Permit application is intended to include “construction-ready” site plans, but the Petitioner has not yet submitted it. The Petitioner intends to apply

for this permit soon and will submit proof of approval to the Council as a precondition to beginning construction of the proposed Project.

58. The U.S. Fish and Wildlife Service's Information, Planning, and Conservation System (IPaC) review documentation appears incomplete. For example, the Project Questionnaire portion of the review has no information. Explain.

Response:

The U.S. Fish and Wildlife Service's IPaC review documentation has been correctly filed and is complete. While filing the IPaC, the only federally listed species noted as having the potential to occur in the project area was the Northern Long long-eared bat (NLEB). Following the protocol of the IPaC review, we utilized the NLEB Rangewide Determination Key (DKey). As no additional federally listed species were potentially present, using the Consultation Package Builder (CPB) was unnecessary. All questions prompted while filing the DKey were answered accurately based on the proposed Project's impact, and the complete returned determination was submitted with the application. See "Exhibit E: USFWS Correspondence."

59. Referencing Petition Exhibit G, p. 10, quantify the acreage of a small core forest that would remain after construction.

Response:

After the proposed project is completed, approximately 18.30 acres of the 24.03 acres of small core forest will remain.

60. Referencing Petition Exhibit H, identify the addresses of the properties with visible residences in Photos 7 East, 8 East, 9 East, 10 East, 19, and 21 East.

Response:

In photos 7 East, 8 East, 9 East, and 19 East, the visible properties are 274 and 262 Blue Ridge Drive. In photos 10 East, the visible properties are 274, 262, 252, and 238 Blue Ridge Drive. In photos 21 East, the visible properties are 274, 262, and 252 Blue Ridge Drive.

FACILITY CONSTRUCTION

61. Will blasting be required to construct the site? If not, how will bedrock be removed if encountered?

Response:

No. Bedrock was encountered during the geotechnical field investigation; therefore, blasting is not anticipated to construct the proposed Project.

62. Referencing Petition Exhibit G, p. 11, where will the 3,500 cubic yards of material be disposed of? What would this material be composed of? What is the total estimate of cut and fill?

Response:

Revisions were made to the stormwater management design based on the Town of Manchester's comments as well as the results of the geotechnical investigation. The design now requires approximately 1,250 cubic yards of material to be imported into the site. Most of the material is required to construct the Stormwater Management Basin's berm and the access drive over the proposed stream crossing. See "Exhibit F: Revised Stormwater Management Report."

FACILITY MAINTENANCE/DECOMMISSIONING

63. Under what circumstances would pesticides and/or herbicides be used at the site? What specific precautions are taken to use these products to prevent effects on water quality and human health?

Response:

Petitioner does not use pesticides or herbicides on any of their solar arrays in Connecticut.

64. What cleaning agents would be used for panel washing? How often would panels be cleaned?

Response:

Petitioner does not currently see the need for panel washing in Connecticut due to rain and snow. If the issue did present itself, Petitioner would follow the manufacturer's requirements to use a nontoxic soap, like Dawn, and water solution.

EXHIBIT A

Summary of Public Comments

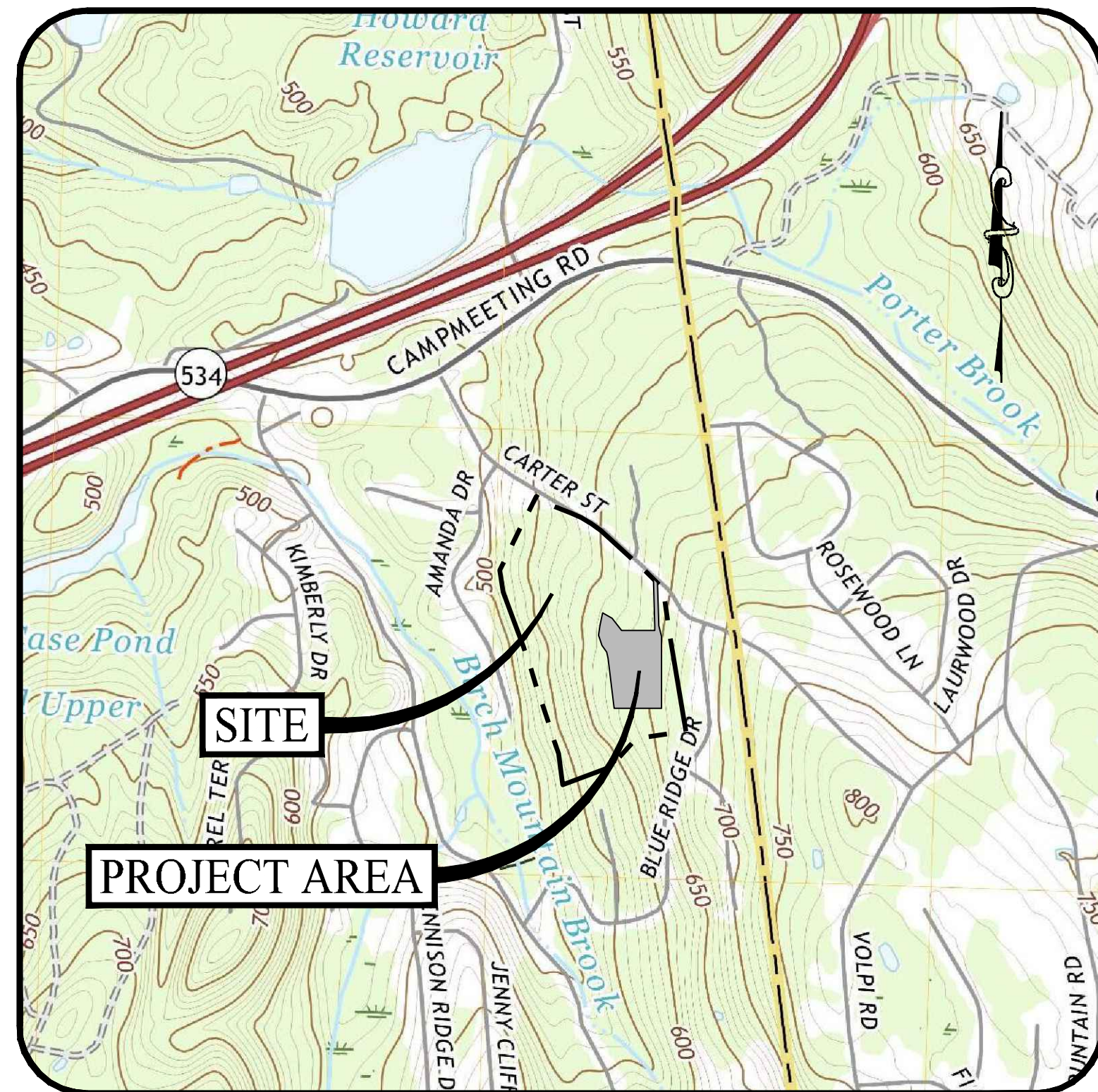
Summary of Public Comments

Thirty-two parties submitted public comments to Siting Council regarding Petition No. 1609. The parties consisted of twenty-seven Manchester residents (one abutter and twenty-six non-abutters), two State Representatives, the Town of Bolton, The Manchester Legislative Delegation, and the Manchester Planning and Zoning Commission. The comments addressed the following topics:

# of Comments	Topic
43	Tree Clearing
42	Wildlife
26	Stormwater Runoff
25	Noise
22	Property Values
21	Gas Pipeline
18	Fire
17	Wetland Impacts
11	Use of chemicals/herbicides/pesticides
10	Shensipit Trail
10	Visibility
10	Located in residential zone

EXHIBIT B

Revised Civil Plan Drawing Set

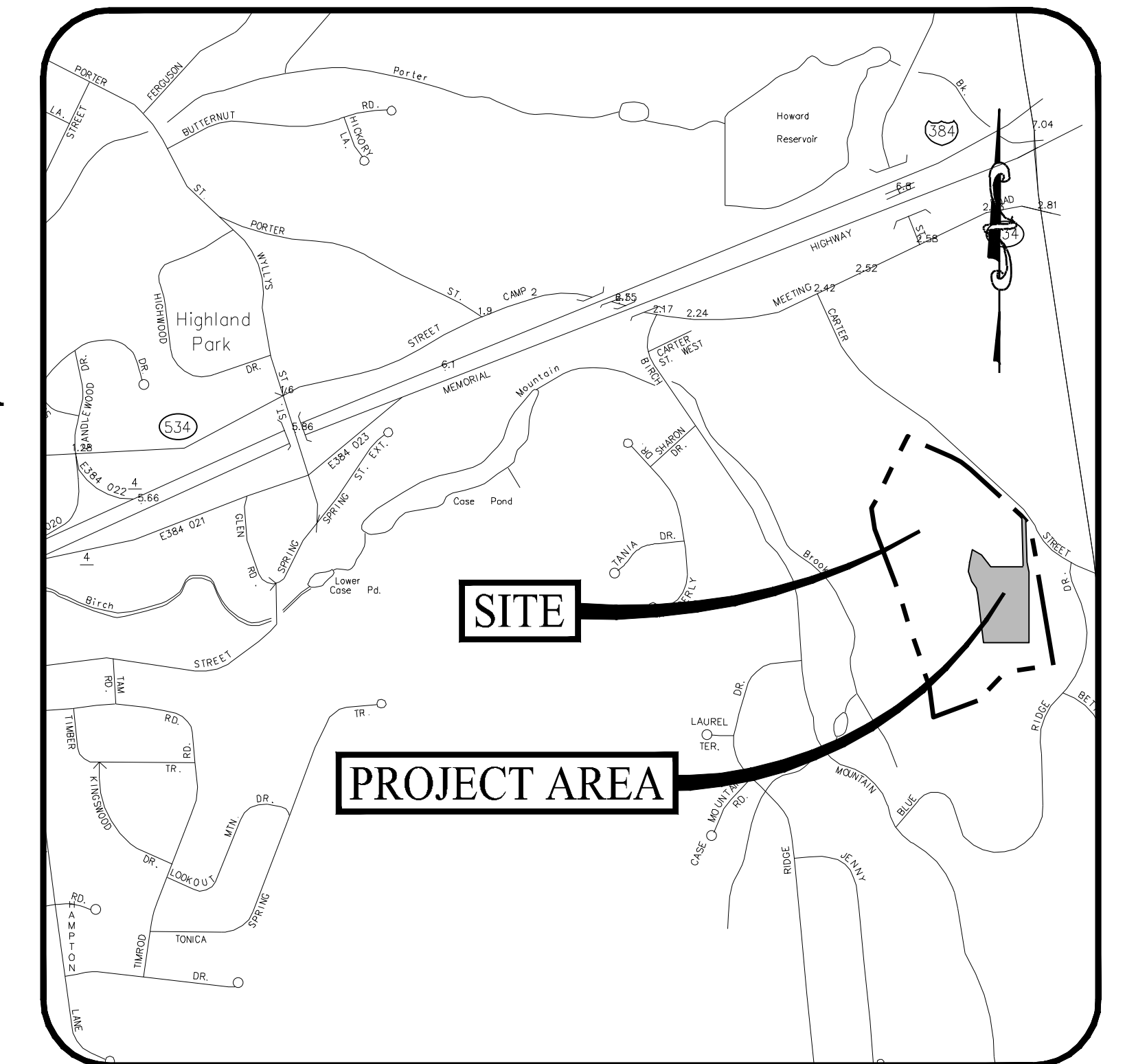


USGS MAP

SCALE: 1" = 1,000'

PROPOSED 0.99 MW SOLAR PHOTOVOLTAIC ARRAY

250 CARTER STREET
MANCHESTER, CONNECTICUT



LOCATION MAP

SCALE: 1" = 1,000'

PREPARED FOR:

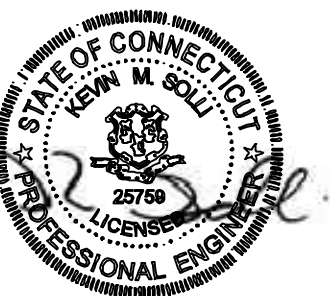


888 PROSPECT STREET, SUITE 200
LA JOLLA, CALIFORNIA

PREPARED BY:



501 MAIN STREET, MONROE, CONNECTICUT 06468
11 VANDERBILT AVENUE, NORWOOD, MASSACHUSETTS 02062
993 FARMINGTON AVENUE, WEST HARTFORD, CONNECTICUT 06107



OWNER

WELLS JACOBSON TRUST
MARGARET JACOBSON TRUST
143 BOULDER ROAD
MANCHESTER, CONNECTICUT 06040

APPLICANT

TRITEC AMERICAS, LLC
888 PROSPECT STREET, SUITE 200
LA JOLLA, CALIFORNIA 92307

PROPERTY INFORMATION

ADDRESS: 250 CARTER STREET, MANCHESTER, CONNECTICUT
MAP-BLOCK-LOT: 154-970-250
ZONE: RR
AREA: 841.08 AC
BOOK/PAGE: 3397/0065

SOIL SCIENTIST

WILLIAM KENNY, CPWS, PLA, ASLA
WILLIAM KENNY ASSOCIATES
195 TUNNIX HILL, CUTOFF SOUTH
FAIRFIELD, CT 06825
(203) 366-0588

ENGINEER OF RECORD

KEVIN SULLI, P.E., CPESC, LEED AP BD+C
LICENSE NO. 25759
SOLLI ENGINEERING, LLC
501 MAIN STREET
MONROE, CONNECTICUT 06468
(203) 880-5455

ELECTRICAL ENGINEER

PURE POWER ENGINEERING, INC.
111 RIVER STREET, SUITE 1110
HOBOKEN, NJ 07030
(201) 687-9975

LANDSCAPE ARCHITECT

MARY BLACKBURN, P.L.A.,
LICENSE CT NO. 1499
SOLLI ENGINEERING, LLC
501 MAIN STREET
MONROE, CONNECTICUT 06468
(203) 880-5455

SURVEYOR OF RECORD

STEPHAN M. GIUDICE, L.S. LICENSE NO. 70145
HARRY E. COLE & SON
876 SOUTH MAIN STREET
P.O. BOX 44
PLANTSVILLE, CT 06479
(203) 630-1406

DRAWING LIST

SHEET #	SHEET NAME	PLAN DATE	LATEST REVISION
0.00	COVER SHEET	01/15/24	04/19/24
-	PROPERTY & TOPOGRAPHIC SURVEY MAP	10/20/23	N/A
2.10	OVERALL SITE LAYOUT PLAN	01/15/24	04/19/24
2.11	SITE LAYOUT PLAN	01/15/24	04/19/24
2.21	GRADING AND DRAINAGE PLAN	01/15/24	04/19/24
2.31	SOIL EROSION & SEDIMENT CONTROL PLAN - PHASE 1	01/15/24	04/19/24
2.32	SOIL EROSION & SEDIMENT CONTROL PLAN - PHASE 2	01/15/24	04/19/24
2.41	SOIL EROSION & SEDIMENT CONTROL NOTES & DETAILS	01/15/24	04/19/24
3.01	CONSTRUCTION DETAILS	01/15/24	04/19/24
3.02	CONSTRUCTION DETAILS	01/15/24	04/19/24
3.02	ENVIRONMENTAL NOTES & DETAILS	01/15/24	04/19/24

Project:	
PROPOSED SOLAR PHOTOVOLTAIC ARRAY	
250 CARTER STREET MANCHESTER, CONNECTICUT	
Sheet Title:	Sheet #:
COVER SHEET	0.00

DRAWING NUMBER: 2379A and the date of the drawing: 10/20/23. All Engineering, LLC 230 Carter Street, Manchester, CT 06105. Project Name: 250 Carter Street, Manchester, CT 06105. Date: 10/20/23. 11:25 AM. OPERATING UNIT: 1000

LEGEND

- Existing utility pole
Existing light pole
Existing fire hydrant
Existing water valve
Existing gas valve
Existing underground pipe
Existing edge of pavement
Existing bituminous concrete lip curb
Existing well
Existing catch basin
Existing drainage manhole
Existing sanitary manhole
Existing utility box
Existing contour
Existing spot elevation
Existing iron pin
Existing drill hole
Existing monument

SURVEY NOTES:

- 1. This map has been prepared pursuant to the Regulation of Connecticut State Agencies Sections 20-300b-1 through 20-300b-20 and the "Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors, Inc. on September 26, 1996.
2. Type of survey performed: Property & Topographic Survey
3. Boundary determination category: Resurvey
4. Class of accuracy: Horizontal: A-2 Vertical: T-2
5. The intent of this map is to depict or note the position of boundaries with respect to: (A) locations of all boundary monumentation found or set; (B) Apparent improvements and features, including as a minimum: dwellings, barns, garages, sheds, driveways, roadways, surface utilities, visible bodies of water and swimming pools; (C) record easements and visible means of ingress and egress; (D) record and apparent means of ingress and egress; (E) lines of occupation, including as a minimum: fences, walls, hedges and yards; (F) deed restrictions pertaining to the location of buildings or other apparent improvements; (G) unresolved conflicts with record deed descriptions and maps; (H) all apparent boundary encroachments; and (I) monumentation required to be set at all corners created by a deflection angle of not less than 70 degrees between two consecutive courses at an intervals not to exceed 600 feet (180 meters) along the boundaries between said corners, except where natural or man-made monumentation defines or occupies the line.
6. Map References:
a.) "Resubdivision Amanda Drive Prepared for Derekseth Homes, Amanda Drive, Manchester, Connecticut; Scale: 1"=100'; Dated: October 26, 1999; Sheet 2 of 19 by Ed Lally and Associates Inc." Filed as Map 1257 at the M.L.R.
b.) "Plot Plan Birch Mountain II Prepared for Mary Catherine Development Company, Manchester, Connecticut; Scale: 1"=40'; Dated: 1/30/89 by Design Professionals, Inc." Filed as Book M27, Page 60 at the M.L.R.
c.) "Resubdivision Amanda Drive Prepared for Derekseth Homes, Amanda Drive, Manchester, Connecticut; Scale: 1"=100'; Dated: October 26, 1999; Sheet 4 of 19 by Ed Lally and Associates Inc." Filed as Map 1259 at the M.L.R.
d.) "Map of Highland Estates, Birch Mountain Road & Carter Street, Manchester, Connecticut; Scale: 1"=50'; Dated: March 23, 1967; Sheet 2 of 3 by Hayden L. Griswold, C.E." Filed as Book M13, Page 48 at the M.L.R.
e.) "Map of Highland Estates, Birch Mountain Road & Carter Street, Manchester, Connecticut; Scale: 1"=50'; Dated: March 23, 1967; Sheet 3 of 3 by Hayden L. Griswold, C.E." Filed as Book M9, Page 36 at the M.L.R.
f.) "Boundary Survey Prepared for John Vontell, Existing Boundary and Features, 143 Carter Street, Manchester, Connecticut; Scale: 1"=30'; Dated: May 22, 2014 by Rob Hellstrom Land Surveying LLC." Filed as Map 2311 in Drawer 16 at the M.L.R.
g.) "Subdivision Plan Prepared for Robert C. Dennison, Carter Street, Manchester, Connecticut; Scale: 1"=100'; Dated: 6/20/83; Last Revised: 6-21-1983 by Fuss & O'Neill." Filed as Book M22, Page 49 at the M.L.R.
7. Per agreement with property owner no boundary corners were set by this survey unless noted hereon. All monumentation found is depicted or noted hereon.
8. Zone: RR
9. Total area: 1,789,597 Sq. Ft. - 41.08 Acres
10. Owner: Wells Jacobson & Margaret Jacobson
11. Town of Manchester Assessors Map #97 Lot #250
12. Filed in Volume 3397, Page 65 of the Town Clerk's office.
13. Contour interval is two(2) feet.
14. Existing contours generated from field topography. (Implemented with Aerial Topography from UCONN Base)
15. This survey does not include the location of any underground improvements or encroachments, subsurface utility lines or buried debris. Nor does it necessarily reflect the existence of any waste dumps or hazardous materials. The underground items depicted or noted are approximate and are not guaranteed. Notify "CALL BEFORE YOU DIG" 1-800-922-4455 prior to any excavation operations.



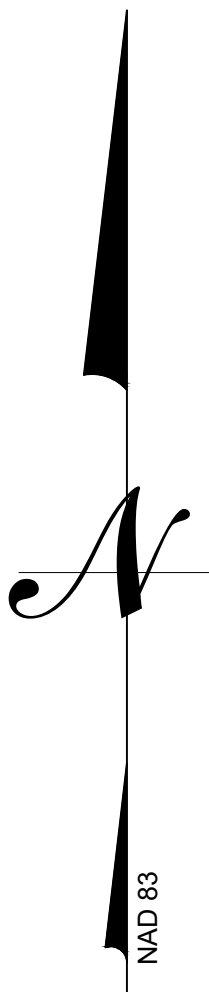
BENCHMARK
MAG. NAIL IN EVERSOURCE #6454
ELEV. = 654.68
(NAVD 88 Datum)

Wetlands Depicted are Field Located as Flagged by Ian T. Cole, Professional Registered Soil Scientist/Wetland Scientist on October 15, 2023

Table with columns for DATE and REVISION, containing a signature and registration information for Stephen M. Gaudin, L.S.

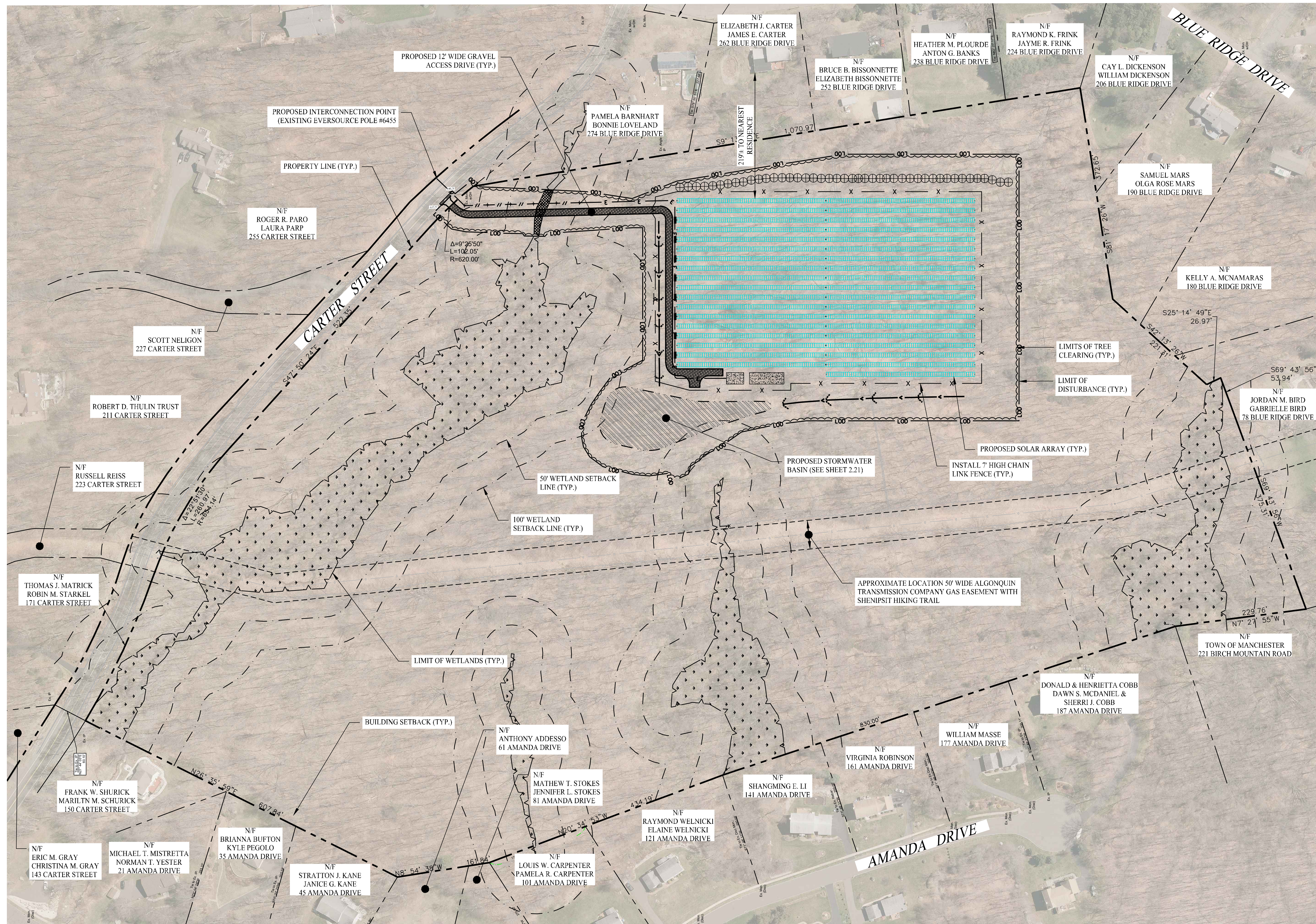
Property & Topographic Survey Map
Prepared For
SOLLI ENGINEERING, LLC
250 Carter Street
Manchester, Connecticut
October 20, 2023 Scale: 1" = 100'

cole
HARRY E. COLE & SON
engineering. surveying. planning.
876 South Main Street
P.O. Box 44
Plainville, CT 06479 - 0044
Tel: (860) 628-4484
Fax: (860) 620-0196
www.hccole.com

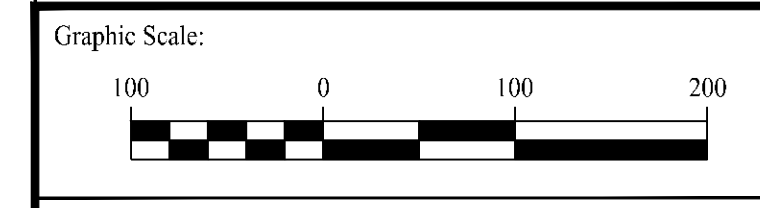




LEGEND	
	PROPERTY LINE
	LIMIT OF WETLANDS
	UPLAND REVIEW AREA
	STORMWATER BASIN AREA
	7' TALL CHAIN LINK FENCE
	TRINA 540W SOLAR MODULES
	UTILITY POLE
	OVERHEAD ELECTRIC LINE
	ELECTRIC CONDUIT
	LIMIT OF TREE CLEARING
	LIMIT OF DISTURBANCE
	GRASS LINED SWALE
	GRAVEL ACCESS DRIVE
	CONCRETE EQUIPMENT PAD
	WETLAND DISTURBANCE AREA
	STORMWATER BASIN
	EVERGREEN TREE
	STONE CHECK DAM

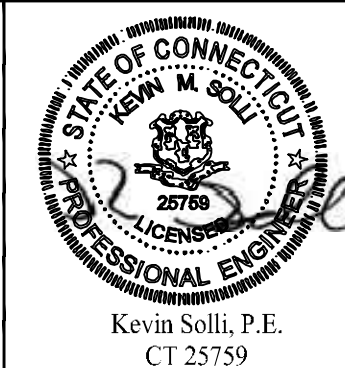


Rev. #	Date	Description
1	04/19/24	CSC INTERROGATORIES



SOLLI ENGINEERING
 501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
 11 Vanderbilt Ave., Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By:	CSH
Checked By:	EEL
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 100'



PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title:	Sheet #:
OVERALL SITE LAYOUT PLAN	2.10

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PLANTING SCHEDULE

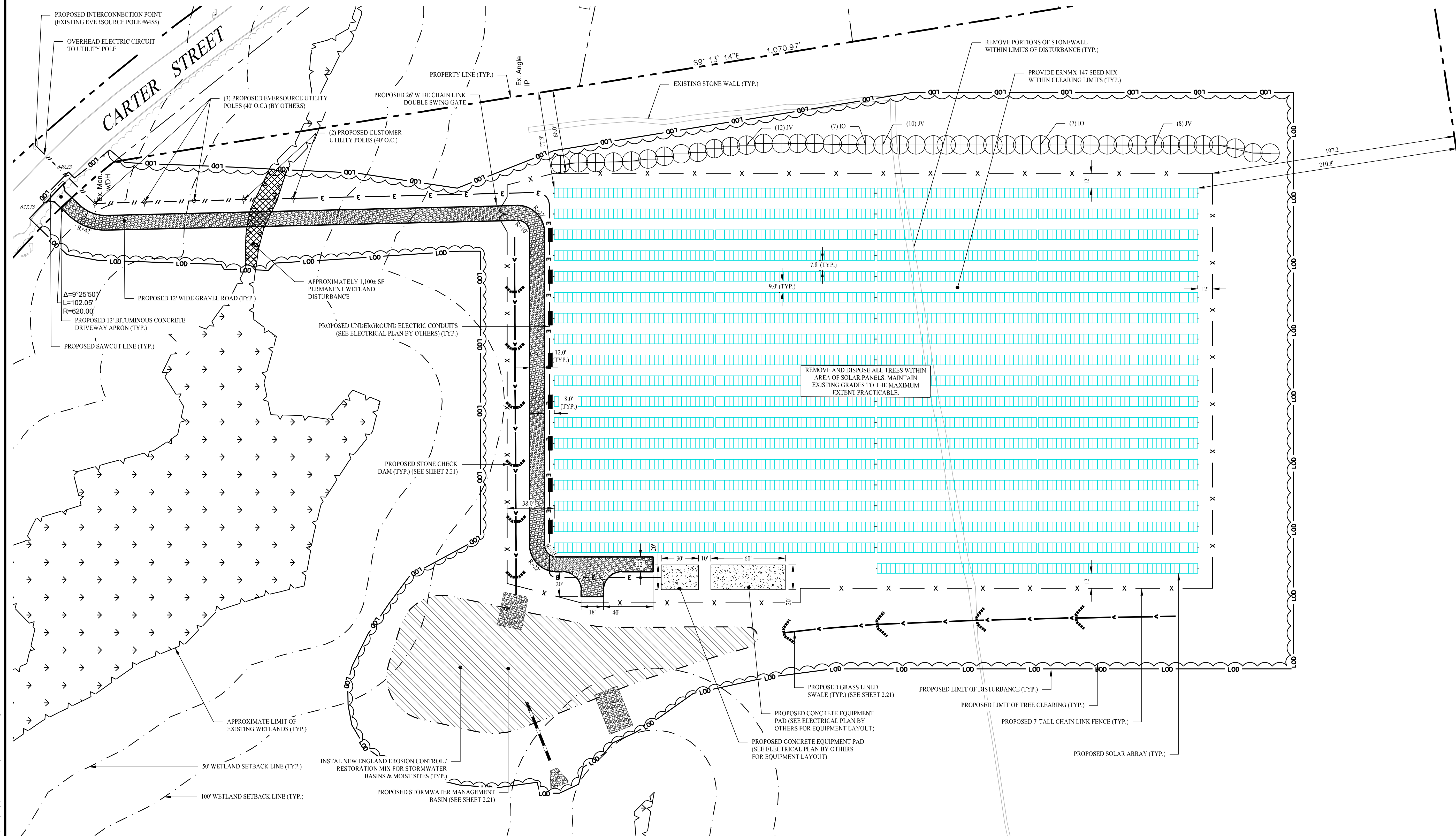
TREES	KEY	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	COMMENTS
	IO	14	ILEX OPACA	AMERICAN HOLLY	B&B	7-8' HT	FULL, EXTRA HEAVY
	JV	30	JUNIPERUS VIRGINIANA	EASTERN RED-CEDAR	B&B	7-8' HT	FULL, EXTRA HEAVY

SOLAR ARRAY SYSTEM INFORMATION

	TOTAL
SIZE DC	1,399 MW
SIZE AC	0,999 MW
INVERTER LOAD RATIO	1.40
MODULE TYPE	TRACKING TRINASOLAR TSM-540-DEG19C.20 (540W)
MODULE QUANTITY	2,590
INVERTER	SUNGROW SG125HV 125KW
INVERTER QUANTITY	8
UTILITY	EVERSOURCE

GENERAL NOTES

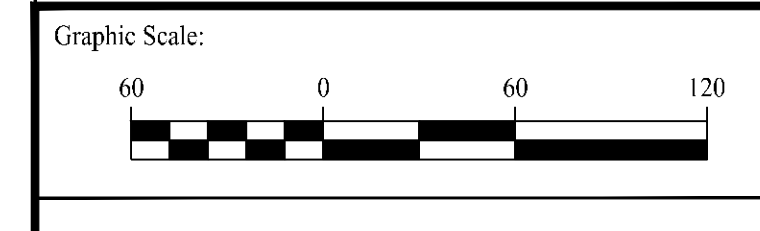
- THESE PLANS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT FOR CONSTRUCTION. NO CONSTRUCTION OR DEMOLITION SHALL BEGIN UNTIL FINAL APPROVAL OF THIS PLAN IS GRANTED.
- ALL PROPOSED SITE WORK TO BE COMPLETED IN ACCORDANCE WITH ALL PERMITS, APPROVALS AND CONDITIONS OF APPROVALS ISSUED BY LOCAL, STATE AND/OR FEDERAL REVIEWING AGENCIES.
- EXISTING BOUNDARY, TOPOGRAPHY AND SITE CONDITIONS INFORMATION TAKEN FROM A PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY MAP PREPARED FOR SOLLI ENGINEERING, 250 CARTER STREET, MANCHESTER, CONNECTICUT," DATED OCTOBER 20, 2023, SCALE: 1"=100', BY HARRY E. COLE & SONS, 676 SOUTH MAIN STREET, PLANTVILLE, CT 06479.
- REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
- THE SUBJECT PARCEL CONSISTS OF A TOTAL AREA OF APPROXIMATELY 41.08± ACRES, LOCATED IN THE RR ZONING DISTRICT IN THE TOWN OF MANCHESTER, CONNECTICUT.
- WETLAND BOUNDARY DETERMINED AND LOCATED BY FIELD SURVEY BY WILLIAM KENNY ASSOCIATES ON JULY 26 & 27, 2023.
- THE SITE IS NOT LOCATED WITHIN FEMA DESIGNATED FLOOD HAZARD AREA, AS DEPICTED ON F.I.R.M. MAP NUMBER 0903C0413F, WITH EFFECTIVE DATE SEPTEMBER 26, 2008.
- ALL CONSTRUCTION SHALL COMPLY WITH THE TOWN OF MANCHESTER, CONNECTICUT DEEP, AND CONNECTICUT DEPARTMENT OF TRANSPORTATION STANDARDS AND SPECIFICATIONS IN THE ABOVE REFERENCED INCREASING HIERARCHY. IF SPECIFICATIONS ARE IN CONFLICT, THE MORE STRINGENT SPECIFICATION SHALL APPLY. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE OSHA, FEDERAL, STATE AND LOCAL REGULATIONS.
- PRIOR TO DEMOLITION OR CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" 72 HOURS BEFORE THE COMMENCEMENT OF WORK AT (800) 922-4455 AND VERIFY ALL UTILITY AND STORM DRAINAGE SYSTEM LOCATIONS. INFORMATION ON EXISTING UTILITIES AND STORM DRAINAGE SYSTEMS HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING UTILITY PROVIDER AND MUNICIPAL RECORD MAPS AND/OR FIELD SURVEY AND IS NOT GUARANTEED CORRECT OR COMPLETE. UTILITIES AND STORM DRAINAGE SYSTEMS ARE SHOWN TO ALERT THE CONTRACTOR TO THEIR PRESENCE AND THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS AND ELEVATIONS OF ALL UTILITIES AND STORM DRAINAGE SYSTEMS INCLUDING SERVICES.
- SHOULD ANY UNCHARTED OR INCORRECTLY CHARTED, EXISTING PIPING OR OTHER UTILITY BE UNCOVERED DURING EXCAVATION, CONSULT THE CIVIL ENGINEER IMMEDIATELY FOR DIRECTIONS BEFORE PROCEEDING FURTHER WITH WORK IN THIS AREA.
- THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY ZONING PERMITS REQUIRED BY GOVERNMENT AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL LOCAL AND STATE PERMITS. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROLS NECESSARY FOR THIS PROJECT.
- THE CONTRACTOR SHALL RESTORE ANY DRAINAGE STRUCTURE, PIPE, UTILITY, PAVEMENT, CURBS, SIDEWALKS, LANDSCAPED AREAS OR SIGNAGE DISTURBED DURING CONSTRUCTION TO THEIR ORIGINAL CONDITION OR BETTER, AS APPROVED BY THE CIVIL ENGINEER OF RECORD. DURING CONSTRUCTION CONTRACTOR IS TO HAVE THE SITE MAINTAINED FREE OF ALL TRASH, LITTER, DEBRIS AND OVERGROWN VEGETATION.
- THE OWNER SHALL BE RESPONSIBLE FOR MAINTAINING THE SITE FREE OF ALL TRASH, LITTER, DEBRIS AND OVERGROWN VEGETATION THROUGHOUT CONSTRUCTION.
- ALTERNATIVE METHODS AND PRODUCTS OTHER THAN THOSE SPECIFIED MAY BE USED IF REVIEWED AND APPROVED BY THE OWNER, CIVIL ENGINEER, AND REGULATORY AGENCY PRIOR TO INSTALLATION DURING THE BIDDING PROCESS.



LEGEND

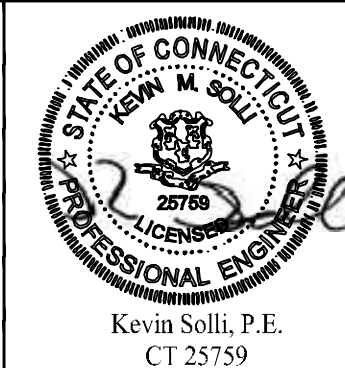
- PROPERTY LINE
- LIMIT OF WETLANDS
- UPLAND REVIEW AREA
- STORMWATER BASIN AREA
- 7' TALL CHAIN LINK FENCE
- TRINA 540W SOLAR MODULES
- UTILITY POLE
- OVERHEAD ELECTRIC LINE
- ELECTRIC CONDUIT
- LIMIT OF TREE CLEARING
- LIMIT OF DISTURBANCE
- GRASS LINED SWALE
- GRAVEL ACCESS DRIVE
- CONCRETE EQUIPMENT PAD
- WETLAND DISTURBANCE AREA
- STORMWATER BASIN
- EVERGREEN TREE

Rev. #:	Date	Description
1	04/19/24	CSC INTERROGATORIES



SOLLI ENGINEERING
 501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
 11 Vandalia Ave., Storwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

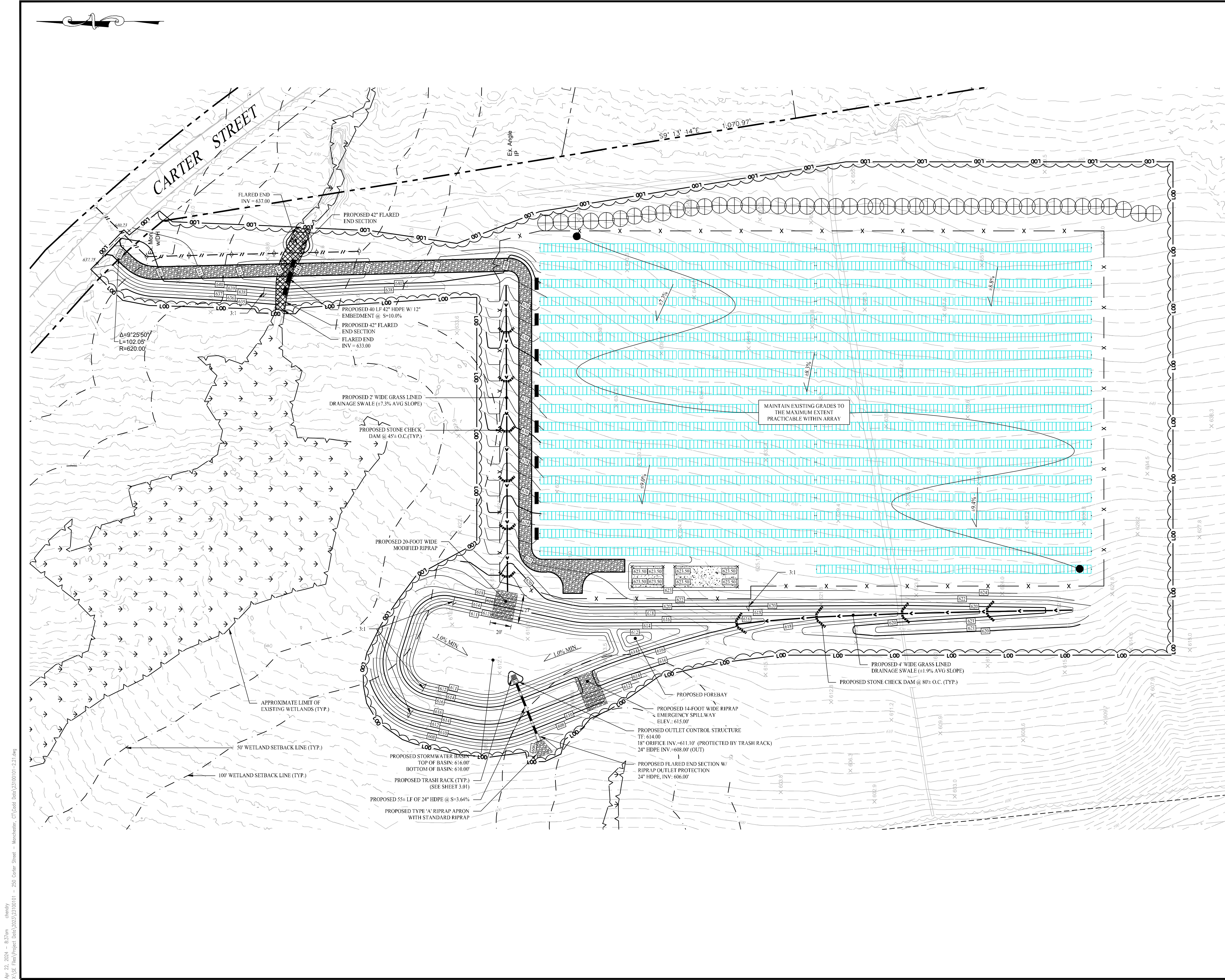
Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 60'



PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title:	SITE LAYOUT PLAN
Sheet #:	2.11

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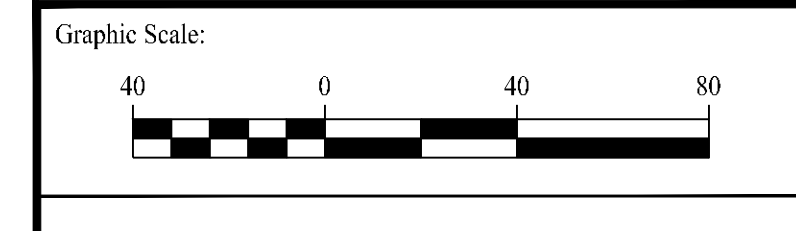
GENERAL NOTES

- REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
- THIS DRAWING IS INTENDED TO DESCRIBE GRADING AND DRAINAGE ONLY. REFER TO SITE PLAN FOR GENERAL INFORMATION, AND DETAIL SHEETS FOR DETAILS.
- THE CONTRACTOR SHALL PRESERVE EXISTING VEGETATION WHERE POSSIBLE AND/OR AS NOTED ON DRAWINGS. REFER TO EROSION CONTROL PLAN FOR LIMIT OF DISTURBANCE AND EROSION CONTROL NOTES.
- TOPSOIL SHALL BE STRIPPED AND STOCKPILED ON SITE FOR USE IN FINAL LANDSCAPING.
- THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS REQUIRED BY GOVERNMENT AND LOCAL AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS FROM THE TOWN OF MANCHESTER REQUIRED TO PERFORM ALL WORK, INCLUDING FOR STREET CUTS AND CONNECTIONS TO EXISTING UTILITIES. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROL NECESSARY FOR THIS WORK.
- ALL DISTURBANCE INCURRED TO TOWN OR STATE PROPERTY DUE TO CONSTRUCTION SHALL BE RESTORED TO ITS PREVIOUS CONDITION OR BETTER, TO THE SATISFACTION OF THE TOWN OF BETHANY AUTHORITY.
- IF IMPACTED OR CONTAMINATED SOIL IS ENCOUNTERED BY THE CONTRACTOR, THE CONTRACTOR SHALL SUSPEND EXCAVATION WORK OF IMPACTED SOIL AND NOTIFY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT PRIOR TO PROCEEDING WITH FURTHER WORK IN THE IMPACTED SOIL LOCATION UNTIL FURTHER INSTRUCTED BY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT.
- ALL PIPE LENGTHS ARE HORIZONTAL DISTANCES AND ARE APPROXIMATE.
- ALL DISTURBED AREAS TO BE RESEDED WITH ERMXX-147 WITHIN THE ARRAY AREA. ERMXX-610 WILL BE USED OUTSIDE FENCELINE AND IN NON-ARRAY AREAS.

LEGEND

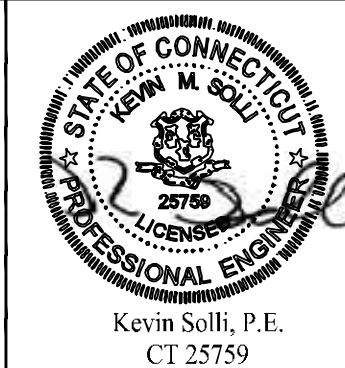
- PROPERTY LINE
- MAJOR CONTOURS
- MINOR CONTOURS
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED SPOT ELEVATION
- EXISTING SPOT ELEVATION
- STORM DRAIN PIPE
- RIP RAP SPILLWAY
- OUTLET CONTROL STRUCTURE
- FLARED END SECTION
- RIPRAP OUTLET PROTECTION
- PERMANENT WETLAND DISTURBANCE AREA

1	04/19/24	CSC INTERROGATORIES
Rev. #:	Date	Description



SOLLI ENGINEERING
 501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
 11 Vanierbill Ave, Norwood, MA 02062 T: (781) 552-8491 F: (203) 880-9695

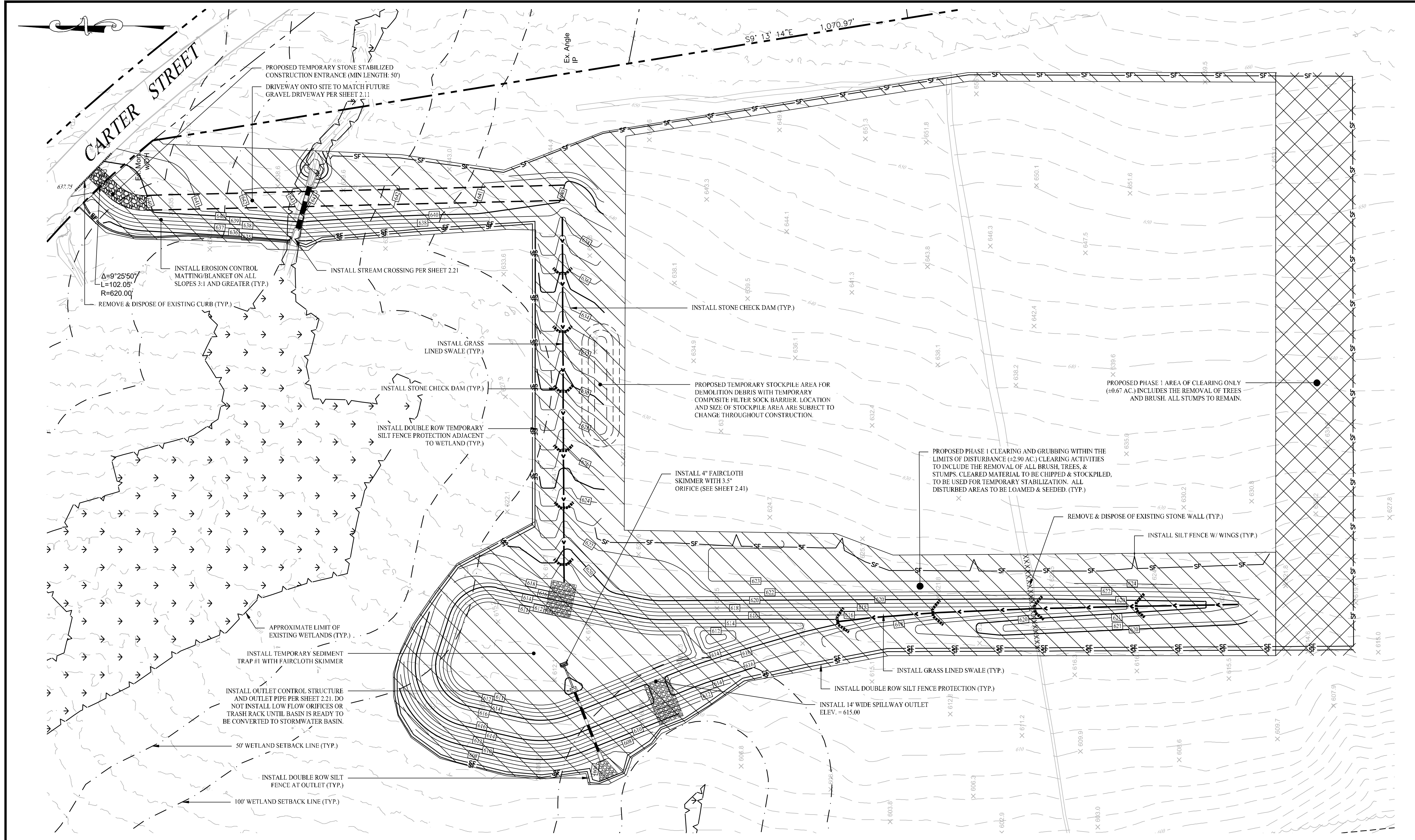
Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 40'



PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title:	Sheet #:
GRADING & DRAINAGE PLAN	2.21

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LEGEND

	PROPERTY LINE
	RIGHT-OF-WAY LINE
	ADJOINING LOT LINE
	SILT FENCE PROTECTION
	CURB REMOVAL
	FENCE / ROCK WALL REMOVAL
	TEMPORARY SEDIMENT TRAP / BASIN
	STONE CHECK DAM
	MATERIAL STOCKPILE AREA
	CONSTRUCTION ENTRANCE
	DIVERSION SWALE/BERM
	EROSION CONTROL MATTING
	PHASE 1 CLEARING AND GRUBBING
	PHASE 1 CLEARING ONLY (STUMPS TO REMAIN)

CONSTRUCTION SEQUENCE (PHASE I)

THE FOLLOWING SUGGESTED SEQUENCE OF CONSTRUCTION ACTIVITIES IS PROJECTED BASED UPON ENGINEERING JUDGEMENT AND BEST MANAGEMENT PRACTICES. THE CONTRACTOR MAY ELECT TO ALTER THE SEQUENCING TO BEST MEET THE CONSTRUCTION SCHEDULE, THE EXISTING SITE ACTIVITIES AND WEATHER CONDITIONS. SHOULD THE CONTRACTOR ALTER THE CONSTRUCTION SEQUENCE OR ANY EROSION AND SEDIMENTATION CONTROL MEASURES THEY SHALL MODIFY THE STORMWATER POLLUTION CONTROL PLAN ("SWPCP") AS REQUIRED BY THE GENERAL PERMIT. MAJOR CHANGES IN SEQUENCING AND/OR METHODS MAY REQUIRE REGULATORY APPROVAL PRIOR TO IMPLEMENTATION.

- PHASE I:**
1. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING. PHYSICALLY FLAG THE LIMITS OF DISTURBANCE IN THE FIELD AS NECESSARY TO FACILITATE THE PRE-CONSTRUCTION MEETING.
 2. CONDUCT A PRE-CONSTRUCTION MEETING TO DISCUSS THE PROPOSED WORK AND EROSION AND SEDIMENTATION CONTROL MEASURES. THE MEETING SHOULD BE ATTENDED BY THE OWNER, THE OWNER'S REPRESENTATIVE(S), THE GENERAL CONTRACTOR, DESIGNATED SUB-CONTRACTORS AND THE PERSON, OR PERSONS, RESPONSIBLE FOR THE IMPLEMENTATION, OPERATION, MONITORING AND MAINTENANCE OF THE EROSION AND SEDIMENTATION MEASURES. THE CONSTRUCTION PROCEDURES FOR THE ENTIRE PROJECT SHALL BE REVIEWED AT THIS MEETING.
 3. NOTIFY CALL BEFORE YOU DIG AT 811 AS REQUIRED, PRIOR TO THE START OF CONSTRUCTION.
 4. REMOVE EXISTING IMPEDIMENTS AS NECESSARY AND PROVIDE MINIMAL DISTURBANCE TO INSTALL THE REQUIRED CONSTRUCTION ENTRANCE.
 5. INSTALL STREAM CROSSING & ACCESS DRIVE.
 6. INSTALL SILT FENCE / PERIMETER SEC MEASURES AS PROPOSED (CLEAR ONLY THOSE AREAS NECESSARY TO INSTALL SEC MEASURES).
 7. PREPARE TEMPORARY PARKING AND STORAGE AREAS. ESTABLISH MATERIAL STOCKPILE AREA AND INSTALL SEC BARRIER SURROUNDING PILE.
 8. COMPLETE PHASE 1 CLEARING & GRUBBING FOR INSTALLATION OF SEDIMENT TRAP AND GRASS LINED SWALES PER DESIGN PLANS. STABILIZE OPEN SOILS WITH SPECIFIED SEED MIXES.

SEDIMENT & EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT ALL SEDIMENT AND EROSION CONTROLS IN ACCORDANCE WITH THE 2024 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL, LATEST EDITION, IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND AS DIRECTED BY THE TOWN OF MANCHESTER, PERMITTEE, AND/OR SWPCP MONITOR. ALL PERIMETER SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CLEARING AND GRUBBING AND DEMOLITION OPERATIONS.
2. THESE DRAWINGS ARE ONLY INTENDED TO DESCRIBE THE SEDIMENT AND EROSION CONTROL MEASURES FOR THIS SITE. SEE CONSTRUCTION SEQUENCE FOR ADDITIONAL INFORMATION. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THE EROSION & SEDIMENT CONTROL PLAN ARE SHOWN AS REQUIRED BY THE ENGINEER OF RECORD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL EROSION CONTROL MEASURES ARE CONFIGURED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION OF SOILS AND PREVENT THE TRANSPORT OF SEDIMENTS AND OTHER POLLUTANTS TO STORM DRAINAGE SYSTEMS AND/OR WATERCOURSES. ACTUAL SITE CONDITIONS OR SEASONAL AND CLIMATIC CONDITIONS MAY WARRANT ADDITIONAL CONTROLS OR CONFIGURATIONS, AS REQUIRED, AND AS DIRECTED BY THE PERMITTEE AND/OR SWPCP MONITOR. REFER TO SHEET PLAN FOR GENERAL INFORMATION AND OTHER CONTRACT PLANS FOR APPROPRIATE INFORMATION.
3. A BOND OR LETTER OF CREDIT MAY BE REQUIRED TO BE POSTED WITH THE GOVERNING AUTHORITY FOR THE EROSION CONTROL INSTALLATION AND MAINTENANCE.
4. THE CONTRACTOR SHALL APPLY THE MINIMUM EROSION & SEDIMENT CONTROL MEASURES SHOWN ON THE PLAN IN CONJUNCTION WITH CONSTRUCTION SEQUENCING, SUCH THAT ALL ACTIVE WORK ZONES ARE PROTECTED. ADDITIONAL AND/OR ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES MAY BE INSTALLED DURING THE CONSTRUCTION PERIOD IF FOUND NECESSARY BY THE CONTRACTOR, OWNER, ENGINEER OF RECORD, MUNICIPAL OFFICIALS, OR ANY GOVERNING AGENCY. THE CONTRACTOR SHALL CONTACT THE OWNER AND APPROPRIATE GOVERNING AGENCIES FOR APPROVAL IF ALTERNATIVE CONTROLS OTHER THAN THOSE SHOWN ON THE PLANS ARE PROPOSED BY THE CONTRACTOR.
5. THE CONTRACTOR SHALL TAKE EXTREME CARE DURING CONSTRUCTION SO AS NOT TO DISTURB UNPROTECTED WETLAND AREAS OR INSTALLED SEDIMENTATION AND EROSION CONTROL MEASURES. THE CONTRACTOR SHALL INSPECT ALL SEDIMENT AND EROSION CONTROLS WEEKLY AND WITHIN 24 HOURS OF A STORM WITH A RAINFALL AMOUNT OF 0.25 INCHES OR GREATER TO VERIFY THAT THE CONTROLS ARE OPERATING PROPERLY AND MAKE REPAIRS AS NECESSARY IN A TIMELY MANNER.
6. THE CONTRACTOR SHALL KEEP A SUPPLY OF EROSION CONTROL, MATERIAL (SILT FENCE, COMPOSITE FILTER SOCK, EROSION CONTROL BLANKET, ETC) ON-SITE FOR PERIODIC MAINTENANCE AND EMERGENCY REPAIRS.
7. ALL FILL MATERIAL PLACED ADJACENT TO ANY WETLAND AREA SHALL BE GOOD QUALITY, WITH LESS THAN 5% FINES PASSING THROUGH A #200 SIEVE (BANK RUN), SHALL BE PLACED IN MAXIMUM ONE FOOT LIFTS, AND SHALL BE COMPACTED TO 95% MAX. DRY DENSITY MODIFIED PROCTOR OR AS SPECIFIED IN THE CONTRACT SPECIFICATIONS.
8. PROTECT EXISTING TREES THAT ARE TO BE SAVED BY FENCING, ORANGE SAFETY FENCE, CONSTRUCTION TAPE, OR EQUIVALENT FENCING TAPE. ANY LIMB TRIMMING SHOULD BE DONE AFTER CONSULTATION WITH AN ARBORIST AND BEFORE CONSTRUCTION BEGINS IN THAT AREA. FENCING SHALL BE MAINTAINED AND REPAIRED DURING CONSTRUCTION.
9. CONSTRUCTION ENTRANCES (ANTI-TRACKING PADS) SHALL BE INSTALLED PRIOR TO ANY SITE EXCAVATION OR CONSTRUCTION ACTIVITY AND SHALL BE MAINTAINED THROUGHOUT THE DURATION OF ALL CONSTRUCTION IF REQUIRED. THE LOCATION OF THE TRACKING PADS MAY CHANGE AS VARIOUS PHASES OF CONSTRUCTION ARE COMPLETED. CONTRACTOR SHALL ENSURE THAT ALL VEHICLES EXITING THE SITE ARE PASSING OVER THE ANTI-TRACKING PADS PRIOR TO EXITING.
10. ALL CONSTRUCTION SHALL BE CONTAINED WITHIN THE LIMIT OF DISTURBANCE, WHICH SHALL BE MARKED WITH SILT FENCE, SAFETY FENCE, HAY BALES, RIBBONS, OR OTHER MEANS PRIOR TO CLEARING. CONSTRUCTION ACTIVITY SHALL REMAIN ON THE UPHILL SIDE OF THE SEDIMENT BARRIER UNLESS WORK IS SPECIFICALLY CALLED FOR ON THE DOWNHILL SIDE OF THE BARRIER.
11. NO CUT OR FILL SLOPES SHALL EXCEED 2:1 EXCEPT WHERE STABILIZED BY ROCK FACED EMBANKMENTS OR EROSION CONTROL BLANKETS. ALL SLOPES SHALL BE SEEDED AND BANKS WILL BE STABILIZED IMMEDIATELY UPON COMPLETION OF FINAL GRADING UNTIL TURF IS ESTABLISHED.
12. DIRECT ANY DEWATERING PUMP DISCHARGE TO A SEDIMENT CONTROL DEVICE CONFORMING TO THE GUIDELINES WITHIN THE APPROVED LIMIT OF DISTURBANCE IF REQUIRED. DISCHARGE TO STORM DRAINS OR SURFACE WATERS FROM SEDIMENT CONTROLS SHALL BE CLEAR AND APPROVED BY THE PERMITTEE OR MUNICIPALITY.
13. THE CONTRACTOR SHALL MAINTAIN A CLEAN CONSTRUCTION SITE AND SHALL NOT ALLOW THE ACCUMULATION OF RUBBISH OR CONSTRUCTION DEBRIS ON THE SITE. PROPER SANITARY DEVICES SHALL BE MAINTAINED ON-SITE AT ALL TIMES AND SECURED APPROPRIATELY. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID THE SPILLAGE OF FUEL OR OTHER POLLUTANTS ON THE CONSTRUCTION SITE AND SHALL ADHERE TO ALL APPLICABLE POLICIES AND REGULATIONS RELATED TO SPILL PREVENTION AND RESPONSE/CONTAINMENT.
14. MINIMIZE LAND DISTURBANCES. SEED AND MULCH DISTURBED AREAS WITH TEMPORARY MIX AS SOON AS PRACTICABLE (2 WEEK MAXIMUM UNSTABILIZED PERIOD) USING PERENNIAL RYEGRASS AT 40 LBS PER ACRE. MULCH ALL CUT AND HILL SLOPES AND SWALES WITH LOOSE HAY AT A RATE OF 2 TONS PER ACRE. IF NECESSARY, REPLACE LOOSE HAY ON SLOPES WITH EROSION CONTROL BLANKETS OR JUTE CLOTH. MODERATELY GRADED AREAS, ISLANDS, AND TEMPORARY CONSTRUCTION STAGING AREAS MAY BE HYDROSEEDED WITH TACKIFIER.
15. SWEEP AFFECTED PORTIONS OF OFF SITE ROADS ONE OR MORE TIMES A DAY (OR LESS FREQUENTLY IF TRACKING IS NOT A PROBLEM) DURING CONSTRUCTION. FOR DUST CONTROL, PERIODICALLY MOISTEN EXPOSED SOIL SURFACES WITH WATER ON UNPAVED TRAVELWAYS TO KEEP THE TRAVELWAYS DAMP. CALCIUM CHLORIDE MAY ALSO BE APPLIED TO ACCESS ROADS. DUMP TRUCK LOADS EXITING THE SITE SHALL BE COVERED.
16. VEGETATIVE ESTABLISHMENT SHALL OCCUR ON ALL DISTURBED SOIL, UNLESS THE AREA IS UNDER ACTIVE CONSTRUCTION. IT IS COVERED IN STONE OR SCHEDULED FOR PAVING WITHIN 30 DAYS. TEMPORARY SEEDING OR NON-LIVING SOIL PROTECTION OF ALL EXPOSED SOILS AND SLOPES SHALL BE INITIATED WITHIN THE FIRST 7 DAYS OF SUSPENDING WORK IN AREAS TO BE LEFT LONGER THAN 30 DAYS.
17. MAINTAIN ALL PERMANENT AND TEMPORARY SEDIMENT CONTROL DEVICES IN EFFECTIVE CONDITION THROUGHOUT THE CONSTRUCTION PERIOD. UPON COMPLETION OF WORK SWEEP CONCRETE PADS, CLEAN THE STORMWATER MANAGEMENT SYSTEMS AND REMOVE ALL TEMPORARY SEDIMENT CONTROLS ONCE THE SITE IS FULLY STABILIZED AND APPROVAL HAS BEEN RECEIVED FROM PERMITTEE OR THE MUNICIPALITY.
18. SEEDING MIXTURES SHALL BE FUZZ & BUZZ MIX - PREMIUM - ERNMX-147, OR APPROVED EQUAL. NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR STORMWATER BASINS & MOIST SITES, OR APPROVED EQUAL, SHALL BE UTILIZED ON THE BOTTOM OF THE BASIN & FUZZ & BUZZ MIX - PREMIUM - ERNMX-147, OR APPROVED EQUAL, ON THE SIDE SLOPES OF THE BASIN. SEE SHEET DN-2 FOR ALL SEED MIXTURES.
19. REFER TO SHEET 2.41 FOR SEDIMENT & EROSION CONTROL NARRATIVE & DETAILS.

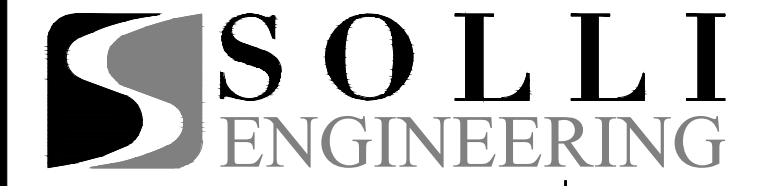
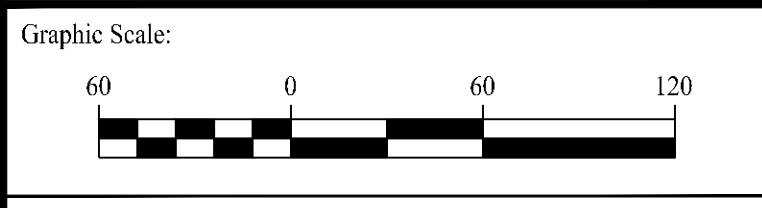
CONSTRUCTION OPERATION & MAINTENANCE PLAN

E&S MEASURE	INSPECTION SCHEDULE	MAINTENANCE REQUIRED
CONSTRUCTION ENTRANCE	DAILY	PLACE ADDITIONAL STONE, EXTEND THE LENGTH OR REMOVE AND REPLACE THE STONE. CLEAN PAVED SURFACES OF TRACKED SEDIMENT.
COMPOSITE FILTER SOCK	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED.
SILT FENCE	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED. REMOVE SILT WHEN IT REACHES 1/2 THE HEIGHT OF THE FENCE.
TOPSOIL/BORROW STOCKPILES	DAILY	REPAIR/REPLACE SEDIMENT BARRIERS AS NECESSARY.
TEMPORARY SOIL PROTECTION	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR ERODED OR BARE AREAS IMMEDIATELY. RESEED AND MULCH.

TEMPORARY SEDIMENT TRAP CALCULATIONS

TRAP NUMBER	DRAINAGE AREA (AC)	R10 STORAGE VOLUME (CF)	R10 WET VOLUME (CF)	BOTTOM ELEVATION (FT)	WET ELEVATION (FT)	DRY ELEVATION (FT)	TOP ELEVATION (FT)	WET VOL PROVIDED (CF)	DRY VOLUME PROVIDED (CF)	TOTAL VOLUME PROVIDED (CF)
1	2.35	8,503	4,251	611.00	612.00	615.00	616.00	14,044	42,650	56,694

1	04/19/24	CSC INTERROGATORIES
Rev. #:	Date	Description



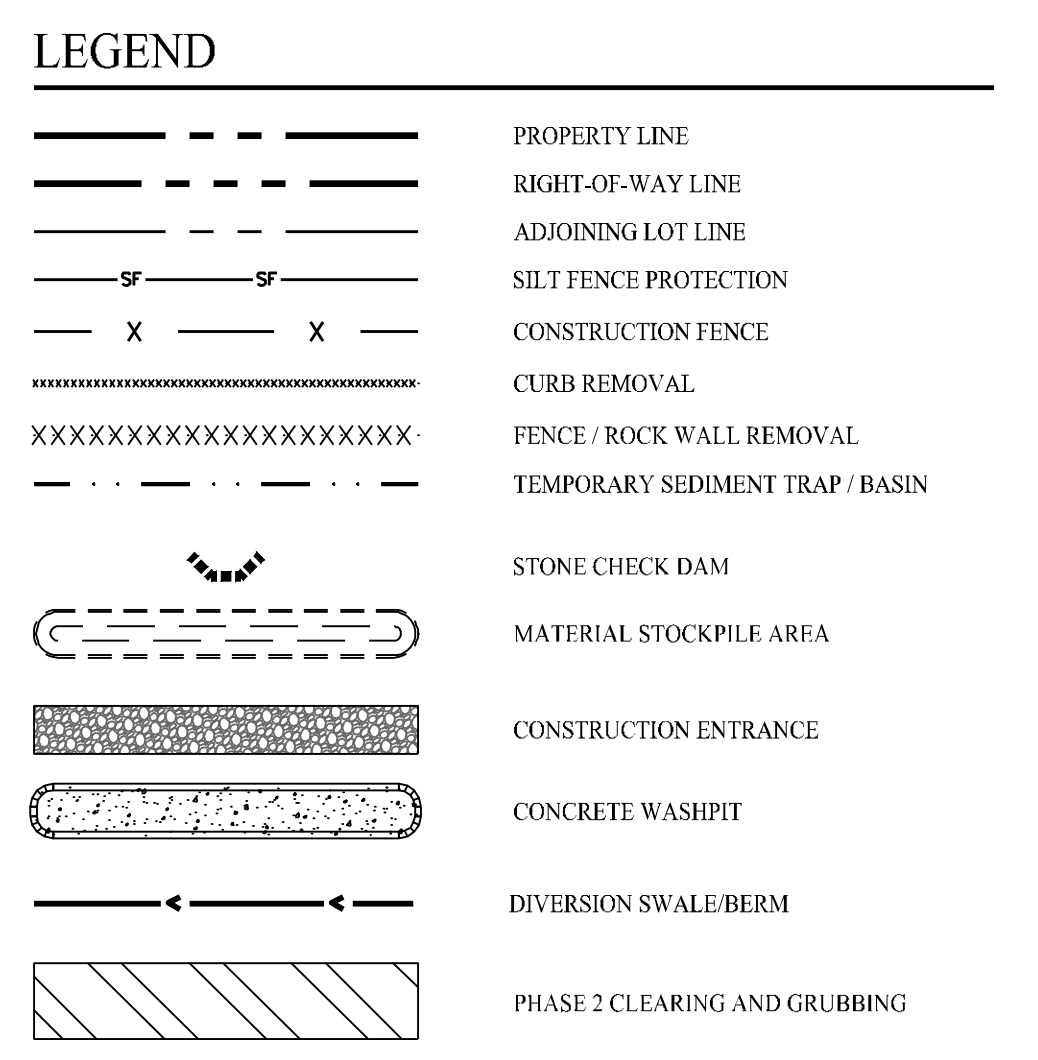
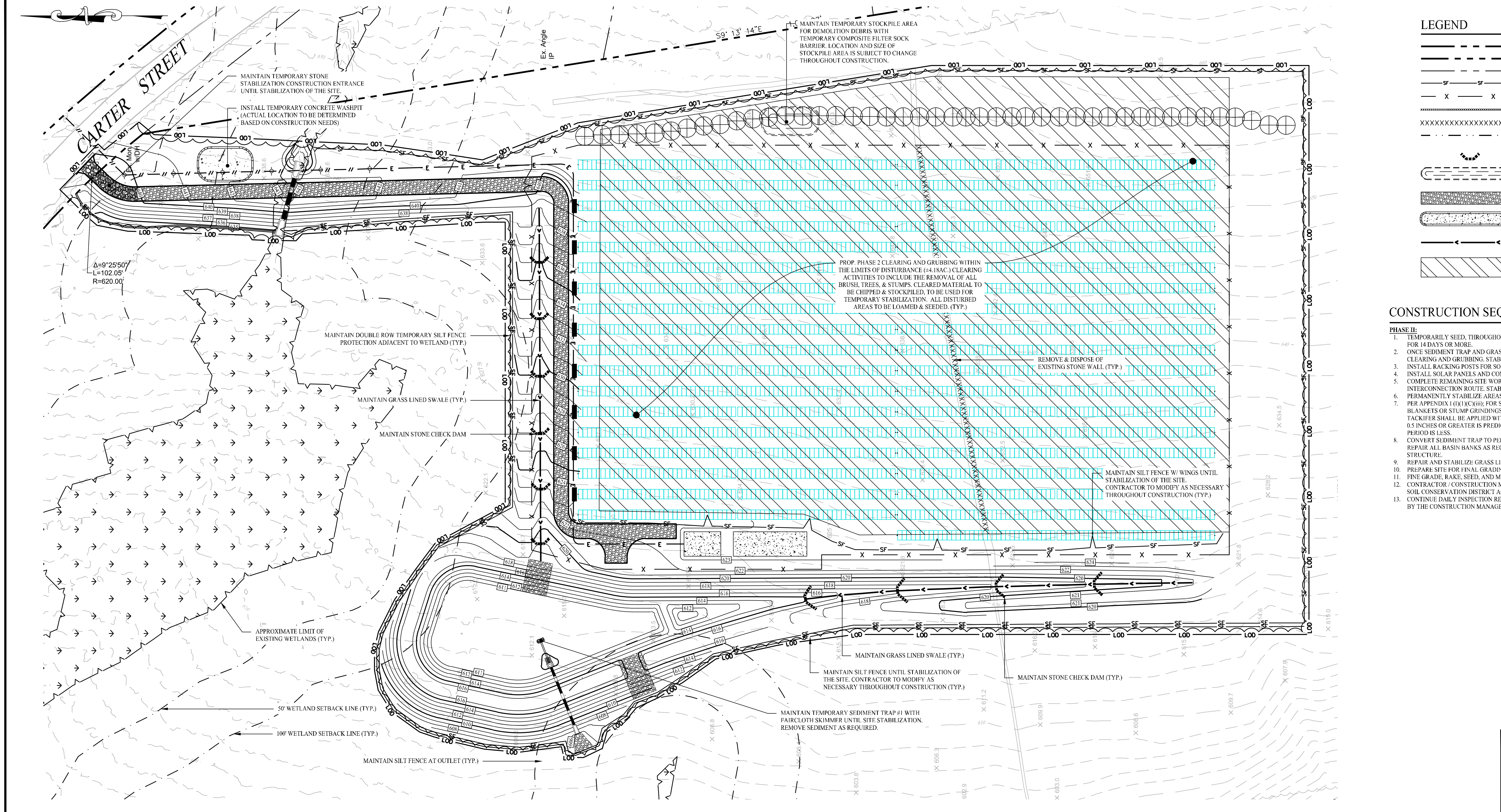
501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
11 Vanierbill Ave, Norwood, MA 02062 T: (781) 552-8491 F: (203) 880-9695

Drawn By:	SFU
Checked By:	AWC
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 60'
Project:	



PROPOSED SOLAR PHOTOVOLTAIC ARRAY
250 CARTER STREET
MANCHESTER, CONNECTICUT

Sheet Title:	SOIL EROSION & SEDIMENT CONTROL PLAN PHASE I	Sheet #:	2.31
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- CONSTRUCTION SEQUENCE (PHASE II)**
- PHASE II:**
- TEMPORARILY SEED, THROUGHOUT CONSTRUCTION, DENUDED AREAS THAT WILL BE INACTIVE FOR 14 DAYS OR MORE.
 - ONCE SEDIMENT TRAP AND GRASS LINED SWALES ARE STABILIZED, COMPLETE PHASE 2 CLEARING AND GRUBBING. STABILIZE OPEN SOILS WITH SPECIFIED SEED MIXES.
 - INSTALL RACKING POSTS FOR SOLAR PANELS.
 - INSTALL SOLAR PANELS AND COMPLETE ELECTRIC INSTALLATION.
 - COMPLETE REMAINING SITE WORK, INCLUDING CHAIN LINK FENCE, EQUIPMENTS PADS, AND INTERCONNECTION ROUTE. STABILIZE ALL DISTURBED AREAS THROUGHOUT CONSTRUCTION.
 - PERMANENTLY STABILIZE AREAS TO BE VEGETATED AS THEY ARE BROUGHT TO FINAL GRADE. PER APPENDIX 1 (1) (C) (iii), FOR SLOPES GREATER THAN OR EQUAL TO 8%, EROSION CONTROL BLANKETS OR STUMP GRINDINGS OR EROSION CONTROL MIX MULCH OR HYDROSEED WITH TACKLIFER SHALL BE APPLIED WITHIN 72 HOURS OF FINAL GRADING, OR WHEN A RAINFALL OF 0.5 INCHES OR GREATER IS PREDICTED WITHIN 24 HOURS OF FINAL GRADING, WHICHEVER TIME PERIOD IS LESS.
 - CONVERT SEDIMENT TRAP TO PERMANENT STORMWATER BASIN. REMOVE ALL SEDIMENT AND REPAIR ALL BASIN BANKS AS REQUIRED. INSTALL LOW FLOW ORIFICES IN OUTLET CONTROL STRUCTURE.
 - REPAIR AND STABILIZE GRASS LINED SWALES AS REQUIRED.
 - PREPARE SITE FOR FINAL GRADING.
 - FINE GRADE, RAKE, SEED, AND MULCH ALL REMAINING DISTURBED AREAS.
 - CONTRACTOR / CONSTRUCTION MANAGER TO COORDINATE WITH ENGINEER OF RECORD AND SOIL CONSERVATION DISTRICT AGENT TO OBTAIN STABILIZED SITE STATUS.
 - CONTINUE DAILY INSPECTION REPORTS UNTIL THE FINAL DAILY INSPECTION REPORT IS SIGNED BY THE CONSTRUCTION MANAGER AND SUBMITTED.

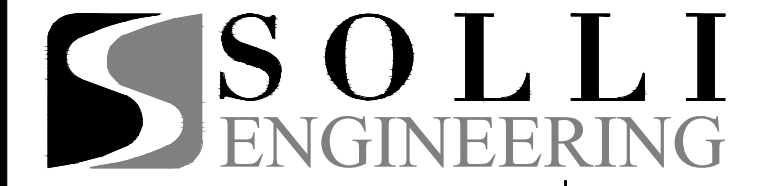
SEDIMENT & EROSION CONTROL NOTES

- THE CONTRACTOR SHALL CONSTRUCT ALL SEDIMENT AND EROSION CONTROLS IN ACCORDANCE WITH THE 2024 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL, LATEST EDITION, IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND AS DIRECTED BY THE TOWN OF MANCHESTER, PERMITTEE, AND/OR SWPCP MONITOR. ALL PERIMETER SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CLEARING AND GRUBBING AND DEMOLITION OPERATIONS.
- THESE DRAWINGS ARE ONLY INTENDED TO DESCRIBE THE SEDIMENT AND EROSION CONTROL MEASURES FOR THIS SITE. SEE CONSTRUCTION SEQUENCE FOR ADDITIONAL INFORMATION. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THE EROSION & SEDIMENT CONTROL PLAN ARE SHOWN AS REQUIRED BY THE ENGINEER OF RECORD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL EROSION CONTROL MEASURES ARE CONFIGURED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION OF SOILS AND PREVENT THE TRANSPORT OF SEDIMENTS AND OTHER POLLUTANTS TO STORM DRAINAGE SYSTEMS AND/OR WATERCOURSES. ACTUAL SITE CONDITIONS OR SEASONAL AND CLIMATIC CONDITIONS MAY WARRANT ADDITIONAL CONTROLS OR CONFIGURATIONS, AS REQUIRED, AND AS DIRECTED BY THE PERMITTEE AND/OR SWPCP MONITOR. REFER TO SITE PLAN FOR GENERAL INFORMATION AND OTHER CONTRACT PLANS FOR APPROPRIATE INFORMATION.
- A BOND OR LETTER OF CREDIT MAY BE REQUIRED TO BE POSTED WITH THE GOVERNING AUTHORITY FOR THE EROSION CONTROL INSTALLATION AND MAINTENANCE.
- THE CONTRACTOR SHALL APPLY THE MINIMUM EROSION & SEDIMENT CONTROL MEASURES SHOWN ON THE PLAN IN CONJUNCTION WITH CONSTRUCTION SEQUENCING, SUCH THAT ALL ACTIVE WORK ZONES ARE PROTECTED. ADDITIONAL AND/OR ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES MAY BE INSTALLED DURING THE CONSTRUCTION PERIOD IF FOUND NECESSARY BY THE CONTRACTOR, OWNER, ENGINEER OF RECORD, MUNICIPAL OFFICIALS, OR ANY GOVERNING AGENCY. THE CONTRACTOR SHALL CONTACT THE OWNER AND APPROPRIATE GOVERNING AGENCIES FOR APPROVAL IF ALTERNATIVE CONTROLS OTHER THAN THOSE SHOWN ON THE PLANS ARE PROPOSED BY THE CONTRACTOR.
- THE CONTRACTOR SHALL TAKE EXTREME CARE DURING CONSTRUCTION SO AS NOT TO DISTURB UNPROTECTED WETLAND AREAS OR INSTALLED SEDIMENTATION AND EROSION CONTROL MEASURES. THE CONTRACTOR SHALL INSPECT ALL SEDIMENT AND EROSION CONTROLS WEEKLY AND WITHIN 24 HOURS OF A STORM WITH A RAINFALL AMOUNT OF 0.25 INCHES OR GREATER TO VERIFY THAT THE CONTROLS ARE OPERATING PROPERLY AND MAKE REPAIRS AS NECESSARY IN A TIMELY MANNER.
- THE CONTRACTOR SHALL KEEP A SUPPLY OF EROSION CONTROL MATERIAL (SILT FENCE, COMPOSITE FILTER SOCK, EROSION CONTROL BLANKET, ETC) ON-SITE FOR PERIODIC MAINTENANCE AND EMERGENCY REPAIRS.
- ALL FILL MATERIAL PLACED ADJACENT TO ANY WETLAND AREA SHALL BE GOOD QUALITY, WITH LESS THAN 5% FINES PASSING THROUGH A #200 SIEVE (BANK RUN), SHALL BE PLACED IN MAXIMUM ONE FOOT LIFTS, AND SHALL BE COMPACTED TO 95% MAX. DRY DENSITY MODIFIED PROCTOR OR AS SPECIFIED IN THE CONTRACT SPECIFICATIONS.
- PROTECT EXISTING TREES THAT ARE TO BE SAVED BY FENCING, ORANGE SAFETY FENCE, CONSTRUCTION TAPE, OR EQUIVALENT FENCING TAPE. ANY LIMB TRIMMING SHOULD BE DONE AFTER CONSULTATION WITH AN ARBORIST AND BEFORE CONSTRUCTION BEGINS IN THAT AREA. FENCING SHALL BE MAINTAINED AND REPAIRED DURING CONSTRUCTION.
- CONSTRUCTION ENTRANCES (ANTI-TRACKING PADS) SHALL BE INSTALLED PRIOR TO ANY SITE EXCAVATION OR CONSTRUCTION ACTIVITY AND SHALL BE MAINTAINED THROUGHOUT THE DURATION OF ALL CONSTRUCTION IF REQUIRED. THE LOCATION OF THE TRACKING PADS MAY CHANGE AS VARIOUS PHASES OF CONSTRUCTION ARE COMPLETED. CONTRACTOR SHALL ENSURE THAT ALL VEHICLES EXITING THE SITE ARE PASSING OVER THE ANTI-TRACKING PADS PRIOR TO EXITING.
- ALL CONSTRUCTION SHALL BE CONTAINED WITHIN THE LIMIT OF DISTURBANCE, WHICH SHALL BE MARKED WITH SILT FENCE, SAFETY FENCE, HAY BALES, RIBBONS, OR OTHER MEANS PRIOR TO CLEARING. CONSTRUCTION ACTIVITY SHALL REMAIN ON THE UPHILL SIDE OF THE SEDIMENT BARRIER UNLESS WORK IS SPECIFICALLY CALLED FOR ON THE DOWNHILL SIDE OF THE BARRIER.
- NO CUT OR FILL SLOPES SHALL EXCEED 2:1 EXCEPT WHERE STABILIZED BY ROCK FACED EMBANKMENTS OR EROSION CONTROL BLANKETS. ALL SLOPES SHALL BE SEEDED AND BANKS WILL BE STABILIZED IMMEDIATELY UPON COMPLETION OF FINAL GRADING UNTIL TURF IS ESTABLISHED.
- DIRECT ANY DEWATERING PUMP DISCHARGE TO A SEDIMENT CONTROL DEVICE CONFORMING TO THE GUIDELINES WITHIN THE APPROVED LIMIT OF DISTURBANCE IF REQUIRED. DISCHARGE TO STORM DRAINS OR SURFACE WATERS FROM SEDIMENT CONTROLS SHALL BE CLEAR AND APPROVED BY THE PERMITTEE OR MUNICIPALITY.
- THE CONTRACTOR SHALL MAINTAIN A CLEAN CONSTRUCTION SITE AND SHALL NOT ALLOW THE ACCUMULATION OF RUBBISH OR CONSTRUCTION DEBRIS ON THE SITE. PROPER SANITARY DEVICES SHALL BE MAINTAINED ON-SITE AT ALL TIMES AND SECURED APPROPRIATELY. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID THE SPILLAGE OF FUEL OR OTHER POLLUTANTS ON THE CONSTRUCTION SITE AND SHALL ADHERE TO ALL APPLICABLE POLICIES AND REGULATIONS RELATED TO SPILL PREVENTION AND RESPONSE/CONTAINMENT.
- MINIMIZE LAND DISTURBANCES. SEED AND MULCH DISTURBED AREAS WITH TEMPORARY MIX AS SOON AS PRACTICABLE (2 WEEK MAXIMUM UNSTABILIZED PERIOD) USING PERENNIAL RYEGRASS AT 40 LBS PER ACRE. MULCH ALL CUT AND HILL SLOPES AND SWALES WITH LOOSE HAY AT A RATE OF 2 TONS PER ACRE. IF NECESSARY, REPLACE LOOSE HAY ON SLOPES WITH EROSION CONTROL BLANKETS OR JUTE CLOTH. MODERATELY GRADED AREAS, ISLANDS, AND TEMPORARY CONSTRUCTION STAGING AREAS MAY BE HYDROSEED WITH TACKLIFER.
- SWEEP AFFECTED PORTIONS OF OFF SITE ROADS ONE OR MORE TIMES A DAY (OR LESS FREQUENTLY IF TRACKING IS NOT A PROBLEM DURING CONSTRUCTION) FOR DUST CONTROL. PERIODICALLY MOISTEN EXPOSED SOIL SURFACES WITH WATER ON UNPAVED TRAVELWAYS TO KEEP THE TRAVELWAYS DAMP. CALCIUM CHLORIDE MAY ALSO BE APPLIED TO ACCESS ROADS. DUMP TRUCK LOADS EXITING THE SITE SHALL BE COVERED.
- VEGETATIVE ESTABLISHMENT SHALL OCCUR ON ALL DISTURBED SOIL, UNLESS THE AREA IS UNDER ACTIVE CONSTRUCTION. IT IS COVERED IN STONE OR SCIEDULED FOR PAVING WITHIN 30 DAYS. TEMPORARY SEEDING OR NON-LIVING SOIL PROTECTION OF ALL EXPOSED SOILS AND SLOPES SHALL BE INITIATED WITHIN THE FIRST 7 DAYS OF SUSPENDING WORK IN AREAS TO BE LEFT LONGER THAN 30 DAYS.
- MAINTAIN ALL PERMANENT AND TEMPORARY SEDIMENT CONTROL DEVICES IN EFFECTIVE CONDITION THROUGHOUT THE CONSTRUCTION PERIOD. UPON COMPLETION OF WORK SWEEP CONCRETE PADS. CLEAN THE STORMWATER MANAGEMENT SYSTEMS AND REMOVE ALL TEMPORARY SEDIMENT CONTROLS ONCE THE SITE IS FULLY STABILIZED AND APPROVAL HAS BEEN RECEIVED FROM PERMITTEE OR THE MUNICIPALITY.
- SEEDING MIXTURES SHALL BE FUZZ & BUZZ MIX - PREMIUM - ERNMX-147, OR APPROVED EQUAL. NEW ENGLAND EROSION CONTROL RESTORATION MIX FOR STORMWATER BASINS & MOIST SITES, OR APPROVED EQUAL, SHALL BE UTILIZED ON THE BOTTOM OF THE BASIN & FUZZ & BUZZ MIX - PREMIUM - ERNMX-147, OR APPROVED EQUAL, ON THE SIDE SLOPES OF THE BASIN. SEE SHEET DN-2 FOR ALL SEED MIXTURES.
- REFER TO SHEET 2.41 FOR SEDIMENT & EROSION CONTROL NARRATIVE & DETAILS.

CONSTRUCTION OPERATION & MAINTENANCE PLAN

E&S MEASURE	INSPECTION SCHEDULE	MAINTENANCE REQUIRED
CONSTRUCTION ENTRANCE	DAILY	PLACE ADDITIONAL STONE, EXTEND THE LENGTH OR REMOVE AND REPLACE THE STONE. CLEAN PAVED SURFACES OF TRACKED SEDIMENT.
COMPOSITE FILTER SOCK	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED.
SILT FENCE	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR/REPLACE WHEN FAILURE OR DETERIORATION IS OBSERVED. REMOVE SILT WHEN IT REACHES 1/2 THE HEIGHT OF THE FENCE.
TOPSOIL/BORROW STOCKPILES	DAILY	REPAIR/REPLACE SEDIMENT BARRIERS AS NECESSARY.
TEMPORARY SOIL PROTECTION	WEEKLY & WITHIN 24 HOURS OF RAINFALL > 0.25"	REPAIR ERODED OR BARE AREAS IMMEDIATELY. RESEED AND MULCH.

1	04/19/24	CSC INTERROGATORIES
Rev. #:	Date	Description



501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
11 Vanierbill Ave, Norwood, MA 02062 T: (781) 552-8491 F: (203) 880-9695

Drawn By:	SFU
Checked By:	AWC
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 60'
Project:	

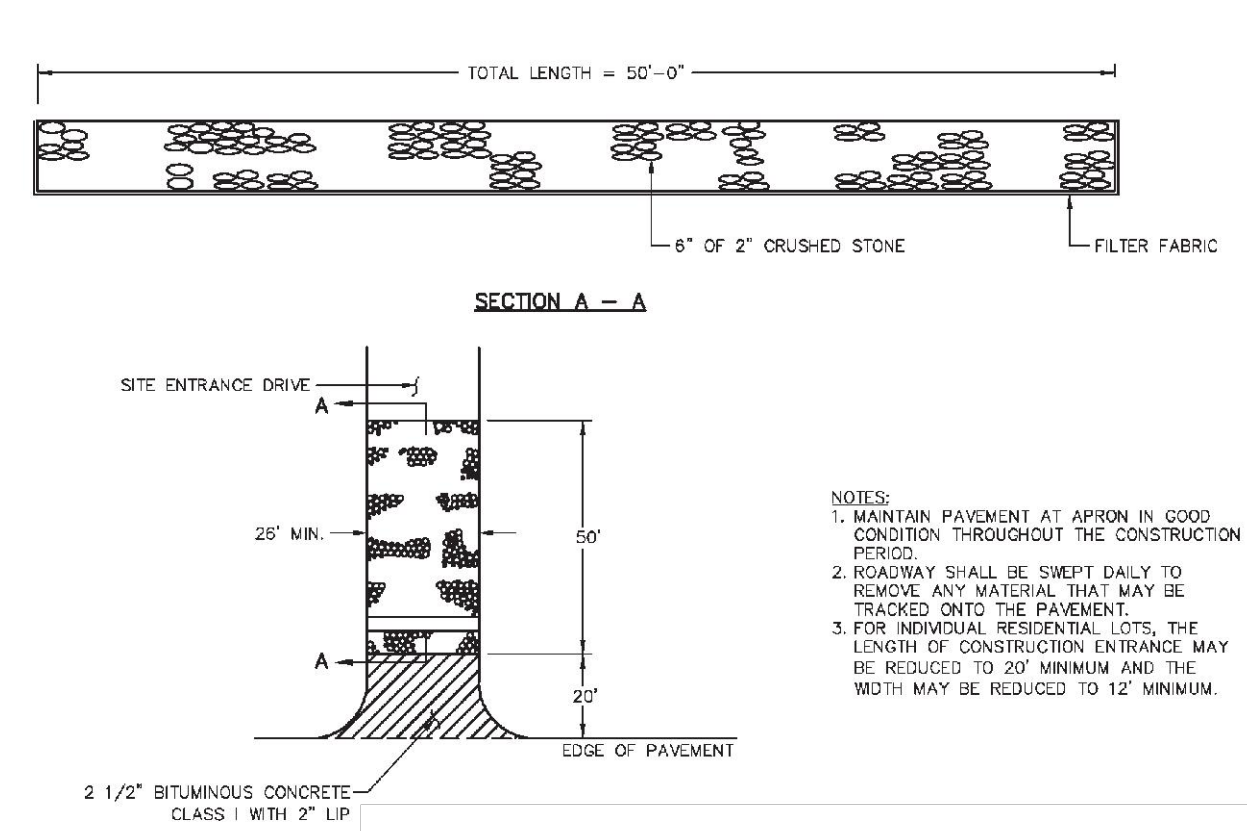


PROPOSED SOLAR PHOTOVOLTAIC ARRAY
250 CARTER STREET
MANCHESTER, CONNECTICUT

Sheet Title:	SOIL EROSION & SEDIMENT CONTROL PLAN PHASE 2	Sheet #:	2.32
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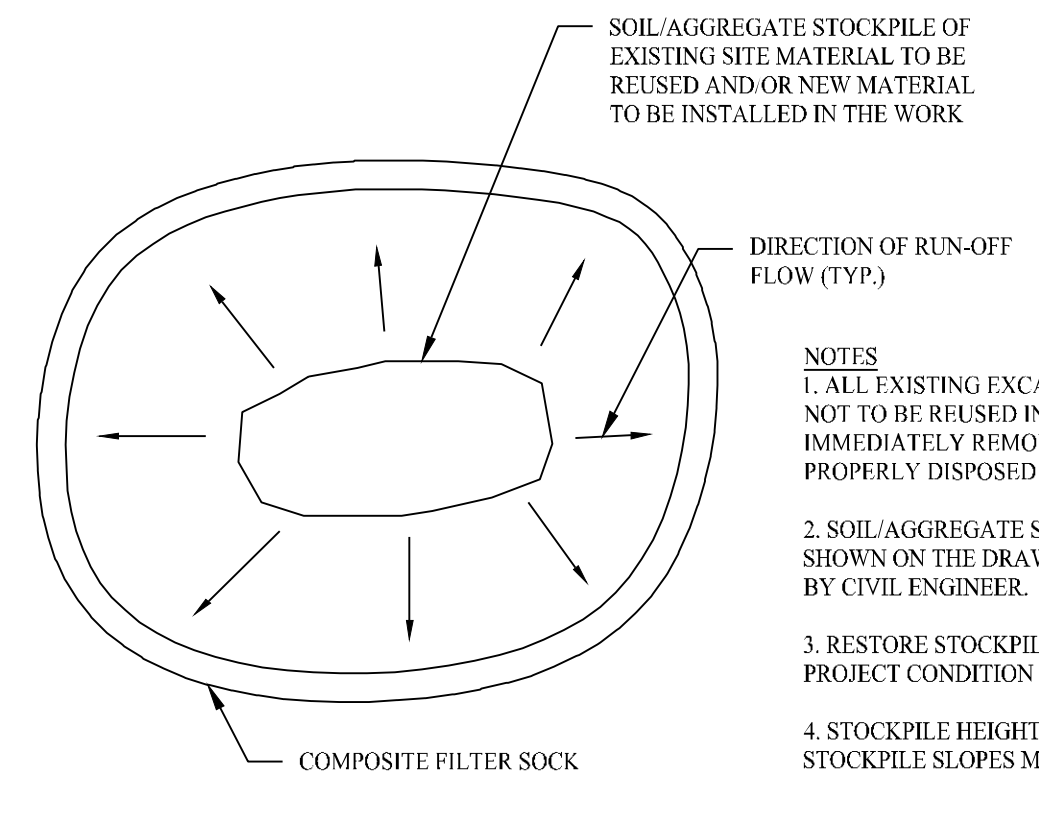
SEDIMENT & EROSION CONTROL NARRATIVE

- THE PROJECT INVOLVES THE CONSTRUCTION OF A GROUND MOUNTED SOLAR PANEL FACILITY WITH ASSOCIATED EQUIPMENT, INCLUDING GRADING OF APPROXIMATELY 7.5+ ACRES OF EXISTING LOT.
 - THE PROPOSED PROJECT INVOLVES THE FOLLOWING CONSTRUCTION:
 - CLEARING, GRUBBING, AND GRADING OF EXISTING LOT.
 - CONSTRUCTION OF 2,590 GROUND MOUNTED SOLAR PANELS AND ASSOCIATED EQUIPMENT.
 - THE STABILIZATION OF DISTURBED AREAS WITH PERMANENT VEGETATIVE TREATMENTS.
- FOR THIS PROJECT, THERE ARE APPROXIMATELY 7.5+ ACRES OF THE SITE BEING DISTURBED WITH NEGLIGIBLE INCREASE IN THE IMPERVIOUS AREA OF THE SITE. IMPERVIOUS AREAS ARE LIMITED TO THE CONCRETE PADS FOR ELECTRICAL EQUIPMENT & GRAVEL ACCESS DRIVE.
- THE PROJECT AREA, AS MAPPED IN THE SOIL SURVEY OF STATE OF CONNECTICUT (NRCS, VERSION 1, SEPTEMBER 30, 2023), CONTAINS TYPE 86C (HYDROLOGIC SOIL GROUP C), 46B & 46C (HYDROLOGIC SOIL GROUP D) AND 2 (HYDROLOGIC SOIL GROUP D). A GEOTECHNICAL ENGINEERING REPORT IS SCHEDULED AND WILL BE PROVIDED UNDER SEPARATE COVER.
- IT IS ANTICIPATED THAT CONSTRUCTION WILL BE COMPLETED IN APPROXIMATELY 4-6 MONTHS.
- REFER TO THE CONSTRUCTION SEQUENCING AND EROSION AND SEDIMENTATION NOTES FOR INFORMATION REGARDING SEQUENCING OF MAJOR OPERATIONS IN THE ON-SITE CONSTRUCTION PHASES.
- STORMWATER MANAGEMENT DESIGN CRITERIA UTILIZES THE APPLICABLE SECTIONS OF THE 2004 CONNECTICUT STORMWATER QUALITY MANUAL AND THE TOWN OF MANCHESTER STANDARDS, TO THE EXTENT POSSIBLE AND PRACTICABLE FOR THIS PROJECT ON THIS SITE. EROSION AND SEDIMENTATION MEASURES ARE BASED UPON ENGINEERING PRACTICE, JUDGMENT AND THE APPLICABLE SECTIONS OF THE CONNECTICUT EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, LATEST EDITION.
- DETAILS FOR THE TYPICAL STORMWATER MANAGEMENT AND EROSION AND SEDIMENTATION MEASURES ARE SHOWN ON THE PLAN SHEETS OR PROVIDED AS SEPARATE SUPPORT DOCUMENTATION FOR REVIEW IN THIS PLAN.
 - CONSERVATION PRACTICES TO BE USED DURING CONSTRUCTION:
 - STAGED CONSTRUCTION;
 - MINIMIZE THE DISTURBED AREAS TO THE EXTENT PRACTICABLE DURING CONSTRUCTION;
 - STABILIZE DISTURBED AREAS WITH TEMPORARY OR PERMANENT MEASURES AS SOON AS POSSIBLE, BUT NO LATER THAN 7-DAYS FOLLOWING DISTURBANCE;
 - MINIMIZE IMPERVIOUS AREAS;
 - UTILIZE APPROPRIATE CONSTRUCTION EROSION AND SEDIMENTATION MEASURES.
- THE FOLLOWING SEPARATE DOCUMENTS ARE TO BE CONSIDERED A PART OF THE EROSION AND SEDIMENTATION PLAN:
 - STORMWATER MANAGEMENT REPORT, TO BE ISSUED AT A LATER DATE.
 - SWPCP, TO BE ISSUED AT A LATER DATE.



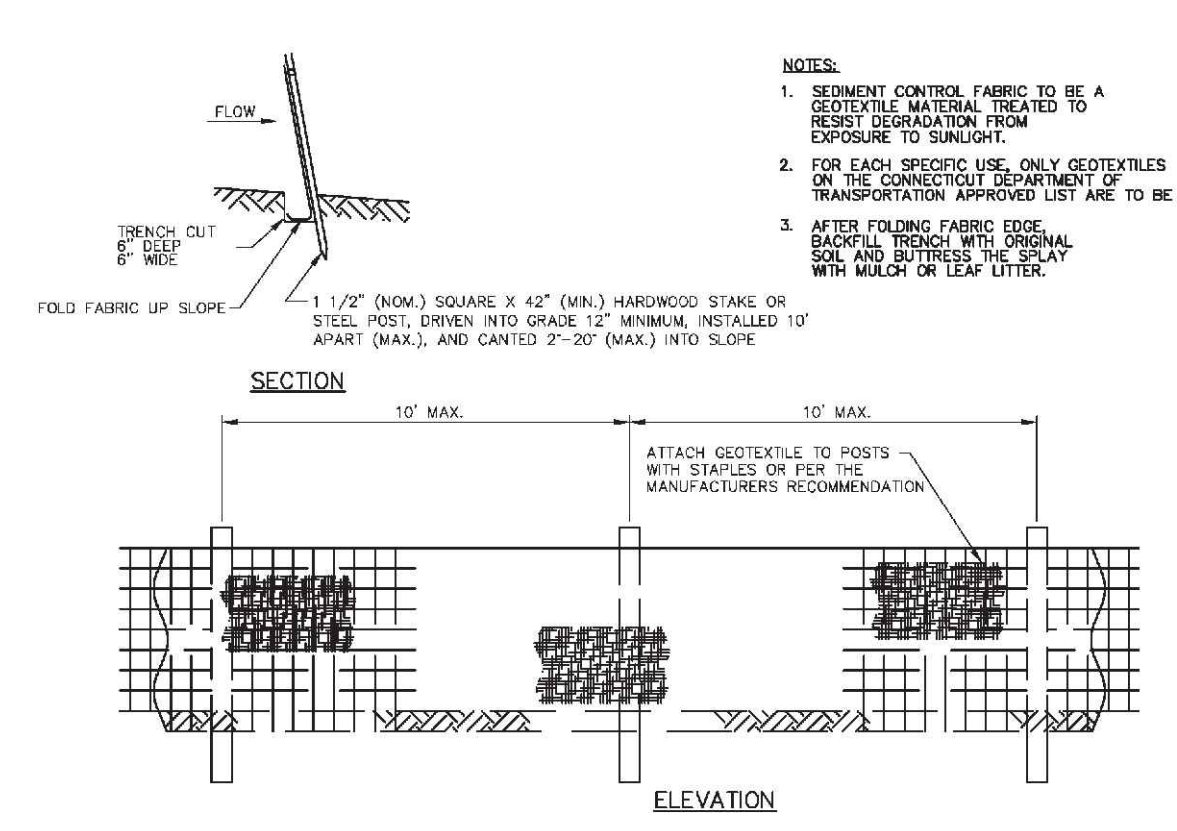
CONSTRUCTION ENTRANCE

SCALE: NTS SOURCE: TOWN OF MANCHESTER



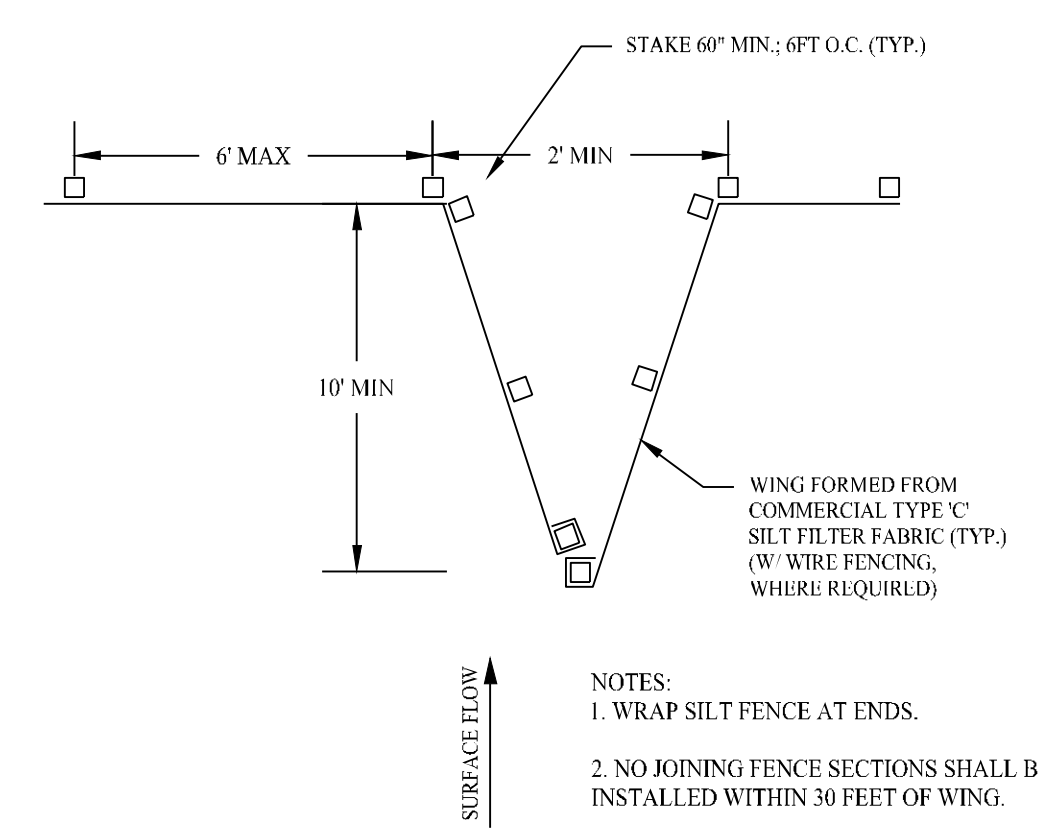
MATERIALS STOCKPILE DETAIL

SCALE: NTS



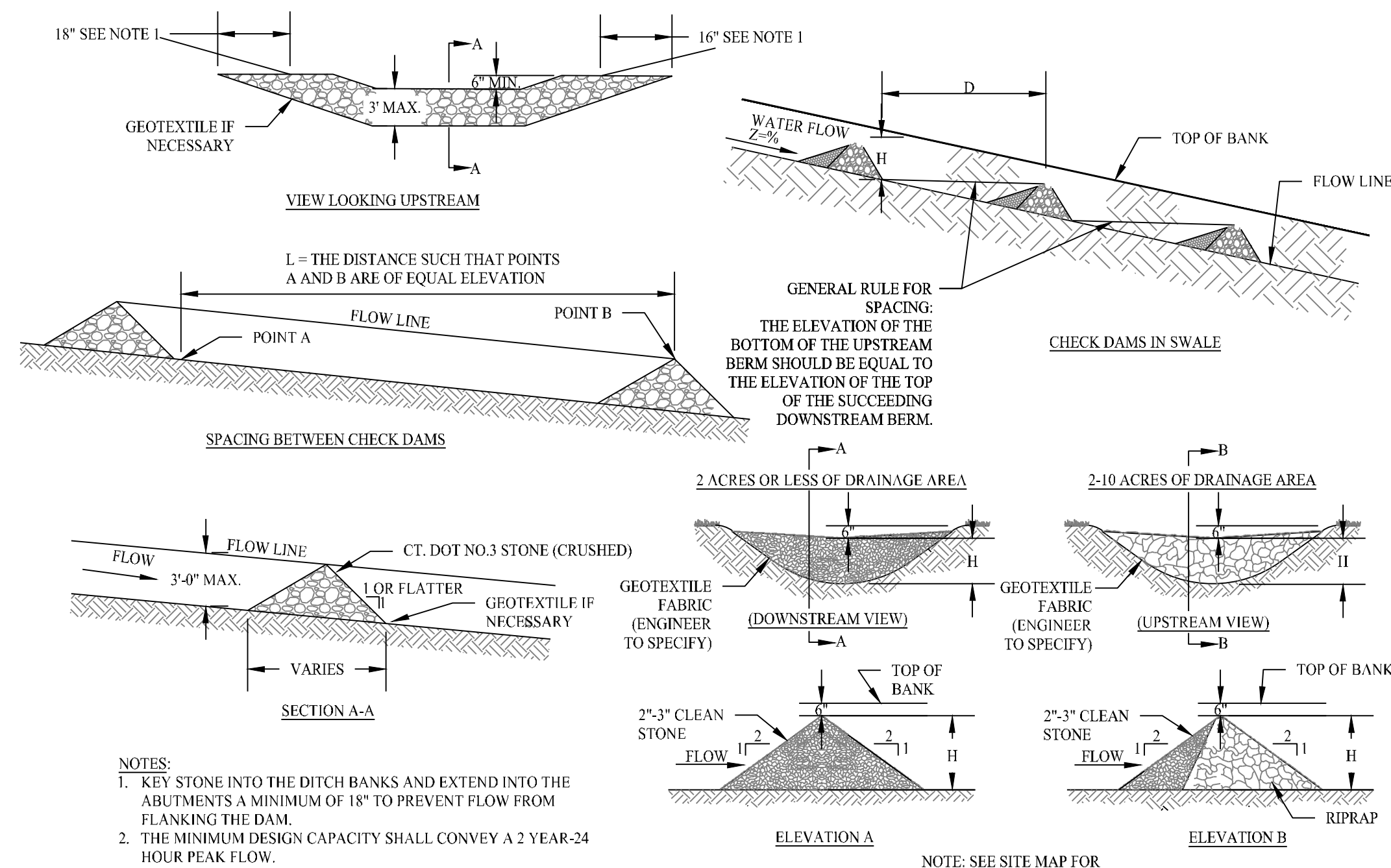
SILT FENCE PROTECTION DETAIL

SCALE: NTS SOURCE: TOWN OR MANCHESTER



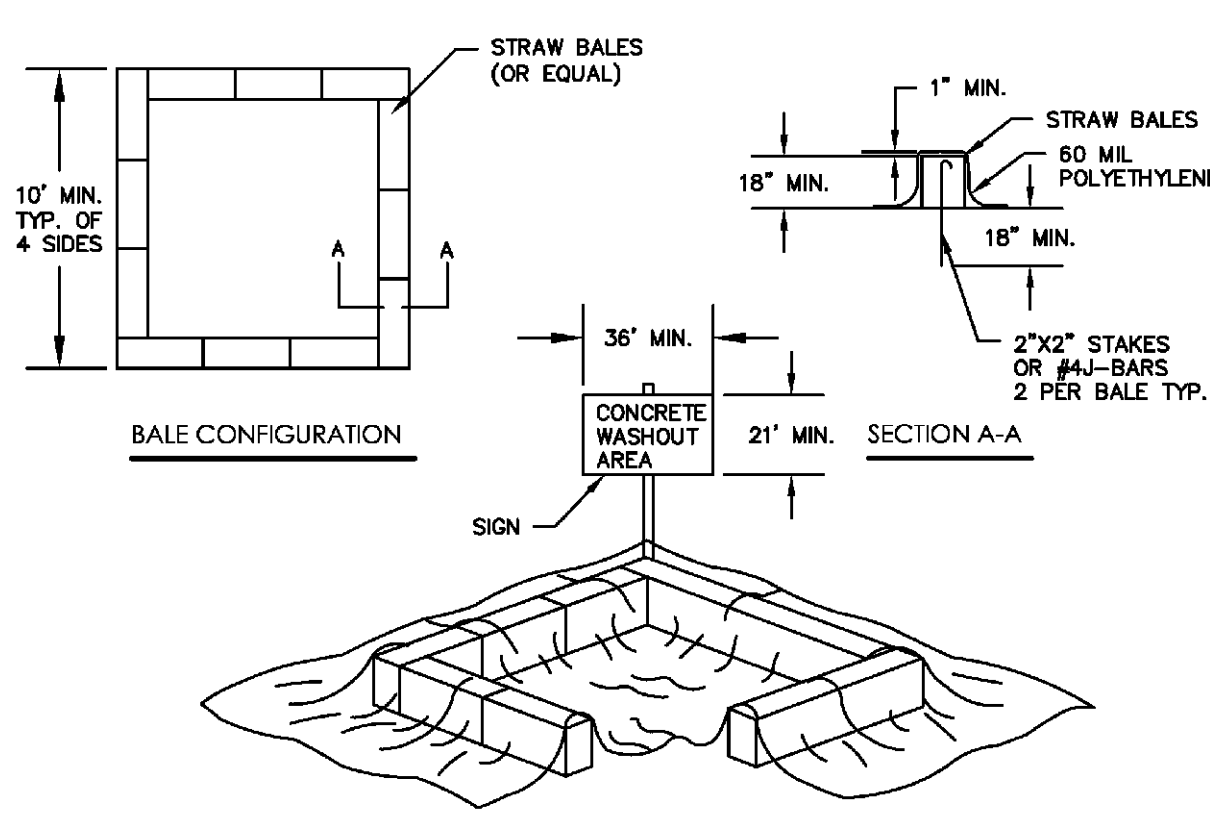
SILT FENCE WING DETAIL

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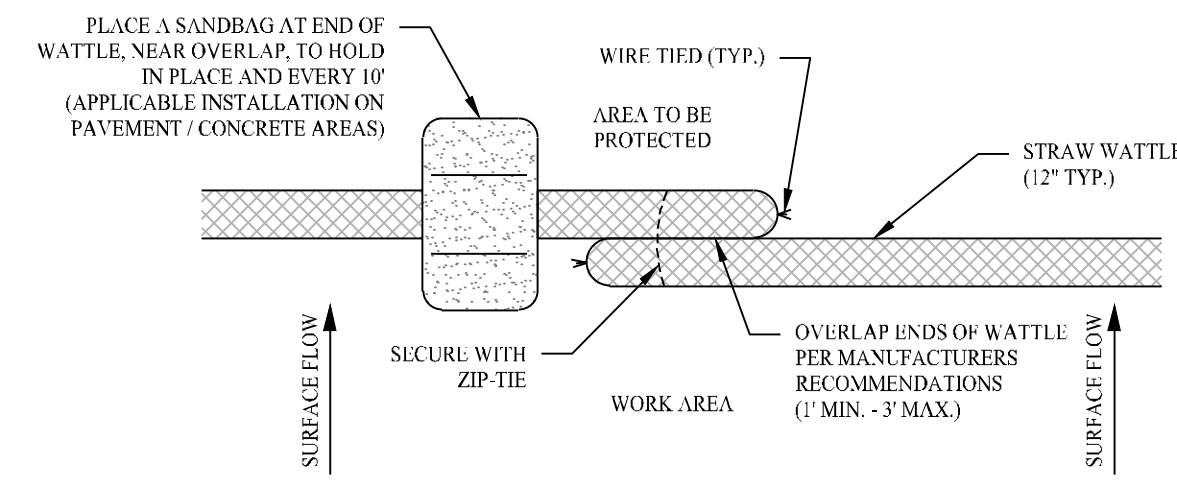
STONE CHECK DAM DETAIL

SCALE: NTS



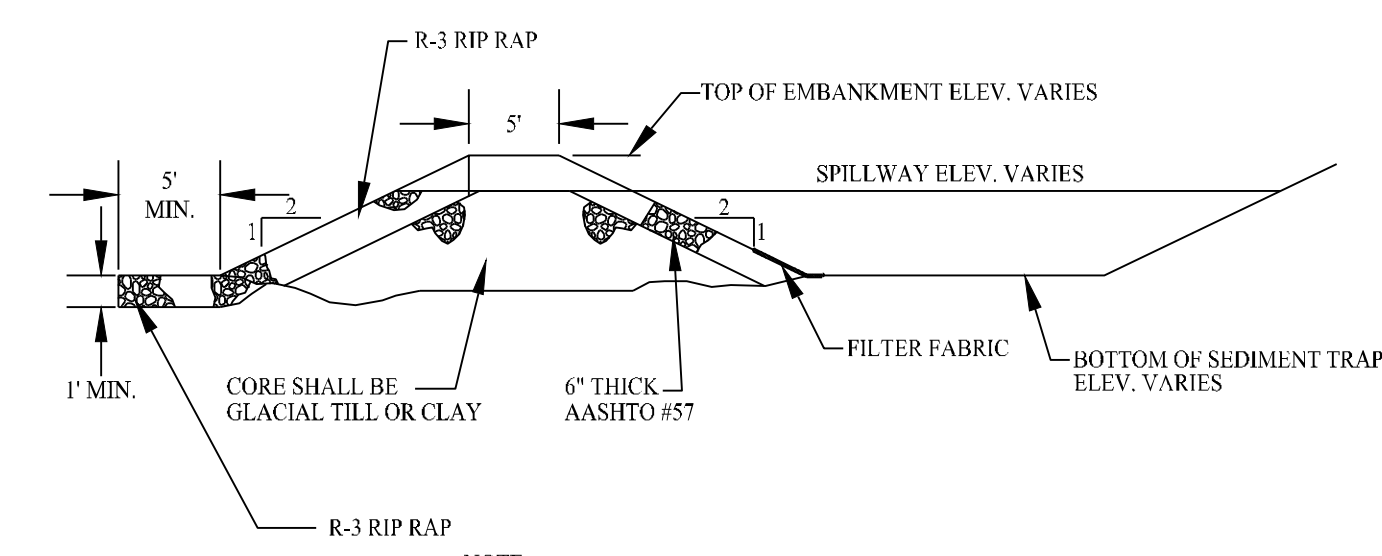
CONCRETE WASHOUT PIT

SCALE: NTS



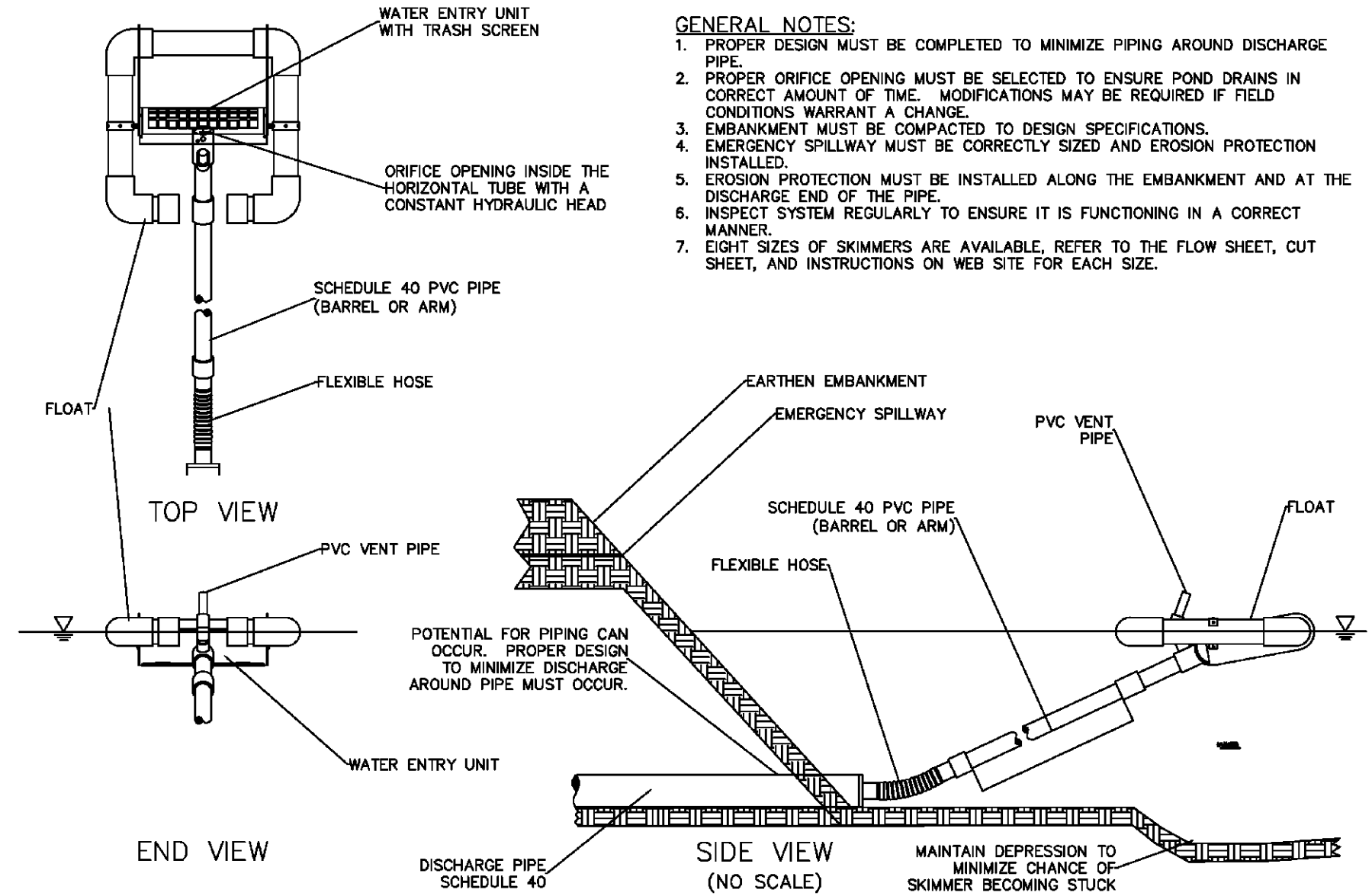
COMPOSITE FILTER SOCK

SCALE: NTS



TYPICAL SEDIMENT TRAP DETAIL

SCALE: NTS



FAIRCLOTH SKIMMER DISCHARGE SYSTEM

SCALE: NTS

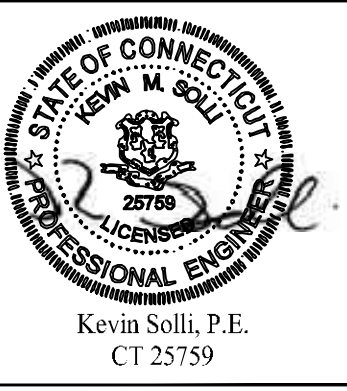
PROVIDED BY: J. W. FAIRCLOTTI & SON INC.

1	04/19/24	CSC INTERROGATORIES
Rev. #:	Date	Description



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 11 Vanslebille Ave., Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	NTS



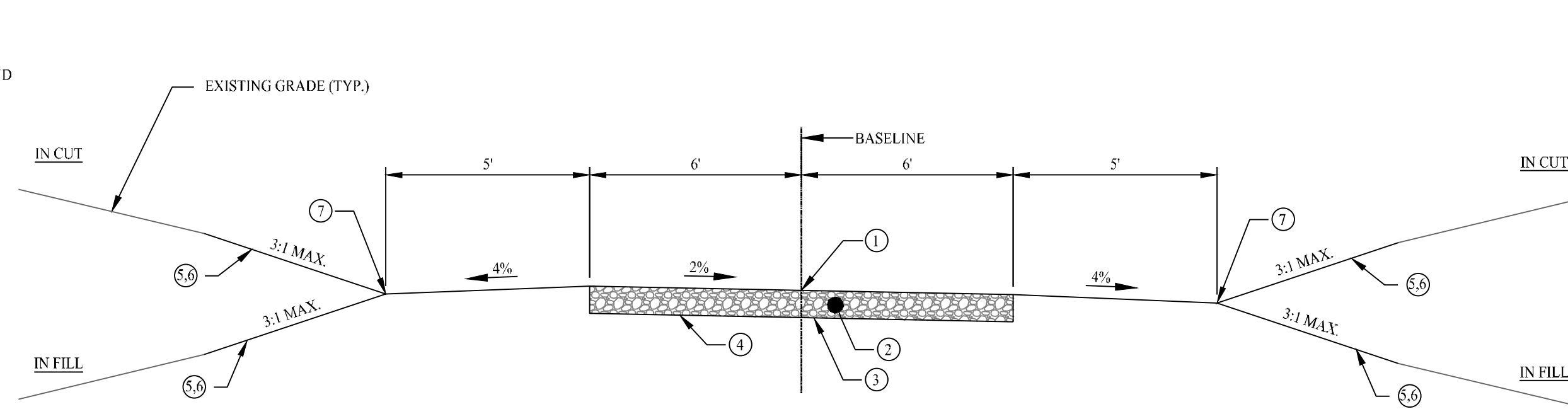
PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title:	SOIL EROSION & SEDIMENT CONTROL NOTES & DETAILS	Sheet #:	2.41
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Apr 22, 2024 - 8:38am chendy X:\SE Files\Project Data\2023\23100101 - 250 Carter Street - Manchester, CT\Coord Data\23100101-2.dwg

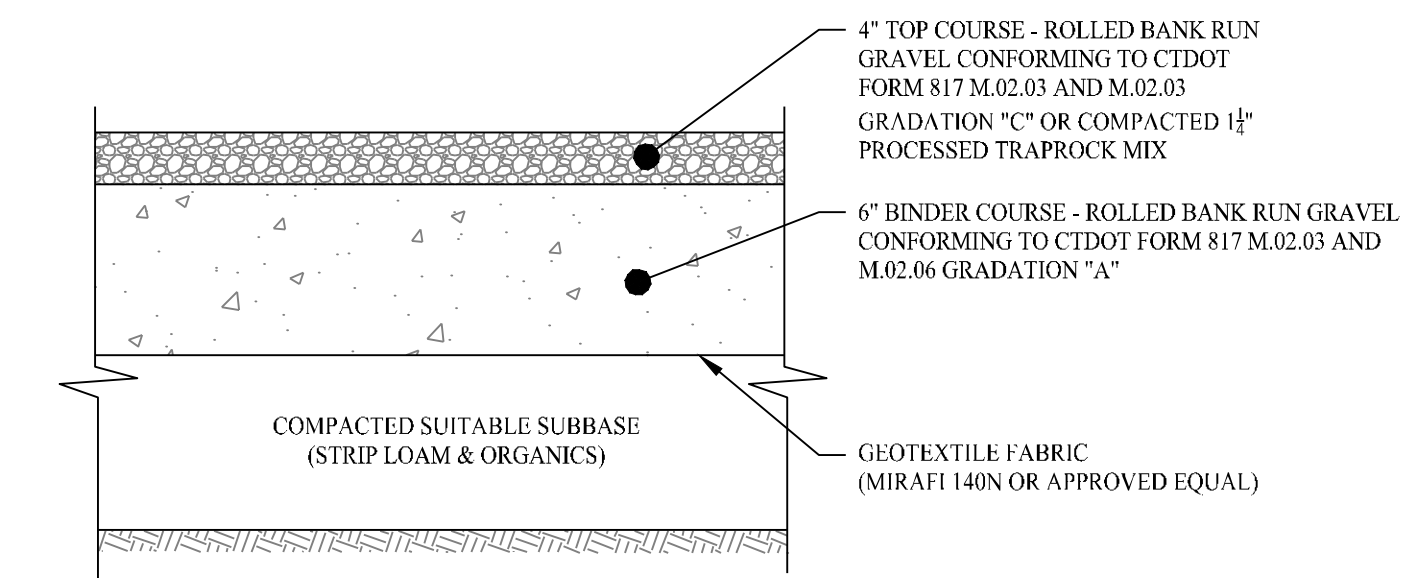
- ① POINT OF APPLICATION OF GRADE OR MATCH EXISTING GROUND
- ② GRAVEL ACCESS DRIVE
- ③ NONWOVEN GEOTEXTILE (MIRAFI 140N OR EQUAL)
- ④ LIMIT OF EXCAVATION OR LIMIT OF COMPACTION
- ⑤ EROSION CONTROL BLANKET ON SLOPES 3:1 OR GREATER
- ⑥ 6" TOPSOIL AND SEED
- ⑦ VEGETATED CHANNEL

NOTES:
 1. THE CONTRACTOR SHALL CONTACT CT CALL BEFORE YOU DIG (CBYD) A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION.
 2. TRANSITIONS BETWEEN TYPICAL ACCESS ROAD SECTIONS SHALL OCCUR OVER 50 FEET. (TYPICAL)



TYPICAL GRAVEL ROADWAY SECTION

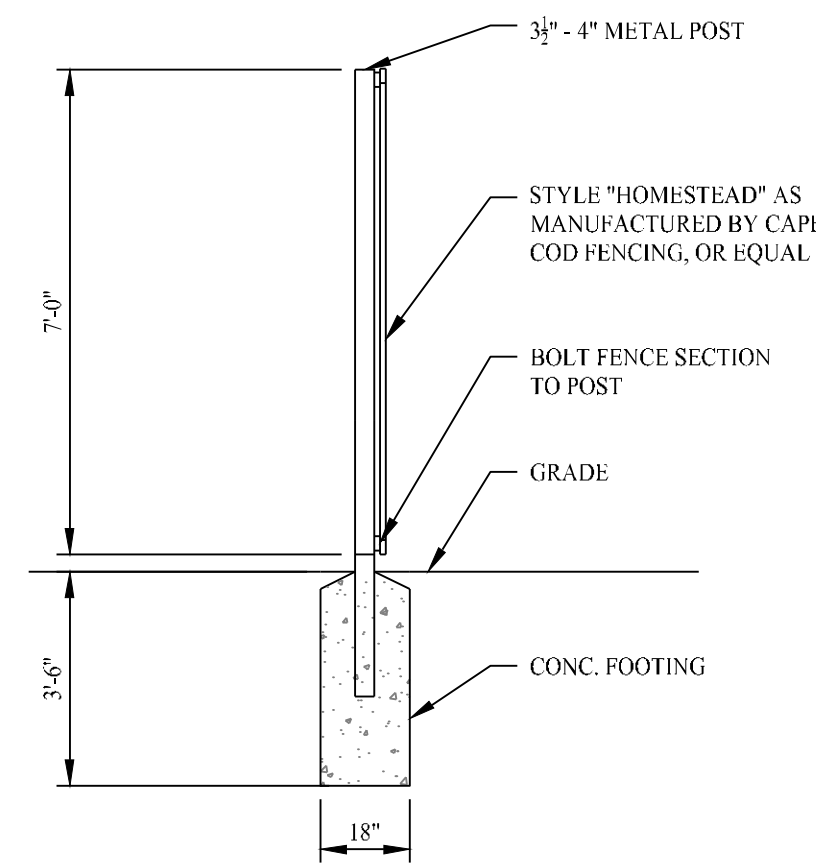
SCALE: NTS



NOTES:
 1. SUBBASE MAY CONSIST OF NATIVE MATERIALS IF FOUND ACCEPTABLE BY THE ENGINEER. SUBBASE TO BE COMPACTED TO 95% MAX DRY DENSITY.
 2. SUBBASE IS TO BE FREE FROM DEBRIS AND UNSUITABLE MATERIALS.

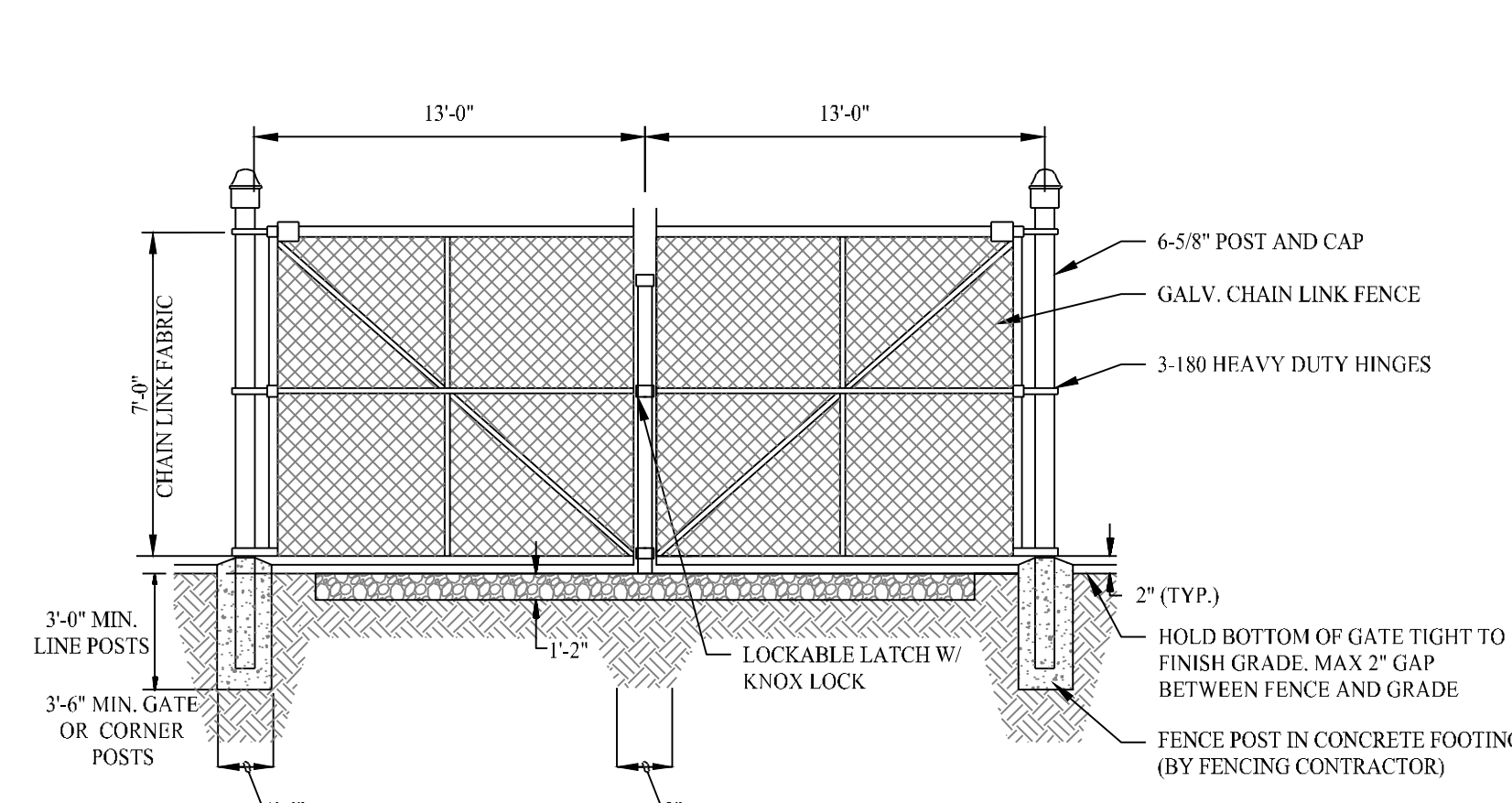
GRAVEL ACCESS DRIVE SECTION

SCALE: NTS



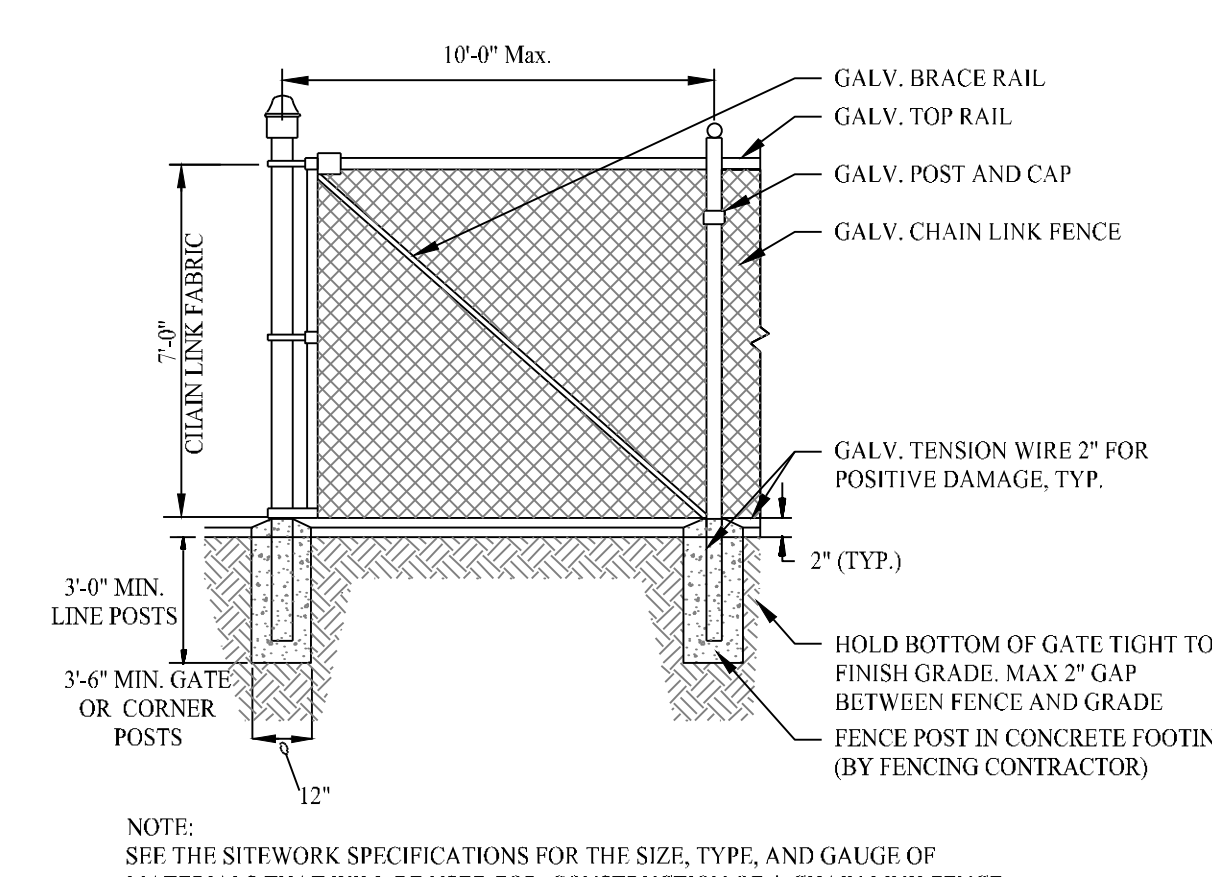
FENCE POST INSTALLATION

SCALE: NTS



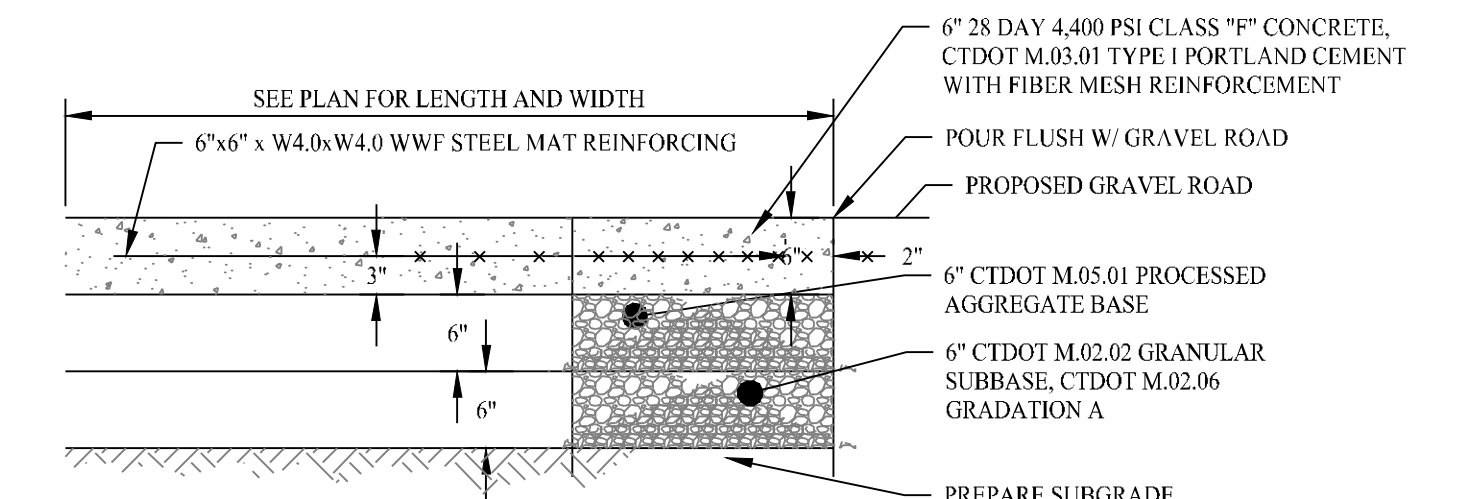
DOUBLE SWING GATE DETAIL

SCALE: NTS



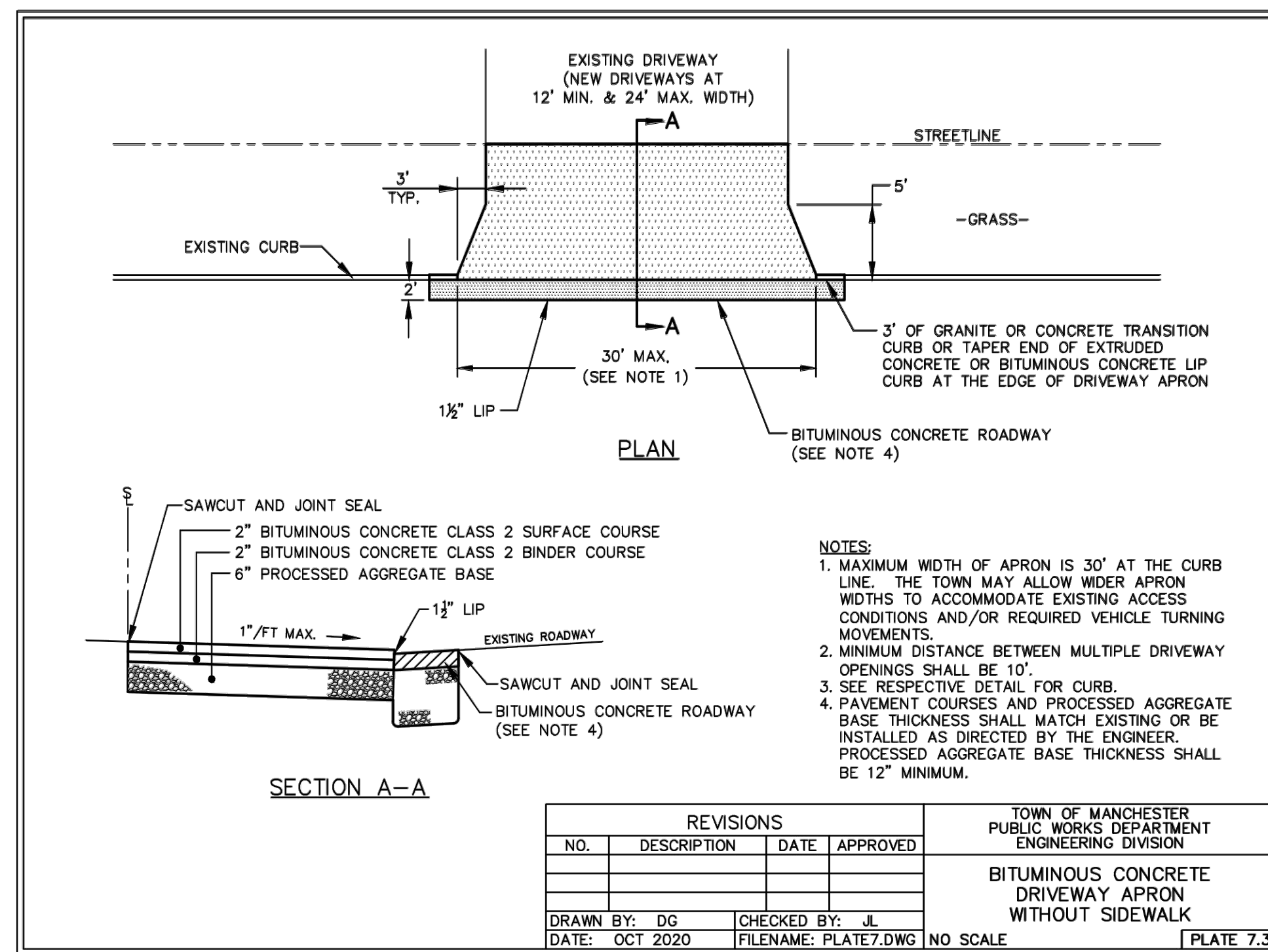
7' HIGH CHAIN LINK FENCE DETAIL

SCALE: NTS



CONCRETE UTILITY PAD

SCALE: NTS



BITUMINOUS CONCRETE DRIVEWAY APRON

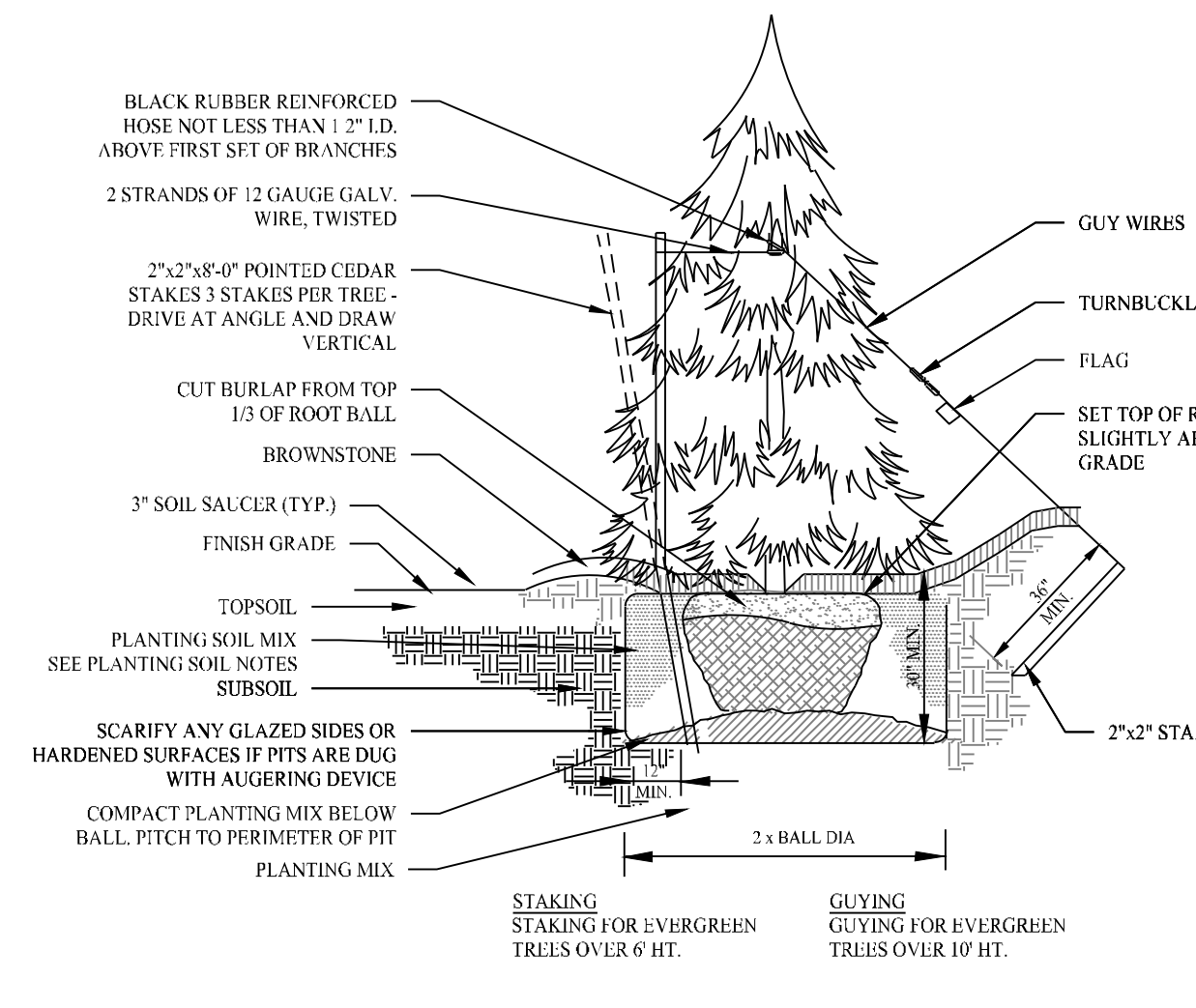
SCALE: NTS

DETAIL PER TOWN OF MANCHESTER

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

DRAWN BY: DG CHECKED BY: JL
 DATE: OCT 2020 FILENAME: PLATE7.DWG NO SCALE

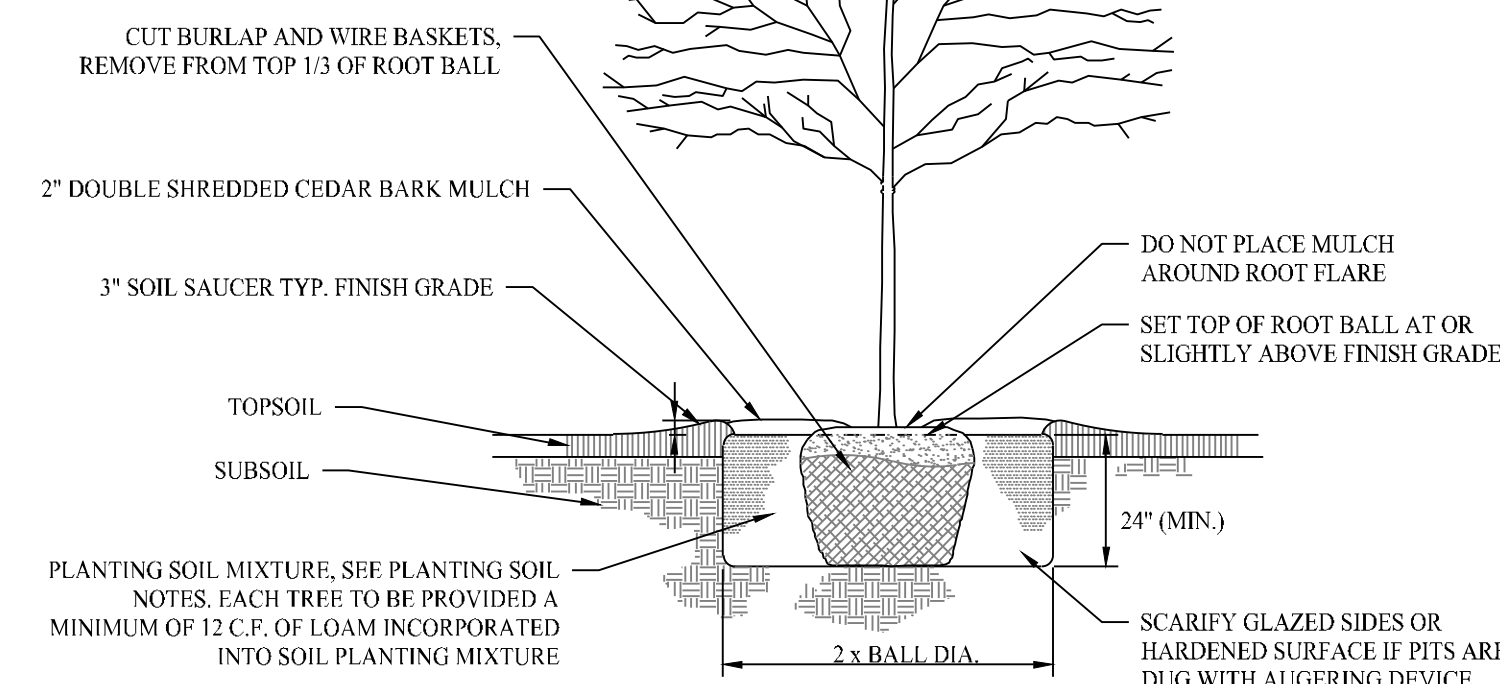
NOTES:
 1. MAXIMUM WIDTH OF APRON IS 30' AT THE CURB LINE. THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS.
 2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
 3. SEE RESPECTIVE DETAIL FOR CURB.
 4. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.



EVERGREEN TREE PLANTING

SCALE: NTS

PRUNING SHALL BE IN ACCORDANCE WITH APPROVED HORTICULTURAL STANDARDS IN ORDER TO PRESERVE THE NATURAL FORM OF THE SPECIFIC PLANTS. IF APPLICABLE & APPROVED BY THE LANDSCAPE ARCHITECT, ONE-FOURTH TO ONE-THIRD OF THE WOOD SHALL BE REMOVED BY THINNING OUT TO BALANCE ROOT LOSS DUE TO TRANSPLANTING.



DECIDUOUS TREE PLANTING

SCALE: NTS

Rev. #	Date	Description
1	04/19/24	CSC INTERROGATORIES

Graphic Scale:



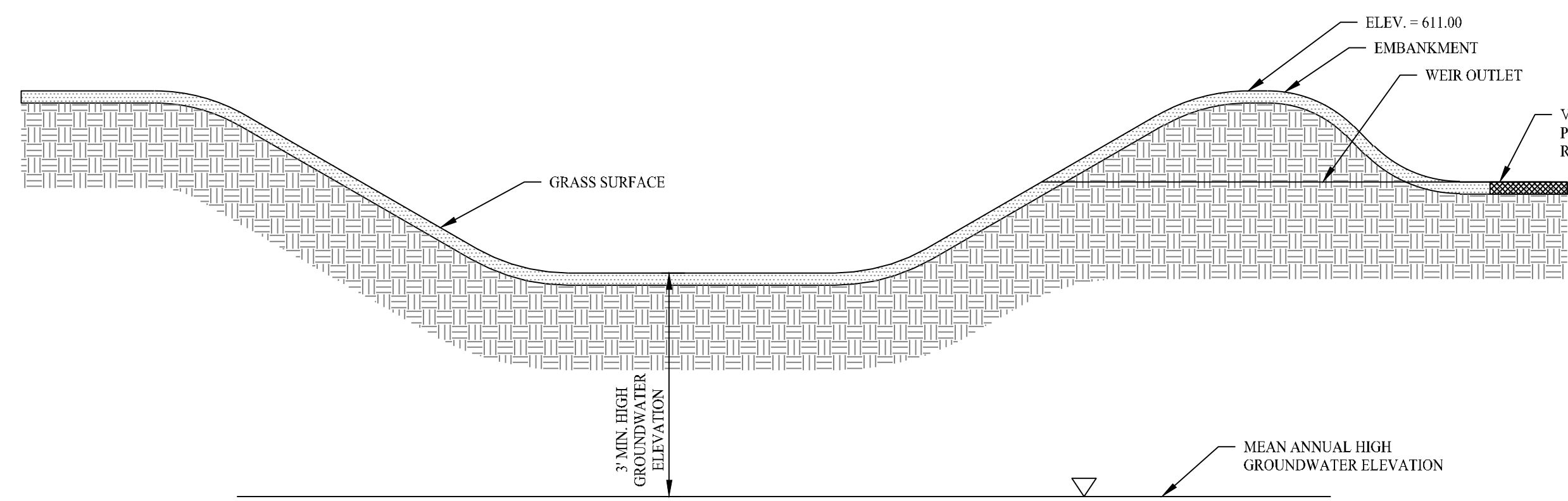
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 11 Vanderbilt Ave., Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By: CJS
 Checked By: CJB
 Approved By: KMS
 Project #: 23100101
 Plan Date: 01/15/24
 Scale: NTS



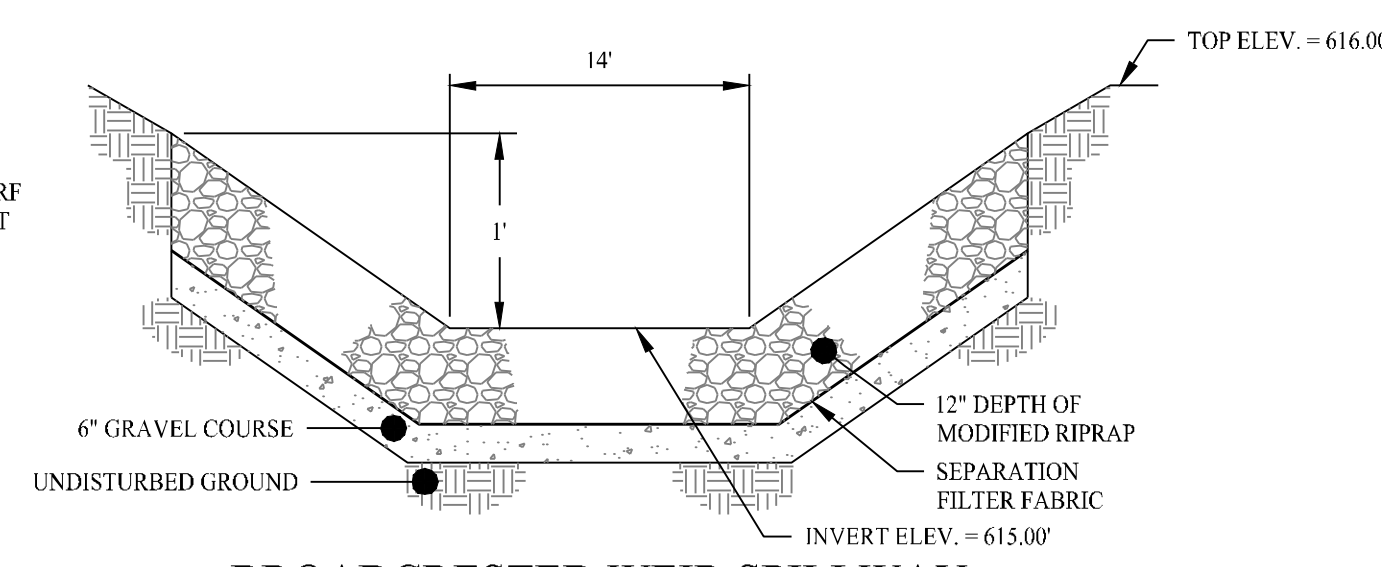
PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title: CONSTRUCTION DETAILS
 Sheet #: 3.01



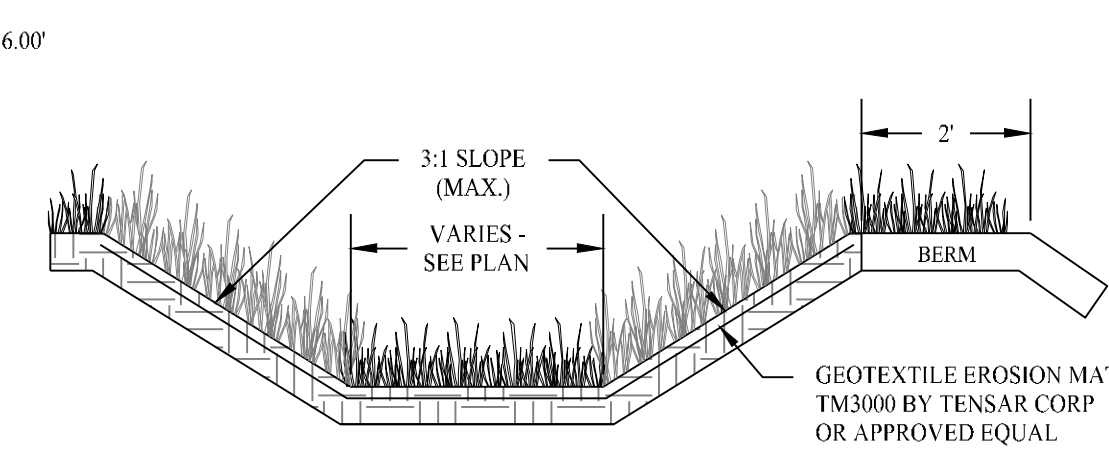
STORMWATER BASIN CROSS-SECTION

SCALE: NTS



BROADCRESTED WEIR SPILLWAY

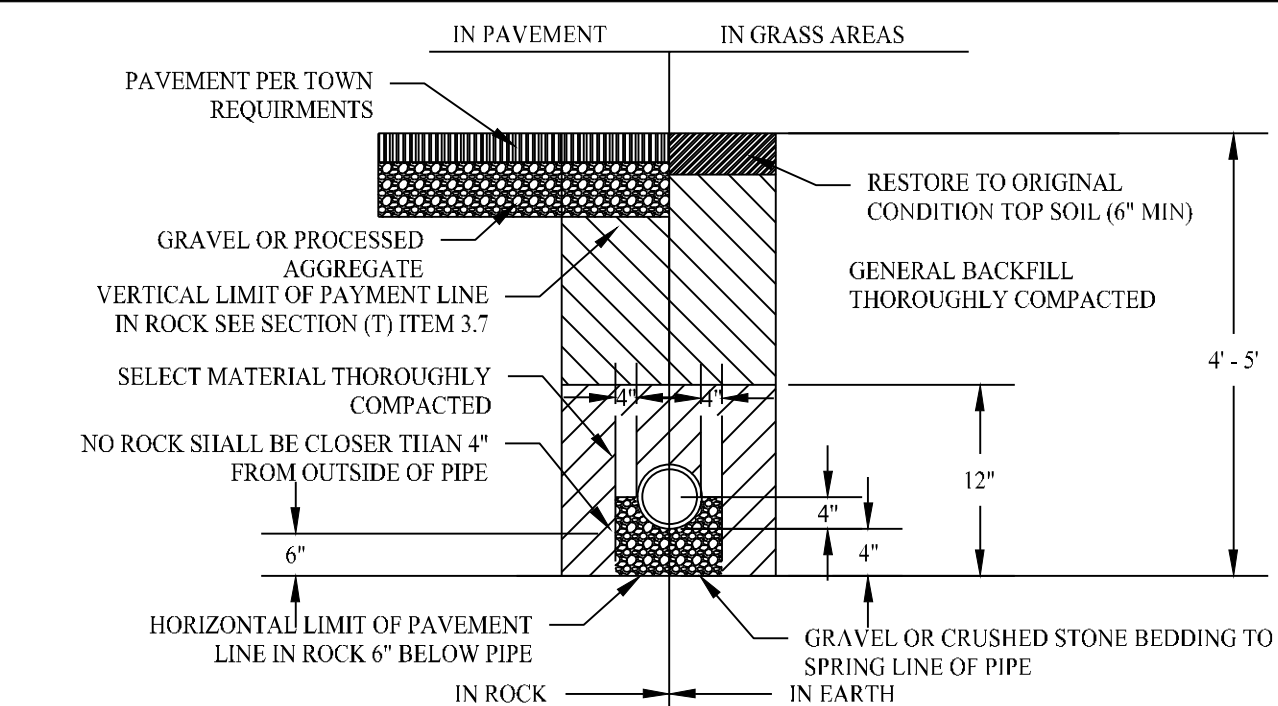
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TYPICAL GRASS LINED SWALE

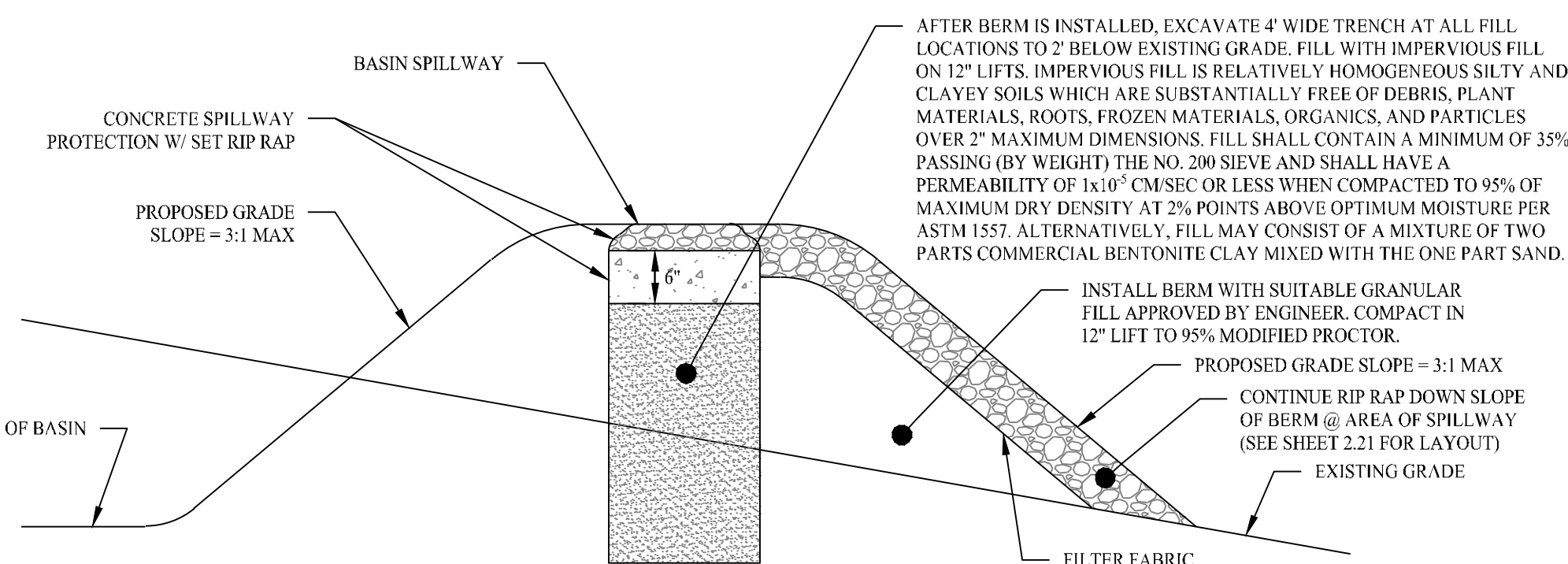
SCALE: NTS

DETAIL PER CT DEEP



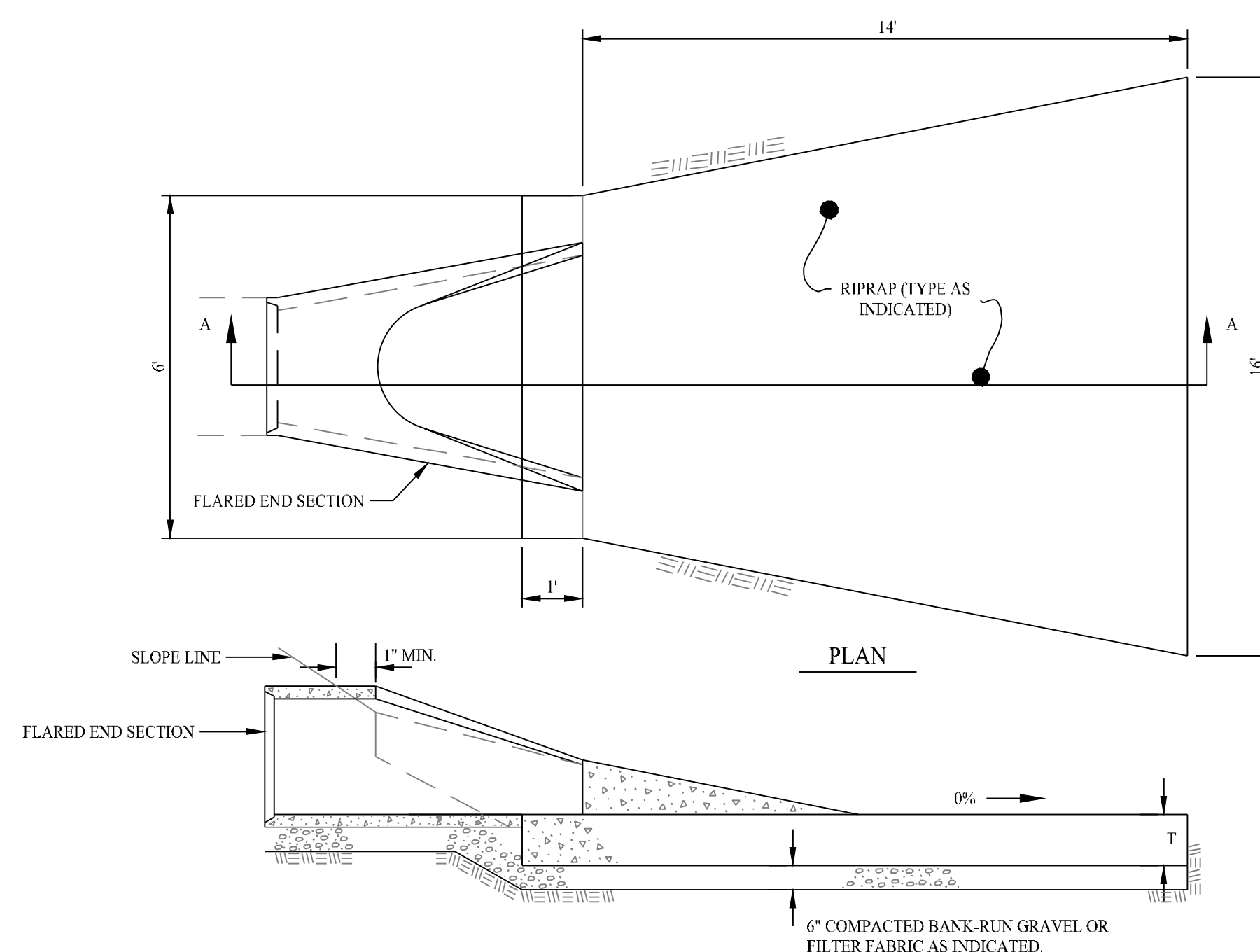
STORM TRENCH DETAIL

SCALE: NTS



TYPICAL SPILLWAY IN FILL SECTION DETAIL

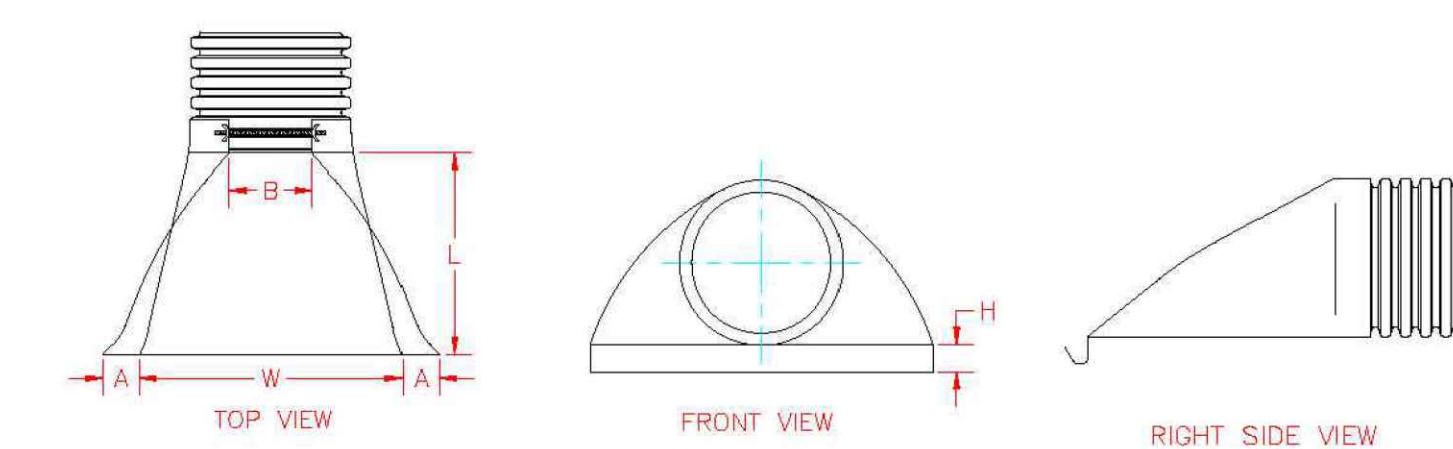
SCALE: NTS



TYPE 'A' RIPRAP APRON

SCALE: NTS

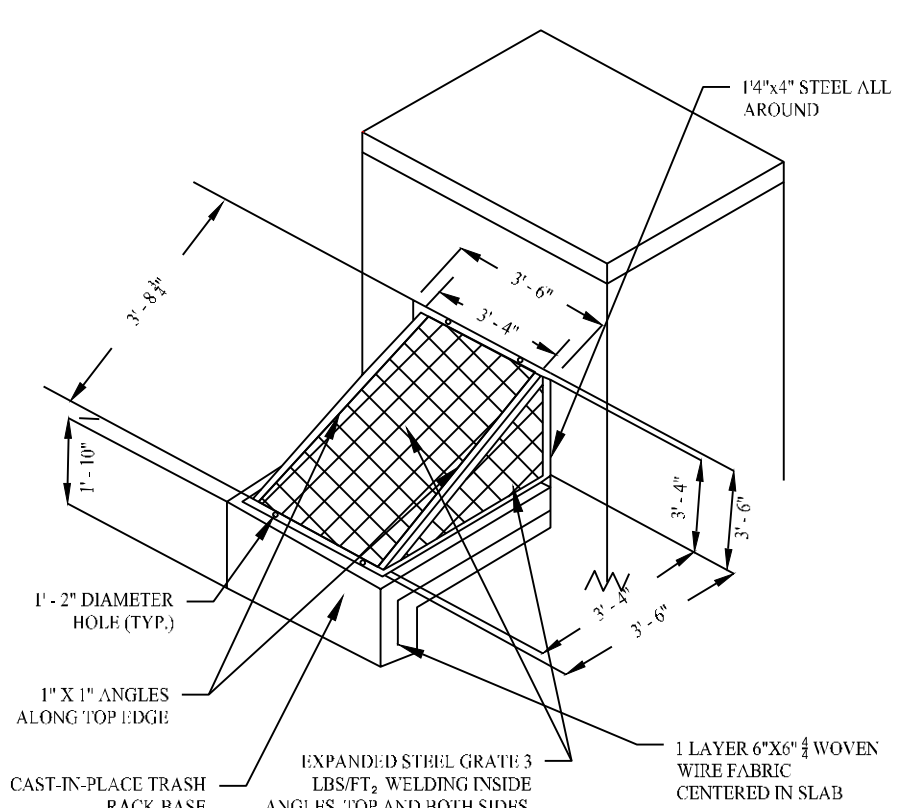
PIPE DIAMETER, in (mm)						
Diameter in (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)
A	6.5 (165)	6.5 (165)	7.5 (191)	7.5 (191)	7.5 (191)	7.5 (191)
B (max)	10.0 (254)	10.0 (254)	15.0 (381)	18.0 (475)	22.0 (559)	25.0 (635)
H	6.5 (165)	6.5 (165)	6.5 (165)	6.5 (165)	8.6 (218)	8.6 (218)
L	25.0 (635)	25.0 (635)	32.0 (813)	36.0 (914)	58.0 (1473)	58.0 (1473)
W	29.0 (737)	29.0 (737)	35.0 (889)	45.0 (1143)	63.0 (1600)	63.0 (1600)



FLARED END SECTION DETAILS

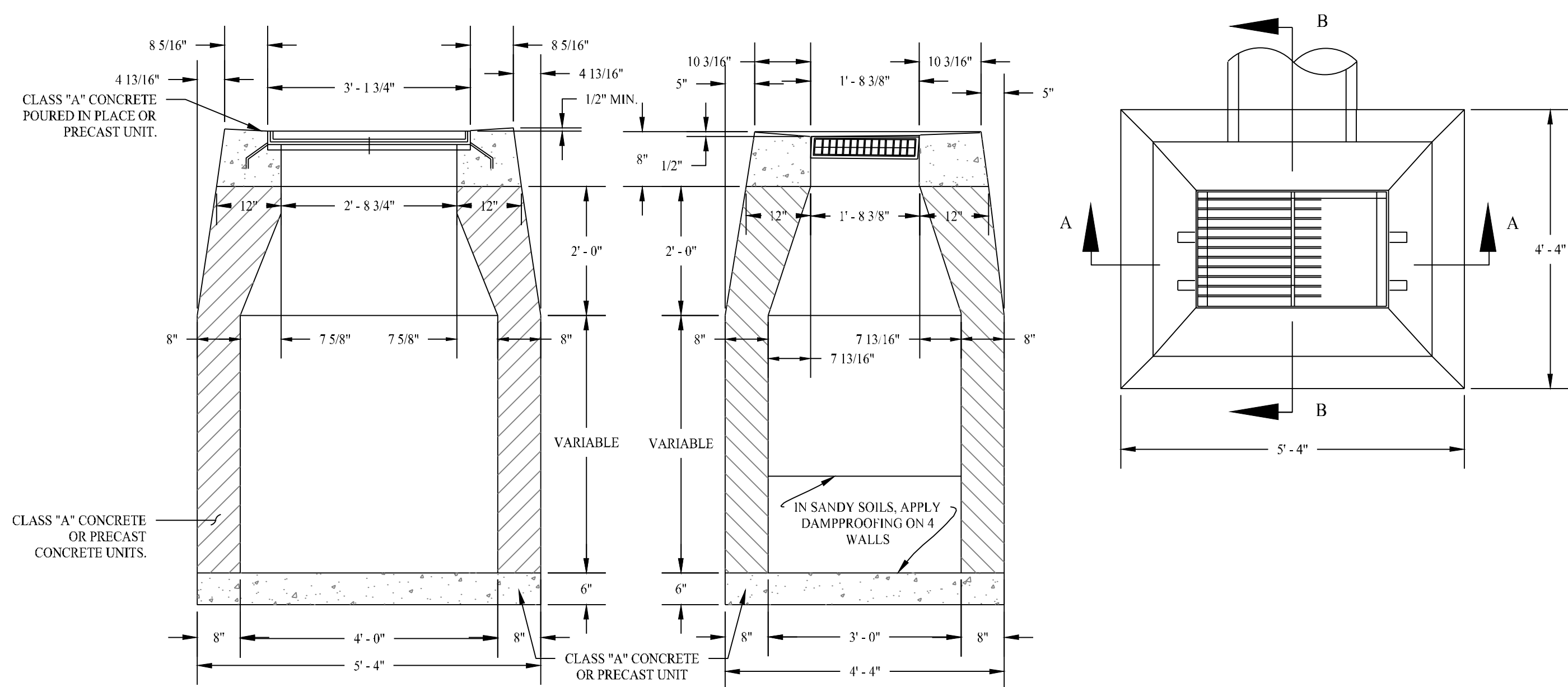
SCALE: NTS

DETAIL PER ADVANCED DRAINAGE SYSTEMS, INC.



PRIMARY OUTLET TRASH RACK DETAIL

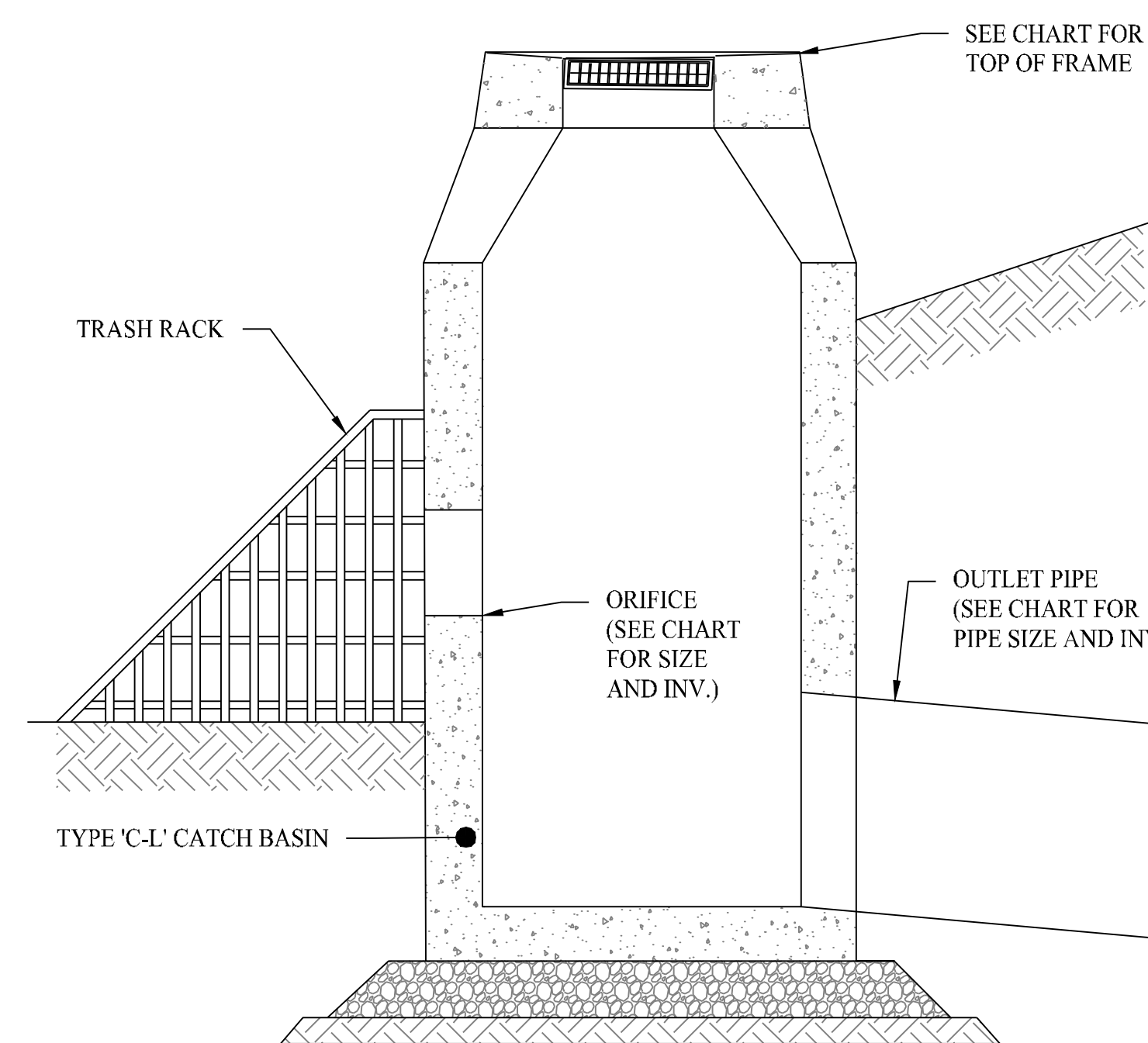
SCALE: NTS



TYPE "C-L" CATCH BASIN

SCALE: NTS

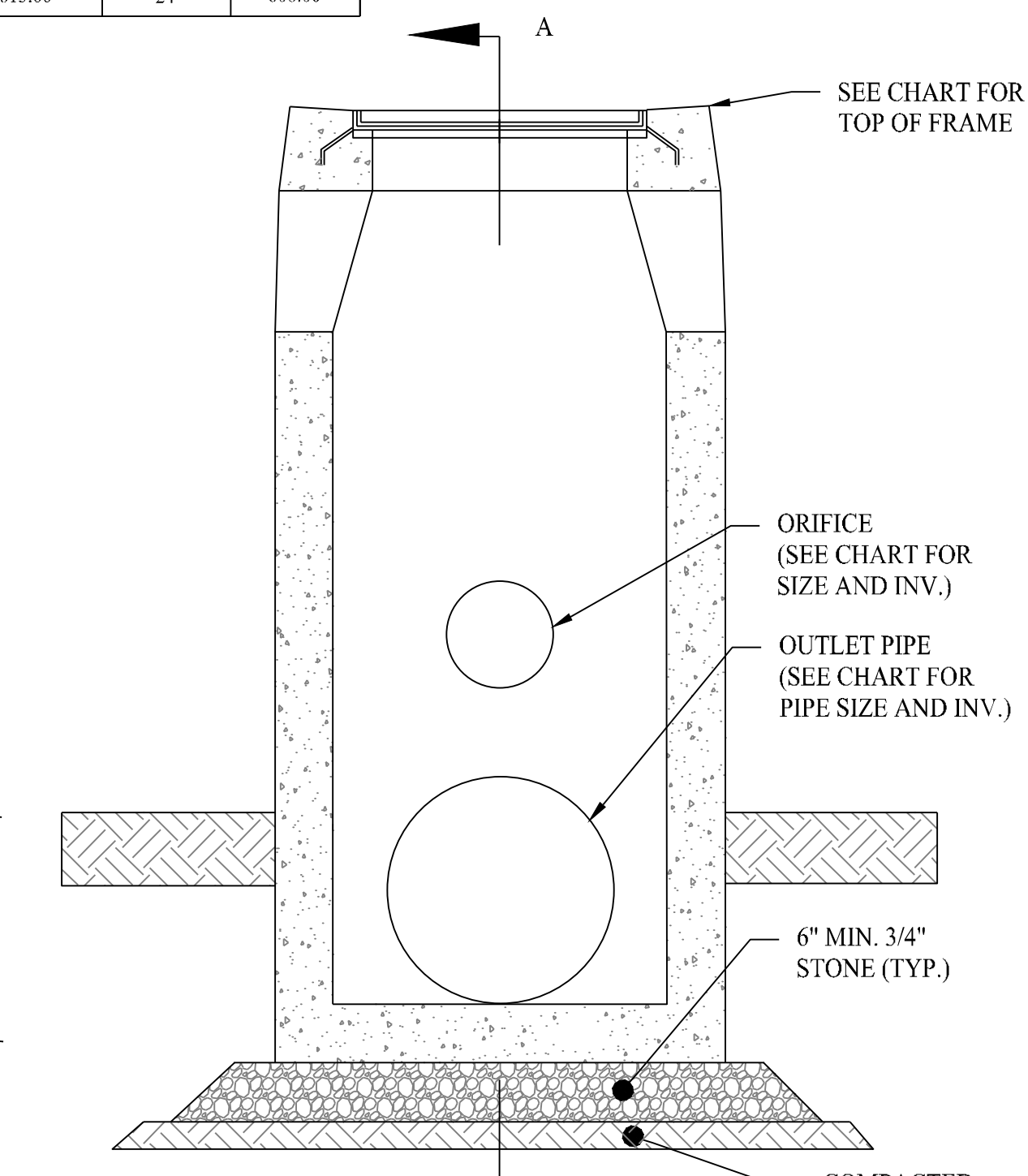
OUTLET I.D.	ORIFICE SIZE (IN.)	ORIFICE ELEV. (FT.)	TOP OF FRAME ELEV. (FT.)	OUTLET SIZE (IN.)	OUTLET ELEV. (FT.)
OCS-1	18	611.10	615.00	24	608.00



SECTION A - A

OUTLET CONTROL STRUCTURE

SCALE: NTS



ELEVATION

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1	04/19/24	CSC INTERROGATORIES



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Drawn By: CJS
 Checked By: CJB
 Approved By: KMS
 Project #: 23100101
 Plan Date: 01/15/24
 Scale: NTS

PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title: CONSTRUCTION DETAILS
 Sheet #: 3.02

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ENVIRONMENTAL NOTES - RESOURCE PROTECTION MEASURES

EASTERN BOX TURTLE PROTECTION PROGRAM

EASTERN BOX TURTLES ARE LISTED AS STATE "SPECIES OF SPECIAL CONCERN" BY THE CT DEEP. SPECIES CLASSIFIED AS "THREATENED" BY THE CT DEEP ARE NATIVE SPECIES THAT HAVE A NATURALLY RESTRICTED RANGE IN HABITAT IN THE STATE, ARE AT A LOW POPULATION LEVEL, ARE IN SUCH HIGH DEMAND BY HUMANS THAT ITS UNREGULATED TAKING WOULD BE DETRIMENTAL TO THE CONSERVATION OF ITS POPULATION, OR HAVE BEEN EXTIRPATED FROM THE STATE. EASTERN BOX TURTLES TYPICALLY INHABIT WELL-DRAINED FOREST BOTTOMLANDS AND OPEN DECIDUOUS FORESTS AND WILL UTILIZE A VARIETY OF OTHER EARLY SUCCESSIONAL HABITATS SUCH AS FIELD EDGES (AND OTHER EDGE HABITAT SUCH AS UTILITY CORRIDORS) AND THICKETS. THEY ALSO WILL UTILIZE WETLAND HABITATS SUCH AS MARSHES, BOGS, AND STREAMS AT VARIOUS TIMES DURING THEIR ACTIVE SEASON. EASTERN BOX TURTLES ARE ACTIVE BETWEEN APRIL 1 AND NOVEMBER 1; IN THE REMAINING MONTHS, THEY ARE DORMANT, IN A STATE OF BRUMATION A FEW INCHES UNDER THE GROUND SURFACE.

THE FOLLOWING IS A SUMMARY OF MEASURES REQUIRED BY THE CT DEEP AND TO BE USED BEFORE, DURING AND FOLLOWING CONSTRUCTION TO PROTECT EASTERN BOX TURTLES THAT MAY POTENTIALLY BE ENCOUNTERED AT THE SITE. ALL GROUND DISTURBANCE WORK ASSOCIATED WITH THE PROJECT MUST BE CONDUCTED BETWEEN APRIL 1 AND NOVEMBER 1, THE EASTERN BOX TURTLES' ACTIVE SEASON. IT IS RECOMMENDED MOWING NOT OCCUR DURING MAY 15 TO SEPTEMBER 15. IF MOWING IS TO OCCUR DURING THIS TIME FRAME, WHETHER PRE- OR POST-CONSTRUCTION, THE CT DEEP RECOMMENDS THE FOLLOWING:

PRE-CONSTRUCTION:

- IN PREPARING THE SITE FOR DEVELOPMENT, EXCLUSIONARY FENCING THAT IS AT LEAST 20 INCHES TALL AND THAT IS SECURED AND KEYED INTO THE GROUND, MUST BE INSTALLED AROUND THE PERIMETER OF THE WORK AREA TO PREVENT TURTLE ACCESS TO THE SITE. THE WORK AREA INCLUDES ALL AREAS USED FOR SITE ACCESS, EQUIPMENT PARKING, MATERIAL STAGING, MATERIAL STORAGE, AND CONSTRUCTION PURPOSES. THE ENTRANCE TO THE SITE ALSO MUST BE CORDONED OFF WITH AN EXCLUSIONARY METHOD WHEN THE SITE IS NOT IN USE. THIS CAN BE ACCOMPLISHED WITH A ROW OF HAY BALES THAT CAN BE MOVED WHEN ACCESS TO THE SITE IS NEEDED.
- IF MOWING NEEDS TO OCCUR BEFORE EXCLUSIONARY FENCE INSTALLATION WITHIN THE ACTIVE TURTLE TIMEFRAME, THE MOWING STYLE, MOWING HEIGHT, MOWING DIRECTIONALITY, MOWING SPEED, AND THE LOCATION OF NON-MOWING AREAS SHOULD BE AS FOLLOWS:
 - MOWING STYLE: AVOID FLAIL MOWER HEADS WITH GUIDE BARS THAT RIDE ALONG THE GROUND. SICKLE BAR MOWERS WILL HAVE THE LEAST IMPACT IF MOWING EVERY ONE TO FIVE YEARS IN AREAS WITH MORE WOODY VEGETATION. A LESS THAN ONE TO TWO-INCH DIAMETER BRONTOSAURUS-STYLE MOWER WILL HAVE THE LEAST IMPACT ON TURTLES.
 - MOWING HEIGHT: THE RETENTION OF MOWING STUBBLE SEVEN TO TWELVE INCHES IN HEIGHT WILL REDUCE MORTALITY, REDUCE BLADE WEAR, AND WILL LEAVE IMPORTANT COVER FOR ANIMALS.
 - MOWING DIRECTIONALITY: START MOWING FROM THE CENTER OF THE FIELD AND USE A BACK-AND-FORTH APPROACH OR LARGE CIRCULAR PATTERNS TO AVOID CONCENTRATING FLEEING ANIMALS WHERE THEY MAY BE KILLED OR STRANDED. IN ADDITION, LEAVE AN UNMOWED 30-FOOT STRIP AROUND THE PERIMETER OF THE FIELD AND MOW THIS AREA LAST. MOST TURTLES ARE FOUND WITHIN THESE AREAS, AND THIS PROVIDES TIME FOR THEM TO REACT TO THE MOWING ACTIVITY AND MOVE OUT OF THE AREA. IF THE FIELD IS NEAR A STREAM, START MOWING THE SIDE FURTHEST FROM THE STREAM AND WORK TOWARDS THE STREAM. IF THE FIELD IS BORDERED BY WOODLAND, START MOWING THE SIDE FURTHEST FROM WOODLAND AND WORK TOWARDS WOODLAND. IF THE FIELD IS BORDERED BY A ROAD, START MOWING NEXT TO THE ROAD AND WORK YOUR WAY ACROSS THE FIELD.
 - MOWING SPEED: MOWING IN LOW GEAR OR AT SLOW SPEEDS WILL ALLOW TURTLES TO REACT AND MOVE OUT OF THE FIELD.
 - NON-MOWING AREAS: LEAVE AN UNMOWED FIELD EDGE IN IIIGII TURTLE-USE AREAS UNTIL AFTER SEPTEMBER 15.
- ONCE EXCLUSIONARY FENCING HAS BEEN INSTALLED SURROUNDING THE WORK AREA, A QUALIFIED INDIVIDUAL MUST SURVEY THE AREA TO DETERMINE IF THERE ARE ANY TURTLES WITHIN THE WORK AREA. IF TURTLES ARE IDENTIFIED, THEY ARE TO BE CAREFULLY MOVED TO AN AREA OUTSIDE OF THE WORK AREA IN A SAFE MANNER THAT WILL NOT HARM THEM. IF LISTED SPECIES OF TURTLES ARE IDENTIFIED, THE QUALIFIED INDIVIDUAL WILL DOCUMENT AND REPORT THESE FINDINGS TO THE CT DEEP IN THE MANNER IDENTIFIED WITHIN THE NDBD DETERMINATION LETTER. ONLY WHEN THE QUALIFIED INDIVIDUAL DETERMINES THAT NO TURTLES ARE WITHIN THE WORK AREA AND THAT THE SITE IS SECURE FROM TURTLES RE-ENTERING CAN CONSTRUCTION BEGIN.
- PRIOR TO COMMENCING ACTIVITY, A MEETING IS TO BE HELD WITH ALL CONSTRUCTION PERSONNEL WORKING WITHIN THE EXCLUSION AREA BY THE QUALIFIED INDIVIDUAL TO APPRAISE THEM OF THE SPECIES DESCRIPTION AND THEIR DUTIES IN REGARD TO MAINTAINING THE SECURITY OF THE SITE. SHOULD CONSTRUCTION PERSONNEL ENCOUNTER A TURTLE, THE QUALIFIED INDIVIDUAL WILL INSTRUCT PERSONNEL DURING THIS MEETING ON HOW TO CAREFULLY REMOVE THE TURTLE FROM THE SITE, HOW TO DOCUMENT THEIR FINDINGS AND TO REPORT IT TO THE QUALIFIED INDIVIDUAL FOR REPORTING TO THE CT DEEP.

MID-CONSTRUCTION:

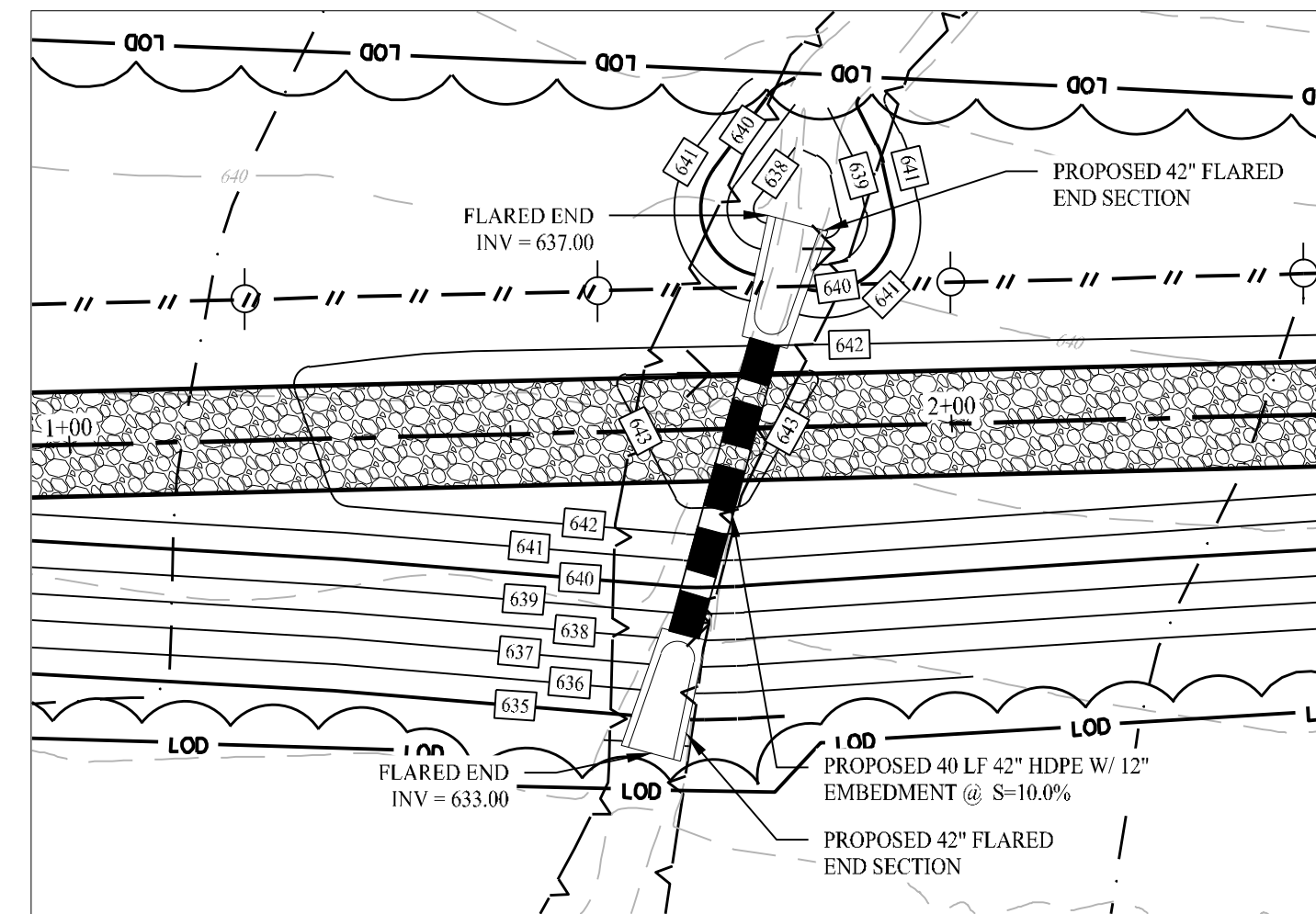
- PRIOR TO THE START OF WORK ACTIVITY EACH DAY, THE EXCLUSIONARY FENCING IS TO BE INSPECTED BY CONSTRUCTION PERSONNEL AND ALL GAPS OR OPENINGS AT THE GROUND LEVEL IDENTIFIED SHOULD BE FIXED OR REPAIRED IMMEDIATELY TO PREVENT TURTLES ACCESS TO THE SITE. IF A BREACH IS IDENTIFIED, WORK SHALL HALT UNTIL THE QUALIFIED INDIVIDUAL SURVEYS THE SITE AND DETERMINES NO TURTLES ARE WITHIN THE WORK AREA.
- ALL HEAVY MACHINERY (ACTIVE OR PARKED) MUST BE WITHIN THE LIMITS OF THE EXCLUSIONARY ZONE OR ON PAVED SURFACES. NO MACHINERY IS TO BE PARKED IN ANY TURTLE HABITAT (I.E., THE AREA OUTSIDE OF THE EXCLUSIONARY ZONE).
- AT THE END OF EACH WORK DAY, THE EXCLUSIONARY MEASURES AT THE ENTRANCE TO THE WORK SITE MUST BE REIMPLEMENTED TO PREVENT TURTLES FROM ACCESSING THE SITE. IF THIS IS NOT DONE, THE EXCLUSIONARY ZONE IS CONSIDERED VOID AND A QUALIFIED INDIVIDUAL MUST RE-SURVEY THE SITE AND CONCLUDE THAT NO TURTLES ARE PRESENT WITHIN THE WORK AREA BEFORE CONSTRUCTION ACTIVITY CAN BEGIN AGAIN.

POST-CONSTRUCTION:

- AFTER COMPLETION OF THE PROJECT, EXCLUSIONARY FENCING SHALL BE REMOVED ONCE THE AREA IS STABILIZED TO ALLOW FOR REPTILE AND AMPHIBIAN PASSAGE TO RESUME. IF CORDONING OFF SEGMENTS OF THE WORKSITE TO BE COMPLETED IN SEPARATE PHASES, ONCE THESE AREAS ARE STABLE, ONLY THEN MAY EXCLUSIONARY FENCING BE REMOVED. ALL ACTIVE AREAS MUST REMAIN EXCLUSIONARY TO TURTLES.

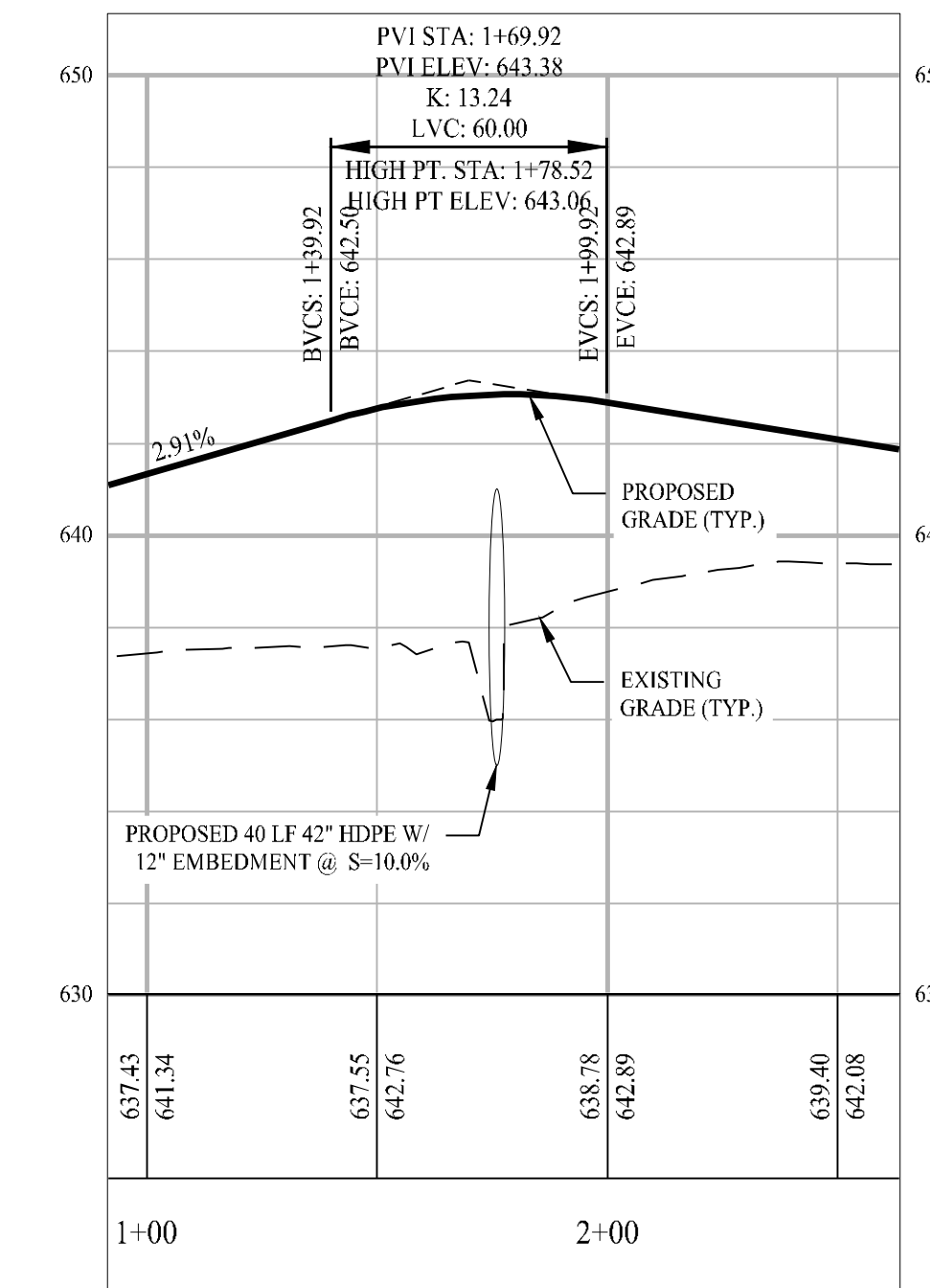
IN ADDITION TO THESE MEASURES, THE CT DEEP RECOMMENDS THE FOLLOWING BE IMPLEMENTED INTO THE GENERAL SITE DESIGN FOR THE DEVELOPMENT TO INCREASE THE VALUE OF HABITAT FOR WILDLIFE AND STATE-LISTED SPECIES.

- A SITE MANAGEMENT PLAN TO PROMOTE NATIVE VEGETATION GROWTH IN THE AREA UNDER THE SOLAR PANELS SHOULD BE CREATED.
- USE WILDLIFE-FRIENDLY FENCING TO ALLOW WILDLIFE MOVEMENT TO AND FROM THE DEVELOPMENT.
- DEVELOP A MANAGEMENT PLAN FOR AREAS OF THE PROPERTY WHERE DEVELOPMENT IS NOT OCCURRING AND/OR FOR WHEN SOLAR PANELS ARE DECOMMISSIONED THAT WILL SUPPORT STATE-LISTED SPECIES.



WETLAND CROSSING

SCALE: 1" = 20'



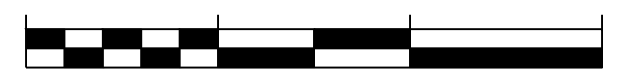
PARTIAL PROFILE AT WETLAND CROSSING

HORIZONTAL SCALE: 1" = 40'

VERTICAL SCALE: 1" = 4'

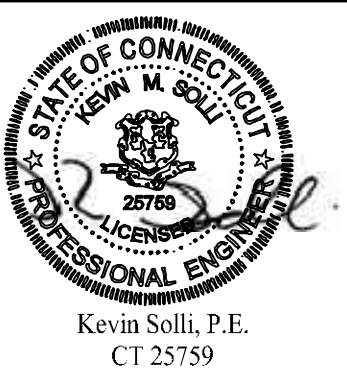
Rev. #:	Date	Description
1	04/19/24	CSC INTERROGATORIES

Graphic Scale:



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Drawn By: CJS
 Checked By: CJB
 Approved By: KMS
 Project #: 23100101
 Plan Date: 01/15/24
 Scale: NTS



Project:
PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title: ENVIRONMENTAL NOTES & DETAILS
 Sheet #: 3.03

EXHIBIT C

Revised Sections of Environmental Assessment

The NDDB Determination, dated August 16, 2023, is attached in Appendix C of this environmental assessment. This determination is valid until August 16, 2025.

3.5.2 USFWS CONSULTATION

The US Fish and Wildlife Service (USFWS) provides an online planning tool, its Information for Planning and Consultation (IPaC) system, allowing for project planners the ability to perform a regulatory review for protected species under the Endangered Species Act (ESA) that inhabit or potentially may inhabit their project sites. This resource is designed to provide a list of potential ESA-protected and/or candidate species, migratory bird species protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, critical habitats, as well as the ability to consult whether a proposed project has the potential to result in “take” of listed species. “Take” refers to any means to “harass, harm, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct to threatened and endangered species”. In consulting this resource, projects can determine whether they are in compliance with the ESA and other federal acts. Solli Engineering filed on November 29, 2023, an IPaC review of the Site and received a letter report from the USFWS titled “*List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project*”. The report specifies that one endangered species, one candidate species and eleven migratory bird species have the potential to be impacted by the proposed Project. The endangered species is the Northern Long Eared Bat, the candidate species is the Monarch Butterfly and the migratory birds are listed in the attached report in Appendix B.

The Northern Long Eared Bat is listed as endangered under the ESA. This species range encompasses the entirety of Connecticut. The CT DEEP has compiled a map of towns with known Northern Long Eared Bat and other bat hibernacula within the state, and no known hibernacula are located within the Town of Manchester. The nearest hibernacula according to the map is within the Town of East Granby, approximately 18 miles northwest of the Project area. For more information regarding the locations of NLEB areas of concern, refer to Figure 7, Natural Diversity Database Map, included in Appendix A of this environmental assessment. Regardless, to stay in compliance with the ESA, the IPaC Consultation Package Builder (CPB) was utilized to assess whether the Project would result in the “take” of Northern Long Eared Bats. The results of the CPB can be found in the attached report “*Technical assistance for ‘250 Carter Street, Manchester, CT Solar Photovoltaic Array’*” found in the attached Appendix B. The results of this report indicate that the Project is not likely to result in the unauthorized “take” of Northern Long Eared Bats and therefore does not require a permit from the USFWS.

The monarch butterfly is a candidate species for protection under the ESA. Candidate species are “species which the USFWS has sufficient information to propose as endangered or threatened under the ESA, but for which their development of a proposed listing regulation is precluded by other higher priority listing activities”. As such, until they are proposed for listing, these species are not officially entitled to legal protection under the ESA, and they are not considered when making a determination as to “take”.

3.6 SOILS & GEOLOGY

The Project grading is expected to generate a net import of approximately 1,250 cubic yards of material. Before any fill material is removed or used, the topsoil will be stripped and stockpiled for later seeding of disturbed areas. Any soil exposed due to construction will be treated according to the *Connecticut Guidelines for Soil Erosion and Sediment Control*.

The following soils exist onsite and in surrounding areas:

1. Ridgebury fine sandy loam, 0 to 3 percent slopes.
2. Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony.
3. Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony.
4. Paxton and Montauk fine sandy loams, 3 to 15 percent slopes, extremely stony.

For more information, refer to the map Figure 8, Prime Farmland Map, included in Appendix A of this environmental assessment.

3.6.1 PRIME FARMLAND SOILS

Solli Engineering has reviewed the listed soils in accordance with the Code of Federal Regulations (“CFR”) Title 7, part 657. Prime Farmland Soils are distinguishable based on soil type. These soils are to be identified under CFR Title 7, part 657 in order to know the extent and location of the best land for producing food, feed, fiber forage and oilseed crops. Upon review, the Project contains no prime farmland. For more information, refer to the map Figure 8, Prime Farmland Map, included in Appendix A of this environmental assessment.

3.7 HISTORIC & ARCHAEOLOGICAL RESOURCES

Archaeological Consulting Services LLC (ACS) performed a Phase 1A cultural resources assessment survey on behalf of Solli Engineering and the Petitioner. Their report discloses that a property National Register of Historic Places does not exist within the Site. Background research indicates a low sensitivity for potential prehistoric cultural resources. The low scores in general can be attributed to very rocky soil contexts and great horizontal and vertical distances to the nearest major water source. ACS therefore recommends no further archaeological conservation efforts for the Site. For more information refer to the Phase 1A report in Appendix D, Cultural Resources.

3.8 SCENIC AND RECREATIONAL AREAS

No state road or local road will be affected physically or impaired visually by the Project. The Shenipsit Trail is a hiking trail that runs through the Site approximately 100-200 feet from the Project area; however, the Facility should not be visible from the trail due to dense forest cover and grading. The Charter Oak Greenway is a protected hiking trail located approximately one-half mile north of the property. The closest open space is located at Yules Park, approximately 1,500 feet southwest of the property. For more information regarding resources located within one mile of the Site refer to Figure 9, Scenic & Recreation Map, included in Appendix A.

3.9 LIGHTING

Exterior lighting is not planned for the Project. There may be onsite equipment that have small lights which will only be activated during maintenance.

3.10 FAA DETERMINATION

The closest federally obligated airport is Hartford-Brainard Airport located approximately 9 miles west of the Site.

Solli Engineering has submitted the required information to the Federal Aviation Administration (FAA) for review. The FAA reviewed multiple sample points to determine whether a potential hazard exists for air navigation. Upon review, the FAA issued a Determination of No Hazard to Air Navigation for all points. A glare analysis is not required at this time. For more information see Appendix F, FAA Determinations.

3.11 VISIBILITY

There will be solar trackers a maximum of 6’ off finished grade within the solar panel facility. All disturbed areas will be contained within a 7’ chain link fence. Trees constituting the existing tree line will be preserved and maintained to the best of the developer’s ability. Neighbors in the vicinity of the subject property will not be able to view the solar panel facility due to existing tree coverage and additional vegetative buffers, which include American Holly and Eastern Red-Cedar trees, proposed on the eastern side of the Project area. For more information refer to Figure 10, Proposed Conditions Viewshed Map, included in Appendix A.

The solar panel products are designed in such a way that they are not highly reflective. Because the solar panel have tracking features, the panels will not reflect one direction for extended durations.

3.12 NOISE

Noise from the construction of the solar panel facility is exempted under Connecticut regulations for the control of noise. For more information refer to RCSA 22a-69-1.8(h). During construction, the increase in noise will likely lead to a subsequent elevation in ambient sound levels in the immediate vicinity of the Project. Standard construction equipment will be used for the Project, and the highest level of noise generated from this equipment - such as backhoes, bulldozers, cranes and trucks – is expected to be approximately 88 dBA from the origin.

The primary sources of noise generation associated with the Facility will be the 2,000 kVA transformer and (8) inverters. The solar panels themselves do not have any associated noise. A summary of the equipment and manufacturer’s listed sound data is provided below in Table 1.

Table 1: Equipment Sound Summary

Equipment	Number of Sources	Listed Sound Pressure (dBA)	Distance of Observed Sound Level (meters)
Sungrow SG125HV 125kW Inverters	8	61.6	1
2,000 kVA Transformer	1	61	1

The logarithmic decibel scale is utilized to combine sound levels and adjust for distance based on the Inverse Square Law. Total sound levels from the proposed equipment was calculated as shown below:

Calculate Anticipated Sound Level at Nearest Property Boundary

Multiple analysis points were studied along the property boundary to determine at which point the highest level of sound will be produced by the equipment on-site. Once the point was determined, following equation was used to determine the sound level of each piece of noise-producing equipment:

$$L_b = L_a - 20 \times \log_{10}\left(\frac{D_b}{D_a}\right)$$

Where:

L_b = Noise level at new distance (dBA)

L_a = Noise level at original distance (dBA)

D_b = New distance from source of noise (meters)

D_a = Original distance from source of noise (meters)

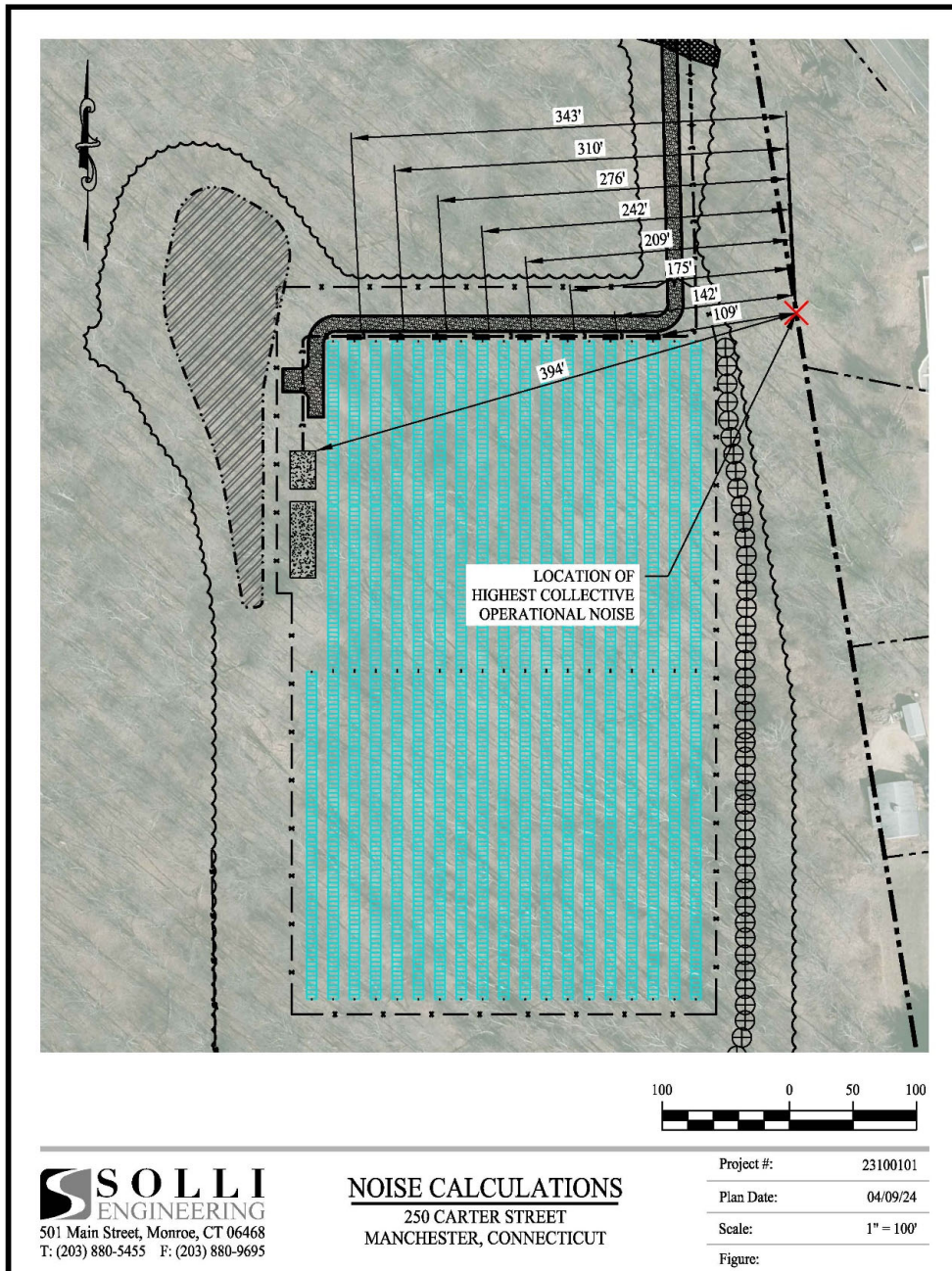
Using the data from Table 1, as well as the distances from each inverter (109’, 142’, 175’, 209’, 242’, 276’, 310’, 343’) and the transformer (394’) to the property line, the total anticipated sound level for each piece equipment was calculated.

Combining Sound Levels

To add multiple sound levels of different strength, the following equation was used:

$$L_t = 10 \log_{10}\left(\sum 10^{\frac{L_b}{10}}\right)$$

After combining all sound levels from each piece of equipment, it was determined that the highest collective operational noise at the property boundary would be 35.8 decibels. This noise level meets applicable CT DEEP Noise Standards, and noise levels will effectively be reduced to zero during nighttime hours when the array is not generating electricity.



SOLLI
ENGINEERING
501 Main Street, Monroe, CT 06468
T: (203) 880-5455 F: (203) 880-9695

NOISE CALCULATIONS
250 CARTER STREET
MANCHESTER, CONNECTICUT

4.0 CONCLUSION

As demonstrated by the information outlined herein, the Project will have no air emissions, no significant adverse environmental impacts, and will comply with the CT DEEP air and water quality standards. The Petitioner, therefore, respectfully requests that the Council issue a declaratory ruling that the proposed Project will comply with CT DEEP air and water quality standards, will not have a substantial adverse environmental impact, and does not require the issuance of a Certificate.

EXHIBIT D

SHPO Response Letter

March 22, 2024

Dr. Gregory F. Walwer
Archaeological Consulting Services
118 Whitfield Street
Guilford, CT 06437
(sent only via email to acsinfo@yahoo.com)

Subject: Phase Ia Archaeological Assessment Survey
250 Carter Street
Manchester, Connecticut

Dear Dr. Walwer:

The State Historic Preservation Office (SHPO) has reviewed the Phase IA Archaeological Assessment survey prepared by Archaeological Consulting Services (ACS) for a proposed solar facility and related improvements situated on the south side of Carter Street near the town line. The project parcel encompasses approximately 41 acres. The property currently consists of vacant wooded land that is traversed by a natural gas pipeline. The proposed solar arrays will be accessed from Carter Street with a proposed gravel road. The project will require approval from the Connecticut Siting Council and has a proposed stormwater basin. Therefore, it is subject to review by our office pursuant to state and federal legislation.

The preliminary context and background research demonstrates knowledge of the project region and is consistent with the standards set forth in the *Environmental Review Primer for Connecticut's Archaeological Resources*. The ACS report describes a landscape that does not contain known cultural resources and does not possess the environmental qualities frequently associated with significant archaeological deposits. As a result, SHPO concurs with ACS that the proposed actions are unlikely to impact significant archaeological sites. Based on the information provided to our office, SHPO concurs that no historic properties will be affected by this undertaking.

SHPO appreciates the opportunity to review and comment upon this project. Do not hesitate to contact Catherine Labadia, Staff Archaeologist and Deputy State Historic Preservation Officer, for additional information at (860) 500-2329 or catherine.labadia@ct.gov.

Sincerely,



Jonathan Kinney
State Historic Preservation Officer

EXHIBIT E

USFWS Correspondence



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To:

04/09/2024 21:05:24 UTC

Project Code: 2024-0021111

Project Name: Manchester CT Solar Photovoltaic Array

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Updated 4/12/2023 - Please review this letter each time you request an Official Species List, we will continue to update it with additional information and links to websites may change.

About Official Species Lists

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Federal and non-Federal project proponents have responsibilities under the Act to consider effects on listed species.

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested by returning to an existing project's page in IPaC.

Endangered Species Act Project Review

Please visit the “**New England Field Office Endangered Species Project Review and Consultation**” website for step-by-step instructions on how to consider effects on listed

species and prepare and submit a project review package if necessary:

<https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review>

NOTE Please do not use the **Consultation Package Builder** tool in IPaC except in specific situations following coordination with our office. Please follow the project review guidance on our website instead and reference your **Project Code** in all correspondence.

Northern Long-eared Bat - (Updated 4/12/2023) The Service published a final rule to reclassify the northern long-eared bat (NLEB) as endangered on November 30, 2022. The final rule went into effect on March 31, 2023. You may utilize the **Northern Long-eared Bat Rangewide Determination Key** available in IPaC. More information about this Determination Key and the Interim Consultation Framework are available on the northern long-eared bat species page:

<https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis>

For projects that previously utilized the 4(d) Determination Key, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective. If your project was not completed by March 31, 2023, and may result in incidental take of NLEB, please reach out to our office at newengland@fws.gov to see if reinitiation is necessary.

Additional Info About Section 7 of the Act

Under section 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether projects may affect threatened and endangered species and/or designated critical habitat. If a Federal agency, or its non-Federal representative, determines that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Federal agency also may need to consider proposed species and proposed critical habitat in the consultation. 50 CFR 402.14(c)(1) specifies the information required for consultation under the Act regardless of the format of the evaluation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<https://www.fws.gov/service/section-7-consultations>

In addition to consultation requirements under Section 7(a)(2) of the ESA, please note that under sections 7(a)(1) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Please contact NEFO if you would like more information.

Candidate species that appear on the enclosed species list have no current protections under the ESA. The species' occurrence on an official species list does not convey a requirement to

consider impacts to this species as you would a proposed, threatened, or endangered species. The ESA does not provide for interagency consultations on candidate species under section 7, however, the Service recommends that all project proponents incorporate measures into projects to benefit candidate species and their habitats wherever possible.

Migratory Birds

In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

<https://www.fws.gov/program/migratory-bird-permit>

<https://www.fws.gov/library/collections/bald-and-golden-eagle-management>

Please feel free to contact us at **newengland@fws.gov** with your **Project Code** in the subject line if you need more information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat.

Attachment(s): Official Species List

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5094

(603) 223-2541

PROJECT SUMMARY

Project Code: 2024-0021111
Project Name: Manchester CT Solar Photovoltaic Array
Project Type: Power Gen - Solar
Project Description: The proposed project is a solar photovoltaic array that will produce 0.999 MW AC within 7.80 acres of the southeastern portion of the approximate 41.08-acre property at 250 Carter Street, Manchester, CT. The entirety of the property was investigated for existing environmental conditions (i.e. wetlands and watercourses surveys, wildlife and vegetation surveys, etc.). No existing improvements are present at the property. Soils throughout the investigation area are formed from dense glacial till deposits. The vegetative cover throughout the investigation area is primarily forested.

The project proposal is to develop the project site with a solar photovoltaic array and associated improvements including access drive, fencing, landscape improvements, utility pads and interconnection systems. The development will require vegetation clearing and minor earthwork within the project area that will utilize standard construction practices. Approximately 1,100 square feet of unavoidable direct impact is proposed to inland wetlands and watercourses in order to construct an access drive from Carter Street to the developable portion of the property. The crossing will be accomplished by installing 40 linear feet of a 42-inch diameter high-density polyethylene pipe embedded 12 inches into the underlying streambed substrate through the narrowest segment of the wetland/stream onsite. The project proposes to implement a variety of soil erosion and sedimentation control measures to protect wetlands and watercourses and neighboring properties from sedimentation. The stormwater management practices proposed to mitigate for the proposed increase in impervious surfaces and to provide treatment to the runoff prior to leaving the project area are still in development at this time. The timing of the project is unknown at this time.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@41.763073399999996,-72.47082150874233,14z>



Counties: Hartford County, Connecticut

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> This species only needs to be considered if the project includes wind turbine operations. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Alexander Wojtkowiak
Address: 1899 Bronson Road
City: Fairfield
State: CT
Zip: 06824
Email: awojtkowiak@wkassociates.net
Phone: 4019355101



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To:
Project code: 2024-0021111
Project Name: Manchester CT Solar Photovoltaic Array

04/09/2024 21:09:34 UTC

Federal Nexus: no
Federal Action Agency (if applicable):

Subject: Technical assistance for 'Manchester CT Solar Photovoltaic Array'

Dear Alexander Wojtkowiak:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 09, 2024, for 'Manchester CT Solar Photovoltaic Array' (here forward, Project). This project has been assigned Project Code 2024-0021111 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (Dkey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis, your project is not reasonably certain to cause incidental take of the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Candidate
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species and/or critical habitat listed above. Note that if a new species is listed that may be affected by the identified action before it is complete, additional review is recommended to ensure compliance with the Endangered Species Act.

Next Steps

Coordination with the Service is complete. This letter serves as technical assistance. All conservation measures should be implemented as proposed. Thank you for considering federally listed species during your project planning.

We are uncertain where the northern long-eared bat occurs on the landscape outside of known locations. Because of the steep declines in the species and vast amount of available and suitable forest habitat, the presence of suitable forest habitat alone is a far less reliable predictor of their presence. Based on the best available information, most suitable habitat is now expected to be unoccupied. During the interim period, while we are working on potential methods to address this uncertainty, we conclude take is not reasonably certain to occur in areas of suitable habitat where presence has not been documented.

If no changes occur with the Project or there are no updates on listed species, no further consultation/coordination for this project is required for the northern long-eared bat. However, the Service recommends that project proponents re-evaluate the Project in IPaC if: 1) the scope, timing, duration, or location of the Project changes (includes any project changes or amendments); 2) new information reveals the Project may impact (positively or negatively) federally listed species or designated critical habitat; or 3) a new species is listed, or critical habitat designated. If any of the above conditions occurs, additional coordination with the Service should take place before project implements any changes which are final or commits additional resources.

If you have any questions regarding this letter or need further assistance, please contact the New England Ecological Services Field Office and reference Project Code 2024-0021111 associated with this Project.

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Manchester CT Solar Photovoltaic Array

2. Description

The following description was provided for the project 'Manchester CT Solar Photovoltaic Array':

The proposed project is a solar photovoltaic array that will produce 0.999 MW AC within 7.80 acres of the southeastern portion of the approximate 41.08-acre property at 250 Carter Street, Manchester, CT. The entirety of the property was investigated for existing environmental conditions (i.e. wetlands and watercourses surveys, wildlife and vegetation surveys, etc.). No existing improvements are present at the property. Soils throughout the investigation area are formed from dense glacial till deposits. The vegetative cover throughout the investigation area is primarily forested.

The project proposal is to develop the project site with a solar photovoltaic array and associated improvements including access drive, fencing, landscape improvements, utility pads and interconnection systems. The development will require vegetation clearing and minor earthwork within the project area that will utilize standard construction practices. Approximately 1,100 square feet of unavoidable direct impact is proposed to inland wetlands and watercourses in order to construct an access drive from Carter Street to the developable portion of the property. The crossing will be accomplished by installing 40 linear feet of a 42-inch diameter high-density polyethylene pipe embedded 12 inches into the underlying streambed substrate through the narrowest segment of the wetland/stream onsite. The project proposes to implement a variety of soil erosion and sedimentation control measures to protect wetlands and watercourses and neighboring properties from sedimentation. The stormwater management practices proposed to mitigate for the proposed increase in impervious surfaces and to provide treatment to the runoff prior to leaving the project area are still in development at this time. The timing of the project is unknown at this time.

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@41.763073399999996,-72.47082150874233,14z>



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect, but not likely to adversely affect” for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

No

2. The action area does not overlap with an area for which U.S. Fish and Wildlife Service currently has data to support the presumption that the northern long-eared bat is present. Are you aware of other data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed NLEB acoustic detections. Data on captures, roost tree use, and acoustic detections should post-date the year when white-nose syndrome was detected in the relevant state. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

No

3. Does any component of the action involve construction or operation of wind turbines?

Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

No

4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

No

PROJECT QUESTIONNAIRE

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Alexander Wojtkowiak
Address: 1899 Bronson Road
City: Fairfield
State: CT
Zip: 06824
Email: awojtkowiak@wkassociates.net
Phone: 4019355101

EXHIBIT F

Revised Stormwater Management Report

STORMWATER MANAGEMENT REPORT

For the Proposed:

0.99 MW SOLAR PHOTOVOLTAIC ARRAY

Located At:
250 Carter Street
Manchester, Connecticut

Prepared On:
January 15th, 2024

Revised on:
April 19th, 2024

Prepared For:



888 Prospect Street, Suite 200
La Jolla, California 92037

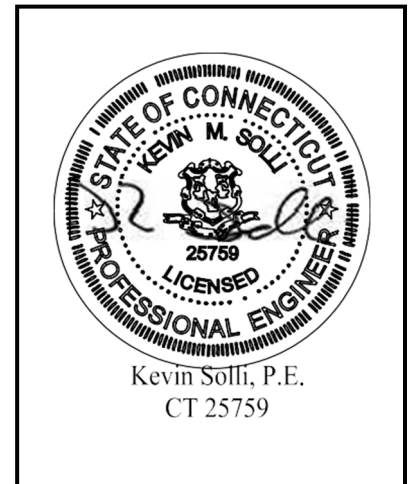
Prepared By:



11 Vanderbilt Avenue, Suite 240
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T: (203) 880-5455

993 Farmington Avenue, Suite 206
West Hartford, Connecticut 06107



Kevin Solli, P.E.
CT 25759

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APPENDICES

APPENDIX A: **FIGURES**

- Property & Topographic Survey Map
Prepared by Harry E. Cole & Son
- NRCS Soil Survey Map
- Grading and Drainage Plan (2.21)
- Existing Drainage Area Map (DA-1)
- Proposed Drainage Area Map (DA-2)

APPENDIX B: **STORMWATER CALCULATIONS**

- Hydrocad Reporting
 - Existing & Proposed Calcs for 2-, 25-, 50- & 100- yr storm events)
- Water Quality Volume Calculations
- NOAA Atlas Precipitation Data



INTRODUCTION

At the request of TRITEC Americas, LLC (Petitioner), Solli Engineering (Solli) has prepared this Stormwater Management Report to provide an analysis of the potential stormwater impacts associated with the proposed 0.99± megawatt (MW) alternating current (AC) ground-mounted solar electric generating facility (Project/Facility) located at 250 Carter Street, Manchester, Connecticut (Site). The proposed stormwater management plan outlined herein has been designed accordance with the following State of Connecticut guidelines as well as other applicable state and federal requirements and regulations:

- General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (Effective Date: December 31, 2020, Modification Date: November 25, 2022)
- Connecticut Stormwater Quality Manual (Publication Date: September 30, 2023, Effective Date: March 30, 2024)
- Connecticut Guidelines for Soil Erosion and Sediment Control (Publication Date: September 30, 2023, Effective Date: March 30, 2024)
- Connecticut Department of Transportation 2000 Drainage Manual
- CT DEEP Appendix I Stormwater Management at Solar Array Construction Projects

EXISTING SITE CONDITIONS

The Site consists of one (1) parcel totaling 41.08± acres located at 250 Carter Street, Manchester, Connecticut. The Site is bound by residential uses to the west, east, and south, and Carter Street to the north. The entire parcel is comprised of vacant land, consisting of wooded and wetland areas.

The Project area's topography gradually slopes between 7%-9% from the east property line of the site to the west. There are four (4) wetland areas located on the site. One (1) wetland is located in the southwest corner of the site, two (2) wetlands are located on the west side of the site and one (1) wetland bisects the north end of the site and runs somewhat parallel to Carter Street.

For more information regarding the Site, refer to the Property & Topographic Survey Map in Appendix A.

PROPOSED SITE CONDITIONS

The proposed Project area is 7.8± acres, within a wooded portion of the eastern region of the Site. Access to the Facility will be provided at the northeastern edge of the Site, from Carter Street, via a new 12' wide, 740'± long gravel road. The Project will be surrounded by a 7-ft tall chain link fence to provide adequate security measures.

Some work will be required within the 100' upland buffer area for northern wetland for access to the proposed project area. All other proposed work will remain outside of the 50' wetland buffer area for the other wetlands.

As currently designed, the proposed Facility will consist of 2,590 TrinaSolar TSM-DEG19C20 540W modules. The modules will be installed on a post-driven ground-mounted, single-axis tracking system, with no anticipated changes to the existing grades within the array, therefore the post-development site conditions will mimic the pre-development site conditions to the maximum extent possible. As discussed

later in this report, perimeter grassed swales with check dams and a proposed stormwater basin are proposed to assist in mitigating peak runoff flows, as well as to treat the Water Quality Volume (WQv) per CT DEEP requirements.

Approximately 1,100 square feet of unavoidable direct impact is proposed to inland wetlands and watercourses in order to construct an access drive from Carter Street to the developable portion of the property. A segment of stream is proposed to be piped to facilitate this crossing. Direct adverse impacts associated with the stream crossing will be minimized to the greatest extent practicable and the crossing will be designed in accordance with the *USACE Programmatic General Permit State of Connecticut* in regard to stream crossing BMPs. Due to the de-minimis level of impact and due to the BMPs provided during construction, the wetland and watercourse impacts associated with the stream crossing are permissible under the USACE General Permit State of Connecticut. The crossing will be accomplished by installing 40 linear feet of a 42-inch diameter high-density polyethylene pipe embedded 12 inches into the underlying streambed substrate through the narrowest segment of the wetland/stream onsite. A crossing such as this will maintain the main function of the wetland and watercourse system within the area of the proposed development, that being water conveyance.

For more information regarding the Project, refer to the Grading and Drainage Plan (Sheet 2.21) in Appendix A.

STORMWATER MANAGEMENT

The Project will add approximately 11,115 square feet of impervious/gravel area. The proposed stormwater management design consists of a stormwater basin and multiple drainage swales providing adequate storage for the water quality volume (WQv) that will effectively clean and treat the stormwater runoff prior to discharging.

METHODOLOGY

A hydrologic analysis was performed using the HydroCAD stormwater modeling system computer program developed by HydroCAD Software Solutions, LLC. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method with a NRCC-D 24-hr rainfall distribution.

Rainfall depths for the site were used for calculating the volumes and rates of runoff for this project. The depths were taken from the NOAA Atlas documents (Latitude: 41.7621°, Longitude: -72.4704°) and the rainfall values are listed in Table 1 below.

Table 1: Rainfall Data

Return Period (Storm Event)	24-hr Rainfall Depth (inches)
2-year	3.16
10-year	4.91
25-year	6.00
50-year	6.81
100-year	7.69

The drainage areas used in the calculations are illustrated on the Existing and Proposed Drainage Area Maps (DA-1 & DA-2). These maps and the corresponding Hydrocad output are attached in Appendices B. Utilizing CT DEEP Appendix I, this hydrologic analysis will reflect a reduction of the Hydrologic Soil Group (“HSG”) present on-site by a half (1/2) step (e.g., half the difference between the runoff curve number for HSG A versus HSG B). This reduction, as indicated by CT DEEP, is intended to account for

the compaction of soils that results from extensive machinery traffic during construction of the array. The WQv for the site was calculated assuming that the gravel surfaces and concrete equipment pads are effectively impervious cover.

EXISTING CONDITIONS

Approximately 23.705 acres of Off-Site and On-Site area were analyzed for stormwater management purposes. The areas analyzed contain the contributing areas which directly impact and are impacted by the proposed redevelopment. Based on existing drainage patterns, two drainage areas are defined.

The 12.707-acre Existing Drainage Area 1 (EDA-1) was considered as the contributing drainage area for the proposed development. The runoff from EDA-1 flows from Blue Ridge Drive to the east, overland to the west through the Project area and continues to flow overland through the Site to the wetlands, streams, and the western property line.

The 10.998-acre Existing Drainage Area 2 (EDA-2) was considered as the contributing drainage area for the proposed wetland crossing. The runoff from EDA-2 flows from Carter Street to the east, overland to Blue Ridge Drive and into a storm drainage system which discharges into the northern wetland.

Table 2: Existing Drainage Areas

Drainage Area Label	Drainage Area	Curve Number	Time of Concentration
Existing Drainage Area 1 (EDA-1)	12.707 AC	77	11.7 Min.
Existing Drainage Area 2 (EDA-2)	10.998 AC	80	12.3 Min.

For more information regarding the existing drainage conditions of the project area refer to the Existing Drainage Area Map (DA-1) in Appendix A and the HydroCAD calculations in Appendix B.

PROPOSED CONDITIONS

The Project proposes grassed drainage swales with stone check dams to convey stormwater runoff to the proposed stormwater infiltration basin. Infiltration tests were performed by Solli Engineering, LLC within the area of the proposed stormwater basin with an average infiltration rate of 1.2 in/hr being observed. A conservative method was used for the purpose of this design and infiltration was not utilized. Based on the proposed drainage patterns, the 12.707-acre area was divided into two (2) contributing drainage areas, Proposed Drainage Area 1A (PDA-1A) and Proposed Drainage Area 1B (PDA-1B).

PDA-1A has a contributing drainage area of approximately 10.448 acres. Similar to existing conditions, runoff from PDA-1A flows from east to west overland and into the proposed basin. Runoff then passes through an outlet control structure before discharging through a flared end section and across a level spreader before flowing to the west.

PDA-1B has a contributing drainage area of approximately 2.259 acres, which flows overland from east to west.

PDA-2 remains the same as EDA-2 and was utilized to design the wetland crossing for the proposed access drive. A 42" HDPE pipe with flared ends, and embedded 12", is proposed to convey the runoff beneath the access drive. The crossing has been designed to convey up to the 100-year design storm without overtopping the proposed access drive.

All proposed areas of disturbance within the solar array will be seeded with a Fuzz & Buzz Mix – ERNMX-147 or approved equal. All proposed areas of disturbance outside of the solar array will be seeded with Northeast Solar Pollinator Buff Mix - ERNMX-610 or approved equal.

Table 3: Proposed Drainage Areas

Drainage Area Label	Drainage Area	Curve Number	Time of Concentration
Proposed Drainage Area 1 (PDA-1)	12.707 AC	-	-
Proposed Drainage Area 1A (PDA-1A)	10.448 AC	77	12.0 Min.
Proposed Drainage Area 1B (PDA-1B)	2.259 AC	77	11.5 Min.
Proposed Drainage Area 2 (PDA-2)	10.998 AC	80	13.0 Min.

For more information regarding the proposed stormwater management design refer to the Proposed Drainage Area Map (DA-2) in Appendix A; and the HydroCAD and WQv calculations in Appendix B.

As a result of the proposed stormwater management measures, the peak flows for the 2, 25, 50 and 100-year storm events are significantly reduced from existing conditions as shown in the chart below.

Table 4: Peak Flow Comparison Table

Peak Flow (cfs)			
Storm Event	Total Drainage Areas		Percent Reduction in Peak Flow
	EDA	PDA	
2-Year	12.91	4.09	68.3%
10-Year	28.42	12.13	57.3%
25-Year	38.73	15.96	58.8%
50-Year	46.54	18.56	60.1%
100-Year	55.09	27.44	50.2%

CT DEEP APPENDIX I DESIGN REGULATIONS/COMPLIANCE

The following identifies and details the regulations and proposed compliance measures within CT DEEP Appendix I that pertain specifically to civil, stormwater, and erosion control designs.

I. Design and construction requirements:

1. Roadways, gravel surfaces, transformer pads are considered effective impervious cover for the purposes of calculating the WQV. The proposed solar panels in the array that are within existing and post-construction slopes that are greater than 15% are considered impervious for the purposes of calculating the WQV. The remainder of the proposed solar panels that are proposed within existing and post-construction slopes that are less than 15% are not considered impervious cover for the purposes of calculating the WQV because the following have been met:
 - a. Vegetative areas between the rows of solar panels have a width of 9 feet which is greater than the solar panel width of 7.8 feet.
 - b. The post-development stormwater runoff volumes and peak flows will be less than that of the pre-development stormwater runoff due to the proposed grassed swales and stormwater management basin.
 - c. The Project meets (iv) of this requirement as the plan includes specific engineered phased construction plans and detailed erosion control measures.

- d. The panels are spaced and provide a minimum height of 3 feet from the ground to provide growth of native vegetation.
2. Setback and buffer requirements have been met as follows:
 - a. No wetlands or waters are located within 100 feet of the proposed solar facility area. No solar panels are located within the 50-foot setback of any property boundary that is located downgradient of the construction activity.
 - b. There is a minimum of 50 feet between the limit of construction activity and downgradient wetlands.
 - c. There is a minimum of 10 feet between the construction activity associated with the installation of the access road and interconnection and downgradient wetlands.
 3. The wetlands and water courses were originally delineated by Ian T. Cole on October 15, 2023. The location of delineated resources, as well as buffers, are shown on the Site Layout Plan (Sheet 2.11) in Appendix A.

II. Design requirements for post-construction stormwater management measures:

1. Post-construction stormwater control measures have been designed and will be constructed to provide permanent stabilization and non-erosive conveyance of runoff from the site.
2. The orientation of the panels follows the existing slopes on the site to the extent practicable.
3. The hydrologic analysis has been completed, as described above, with the following details:
 - a. The Project evaluated and will control the 2, 25, 50, and 100-year 24-hour rainfall events in accordance with the CT Stormwater Quality Manual. Maximum sheet flow was kept to 100 feet and shallow concentrated flows were calculated using velocity factors per NRCS Part 630 National Engineering Handbook Chapter 15. The proposed swales have been designed to convey and control stormwater from a 100-year, 24-hr rainfall event.
 - b. NRCS soil mapping was used for the stormwater design.
 - c. There are no areas where the grades will change by more than two (2) feet from existing conditions. With the modeled half-drop (1/2) in HSG for the facility area and the change in curve number associated with the ground cover change from existing to proposed conditions, there will be a decrease in post-development runoff in comparison to pre-development runoff.
 - d. Pre-and post-development drainage area maps & computations are provided in Appendices A and B.
 - e. The information above and herein demonstrates that the Project will have no net increase in peak flows, erosive velocities or volumes, or adverse impacts to downstream properties.

SOIL EROSION & SEDIMENT CONTROL

The proposed plans for soil erosion and sediment control prepared for this project have been developed in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control, prepared by the Connecticut Council on Soil and Water Conservation in Collaboration with the Connecticut Department of Energy and Environmental Protection.

The soil erosion and sediment control measures that will be proposed as part of this project include geotextile silt fences with wings for areas less than 1 acre, compost filter socks, construction entrance, dust control measures, and a temporary sediment trap. The soil erosion and sediment control measures will be implemented in two (2) phases. Phase I measures are associated with the clearing, grubbing and installation of the sediment trap and diversion swales. Phase II measures are associated with the remain clearing and grubbing, fine grading and installation of the modules, hardscape, and utilities infrastructure.

CONCLUSION

The stormwater management for the proposed Project has been designed such that the post-development peak discharges to the waters of the State of Connecticut for the 2-, 10-, 25-, 50-, and 100- year storm events are less than the pre-development peak discharges. In addition, the Project adheres to the regulations and guidelines presented by CT DEEP's Appendix I as described above. As a result, the proposed solar array will not result in any adverse conditions to the surrounding areas and properties.

APPENDICES

Appendix A – Figures

Appendix B – Stormwater Calculations

Appendix A – Figures

- Property & Topographic Survey Map
(Prepared by Harry E. Cole & Son)
 - NRCS Soil Survey Map
 - Grading & Drainage Plan (2.21)
- Existing Drainage Area Map (DA-1)
- Proposed Drainage Area Map (DA-2)

DRAWING NUMBER: 2379A and the date of the drawing: 10/20/2023. The drawing was prepared by SOLLI ENGINEERING, LLC on 10/20/2023. The drawing was prepared by SOLLI ENGINEERING, LLC on 10/20/2023. The drawing was prepared by SOLLI ENGINEERING, LLC on 10/20/2023.

LEGEND

- Existing utility pole
Existing light pole
Existing fire hydrant
Existing water valve
Existing gas valve
Existing underground pipe
Existing edge of pavement
Existing bituminous concrete lip curb
Existing well
Existing catch basin
Existing drainage manhole
Existing sanitary manhole
Existing utility box
Existing contour
Existing spot elevation
Existing iron pin
Existing drill hole
Existing monument

SURVEY NOTES:

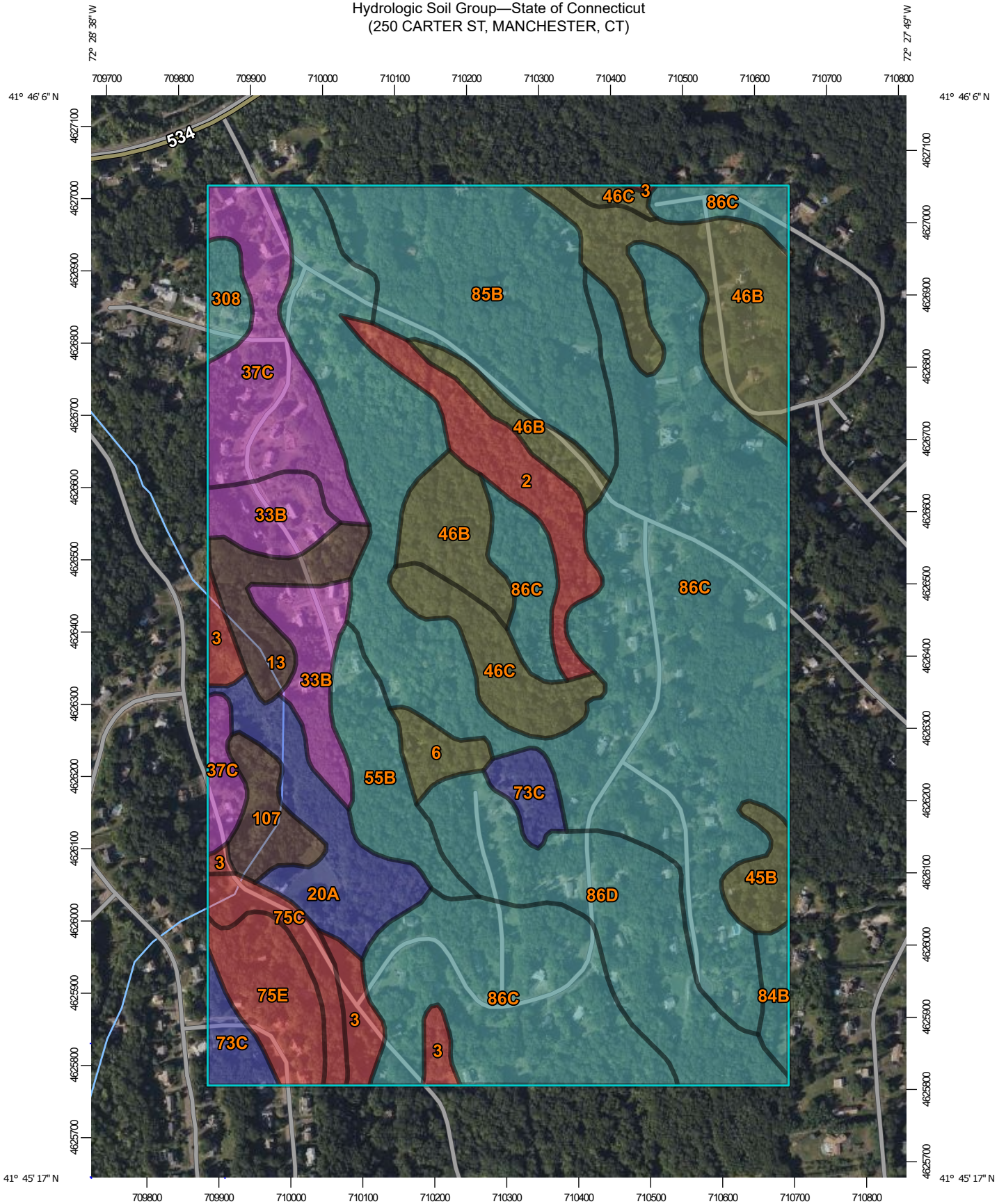
- This map has been prepared pursuant to the Regulation of Connecticut State Agencies Sections 20-300b-1 through 20-300b-20 and the "Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors, Inc. on September 26, 1996.
Type of survey performed: Property & Topographic Survey
Boundary determination category: Resurvey
Class of accuracy: Horizontal: A-2, Vertical: T-2
The intent of this map is to depict or note the position of boundaries with respect to: (A) locations of all boundary monumentation found or set; (B) Apparent improvements and features, including as a minimum: dwellings, barns, garages, sheds, driveways, roadways, surface utilities, visible bodies of water and swimming pools; (C) record easements and visible means of ingress and egress; (D) record and apparent means of ingress and egress; (E) lines of occupation, including as a minimum: fences, walls, hedges and yards; (F) deed restrictions pertaining to the location of buildings or other apparent improvements; (G) unresolved conflicts with record deed descriptions and maps; (H) all apparent boundary encroachments; and (I) monumentation required to be set at all corners created by a deflection angle of not less than 70 degrees between two consecutive courses at an intervals not to exceed 600 feet (180 meters) along the boundaries between said corners, except where natural or man-made monumentation defines or occupies the line.
Map References:
a.) "Resubdivision Amanda Drive Prepared for Derekseth Homes, Amanda Drive, Manchester, Connecticut; Scale: 1"=100'; Dated: October 26, 1999; Sheet 2 of 19 by Ed Lally and Associates Inc." Filed as Map 1257 at the M.L.R.
b.) "Plot Plan Birch Mountain II Prepared for Mary Catherine Development Company, Manchester, Connecticut; Scale: 1"=40'; Dated: 1/30/89 by Design Professionals, Inc." Filed as Book M27, Page 60 at the M.L.R.
c.) "Resubdivision Amanda Drive Prepared for Derekseth Homes, Amanda Drive, Manchester, Connecticut; Scale: 1"=100'; Dated: October 26, 1999; Sheet 4 of 19 by Ed Lally and Associates Inc." Filed as Map 1259 at the M.L.R.
d.) "Map of Highland Estates, Birch Mountain Road & Carter Street, Manchester, Connecticut; Scale: 1"=50'; Dated: March 23, 1967; Sheet 2 of 3 by Hayden L. Griswold, C.E." Filed as Book M13, Page 48 at the M.L.R.
e.) "Map of Highland Estates, Birch Mountain Road & Carter Street, Manchester, Connecticut; Scale: 1"=50'; Dated: March 23, 1967; Sheet 3 of 3 by Hayden L. Griswold, C.E." Filed as Book M9, Page 36 at the M.L.R.
f.) "Boundary Survey Prepared for John Vontell, Existing Boundary and Features, 143 Carter Street, Manchester, Connecticut; Scale: 1"=30'; Dated: May 22, 2014 by Rob Hellstrom Land Surveying LLC." Filed as Map 2311 in Drawer 16 at the M.L.R.
g.) "Subdivision Plan Prepared for Robert C. Dennison, Carter Street, Manchester, Connecticut; Scale: 1"=100'; Dated: 6/20/83; Last Revised: 6-21-1983 by Fuss & O'Neill." Filed as Book M22, Page 49 at the M.L.R.
Per agreement with property owner no boundary corners were set by this survey unless noted hereon. All monumentation found is depicted or noted hereon.
Zone: RR
Total area: 1,789,597 Sq. Ft. - 41.08 Acres
Owner: Wells Jacobson & Margaret Jacobson
Town of Manchester Assessors Map #97 Lot #250
Filed in Volume 3397, Page 65 of the Town Clerk's office.
Contour interval is two(2) feet.
Existing contours generated from field topography. (Implemented with Aerial Topography from UCONN Base)
This survey does not include the location of any underground improvements or encroachments, subsurface utility lines or buried debris. Nor does it necessarily reflect the existence of any waste dumps or hazardous materials. The underground items depicted or noted are approximate and are not guaranteed. Notify "CALL BEFORE YOU DIG" 1-800-922-4455 prior to any excavation operations.



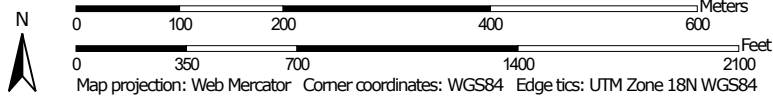
Wetlands Depicted are Field Located as Flagged by Ian T. Cole, Professional Registered Soil Scientist/Wetland Scientist on October 15, 2023

Property & Topographic Survey Map
Prepared For
SOLLI ENGINEERING, LLC
250 Carter Street
Manchester, Connecticut
October 20, 2023
Scale: 1" = 100'
cole engineering. surveying. planning.
876 South Main Street
P.O. Box 44
Plainville, CT 06479 - 0044
Tel: (860) 628-4484
Fax: (860) 620-0196
www.hccole.com
DATE: 10/20/23
REVISION:
To the best of my knowledge and belief, this map is substantially correct as noted hereon.
Stephen M. Gaudin, L.S. #70145
Reg. No.
NOT VALID UNLESS EMBOSSED SEAL OR STAMP IS AFFIXED HERETO
F.B. #
PROJECT #: 2379a

Hydrologic Soil Group—State of Connecticut
(250 CARTER ST, MANCHESTER, CT)



Map Scale: 1:7,300 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: State of Connecticut
 Survey Area Data: Version 22, Sep 12, 2022

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	7.7	3.1%
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	4.6	1.9%
6	Wilbraham and Menlo soils, 0 to 8 percent slopes, extremely stony	C/D	2.2	0.9%
13	Walpole sandy loam, 0 to 3 percent slopes	B/D	5.2	2.1%
20A	Ellington silt loam, 0 to 5 percent slopes	B	8.8	3.5%
33B	Hartford sandy loam, 3 to 8 percent slopes	A	9.0	3.6%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	A	14.1	5.7%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	2.7	1.1%
46B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	20.5	8.2%
46C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	C/D	6.5	2.6%
55B	Watchaug fine sandy loam, 3 to 8 percent slopes	C	6.9	2.8%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	4.5	1.8%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	3.4	1.4%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	6.2	2.5%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	1.8	0.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	C	22.2	8.9%
86C	Paxton and Montauk fine sandy loams, 3 to 15 percent slopes, extremely stony	C	99.6	39.9%
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	C	17.9	7.2%
107	Limerick and Lim soils	B/D	3.6	1.5%
308	Udorthents, smoothed	C	2.0	0.8%
Totals for Area of Interest			249.5	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

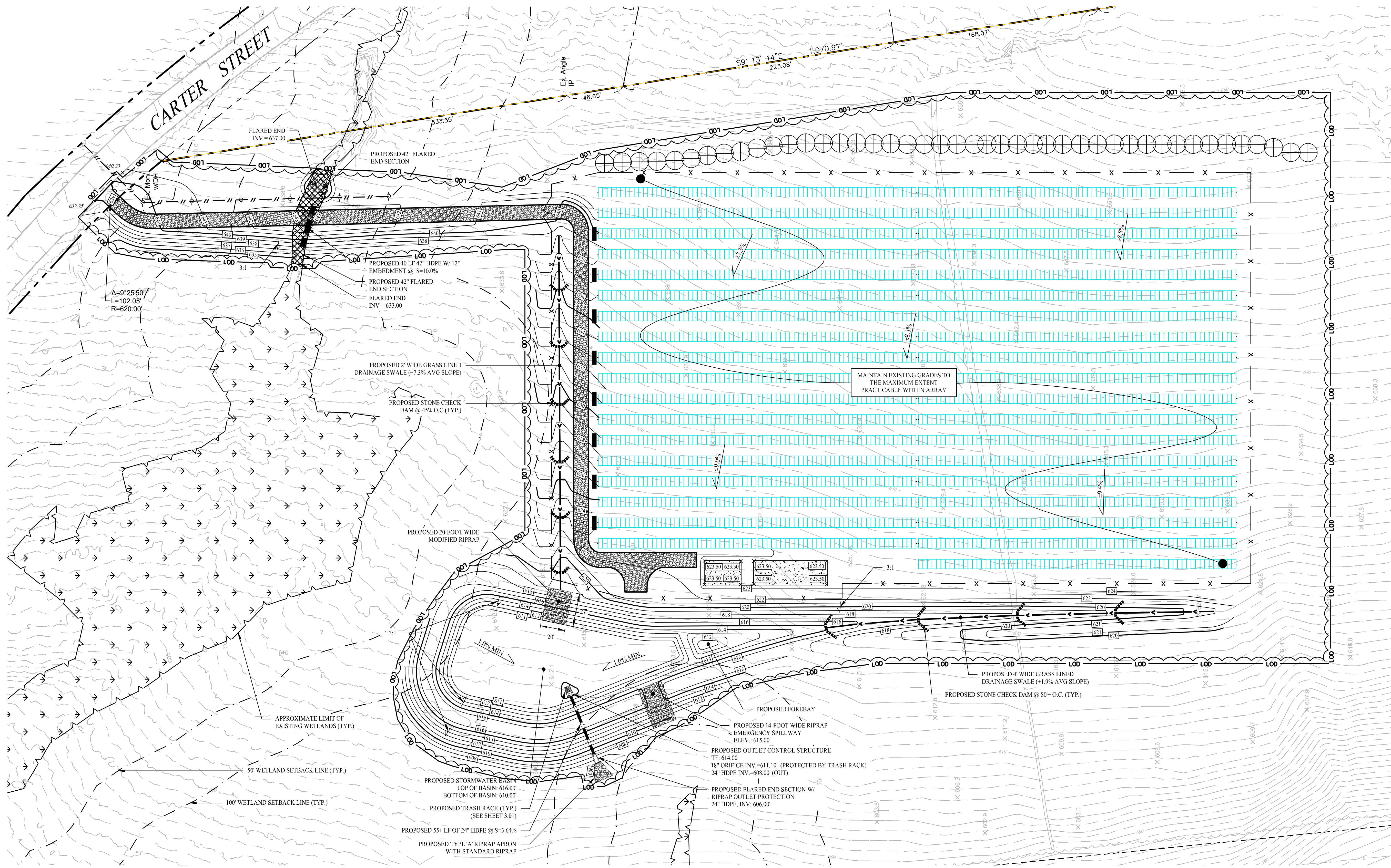


GENERAL NOTES

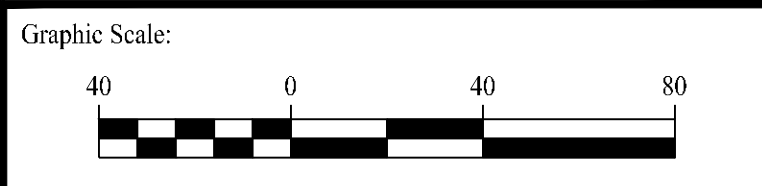
- REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
- THIS DRAWING IS INTENDED TO DESCRIBE GRADING AND DRAINAGE ONLY. REFER TO SITE PLAN FOR GENERAL INFORMATION, AND DETAIL SHEETS FOR DETAILS.
- THE CONTRACTOR SHALL PRESERVE EXISTING VEGETATION WHERE POSSIBLE AND/OR AS NOTED ON DRAWINGS. REFER TO EROSION CONTROL PLAN FOR LIMIT OF DISTURBANCE AND EROSION CONTROL NOTES.
- TOPSOIL SHALL BE STRIPPED AND STOCKPILED ON SITE FOR USE IN FINAL LANDSCAPING.
- THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS REQUIRED BY GOVERNMENT AND LOCAL AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS FROM THE TOWN OF MANCHESTER REQUIRED TO PERFORM ALL WORK, INCLUDING FOR STREET CUTS AND CONNECTIONS TO EXISTING UTILITIES. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROL NECESSARY FOR THIS WORK.
- ALL DISTURBANCE INCURRED TO TOWN OR STATE PROPERTY DUE TO CONSTRUCTION SHALL BE RESTORED TO ITS PREVIOUS CONDITION OR BETTER, TO THE SATISFACTION OF THE TOWN OF BETHANY AUTHORITY.
- IF IMPACTED OR CONTAMINATED SOIL IS ENCOUNTERED BY THE CONTRACTOR, THE CONTRACTOR SHALL SUSPEND EXCAVATION WORK OF IMPACTED SOIL AND NOTIFY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT PRIOR TO PROCEEDING WITH FURTHER WORK IN THE IMPACTED SOIL LOCATION UNTIL FURTHER INSTRUCTED BY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT.
- ALL PIPE LENGTHS ARE HORIZONTAL DISTANCES AND ARE APPROXIMATE.
- ALL DISTURBED AREAS TO BE RESEDED WITH ERNMX-147 WITHIN THE ARRAY AREA. ERNMX-610 WILL BE USED OUTSIDE FENCELINE AND IN NON-ARRAY AREAS.

LEGEND

- PROPERTY LINE
- MAJOR CONTOURS
- MINOR CONTOURS
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED SPOT ELEVATION
- EXISTING SPOT ELEVATION
- STORM DRAIN PIPE
- RIP RAP SPILLWAY
- OUTLET CONTROL STRUCTURE
- FLARED END SECTION
- RIPRAP OUTLET PROTECTION
- PERMANENT WETLAND DISTURBANCE AREA



1	04/19/24	CSC INTERROGATORIES
Rev. #:	Date	Description



SOLLI ENGINEERING
 501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
 11 Vanierbilt Ave, Norwood, MA 02062 T: (781) 552-8491 F: (203) 880-9695

Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	23100101
Plan Date:	01/15/24
Scale:	1" = 40'



PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title:	Sheet #:
GRADING & DRAINAGE PLAN	2.21

Apr 10, 2024 - 12:25 pm chowdy
 X:\SE_Flash\Project\Tab\2024\23100101 - 250 Carter Street - Manchester, CT\Cadd\Draw\23100101-2.21.dwg

GENERAL NOTES

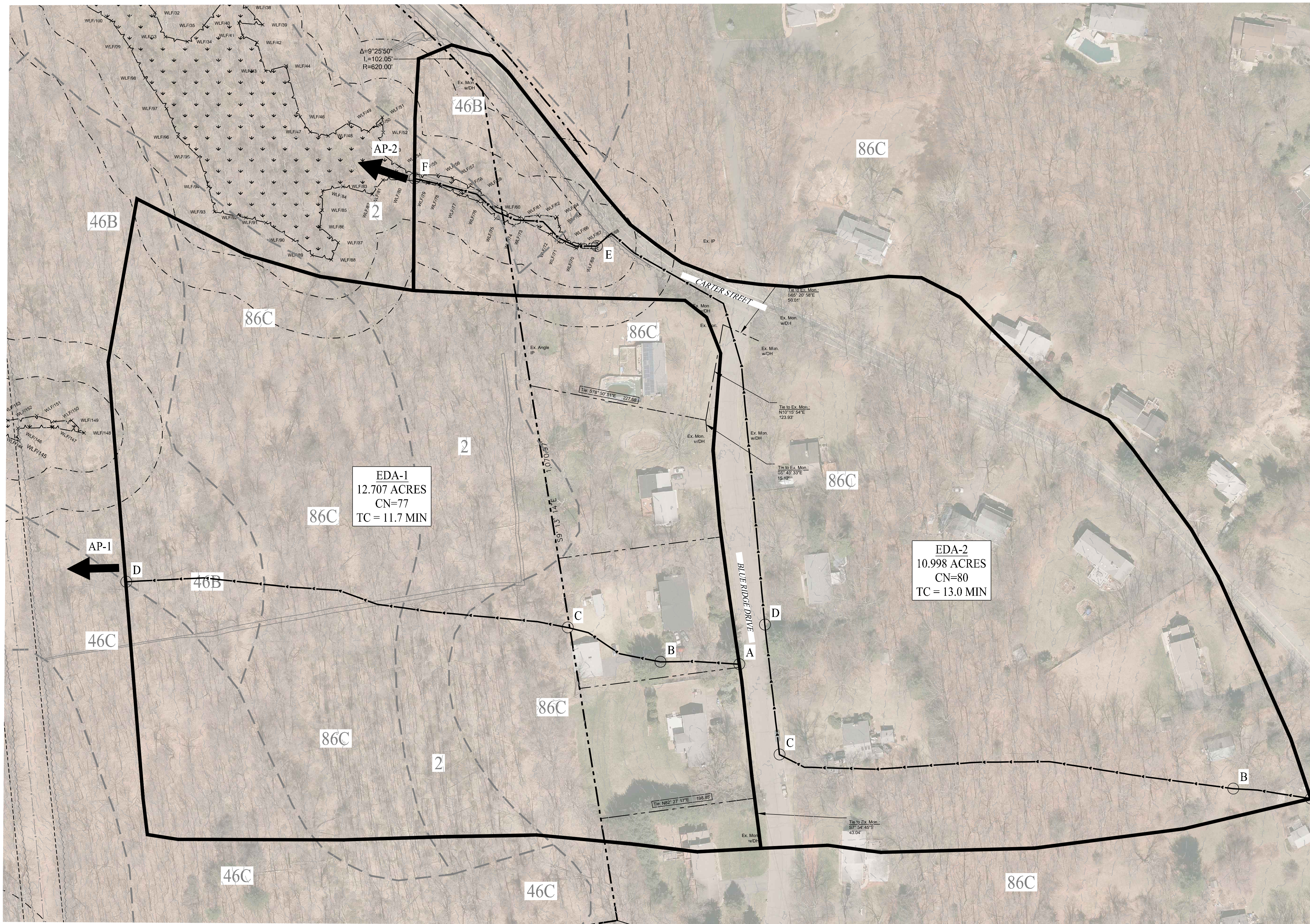
1. THE STORMWATER MANAGEMENT PLAN AND DESIGN IS INTENDED TO BE IN COMPLIANCE WITH THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION STORMWATER QUALITY MANUAL AND THE TOWN OF MANCHESTER, CONNECTICUT STORMWATER REGULATIONS.
2. STORMWATER RUNOFF ANALYSIS WAS CALCULATED USING THE SCS TR-55 METHODOLOGY.

LEGEND

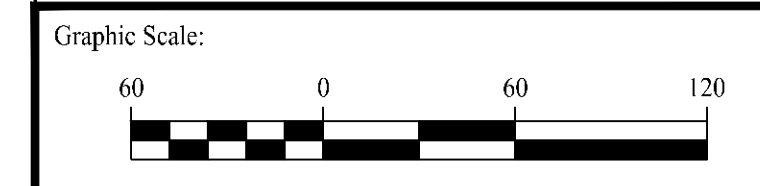
- PROPERTY LINE
- RIGHT-OF-WAY LINE
- ADJOINING LOT LINE
- SOIL BOUNDARY
- LIMIT OF DRAINAGE AREA
- FLOW PATH

EXISTING CONDITIONS PEAK FLOWS

ANALYSIS POINT	2-YEAR (CFS)	10-YEAR (CFS)	25-YEAR (CFS)	50-YEAR (CFS)	100-YEAR (CFS)
AP-1	12.91	28.42	38.73	46.54	55.09
AP-2	12.85	26.55	35.47	42.16	49.46



Rev. #:	Date	Description
1	04/19/24	CSC INTERROGATORIES

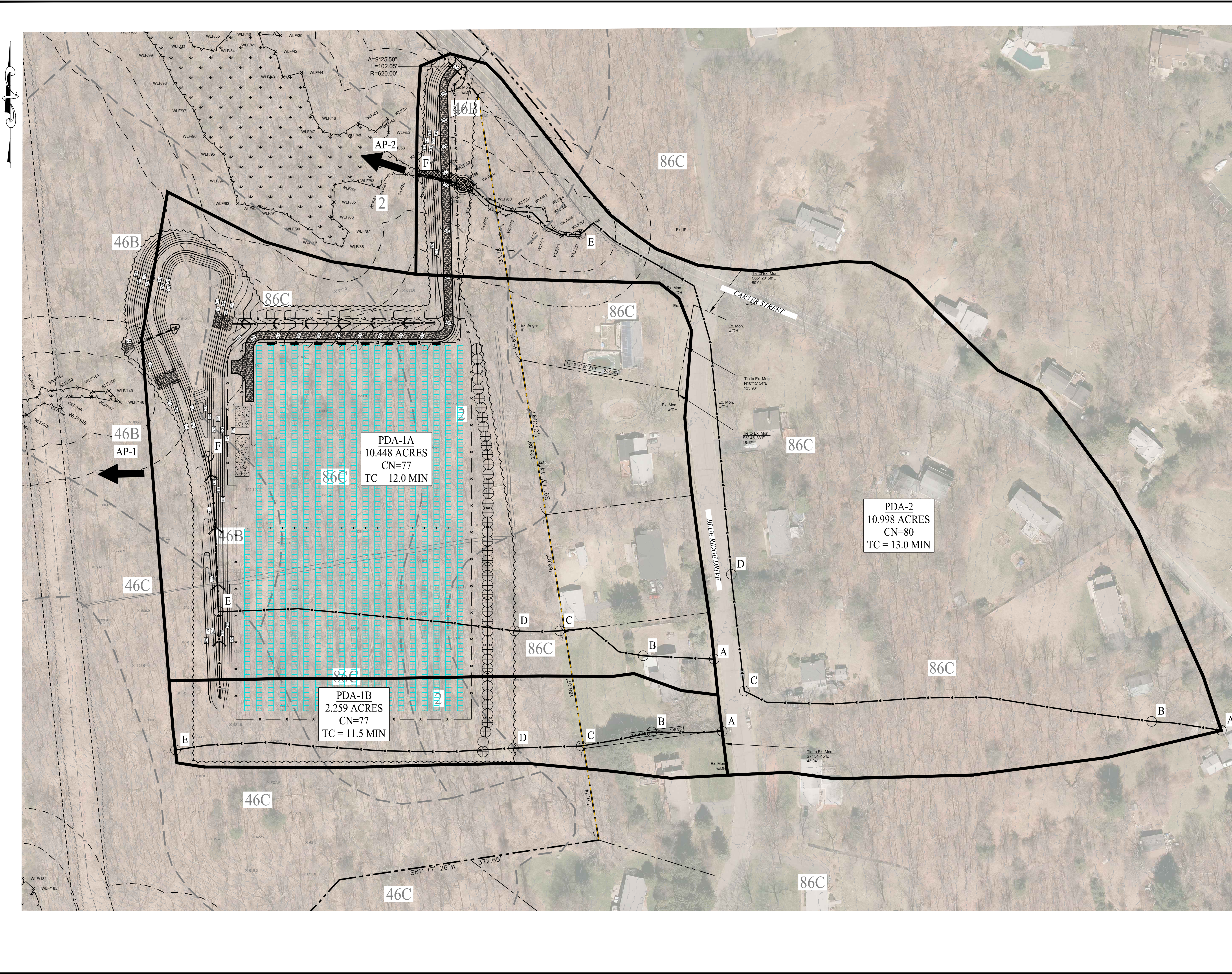


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 11 Vansicelli Ave., Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By: CSH	Kevin Solli, P.E. CT 25759
Checked By: EEL	
Approved By: KMS	
Project #: 23100101	
Plan Date: 01/15/24	
Scale: 1" = 60'	

PROPOSED SOLAR PHOTOVOLTAIC ARRAY
 250 CARTER STREET
 MANCHESTER, CONNECTICUT

Sheet Title: EXISTING DRAINAGE AREA MAP	Sheet #: DA-1
---	-------------------------



- GENERAL NOTES**
1. THE STORMWATER MANAGEMENT PLAN AND DESIGN IS INTENDED TO BE IN COMPLIANCE WITH THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION STORMWATER QUALITY MANUAL AND THE TOWN OF MANCHESTER, CONNECTICUT STORMWATER REGULATIONS.
 2. STORMWATER RUNOFF ANALYSIS WAS CALCULATED USING THE SCS TR-55 METHODOLOGY.

LEGEND

	PROPERTY LINE
	RIGHT-OF-WAY LINE
	ADJOINING LOT LINE
	SOIL BOUNDARY
	LIMIT OF DRAINAGE AREA
	FLOW PATH

PROPOSED CONDITIONS PEAK FLOWS

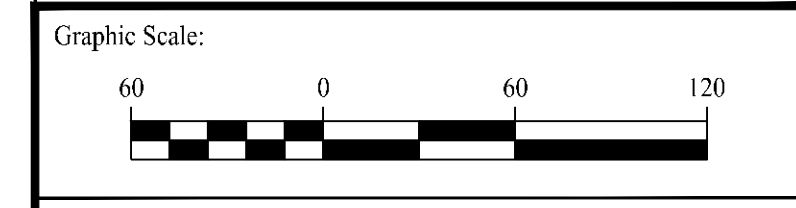
ANALYSIS POINT	2-YEAR (CFS)	10-YEAR (CFS)	25-YEAR (CFS)	50-YEAR (CFS)	100-YEAR (CFS)
AP-1	4.09	12.13	15.96	18.56	27.44
AP-2	12.85	26.55	35.46	42.16	49.46

PDA-1A
10.448 ACRES
CN=77
TC = 12.0 MIN

PDA-2
10.998 ACRES
CN=80
TC = 13.0 MIN

PDA-1B
2.259 ACRES
CN=77
TC = 11.5 MIN

Rev. #	Date	Description
1	04/19/24	CSC INTERROGATORIES



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11 Vanierhill Ave., Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By: CSH
Checked By: EEL
Approved By: KMS
Project #: 23100101
Plan Date: 01/15/24
Scale: 1" = 60'

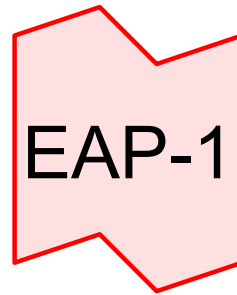
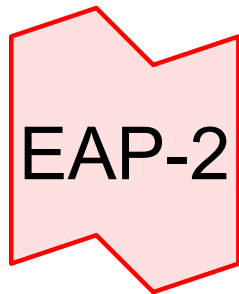
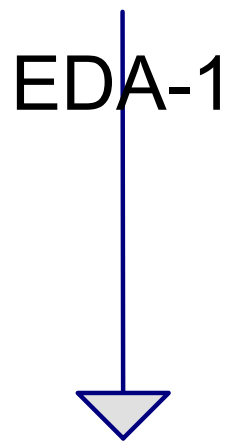
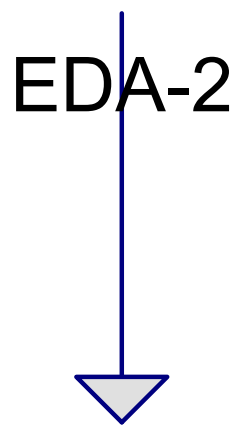
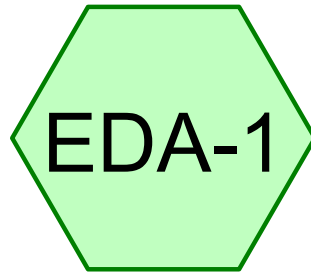
Kevin Solli, P.E.
CT 25759

PROPOSED SOLAR PHOTOVOLTAIC ARRAY
250 CARTER STREET
MANCHESTER, CONNECTICUT

Sheet Title: PROPOSED DRAINAGE AREA MAP
Sheet #: DA-2

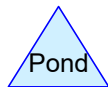
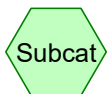
Appendix B – Stormwater Calculations

- Hydrology Calculations (2-, 25-, 50-, 100-year storm events)
 - Water Quality Volume Calculations
 - NOAA Atlas Precipitation Data



AP-2

AP-1



250 Carter St - Manchester, CT

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NRCC 24-hr	D	Default	24.00	1	3.16	2
2	10-year	NRCC 24-hr	D	Default	24.00	1	4.91	2
3	25-year	NRCC 24-hr	D	Default	24.00	1	6.00	2
4	50-year	NRCC 24-hr	D	Default	24.00	1	6.81	2
5	100-year	NRCC 24-hr	D	Default	24.00	1	7.69	2

250 Carter St - Manchester, CT

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Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.575	79	1 acre lots, 20% imp, HSG C (EDA-1, EDA-2)
1.152	98	Paved roads w/curbs & sewers, HSG C (EDA-2)
0.135	98	Paved roads w/curbs & sewers, HSG D (EDA-2)
8.238	73	Woods, Fair, HSG C (EDA-1, EDA-2)
5.605	79	Woods, Fair, HSG D (EDA-1, EDA-2)
23.706	78	TOTAL AREA

250 Carter St - Manchester, CT

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Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
17.965	HSG C	EDA-1, EDA-2
5.741	HSG D	EDA-1, EDA-2
0.000	Other	
23.706		TOTAL AREA

250 Carter St - Manchester, CT

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Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	8.575	0.000	0.000	8.575	1 acre lots, 20% imp	ED A-1 ,
							ED A-2
0.000	0.000	1.152	0.135	0.000	1.288	Paved roads w/curbs & sewers	ED A-2
0.000	0.000	8.238	5.605	0.000	13.843	Woods, Fair	ED A-1 ,
							ED A-2
0.000	0.000	17.965	5.741	0.000	23.706	TOTAL AREA	

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Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	EDA-2	0.00	0.00	608.0	0.0444	0.011	0.0	15.0	0.0	

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NRCC 24-hr D 2-year Rainfall=3.16"

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Page 7

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1

Runoff Area=12.707 ac 4.56% Impervious Runoff Depth=1.18"
Flow Length=796' Tc=12.3 min CN=77 Runoff=12.91 cfs 1.253 af

Subcatchment EDA-2: EDA-2

Runoff Area=479,116 sf 22.03% Impervious Runoff Depth=1.37"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=12.85 cfs 1.257 af

Link EAP-1: AP-1

Inflow=12.91 cfs 1.253 af
Primary=12.91 cfs 1.253 af

Link EAP-2: AP-2

Inflow=12.85 cfs 1.257 af
Primary=12.85 cfs 1.257 af

Total Runoff Area = 23.706 ac Runoff Volume = 2.510 af Average Runoff Depth = 1.27"
87.33% Pervious = 20.703 ac 12.67% Impervious = 3.003 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 12.91 cfs @ 12.20 hrs, Volume= 1.253 af, Depth= 1.18"
 Routed to Link EAP-1 : AP-1

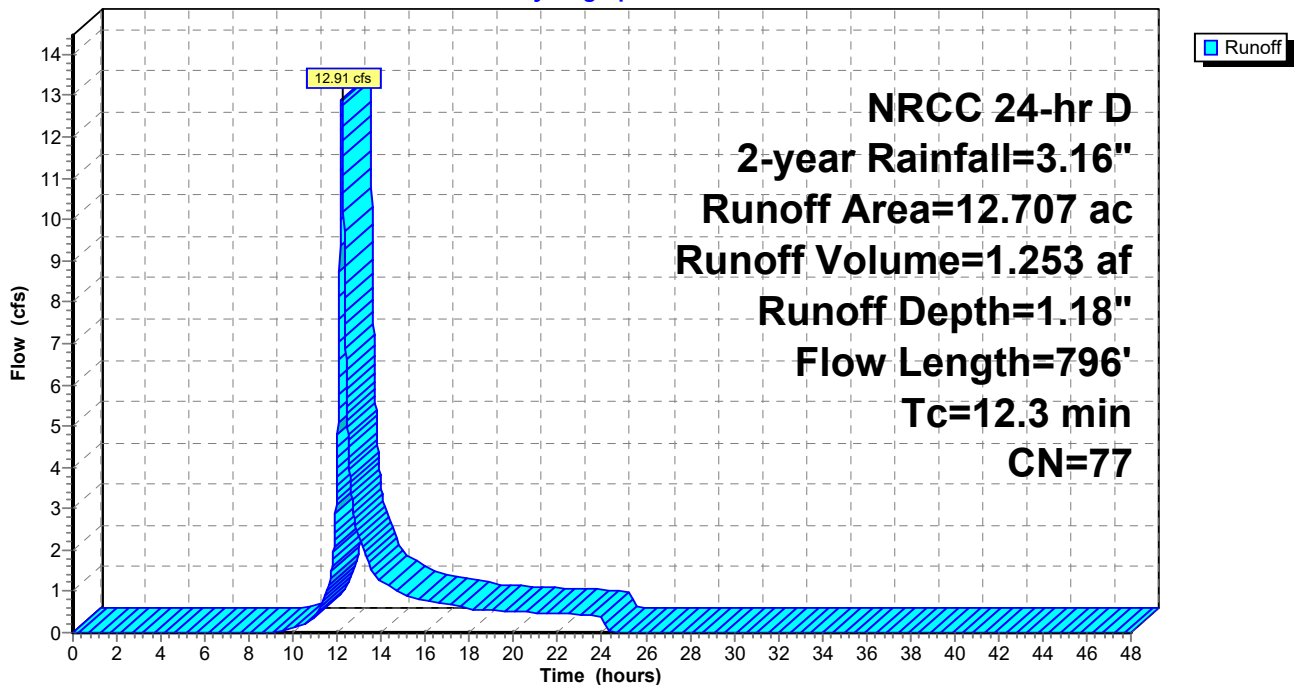
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 2-year Rainfall=3.16"

Area (ac)	CN	Description
2.898	79	1 acre lots, 20% imp, HSG C
5.274	73	Woods, Fair, HSG C
4.535	79	Woods, Fair, HSG D
12.707	77	Weighted Average
12.127		95.44% Pervious Area
0.580		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	128	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
6.2	568	0.0933	1.53		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
12.3	796	Total			

Subcatchment EDA-1: EDA-1

Hydrograph



Summary for Subcatchment EDA-2: EDA-2

Runoff = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af, Depth= 1.37"
 Routed to Link EAP-2 : AP-2

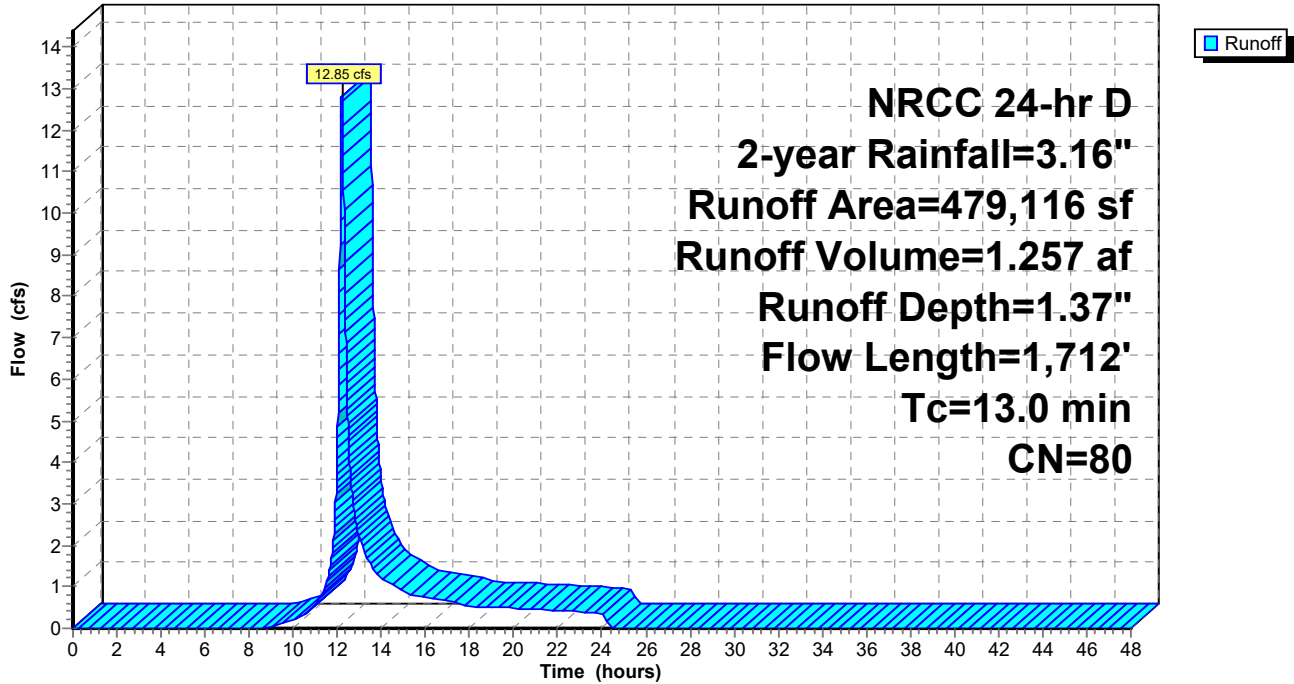
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 2-year Rainfall=3.16"

Area (sf)	CN	Description
247,300	79	1 acre lots, 20% imp, HSG C
129,102	73	Woods, Fair, HSG C
46,629	79	Woods, Fair, HSG D
50,194	98	Paved roads w/curbs & sewers, HSG C
5,891	98	Paved roads w/curbs & sewers, HSG D
479,116	80	Weighted Average
373,571		77.97% Pervious Area
105,545		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment EDA-2: EDA-2

Hydrograph



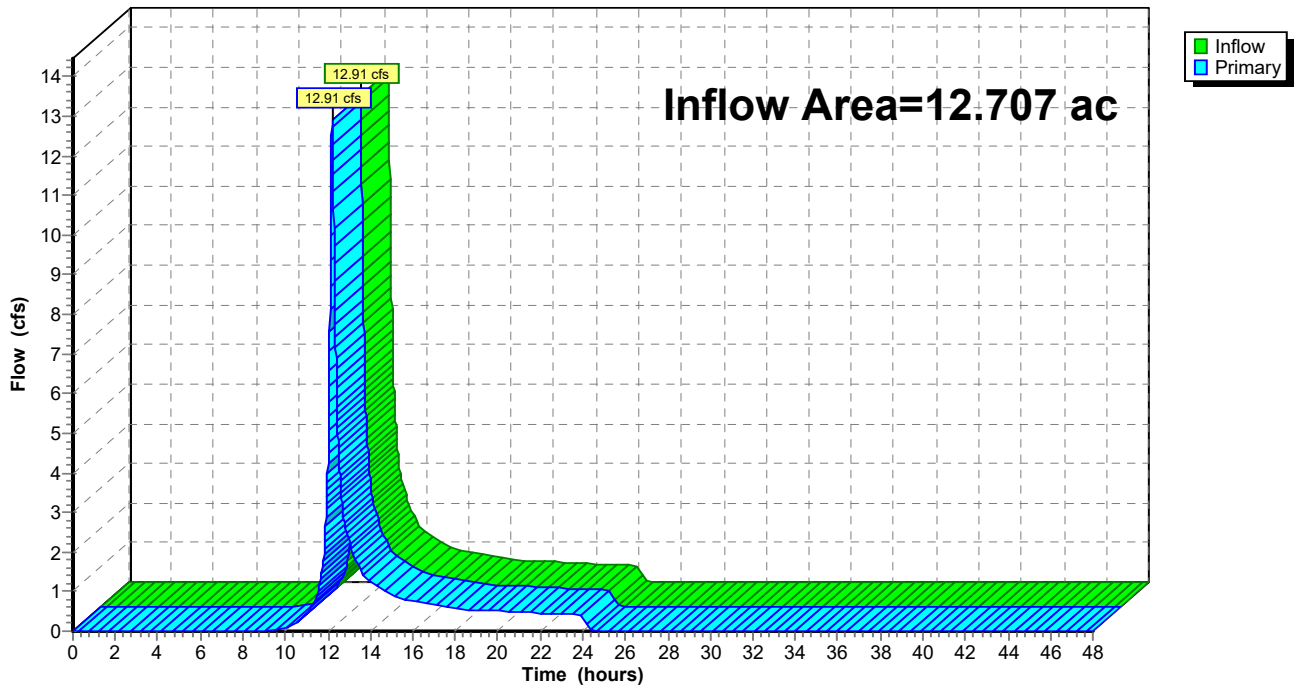
Summary for Link EAP-1: AP-1

Inflow Area = 12.707 ac, 4.56% Impervious, Inflow Depth = 1.18" for 2-year event
Inflow = 12.91 cfs @ 12.20 hrs, Volume= 1.253 af
Primary = 12.91 cfs @ 12.20 hrs, Volume= 1.253 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-1: AP-1

Hydrograph



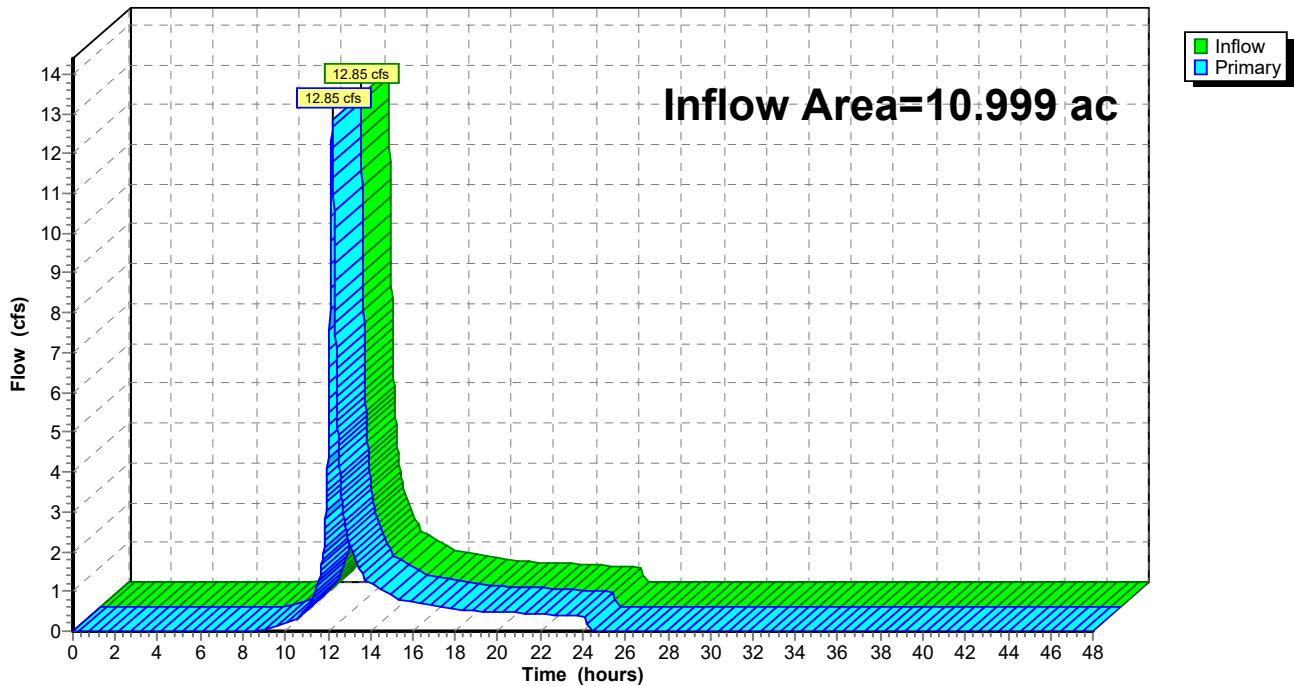
Summary for Link EAP-2: AP-2

Inflow Area = 10.999 ac, 22.03% Impervious, Inflow Depth = 1.37" for 2-year event
Inflow = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af
Primary = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 10-year Rainfall=4.91"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1

Runoff Area=12.707 ac 4.56% Impervious Runoff Depth=2.55"
Flow Length=796' Tc=12.3 min CN=77 Runoff=28.42 cfs 2.698 af

Subcatchment EDA-2: EDA-2

Runoff Area=479,116 sf 22.03% Impervious Runoff Depth=2.81"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=26.55 cfs 2.580 af

Link EAP-1: AP-1

Inflow=28.42 cfs 2.698 af
Primary=28.42 cfs 2.698 af

Link EAP-2: AP-2

Inflow=26.55 cfs 2.580 af
Primary=26.55 cfs 2.580 af

Total Runoff Area = 23.706 ac Runoff Volume = 5.278 af Average Runoff Depth = 2.67"
87.33% Pervious = 20.703 ac 12.67% Impervious = 3.003 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 28.42 cfs @ 12.20 hrs, Volume= 2.698 af, Depth= 2.55"
 Routed to Link EAP-1 : AP-1

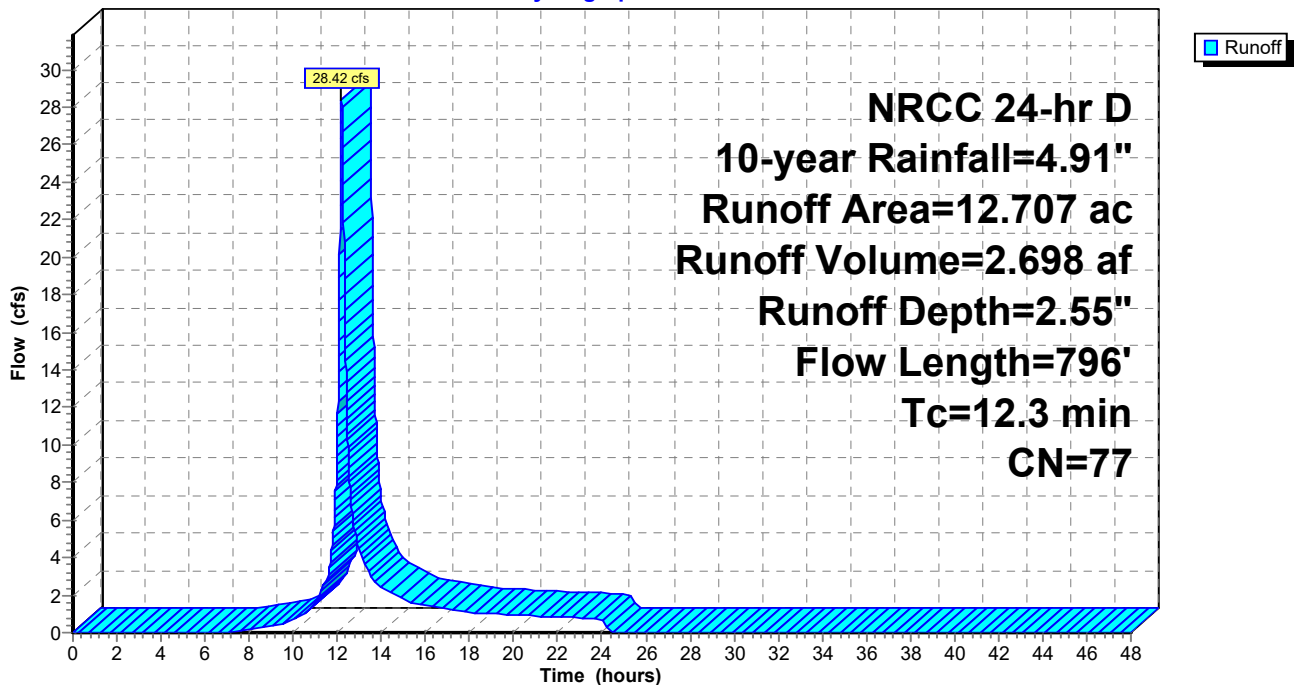
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 10-year Rainfall=4.91"

Area (ac)	CN	Description
2.898	79	1 acre lots, 20% imp, HSG C
5.274	73	Woods, Fair, HSG C
4.535	79	Woods, Fair, HSG D
12.707	77	Weighted Average
12.127		95.44% Pervious Area
0.580		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
1.1	128	0.0780	1.95		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
6.2	568	0.0933	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
12.3	796	Total			

Subcatchment EDA-1: EDA-1

Hydrograph



Summary for Subcatchment EDA-2: EDA-2

[47] Hint: Peak is 165% of capacity of segment #4

Runoff = 26.55 cfs @ 12.21 hrs, Volume= 2.580 af, Depth= 2.81"
 Routed to Link EAP-2 : AP-2

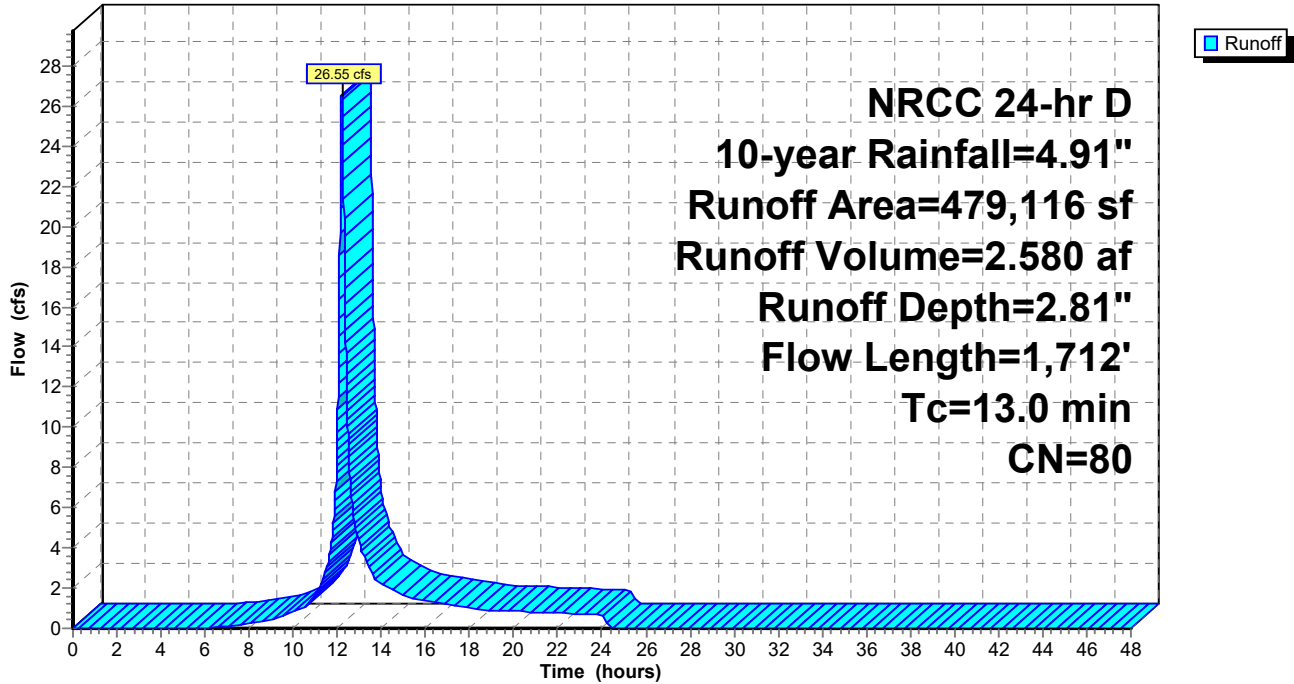
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 10-year Rainfall=4.91"

Area (sf)	CN	Description
247,300	79	1 acre lots, 20% imp, HSG C
129,102	73	Woods, Fair, HSG C
46,629	79	Woods, Fair, HSG D
50,194	98	Paved roads w/curbs & sewers, HSG C
5,891	98	Paved roads w/curbs & sewers, HSG D
479,116	80	Weighted Average
373,571		77.97% Pervious Area
105,545		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment EDA-2: EDA-2

Hydrograph



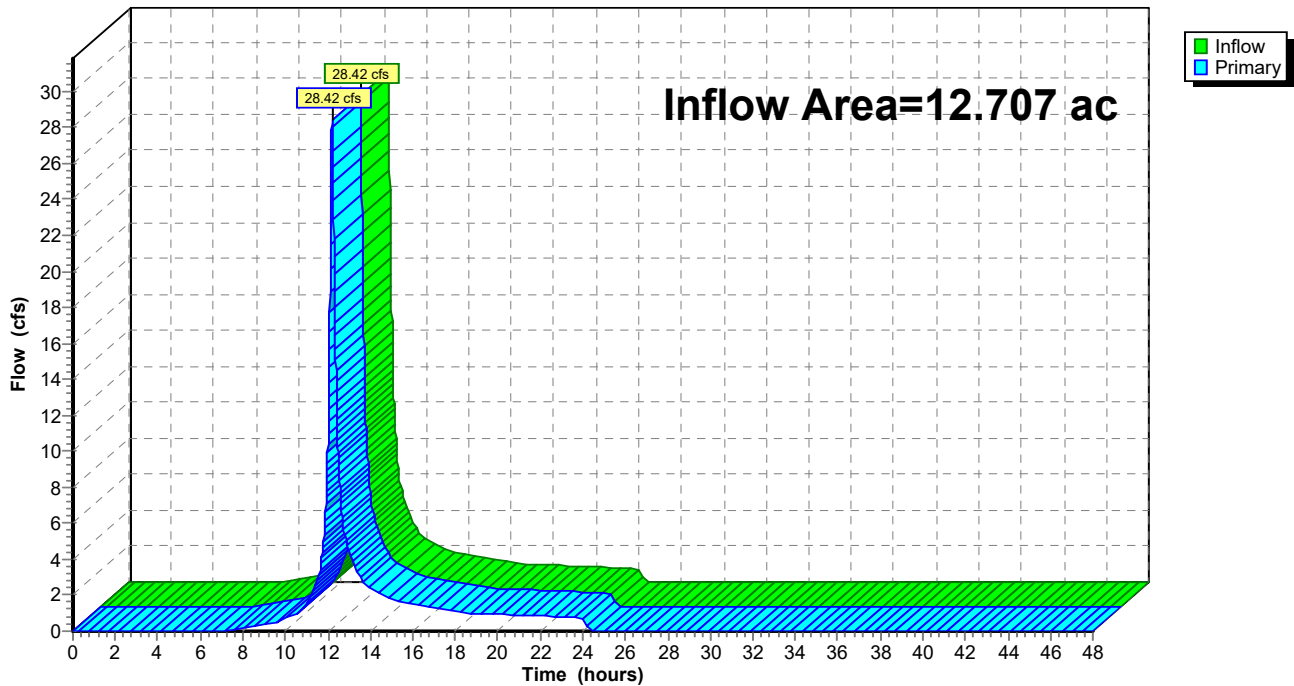
Summary for Link EAP-1: AP-1

Inflow Area = 12.707 ac, 4.56% Impervious, Inflow Depth = 2.55" for 10-year event
Inflow = 28.42 cfs @ 12.20 hrs, Volume= 2.698 af
Primary = 28.42 cfs @ 12.20 hrs, Volume= 2.698 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-1: AP-1

Hydrograph



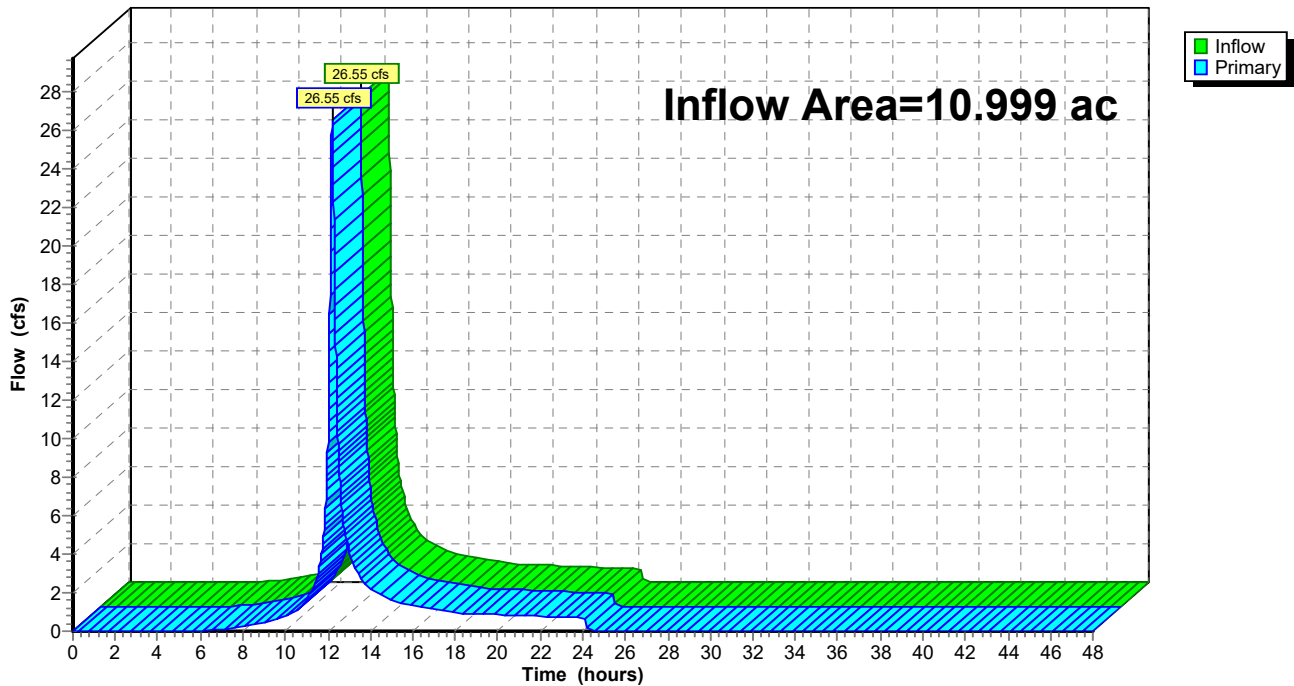
Summary for Link EAP-2: AP-2

Inflow Area = 10.999 ac, 22.03% Impervious, Inflow Depth = 2.81" for 10-year event
Inflow = 26.55 cfs @ 12.21 hrs, Volume= 2.580 af
Primary = 26.55 cfs @ 12.21 hrs, Volume= 2.580 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 25-year Rainfall=6.00"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1

Runoff Area=12.707 ac 4.56% Impervious Runoff Depth=3.48"
Flow Length=796' Tc=12.3 min CN=77 Runoff=38.73 cfs 3.684 af

Subcatchment EDA-2: EDA-2

Runoff Area=479,116 sf 22.03% Impervious Runoff Depth=3.78"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=35.47 cfs 3.466 af

Link EAP-1: AP-1

Inflow=38.73 cfs 3.684 af
Primary=38.73 cfs 3.684 af

Link EAP-2: AP-2

Inflow=35.47 cfs 3.466 af
Primary=35.47 cfs 3.466 af

Total Runoff Area = 23.706 ac Runoff Volume = 7.150 af Average Runoff Depth = 3.62"
87.33% Pervious = 20.703 ac 12.67% Impervious = 3.003 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 38.73 cfs @ 12.20 hrs, Volume= 3.684 af, Depth= 3.48"
 Routed to Link EAP-1 : AP-1

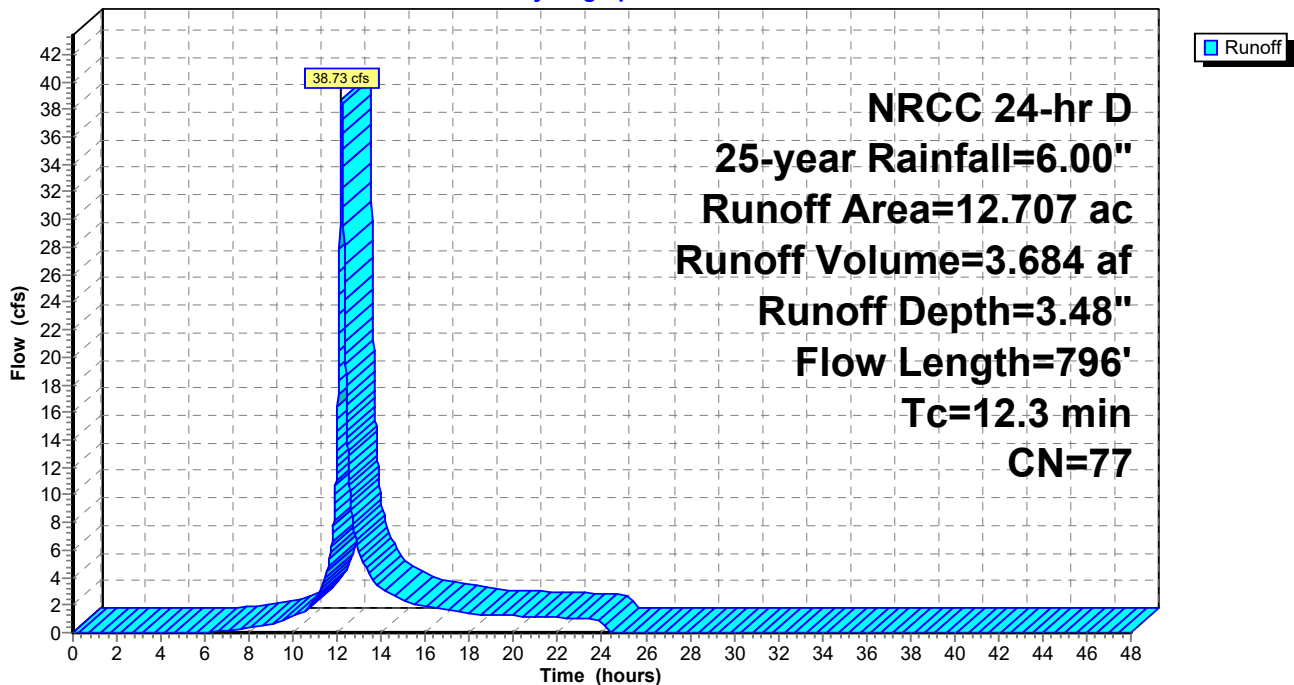
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 25-year Rainfall=6.00"

Area (ac)	CN	Description
2.898	79	1 acre lots, 20% imp, HSG C
5.274	73	Woods, Fair, HSG C
4.535	79	Woods, Fair, HSG D
12.707	77	Weighted Average
12.127		95.44% Pervious Area
0.580		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
1.1	128	0.0780	1.95		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
6.2	568	0.0933	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
12.3	796	Total			

Subcatchment EDA-1: EDA-1

Hydrograph



Summary for Subcatchment EDA-2: EDA-2

[47] Hint: Peak is 220% of capacity of segment #4

Runoff = 35.47 cfs @ 12.21 hrs, Volume= 3.466 af, Depth= 3.78"
 Routed to Link EAP-2 : AP-2

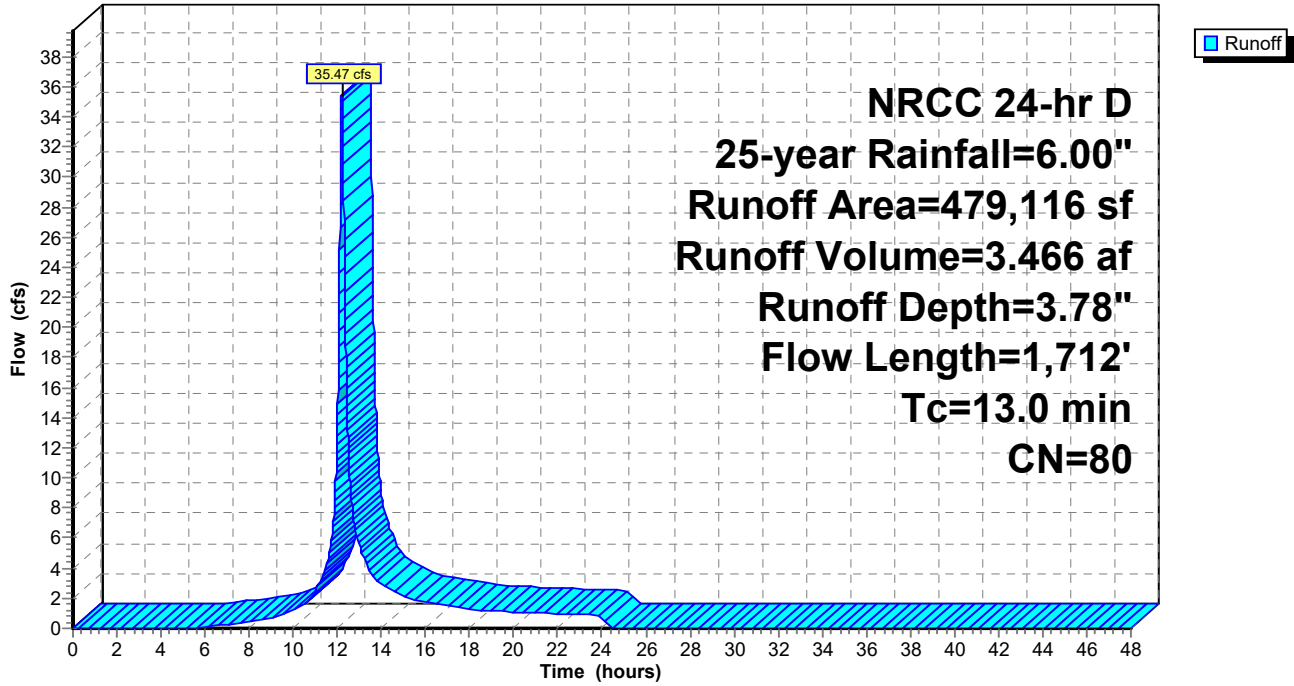
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 25-year Rainfall=6.00"

Area (sf)	CN	Description
247,300	79	1 acre lots, 20% imp, HSG C
129,102	73	Woods, Fair, HSG C
46,629	79	Woods, Fair, HSG D
50,194	98	Paved roads w/curbs & sewers, HSG C
5,891	98	Paved roads w/curbs & sewers, HSG D
479,116	80	Weighted Average
373,571		77.97% Pervious Area
105,545		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment EDA-2: EDA-2

Hydrograph



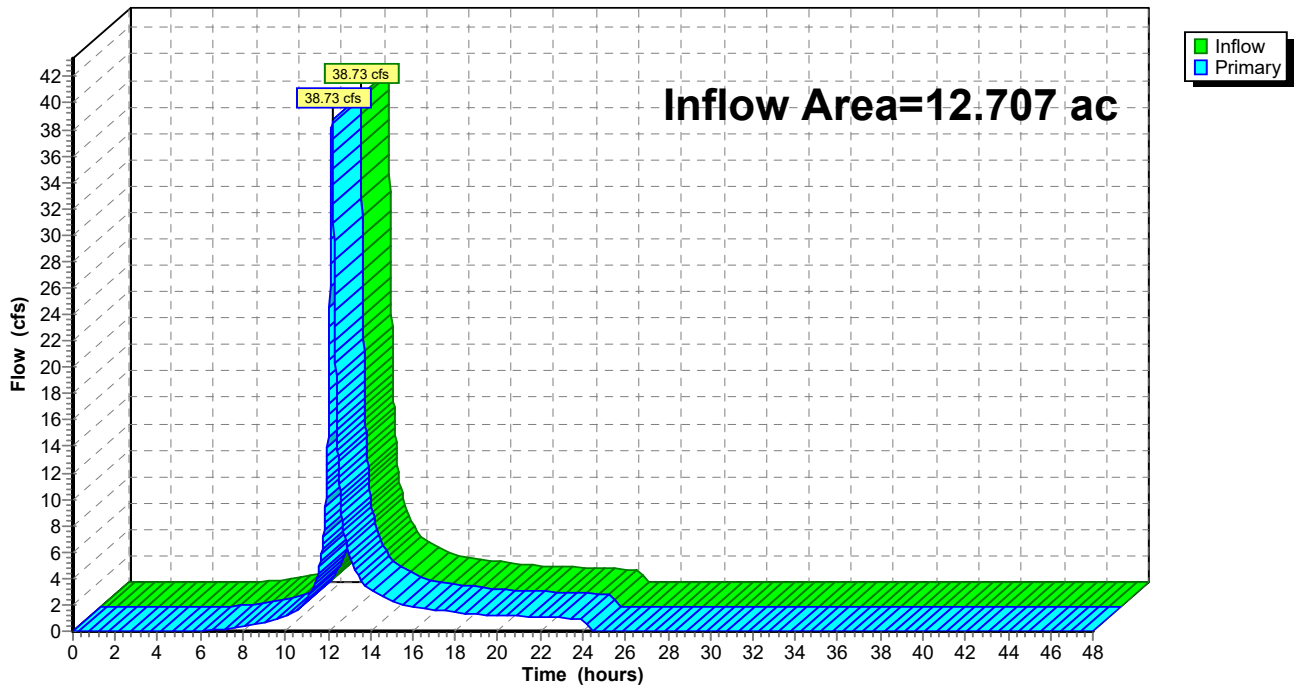
Summary for Link EAP-1: AP-1

Inflow Area = 12.707 ac, 4.56% Impervious, Inflow Depth = 3.48" for 25-year event
Inflow = 38.73 cfs @ 12.20 hrs, Volume= 3.684 af
Primary = 38.73 cfs @ 12.20 hrs, Volume= 3.684 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-1: AP-1

Hydrograph



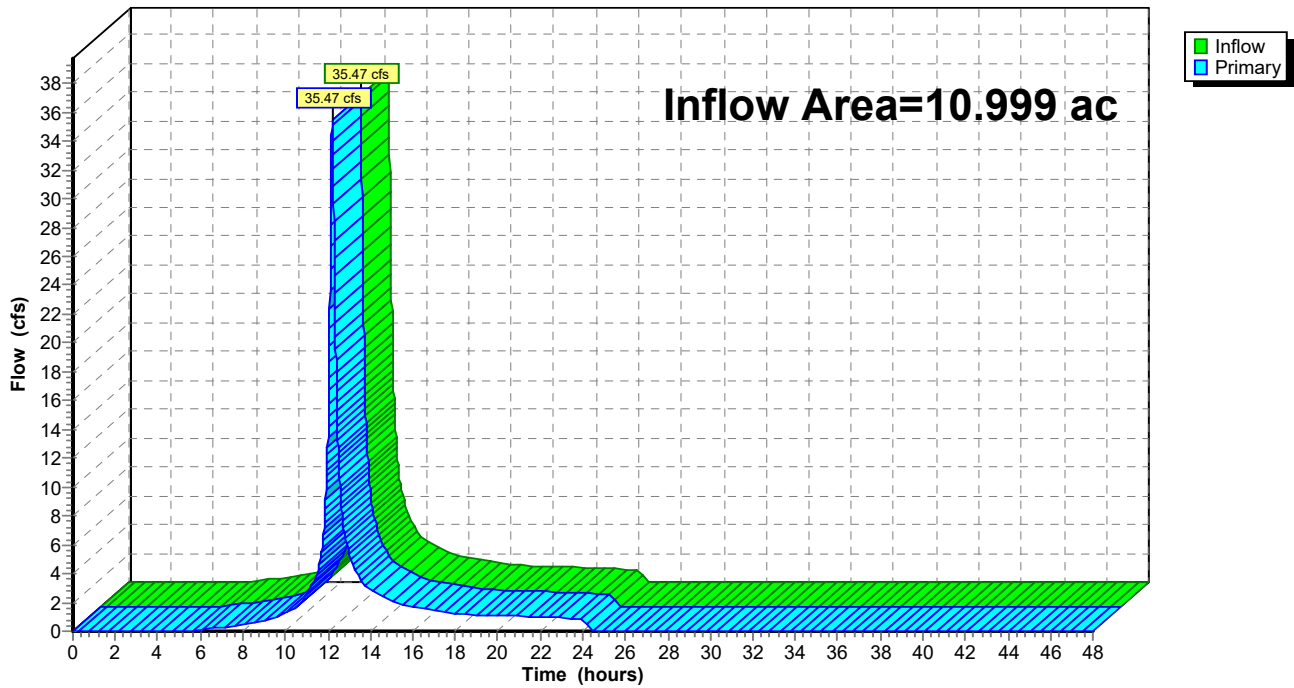
Summary for Link EAP-2: AP-2

Inflow Area = 10.999 ac, 22.03% Impervious, Inflow Depth = 3.78" for 25-year event
Inflow = 35.47 cfs @ 12.21 hrs, Volume= 3.466 af
Primary = 35.47 cfs @ 12.21 hrs, Volume= 3.466 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 50-year Rainfall=6.81"

Prepared by Solli Engineering

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1

Runoff Area=12.707 ac 4.56% Impervious Runoff Depth=4.20"
Flow Length=796' Tc=12.3 min CN=77 Runoff=46.54 cfs 4.443 af

Subcatchment EDA-2: EDA-2

Runoff Area=479,116 sf 22.03% Impervious Runoff Depth=4.52"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=42.16 cfs 4.142 af

Link EAP-1: AP-1

Inflow=46.54 cfs 4.443 af
Primary=46.54 cfs 4.443 af

Link EAP-2: AP-2

Inflow=42.16 cfs 4.142 af
Primary=42.16 cfs 4.142 af

Total Runoff Area = 23.706 ac Runoff Volume = 8.585 af Average Runoff Depth = 4.35"
87.33% Pervious = 20.703 ac 12.67% Impervious = 3.003 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 46.54 cfs @ 12.20 hrs, Volume= 4.443 af, Depth= 4.20"
 Routed to Link EAP-1 : AP-1

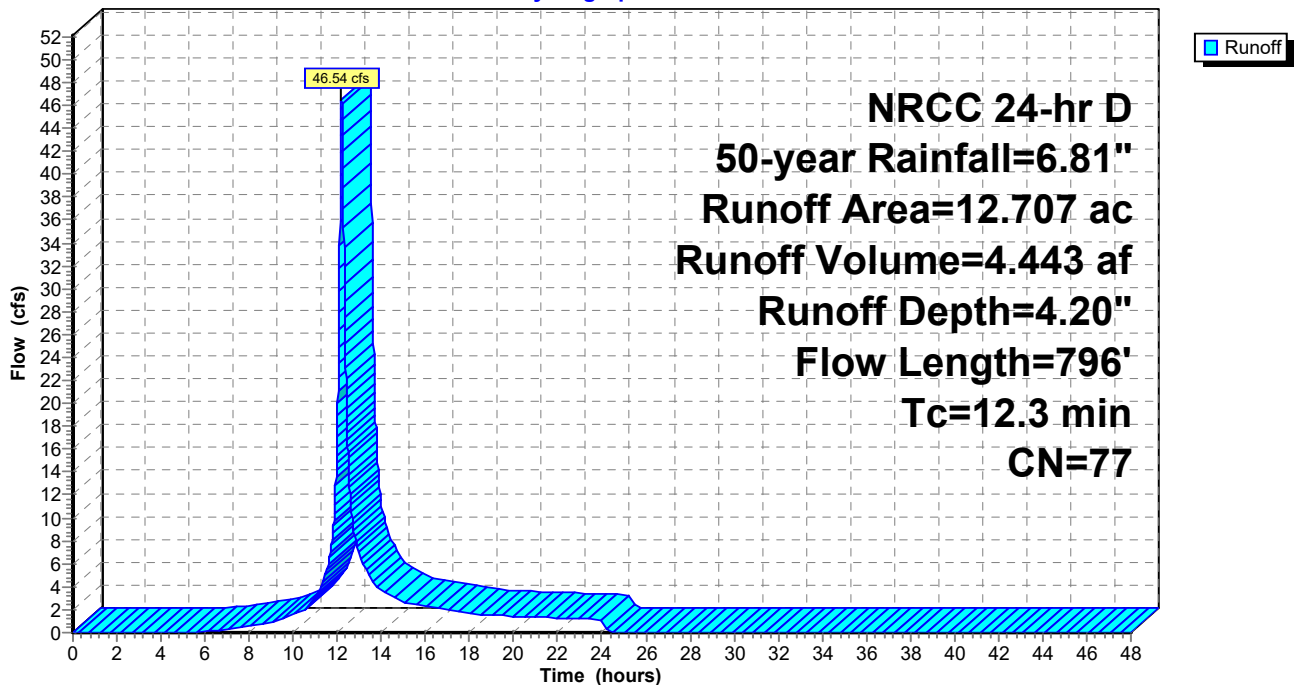
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 50-year Rainfall=6.81"

Area (ac)	CN	Description
2.898	79	1 acre lots, 20% imp, HSG C
5.274	73	Woods, Fair, HSG C
4.535	79	Woods, Fair, HSG D
12.707	77	Weighted Average
12.127		95.44% Pervious Area
0.580		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
1.1	128	0.0780	1.95		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
6.2	568	0.0933	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
12.3	796	Total			

Subcatchment EDA-1: EDA-1

Hydrograph



Summary for Subcatchment EDA-2: EDA-2

[47] Hint: Peak is 262% of capacity of segment #4

Runoff = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af, Depth= 4.52"
 Routed to Link EAP-2 : AP-2

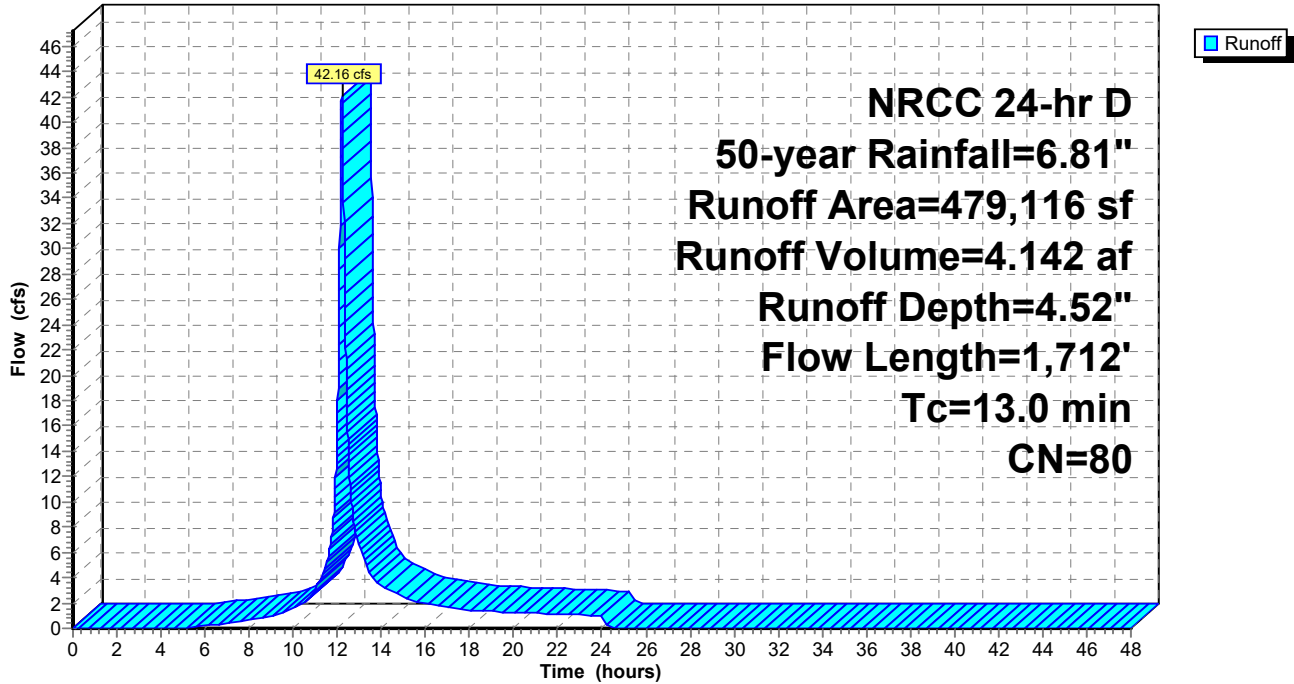
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 50-year Rainfall=6.81"

Area (sf)	CN	Description
247,300	79	1 acre lots, 20% imp, HSG C
129,102	73	Woods, Fair, HSG C
46,629	79	Woods, Fair, HSG D
50,194	98	Paved roads w/curbs & sewers, HSG C
5,891	98	Paved roads w/curbs & sewers, HSG D
479,116	80	Weighted Average
373,571		77.97% Pervious Area
105,545		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment EDA-2: EDA-2

Hydrograph



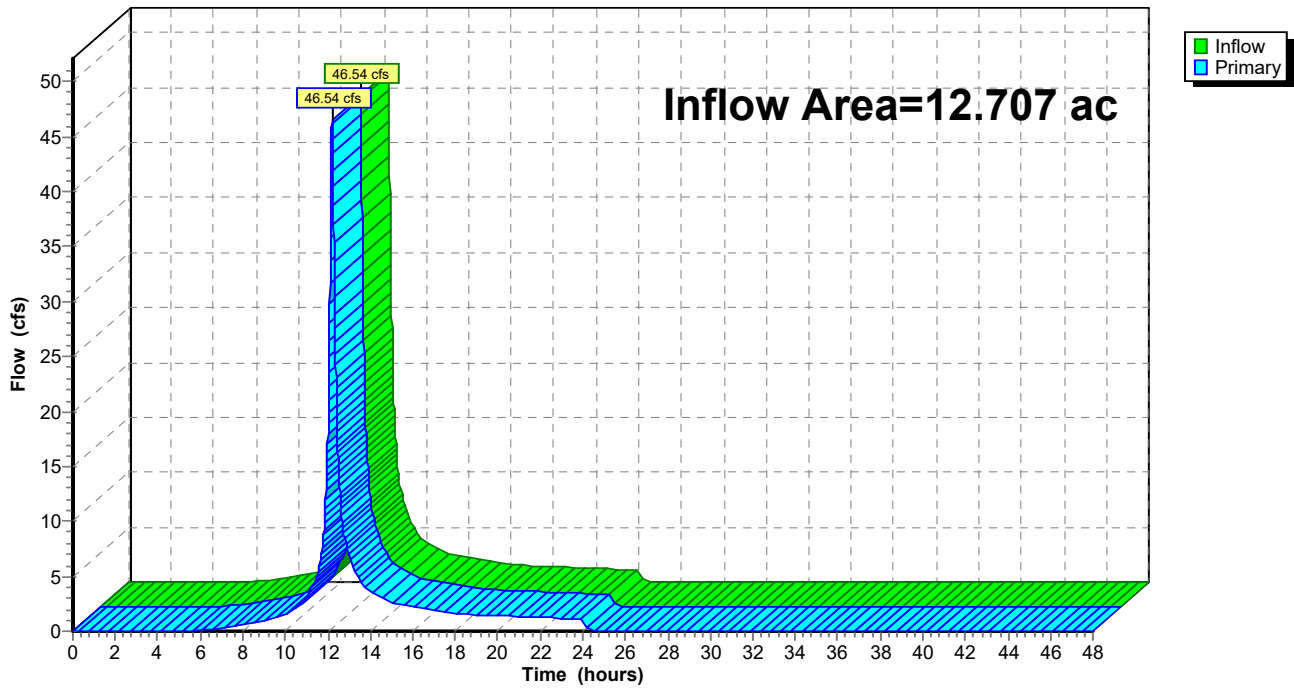
Summary for Link EAP-1: AP-1

Inflow Area = 12.707 ac, 4.56% Impervious, Inflow Depth = 4.20" for 50-year event
Inflow = 46.54 cfs @ 12.20 hrs, Volume= 4.443 af
Primary = 46.54 cfs @ 12.20 hrs, Volume= 4.443 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-1: AP-1

Hydrograph



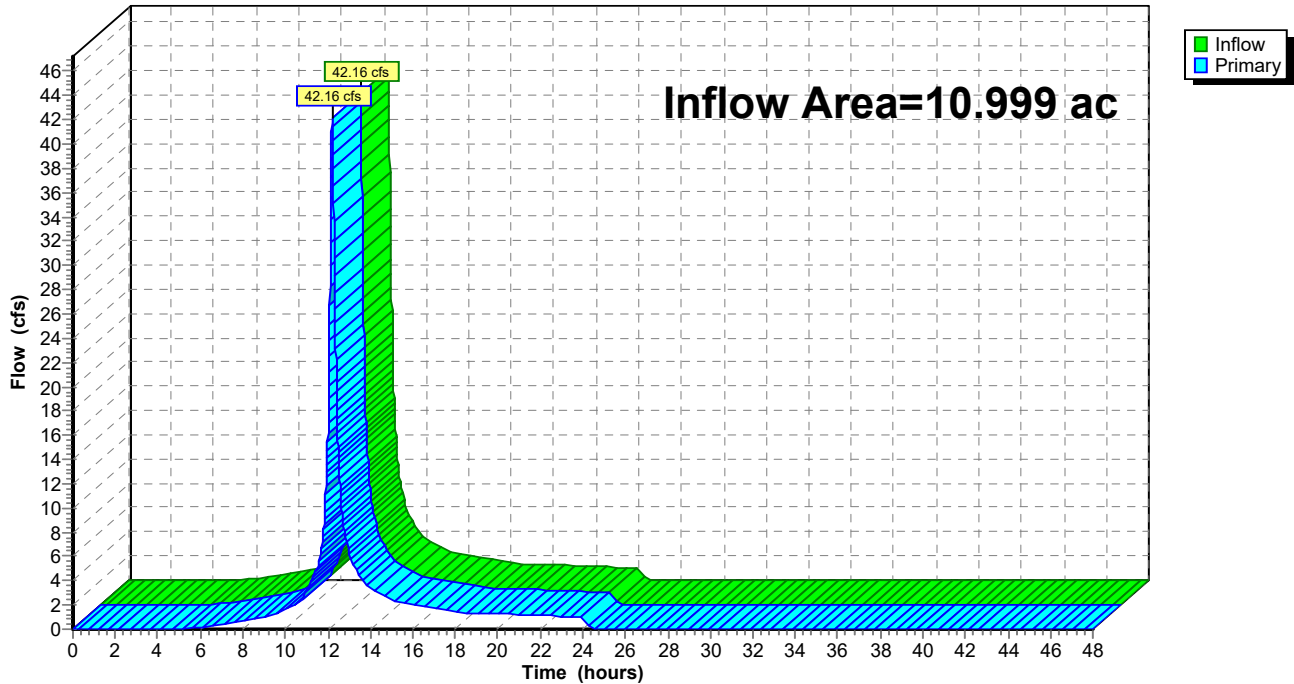
Summary for Link EAP-2: AP-2

Inflow Area = 10.999 ac, 22.03% Impervious, Inflow Depth = 4.52" for 50-year event
Inflow = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af
Primary = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 100-year Rainfall=7.69"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EDA-1: EDA-1

Runoff Area=12.707 ac 4.56% Impervious Runoff Depth=4.99"
Flow Length=796' Tc=12.3 min CN=77 Runoff=55.09 cfs 5.285 af

Subcatchment EDA-2: EDA-2

Runoff Area=479,116 sf 22.03% Impervious Runoff Depth=5.33"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=49.46 cfs 4.890 af

Link EAP-1: AP-1

Inflow=55.09 cfs 5.285 af
Primary=55.09 cfs 5.285 af

Link EAP-2: AP-2

Inflow=49.46 cfs 4.890 af
Primary=49.46 cfs 4.890 af

Total Runoff Area = 23.706 ac Runoff Volume = 10.175 af Average Runoff Depth = 5.15"
87.33% Pervious = 20.703 ac 12.67% Impervious = 3.003 ac

Summary for Subcatchment EDA-1: EDA-1

Runoff = 55.09 cfs @ 12.20 hrs, Volume= 5.285 af, Depth= 4.99"
 Routed to Link EAP-1 : AP-1

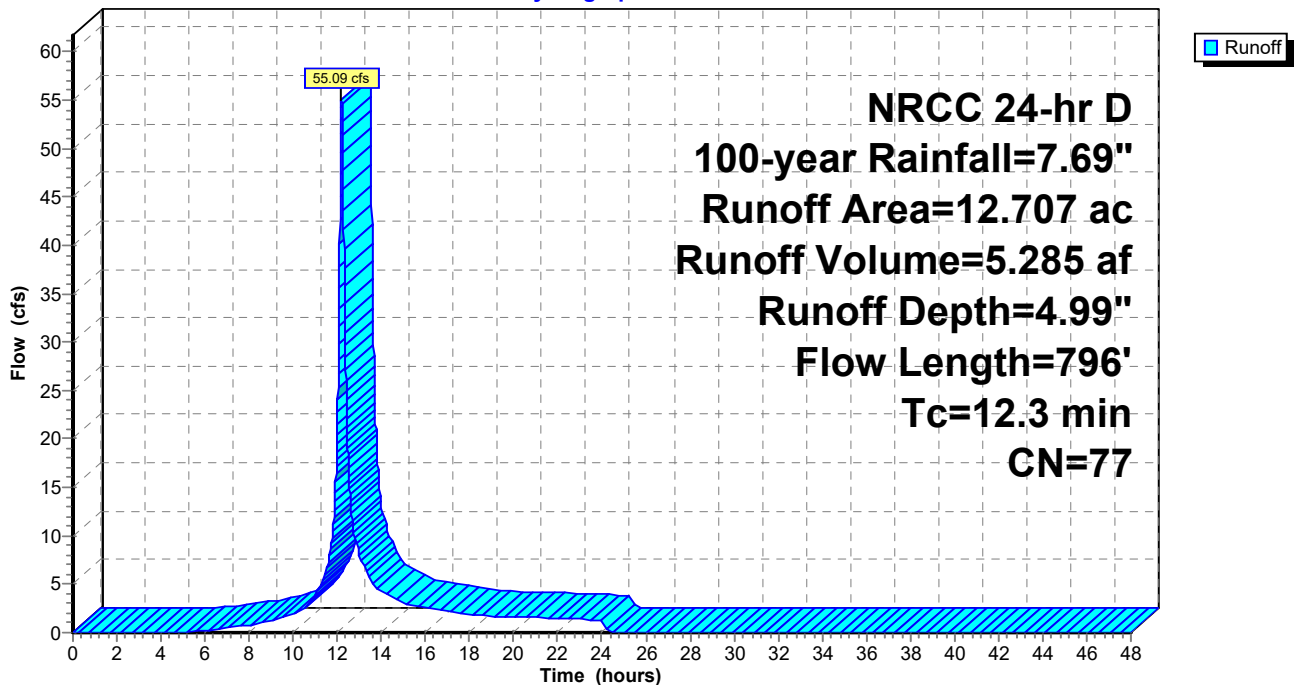
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 100-year Rainfall=7.69"

Area (ac)	CN	Description
2.898	79	1 acre lots, 20% imp, HSG C
5.274	73	Woods, Fair, HSG C
4.535	79	Woods, Fair, HSG D
12.707	77	Weighted Average
12.127		95.44% Pervious Area
0.580		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
1.1	128	0.0780	1.95		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
6.2	568	0.0933	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
12.3	796	Total			

Subcatchment EDA-1: EDA-1

Hydrograph



Summary for Subcatchment EDA-2: EDA-2

[47] Hint: Peak is 307% of capacity of segment #4

Runoff = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af, Depth= 5.33"
 Routed to Link EAP-2 : AP-2

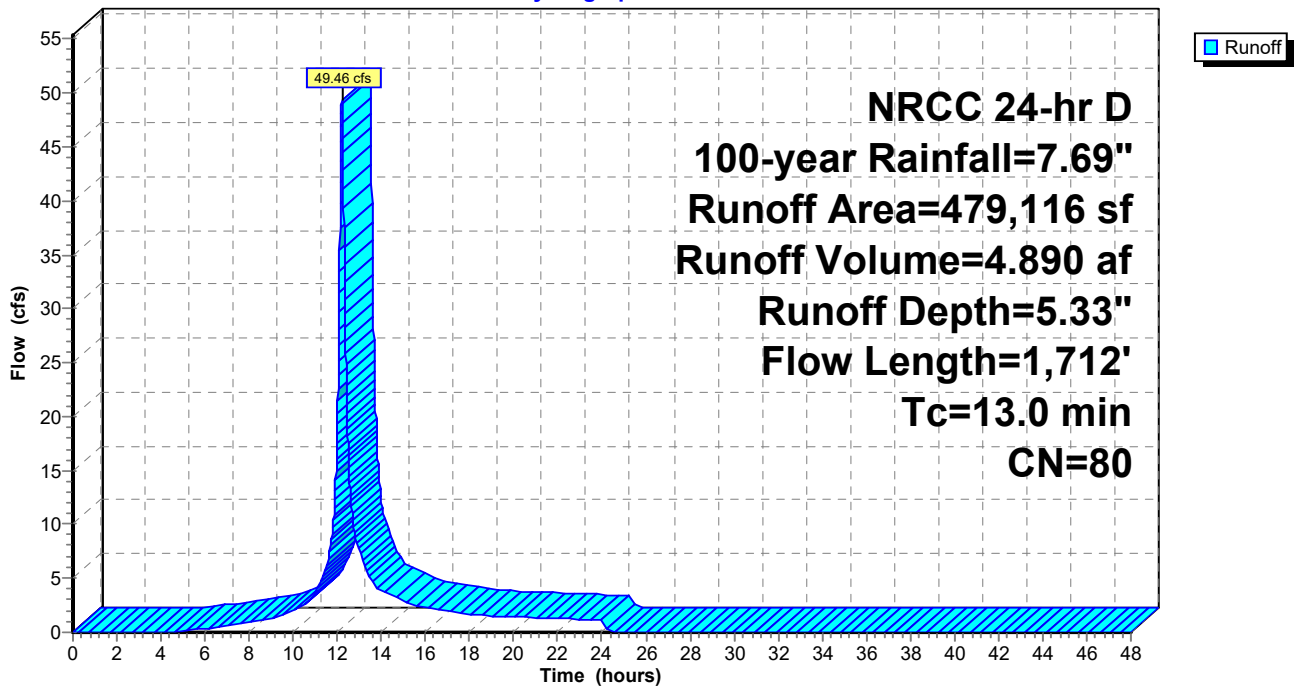
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 100-year Rainfall=7.69"

Area (sf)	CN	Description
247,300	79	1 acre lots, 20% imp, HSG C
129,102	73	Woods, Fair, HSG C
46,629	79	Woods, Fair, HSG D
50,194	98	Paved roads w/curbs & sewers, HSG C
5,891	98	Paved roads w/curbs & sewers, HSG D
479,116	80	Weighted Average
373,571		77.97% Pervious Area
105,545		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment EDA-2: EDA-2

Hydrograph



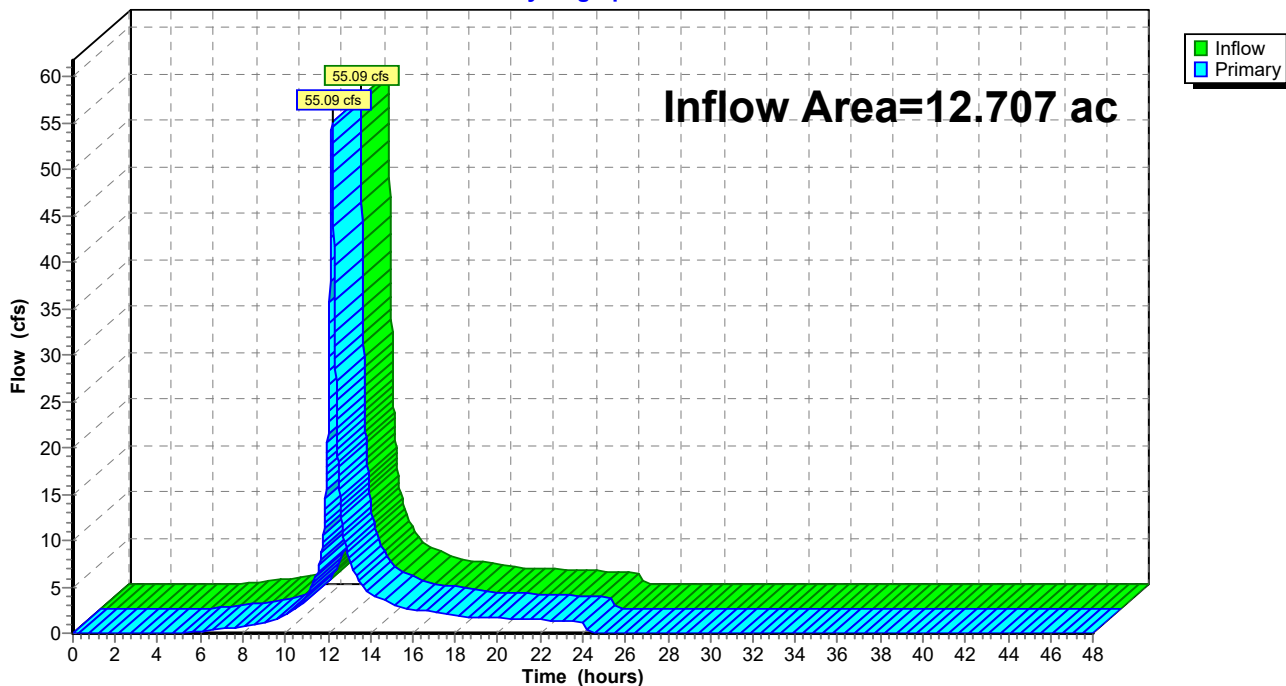
Summary for Link EAP-1: AP-1

Inflow Area = 12.707 ac, 4.56% Impervious, Inflow Depth = 4.99" for 100-year event
Inflow = 55.09 cfs @ 12.20 hrs, Volume= 5.285 af
Primary = 55.09 cfs @ 12.20 hrs, Volume= 5.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link EAP-1: AP-1

Hydrograph



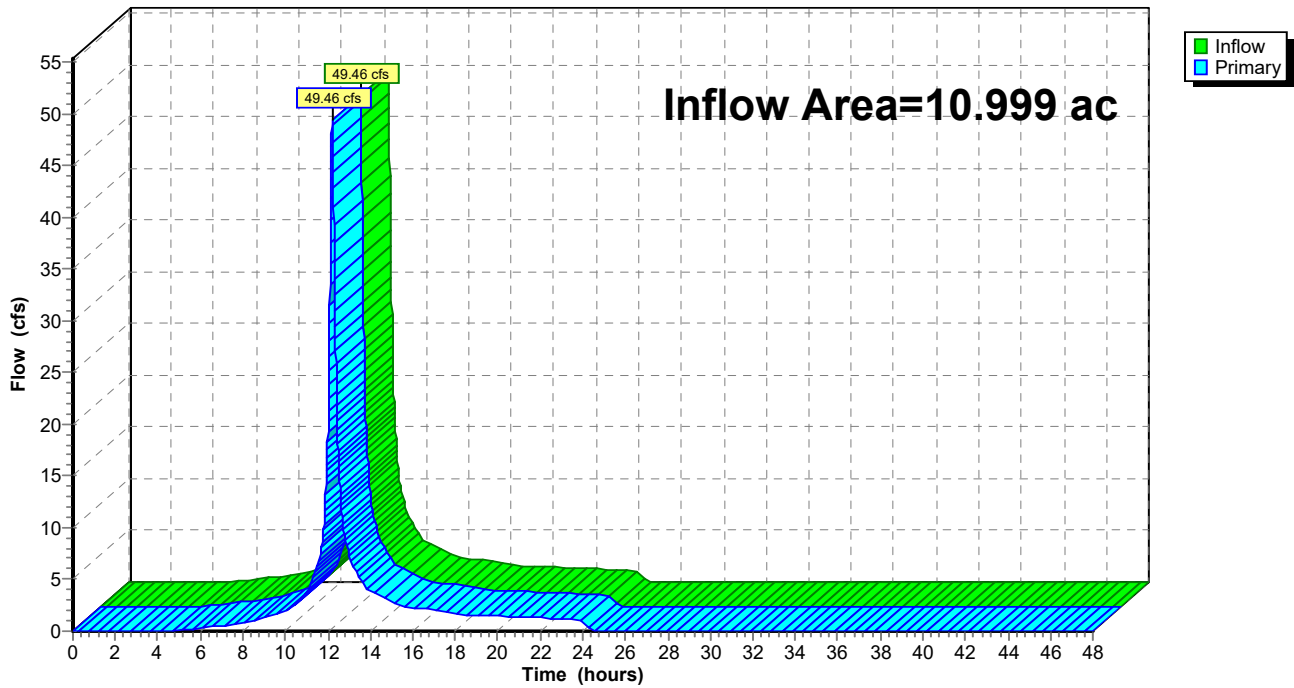
Summary for Link EAP-2: AP-2

Inflow Area = 10.999 ac, 22.03% Impervious, Inflow Depth = 5.33" for 100-year event
Inflow = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af
Primary = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

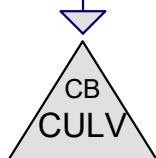
Link EAP-2: AP-2

Hydrograph





PDA-2



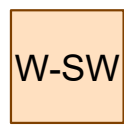
Culvert



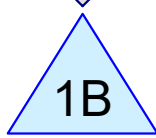
AP-2



PDA-1A



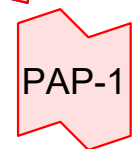
Western Swale



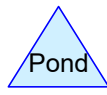
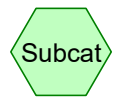
Stormwater Basin



PDA-1B



AP-1



Routing Diagram for 250 Carter St - Manchester, CT
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250 Carter St - Manchester, CT

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NRCC 24-hr	D	Default	24.00	1	3.16	2
2	10-year	NRCC 24-hr	D	Default	24.00	1	4.91	2
3	25-year	NRCC 24-hr	D	Default	24.00	1	6.00	2
4	50-year	NRCC 24-hr	D	Default	24.00	1	6.81	2
5	100-year	NRCC 24-hr	D	Default	24.00	1	7.69	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.576	79	1 acre lots, 20% imp, HSG C (PDA-1A, PDA-1B, PDA-2)
0.127	96	Gravel surface, HSG D (PDA-1A)
1.556	71	Meadow, non-grazed, HSG C (PDA-1A)
0.565	75	Meadow, non-grazed, HSG C/D (PDA-1B)
4.665	78	Meadow, non-grazed, HSG D (PDA-1A, PDA-1B)
0.041	98	Paved parking, HSG D (PDA-1A)
1.152	98	Paved roads w/curbs & sewers, HSG C (PDA-2)
0.135	98	Paved roads w/curbs & sewers, HSG D (PDA-2)
4.437	73	Woods, Fair, HSG C (PDA-1A, PDA-1B, PDA-2)
2.451	79	Woods, Fair, HSG D (PDA-1A, PDA-1B, PDA-2)
23.705	78	TOTAL AREA

250 Carter St - Manchester, CT

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
16.286	HSG C	PDA-1A, PDA-1B, PDA-2
7.419	HSG D	PDA-1A, PDA-1B, PDA-2
0.000	Other	
23.705		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	8.576	0.000	0.000	8.576	1 acre lots, 20% imp	PD A-1 A, PD A-1 B, PD A-2
0.000	0.000	0.000	0.127	0.000	0.127	Gravel surface	PD A-1 A
0.000	0.000	2.121	4.665	0.000	6.786	Meadow, non-grazed	PD A-1 A, PD A-1 B
0.000	0.000	0.000	0.041	0.000	0.041	Paved parking	PD A-1 A
0.000	0.000	1.152	0.135	0.000	1.287	Paved roads w/curbs & sewers	PD A-2
0.000	0.000	4.437	2.451	0.000	6.888	Woods, Fair	PD A-1 A, PD A-1 B, PD A-2
0.000	0.000	16.286	7.419	0.000	23.705	TOTAL AREA	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	PDA-2	0.00	0.00	608.0	0.0444	0.011	0.0	15.0	0.0	
2	1B	608.00	606.00	55.0	0.0364	0.013	0.0	24.0	0.0	
3	CULV	637.00	633.00	40.0	0.1000	0.013	0.0	42.0	12.0	

250 Carter St - Manchester, CT

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NRCC 24-hr D 2-year Rainfall=3.16"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-1A: PDA-1A

Runoff Area=10.448 ac 4.72% Impervious Runoff Depth=1.18"
Flow Length=938' Tc=12.0 min CN=77 Runoff=10.75 cfs 1.030 af

SubcatchmentPDA-1B: PDA-1B

Runoff Area=2.259 ac 5.66% Impervious Runoff Depth=1.18"
Flow Length=779' Tc=11.5 min CN=77 Runoff=2.35 cfs 0.223 af

SubcatchmentPDA-2: PDA-2

Runoff Area=10.998 ac 22.03% Impervious Runoff Depth=1.37"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=12.85 cfs 1.257 af

Reach W-SW: Western Swale

Avg. Flow Depth=0.50' Max Vel=3.52 fps Inflow=10.75 cfs 1.030 af
n=0.030 L=316.0' S=0.0190 '/' Capacity=182.01 cfs Outflow=10.57 cfs 1.030 af

Pond 1B: Stormwater Basin

Peak Elev=611.97' Storage=13,727 cf Inflow=10.57 cfs 1.030 af
Primary=3.39 cfs 0.923 af Secondary=0.00 cfs 0.000 af Outflow=3.39 cfs 0.923 af

Pond CULV: Culvert

Peak Elev=639.12' Inflow=12.85 cfs 1.257 af
42.0" Round Culvert w/ 12.0" inside fill n=0.013 L=40.0' S=0.1000 '/' Outflow=12.85 cfs 1.257 af

Link PAP-1: AP-1

Inflow=4.09 cfs 1.146 af
Primary=4.09 cfs 1.146 af

Link PAP-2: AP-2

Inflow=12.85 cfs 1.257 af
Primary=12.85 cfs 1.257 af

Total Runoff Area = 23.705 ac Runoff Volume = 2.510 af Average Runoff Depth = 1.27"
87.16% Pervious = 20.662 ac 12.84% Impervious = 3.043 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 10.75 cfs @ 12.20 hrs, Volume= 1.030 af, Depth= 1.18"
 Routed to Reach W-SW : Western Swale

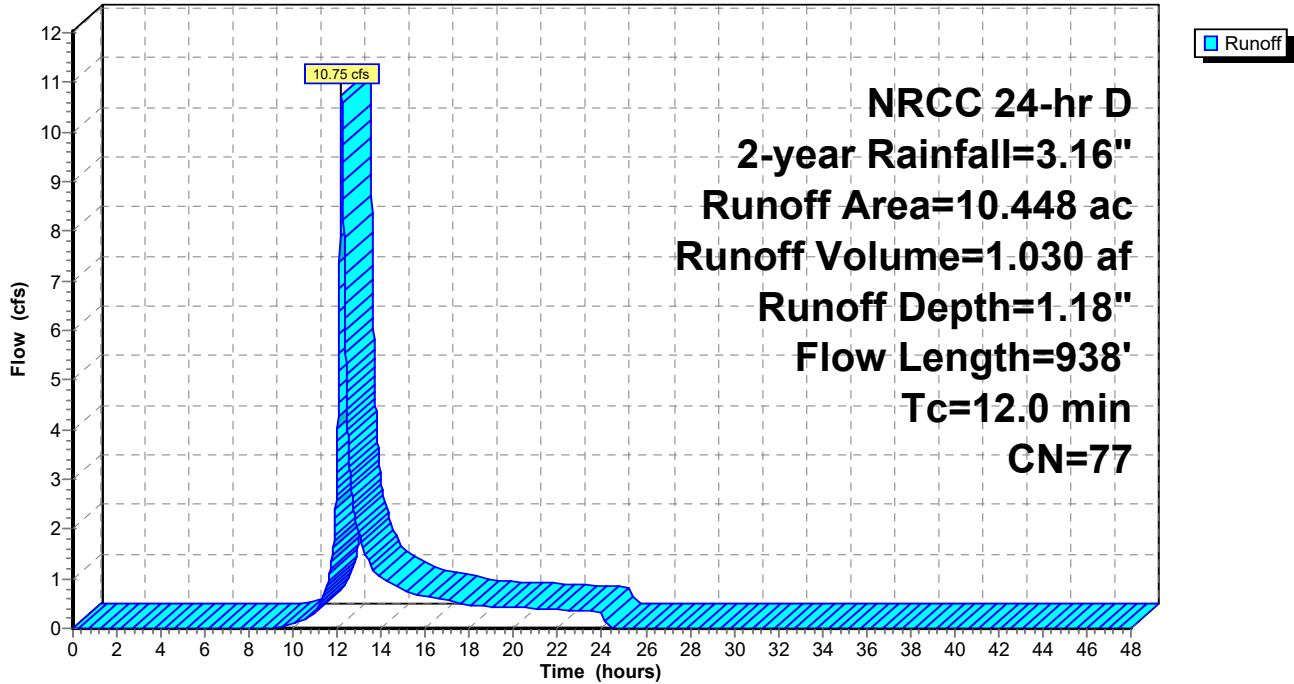
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 2-year Rainfall=3.16"

Area (ac)	CN	Description
2.260	79	1 acre lots, 20% imp, HSG C
1.245	73	Woods, Fair, HSG C
1.303	79	Woods, Fair, HSG D
1.556	71	Meadow, non-grazed, HSG C
3.916	78	Meadow, non-grazed, HSG D
0.127	96	Gravel surface, HSG D
0.041	98	Paved parking, HSG D
10.448	77	Weighted Average
9.955		95.28% Pervious Area
0.493		4.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	131	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
0.7	65	0.1091	1.65		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
3.4	422	0.0899	2.10		Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps
1.8	220	0.0190	2.07		Shallow Concentrated Flow, E-F Grassed Waterway Kv= 15.0 fps
12.0	938	Total			

Subcatchment PDA-1A: PDA-1A

Hydrograph



Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 2.35 cfs @ 12.20 hrs, Volume= 0.223 af, Depth= 1.18"
 Routed to Link PAP-1 : AP-1

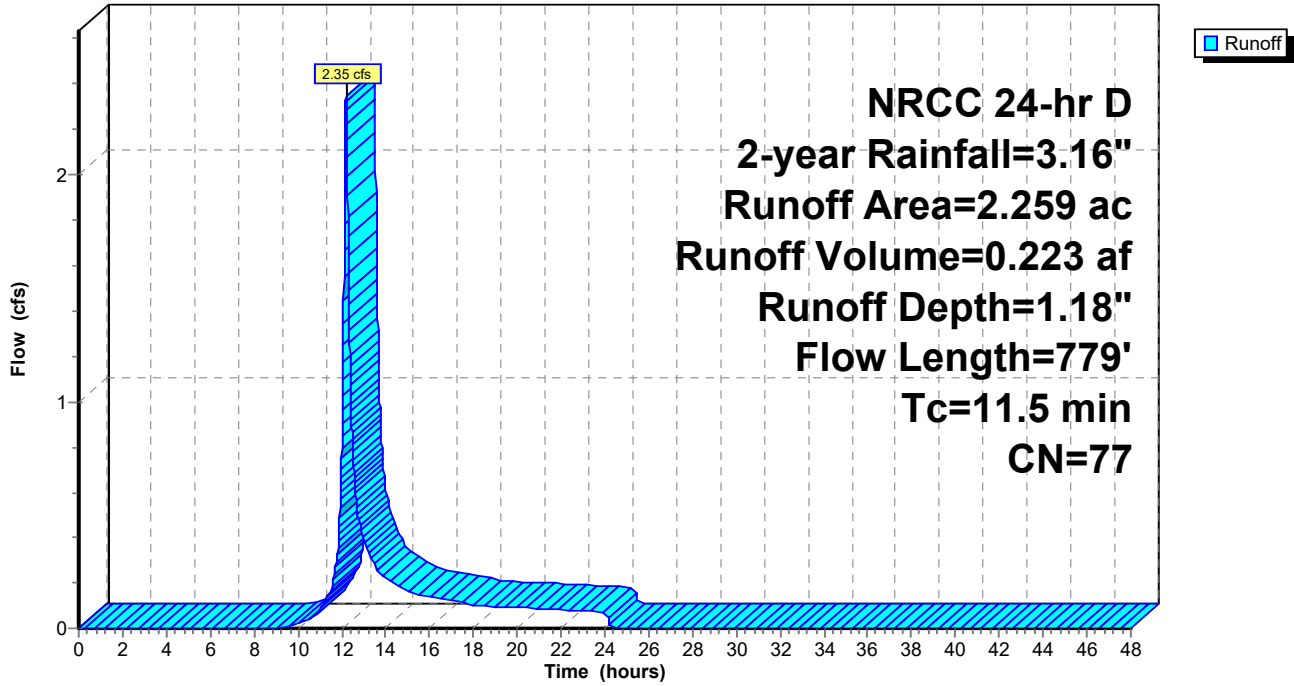
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 2-year Rainfall=3.16"

Area (ac)	CN	Description
0.639	79	1 acre lots, 20% imp, HSG C
0.228	73	Woods, Fair, HSG C
0.078	79	Woods, Fair, HSG D
* 0.565	75	Meadow, non-grazed, HSG C/D
0.749	78	Meadow, non-grazed, HSG D
2.259	77	Weighted Average
2.131		94.34% Pervious Area
0.128		5.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
0.7	102	0.1078	2.30		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
1.0	96	0.0937	1.53		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
5.1	481	0.0986	1.57		Shallow Concentrated Flow, D-E Woodland Kv= 5.0 fps
11.5	779	Total			

Subcatchment PDA-1B: PDA-1B

Hydrograph



Summary for Subcatchment PDA-2: PDA-2

Runoff = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af, Depth= 1.37"
 Routed to Pond CULV : Culvert

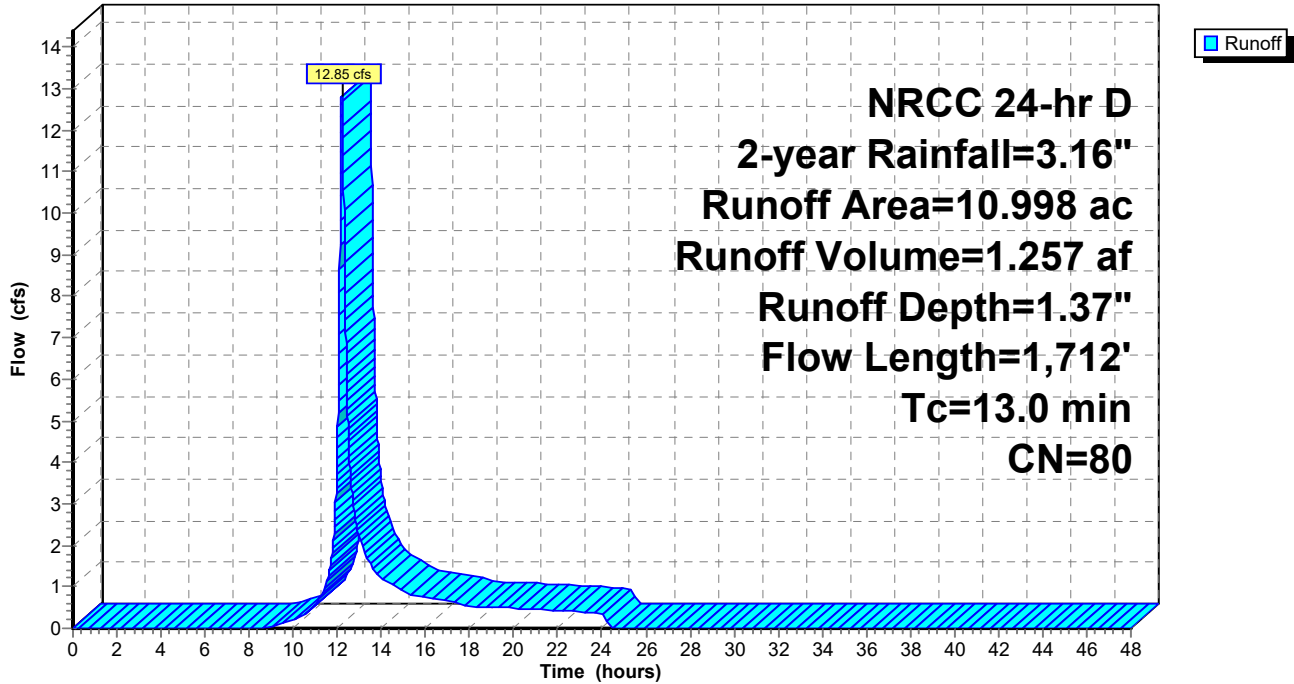
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 2-year Rainfall=3.16"

Area (ac)	CN	Description
5.677	79	1 acre lots, 20% imp, HSG C
2.964	73	Woods, Fair, HSG C
1.070	79	Woods, Fair, HSG D
1.152	98	Paved roads w/curbs & sewers, HSG C
0.135	98	Paved roads w/curbs & sewers, HSG D
10.998	80	Weighted Average
8.576		77.97% Pervious Area
2.422		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment PDA-2: PDA-2

Hydrograph



Summary for Reach W-SW: Western Swale

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 1.18" for 2-year event
 Inflow = 10.75 cfs @ 12.20 hrs, Volume= 1.030 af
 Outflow = 10.57 cfs @ 12.24 hrs, Volume= 1.030 af, Atten= 2%, Lag= 2.6 min
 Routed to Pond 1B : Stormwater Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 3.52 fps, Min. Travel Time= 1.5 min
 Avg. Velocity = 1.29 fps, Avg. Travel Time= 4.1 min

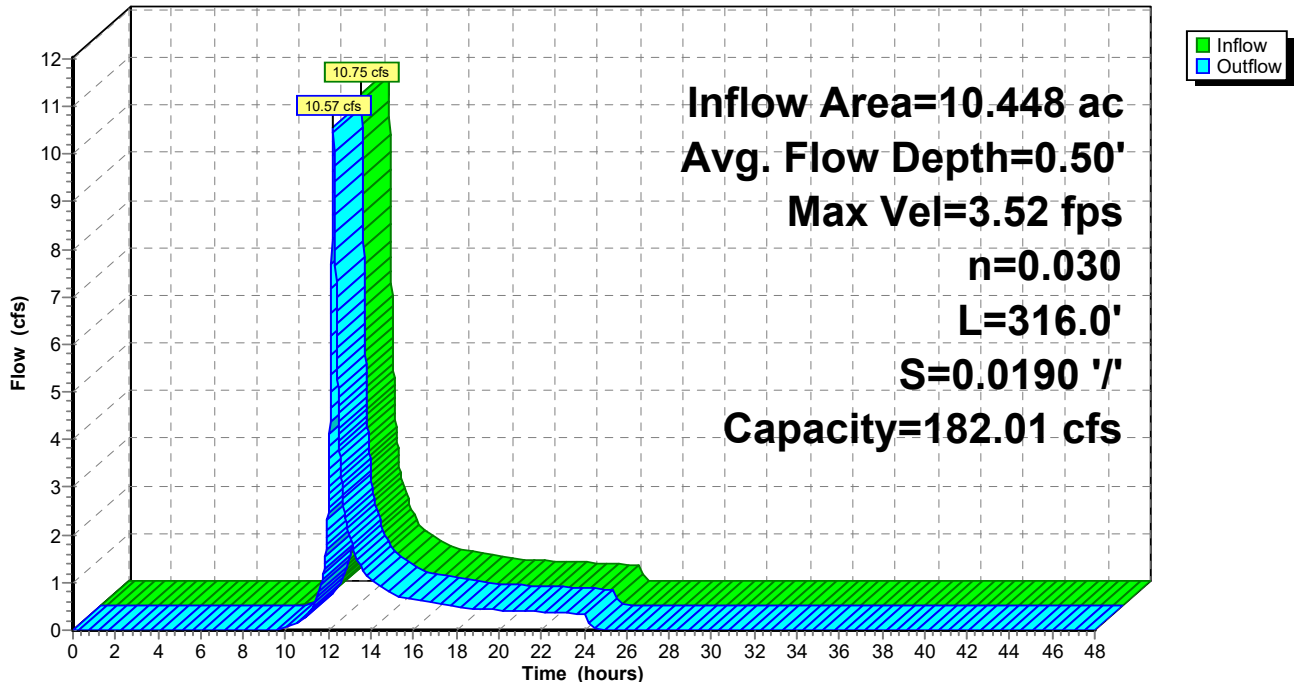
Peak Storage= 950 cf @ 12.22 hrs
 Average Depth at Peak Storage= 0.50' , Surface Width= 8.01'
 Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 182.01 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 4.0 ' / ' Top Width= 20.00'
 Length= 316.0' Slope= 0.0190 ' / '
 Inlet Invert= 621.00', Outlet Invert= 615.00'



Reach W-SW: Western Swale

Hydrograph



Summary for Pond 1B: Stormwater Basin

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 1.18" for 2-year event
 Inflow = 10.57 cfs @ 12.24 hrs, Volume= 1.030 af
 Outflow = 3.39 cfs @ 12.59 hrs, Volume= 0.923 af, Atten= 68%, Lag= 20.5 min
 Primary = 3.39 cfs @ 12.59 hrs, Volume= 0.923 af
 Routed to Link PAP-1 : AP-1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link PAP-1 : AP-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 611.97' @ 12.59 hrs Surf.Area= 11,329 sf Storage= 13,727 cf

Plug-Flow detention time= 158.4 min calculated for 0.923 af (90% of inflow)
 Center-of-Mass det. time= 105.8 min (999.5 - 893.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	610.00'	75,163 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
610.00	126	42.7	0	0	126	
611.00	9,551	438.8	3,591	3,591	15,305	
612.00	11,382	522.9	10,453	14,044	21,759	
613.00	13,181	584.7	12,271	26,315	27,234	
614.00	15,158	647.5	14,158	40,473	33,423	
615.00	17,308	711.0	16,221	56,694	40,321	
616.00	19,655	774.8	18,469	75,163	47,901	

Device	Routing	Invert	Outlet Devices
#1	Primary	608.00'	24.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.00' / 606.00' S= 0.0364 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	611.10'	18.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	614.00'	36.0" x 21.0" Horiz. Oriface/Grate Outlet C= 0.600 Limited to weir flow at low heads
#4	Secondary	615.00'	16.0' long + 3.0 ' SideZ x 14.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=3.39 cfs @ 12.59 hrs HW=611.97' (Free Discharge)

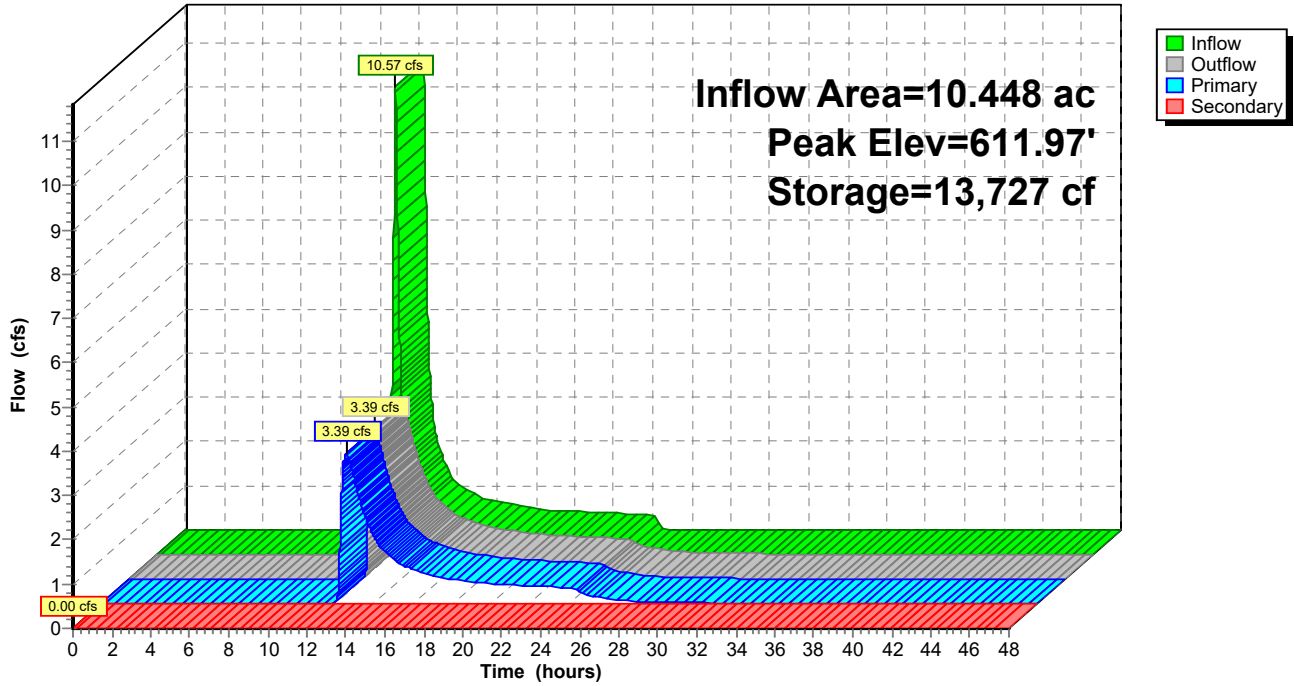
- ↑1=Culvert (Passes 3.39 cfs of 26.08 cfs potential flow)
- ↑2=Orifice/Grate (Orifice Controls 3.39 cfs @ 3.18 fps)
- ↑3=Oriface/Grate Outlet (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=610.00' (Free Discharge)

- ↑4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1B: Stormwater Basin

Hydrograph



Summary for Pond CULV: Culvert

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 1.37" for 2-year event
 Inflow = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af
 Outflow = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af, Atten= 0%, Lag= 0.0 min
 Primary = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af
 Routed to Link PAP-2 : AP-2

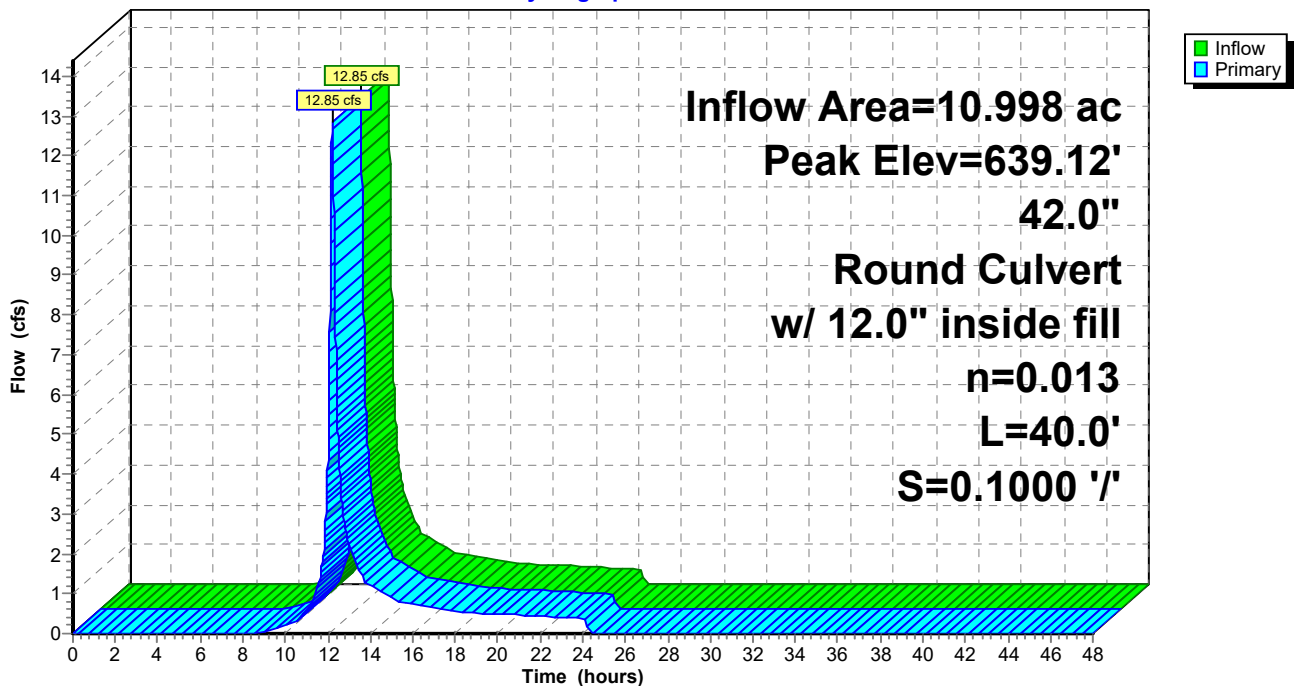
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 639.12' @ 12.21 hrs
 Flood Elev= 643.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	638.00'	42.0" Round Culvert w/ 12.0" inside fill L= 40.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 633.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.35 sf

Primary OutFlow Max=12.84 cfs @ 12.21 hrs HW=639.12' TW=636.50' (Fixed TW Elev= 636.50')
 ↑1=Culvert (Inlet Controls 12.84 cfs @ 3.37 fps)

Pond CULV: Culvert

Hydrograph



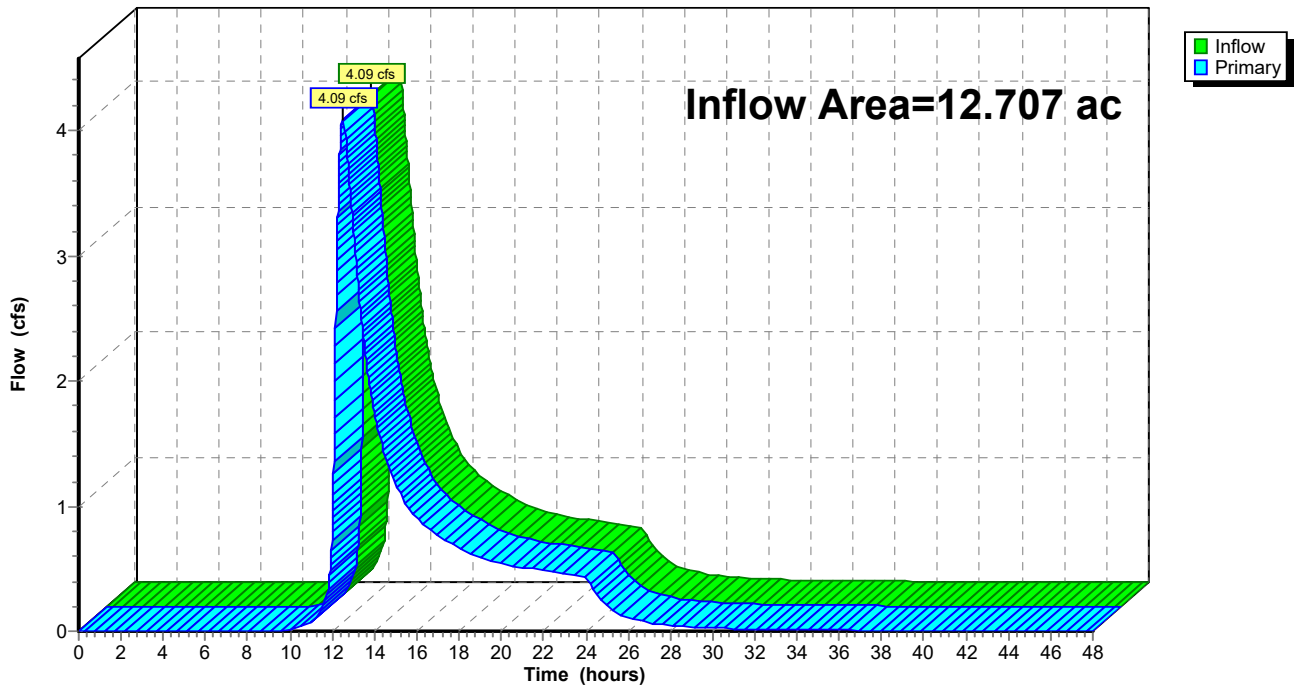
Summary for Link PAP-1: AP-1

Inflow Area = 12.707 ac, 4.89% Impervious, Inflow Depth > 1.08" for 2-year event
Inflow = 4.09 cfs @ 12.51 hrs, Volume= 1.146 af
Primary = 4.09 cfs @ 12.51 hrs, Volume= 1.146 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-1: AP-1

Hydrograph



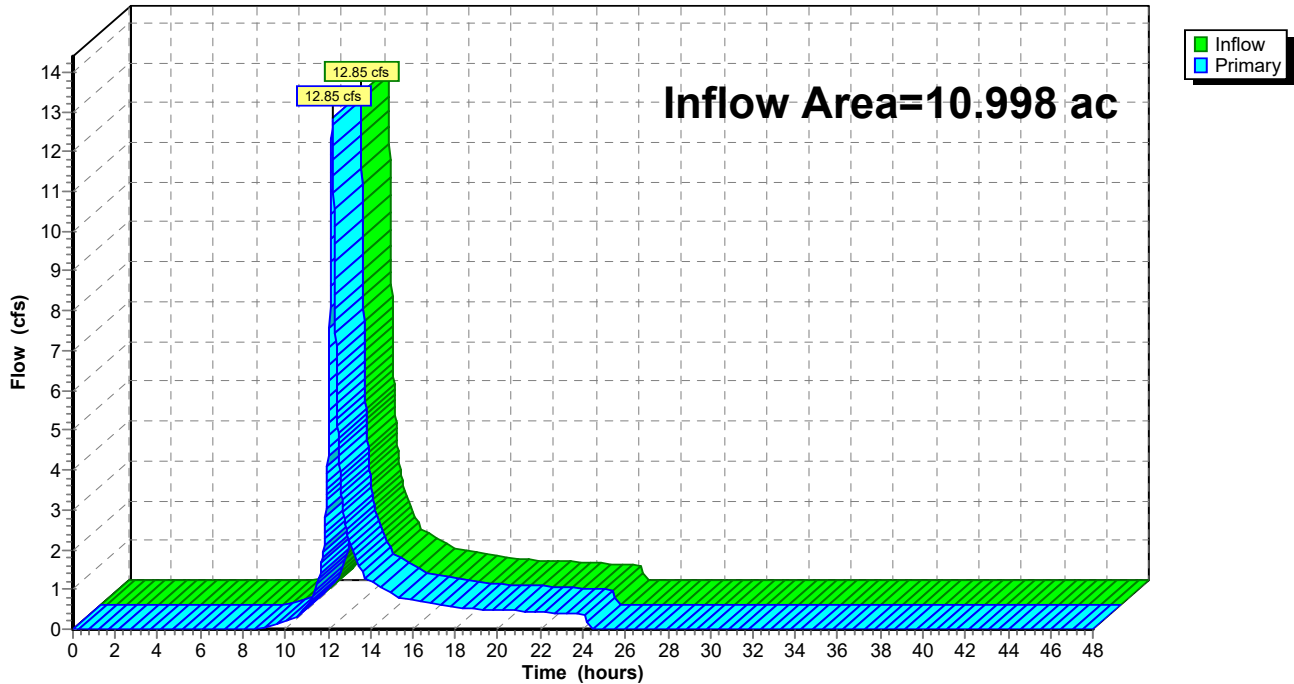
Summary for Link PAP-2: AP-2

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 1.37" for 2-year event
Inflow = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af
Primary = 12.85 cfs @ 12.21 hrs, Volume= 1.257 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 10-year Rainfall=4.91"

Prepared by Solli Engineering

Printed 4/10/2024

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-1A: PDA-1A

Runoff Area=10.448 ac 4.72% Impervious Runoff Depth=2.55"
Flow Length=938' Tc=12.0 min CN=77 Runoff=23.64 cfs 2.218 af

SubcatchmentPDA-1B: PDA-1B

Runoff Area=2.259 ac 5.66% Impervious Runoff Depth=2.55"
Flow Length=779' Tc=11.5 min CN=77 Runoff=5.17 cfs 0.480 af

SubcatchmentPDA-2: PDA-2

Runoff Area=10.998 ac 22.03% Impervious Runoff Depth=2.81"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=26.55 cfs 2.579 af

Reach W-SW: Western Swale

Avg. Flow Depth=0.76' Max Vel=4.41 fps Inflow=23.64 cfs 2.218 af
n=0.030 L=316.0' S=0.0190 '/' Capacity=182.01 cfs Outflow=23.40 cfs 2.218 af

Pond 1B: Stormwater Basin

Peak Elev=613.06' Storage=27,167 cf Inflow=23.40 cfs 2.218 af
Primary=9.38 cfs 2.111 af Secondary=0.00 cfs 0.000 af Outflow=9.38 cfs 2.111 af

Pond CULV: Culvert

Peak Elev=639.82' Inflow=26.55 cfs 2.579 af
42.0" Round Culvert w/ 12.0" inside fill n=0.013 L=40.0' S=0.1000 '/' Outflow=26.55 cfs 2.579 af

Link PAP-1: AP-1

Inflow=12.13 cfs 2.590 af
Primary=12.13 cfs 2.590 af

Link PAP-2: AP-2

Inflow=26.55 cfs 2.579 af
Primary=26.55 cfs 2.579 af

Total Runoff Area = 23.705 ac Runoff Volume = 5.277 af Average Runoff Depth = 2.67"
87.16% Pervious = 20.662 ac 12.84% Impervious = 3.043 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 23.64 cfs @ 12.20 hrs, Volume= 2.218 af, Depth= 2.55"
 Routed to Reach W-SW : Western Swale

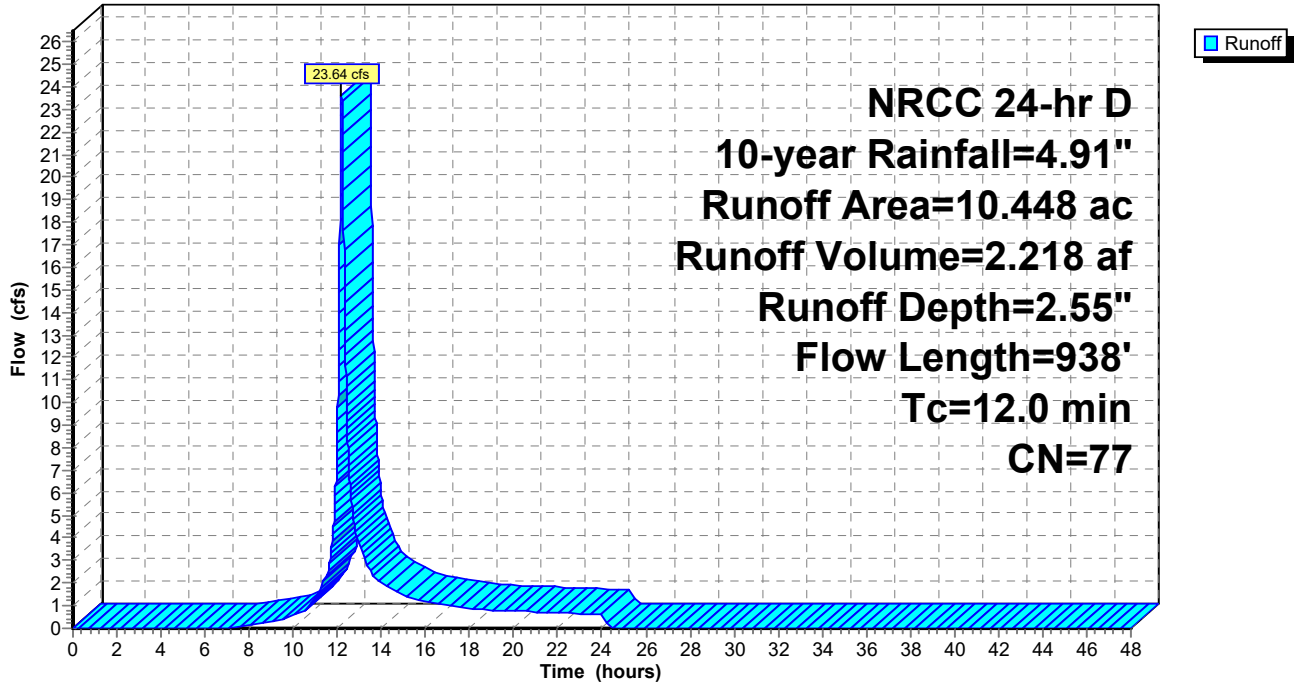
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 10-year Rainfall=4.91"

Area (ac)	CN	Description
2.260	79	1 acre lots, 20% imp, HSG C
1.245	73	Woods, Fair, HSG C
1.303	79	Woods, Fair, HSG D
1.556	71	Meadow, non-grazed, HSG C
3.916	78	Meadow, non-grazed, HSG D
0.127	96	Gravel surface, HSG D
0.041	98	Paved parking, HSG D
10.448	77	Weighted Average
9.955		95.28% Pervious Area
0.493		4.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	131	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
0.7	65	0.1091	1.65		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
3.4	422	0.0899	2.10		Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps
1.8	220	0.0190	2.07		Shallow Concentrated Flow, E-F Grassed Waterway Kv= 15.0 fps
12.0	938	Total			

Subcatchment PDA-1A: PDA-1A

Hydrograph



Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 5.17 cfs @ 12.19 hrs, Volume= 0.480 af, Depth= 2.55"
 Routed to Link PAP-1 : AP-1

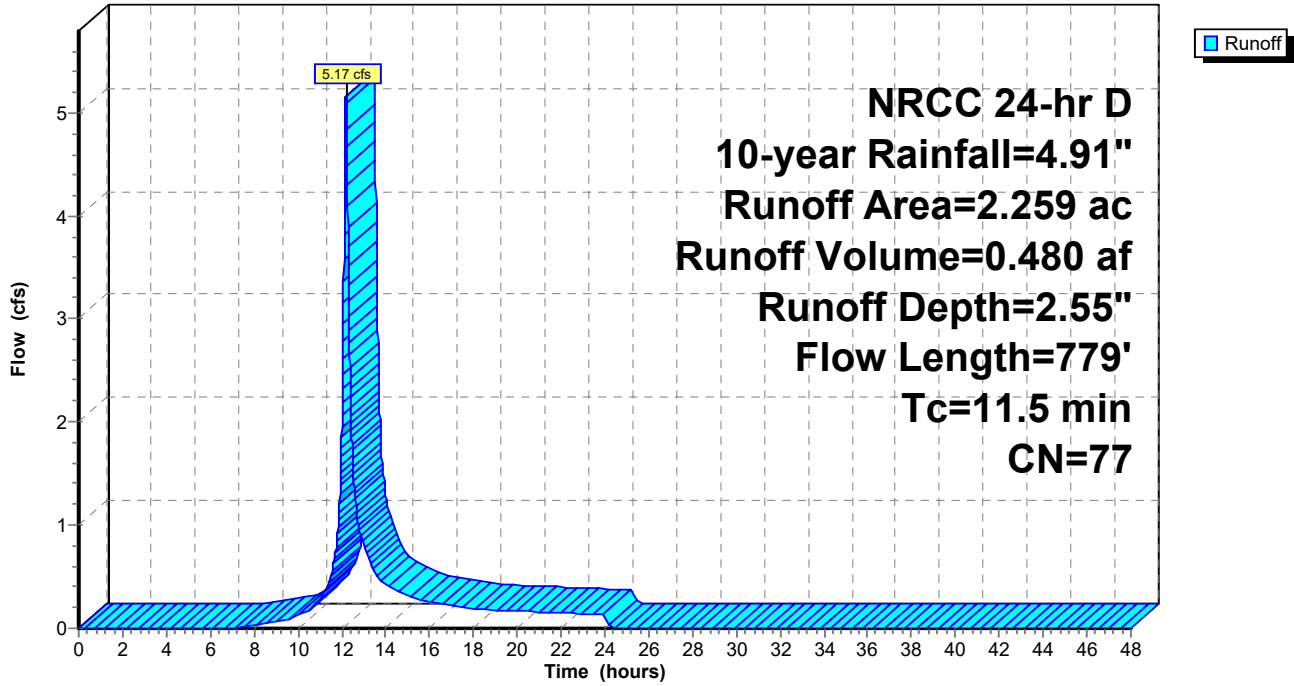
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 10-year Rainfall=4.91"

Area (ac)	CN	Description
0.639	79	1 acre lots, 20% imp, HSG C
0.228	73	Woods, Fair, HSG C
0.078	79	Woods, Fair, HSG D
* 0.565	75	Meadow, non-grazed, HSG C/D
0.749	78	Meadow, non-grazed, HSG D
2.259	77	Weighted Average
2.131		94.34% Pervious Area
0.128		5.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
0.7	102	0.1078	2.30		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
1.0	96	0.0937	1.53		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
5.1	481	0.0986	1.57		Shallow Concentrated Flow, D-E Woodland Kv= 5.0 fps
11.5	779	Total			

Subcatchment PDA-1B: PDA-1B

Hydrograph



Summary for Subcatchment PDA-2: PDA-2

[47] Hint: Peak is 165% of capacity of segment #4

Runoff = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af, Depth= 2.81"
 Routed to Pond CULV : Culvert

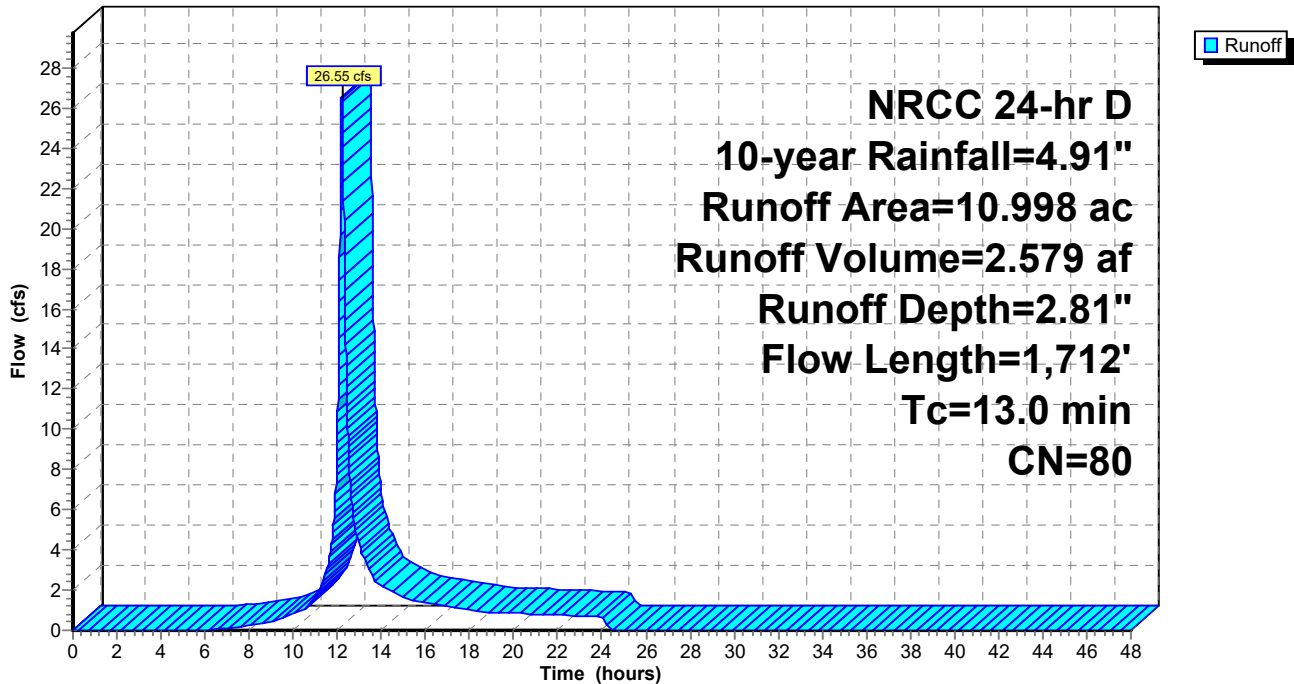
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 10-year Rainfall=4.91"

Area (ac)	CN	Description
5.677	79	1 acre lots, 20% imp, HSG C
2.964	73	Woods, Fair, HSG C
1.070	79	Woods, Fair, HSG D
1.152	98	Paved roads w/curbs & sewers, HSG C
0.135	98	Paved roads w/curbs & sewers, HSG D
10.998	80	Weighted Average
8.576		77.97% Pervious Area
2.422		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment PDA-2: PDA-2

Hydrograph



Summary for Reach W-SW: Western Swale

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 2.55" for 10-year event
 Inflow = 23.64 cfs @ 12.20 hrs, Volume= 2.218 af
 Outflow = 23.40 cfs @ 12.23 hrs, Volume= 2.218 af, Atten= 1%, Lag= 2.0 min
 Routed to Pond 1B : Stormwater Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 4.41 fps, Min. Travel Time= 1.2 min
 Avg. Velocity = 1.56 fps, Avg. Travel Time= 3.4 min

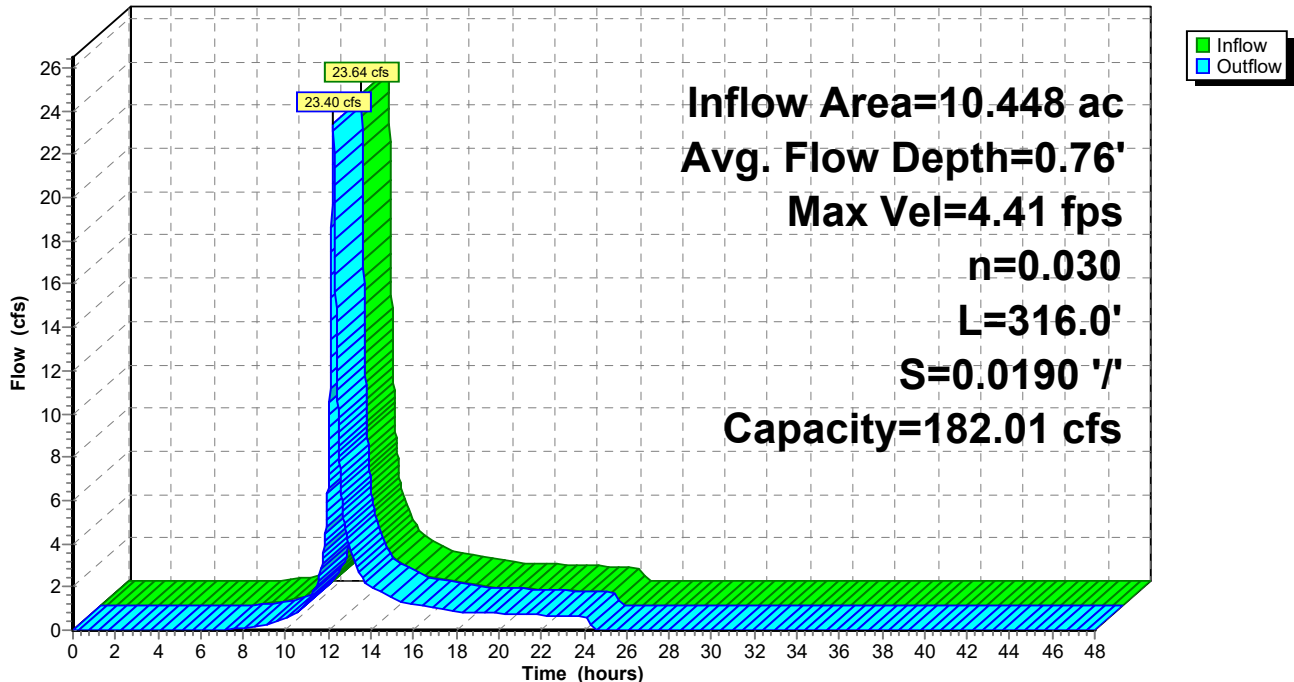
Peak Storage= 1,678 cf @ 12.21 hrs
 Average Depth at Peak Storage= 0.76' , Surface Width= 10.05'
 Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 182.01 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 4.0 ' / ' Top Width= 20.00'
 Length= 316.0' Slope= 0.0190 ' / '
 Inlet Invert= 621.00', Outlet Invert= 615.00'



Reach W-SW: Western Swale

Hydrograph



Summary for Pond 1B: Stormwater Basin

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 2.55" for 10-year event
 Inflow = 23.40 cfs @ 12.23 hrs, Volume= 2.218 af
 Outflow = 9.38 cfs @ 12.47 hrs, Volume= 2.111 af, Atten= 60%, Lag= 14.5 min
 Primary = 9.38 cfs @ 12.47 hrs, Volume= 2.111 af
 Routed to Link PAP-1 : AP-1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link PAP-1 : AP-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 613.06' @ 12.47 hrs Surf.Area= 13,304 sf Storage= 27,167 cf

Plug-Flow detention time= 99.6 min calculated for 2.111 af (95% of inflow)
 Center-of-Mass det. time= 72.6 min (936.6 - 864.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	610.00'	75,163 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
610.00	126	42.7	0	0	126	
611.00	9,551	438.8	3,591	3,591	15,305	
612.00	11,382	522.9	10,453	14,044	21,759	
613.00	13,181	584.7	12,271	26,315	27,234	
614.00	15,158	647.5	14,158	40,473	33,423	
615.00	17,308	711.0	16,221	56,694	40,321	
616.00	19,655	774.8	18,469	75,163	47,901	

Device	Routing	Invert	Outlet Devices
#1	Primary	608.00'	24.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.00' / 606.00' S= 0.0364 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	611.10'	18.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	614.00'	36.0" x 21.0" Horiz. Oriface/Grate Outlet C= 0.600 Limited to weir flow at low heads
#4	Secondary	615.00'	16.0' long + 3.0 ' SideZ x 14.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=9.38 cfs @ 12.47 hrs HW=613.06' (Free Discharge)

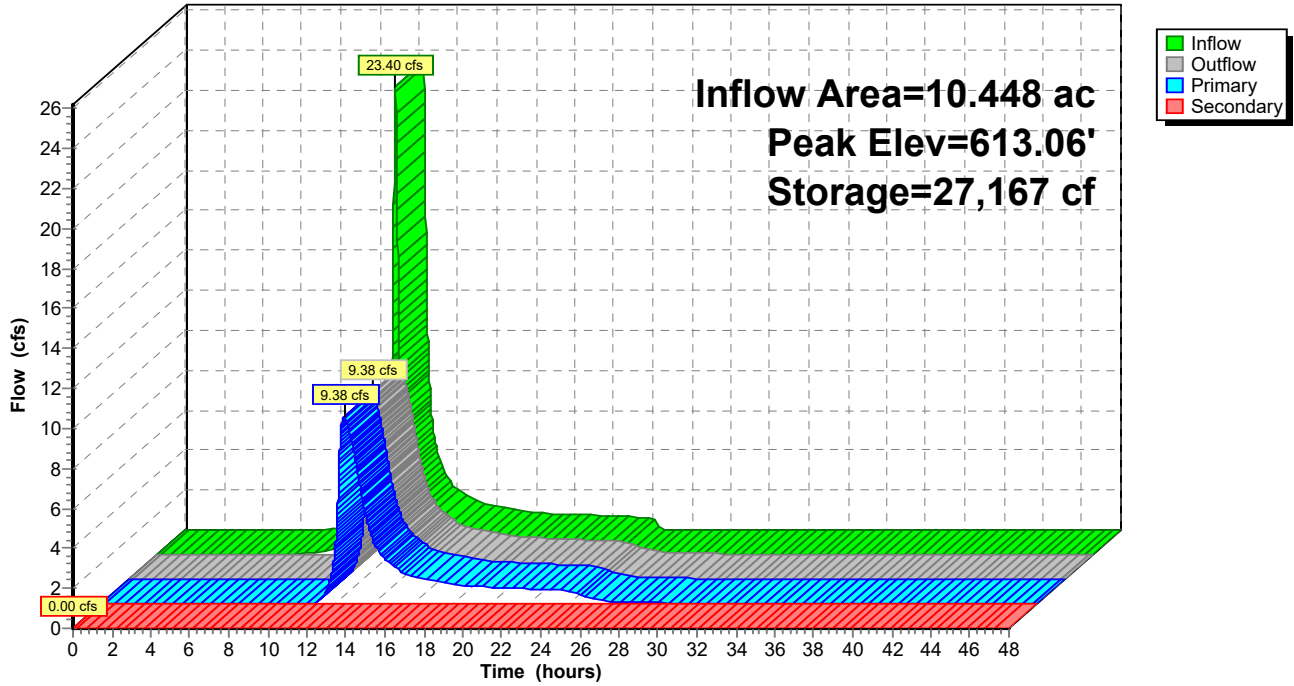
- ↑1=Culvert (Passes 9.38 cfs of 30.50 cfs potential flow)
- ↑2=Orifice/Grate (Orifice Controls 9.38 cfs @ 5.31 fps)
- ↑3=Oriface/Grate Outlet (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=610.00' (Free Discharge)

- ↑4=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 1B: Stormwater Basin

Hydrograph



Summary for Pond CULV: Culvert

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 2.81" for 10-year event
 Inflow = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af
 Outflow = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af, Atten= 0%, Lag= 0.0 min
 Primary = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af
 Routed to Link PAP-2 : AP-2

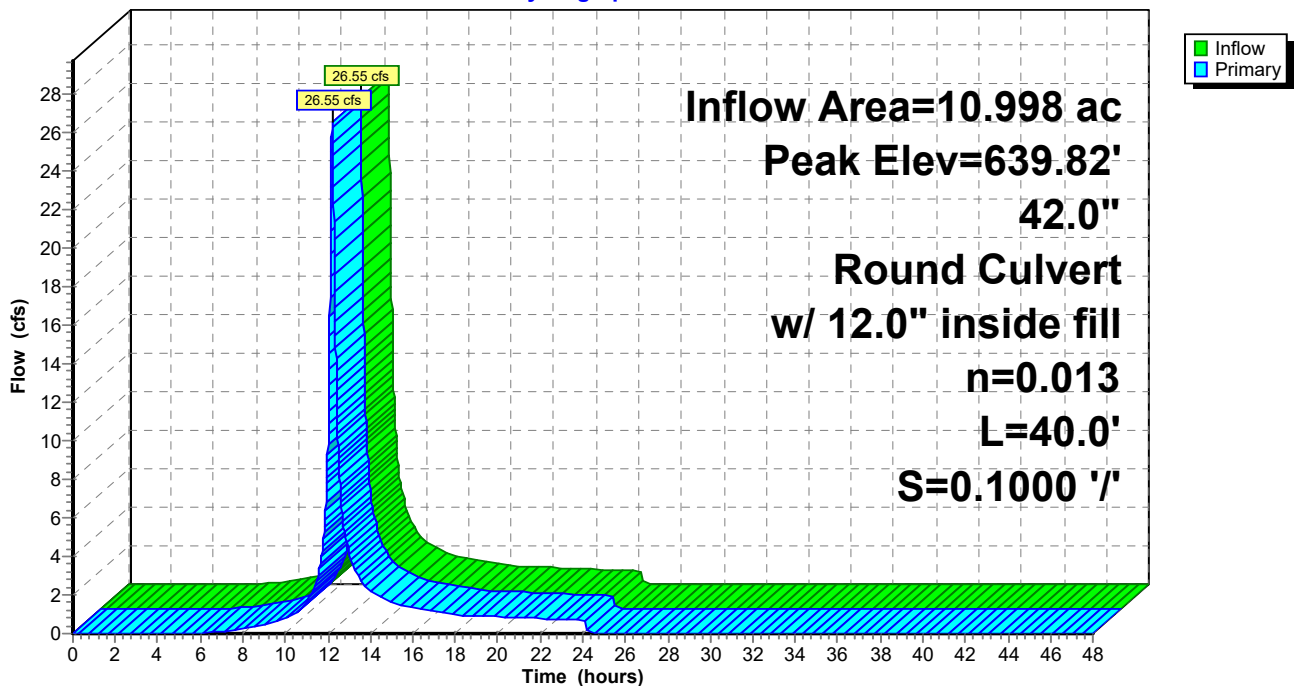
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 639.82' @ 12.21 hrs
 Flood Elev= 643.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	638.00'	42.0" Round Culvert w/ 12.0" inside fill L= 40.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 633.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.35 sf

Primary OutFlow Max=26.52 cfs @ 12.21 hrs HW=639.82' TW=636.50' (Fixed TW Elev= 636.50')
 ↑1=Culvert (Inlet Controls 26.52 cfs @ 4.39 fps)

Pond CULV: Culvert

Hydrograph



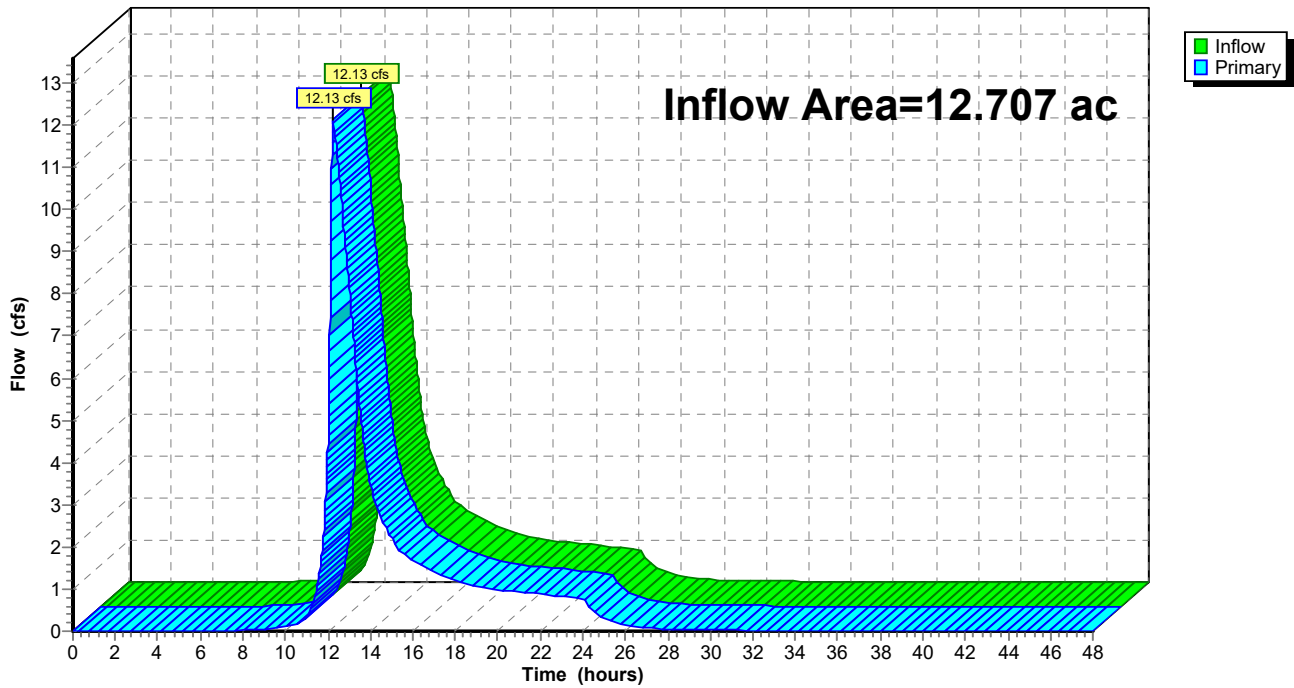
Summary for Link PAP-1: AP-1

Inflow Area = 12.707 ac, 4.89% Impervious, Inflow Depth > 2.45" for 10-year event
Inflow = 12.13 cfs @ 12.26 hrs, Volume= 2.590 af
Primary = 12.13 cfs @ 12.26 hrs, Volume= 2.590 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-1: AP-1

Hydrograph



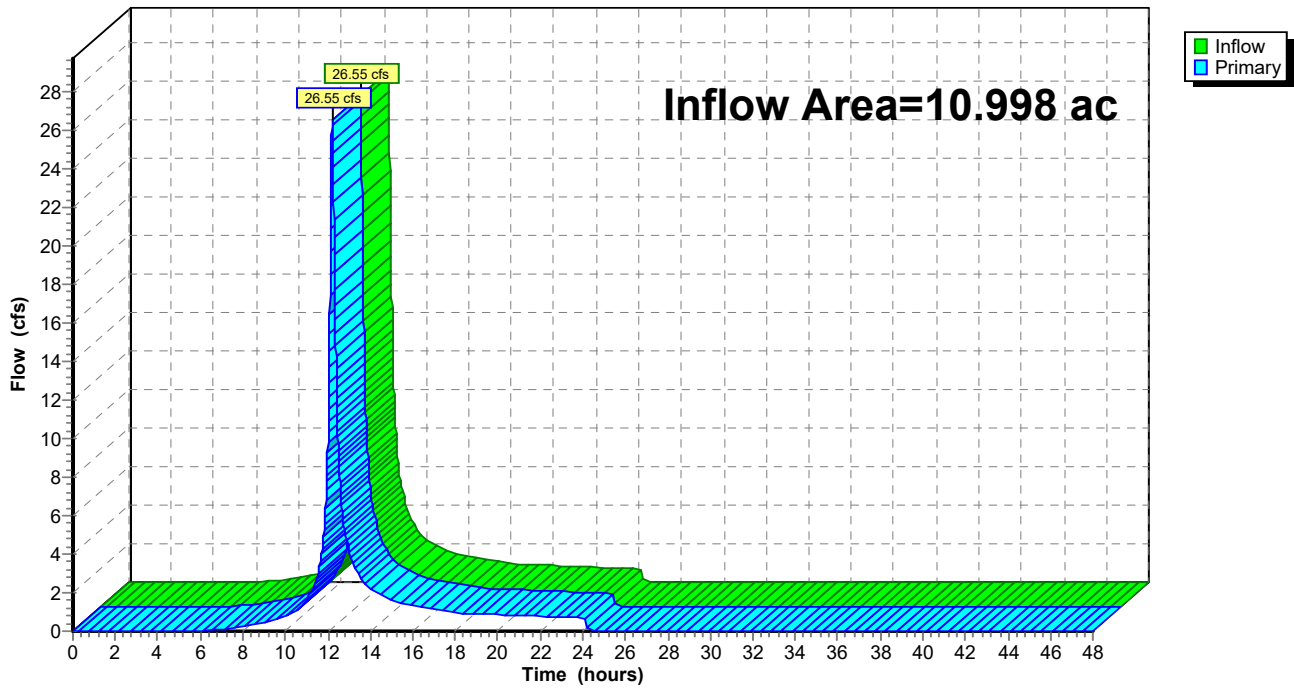
Summary for Link PAP-2: AP-2

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 2.81" for 10-year event
Inflow = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af
Primary = 26.55 cfs @ 12.21 hrs, Volume= 2.579 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 25-year Rainfall=6.00"

Prepared by Solli Engineering

Printed 4/10/2024

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-1A: PDA-1A Runoff Area=10.448 ac 4.72% Impervious Runoff Depth=3.48"
Flow Length=938' Tc=12.0 min CN=77 Runoff=32.22 cfs 3.029 af

SubcatchmentPDA-1B: PDA-1B Runoff Area=2.259 ac 5.66% Impervious Runoff Depth=3.48"
Flow Length=779' Tc=11.5 min CN=77 Runoff=7.05 cfs 0.655 af

SubcatchmentPDA-2: PDA-2 Runoff Area=10.998 ac 22.03% Impervious Runoff Depth=3.78"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=35.46 cfs 3.466 af

Reach W-SW: Western Swale Avg. Flow Depth=0.88' Max Vel=4.80 fps Inflow=32.22 cfs 3.029 af
n=0.030 L=316.0' S=0.0190 '/' Capacity=182.01 cfs Outflow=31.91 cfs 3.029 af

Pond 1B: Stormwater Basin Peak Elev=613.73' Storage=36,447 cf Inflow=31.91 cfs 3.029 af
Primary=11.66 cfs 2.922 af Secondary=0.00 cfs 0.000 af Outflow=11.66 cfs 2.922 af

Pond CULV: Culvert Peak Elev=640.25' Inflow=35.46 cfs 3.466 af
42.0" Round Culvert w/ 12.0" inside fill n=0.013 L=40.0' S=0.1000 '/' Outflow=35.46 cfs 3.466 af

Link PAP-1: AP-1 Inflow=15.95 cfs 3.576 af
Primary=15.95 cfs 3.576 af

Link PAP-2: AP-2 Inflow=35.46 cfs 3.466 af
Primary=35.46 cfs 3.466 af

Total Runoff Area = 23.705 ac Runoff Volume = 7.150 af Average Runoff Depth = 3.62"
87.16% Pervious = 20.662 ac 12.84% Impervious = 3.043 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 32.22 cfs @ 12.20 hrs, Volume= 3.029 af, Depth= 3.48"
 Routed to Reach W-SW : Western Swale

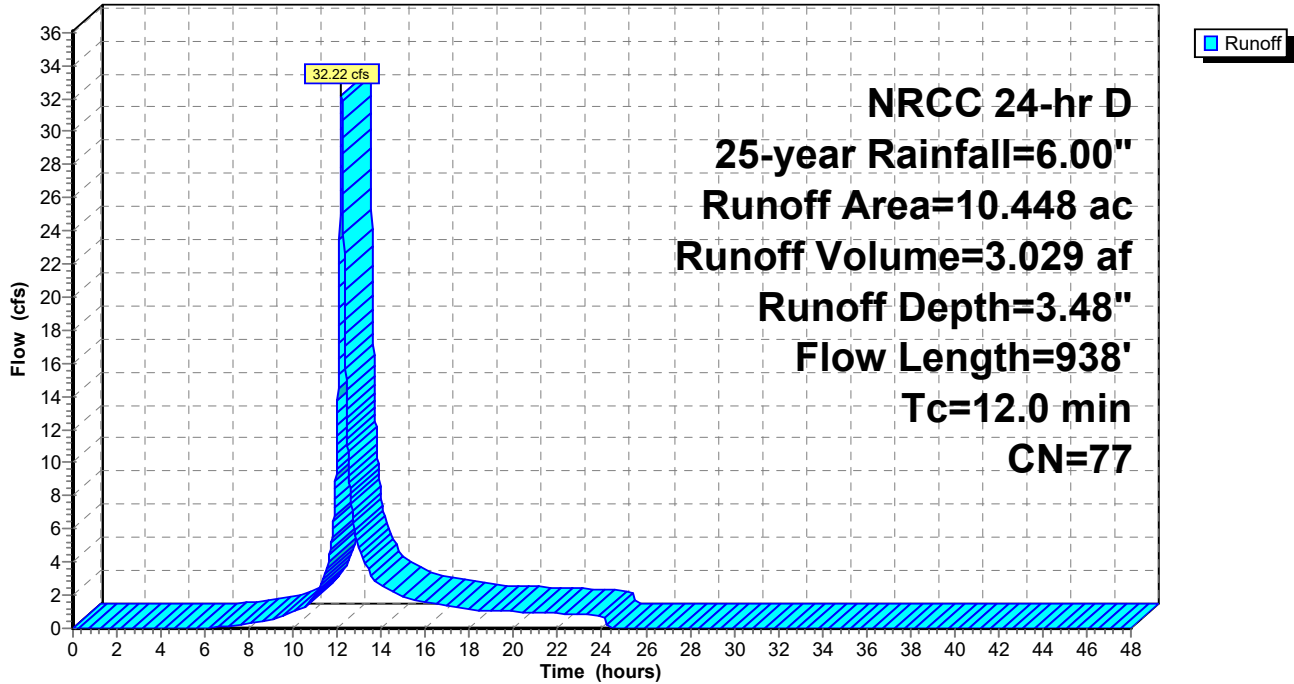
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 25-year Rainfall=6.00"

Area (ac)	CN	Description
2.260	79	1 acre lots, 20% imp, HSG C
1.245	73	Woods, Fair, HSG C
1.303	79	Woods, Fair, HSG D
1.556	71	Meadow, non-grazed, HSG C
3.916	78	Meadow, non-grazed, HSG D
0.127	96	Gravel surface, HSG D
0.041	98	Paved parking, HSG D
10.448	77	Weighted Average
9.955		95.28% Pervious Area
0.493		4.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	131	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
0.7	65	0.1091	1.65		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
3.4	422	0.0899	2.10		Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps
1.8	220	0.0190	2.07		Shallow Concentrated Flow, E-F Grassed Waterway Kv= 15.0 fps
12.0	938	Total			

Subcatchment PDA-1A: PDA-1A

Hydrograph



Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 7.05 cfs @ 12.19 hrs, Volume= 0.655 af, Depth= 3.48"
 Routed to Link PAP-1 : AP-1

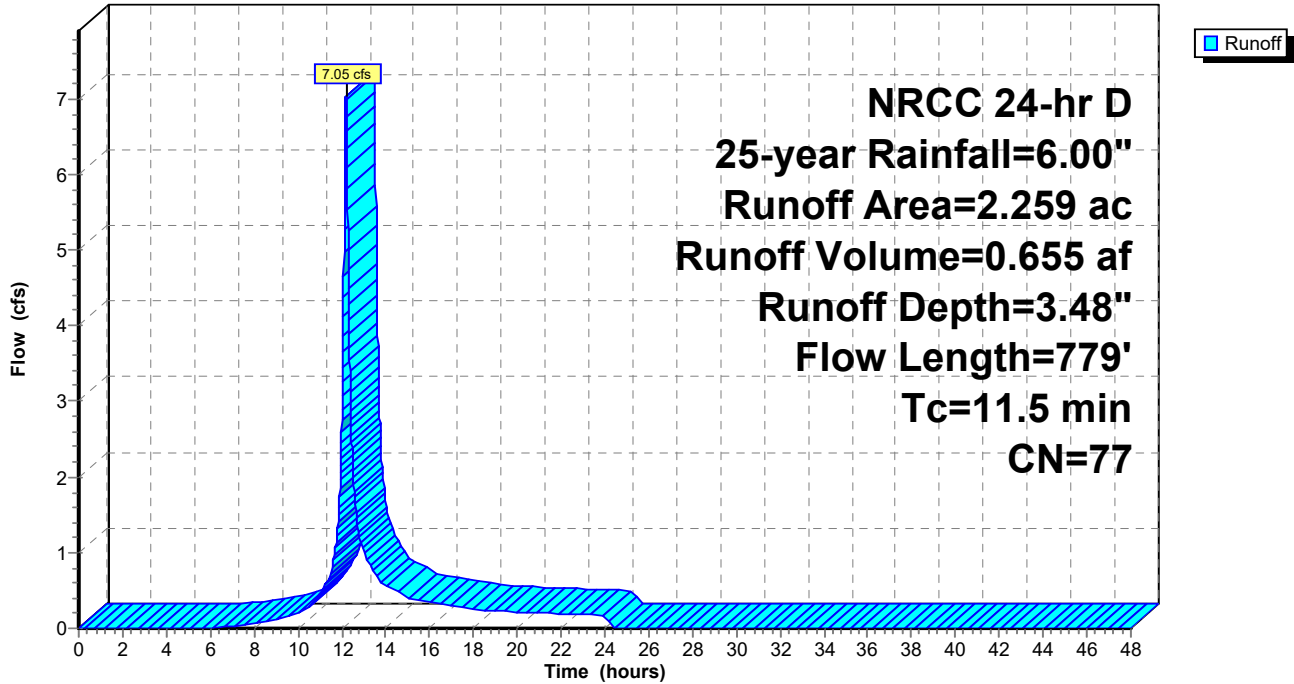
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 25-year Rainfall=6.00"

Area (ac)	CN	Description
0.639	79	1 acre lots, 20% imp, HSG C
0.228	73	Woods, Fair, HSG C
0.078	79	Woods, Fair, HSG D
* 0.565	75	Meadow, non-grazed, HSG C/D
0.749	78	Meadow, non-grazed, HSG D
2.259	77	Weighted Average
2.131		94.34% Pervious Area
0.128		5.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
0.7	102	0.1078	2.30		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
1.0	96	0.0937	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
5.1	481	0.0986	1.57		Shallow Concentrated Flow, D-E
					Woodland Kv= 5.0 fps
11.5	779	Total			

Subcatchment PDA-1B: PDA-1B

Hydrograph



Summary for Subcatchment PDA-2: PDA-2

[47] Hint: Peak is 220% of capacity of segment #4

Runoff = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af, Depth= 3.78"
 Routed to Pond CULV : Culvert

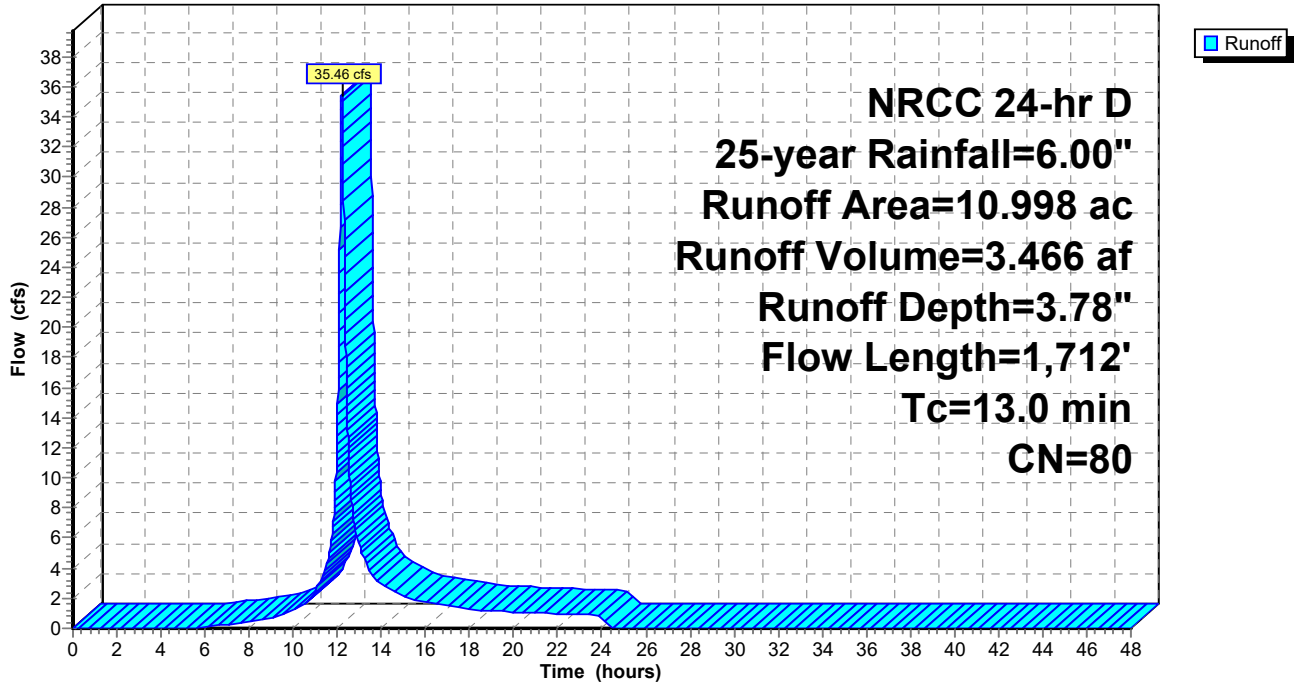
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 25-year Rainfall=6.00"

Area (ac)	CN	Description
5.677	79	1 acre lots, 20% imp, HSG C
2.964	73	Woods, Fair, HSG C
1.070	79	Woods, Fair, HSG D
1.152	98	Paved roads w/curbs & sewers, HSG C
0.135	98	Paved roads w/curbs & sewers, HSG D
10.998	80	Weighted Average
8.576		77.97% Pervious Area
2.422		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment PDA-2: PDA-2

Hydrograph



Summary for Reach W-SW: Western Swale

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 3.48" for 25-year event
 Inflow = 32.22 cfs @ 12.20 hrs, Volume= 3.029 af
 Outflow = 31.91 cfs @ 12.23 hrs, Volume= 3.029 af, Atten= 1%, Lag= 1.9 min
 Routed to Pond 1B : Stormwater Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 4.80 fps, Min. Travel Time= 1.1 min
 Avg. Velocity = 1.69 fps, Avg. Travel Time= 3.1 min

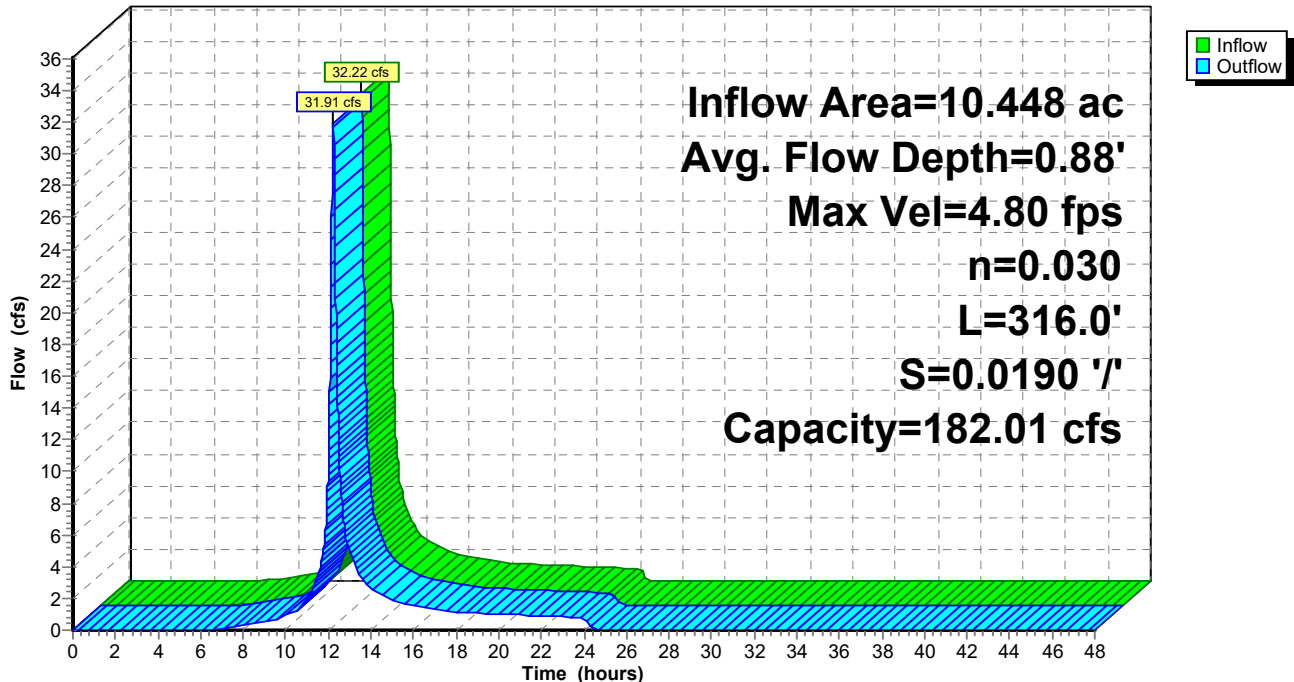
Peak Storage= 2,102 cf @ 12.21 hrs
 Average Depth at Peak Storage= 0.88' , Surface Width= 11.07'
 Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 182.01 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 4.0 ' / ' Top Width= 20.00'
 Length= 316.0' Slope= 0.0190 ' / '
 Inlet Invert= 621.00', Outlet Invert= 615.00'



Reach W-SW: Western Swale

Hydrograph



Summary for Pond 1B: Stormwater Basin

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 3.48" for 25-year event
 Inflow = 31.91 cfs @ 12.23 hrs, Volume= 3.029 af
 Outflow = 11.66 cfs @ 12.49 hrs, Volume= 2.922 af, Atten= 63%, Lag= 15.7 min
 Primary = 11.66 cfs @ 12.49 hrs, Volume= 2.922 af
 Routed to Link PAP-1 : AP-1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link PAP-1 : AP-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 613.73' @ 12.49 hrs Surf.Area= 14,610 sf Storage= 36,447 cf

Plug-Flow detention time= 86.7 min calculated for 2.921 af (96% of inflow)
 Center-of-Mass det. time= 66.6 min (918.8 - 852.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	610.00'	75,163 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
610.00	126	42.7	0	0	126	
611.00	9,551	438.8	3,591	3,591	15,305	
612.00	11,382	522.9	10,453	14,044	21,759	
613.00	13,181	584.7	12,271	26,315	27,234	
614.00	15,158	647.5	14,158	40,473	33,423	
615.00	17,308	711.0	16,221	56,694	40,321	
616.00	19,655	774.8	18,469	75,163	47,901	

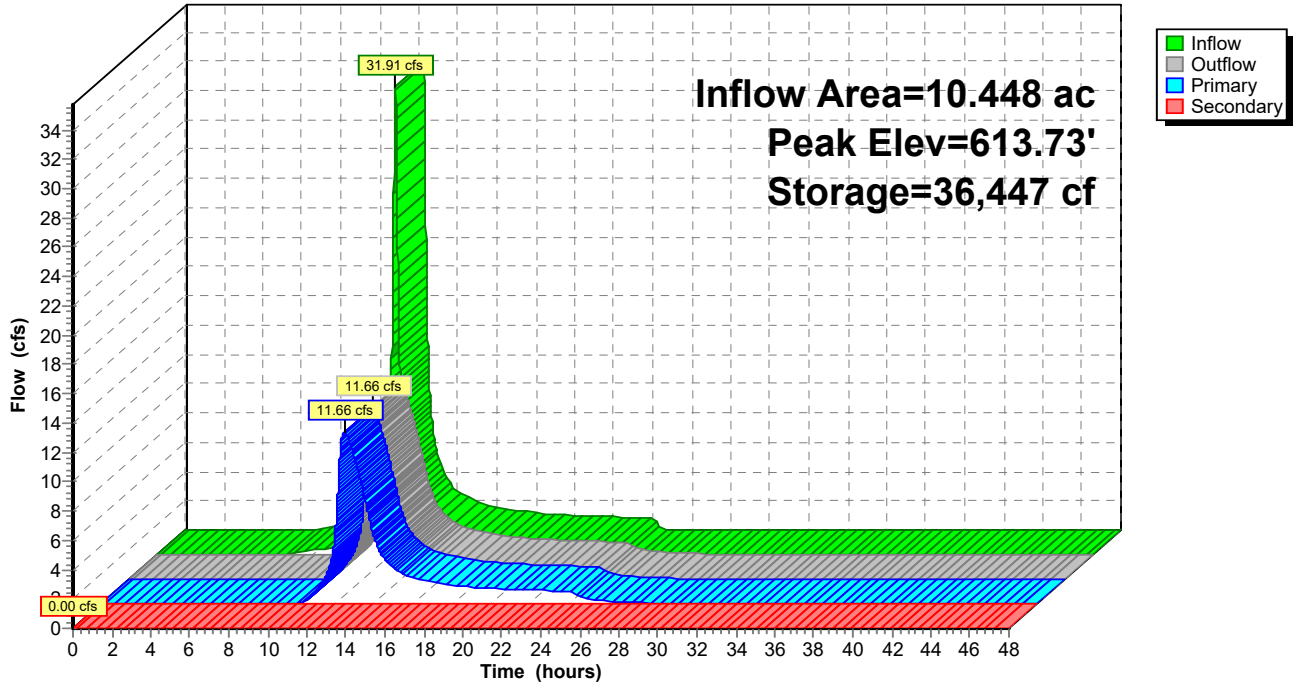
Device	Routing	Invert	Outlet Devices
#1	Primary	608.00'	24.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.00' / 606.00' S= 0.0364 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	611.10'	18.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	614.00'	36.0" x 21.0" Horiz. Oriface/Grate Outlet C= 0.600 Limited to weir flow at low heads
#4	Secondary	615.00'	16.0' long + 3.0 ' SideZ x 14.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=11.67 cfs @ 12.49 hrs HW=613.73' (Free Discharge)
 ↑ **1=Culvert** (Passes 11.67 cfs of 32.90 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 11.67 cfs @ 6.60 fps)
 ↑ **3=Oriface/Grate Outlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=610.00' (Free Discharge)
 ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1B: Stormwater Basin

Hydrograph



Summary for Pond CULV: Culvert

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 3.78" for 25-year event
 Inflow = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af
 Outflow = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af, Atten= 0%, Lag= 0.0 min
 Primary = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af
 Routed to Link PAP-2 : AP-2

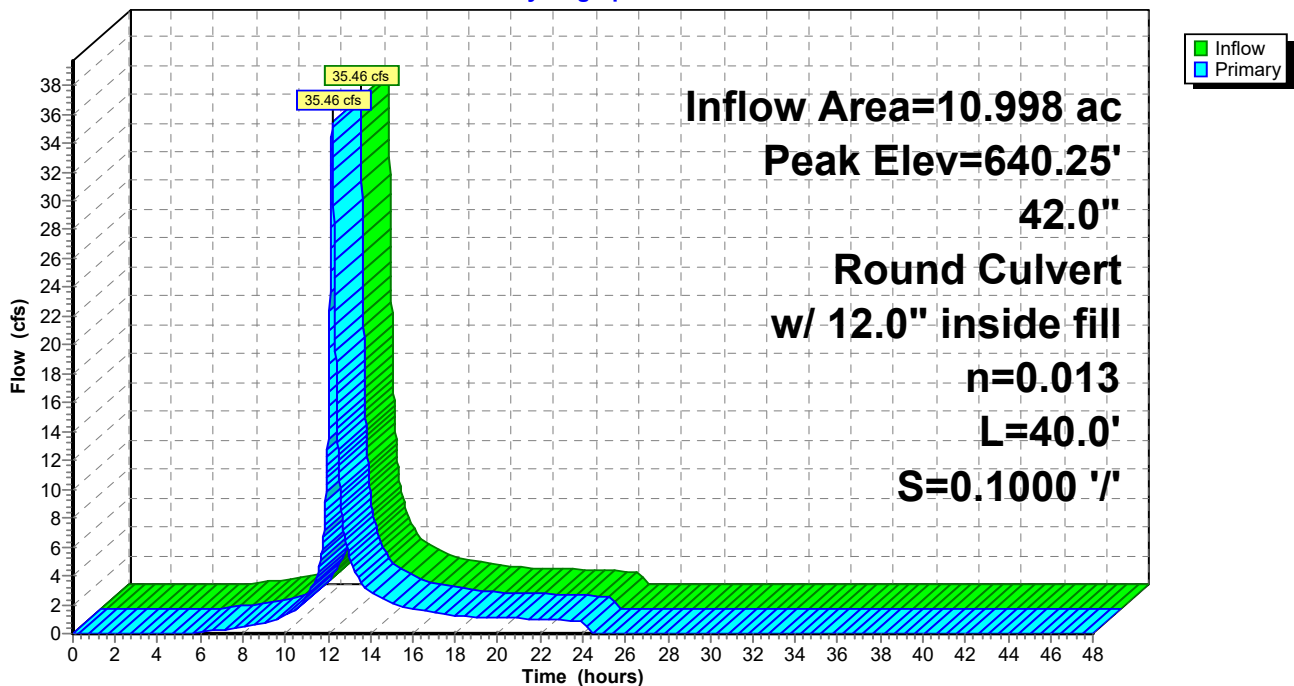
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 640.25' @ 12.21 hrs
 Flood Elev= 643.00'

Device #	Routing	Invert	Outlet Devices
1	Primary	638.00'	42.0" Round Culvert w/ 12.0" inside fill L= 40.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 633.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.35 sf

Primary OutFlow Max=35.43 cfs @ 12.21 hrs HW=640.25' TW=636.50' (Fixed TW Elev= 636.50')
 ↑1=Culvert (Inlet Controls 35.43 cfs @ 5.03 fps)

Pond CULV: Culvert

Hydrograph



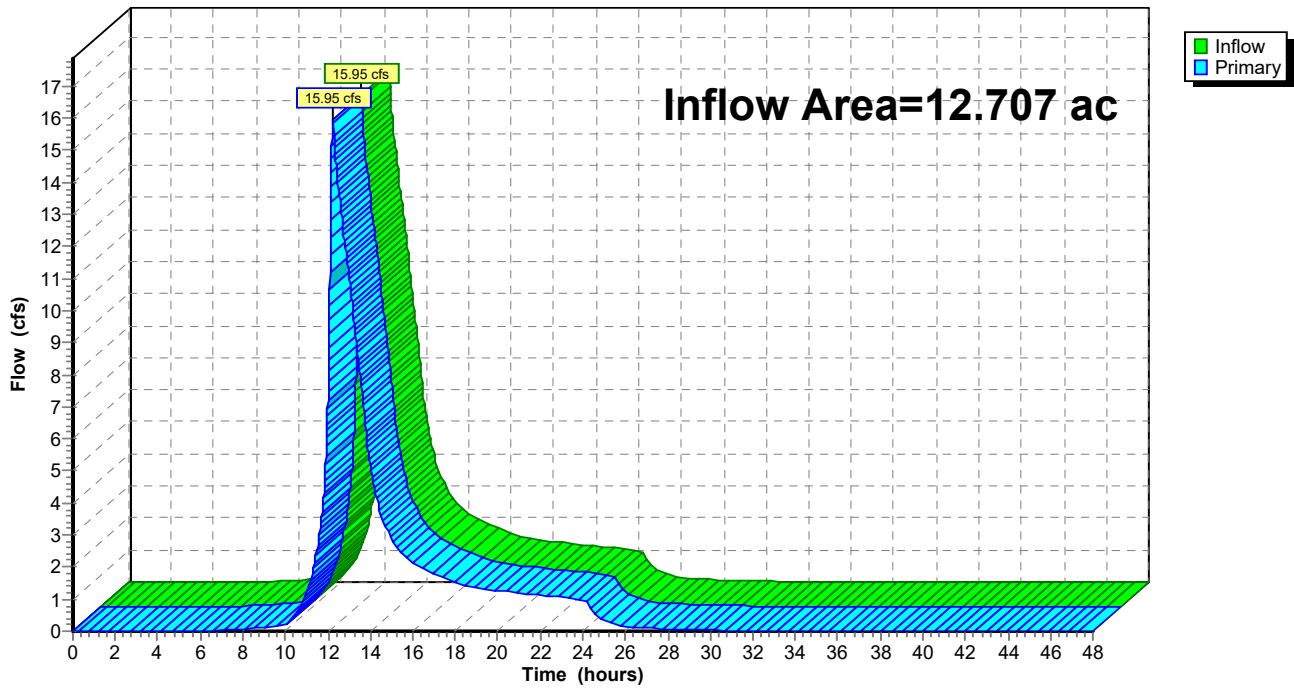
Summary for Link PAP-1: AP-1

Inflow Area = 12.707 ac, 4.89% Impervious, Inflow Depth > 3.38" for 25-year event
Inflow = 15.95 cfs @ 12.23 hrs, Volume= 3.576 af
Primary = 15.95 cfs @ 12.23 hrs, Volume= 3.576 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-1: AP-1

Hydrograph



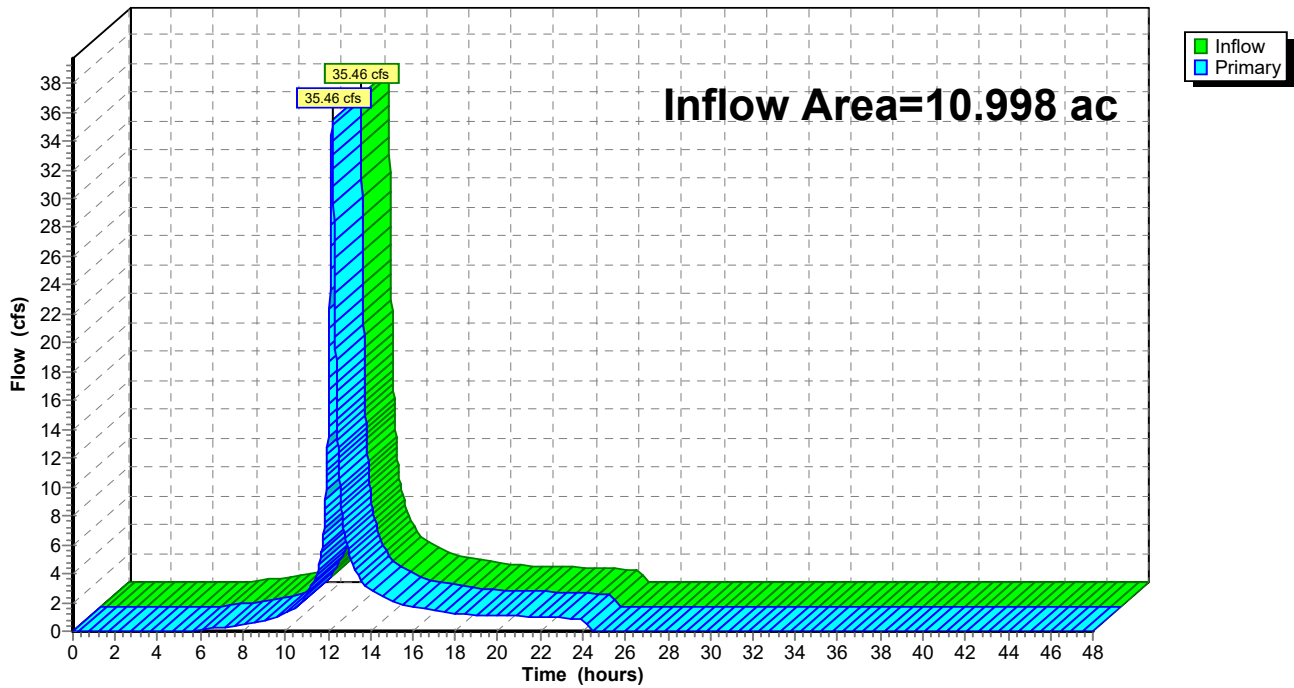
Summary for Link PAP-2: AP-2

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 3.78" for 25-year event
Inflow = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af
Primary = 35.46 cfs @ 12.21 hrs, Volume= 3.466 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 50-year Rainfall=6.81"

Prepared by Solli Engineering

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-1A: PDA-1A

Runoff Area=10.448 ac 4.72% Impervious Runoff Depth=4.20"
Flow Length=938' Tc=12.0 min CN=77 Runoff=38.71 cfs 3.653 af

SubcatchmentPDA-1B: PDA-1B

Runoff Area=2.259 ac 5.66% Impervious Runoff Depth=4.20"
Flow Length=779' Tc=11.5 min CN=77 Runoff=8.47 cfs 0.790 af

SubcatchmentPDA-2: PDA-2

Runoff Area=10.998 ac 22.03% Impervious Runoff Depth=4.52"
Flow Length=1,712' Tc=13.0 min CN=80 Runoff=42.16 cfs 4.142 af

Reach W-SW: Western Swale

Avg. Flow Depth=0.97' Max Vel=5.05 fps Inflow=38.71 cfs 3.653 af
n=0.030 L=316.0' S=0.0190 '/' Capacity=182.01 cfs Outflow=38.36 cfs 3.653 af

Pond 1B: Stormwater Basin

Peak Elev=614.17' Storage=43,037 cf Inflow=38.36 cfs 3.653 af
Primary=15.10 cfs 3.545 af Secondary=0.00 cfs 0.000 af Outflow=15.10 cfs 3.545 af

Pond CULV: Culvert

Peak Elev=640.61' Inflow=42.16 cfs 4.142 af
42.0" Round Culvert w/ 12.0" inside fill n=0.013 L=40.0' S=0.1000 '/' Outflow=42.16 cfs 4.142 af

Link PAP-1: AP-1

Inflow=18.55 cfs 4.335 af
Primary=18.55 cfs 4.335 af

Link PAP-2: AP-2

Inflow=42.16 cfs 4.142 af
Primary=42.16 cfs 4.142 af

Total Runoff Area = 23.705 ac Runoff Volume = 8.585 af Average Runoff Depth = 4.35"
87.16% Pervious = 20.662 ac 12.84% Impervious = 3.043 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 38.71 cfs @ 12.20 hrs, Volume= 3.653 af, Depth= 4.20"
 Routed to Reach W-SW : Western Swale

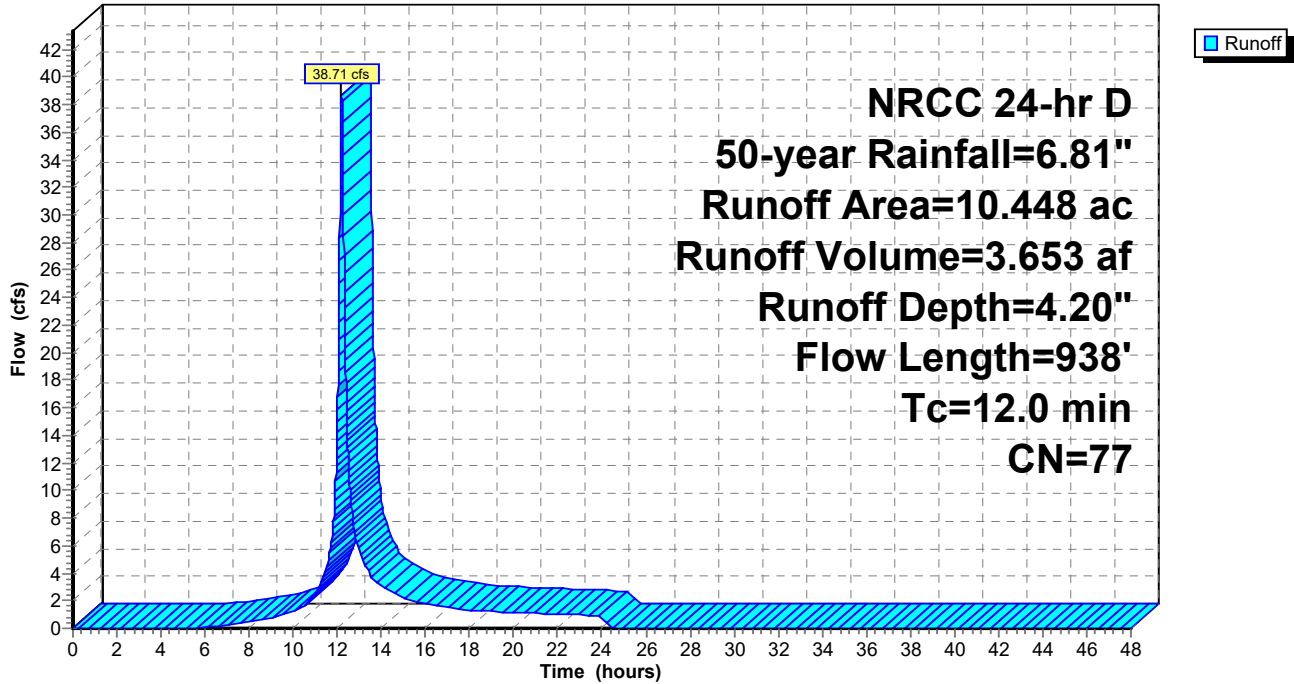
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 50-year Rainfall=6.81"

Area (ac)	CN	Description
2.260	79	1 acre lots, 20% imp, HSG C
1.245	73	Woods, Fair, HSG C
1.303	79	Woods, Fair, HSG D
1.556	71	Meadow, non-grazed, HSG C
3.916	78	Meadow, non-grazed, HSG D
0.127	96	Gravel surface, HSG D
0.041	98	Paved parking, HSG D
10.448	77	Weighted Average
9.955		95.28% Pervious Area
0.493		4.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	131	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
0.7	65	0.1091	1.65		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
3.4	422	0.0899	2.10		Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps
1.8	220	0.0190	2.07		Shallow Concentrated Flow, E-F Grassed Waterway Kv= 15.0 fps
12.0	938	Total			

Subcatchment PDA-1A: PDA-1A

Hydrograph



Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 8.47 cfs @ 12.19 hrs, Volume= 0.790 af, Depth= 4.20"
 Routed to Link PAP-1 : AP-1

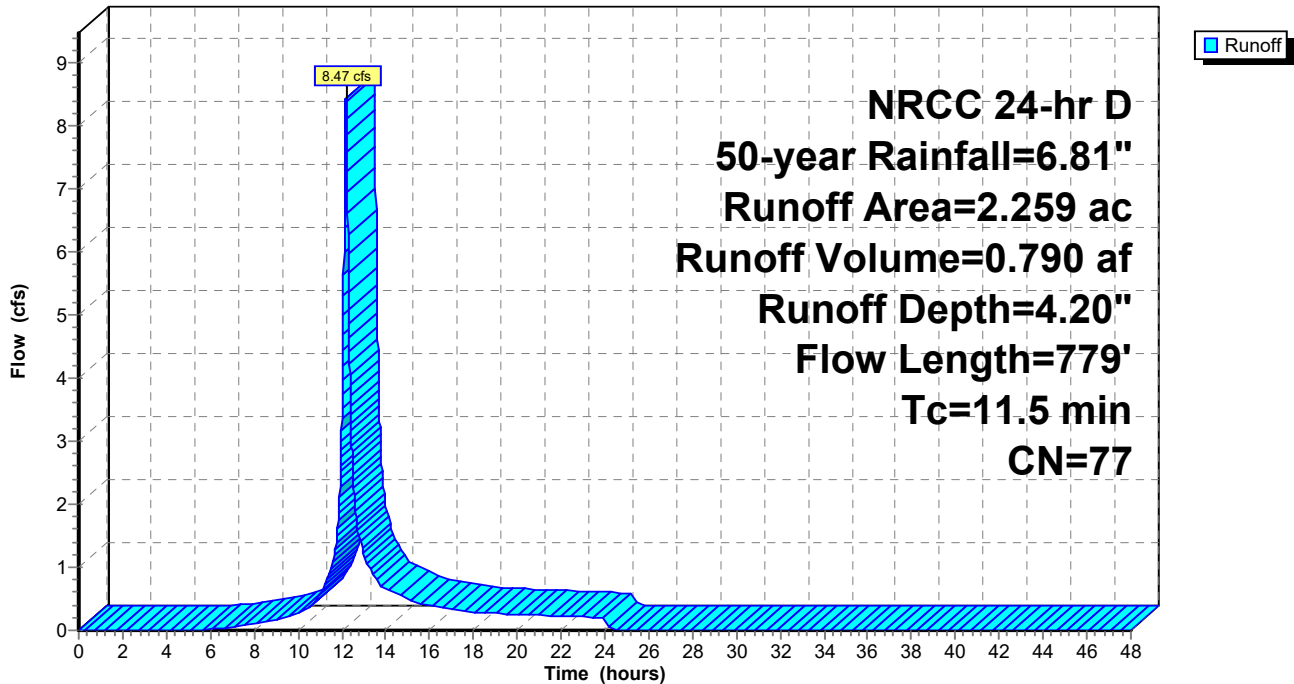
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 50-year Rainfall=6.81"

Area (ac)	CN	Description
0.639	79	1 acre lots, 20% imp, HSG C
0.228	73	Woods, Fair, HSG C
0.078	79	Woods, Fair, HSG D
* 0.565	75	Meadow, non-grazed, HSG C/D
0.749	78	Meadow, non-grazed, HSG D
2.259	77	Weighted Average
2.131		94.34% Pervious Area
0.128		5.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
0.7	102	0.1078	2.30		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
1.0	96	0.0937	1.53		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
5.1	481	0.0986	1.57		Shallow Concentrated Flow, D-E Woodland Kv= 5.0 fps
11.5	779	Total			

Subcatchment PDA-1B: PDA-1B

Hydrograph



Summary for Subcatchment PDA-2: PDA-2

[47] Hint: Peak is 262% of capacity of segment #4

Runoff = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af, Depth= 4.52"
 Routed to Pond CULV : Culvert

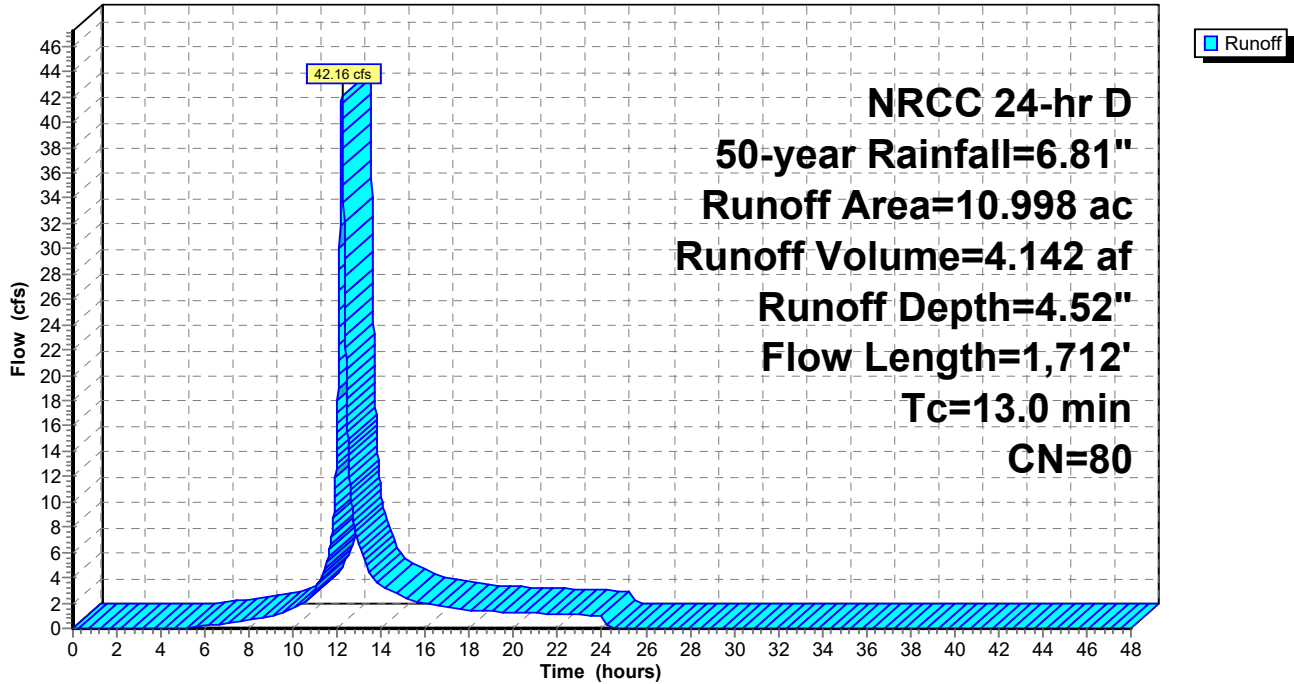
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 50-year Rainfall=6.81"

Area (ac)	CN	Description
5.677	79	1 acre lots, 20% imp, HSG C
2.964	73	Woods, Fair, HSG C
1.070	79	Woods, Fair, HSG D
1.152	98	Paved roads w/curbs & sewers, HSG C
0.135	98	Paved roads w/curbs & sewers, HSG D
10.998	80	Weighted Average
8.576		77.97% Pervious Area
2.422		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment PDA-2: PDA-2

Hydrograph



Summary for Reach W-SW: Western Swale

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 4.20" for 50-year event
 Inflow = 38.71 cfs @ 12.20 hrs, Volume= 3.653 af
 Outflow = 38.36 cfs @ 12.23 hrs, Volume= 3.653 af, Atten= 1%, Lag= 1.8 min
 Routed to Pond 1B : Stormwater Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 5.05 fps, Min. Travel Time= 1.0 min
 Avg. Velocity = 1.77 fps, Avg. Travel Time= 3.0 min

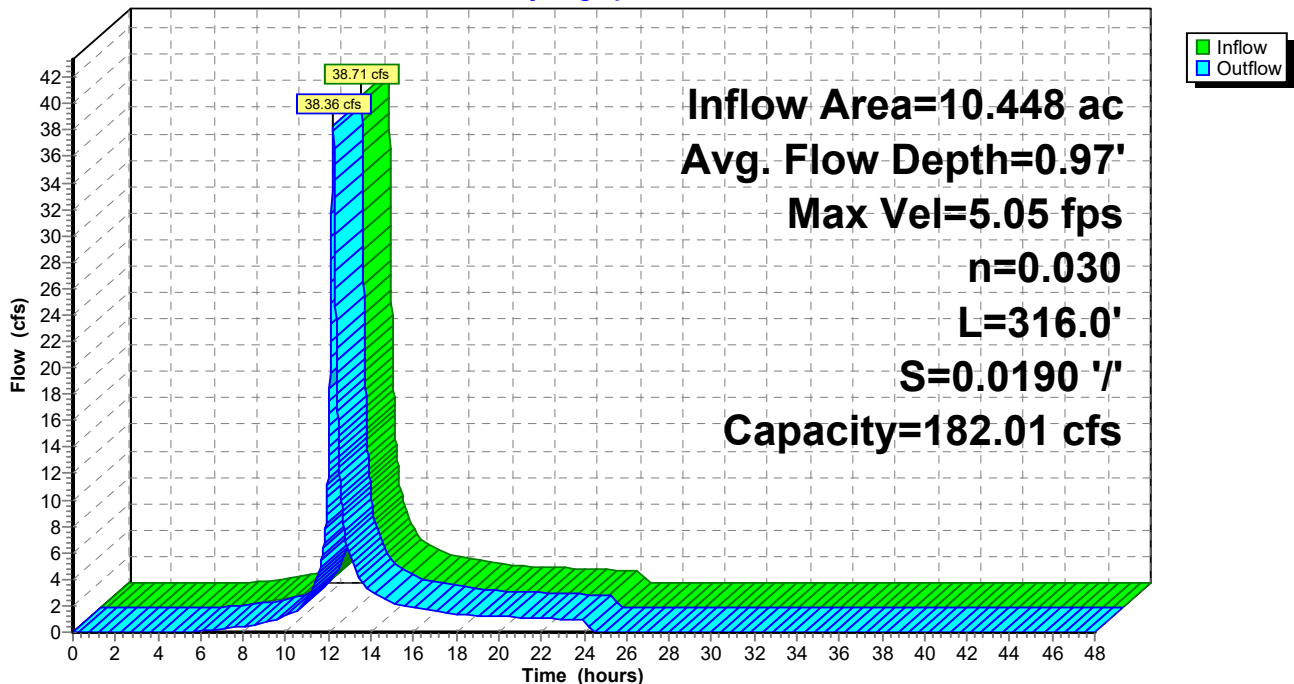
Peak Storage= 2,405 cf @ 12.21 hrs
 Average Depth at Peak Storage= 0.97' , Surface Width= 11.74'
 Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 182.01 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 4.0 ' / ' Top Width= 20.00'
 Length= 316.0' Slope= 0.0190 ' / '
 Inlet Invert= 621.00', Outlet Invert= 615.00'



Reach W-SW: Western Swale

Hydrograph



Summary for Pond 1B: Stormwater Basin

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 4.20" for 50-year event
 Inflow = 38.36 cfs @ 12.23 hrs, Volume= 3.653 af
 Outflow = 15.10 cfs @ 12.47 hrs, Volume= 3.545 af, Atten= 61%, Lag= 14.3 min
 Primary = 15.10 cfs @ 12.47 hrs, Volume= 3.545 af
 Routed to Link PAP-1 : AP-1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link PAP-1 : AP-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 614.17' @ 12.47 hrs Surf.Area= 15,508 sf Storage= 43,037 cf

Plug-Flow detention time= 80.9 min calculated for 3.545 af (97% of inflow)
 Center-of-Mass det. time= 63.6 min (908.7 - 845.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	610.00'	75,163 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
610.00	126	42.7	0	0	126	
611.00	9,551	438.8	3,591	3,591	15,305	
612.00	11,382	522.9	10,453	14,044	21,759	
613.00	13,181	584.7	12,271	26,315	27,234	
614.00	15,158	647.5	14,158	40,473	33,423	
615.00	17,308	711.0	16,221	56,694	40,321	
616.00	19,655	774.8	18,469	75,163	47,901	

Device	Routing	Invert	Outlet Devices
#1	Primary	608.00'	24.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.00' / 606.00' S= 0.0364 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	611.10'	18.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	614.00'	36.0" x 21.0" Horiz. Oriface/Grate Outlet C= 0.600 Limited to weir flow at low heads
#4	Secondary	615.00'	16.0' long + 3.0 ' SideZ x 14.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=15.07 cfs @ 12.47 hrs HW=614.17' (Free Discharge)

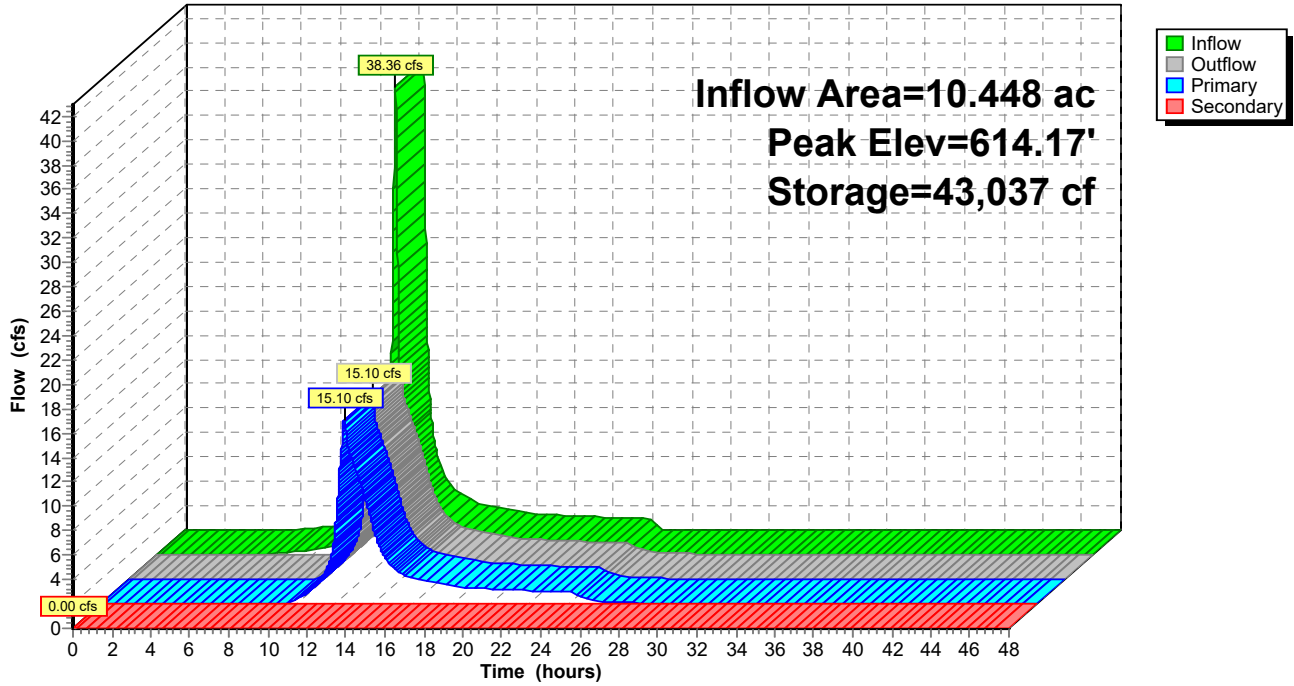
- ↑ 1=Culvert (Passes 15.07 cfs of 34.38 cfs potential flow)
- ↑ 2=Orifice/Grate (Orifice Controls 12.95 cfs @ 7.33 fps)
- ↑ 3=Oriface/Grate Outlet (Weir Controls 2.12 cfs @ 1.34 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=610.00' (Free Discharge)

- ↑ 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1B: Stormwater Basin

Hydrograph



Summary for Pond CULV: Culvert

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 4.52" for 50-year event
 Inflow = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af
 Outflow = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af, Atten= 0%, Lag= 0.0 min
 Primary = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af
 Routed to Link PAP-2 : AP-2

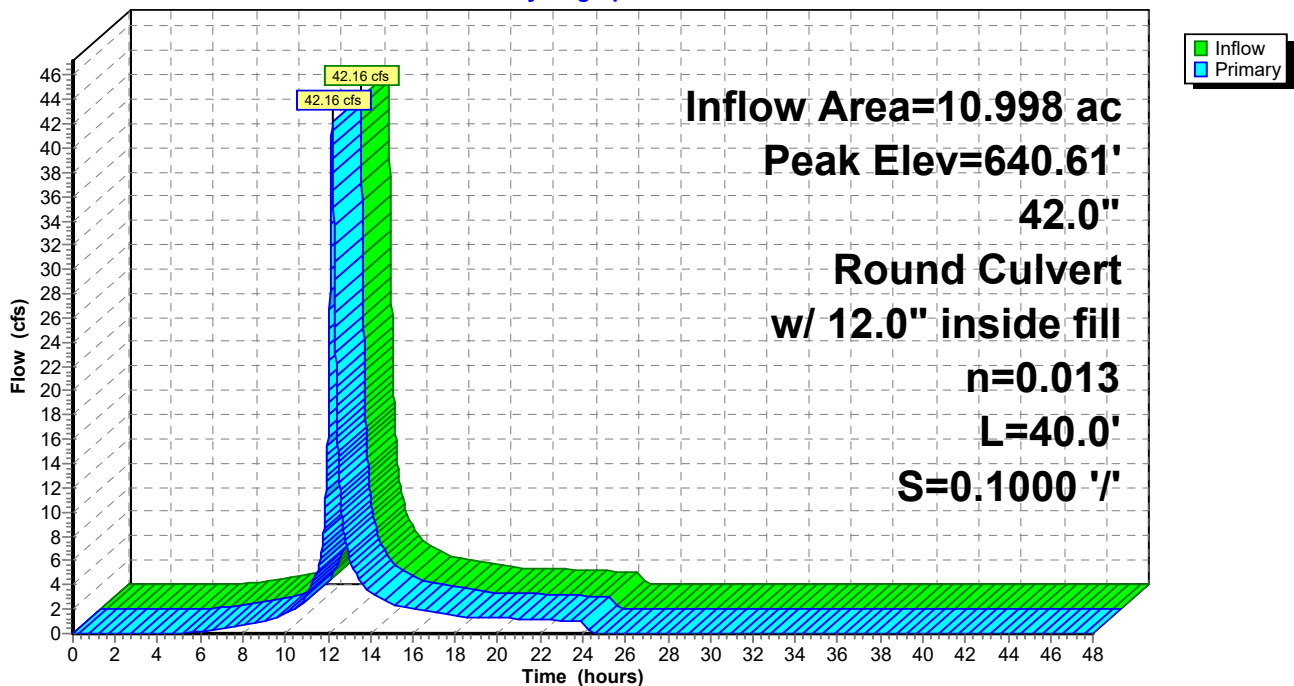
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 640.61' @ 12.21 hrs
 Flood Elev= 643.00'

Device #	Routing	Invert	Outlet Devices
1	Primary	638.00'	42.0" Round Culvert w/ 12.0" inside fill L= 40.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 633.00' S= 0.1000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.35 sf

Primary OutFlow Max=42.11 cfs @ 12.21 hrs HW=640.61' TW=636.50' (Fixed TW Elev= 636.50')
 ↑1=Culvert (Inlet Controls 42.11 cfs @ 5.73 fps)

Pond CULV: Culvert

Hydrograph



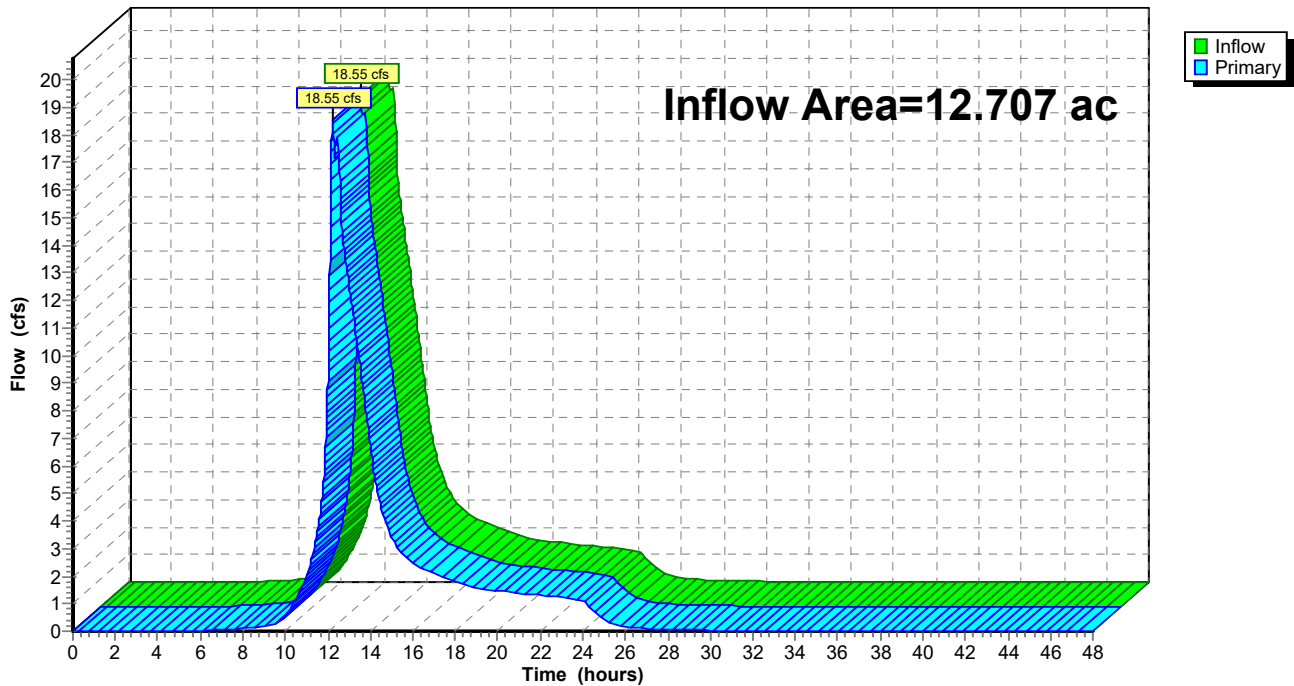
Summary for Link PAP-1: AP-1

Inflow Area = 12.707 ac, 4.89% Impervious, Inflow Depth > 4.09" for 50-year event
Inflow = 18.55 cfs @ 12.23 hrs, Volume= 4.335 af
Primary = 18.55 cfs @ 12.23 hrs, Volume= 4.335 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-1: AP-1

Hydrograph



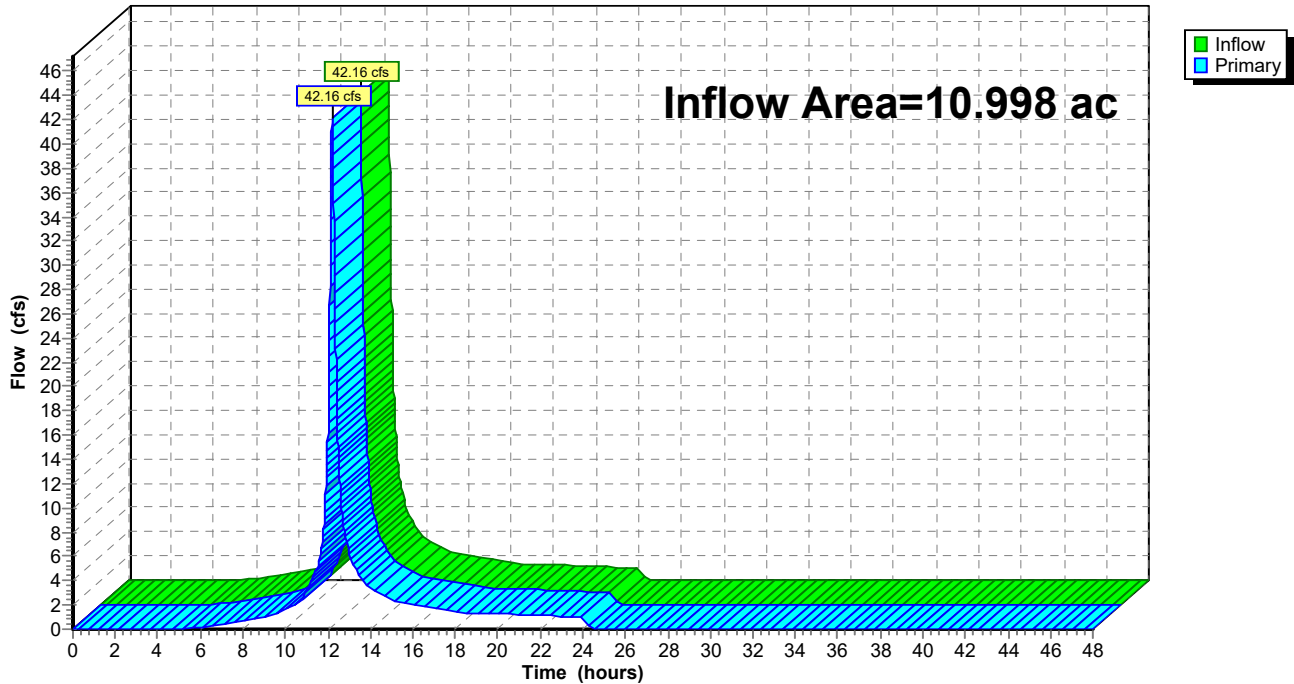
Summary for Link PAP-2: AP-2

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 4.52" for 50-year event
Inflow = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af
Primary = 42.16 cfs @ 12.21 hrs, Volume= 4.142 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-2: AP-2

Hydrograph



250 Carter St - Manchester, CT

NRCC 24-hr D 100-year Rainfall=7.69"

Prepared by Solli Engineering

Printed 4/10/2024

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPDA-1A: PDA-1A

Runoff Area=10.448 ac 4.72% Impervious Runoff Depth=4.99"
 Flow Length=938' Tc=12.0 min CN=77 Runoff=45.82 cfs 4.345 af

SubcatchmentPDA-1B: PDA-1B

Runoff Area=2.259 ac 5.66% Impervious Runoff Depth=4.99"
 Flow Length=779' Tc=11.5 min CN=77 Runoff=10.03 cfs 0.940 af

SubcatchmentPDA-2: PDA-2

Runoff Area=10.998 ac 22.03% Impervious Runoff Depth=5.33"
 Flow Length=1,712' Tc=13.0 min CN=80 Runoff=49.46 cfs 4.890 af

Reach W-SW: Western Swale

Avg. Flow Depth=1.05' Max Vel=5.28 fps Inflow=45.82 cfs 4.345 af
 n=0.030 L=316.0' S=0.0190 '/' Capacity=182.01 cfs Outflow=45.43 cfs 4.345 af

Pond 1B: Stormwater Basin

Peak Elev=614.45' Storage=47,474 cf Inflow=45.43 cfs 4.345 af
 Primary=23.04 cfs 4.238 af Secondary=0.00 cfs 0.000 af Outflow=23.04 cfs 4.238 af

Pond CULV: Culvert

Peak Elev=641.12' Inflow=49.46 cfs 4.890 af
 42.0" Round Culvert w/ 12.0" inside fill n=0.013 L=40.0' S=0.1000 '/' Outflow=49.46 cfs 4.890 af

Link PAP-1: AP-1

Inflow=27.44 cfs 5.177 af
 Primary=27.44 cfs 5.177 af

Link PAP-2: AP-2

Inflow=49.46 cfs 4.890 af
 Primary=49.46 cfs 4.890 af

Total Runoff Area = 23.705 ac Runoff Volume = 10.174 af Average Runoff Depth = 5.15"
87.16% Pervious = 20.662 ac 12.84% Impervious = 3.043 ac

Summary for Subcatchment PDA-1A: PDA-1A

Runoff = 45.82 cfs @ 12.20 hrs, Volume= 4.345 af, Depth= 4.99"
 Routed to Reach W-SW : Western Swale

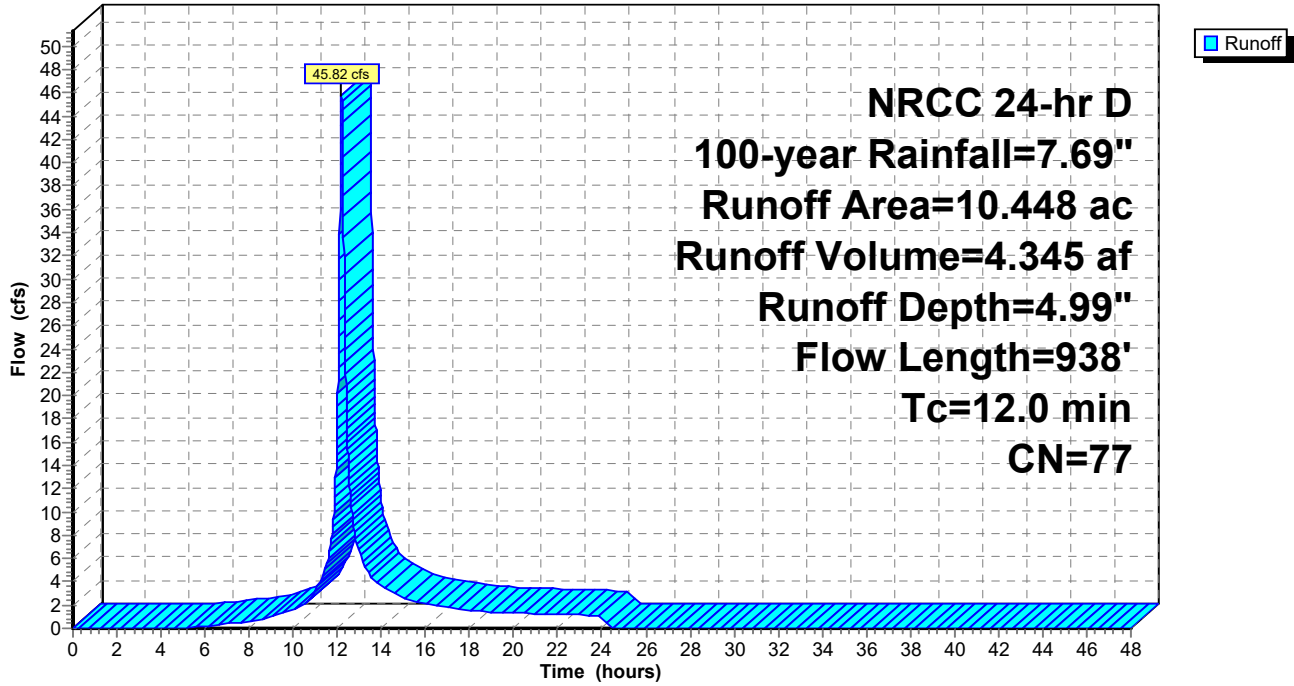
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 100-year Rainfall=7.69"

Area (ac)	CN	Description
2.260	79	1 acre lots, 20% imp, HSG C
1.245	73	Woods, Fair, HSG C
1.303	79	Woods, Fair, HSG D
1.556	71	Meadow, non-grazed, HSG C
3.916	78	Meadow, non-grazed, HSG D
0.127	96	Gravel surface, HSG D
0.041	98	Paved parking, HSG D
10.448	77	Weighted Average
9.955		95.28% Pervious Area
0.493		4.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.1100	0.33		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
1.1	131	0.0780	1.95		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
0.7	65	0.1091	1.65		Shallow Concentrated Flow, C-D Woodland Kv= 5.0 fps
3.4	422	0.0899	2.10		Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps
1.8	220	0.0190	2.07		Shallow Concentrated Flow, E-F Grassed Waterway Kv= 15.0 fps
12.0	938	Total			

Subcatchment PDA-1A: PDA-1A

Hydrograph



Summary for Subcatchment PDA-1B: PDA-1B

Runoff = 10.03 cfs @ 12.19 hrs, Volume= 0.940 af, Depth= 4.99"
 Routed to Link PAP-1 : AP-1

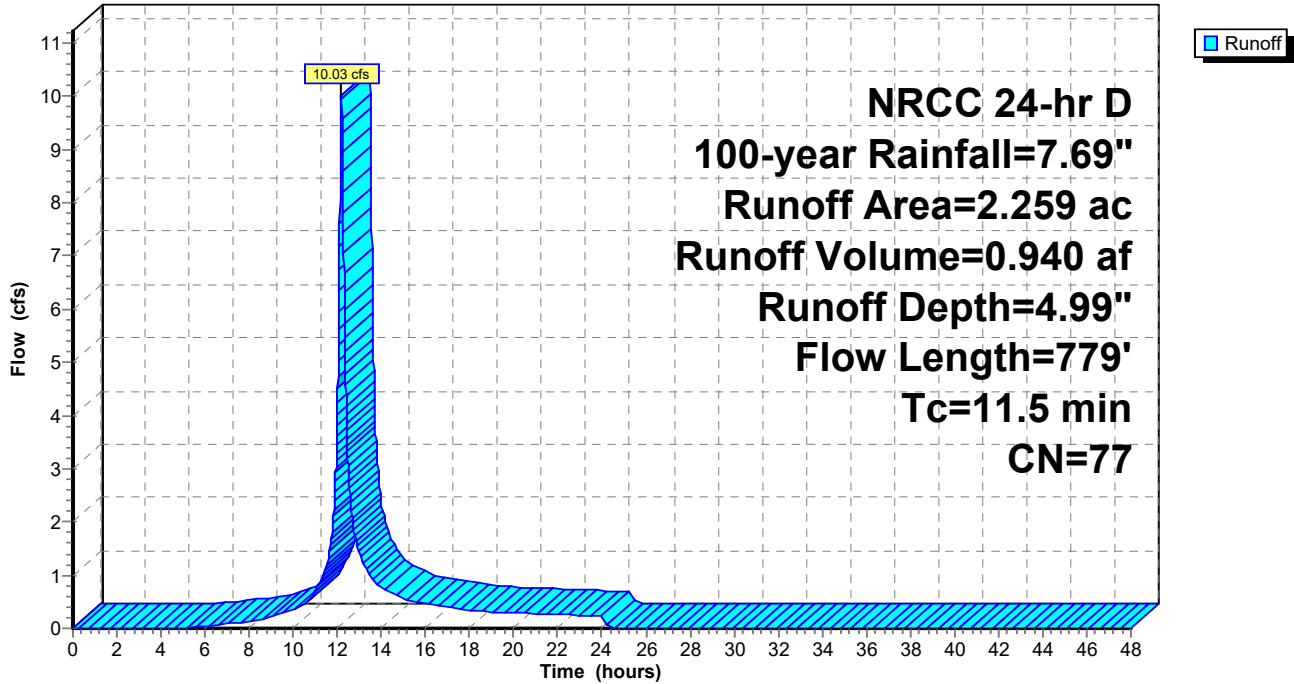
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 100-year Rainfall=7.69"

Area (ac)	CN	Description
0.639	79	1 acre lots, 20% imp, HSG C
0.228	73	Woods, Fair, HSG C
0.078	79	Woods, Fair, HSG D
* 0.565	75	Meadow, non-grazed, HSG C/D
0.749	78	Meadow, non-grazed, HSG D
2.259	77	Weighted Average
2.131		94.34% Pervious Area
0.128		5.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1300	0.36		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.16"
0.7	102	0.1078	2.30		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
1.0	96	0.0937	1.53		Shallow Concentrated Flow, C-D
					Woodland Kv= 5.0 fps
5.1	481	0.0986	1.57		Shallow Concentrated Flow, D-E
					Woodland Kv= 5.0 fps
11.5	779	Total			

Subcatchment PDA-1B: PDA-1B

Hydrograph



Summary for Subcatchment PDA-2: PDA-2

[47] Hint: Peak is 307% of capacity of segment #4

Runoff = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af, Depth= 5.33"
 Routed to Pond CULV : Culvert

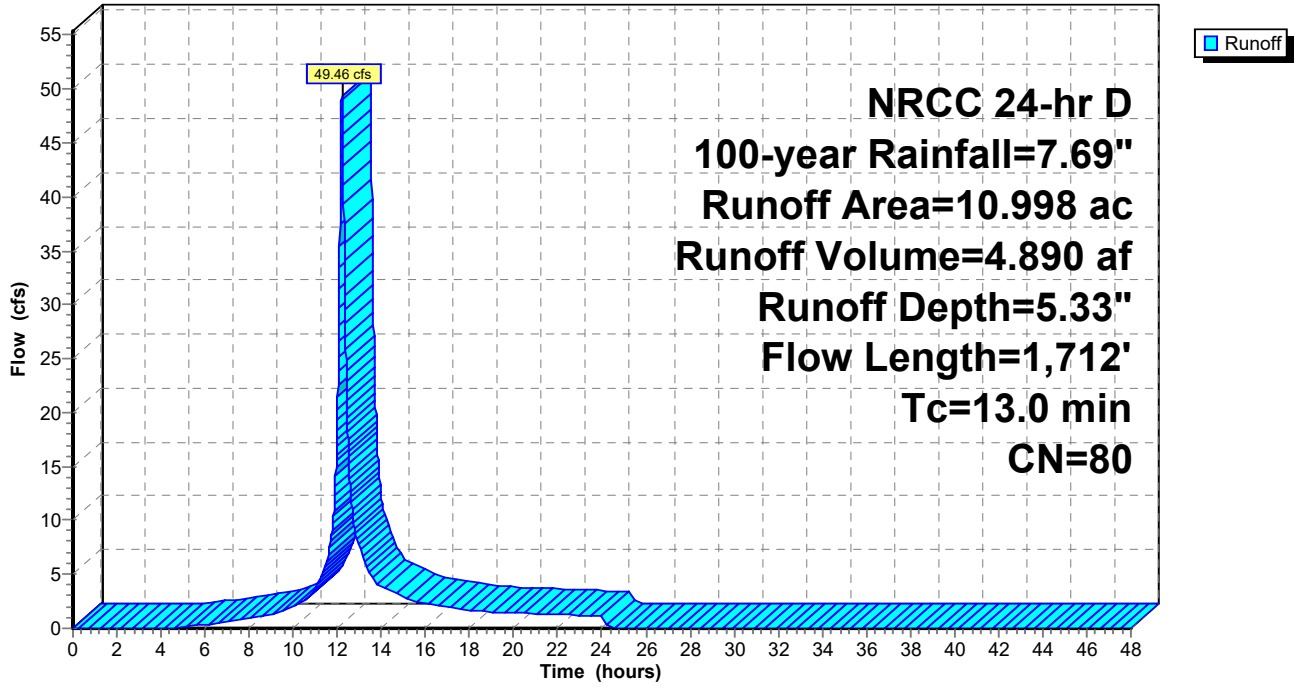
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 NRCC 24-hr D 100-year Rainfall=7.69"

Area (ac)	CN	Description
5.677	79	1 acre lots, 20% imp, HSG C
2.964	73	Woods, Fair, HSG C
1.070	79	Woods, Fair, HSG D
1.152	98	Paved roads w/curbs & sewers, HSG C
0.135	98	Paved roads w/curbs & sewers, HSG D
10.998	80	Weighted Average
8.576		77.97% Pervious Area
2.422		22.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.1000	0.32		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.16"
5.9	585	0.1094	1.65		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.9	167	0.0240	3.14		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.8	608	0.0444	13.11	16.09	Pipe Channel, D-E 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.2	252	0.1071	26.20	487.30	Channel Flow, E-F Area= 18.6 sf Perim= 11.9' r= 1.56' n= 0.025 Earth, clean & winding
13.0	1,712	Total			

Subcatchment PDA-2: PDA-2

Hydrograph



Summary for Reach W-SW: Western Swale

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 4.99" for 100-year event
 Inflow = 45.82 cfs @ 12.20 hrs, Volume= 4.345 af
 Outflow = 45.43 cfs @ 12.22 hrs, Volume= 4.345 af, Atten= 1%, Lag= 1.7 min
 Routed to Pond 1B : Stormwater Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 5.28 fps, Min. Travel Time= 1.0 min
 Avg. Velocity = 1.86 fps, Avg. Travel Time= 2.8 min

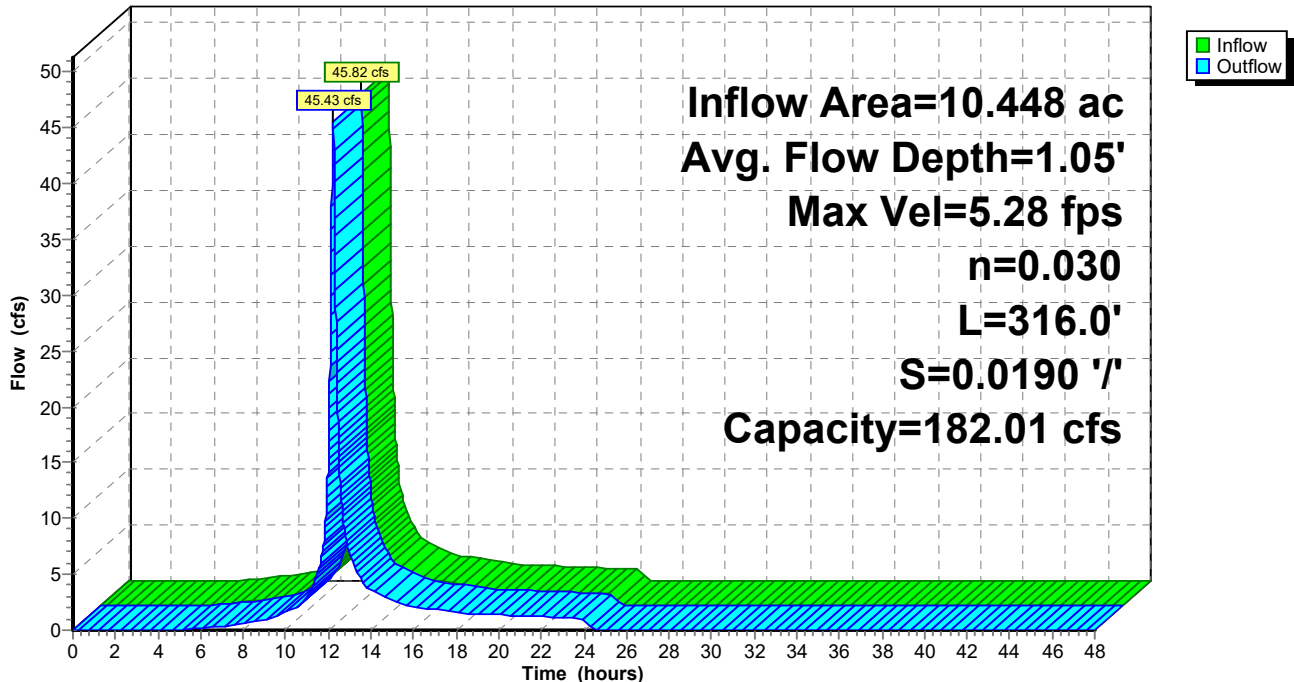
Peak Storage= 2,722 cf @ 12.21 hrs
 Average Depth at Peak Storage= 1.05' , Surface Width= 12.40'
 Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 182.01 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 4.0 ' / ' Top Width= 20.00'
 Length= 316.0' Slope= 0.0190 ' / '
 Inlet Invert= 621.00', Outlet Invert= 615.00'



Reach W-SW: Western Swale

Hydrograph



Summary for Pond 1B: Stormwater Basin

Inflow Area = 10.448 ac, 4.72% Impervious, Inflow Depth = 4.99" for 100-year event
 Inflow = 45.43 cfs @ 12.22 hrs, Volume= 4.345 af
 Outflow = 23.04 cfs @ 12.40 hrs, Volume= 4.238 af, Atten= 49%, Lag= 10.6 min
 Primary = 23.04 cfs @ 12.40 hrs, Volume= 4.238 af
 Routed to Link PAP-1 : AP-1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link PAP-1 : AP-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 614.45' @ 12.40 hrs Surf.Area= 16,103 sf Storage= 47,474 cf

Plug-Flow detention time= 74.0 min calculated for 4.237 af (98% of inflow)
 Center-of-Mass det. time= 59.5 min (898.0 - 838.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	610.00'	75,163 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
610.00	126	42.7	0	0	126	
611.00	9,551	438.8	3,591	3,591	15,305	
612.00	11,382	522.9	10,453	14,044	21,759	
613.00	13,181	584.7	12,271	26,315	27,234	
614.00	15,158	647.5	14,158	40,473	33,423	
615.00	17,308	711.0	16,221	56,694	40,321	
616.00	19,655	774.8	18,469	75,163	47,901	

Device	Routing	Invert	Outlet Devices	
#1	Primary	608.00'	24.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.00' / 606.00' S= 0.0364 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf	
#2	Device 1	611.10'	18.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Device 1	614.00'	36.0" x 21.0" Horiz. Oriface/Grate Outlet C= 0.600 Limited to weir flow at low heads	
#4	Secondary	615.00'	16.0' long + 3.0 ' SideZ x 14.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63	

Primary OutFlow Max=23.03 cfs @ 12.40 hrs HW=614.45' (Free Discharge)

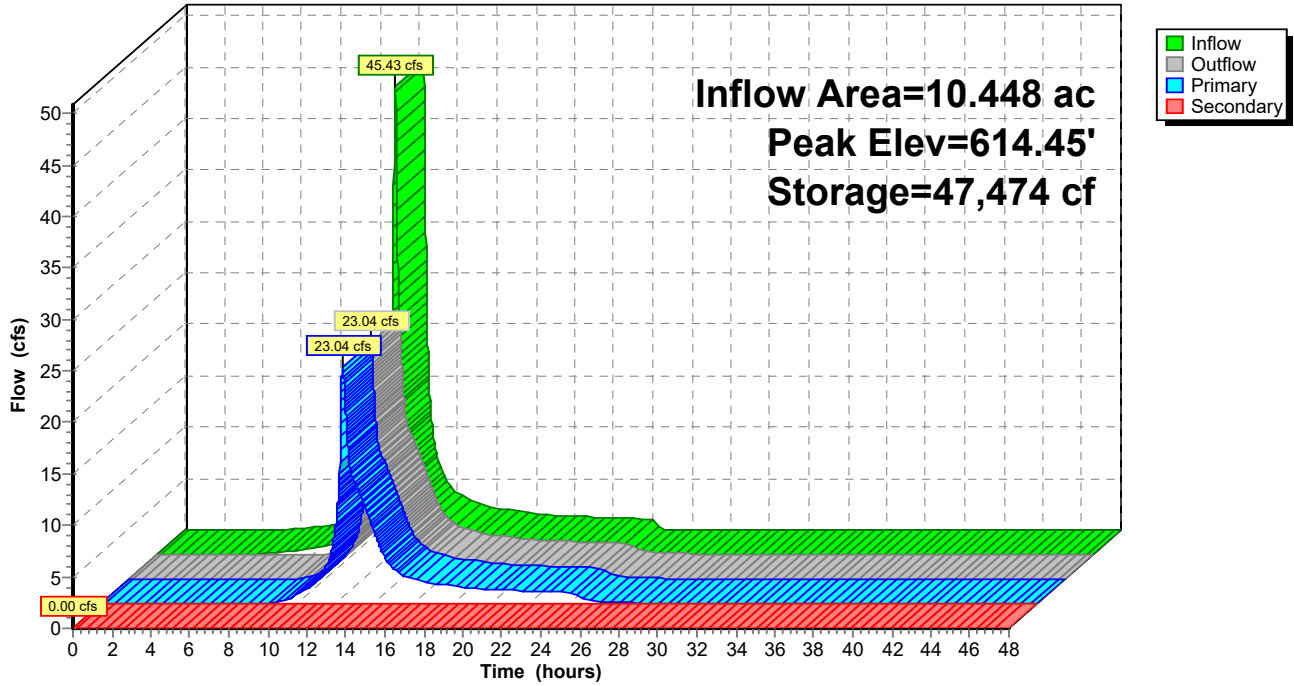
- ↑ 1=Culvert (Passes 23.03 cfs of 35.31 cfs potential flow)
- ↑ 2=Orifice/Grate (Orifice Controls 13.71 cfs @ 7.76 fps)
- ↑ 3=Oriface/Grate Outlet (Weir Controls 9.31 cfs @ 2.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=610.00' (Free Discharge)

- ↑ 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1B: Stormwater Basin

Hydrograph



Summary for Pond CULV: Culvert

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 5.33" for 100-year event
 Inflow = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af
 Outflow = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af, Atten= 0%, Lag= 0.0 min
 Primary = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af
 Routed to Link PAP-2 : AP-2

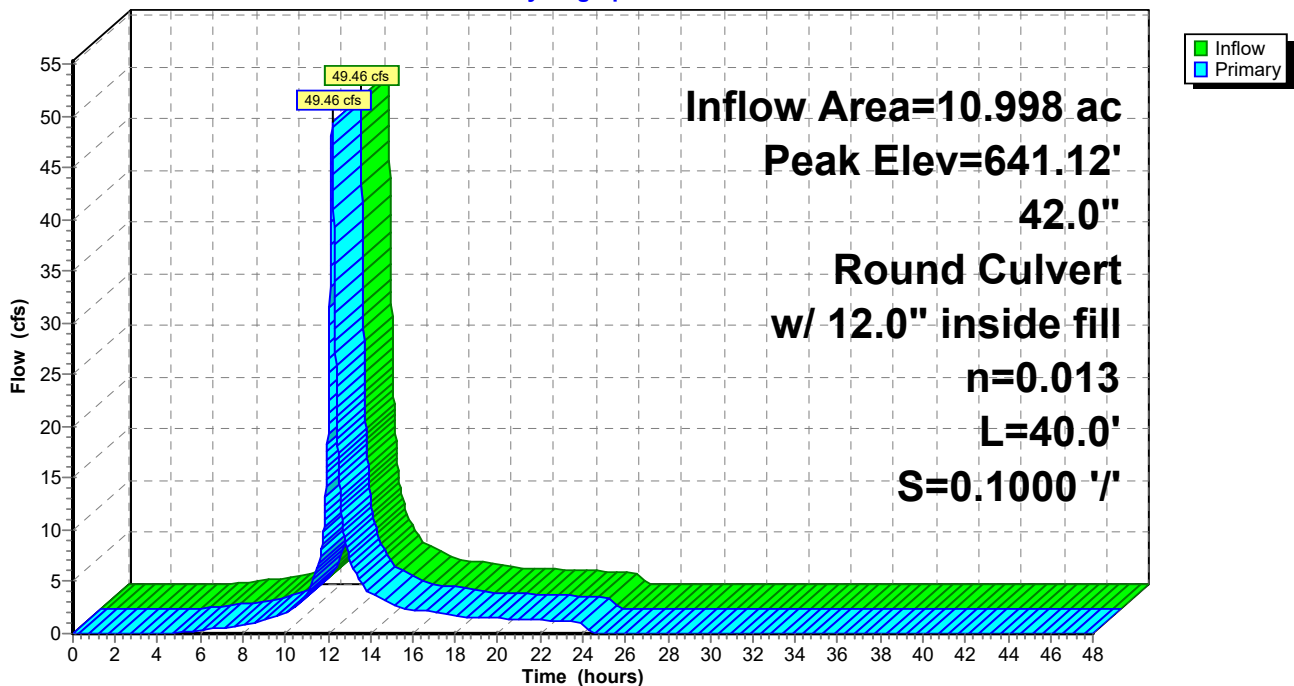
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 641.12' @ 12.21 hrs
 Flood Elev= 643.00'

Device #	Routing	Invert	Outlet Devices
#1	Primary	638.00'	42.0" Round Culvert w/ 12.0" inside fill L= 40.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 637.00' / 633.00' S= 0.1000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.35 sf

Primary OutFlow Max=49.40 cfs @ 12.21 hrs HW=641.12' TW=636.50' (Fixed TW Elev= 636.50')
 ↳1=Culvert (Inlet Controls 49.40 cfs @ 6.72 fps)

Pond CULV: Culvert

Hydrograph



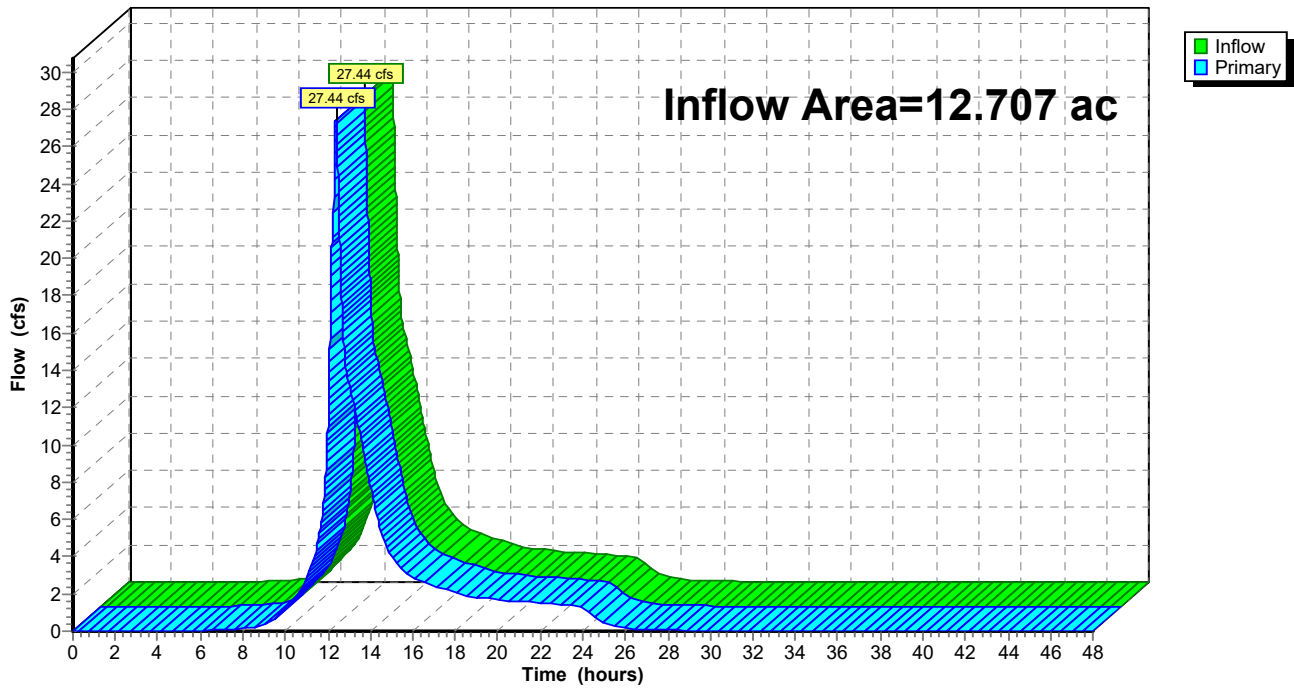
Summary for Link PAP-1: AP-1

Inflow Area = 12.707 ac, 4.89% Impervious, Inflow Depth > 4.89" for 100-year event
Inflow = 27.44 cfs @ 12.38 hrs, Volume= 5.177 af
Primary = 27.44 cfs @ 12.38 hrs, Volume= 5.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-1: AP-1

Hydrograph



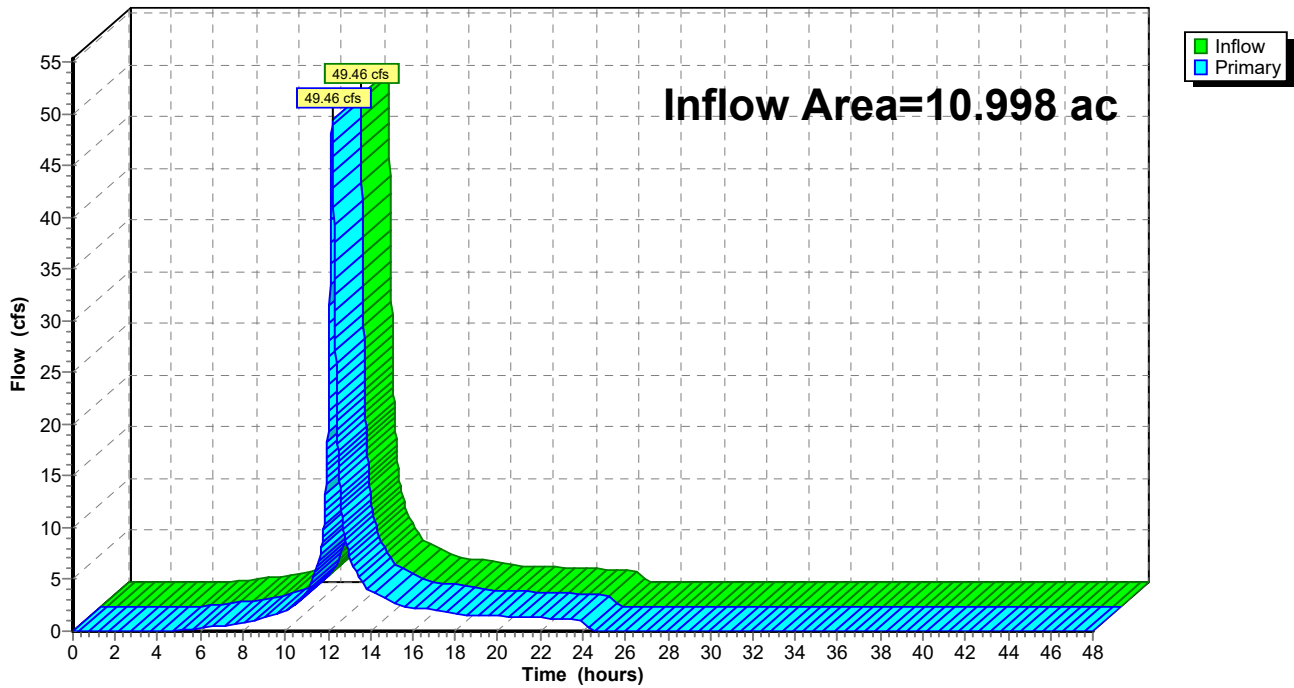
Summary for Link PAP-2: AP-2

Inflow Area = 10.998 ac, 22.03% Impervious, Inflow Depth = 5.33" for 100-year event
Inflow = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af
Primary = 49.46 cfs @ 12.21 hrs, Volume= 4.890 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PAP-2: AP-2

Hydrograph



WATER QUALITY VOLUME (WQV) COMPUTATIONS FOR PDA-1A

Project: Proposed Solar Photovoltaic Array
Location: 250 Carter St., Manchester, CT
Date: 10/13/23

Water Quality Volume Calculations:

$$WQV = \frac{(1.3'')(R)(A)}{12}$$

Where:
 WQV = water quality volume (ac-ft)
 R = volumetric runoff coefficient = 0.05+0.009(I)
 I = percent impervious cover (see below)
 A = site area in acres

$$I = \frac{A_{IMP}}{A_{TOT}} \times 100$$

Where:
 I = percent impervious cover
 A_{IMP} = area of impervious cover
 A_{TOT} = total area of watershed

Watershed Description:	<u>PDA-1A</u>	
Area of impervious coverage, A _{IMP}	<input type="text" value="0.26"/>	Acres
Total area of watershed, A _{TOT}	<input type="text" value="11.40"/>	Acres
Percent impervious cover, I	<input type="text" value="2.28"/>	%
Volumetric runoff coefficient, R	<input type="text" value="0.07"/>	
Water Quality Volume, WQV	<input type="text" value="0.087"/>	ac-ft <input type="text" value="3,794"/> CF required

4,555 CF provided



NOAA Atlas 14, Volume 10, Version 3
Location name: Town of Manchester, Connecticut, USA*

Latitude: 41.7621°, Longitude: -72.4704°

Elevation: m/ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.331 (0.255-0.427)	0.403 (0.310-0.520)	0.520 (0.399-0.674)	0.617 (0.471-0.805)	0.751 (0.556-1.02)	0.851 (0.620-1.18)	0.957 (0.677-1.38)	1.08 (0.722-1.58)	1.25 (0.808-1.90)	1.39 (0.881-2.16)
10-min	0.469 (0.362-0.605)	0.570 (0.439-0.737)	0.736 (0.565-0.955)	0.873 (0.666-1.14)	1.06 (0.788-1.45)	1.21 (0.877-1.68)	1.36 (0.960-1.96)	1.53 (1.02-2.24)	1.77 (1.15-2.69)	1.97 (1.25-3.06)
15-min	0.552 (0.425-0.712)	0.671 (0.517-0.867)	0.866 (0.665-1.12)	1.03 (0.785-1.34)	1.25 (0.927-1.70)	1.42 (1.03-1.97)	1.60 (1.13-2.30)	1.80 (1.20-2.64)	2.08 (1.35-3.17)	2.32 (1.47-3.60)
30-min	0.746 (0.575-0.963)	0.907 (0.699-1.17)	1.17 (0.899-1.52)	1.39 (1.06-1.81)	1.69 (1.25-2.30)	1.92 (1.40-2.67)	2.16 (1.53-3.11)	2.43 (1.63-3.57)	2.82 (1.82-4.28)	3.14 (1.98-4.87)
60-min	0.940 (0.725-1.21)	1.14 (0.881-1.48)	1.48 (1.13-1.92)	1.75 (1.34-2.29)	2.13 (1.58-2.90)	2.42 (1.76-3.36)	2.72 (1.92-3.92)	3.06 (2.05-4.50)	3.55 (2.30-5.40)	3.95 (2.50-6.13)
2-hr	1.21 (0.941-1.56)	1.47 (1.14-1.89)	1.88 (1.45-2.43)	2.23 (1.71-2.89)	2.70 (2.02-3.67)	3.06 (2.24-4.24)	3.44 (2.46-4.96)	3.89 (2.62-5.69)	4.57 (2.97-6.92)	5.15 (3.27-7.94)
3-hr	1.40 (1.09-1.79)	1.69 (1.31-2.17)	2.16 (1.68-2.78)	2.56 (1.97-3.31)	3.10 (2.32-4.20)	3.50 (2.58-4.86)	3.94 (2.83-5.69)	4.47 (3.01-6.51)	5.28 (3.43-7.96)	5.98 (3.80-9.18)
6-hr	1.77 (1.38-2.25)	2.14 (1.67-2.72)	2.74 (2.13-3.50)	3.23 (2.50-4.16)	3.92 (2.95-5.29)	4.42 (3.28-6.11)	4.98 (3.60-7.16)	5.66 (3.83-8.20)	6.71 (4.38-10.0)	7.62 (4.86-11.6)
12-hr	2.18 (1.72-2.77)	2.65 (2.08-3.36)	3.42 (2.67-4.35)	4.05 (3.15-5.18)	4.92 (3.72-6.60)	5.56 (4.14-7.63)	6.26 (4.55-8.95)	7.12 (4.84-10.3)	8.44 (5.52-12.6)	9.58 (6.13-14.5)
24-hr	2.57 (2.03-3.24)	3.16 (2.49-3.98)	4.12 (3.24-5.21)	4.91 (3.84-6.25)	6.00 (4.57-8.02)	6.81 (5.09-9.30)	7.69 (5.62-11.0)	8.79 (5.99-12.6)	10.5 (6.88-15.5)	12.0 (7.68-18.0)
2-day	2.90 (2.30-3.64)	3.61 (2.87-4.54)	4.78 (3.78-6.02)	5.75 (4.52-7.28)	7.08 (5.42-9.44)	8.06 (6.07-11.0)	9.14 (6.75-13.0)	10.5 (7.20-15.0)	12.8 (8.40-18.7)	14.7 (9.49-22.0)
3-day	3.15 (2.51-3.94)	3.93 (3.13-4.92)	5.22 (4.14-6.55)	6.28 (4.95-7.93)	7.74 (5.95-10.3)	8.81 (6.66-12.0)	10.0 (7.41-14.2)	11.6 (7.91-16.4)	14.0 (9.26-20.5)	16.3 (10.5-24.2)
4-day	3.38 (2.70-4.21)	4.21 (3.36-5.26)	5.57 (4.43-6.98)	6.70 (5.30-8.44)	8.26 (6.36-11.0)	9.40 (7.12-12.8)	10.7 (7.92-15.1)	12.3 (8.44-17.4)	15.0 (9.88-21.8)	17.3 (11.2-25.7)
7-day	3.99 (3.20-4.96)	4.93 (3.95-6.13)	6.46 (5.15-8.05)	7.72 (6.13-9.68)	9.47 (7.31-12.5)	10.7 (8.15-14.5)	12.2 (9.03-17.1)	14.0 (9.62-19.6)	16.9 (11.2-24.4)	19.4 (12.6-28.6)
10-day	4.62 (3.71-5.72)	5.61 (4.50-6.96)	7.22 (5.78-8.99)	8.57 (6.82-10.7)	10.4 (8.05-13.6)	11.8 (8.94-15.8)	13.3 (9.83-18.5)	15.1 (10.4-21.2)	18.1 (12.0-26.1)	20.6 (13.4-30.3)
20-day	6.61 (5.35-8.15)	7.67 (6.20-9.47)	9.40 (7.57-11.6)	10.8 (8.67-13.5)	12.8 (9.92-16.6)	14.3 (10.8-18.8)	15.9 (11.7-21.6)	17.7 (12.3-24.5)	20.3 (13.5-29.1)	22.5 (14.7-32.8)
30-day	8.32 (6.75-10.2)	9.40 (7.62-11.6)	11.2 (9.03-13.8)	12.7 (10.2-15.7)	14.7 (11.4-18.8)	16.2 (12.3-21.2)	17.8 (13.0-24.0)	19.5 (13.6-26.9)	21.9 (14.6-31.1)	23.7 (15.5-34.5)
45-day	10.5 (8.51-12.8)	11.6 (9.41-14.2)	13.4 (10.9-16.5)	14.9 (12.0-18.4)	17.0 (13.2-21.7)	18.6 (14.1-24.1)	20.2 (14.8-26.9)	21.8 (15.3-30.0)	23.9 (16.0-33.8)	25.4 (16.6-36.6)
60-day	12.3 (10.0-15.0)	13.4 (10.9-16.4)	15.3 (12.4-18.8)	16.8 (13.6-20.8)	19.0 (14.8-24.1)	20.7 (15.7-26.6)	22.3 (16.2-29.4)	23.8 (16.7-32.6)	25.6 (17.2-36.2)	26.9 (17.6-38.8)

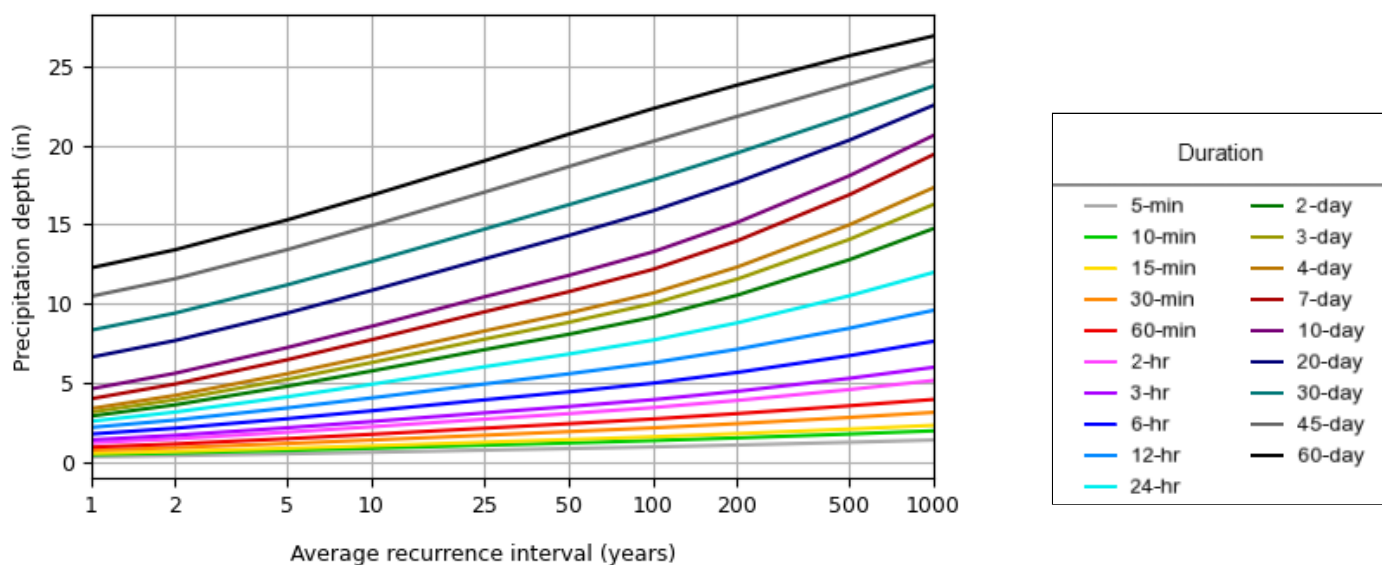
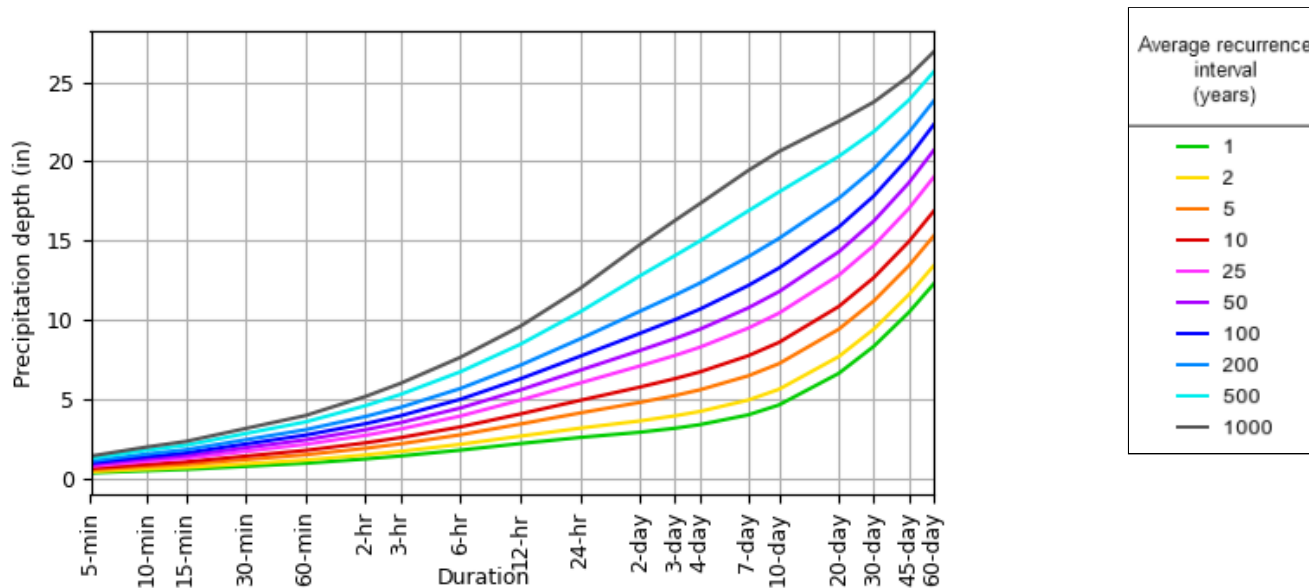
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

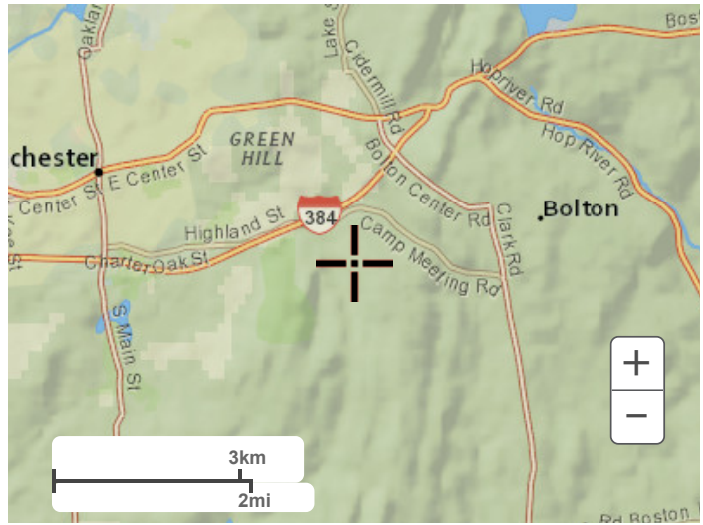
Latitude: 41.7621°, Longitude: -72.4704°



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Maps & aeriels

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial