BEALS + THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS | ENVIRONMENTAL SPECIALISTS

September 16, 2020

Mr. George Barrett, Chair
Wareham Planning Board
c/o Mr. Kenneth Buckland, Town Planner
54 Marion Road
Wareham, Massachusetts 02571

Via: FedEx and Email to *sraposo@wareham.ma.us*
and *kbuckland@wareham.ma.us*

Reference: Response to Peer Review Comments
Application for Site Plan Review
27 Charge Pond Road PV+ES Project
Wareham, Massachusetts
B+T Project No. 1833.109

Dear Planning Board Members:

On behalf of the Applicant, Borrego Solar Systems, Inc. (BSSI), Beals and Thomas, Inc. (B+T) respectfully submits this response to comments and associated revised plans and revised stormwater management report in response to Planning Board and peer review comments on the above-referenced solar project. For ease of review, comments are indicated in *italicized* font, with our responses in regular font.

As requested, we have enclosed nine hard copies of this letter with full size plans. We understand that the Board will distribute one of these copies to the peer review consultant for supplemental review. A separate copy of the letter and plans have been submitted directly to Wareham Fire.

General:

1. *The project is for a large ground mounted solar energy project located on the westerly side of Charge Pond Road and is of 44 acres in size. A total of 30,078 solar modules are proposed.*

   Please refer to the enclosed revised plans for the updated array layout and estimated solar module count, found on the cover sheet and Note #2 on the Layout and Materials and Grading and Erosion Control plan sheets. Specifically, the limit of work is now 42.2± acres in size, and the number of solar modules is approximately 28,620.

2. *Reference is made to Section 590, Solar Energy Generation Facilities of the Wareham Zoning By-Law and successive sections of the By-Law through Section 596.4.*

   No response required.

3. *Section 1510.7 of Site Plan Review requires compliance with all applicable sections of the By-Law.*

   No response required.

4. *Page 2-11 of the Project Narrative lists four waivers from the requirements of the By-Law for Site Plan Review. The waivers relate to the submittal of photos of the site, notations as to contiguous land, plan scale and the presentation of certain natural features of the site.*

   The waivers requested for the Project relate to submittal and plan requirements, rather than design or dimensional provisions of the Zoning By-Laws. Based on a review of the Applicant's past filings with the Board, the Planning Board has previously granted waivers from these administrative requirements for some solar projects proposed by the Applicant, while in other cases the projects were approved with those minor deviations from such requirements. Given the Board's past practice, we respectfully withdraw these waiver requests and ask the Board to accept these minor deviations as follows:

   - The Applicant respectfully withdraws the request for a waiver from Section 1531.11, which requires photographs of the site at size of 8" by 10", and requests that the Board accept the Aerial Map and Regional Context exhibits, as well as the photographs included in the narrative.
   - The Applicant respectfully withdraws the requests for waivers from Section 1531.10: "*All contiguous land owned by the applicant or by the owner of the property*" and 1532.3: "Existing Legal Features" b) "*Property lines (with dimensions identified)*" and requests that the Board approve the plans as submitted. It is not practical to depict the property lines and dimensions and all contiguous parcels, due to the size of the overall Property and the extent of the surrounding land owned by ADM.
   - The Applicant respectfully withdraws the request for a waiver from the provisions of Subsection 1532: "Existing Features" that require that plans be at a scale of 1" = 20', 40', or 100', and accept the plans at 1" = 80', 1" = 50' and 1" = 30'. Additionally, overall index sheets are provided at a scale of 1" = 150' in order to see the Site on a single sheet, to facilitate the Board's understanding of the Project. These scales are appropriate for the Project Site.

- The Applicant respectfully withdraws the request for a waiver from Section 1532.1 "Existing Natural Features" 2. "*Individual trees 18" dbh or over*" and requests that the Board approve the plans as submitted. Due to the size of the Property and the character of the Project, it is infeasible to locate all trees greater than 18 inches.

5. *The Planning Board does not have the authority under the Zoning By-Law to grant waivers, however relief can be sought by applying to the Zoning Board of Appeals for variances to the requirements of the appropriate sections.*

   Please refer to the response to General Comment 4 for discussion regarding the withdrawal of the waiver requests.

Existing Site Conditions

1. *The site is generally wooded and is so described beginning on Page 2.2 of the Project Narrative. A photograph taken in February of 2020 indicates the typical vegetation found. In the photo, the various deciduous trees and underlying brush are void of leaf cover, giving a sense of the visibility throughout the site.*

   No response required.

2. *Topography is undulating and extends from elevation 16 near Parker Mills Pond to elevation 45 near the south center and southeasterly portion of the site. In the vicinity of Charge Pond Road, the elevation is approximately 32. In the northerly portion of the site abutting the Wareham Little League fields, elevations vary from 24 to 40.*

   No response required.

Site Construction Proposal

1. *Access to the site is on the northwesterly side of Charge Pond Road south and west of the YMCA. Pavement width is approximately 24 feet with an asphalt sidewalk and grass strip abutting on the project side of the road. A temporary access is proposed consisting of crushed stone. It is proposed to replace the sidewalk after work is complete.*

   a. *A curb cut permit is required from Municipal Maintenance for any construction access to the site.*

      The Applicant acknowledges this requirement and will apply for the required permit prior to the application for building permit.

b. *Construction should include the removal of the sidewalk as necessary, providing handicap access at each side and a paved apron of sufficient thickness and grade for truck traffic and should not allow runoff onto the surface of Charge Pond Road. This modification should be made permanent.*

   The revised plans include a detail depicting the site entrance, including sidewalk removal and a paved apron that is handicap accessible. Please refer to Sheet C-6.0.

c. *The temporary access should be greater than 12 feet in width and the return radii should be greater than 10 feet in order to protect shoulders.*

   The temporary access was depicted as 88 feet wide at the back of sidewalk along Charge Pond Road in the originally submitted plans. The temporary access then narrowed to a 20-foot width as it entered the Site. Return radii were established at a minimum of 35+ feet. The current revised plans maintain these dimensions at the site entrance, and the associated detail has been clarified. Please refer to Sheet C-6.0.

2. *Section 594.3 requires all utility connections to be underground. The plan shows two overhead power lines extending from Charge Pond Road into the site for a distance of approximately 600 feet before going underground. Most of the poles will be visible from Charge Pond Road. The plan should be changed accordingly.*

   For clarity, Section 594.3 reads: "*All utility connections shall be underground* ***except to the extent that underground utilities are not feasible in the reasonable determination of the board review***" (emphasis added). The Project has been designed to meet the interconnection and metering requirements of the utility company, with impacts minimized to the maximum extent feasible. It is the Applicant's opinion that pad-mounted equipment, which reduce the extent of overhead poles, results in greater construction-related and ground disturbance than pole-mounted equipment, due to the need for construction of vaults and concrete pads, as well as potentially greater visual impacts due to the clustering of equipment . The Board held a similar discussion related to the previous group of solar projects proposed by BSSI in Wareham, and agreed to pole mounted metering at that time. Accordingly, the proposed Project is consistent with previously-approved projects. If preferred by the Board, the Applicant can instead utilize pad mounted metering.

3. *Section 594.3.7 is the setback requirement for the perimeter of the project. Except for access, the buffer is to only to be used as natural buffer and/or screening. No other uses are allowed. The proposed stormwater infiltration basins and other structures violate this requirement and should be relocated. This applies to all stormwater facilities that have been located in the buffer.*

   A small area of off-grading for Basin 3 was previously located within the 50-foot zoning setback, but has been removed (please refer to Sheet C-4.2 and C-4.4 of the enclosed revised plans).

   The only remaining feature within the 50-foot zoning setback consists of a stormwater basin and associated piping to address stormwater runoff from the site entrance drive. It is not possible to relocate the stormwater basin outside of the 50-foot zoning setback, as the proposed design maintains existing drainage patterns to the maximum extent feasible, and will prevent water and debris from entering Charge Pond Road. Because this stormwater feature is necessary for the site entrance drive, which is allowable within the zoning setback, it is our understanding that it is permissible.

4. *Consideration should be given to modifying the stormwater drainage infiltration basins and open areas that are near the project entrance so that the cleared expanse of panels will be less visible from Charge Pond Road.*

   The design of the Project in the area of Charge Pond Road was evaluated; however, the extent of clearing proximate to the road is necessary in order to accommodate the site entrance drive and associated stormwater basin. Therefore, a reduction in the limit of clearing at this location is not feasible. Further, as indicated in Site Construction Proposal Comment 3 above, it is not feasible to relocate the site entrance stormwater basin.

   a. *Consider more use of existing buffers and vegetation for the control of stormwater.*

      Stormwater basins have been generally sited in areas of peripheral clearing for the solar array and are designed to directly capture, treat and infiltrate stormwater runoff from the project perimeter driveway and proposed array area. They have been designed to mitigate peak rates of runoff from the site to the respective design points and serve to protect down-gradient resource areas and maintain existing drainage patterns and flow paths.

b. *Check sub-watersheds that function naturally now as possible receptors of runoff rather than creating additional open areas.*

Areas that currently function as receptors of runoff under existing conditions consist of wetlands, for example, the existing kettle depressions associated with the A, B, C, E and F series wetlands. These areas were all analyzed as design points to compare pre- and post-development runoff to ensure compliance with mitigation of peak runoff rates per Standard 2 of the MassDEP Stormwater Handbook. The various basins were designed to protect these resource areas while maintaining the existing hydrology and drainage patterns tributary to these low points in terms of direction of basin overflows and infiltration.

c. *Reduce the amount of clearing leading from Charge Pond Road to the interior of the site and maintain natural vegetation as much as possible for screening of the open area that will block direct views.*

Please refer to the response at the above introduction of this Site Construction Proposal Comment 4.

5. *The southwestern portion of the site has the most extreme contour differences that change from elevation 16 at Parker Mills Pond to elevation 43 near the narrow area lying between two isolated wetlands.*

a. *Clearing all but a 50-foot wide buffer at the lowest elevations will expose this sloped area to visibility from some lines of site on the westerly side of Parker Mills Pond.*

In the vicinity of Parker Mills Pond, the previously-proposed 65-linear foot wooded buffer (on average) from the edge of Tihonet Pond has been increased by 15-feet (on average) to 80 linear feet (on average). More specifically, although the minimum width of woods (50+ feet) remains similar at the north edge of the western lobe of solar panels, the width in other areas has been increased from the previous maximum of 73 feet to a current maximum of 128 feet. Please refer to Sheet C-3.1.

b. *Leaving the most westerly projection of this area uncut and thereby expanding the buffer would offer some visibility protection to the exposed panels at the higher elevations. Given that there are more than 30,000 panels proposed, it would appear feasible to do without substantially harming the project viability. A north/south line through contour 34 is recommended.*

   BSSI evaluated this and other feedback received from the Planning Board and Conservation Commission. The resulting layout revisions reduces the limit of clearing by 1.6 acres. Please refer to Sheet C-2.0.

c. *Leaving this area in a natural state could conceivably eliminate the necessity of having open drainage infiltration areas adjacent to the 50-foot no-touch zone of bordering vegetated wetlands. It would also eliminate the violation of a natural buffer as required by Section 594.3.7 of the By-Law.*

   The Project design has been updated based on revisions to the wetland delineation by the Conservation Administrator, and with consideration of the peer review comments herein. As previously noted in Site Construction Proposal Comment 3 above, the only location where a stormwater basin lies within the 50-foot zoning setback is at the site entrance drive.

6. *The Board is encouraged to review the screened buffer in other portions of the site as well. The minimum 50-foot wide buffer is proposed throughout the project.*

   No response required.

7. *It is noted in the Project Narrative that the removal of trees outside the panel areas will be necessary to provide ample light to panels during winter months. Those areas that may need additional clearing should be identified for consideration. The removal of trees should be limited to only those of a certain height. The applicant should demonstrate the maximum height of vegetation to remain.*

   No clearing will occur beyond the limit of clearing that is depicted on the plans. Selective clearing is not a preferred construction method of construction.

8. *Underbrush and stumps are to be left in the various additional cutting areas. Note that leaving stumps of white pine, while positive for the least disruption of surrounding vegetation, will not result in new growth to fill in the buffer. Existing vegetation may be encouraged with added sunlight exposure.*

   Agreed; no response required.

Decommissioning Estimate

1. *The decommissioning cost estimate for the project is found in Section 5 of the Project Narrative. It is broken down into categories of system specifications, labor and equipment costs, equipment and material removal rates and energy storage decommissioning.*

   No response required.

2. *Reference is made to much of the materials being 100 percent recyclable. While this may be true, the statement is also made that the materials will be taken to the nearest transfer station where it will be accepted at no charge. Evidence of there being no charge should be presented.*

   The assumptions detailed in the decommissioning estimate provided with the initial application materials copies, almost exactly the assumptions approved by the Wareham Planning Board for the previous four solar and energy storage project approved approximately 18 months ago (see projects approved at 160 Tihonet Road, 77 Farm to Market Road, 299 Farm to Market Road, and 71 Charlotte Furnace Road). For these previously approved projects the decommissioning amount average was $24,971 per MW DC. The 27 Charge Pond Road decommissioning amount was estimated at $24,631 per MW DC.

   The Applicant respectfully that the decommissioning estimate provided be accepted by the Board.

3. *Reference is also made to the Wareham Recycling Center as being the site of material disposal. This site is not set up for the disposal of large quantities of materials such as this and should not be assumed to be acceptable.*

   Please see response to Decommissioning Estimate Comment 2 above.

4. *The cost of removal of several items including modules, rack dismantling, concrete pad removal and disposal, fence removal and seeding of disturbed areas appears to be low. It assumes a very fast pace of disassembly and staging of materials for removal. These items should be reviewed further.*

   Please see response to Decommissioning Estimate Comment 2 above.

5. *The re-seeding of the site covers only a small portion of the area based on the cost estimate. Removal of modules, racks and fencing will result in disturbance of the underlying ground and could substantially increase the areas to be reseeded. The cost estimate should be reconsidered.*

   Please see response to Decommissioning Estimate Comment 2 above.
6. *The surety documentation for the dismantling of the site needs to be presented for discussion purposes prior to approval.*

   The Applicant acknowledges this requirement. Please see attached for a template of the surety documents that are widely accepted across the Commonwealth as well as for previous Borrego projects in Wareham. The Applicant will provide a copy of the final surety prior to the start of construction.

Stormwater Calculations

1. *The stormwater calculations in general follow acceptable practice and use reasonable assumptions for soil infiltration and runoff rates.*

   No response required.

2. *Because there needs to be reconsideration of the location and sizing of various infiltration areas, the calculations should be revisited as necessary.*

   The site design has been updated to reflect Planning Board and peer review comments, as well as the wetland resource area limits agreed upon by the Conservation Administrator and Applicant. As noted, this has necessitated revisions to the stormwater management system. An updated stormwater management report is enclosed herewith.

3. *There appear to be no significant issues regarding depth to groundwater for this site.*

   No response required.

Operation and Maintenance Plan

1. *A stormwater operation and maintenance plan has been presented as Attachment 5 of the Stormwater Management Report. This report should be referenced in any Special Permit the Planning Board may approve.*

   No response required.

2. *In addition, an NPDES permit is required from EPA since the project is over one acre in size. Proof of the filing and approval of the permit should be submitted to the Planning Board for the project file.*

   The Applicant acknowledges this requirement. A draft Stormwater Pollution Prevention Plan (SWPPP) prepared in compliance with the Construction General Permit administered by EPA was included as an attachment to the stormwater management report submitted with the Application for Site Plan Review. The Applicant will provide a copy of the final SWPPP prior to the start of construction.

We trust that the information provided herein satisfies the comments on the Project, and look forward to meeting with the Planning Board at the continued hearing on September 28, 2020. Please do not hesitate to contact us should you have any questions in the interim.

Very truly yours,

BEALS AND THOMAS, INC.

Stacy H. Minihane, PWS
Senior Associate

Jeffrey R. Murphy, PE
Civil Engineer

Attachments: Revised Plans dated September 16, 2020 in 165 sheets
Revised Stormwater Management Report dated September 15, 2020

cc: Wareham Fire Department (via Certified Mail)
Borrego Solar Systems, Inc. (via Box upload)
A.D. Makepeace Company, James Kane (1 copy via US Mail and email)
Charles L. Rowley PE, PLS (via email and hard copy via Planning Office)

MKS/JRM/shm/cmv/1833109LT002

DECOMMISSIONING BOND

Bond [redacted]

KNOW ALL BY THESE PRESENTS, That Borrego Solar Systems, Inc., as principal, and [redacted], a corporation duly organized and existing under and by virtue of the laws of the State of [redacted], as Surety, are held and firmly bound unto, [redacted] as Obligee in the sum of [redacted] lawful money of the United States of America, for payment of which well and truly to be made, we bind ourselves, our heirs, executors, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has received a Conditional Use Permit from the Obligee for the placement of a solar energy facility comprised of solar energy collection cells/panels and related facilities necessary to harness sunlight for energy generation and distribution and associated support structure, braces, racking, wiring and related interconnection equipment (the "Solar Facility"), which Site Plan Review sets forth the terms and conditions which govern the use of such Solar Facility and which agreement is hereby specifically referred to and made part hereof as Exhibit A ("Site Plan Review"). A surety bond is required as a condition of the Site Plan Review in order to guarantee the maintenance, replacement, removal or relocation of said Solar Facility which will be located at [redacted] as further detailed in the Site

NOW, THEREFORE, the condition of this obligation is such, that if the Principal shall faithfully perform in accordance with the aforesaid Resolution and indemnify the Obligee against all loss caused by the Principal's breach of any ordinance or agreement relating to the removal or relocation of the Solar Facility, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, THAT THIS BOND IS EXECUTED BY THE PRINCIPAL AND SURETY AND ACCEPTED BY THE OBLIGEE SUBJECT TO THE FOLLOWING EXPRESS CONDITIONS:

1. The bond shall be effective [redacted]
2. The liability of the Surety shall in no event exceed [redacted] the aggregate, the penal sum of this bond.
3. It is understood and agreed that this bond shall remain in full force and effect for the full period of the Permit, and that the obligation of the Surety may be terminated by the Surety by giving sixty (60) days advance notice in writing to the Obligee, delivered by a traceable form of delivery; and provided further, that nothing herein shall affect any rights or liabilities which shall have accrued under this bond prior to the date of such termination.
4. Neither the Surety's decision to cancel, nor the failure of the Principal to file a replacement bond or other security, shall in itself constitute a loss to the obligee recoverable under this bond.
5. All suits and actions against this bond must be brought within 60 days of the termination of the Permit or bond, whichever shall occur first.

SIGNED, SEALED AND DATED THIS [redacted]

Borrego Solar Systems, Inc.
(Principal)

BY: _____

[redacted] _____

BY: [redacted] _____

THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

POWER OF ATTORNEY

THIS Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

KNOW ALL PERSONS BY THESE PRESENTS:

That THE HANOVER INSURANCE COMPANY and MASSACHUSETTS BAY INSURANCE COMPANY, both being corporations organized and existing under the laws of the State of New Hampshire, and CITIZENS INSURANCE COMPANY OF AMERICA, a corporation organized and existing under the laws of the State of Michigan, (hereinafter individually and collectively the "Company") does hereby constitute and appoint,

Paul J. Hering, Aidan Smock, Tim McClellen, Kathy Vanderslice, Richard Hallett, Marta Collett and/or Sandra Corona

Of **Marsh & McLennan Insurance Agency, LLC of San Diego, CA** each individually, if there be more than one named, as its true and lawful attorney(s)-in-fact to sign, execute, seal, acknowledge and deliver for, and on its behalf, and as its act and deed any place within the United States, any and all surety bonds, recognizances, undertakings, or other surety obligations. The execution of such surety bonds, recognizances, undertakings or surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company, in their own proper persons. Provided however, that this power of attorney limits the acts of those named herein; and they have no authority to bind the Company except in the manner stated and to the extent of any limitation stated below:

Any such obligations in the United States, not to exceed Fifty Million and No/100 ($50,000,000) in any single instance

That this power is made and executed pursuant to the authority of the following Resolutions passed by the Board of Directors of said Company, and said Resolutions remain in full force and effect:

RESOLVED: That the President or any Vice President, in conjunction with any Vice President, be and they hereby are authorized and empowered to appoint Attorneys-in-fact of the Company, in its name and as it acts, to execute and acknowledge for and on its behalf as surety, any and all bonds, recognizances, contracts of indemnity, waivers of citation and all other writings obligatory in the nature thereof, with power to attach thereto the seal of the Company. Any such writings so executed by such Attorneys-in-fact shall be binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company in their own proper persons.

RESOLVED: That any and all Powers of Attorney and Certified Copies of such Powers of Attorney and certification in respect thereto, granted and executed by the President or Vice President in conjunction with any Vice President of the Company, shall be binding on the Company to the same extent as if all signatures therein were manually affixed, even though one or more of any such signatures thereon may be facsimile. (Adopted October 7, 1981 – The Hanover Insurance Company; Adopted April 14, 1982 – Massachusetts Bay Insurance Company; Adopted September 7, 2001 – Citizens Insurance Company of America)

IN WITNESS WHEREOF, THE HANOVER INSURANCE COMPANY, MASSACHUSETTS BAY INSURANCE COMPANY and CITIZENS INSURANCE COMPANY OF AMERICA have caused these presents to be sealed with their respective corporate seals, duly attested by two Vice Presidents, this 1st day of **August, 2019**.

The Hanover Insurance Company
Massachusetts Bay Insurance Company
Citizens Insurance Company of America

John C. Roche, EVP and President

The Hanover Insurance Company
Massachusetts Bay Insurance Company
Citizens Insurance Company of America

James H. Kawiecki, Vice President

THE COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF WORCESTER) ss.

On this 1st day of **August, 2019** before me came the above named Vice Presidents of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, to me personally known to be the individuals and officers described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, respectively, and that the said corporate seals and their signatures as officers were duly affixed and subscribed to said instrument by the authority and direction of said Corporations.

DIANE J. MARINO
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
March 4, 2022

Diane J. Marino, Notary Public
My Commission Expires March 4, 2022

I, the undersigned Vice President of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, hereby certify that the above and foregoing is a full, true and correct copy of the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Powers of Attorney are still in force and effect.

GIVEN under my hand and the seals of said Companies, at Worcester, Massachusetts, this 19th day of August, 2020

CERTIFIED COPY

Theodore G. Martinez, Vice President

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA

County of San Diego }

On AUG 19 2020 (Date) before me, Sandra Corona (Insert Name of Notary exactly as it appears on the official seal), Notary Public,

personally appeared Richard Hallett (Name(s) of Signer(s)),

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he~~/she/~~they~~ executed the same in ~~his~~/her/~~their~~ authorized capacity(~~ies~~), and that by ~~his~~/her/~~their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

Witness my hand and official seal.

Signature Sandra Corona (Signature of Notary Public)

SANDRA CORONA
Commission No. 2299905
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
Commission Expires August 2, 2023
ANP1 ANP1

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of the form to another document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____
☐ Individual
☐ Corporate Officer — Title(s): _____
☐ Partner ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

Signer's Name: _____
☐ Individual
☐ Corporate Officer — Title(s): _____
☐ Partner ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
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SITE USE PLAN SUBMISSION

27 CHARGE POND ROAD

27 CHARGE POND ROAD, WAREHAM, MA 02571

SOLAR PHOTOVOLTAIC AND ENERGY STORAGE ELECTRIC SYSTEM

GENERAL NOTES

1. AS CONTAINED HEREIN, "CONTRACTOR" IS ASSUMED TO BE BORREGO SOLAR SYSTEMS, INC AND "SUBCONTRACTOR" IS BORREGO'S INSTALLATION SUBCONTRACTOR.
2. THESE NOTES SET MINIMUM STANDARDS FOR CONSTRUCTION. THE DRAWINGS GOVERN OVER THESE NOTES TO THE EXTENT SHOWN.
3. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE FOLLOWING: LOCAL BUILDING CODE, LOCAL ELECTRICAL CODE, ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK AND THOSE CODES AND STANDARDS LISTED IN THESE DRAWINGS AND IN THE SUBCONTRACTOR AGREEMENT.
4. EXCEPTIONS TO THE CONTRACT DOCUMENTS ARE PERMITTED ONLY WITH THE APPROVAL OF BORREGO.
5. COORDINATE THESE DRAWINGS WITH SPECIFICATIONS AND MANUFACTURER INSTALLATION AND OPERATION MANUALS AND NOTIFY BORREGO OF ANY DISCREPANCIES PRIOR TO BEGINNING WORK.
6. DRAWINGS HAVE BEEN DETAILED IN COMPLIANCE WITH U.L. LISTING REQUIREMENTS AND THE BUILDING CODE FOR THE MATERIALS SPECIFIED. IF AN ALTERNATE OR SUBSTITUTED MATERIAL IS ACCEPTED AS AN EQUAL BY BORREGO, THE SUBCONTRACTOR WILL ASSUME THE RESPONSIBILITY FOR WHATEVER CONSTRUCTION MODIFICATION AND/OR ADDITIONAL COST THAT IS REQUIRED BY REASON OF THIS ACCEPTANCE.
7. PRIOR TO THE COMMENCEMENT OF ANY WORK, EACH TRADE SHALL VERIFY EXISTING CONDITIONS AND NOTIFY BORREGO OF ANY DISCREPANCIES TO THAT WHICH IS SHOWN IN THESE DRAWINGS, INCLUDING BUT NOT LIMITED TO DIMENSIONS OF THE WORK AREA, STRUCTURE, EXISTING ELECTRICAL SERVICE, CONDUIT PATHS, OBSTRUCTIONS, ACCESSIBILITY ISSUES, AND WORKING CLEARANCES. ANY WORK PERFORMED IN CONFLICT WITH THE CONTRACT DOCUMENTS OR ANY CODE REQUIREMENTS SHALL BE CORRECTED BY THE SUBCONTRACTOR AT HIS OWN EXPENSE.
8. SUBCONTRACTOR INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO BORREGO FOR APPROVAL PRIOR TO MAKING ANY CHANGES. APPROVED CHANGES REQUIRE A DRAWING REVISION TO MAINTAIN CONTROL OVER THE APPROVED DESIGN. DEVIATION FROM THESE PLANS PRIOR TO BORREGO APPROVAL PLACES ALL LIABILITY ON THE SUBCONTRACTOR.
9. UNLESS INDICATED AS EXISTING (E), ALL PROPOSED MATERIALS AND EQUIPMENT ARE NEW.
10. ALL ITEMS TO BE REMOVED AND RELOCATED OR REPLACED SHALL BE HANDLED WITH PROPER CARE AND STORED IN A SAFE PLACE TO PREVENT DAMAGE; OR BE REPLACED AT THE SUBCONTRACTOR'S EXPENSE.
11. ALL EQUIPMENT SHALL BE MOUNTED AS SHOWN. WHERE DETAILS ARE NOT PROVIDED, THE SUBCONTRACTOR SHALL USE DILIGENT EFFORTS TO MOUNT EQUIPMENT SUCH THAT IT WILL BE CLEAN, LEVEL AND SOLID.
12. ALL SURFACES SHALL BE PATCHED AND PAINTED AROUND NEW DEVICES AND EQUIPMENT TO MATCH EXISTING FINISHES.
13. ANY METAL SHAVINGS RESULTING FROM SITE WORK SHALL BE CLEANED FROM ROOF SURFACES, ENCLOSURES AND ANY ADDITIONAL AREAS WHERE OXIDIZED OR CONDUCTIVE METAL SHAVINGS MAY CAUSE RUST, ELECTRICAL SHORT CIRCUITS OR OTHER DAMAGE.
14. NO STRUCTURAL MEMBER SHALL BE DRILLED UNLESS SPECIFICALLY AUTHORIZED BY BORREGO.
15. SUBCONTRACTOR ACKNOWLEDGES THAT THE SYSTEM AS INDICATED ON THE PLANS REQUIRES ALL COMPONENTS TO BE INSTALLED TO PROPERLY RESIST WIND LOADS, SUCH AS BALLAST, WIND DEFLECTORS, ETC. IT IS THE RESPONSIBILITY OF THE SUBCONTRACTOR TO PROVIDE TEMPORARY MEANS TO RESIST WIND LOADS FOR ALL COMPONENTS NOT YET INSTALLED DURING AND AFTER REGULAR WORKING HOURS. THIS MAY INCLUDE TEMPORARY TIE DOWNS, COVERING, BALLAST OR ANY OTHER MEANS. DAMAGE TO ANY INSTALLED SYSTEM COMPONENT OR THE EXISTING FACILITY AS A RESULT OF THE UNFINISHED CONDITION NOT ADEQUATELY RESISTING WIND SHALL BE THE RESPONSIBILITY OF THE SUBCONTRACTOR TO REPAIR OR REPLACE AT THE SUBCONTRACTOR'S COST.
16. TREES MAY GROW DURING THE LIFE OF THE SYSTEM AND IMPACT THE PRODUCTION.

V.7

PROJECT SCOPE

THIS PROJECT CONSISTS OF THE INSTALLATION OF SOLAR MODULES PER THE SYSTEM DESCRIPTION, BELOW. THE MODULES WILL BE INSTALLED ON A GROUND MOUNTED RACKING SYSTEM. THE MODULES WILL BE WIRED IN SERIES STRINGS AND CONNECTED IN PARALLEL TO THE INVERTERS, WHICH CONVERT THE PHOTOVOLTAIC OUTPUT POWER FROM DC TO AC. THE SOLAR ELECTRIC SYSTEM WILL BE INTERCONNECTED WITH THE EXISTING SITE ELECTRICAL SYSTEM IN ACCORDANCE WITH THE APPLICABLE ELECTRIC CODE AND EVERSOURCE REQUIREMENTS.

THIS PROJECT CONSISTS OF THE INSTALLATION OF ENERGY STORAGE EQUIPMENT, PER THE SYSTEM DESCRIPTION, BELOW. THE LITHIUM-ION ENERGY STORAGE MODULES WILL BE INSTALLED IN A PURPOSE BUILT CONTAINER WITH INTEGRATED BATTERY MANAGEMENT SYSTEM, HEATING, VENTILATION, AIR-CONDITIONING UNIT(S), AND FIRE SUPPRESSION SYSTEMS. THE ENERGY STORAGE MODULES WILL BE WIRED IN SERIES STRINGS AND CONNECTED TO THE POWER CONVERSION SYSTEM, WHICH WILL CONVERT DC TO AC WHILE THE BATTERIES ARE DISCHARGING AND WILL CONVERT AC TO DC WHILE THE BATTERIES ARE CHARGING.

PV SYSTEM DESCRIPTION

APPROXIMATE SYSTEM SIZE (DC)	11,591.1 KW	SYSTEM SIZE (AC)	5,000 KW
MODULES	(28,620) LG405N2T-J5	INVERTER(S)	POWER ELECTRONICS (1) HEMK FS2125K / (1) HEMK FS3190 (FACTORY LIMITED TO 2000 / 2990)
STC RATING	405	CEC EFFICIENCY	98.5%
RACKING	TERRASMART TGP 2X12 / 2x10	AZIMUTH	180° (SOUTH = 180°)
TILT ANGLE	25°		

ENERGY STORAGE SYSTEM DESCRIPTION

SYSTEM POWER CAPACITY	5000kW
USABLE ENERGY CAPACITY	20000kWH
POWER CONVERSION SYSTEM	SAME AS ABOVE
DC/DC CONVERTER	POWER ELECTRONICS FREEMAQ FD0500 DC/DC CONVERTER 500kW

TOTAL SYSTEM DESCRIPTION

TOTAL PV+STORAGE POWER CAPACITY	5,000kWAC
MAXIMUM EXPORT TO UTILITY	5,000kWAC
STORAGE CHARGING MODE	SOLAR ONLY

LOCATION MAP

AERIAL VIEW

DRAWING LIST

SHEET NUMBER	SHEET TITLE
T-1	TITLE PAGE
CIVIL	
C-1.0	EXISTING CONDITIONS PLAN
C-2.0	TREE CLEARING PLAN
C-3.0	LAYOUT AND MATERIALS PLAN
C-3.1	LAYOUT AND MATERIALS PLAN – SOUTHWEST
C-3.2	LAYOUT AND MATERIALS PLAN – NORTHEAST
C-4.0	GRADING AND EROSION CONTROL PLAN
C-4.1	GRADING AND EROSION CONTROL PLAN – SOUTHWEST
C-4.2	GRADING AND EROSION CONTROL PLAN – NORTHEAST
C-4.3	GRADING AND EROSION CONTROL PLAN – BASINS 9 – 16
C-4.4	GRADING AND EROSION CONTROL PLAN – BASINS 1, 2, 3, 4
C-4.5	GRADING AND EROSION CONTROL PLAN – BASINS 9, 7, 6, 8
C-5.0	CIVIL DETAILS
C-5.1	CIVIL DETAILS
C-6.0	SITE ACCESS AND INTERCONNECTION PLAN

APPLICABLE CODES AND STANDARDS

2017 MASSACHUSETTS ELECTRICAL CODE 527 CMR12.00
MASSACHUSETTS BUILDING CODE 9TH EDITION
UL-1703 – SOLAR MODULES
UL-1741 – INVERTERS, COMBINER BOXES
UL-2703 – RACKING MOUNTING SYSTEMS AND CLAMPING DEVICES FOR PV MODULES

PROJECT DIRECTORY

SYSTEM / PROJECT OWNER
TBD

LAND OWNER / HOST
A.D. MAKEPEACE COMPANY
158 TIHONET ROAD
WAREHAM, MA 02571

AUTHORITY HAVING JURISDICTION
TOWN OF WAREHAM
54 MARION ROAD
WAREHAM, MA 02571

UTILITY
EVERSOURCE

CIVIL ENGINEER
FIRM: BEALS AND THOMAS, INC.
CONTACT: JEFFREY R. MURPHY, P.E.
PHONE: (508)-366-0560

FIRM: BORREGO SOLAR SYSTEM, INC.
CONTACT: DEAN SMITH. P.E.
PHONE: (978)-221-3103

STRUCTURAL ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC.
CONTACT: DAVID DUTIL, P.E.
PHONE: (978)-513-2623

ELECTRICAL ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC.
CONTACT: AHARON WRIGHT, P.E.
PHONE: (978)-221-3081

DESIGN ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC.
CONTACT: JOHN LAGASSE
PHONE: (978)-973-5022

GENERAL ABBREVIATIONS

(E)	EXISTING
AHJ	AUTHORITY HAVING JURISDICTION
AL	ALUMINUM
APPROX	APPROXIMATE
ARY	ARRAY
BLDG	BUILDING
BSS	BORREGO SOLAR SYSTEM
CL	CENTERLINE
DAS	DATA ACQUISITION SYSTEM
DIA	DIAMETER
DO	DITTO
EW	EAST-WEST
FBO	FURNISHED BY OTHERS
FF	FORWARD FACING
GALV	GALVANIZED
HDG	HOT DIP GALVANIZED
HVAC	HEATING VENTILATION AND AIR CONDITIONING
ID	INSIDE DIAMETER
MFR	MANUFACTURER
MOD	SOLAR MODULE
NS	NORTH-SOUTH
NTS	NOT TO SCALE
OAE	OR APPROVED EQUAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PV	PHOTOVOLTAIC
PVC	POLY VINYL CHLORIDE
SCH	SCHEDULE
SS	STAINLESS STEEL
SSS	SOLAR SUPPORT STRUCTURE
STC	STANDARD TEST CONDITIONS
TBD	TO BE DETERMINED
TP	TAMPER PROOF
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
WP	WEATHER PROOF

REV 1.0

BORREGO SOLAR
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER
9/16/2020

27 CHARGE POND RD
27 CHARGE POND ROAD, WAREHAM, MA 02571

PROJECT NUMBER: 905-2712

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5	09/16/20	WS	JM	REVISIONS PER PEER REVIEW COMMENTS

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

T-1
TITLE PAGE

NOTE:

1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
2. THIS PLAN IS PREPARED BASED ON THE LIMITED ALTA/NSPS LAND TITLE SURVEY PREPARED BY NORTHEAST SURVEY CONSULTANTS AND STAMPED MAY 7, 2020. WITH FIELD WORK COMPLETED ON MARCH 20, 2020.
3. SOME SUPPLEMENTAL INFORMATION HAS BEEN ADDED TO THE PLAN.
4. WETLAND RESOURCE AREAS WERE DELINEATED BY BEALS AND THOMAS, INC. IN JUNE 2019 AND FEBRUARY 2020, WITH INVESTIGATIONS OF POTENTIAL VERNAL POOLS OCCURING ON MARCH 31 AND APRIL 17, 2020.

EXISTING CONDITIONS PLAN

SCALE: 1" = 150'

0 150' 300'

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NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
CHARLES D. SMITH
CIVIL
No. 52136
REGISTERED PROFESSIONAL ENGINEER

Charles D Smith
9/16/20

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C-1.0
EXISTING CONDITIONS PLAN

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4. LOAM AND SEED AREAS WITHIN THE LIMIT OF WORK AND OUTSIDE OF ACCESS ROADS, EQUIPMENT PADS, AND AREAS WHERE STUMPS WILL REMAIN.
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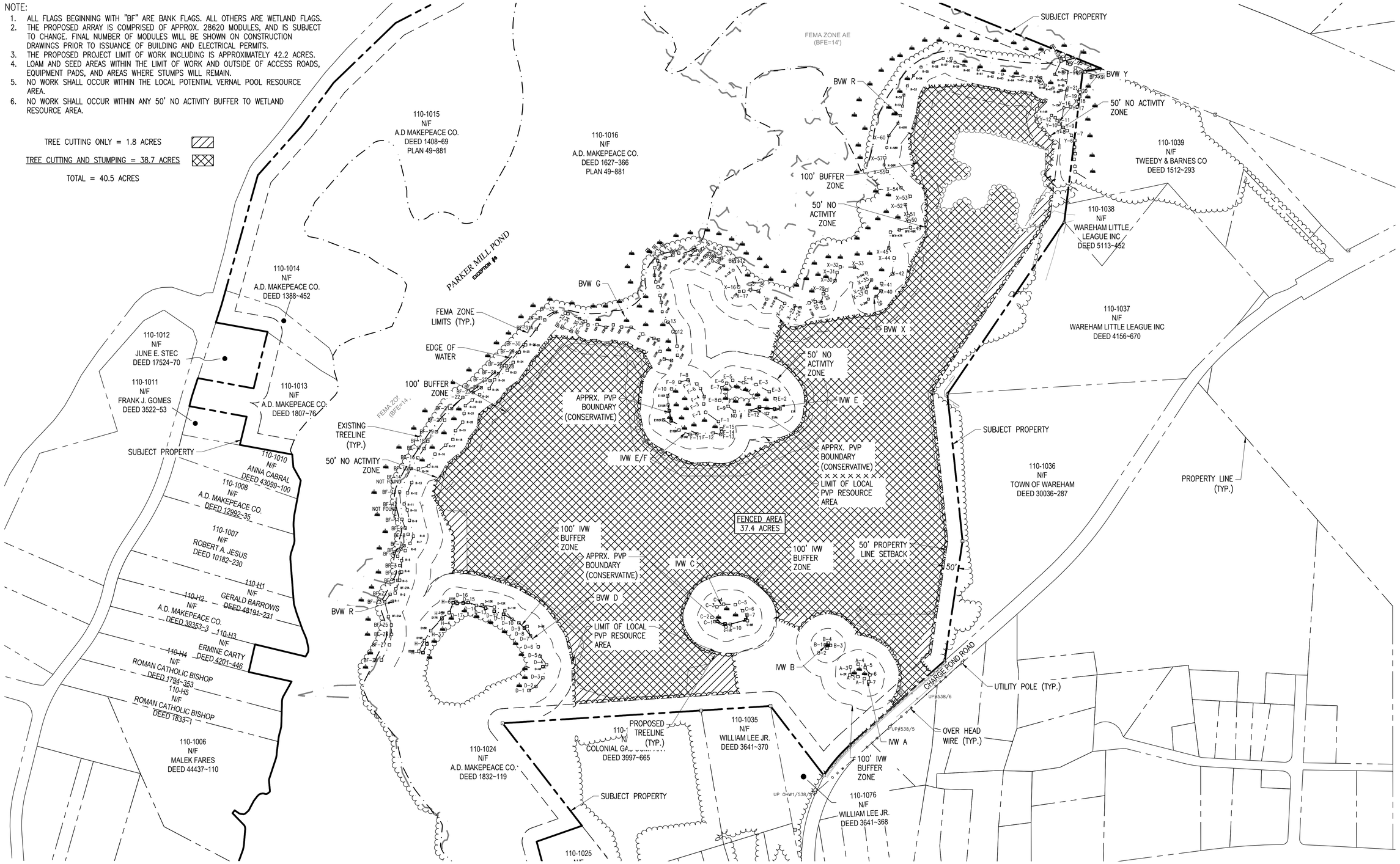
TREE CUTTING ONLY = 1.8 ACRES

TREE CUTTING AND STUMPING = 38.7 ACRES

TOTAL = 40.5 ACRES



TREE CLEARING PLAN

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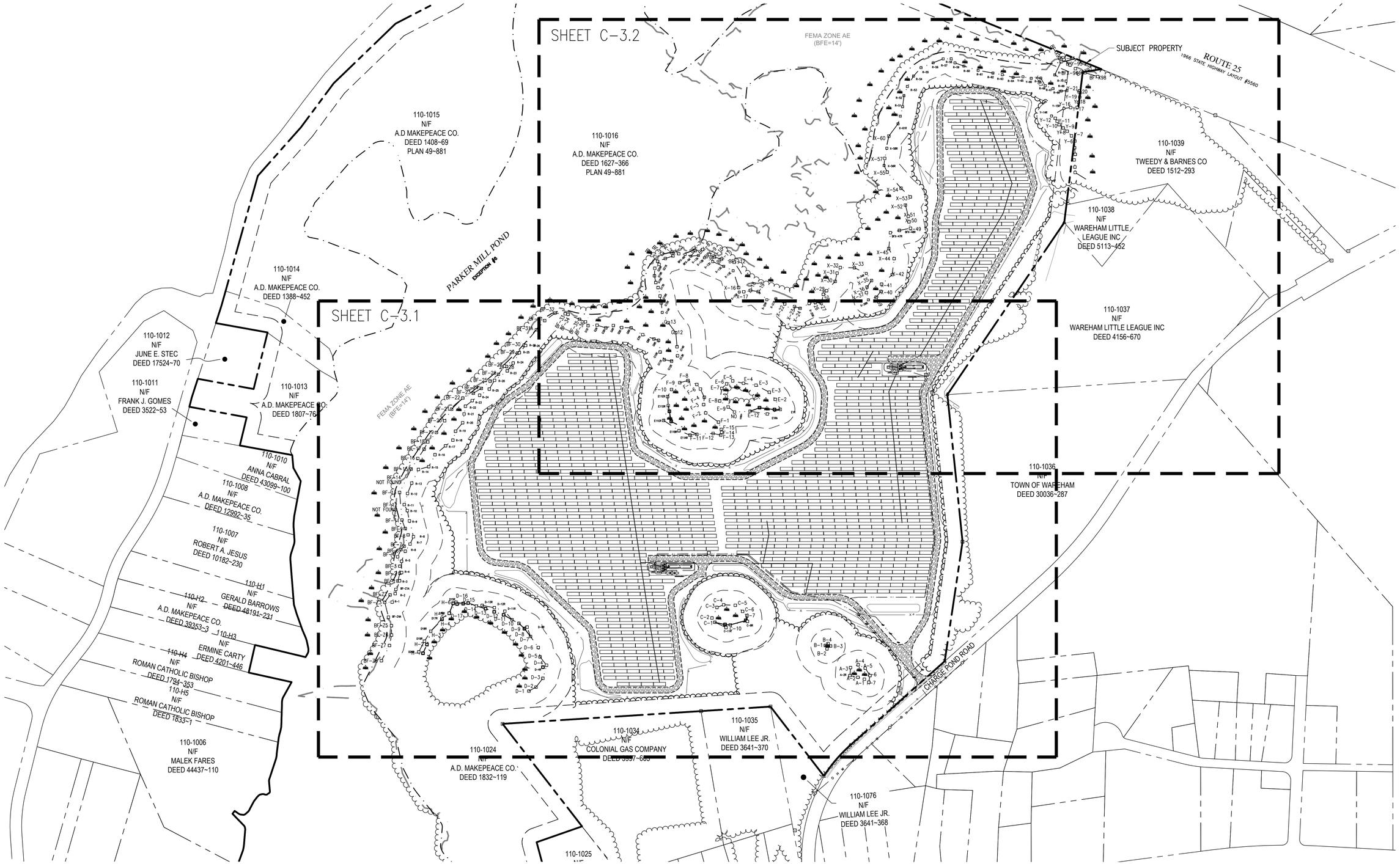
C-2.0
TREE CLEARING PLAN



LAYOUT AND MATERIALS PLAN

SCALE: 1" = 150'

0 150' 300'

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C-3.0
LAYOUT AND MATERIALS PLAN

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ZONING TABLE	
ZONING DISTRICT – RESIDENTIAL R-60 DISTRICT	
	NON RESIDENTIAL USE REQUIREMENTS
MINIMUM LOT AREA	130,680 SF
MINIMUM FRONTAGE	180 FT
MINIMUM FRONT SETBACK	50 FT
MINIMUM SIDE SETBACK	50 FT
MINIMUM REAR SETBACK	50 FT
MAXIMUM HEIGHT	35 FT
MAXIMUM BUILDING COVERAGE	–
MAXIMUM IMPERVIOUS SURFACE	–

LAYOUT AND MATERIALS PLAN - SOUTHWEST

SCALE: 1" = 80'

0 80' 160'

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C-3.1
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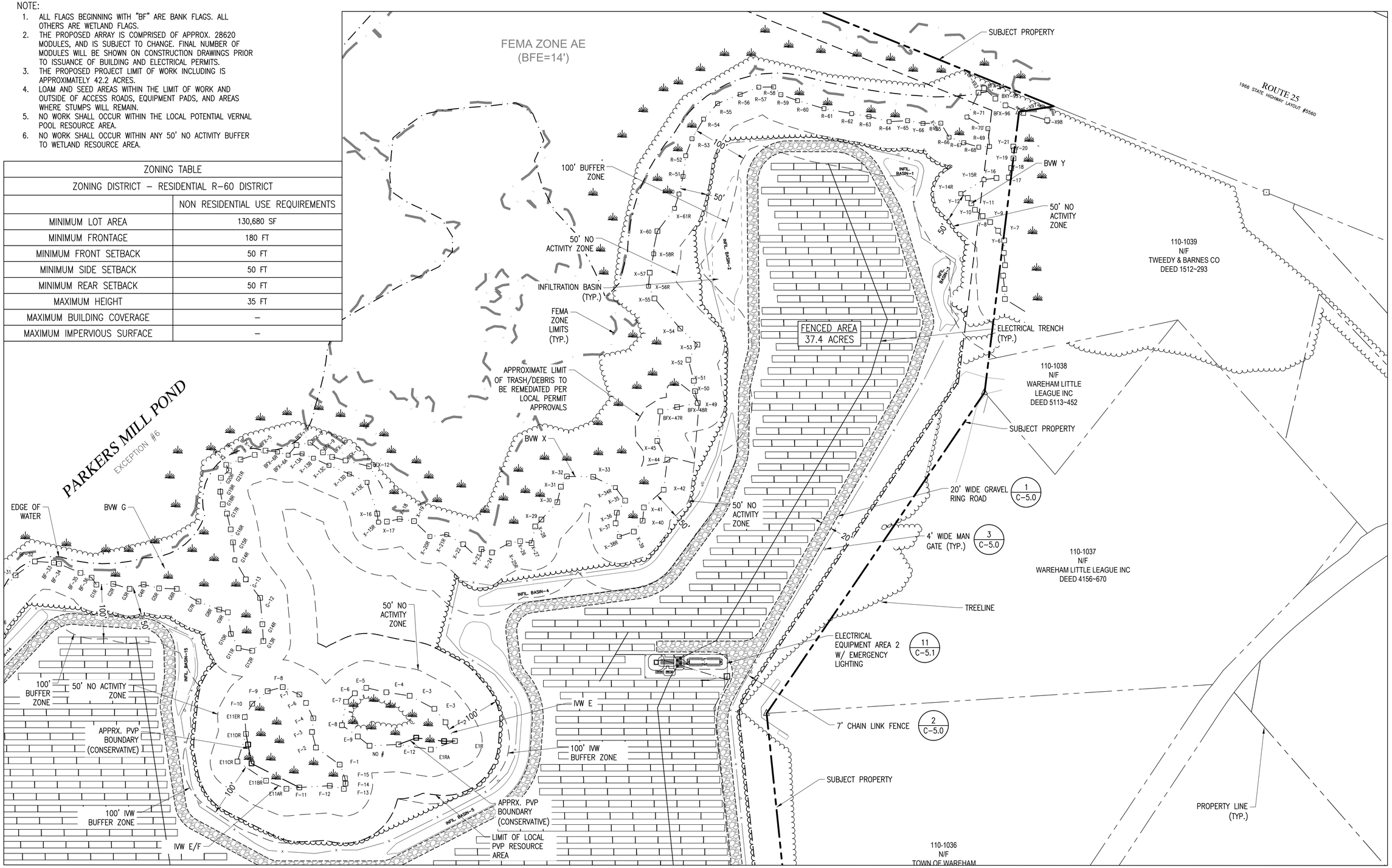

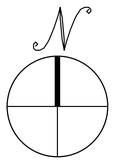

LAYOUT AND MATERIALS PLAN - NORTHEAST

SCALE: 1" = 80'

0 80' 160'

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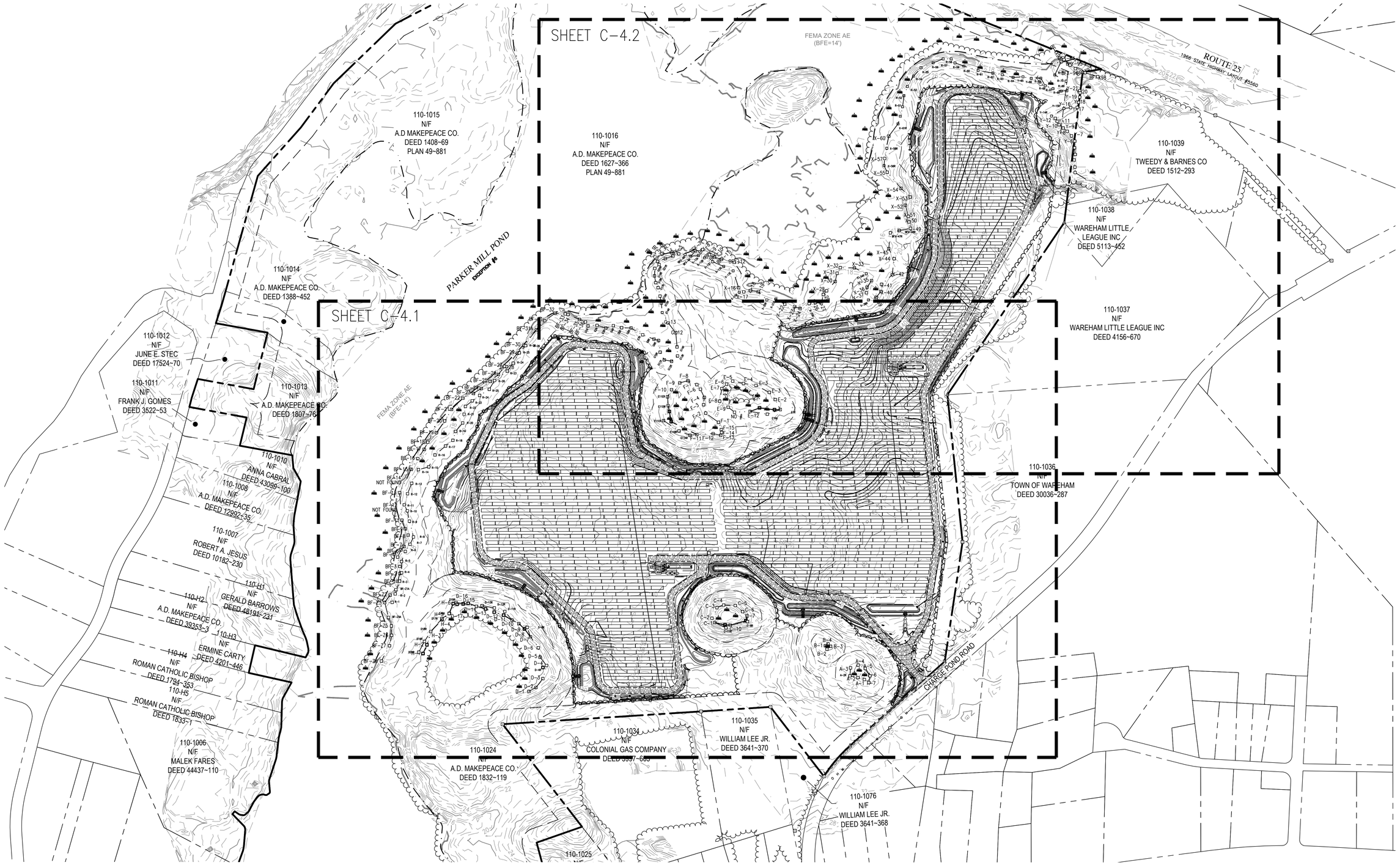
C-3.2
LAYOUT AND MATERIALS PLAN - NORTHEAST



GRADING AND EROSION CONTROL PLAN

SCALE: 1" = 150'

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C-4.0
GRADING AND EROSION CONTROL PLAN

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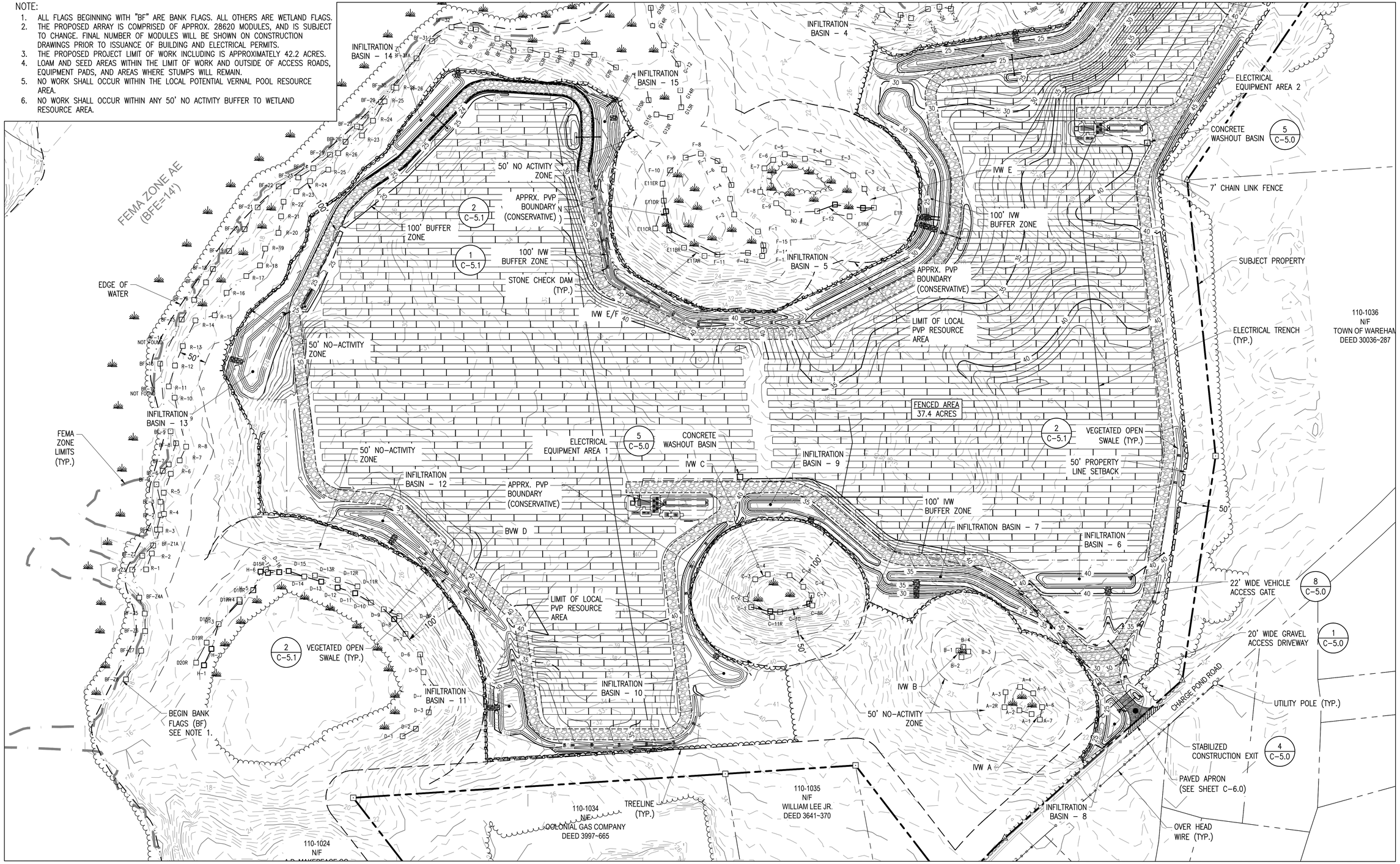

GRADING AND EROSION CONTROL PLAN - SOUTHWEST

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GRADING AND EROSION CONTROL PLAN - SOUTHWEST

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FEMA ZONE AE
(BFE=14')

SUBJECT PROPERTY

ROUTE 25
1966 STATE HIGHWAY LAYOUT #5560

110-1016
N/F
A.D. MAKEPEACE CO.
DEED 1627-366
PLAN 49-881

PARKERS MILL POND
EXCEPTION #6

FEMA ZONE LIMITS (TYP.)

INFILTRATION BASIN – 2

50' NO ACTIVITY ZONE

VEGETATED OPEN SWALE (TYP.)

2 C-5.1

RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

APPROXIMATE LIMIT OF TRASH/DEBRIS TO BE REMEDIATED PER LOCAL PERMIT APPROVALS

FENCED AREA
37.4 ACRES

INFILTRATION BASIN – 1

SILT SOCK (TYP.)

1 C-5.1

BVW Y

50' NO ACTIVITY ZONE

INFILTRATION BASIN – 3

110-1039
N/F
TWEEDY & BARNES CO
DEED 1512-293

110-1038
N/F
WAREHAM LITTLE LEAGUE INC
DEED 5113-452

RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

1 C-5.1

20' WIDE GRAVEL RING ROAD

1 C-5.0

BVW X

50' NO ACTIVITY ZONE

EDGE OF WATER

BVW G

INFILTRATION BASIN – 14

INFILTRATION BASIN – 4

50' NO ACTIVITY ZONE

110-1037
N/F
WAREHAM LITTLE LEAGUE INC
DEED 4156-670

SUBJECT PROPERTY

ELECTRICAL EQUIPMENT AREA 2

CONCRETE WASHOUT BASIN

5 C-5.0

INFILTRATION BASIN – 15

100' BUFFER ZONE

50' NO ACTIVITY ZONE

IVW E

100' IVW BUFFER ZONE

7' CHAIN LINK FENCE

2 C-5.0

APPRX. PVP BOUNDARY (CONSERVATIVE)

SUBJECT PROPERTY

1 C-5.1

RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

2 C-5.1

VEGETATED OPEN SWALE (TYP.)

IVW E/F

INFILTRATION BASIN – 5

APPRX. PVP BOUNDARY (CONSERVATIVE)

LIMIT OF LOCAL PVP RESOURCE AREA

PROPERTY LINE (TYP.)

110-1036
N/F
TOWN OF WAREHAM
DEED 30036-287

GRADING AND EROSION CONTROL PLAN - NORTHEAST

SCALE: 1" = 80'

0 80' 160'

BORREGO SOLAR
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER
9/16/2020

27 CHARGE POND RD
27 CHARGE POND ROAD, WAREHAM, MA 02571

PROJECT NUMBER: 905-2712

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	04/27/20	WS	CDS	PLAN SET CREATION
2	04/28/20	JPL	CDS	UPDATED TITLE PAGE
3	05/22/20	WS	CDS	UPDATED TO MATCH DESIGN CHANGES
4	05/28/20	WS	CDS	ISSUED FOR LOCAL PERMITTING
5	09/16/20	WS	JM	REVISIONS PER PEER REVIEW COMMENTS

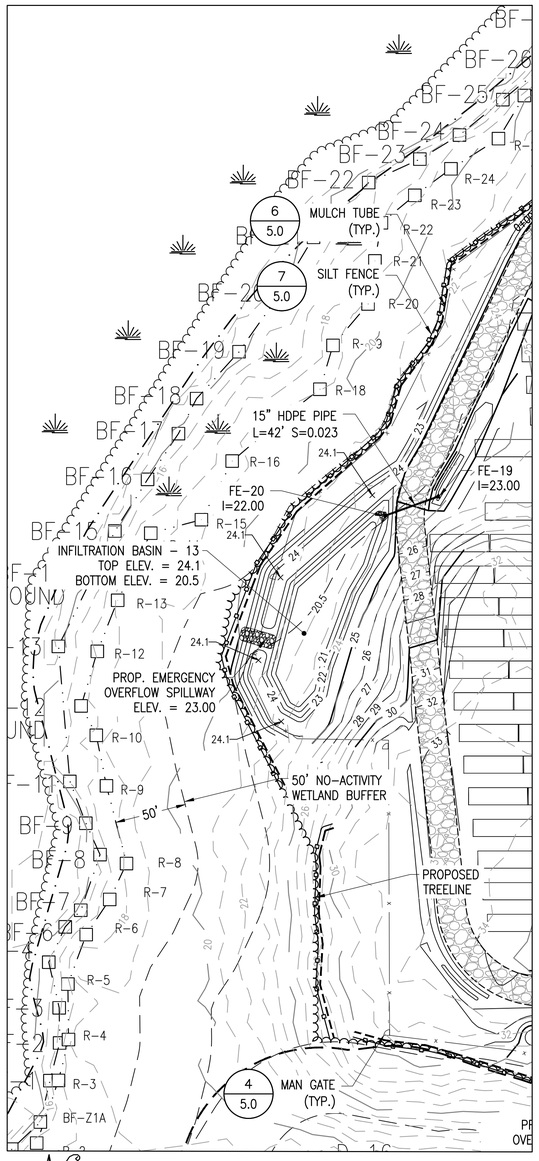
SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-4.2

GRADING AND EROSION CONTROL PLAN - NORTHEAST

NOTE:

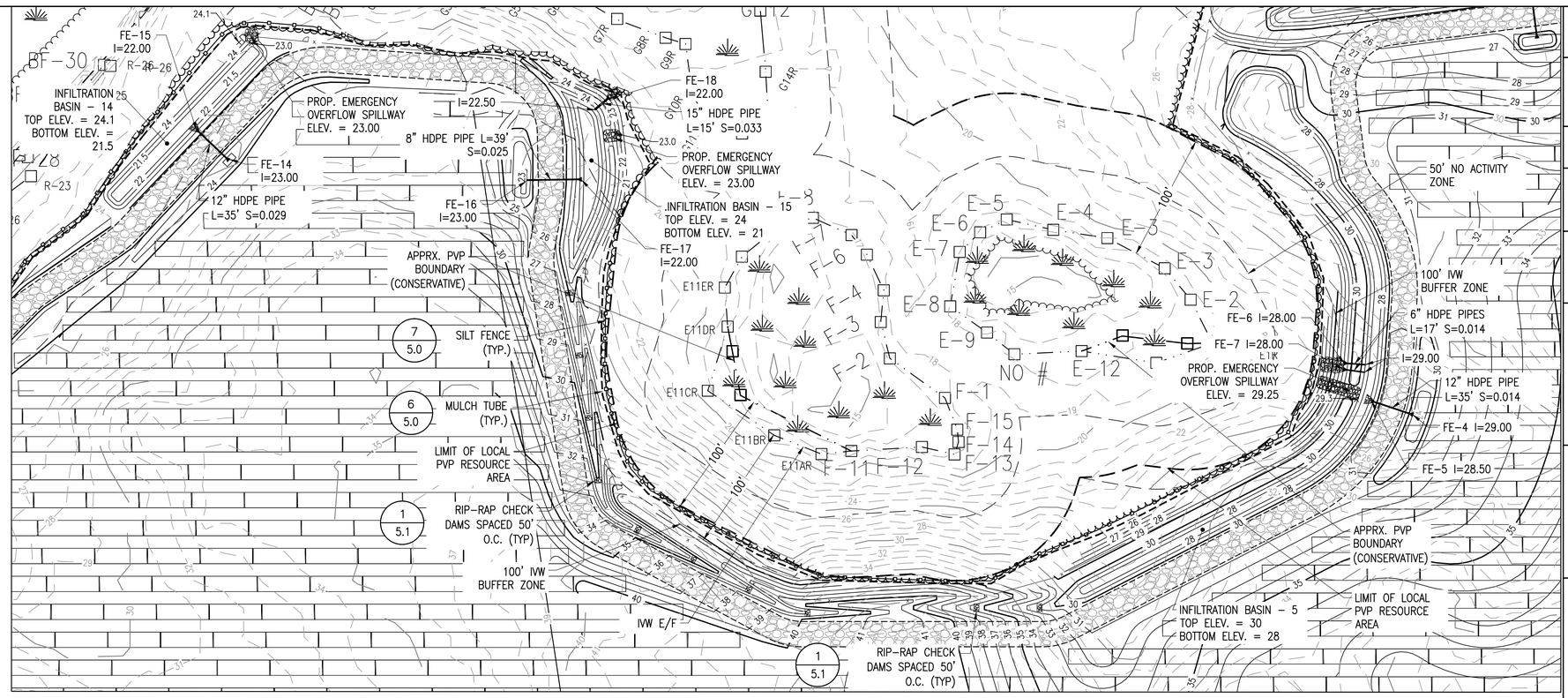
1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
2. THE PROPOSED ARRAY IS COMPRISED OF APPROX. 28620 MODULES, AND IS SUBJECT TO CHANGE. FINAL NUMBER OF MODULES WILL BE SHOWN ON CONSTRUCTION DRAWINGS PRIOR TO ISSUANCE OF BUILDING AND ELECTRICAL PERMITS.
3. THE PROPOSED PROJECT LIMIT OF WORK INCLUDING IS APPROXIMATELY 42.2 ACRES.
4. LOAM AND SEED AREAS WITHIN THE LIMIT OF WORK AND OUTSIDE OF ACCESS ROADS, EQUIPMENT PADS, AND AREAS WHERE STUMPS WILL REMAIN.
5. NO WORK SHALL OCCUR WITHIN THE LOCAL POTENTIAL VERNAL POOL RESOURCE AREA.
6. NO WORK SHALL OCCUR WITHIN ANY 50' NO ACTIVITY BUFFER TO WETLAND RESOURCE AREA.



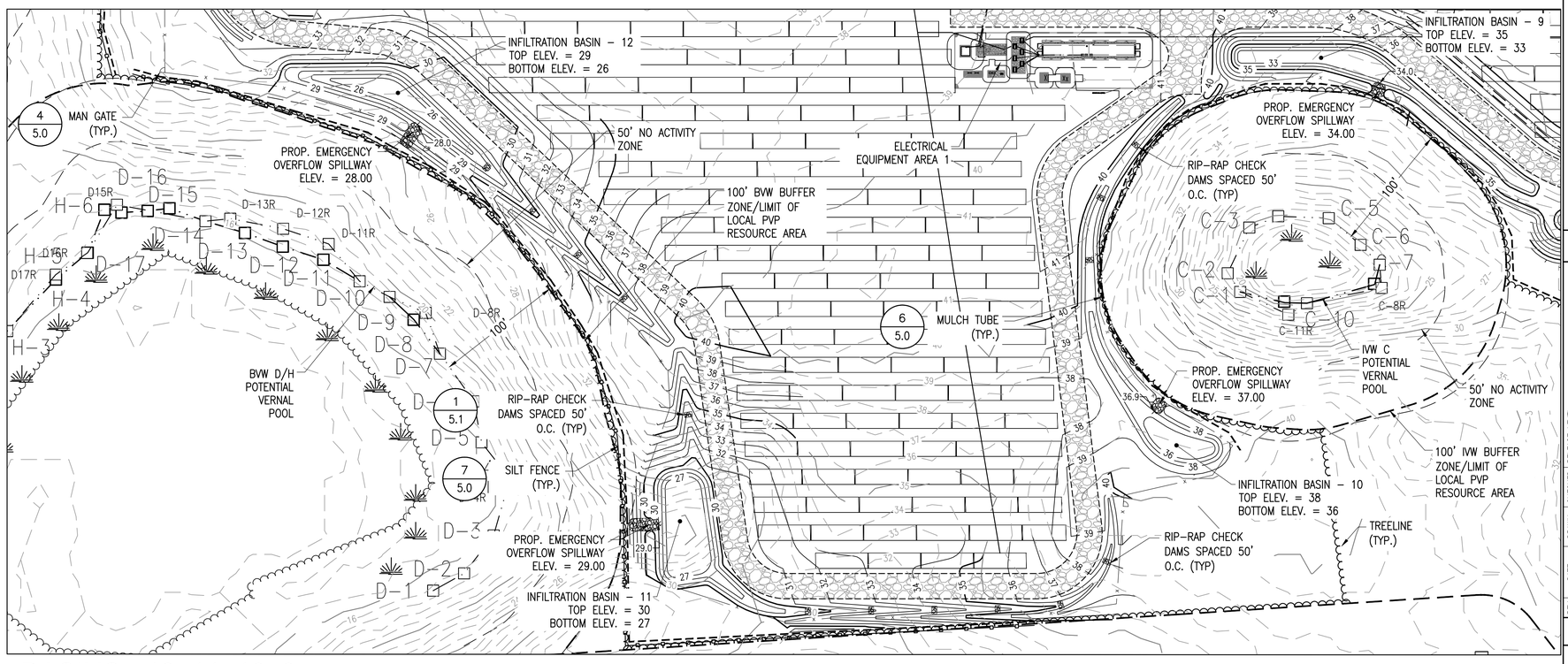
BASINS - 13

SCALE: 1" = 50'

0 50' 100'



BASINS - 14, 15



BASINS - 12, 11, 10, 9

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PROJECT NUMBER: 905-2712

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4	05/28/20	WS	CDS	ISSUED FOR LOCAL PERMITTING
5	09/16/20	WS	JM	REVISIONS PER PEER REVIEW COMMENTS

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ANSI D 24" X 36"

C-4.3

GRADING AND EROSION CONTROL PLAN - BASINS 9 - 16

NOTE:

1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
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4. LOAM AND SEED AREAS WITHIN THE LIMIT OF WORK AND OUTSIDE OF ACCESS ROADS, EQUIPMENT PADS, AND AREAS WHERE STUMPS WILL REMAIN.
5. NO WORK SHALL OCCUR WITHIN THE LOCAL POTENTIAL VERNAL POOL RESOURCE AREA.
6. NO WORK SHALL OCCUR WITHIN ANY 50' NO ACTIVITY BUFFER TO WETLAND RESOURCE AREA.

PROP. EMERGENCY OVERFLOW SPILLWAY ELEV. = 22.00

INFILTRATION BASIN – 1
TOP ELEV. = 23
BOTTOM ELEV. = 20

50' NO ACTIVITY ZONE

PROP. EMERGENCY OVERFLOW SPILLWAY ELEV. = 24.00

6 C-5.0 MULCH TUBE (TYP.)

BVW Y

1 C-5.1 RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

INFILTRATION BASIN – 2
TOP ELEV. = 25
BOTTOM ELEV. = 23

50' NO ACTIVITY ZONE

INFILTRATION BASIN – 3
TOP ELEV. = 31
BOTTOM ELEV. = 29

SILT FENCE (TYP.) 7 C-5.0

PROP. EMERGENCY OVERFLOW SPILLWAY ELEV. = 30.00

FEMA ZONE LIMITS (TYP.)

1 C-5.1 RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

APPROXIMATE LIMIT OF TRASH/DEBRIS TO BE REMEDIATED PER LOCAL PERMIT APPROVALS

1 C-5.1 RIP-RAP CHECK DAMS SPACED 50' O.C. (TYP)

FE-1 I=21.50

12" HDPE PIPE L=25' S=0.020

I=22.00

7 C-5.0 SILT FENCE (TYP.)

20' WIDE GRAVEL RING ROAD

1 C-5.0

PROP. EMERGENCY OVERFLOW SPILLWAY ELEV. = 24.00

INFILTRATION BASIN – 4
TOP ELEV. = 25
BOTTOM ELEV. = 21

8" HDPE PIPE L=40' S=0.038

FE-3 I=22.00

FE-2 I=23.50

GRAVEL

110-1038
N/F
WAREHAM LITTLE LEAGUE INC
DEED 5113~452

110-1037
N/F
WAREHAM LITTLE LEAGUE
DEED 4156~670

SUBJECT PROPERTY

GRADING AND EROSION CONTROL PLAN - BASINS 1, 2, 3, 4

SCALE: 1" = 50'

0 50' 100'

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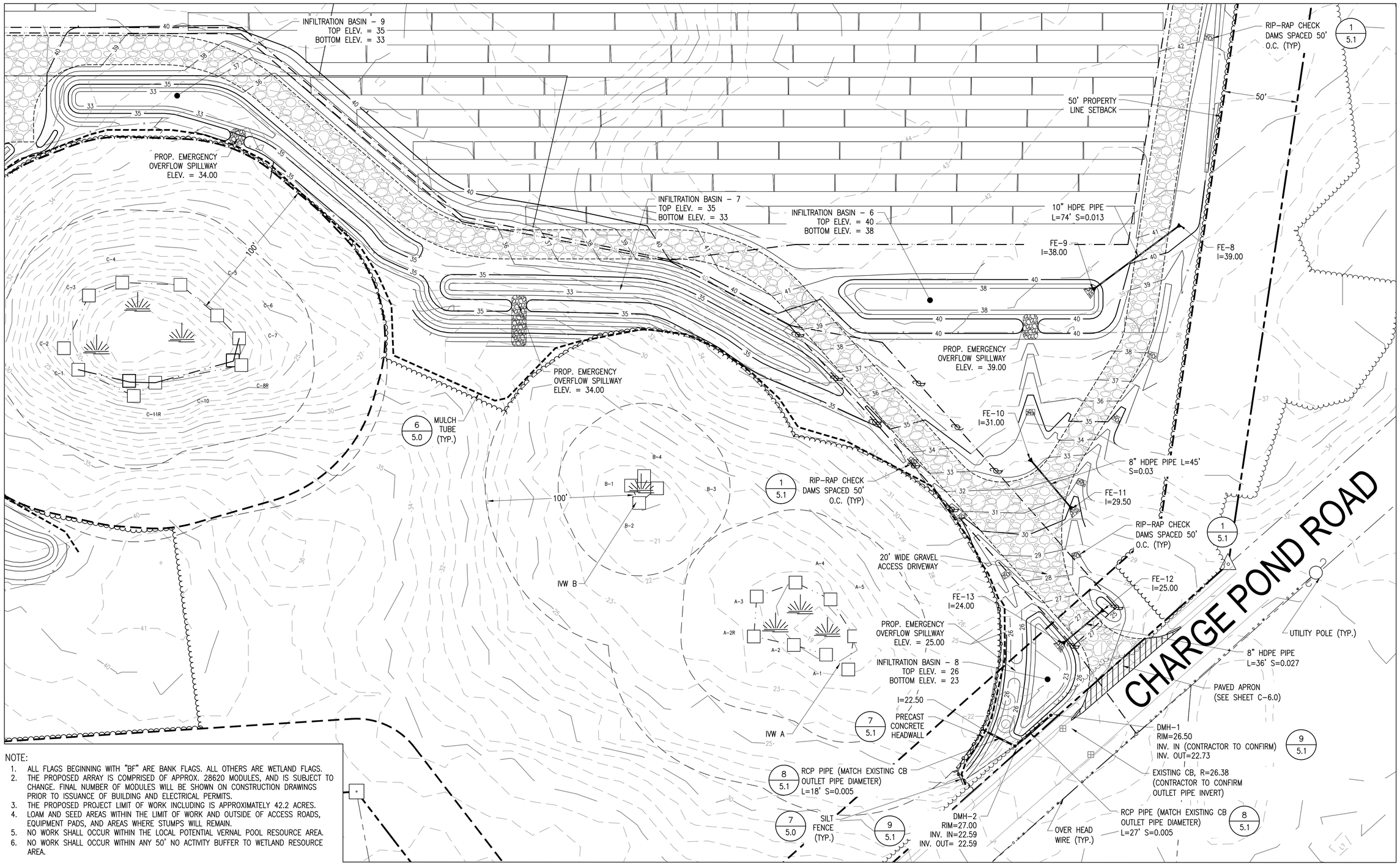
C-4.4

GRADING AND EROSION CONTROL PLAN - BASINS 1, 2, 3, 4



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GRADING AND EROSION CONTROL PLAN - BASINS 9, 7, 6, 8

SCALE: 1" = 30'

0 30' 60'

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9/16/2020

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27 CHARGE POND ROAD, WAREHAM, MA 02571

PROJECT NUMBER:
905–2712

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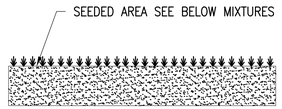
SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-4.5

GRADING AND EROSION CONTROL PLAN - BASINS 9, 7, 6, 8



ADM SANDY MIXTURE

CONTAINS	PURE SEED	GERM	ORIGIN
HARD FESCUE*	24.64%	85.00%	OREGON
PENNLAWN CREEPING RED FESCUE	24.61%	85.00%	OREGON
BOREAL CREEPING RED FESCUE	24.51%	85.00%	CANADA
AZURE SHEEPS FESCUE	24.50%	85.00%	OREGON
OTHER CROP SEEDS:	0.16%		
INERT MATTER:	1.49%		
WEED SEEDS:	0.09%		

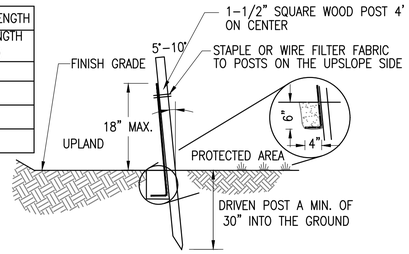
NOXIOUS WEED SEEDS NONE FOUND
* VARIETY NOT STATED

PROVIDED BY: VALLEY GREEN, 14 COPPERBEECH DR., KINGSTON, MA 02364

10 SEED DETAIL

SCALE: NTS

MAX ALLOWABLE SLOPE LENGTH	
STEEPNESS	MAX LENGTH (FT.)
2:1	25
3:1	50
4:1	75
5+:1	100

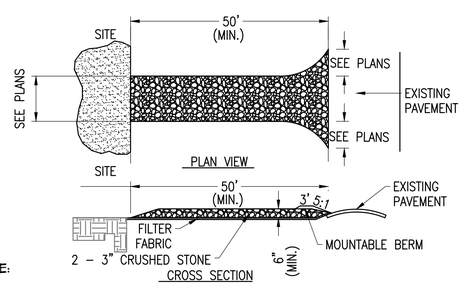


NOTES:

1. MAX DRAINAGE AREA FOR OVERLAND FLOW SHALL NOT EXCEED 1/4 ACRE-FOOT PER 100 FEET OF FENCE.
2. FILTER FABRIC TO BE FASTENED SECURELY TO FENCE POST WITH WIRE TIES OR STAPLES. POST SHALL BE STEEL EITHER "T" OR "U" SHAPED OR HARDWOOD.
3. FILTER CLOTH SHALL BE FASTENED SECURELY WITH TIES SPACED EVERY 24" AT TOP AND MID-SECTION.
4. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED. FILTER CLOTH SHALL BE FILTER X, MIRAFI 100X, STABILENKA T140N, OR APPROVED EQUAL.
5. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SEDIMENT FENCE.

7 SILT FENCE

SCALE: NTS
XD_CIVIL_EROSION_SILT FENCE_P 2014-10-17

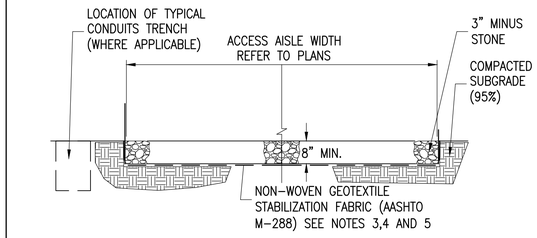


NOTE:

1. ENTRANCE WIDTH SHALL BE A TWENTY-FOUR (24) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.

4 STABILIZED CONSTRUCTION EXIT

SCALE: NTS
XD_CIVIL_TEMPORARY CONSTRUCTION_STABILIZED CONSTRUCTION EXIT 06-10-2016

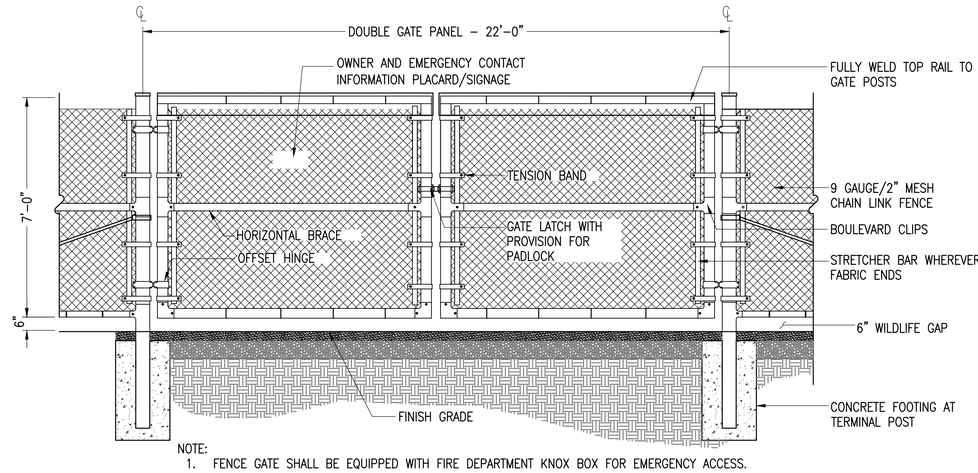


NOTES:

1. SUBCONTRACTOR SHALL EXCAVATE TO SUITABLE MATERIAL FOR SUBGRADE.
2. SUBCONTRACTOR SHALL COMPACT SUBGRADE TO PROVIDE SUITABLE SURFACE TO PLACE ROAD.
3. GEOTEXTILE FABRIC SHALL MEET THE FOLLOWING REQUIREMENTS:
   - TENSILE STRENGTH: 150 LB MIN.
   - ELONGATION: 50%
   - CBR PUNCTURE: 400 LB MIN.
   - MINIMUM WATER FLOW RATE: 120 GPM / FT²
4. SUBCONTRACTOR SHALL FOLLOW GEOTEXTILE FABRIC MANUFACTURER INSTALLATION PROCEDURES.
5. WHERE OVERLAPPING OF GEOTEXTILE FABRIC IS REQUIRED, SUBCONTRACTOR SHALL OVERLAP A MINIMUM OF 24".
6. SUBCONTRACTOR SHALL REMOVE TEMPORARY CONSTRUCTION ACCESS ROADS, AND RESTORE TO PRE-CONSTRUCTION CONDITIONS TO THE SATISFACTION OF THE CEOR AND THE GOVERNING AGENCIES.

1 GRAVEL ACCESS ROAD

SCALE: NTS
XD_CIVIL_GRAVEL_ROAD 07-24-2017

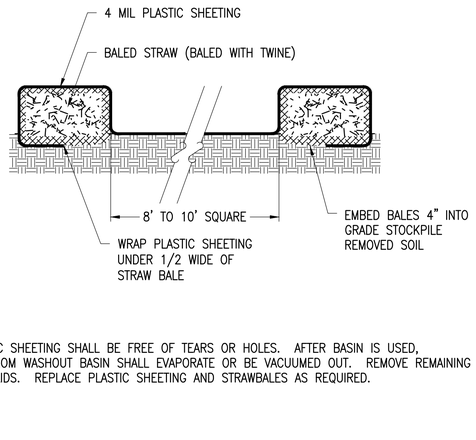


NOTE:

1. FENCE GATE SHALL BE EQUIPPED WITH FIRE DEPARTMENT KNOX BOX FOR EMERGENCY ACCESS.

8 VEHICLE GATE - WILDLIFE GAP

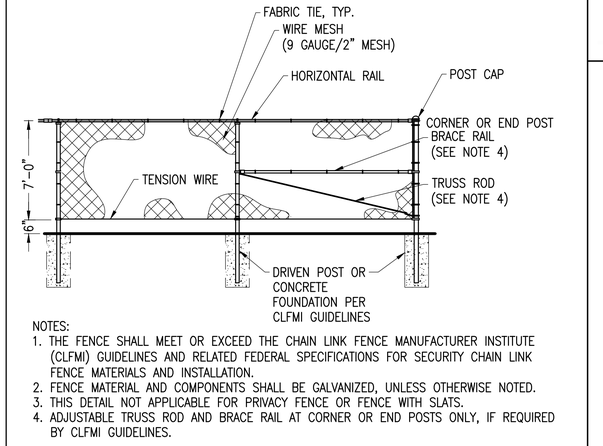
SCALE: NTS
XD_CIVIL_FENCE_VEHICLE GATE_3' 10-23-2018



NOTE: PLASTIC SHEETING SHALL BE FREE OF TEARS OR HOLES. AFTER BASIN IS USED, WASHWATER FROM WASHOUT BASIN SHALL EVAPORATE OR BE VACUUMED OUT. REMOVE REMAINING HARDENED SOLIDS. REPLACE PLASTIC SHEETING AND STRAWBALES AS REQUIRED.

5 CONCRETE WASHOUT BASINS

SCALE: NTS
XD_CIVIL_CONCRETE WASHOUT BASINS 07-24-2017



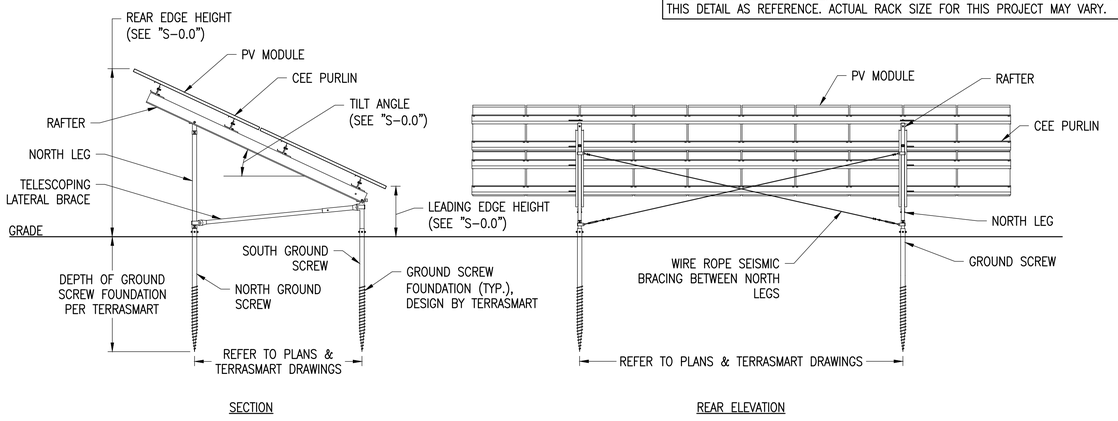
NOTES:

1. THE FENCE SHALL MEET OR EXCEED THE CHAIN LINK FENCE MANUFACTURER INSTITUTE (CLFMI) GUIDELINES AND RELATED FEDERAL SPECIFICATIONS FOR SECURITY CHAIN LINK FENCE MATERIALS AND INSTALLATION.
2. FENCE MATERIAL AND COMPONENTS SHALL BE GALVANIZED, UNLESS OTHERWISE NOTED.
3. THIS DETAIL NOT APPLICABLE FOR PRIVACY FENCE OR FENCE WITH SLATS.
4. ADJUSTABLE TRUSS ROD AND BRACE RAIL AT CORNER OR END POSTS ONLY, IF REQUIRED BY CLFMI GUIDELINES.

2 CHAIN LINK FENCE - WILDLIFE GAP

SCALE: NTS
XD_CIVIL_FENCE_7'_CHAIN_LINK_WILDLIFE_GAP 06-27-2016

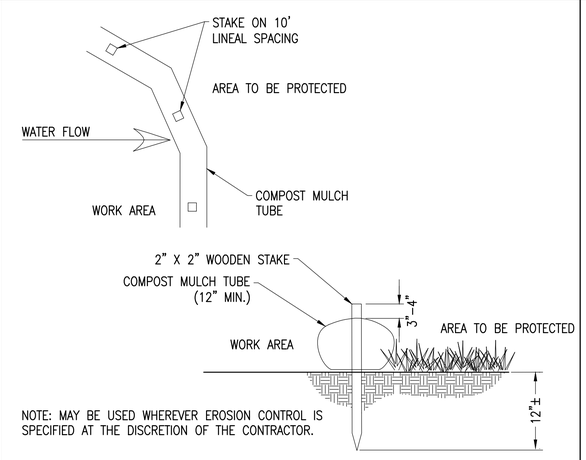
NOTE: THE "TERRAFARM" RACKING AND GROUND SCREW FOUNDATIONS ARE DESIGNED BY TERRASMART AND WILL BE A SUBMITTAL TO BORREGO. THE INFORMATION SHOWN HERE IS FOR GENERAL REFERENCE ONLY. 2x10 RACKING CONFIGURATION SHOWN IN THIS DETAIL AS REFERENCE. ACTUAL RACK SIZE FOR THIS PROJECT MAY VARY.



9 TYPICAL RACK SECTION & REAR ELEVATION

TERRASMART TF2P

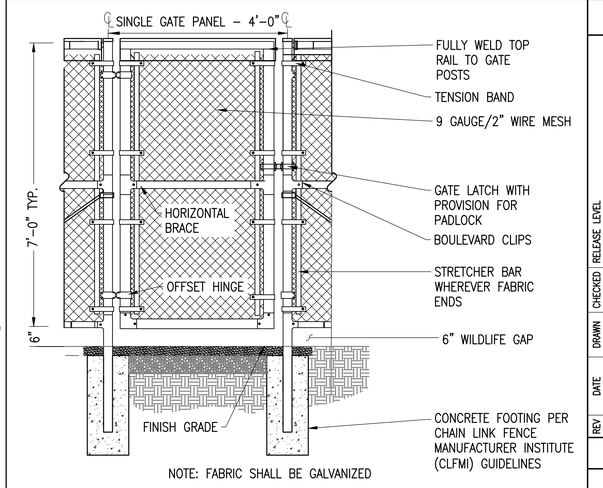
SCALE: NTS
XD_STRUC_TERRASMART_TF2P_RACK SECT & REAR ELEV 2017-12-04



NOTE: MAY BE USED WHEREVER EROSION CONTROL IS SPECIFIED AT THE DISCRETION OF THE CONTRACTOR.

6 MULCH TUBE

SCALE: NTS
XD_CIVIL_FILTREXX_FILTER_SOCK 03-29-2016



NOTE: FABRIC SHALL BE GALVANIZED

3 4' MAN GATE - WILDLIFE GAP

SCALE: NTS
XD_CIVIL_SITE CONSTRUCTION_4' WALK THROUGH GATE 07-25-2017

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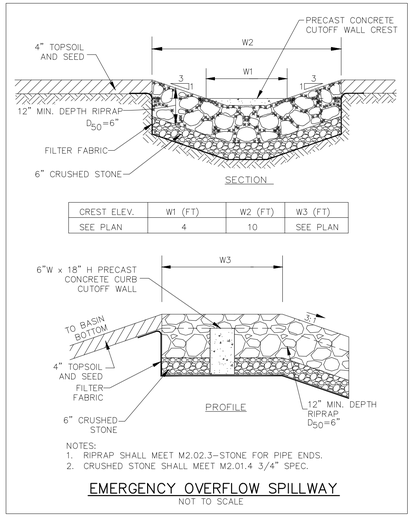
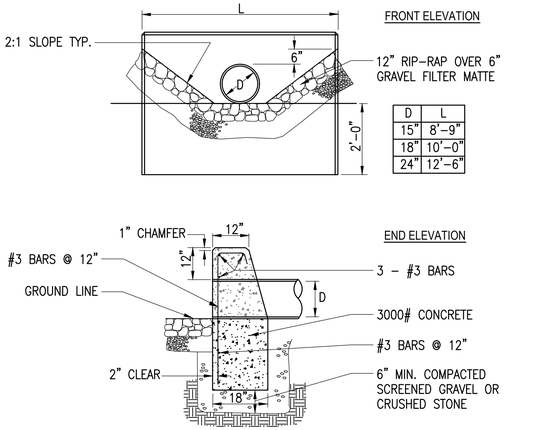
C-5.0
CIVIL DETAILS



CREST ELEV.	W1 (FT)	W2 (FT)	W3 (FT)
SEE PLAN	4	10	SEE PLAN

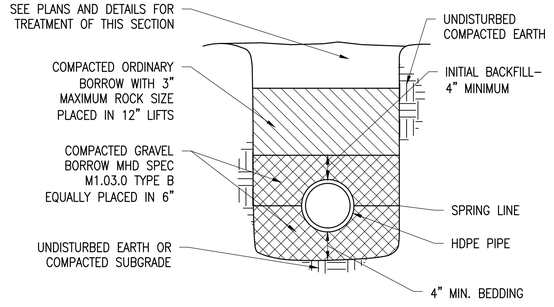
NOTES:
1. RIPRAP SHALL MEET M2.02.3–STONE FOR PIPE ENDS.
2. CRUSHED STONE SHALL MEET M2.01.4 3/4" SPEC.

10 EMERGENCY OVERFLOW SPILLWAY
NOT TO SCALE



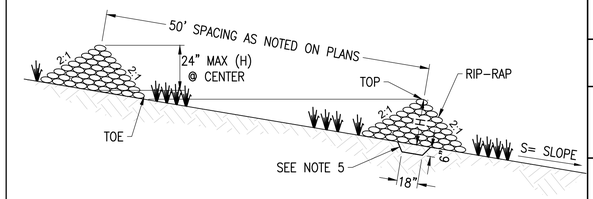
D	L
15"	8'–9"
18"	10'–0"
24"	12'–6"

7 HEADWALL
SCALE: NTS
2013–12–27



NOTES:
1. TRENCH EXCAVATION WIDTH TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.
2. ALL COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557 SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

5 HDPE DRAIN PIPE BEDDING
SCALE: NTS
XD_CIVIL_D_HDPE DRAIN PIPE BEDDING 06–28–2016



NOTES:
1. MAXIMUM DRAINAGE AREA ≤ 2 ACRES
2. USE 6" RIP–RAP
3. H=24" MAX @ CENTER
4. RIP–RAP SHALL BE PLACED ON A FILTER FABRIC FOUNDATION
5. INSTALL 6" DEEP CUT–OFF TRENCH BELOW
6. EXTEND THE STONE A MINIMUM OF 1.5' BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM

1 RIP-RAP CHECK DAM
SCALE: N.T.S.
XD_CIVIL_CHECK DAM 06–15–2016

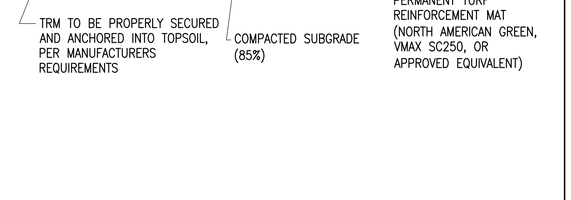
11 LIGHTING MOUNTING - DOWNLIGHT
SCALE: NTS
XD_ELEC_ LIGHT MOUNTING–DOWNLIGHT 2018–06–22 JPL

NOTES:
1. TRENCH EXCAVATION WIDTH TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.
2. ALL COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557 SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

8 REINFORCED CONCRETE DRAIN PIPE BEDDING
SCALE: NTS
XD_CIVIL_D_REINFORCED CONCRETE DRAIN PIPE BEDDING 06–28–2016

NOTES:
1. ALL RIP RAP DIMENSIONS SHALL BE AS NOTED ON GRAVEL AND DRAINAGE PLANS

4 FLARED END SECTION/RIP-RAP APRON
SCALE: NTS
XD_CIVIL_DRAINAGE_FLARED END SECTION RIP–RAP APRON 2016–08–15



2 VEGETATED OPEN SWALE
SCALE: NTS
XD_CIVIL_DRAINAGE_ROCK–LINED_SWALE 06–27–2016

NOTES:
1. EXCAVATION TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.
2. COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557 SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. PRECAST TO MEET OR EXCEED ASTM C–478 AND ASSHTO M 199 SPECIFICATIONS.
4. REINFORCED STEEL TO MEET OR EXCEED ASTM A185 AND H–20 LOADING REQUIREMENTS.
5. PRECAST CONCRETE TO BE 4,000 PSI MINIMUM AND MEET ASTM C–478 (6.1).
6. STEPS SHALL BE COPOLYMER POLYPROPYLENE COATED REINFORCED PER ASTM C–478 AND OSHA (STD 1–1.9).
7. CONTRACTOR TO CONFIRM WITH CITY OR TOWN DPW THAT BRICK INVERTS ARE NOT A REQUIREMENT.
8. FILL INTERNAL AND EXTERNAL HOLES WITH NON–SHRINK GROUT.

9 4' DIAMETER PRECAST CONCRETE DRAIN MANHOLE
SCALE: NTS
XD_CIVIL_DRAINAGE_4' I.D.DIAMETER PRECAST CONCRETE_DRAIN MANHOLE 03–10–2016

3 INFILTRATION BASIN AND POCKET POND OUTLET
SCALE: NTS
XD_CIVIL_DRAINAGE_DETENTION BASIN WITH RISER 08–16–2018

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55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898–6273
FAX: (888) 843–6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER
9/14/2020

27 CHARGE POND RD
27 CHARGE POND ROAD, WAREHAM, MA 02571

PROJECT NUMBER: 905–2712

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	04/27/20	WS	CDS	PLAN SET CREATION
2	04/28/20	JPL	CDS	UPDATED TITLE PAGE
3	05/22/20	WS	CDS	UPDATED TO MATCH DESIGN CHANGES
4	05/28/20	WS	CDS	ISSUED FOR LOCAL PERMITTING
5	09/16/20	WS	JM	REVISIONS PER PEER REVIEW COMMENTS

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-5.1
CIVIL DETAILS

POLE #6 CUSTOMER RISER POLE

POLE #5 CUSTOMER RECLOSER

POLE #10 ESS AUX RISER POLE

POLE #9 ESS AUX METER

POLE #8 ESS AUX DISCONNECT

POLE #4 CUSTOMER DISCONNECT

POLE #3 UTILITY METER

POLE #2 UTILITY RECLOSER

20' WIDE GRAVEL ACCESS DRIVEWAY

PROPERTY LINE SETBACK (TYP.)

50'

CHARGE POND ROAD

POLE #7 TURNING POLE

PROPOSED TREELINE

POLE #1 TURNING POLE

7 / C-5.0 SILT FENCE (TYP.)

SEE SHEET C-4.5 FOR STORMWATER AND FURTHER GRADING DETAILS

RAMP SIDEWALK DOWN TO BE FLUSH WITH PAVED APRON MAX SLOPE = 5%

CONSTRUCT BITUMINUS CONCRETE BERM (BCB) (BOTH SIDES) 2 / --

PAVED APRON FROM CURB CUT TO RIGHT OF WAY TO REMAIN POST CONSTRUCTION 1 / --

MAINTAIN EXISTING GUTTER LINE IN CHARGE POND ROAD

STABILIZED CONSTRUCTION EXIT TO BEGIN FOLLOWING PAVED APRON 4 / C-5.0

6 / C-5.0 MULCH TUBE (TYP.)

POI

RAMP SIDEWALK DOWN TO BE FLUSH WITH PAVED APRON MAX SLOPE = 5%

OVER HEAD WIRE (TYP.)

INSTALL FILTER BAG 3 / --

CHARGE POND ROAD

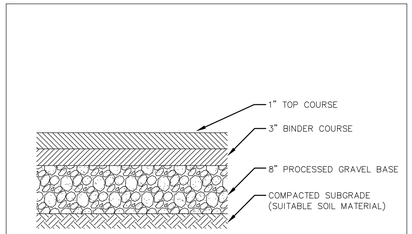
A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-2R

NOTE:
1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
2. THE PROPOSED ARRAY IS COMPRISED OF APPROX. 28620 MODULES, AND IS SUBJECT TO CHANGE. FINAL NUMBER OF MODULES WILL BE SHOWN ON CONSTRUCTION DRAWINGS PRIOR TO ISSUANCE OF BUILDING AND ELECTRICAL PERMITS.
3. THE PROPOSED PROJECT LIMIT OF WORK INCLUDING IS APPROXIMATELY 42.2 ACRES.
4. LOAM AND SEED AREAS WITHIN THE LIMIT OF WORK AND OUTSIDE OF ACCESS ROADS, EQUIPMENT PADS, AND AREAS WHERE STUMPS WILL REMAIN.
5. NO WORK SHALL OCCUR WITHIN THE LOCAL POTENTIAL VERNAL POOL RESOURCE AREA.
6. NO WORK SHALL OCCUR WITHIN ANY 50' NO ACTIVITY BUFFER TO WETLAND RESOURCE AREA.

SITE ACCESS AND INTERCONNECTION PLAN

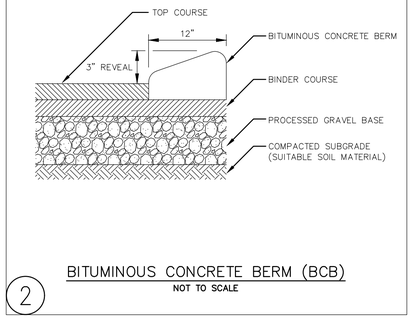
SCALE: 1" = 20'

0 20' 40'

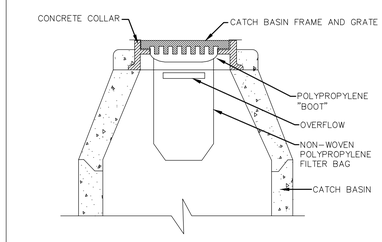


1. PROCESSED GRAVEL BASE SHALL BE MEET MASSDOT M1.03.1 SPEC. OR APPROVED EQUAL.
2. CONTRACTOR TO REGRADE/ADD GRAVEL BASE TO ENSURE A MINIMUM OF 8" FOR PROPER DRAINAGE.SUPPLEMENT OR REHAB EXISTING GRAVEL AS NEEDED TO ACHIEVE MINIMUM DEPTH.
3. COMPACT SUBGRADE TO MINIMUM 95% COMPACTION.

1 BITUMINOUS CONCRETE PAVEMENT
NOT TO SCALE



2 BITUMINOUS CONCRETE BERM (BCB)
NOT TO SCALE



NOTES:
1. TO BE INSTALLED IN CATCH BASINS IN TRAFFIC AREAS UNTIL COMPLETION OF CONSTRUCTION.
2. BOOT ADAPTER MAY BE TRIMMED TO SIZE.
3. CONTRACTOR SHALL CLEAN ACCUMULATED SEDIMENT AND DEBRIS FROM EXISTING CATCH BASIN AND DISPOSE OF LEGALLY OFF-SITE.

3 FILTER BAG
NOT TO SCALE

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SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-6.0
SITE ACCESS AND INTERCONNECTION PLAN

Stormwater Management Report

27 Charge Pond Road PV+ES Project

27 Charge Pond Road
Wareham, Massachusetts

Prepared for:

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, MA 01851

Prepared by:

BEALS + THOMAS
BEALS AND THOMAS, INC.
32 Court Street
Plymouth, MA 02360

September 15, 2020

Calculated by: **Elizabeth A. Ennis, PE**

Checked by: **Jeffrey R. Murphy, PE**

Approved by:

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER

9/15/20

Jeffrey R. Murphy, PE

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 INTRODUCTION

The proposed project includes a stormwater management system designed to mitigate potential impacts the proposed project could have on the existing watershed. Stormwater controls are proposed to control peak runoff rates, provide water quality, promote groundwater recharge and sediment removal. The proposed system has been designed to comply with:

- The 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Handbook,
- The Massachusetts Wetland Protection Act (310 CMR 10.00), and
- Town of Wareham Zoning Bylaw
- Town of Wareham Wetland Protective Bylaw

The pre- and post-development hydrologic conditions were modeled using HydroCAD™ version 10.00 to demonstrate that post-development stormwater runoff rates will be less than or equal to the pre-development rates. Watershed maps with soil types as well as detailed analysis of the model results are also included. The following table summarizes the peak runoff rates for the pre- and post-development conditions.

Table 1: Pre- & Post-development Peak Runoff Rate Comparison, units are in cubic feet per second (cfs).

Storm Event	2 Year		10 Year		100 Year	
	Pre	Post	*Pre*	Post	*Pre*	Post
Design Point 1	*0.00*	0.00	*0.51*	0.41	*8.64*	5.98
Design Point 2	*0.00*	0.00	*0.00*	0.00	*0.08*	0.04
Design Point 3	*0.00*	0.00	*0.00*	0.00	*0.09*	0.08
Design Point 4	*0.00*	0.00	*0.00*	0.00	*0.18*	0.11
Design Point 5	*0.00*	0.00	*0.00*	0.00	*0.09*	0.06
Design Point 6	*0.00*	0.00	*0.00*	0.00	*0.33*	0.33
Design Point 7	*0.00*	0.00	*0.00*	0.00	*0.08*	0.06

2.0 PRE-DEVELOPMENT CONDITIONS

2.1 Site Conditions

The existing site is generally forested and undeveloped, although a previously cleared/disturbed area, is located in the northeastern portion of the Site. According to the Wareham Assessor's Office, the Property is comprised of two discontinuous areas lying east and west of Parker Mills Pond. The area of the proposed array (the Site), which consists of forested uplands typical of this region, is located east of Parker Mills Pond. The Site can be accessed via Charge Pond Road, an existing public way.

The general topography of the Site slopes east to west with exceptions in the form of isolated depressions throughout, some of which house wetland resource areas. The primary design point, DP-1, used for the stormwater analysis represents flows to Parker Mills Pond. Additional design points include DP-2, which represents flows to the south to an adjacent property containing a natural gas distribution facility. DP-3, 4, 5, and 6 consider flows to existing depressions that contain resource areas. DP-7 represents flows to the east onto a Town owned parcel with ball fields.

The site does not contain, nor is it tributary to any Critical Areas.

The site does not discharge to a surface water with a TMDL or draft TMDL.

2.2 Soil Description

The Natural Resources Conservation Service (NRCS) lists the on-site soils types as predominantly hydrologic soil class A. These soil groups include Windsor loamy sand, Deerfield loamy fine sand, and Udipsamments. Another area partially on site but mostly in the Town's ball fields, is mapped as Udorthents, refuse substratum, which is considered hydrologic soil class B. Finally, a small area of hydrologic soil class D soils is present at the southwestern corner of the proposed project locus, which is mapped as Scarboro muck, coastal lowland.

Windsor loamy sand is an excessively drained soil comprised of loose sandy glaciofluvial deposits. Generally, this soil is in outwash plains, dunes and terrace landforms, and has a loamy sand top and subsoil layer over top of sand. Deerfield loamy sand is a moderately well drained soil that is characterized by sandy outwash deposits. Udorthents, refuse substratum is filled loamy land over man made land. Udipsamments are areas of sandy human transported material over gravelly glaciofluvial deposits. Scarboro muck is poorly drained soil found in outwash terrace depressions and drainage ways.

2.3 Hydrologic Analysis

Sub-catchment areas were delineated based on existing runoff patterns and topographic information. This information is shown on the *Pre-Development Conditions Hydrologic Areas Map* included in Attachment 2. Summaries of each area with respect to Curve

Number and Time of Concentration calculations can be found in the model results also in Attachment 2.

3.0 POST-DEVELOPMENT CONDITIONS

3.1 Design Strategy

During the design phase of the site layout, consideration was given to conserving environmentally sensitive features and minimizing impact on the existing hydrology. To achieve this, the proposed grading endeavored to match the existing drainage patterns where feasible.

Wetlands in the vicinity of the site were excluded from the development envelope and will not be altered by the proposed project. The hydrology analysis considers these wetlands in order to maintain their existing hydrology.

The proposed solar panels are raised above the ground with the leading edge tilted to the south. Stormwater that lands on the panels will sheet down off the front edge to the pervious sandy ground below, which will be vegetated with an herbaceous seed mix.

There will be several concrete pads associated with the utility equipment that will produce a negligible amount of runoff which will flow to adjacent pervious soils. These have been accounted for in the stormwater design and analysis.

3.2 Hydrologic Analysis Methodology

The established design points used in the pre-development conditions analysis were used in the post-development analysis for direct comparison. The tributary areas and flow paths were modified to reflect post-development conditions. See Attachment 3 for the *Post-Development Conditions Hydrologic Areas Map*. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results in Attachment 3.

3.3 Compliance with MassDEP Stormwater Management Standards

The proposed stormwater management system was designed in compliance with the ten (10) MassDEP Stormwater Management Standards. The following summary provides key information related to the design approach and mitigation measures for stormwater.

STANDARD 1: **No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

There will be no direct discharge of untreated stormwater from the site. Erosion control barriers will be installed as depicted on the plans and will remain in place throughout construction and until the site is stabilized with vegetation.

STANDARD 2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

The proposed stormwater management system will effectively maintain the post-development peak discharge rates for the 2-, 10-, and 100-year, 24-hour storms. Refer to Section 1.0 Introduction for a summary of the peak runoff rates.

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

The proposed solar panels, while covering a large footprint, will allow water to sheet flow to the ground below where it can be absorbed into the sandy on-site soils. Other minimal areas of impervious (i.e. concrete pads) as well as the proposed changes in vegetative cover have been accounted for in the design. Proposed infiltration basins will provide the required recharge based on the footprint of the impervious concrete pads. Therefore, recharge of groundwater will be maintained under the post-development condition.

STANDARD 4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).**

The proposed project does not include any proposed impervious surfaces requiring treatment for water quality. Therefore, the 80% TSS removal requirement does not apply.

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

The proposed project is not associated with stormwater discharges from land uses with higher potential pollutant loads.

STANDARD 6: **Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters, shellfish beds, swimming beaches, coldwater fisheries and recharge areas for public water supplies.**

There are no stormwater discharges to critical areas associated with this project.

STANDARD 7: **Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.**

The proposed project is new development, and therefore this standard does not apply.

STANDARD 8: **A plan to control construction-related impacts during erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.**

Since the project will disturb greater than 1 acre, a DRAFT Stormwater Pollution Prevention Plan (SWPPP) has been developed and is included in Attachment 5. The SWPPP will be finalized prior to construction to comply with Section 3 of the NPDES Construction General Permit for Stormwater Discharges; therefore the requirements of Standard 8 are fulfilled.

STANDARD 9: A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 MassDEP Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements associated with the proposed development.

STANDARD 10: All illicit discharges to the stormwater management system are prohibited.

There will be no illicit discharges to the proposed stormwater management system associated with the proposed project. An Illicit Discharge Compliance Statement is provided on the following page.

3.5 Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a stormwater management system that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. A Site Owner's Manual is included, which contains the Long Term Pollution Prevention Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Signature: _____

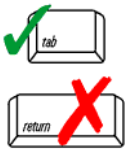
Owner's Name

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Jeffrey R Murphy 9/15/20
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

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

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

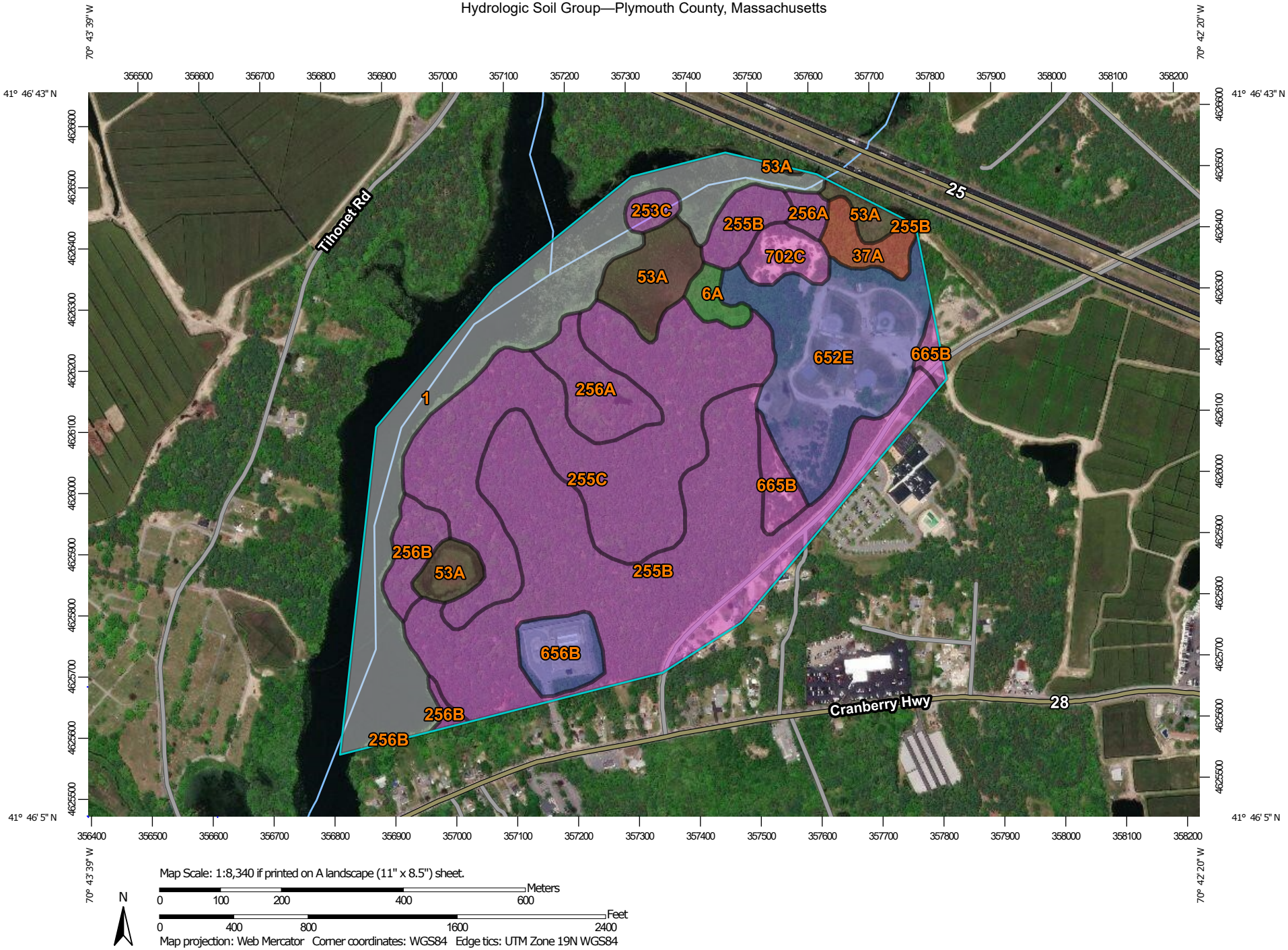
Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

Attachment 1
Soil Data


70° 43' 39" W
70° 42' 20" W
41° 46' 43" N
41° 46' 5" N
356500
356600
356700
356800
356900
357000
357100
357200
357300
357400
357500
357600
357700
357800
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358000
358100
358200
4626600
4626500
4626400
4626300
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4626100
4626000
4625900
4625800
4625700
4625600
4625500
53A
25
Tihonet Rd
253C
255B
256A
53A
255B
702C
37A
53A
6A
652E
665B
1
256A
255C
665B
256B
53A
255B
656B
256B
256B
Cranberry Hwy
28
356400
Map Scale: 1:8,340 if printed on A landscape (11" x 8.5") sheet.
N
0
100
200
400
600
Meters
0
400
800
1600
2400
Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

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: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

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

Date(s) aerial images were photographed: Dec 31, 2009—Jul 3, 2017

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
1	Water		26.3	17.2%
6A	Scarboro muck, coastal lowland, 0 to 3 percent slopes	A/D	1.5	1.0%
37A	Massasoit - Mashpee complex, 0 to 3 percent slopes	D	2.6	1.7%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	8.3	5.4%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	1.2	0.8%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	43.5	28.5%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	31.8	20.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	6.0	3.9%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	3.4	2.2%
652E	Udorthents, refuse substratum, 8 to 35 percent slopes	B	18.9	12.4%
656B	Udorthents - Urban land complex, 0 to 8 percent slopes	B	3.8	2.5%
665B	Udipsamments, 0 to 8 percent slopes	A	2.8	1.8%
702C	Udipsamments, 8 to 15 percent slopes	A	2.7	1.7%
Totals for Area of Interest			**152.8**	**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

Plymouth County, Massachusetts

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

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor, Loamy Sand

Setting

Landform: Deltas, outwash plains, dunes, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hinckley, loamy sand
Percent of map unit: 10 percent
Landform: Deltas, outwash plains, kames, eskers
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand
Percent of map unit: 5 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

Plymouth County, Massachusetts

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

Map Unit Setting

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

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Kame terraces, outwash plains, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Concave, linear, convex
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

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

Properties and qualities

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

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

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

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

Ninigret
Percent of map unit: 1 percent
Landform: Outwash terraces, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

Plymouth County, Massachusetts

652E—Udorthents, refuse substratum, 8 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2pr8l
Elevation: 0 to 390 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, refuse substratum, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Refuse Substratum

Setting

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Excavated and filled loamy land over made land, refuse

Typical profile

^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 80 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 20 to 39 inches to manufactured layer
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.01 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Udorthents, loamy

Percent of map unit: 5 percent
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

Plymouth County, Massachusetts

6A—Scarboro muck, coastal lowland, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkw
Elevation: 0 to 650 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Scarboro, Coastal Lowland

Setting

Landform: Outwash deltas, depressions, drainageways, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Sandy glaciofluvial deposits derived from schist and/or gneiss and/or granite

Typical profile

Oa - 0 to 8 inches: muck
A - 8 to 14 inches: mucky fine sandy loam
Cg1 - 14 to 22 inches: sand
Cg2 - 22 to 65 inches: gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Swansea
Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Mashpee
Percent of map unit: 5 percent
Landform: Depressions, drainageways, terraces
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

Plymouth County, Massachusetts

665B—Udipsamments, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2pr8k
Elevation: 0 to 390 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udipsamments

Setting

Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile

^Ap - 0 to 9 inches: loamy sand
C1 - 9 to 22 inches: sand
C2 - 22 to 49 inches: coarse sand
C3 - 49 to 54 inches: sand
C4 - 54 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Udipsamments, wet substratum
Percent of map unit: 10 percent
Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

Udorthents, loamy
Percent of map unit: 5 percent
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tihonet
Percent of map unit: 5 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 12, Sep 12, 2019

Attachment 2
Pre-Development Hydrologic Analysis

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

1833.109
Wareham, MA

CLIENT/PROJECT:

Borrego Solar Systems, Inc.
27 Charge Pond Road PV+ES Project

SUBJECT/TITLE:

Pre-Development Hydrologic Calculations

OBJECTIVE OF CALCULATION:

- To determine the pre-development peak rates of runoff from the site for the 2, 10, & 100-year storm events at design points DP-1 through 7.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- Autodesk Civil 3D 2019 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.

ASSUMPTIONS:

- The ground cover types were determined using MassGIS aerial imagery and hydrologic soil groups based on United States Department of Agriculture, NRCS Soil Survey map information.
- Watershed boundaries have been estimated based upon contour information depicted on the Existing Conditions Plan as well as MassGIS contours in offsite areas outside limits of those shown on the existing conditions plan.
- Wetland systems that were included in the hydrologic analysis were modeled as Woods, Good.

SOURCES OF DATA/EQUATIONS:

- Pre-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 1833109P600A-001.
- NRCS Soil Survey for Plymouth County, hydrologic soil group report, downloaded from Web Soil Survey on 4/15/2020 and 5/21/2020.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020

B E A L S + T H O M A S
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

T 508.366.0560
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www.bealsandthomas.com
Regional Office: Plymouth, MA

CONCLUSIONS:

Storm Event	2-Year	10-Year	100-Year
DP-1 (cfs)	0.00	0.51	8.64
DP-2 (cfs)	0.00	0.00	0.08
DP-3 (cfs)	0.00	0.00	0.09
DP-4 (cfs)	0.00	0.00	0.18
DP-5 (cfs)	0.00	0.00	0.09
DP-6 (cfs)	0.00	0.00	0.33
DP-7 (cfs)	0.00	0.00	0.08

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020

Pre-Development Conditions Hydrologic Areas Map

Figure Number 001

~~Scale: 1" = 150'~~

Date: 05/22/2020

Plan 1833109P600A-001

B+T Project No. 1833.109

27 Charge Pond Road PV+ES Project

Wareham, Massachusetts

Borrego Solar Systems, Inc.

55 Technology Drive, Suite 102

Lowell, Massachusetts

North Arrow

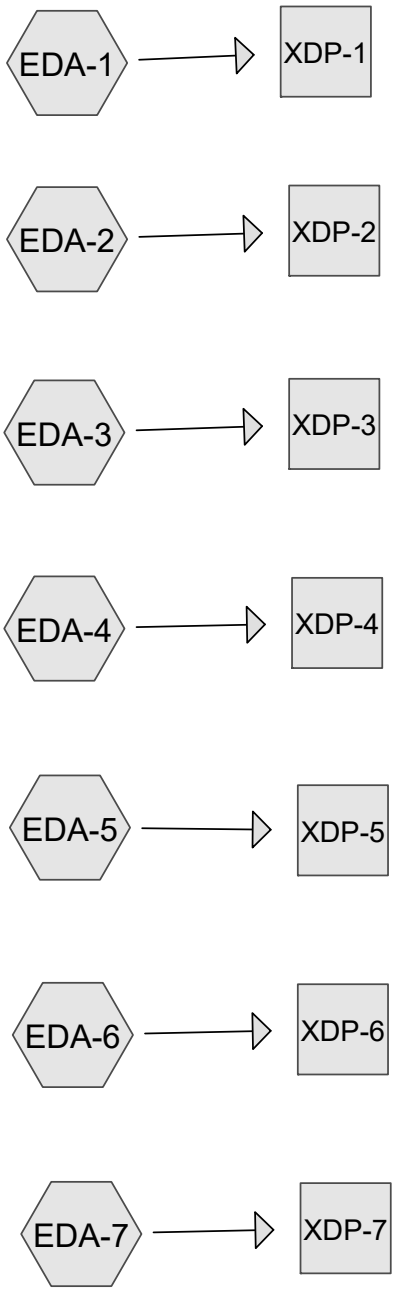
NORTH

DRAINAGE AREA

Tc PATH

BEALS AND THOMAS, INC.

Pre-Development
Conditions Hydrology



Subcat Reach Pond Link

Routing Diagram for 1833109HC001
Prepared by Beals and Thomas, Inc., Printed 5/23/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.998	39	>75% Grass cover, Good, HSG A (EDA-1, EDA-4, EDA-6, EDA-7)
3.732	61	>75% Grass cover, Good, HSG B (EDA-1, EDA-7)
0.413	96	Gravel surface, HSG B (EDA-1)
0.004	98	Roofs, HSG A (EDA-7)
0.049	98	Roofs, HSG B (EDA-1)
60.944	30	Woods, Good, HSG A (EDA-1, EDA-2, EDA-3, EDA-4, EDA-5, EDA-6, EDA-7)
2.936	55	Woods, Good, HSG B (EDA-1)
0.998	77	Woods, Good, HSG D (EDA-1)
71.074	**34**	**TOTAL AREA**

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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: Runoff Area=42.429 ac 0.12% Impervious Runoff Depth=0.00"
Flow Length=1,024' Tc=32.1 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-2: Runoff Area=2.708 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=442' Tc=17.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-3: Runoff Area=3.078 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=290' Tc=12.4 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-4: Runoff Area=6.130 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=367' Tc=14.6 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-5: Runoff Area=3.277 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=303' Tc=13.9 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-6: Runoff Area=11.348 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=782' Tc=24.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-7: Runoff Area=2.104 ac 0.19% Impervious Runoff Depth=0.00"
Flow Length=382' Tc=17.8 min CN=31 Runoff=0.00 cfs 0.000 af

Reach XDP-1: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-2: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-3: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-4: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-5: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-6: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-7: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 71.074 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
99.93% Pervious = 71.021 ac 0.07% Impervious = 0.053 ac

Summary for Subcatchment EDA-1:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
32.524	30	Woods, Good, HSG A
2.936	55	Woods, Good, HSG B
0.998	77	Woods, Good, HSG D
1.793	39	>75% Grass cover, Good, HSG A
3.716	61	>75% Grass cover, Good, HSG B
0.413	96	Gravel surface, HSG B
0.049	98	Roofs, HSG B
42.429	37	Weighted Average
42.380		99.88% Pervious Area
0.049		0.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
17.7	694	0.0170	0.65		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
32.1	1,024	Total			

Summary for Subcatchment EDA-2:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
2.708	30	Woods, Good, HSG A
2.708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	392	0.0370	0.96		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.0	442	Total			

Summary for Subcatchment EDA-3:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
3.078	30	Woods, Good, HSG A
3.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	81	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
0.8	63	0.0630	1.25		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
0.8	96	0.1560	1.97		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
12.4	290	Total			

Summary for Subcatchment EDA-4:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
6.071	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
6.130	30	Weighted Average
6.130		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	99	0.0400	1.00		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
14.6	367	Total			

Summary for Subcatchment EDA-5:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
3.277	30	Woods, Good, HSG A
3.277		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	70	0.0140	0.59		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.7	183	0.1260	1.77		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
13.9	303	Total			

Summary for Subcatchment EDA-6:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
11.289	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
11.348	30	Weighted Average
11.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.1	339	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
3.2	217	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
3.6	176	0.0260	0.81		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
24.1	782	Total			

Summary for Subcatchment EDA-7:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.997	30	Woods, Good, HSG A
0.087	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.004	98	Roofs, HSG A
2.104	31	Weighted Average
2.100		99.81% Pervious Area
0.004		0.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.6	332	0.0210	0.72		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.8	382	Total			

Summary for Reach XDP-1:

Inflow Area = 42.429 ac, 0.12% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2:

Inflow Area = 2.708 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3:

Inflow Area = 3.078 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4:

Inflow Area = 6.130 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-5:

Inflow Area = 3.277 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-6:

Inflow Area = 11.348 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-7:

Inflow Area = 2.104 ac, 0.19% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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: Runoff Area=42.429 ac 0.12% Impervious Runoff Depth=0.09"
Flow Length=1,024' Tc=32.1 min CN=37 Runoff=0.51 cfs 0.323 af

Subcatchment EDA-2: Runoff Area=2.708 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=442' Tc=17.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-3: Runoff Area=3.078 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=290' Tc=12.4 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-4: Runoff Area=6.130 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=367' Tc=14.6 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-5: Runoff Area=3.277 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=303' Tc=13.9 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-6: Runoff Area=11.348 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=782' Tc=24.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment EDA-7: Runoff Area=2.104 ac 0.19% Impervious Runoff Depth=0.00"
Flow Length=382' Tc=17.8 min CN=31 Runoff=0.00 cfs 0.000 af

Reach XDP-1: Inflow=0.51 cfs 0.323 af
Outflow=0.51 cfs 0.323 af

Reach XDP-2: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-3: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-4: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-5: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-6: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach XDP-7: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 71.074 ac Runoff Volume = 0.324 af Average Runoff Depth = 0.05"
99.93% Pervious = 71.021 ac 0.07% Impervious = 0.053 ac

Summary for Subcatchment EDA-1:

Runoff = 0.51 cfs @ 15.37 hrs, Volume= 0.323 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
32.524	30	Woods, Good, HSG A
2.936	55	Woods, Good, HSG B
0.998	77	Woods, Good, HSG D
1.793	39	>75% Grass cover, Good, HSG A
3.716	61	>75% Grass cover, Good, HSG B
0.413	96	Gravel surface, HSG B
0.049	98	Roofs, HSG B
42.429	37	Weighted Average
42.380		99.88% Pervious Area
0.049		0.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
17.7	694	0.0170	0.65		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
32.1	1,024	Total			

Summary for Subcatchment EDA-2:

Runoff = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
2.708	30	Woods, Good, HSG A
2.708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	392	0.0370	0.96		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.0	442	Total			

Summary for Subcatchment EDA-3:

Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
3.078	30	Woods, Good, HSG A
3.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	81	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
0.8	63	0.0630	1.25		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
0.8	96	0.1560	1.97		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
12.4	290	Total			

Summary for Subcatchment EDA-4:

Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
6.071	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
6.130	30	Weighted Average
6.130		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	99	0.0400	1.00		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
14.6	367	Total			

Summary for Subcatchment EDA-5:

Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
3.277	30	Woods, Good, HSG A
3.277		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	70	0.0140	0.59		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.7	183	0.1260	1.77		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
13.9	303	Total			

Summary for Subcatchment EDA-6:

Runoff = 0.00 cfs @ 24.14 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
11.289	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
11.348	30	Weighted Average
11.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.1	339	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
3.2	217	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
3.6	176	0.0260	0.81		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
24.1	782	Total			

Summary for Subcatchment EDA-7:

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.997	30	Woods, Good, HSG A
0.087	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.004	98	Roofs, HSG A
2.104	31	Weighted Average
2.100		99.81% Pervious Area
0.004		0.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.6	332	0.0210	0.72		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.8	382	Total			

Summary for Reach XDP-1:

Inflow Area = 42.429 ac, 0.12% Impervious, Inflow Depth = 0.09" for 10-Year event
Inflow = 0.51 cfs @ 15.37 hrs, Volume= 0.323 af
Outflow = 0.51 cfs @ 15.37 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2:

Inflow Area = 2.708 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3:

Inflow Area = 3.078 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4:

Inflow Area = 6.130 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-5:

Inflow Area = 3.277 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-6:

Inflow Area = 11.348 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.14 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.14 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-7:

Inflow Area = 2.104 ac, 0.19% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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: Runoff Area=42.429 ac 0.12% Impervious Runoff Depth=0.63"
Flow Length=1,024' Tc=32.1 min CN=37 Runoff=8.64 cfs 2.215 af

Subcatchment EDA-2: Runoff Area=2.708 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=442' Tc=17.0 min CN=30 Runoff=0.08 cfs 0.048 af

Subcatchment EDA-3: Runoff Area=3.078 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=290' Tc=12.4 min CN=30 Runoff=0.09 cfs 0.054 af

Subcatchment EDA-4: Runoff Area=6.130 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=367' Tc=14.6 min CN=30 Runoff=0.18 cfs 0.108 af

Subcatchment EDA-5: Runoff Area=3.277 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=303' Tc=13.9 min CN=30 Runoff=0.09 cfs 0.058 af

Subcatchment EDA-6: Runoff Area=11.348 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=782' Tc=24.1 min CN=30 Runoff=0.33 cfs 0.201 af

Subcatchment EDA-7: Runoff Area=2.104 ac 0.19% Impervious Runoff Depth=0.26"
Flow Length=382' Tc=17.8 min CN=31 Runoff=0.08 cfs 0.046 af

Reach XDP-1: Inflow=8.64 cfs 2.215 af
Outflow=8.64 cfs 2.215 af

Reach XDP-2: Inflow=0.08 cfs 0.048 af
Outflow=0.08 cfs 0.048 af

Reach XDP-3: Inflow=0.09 cfs 0.054 af
Outflow=0.09 cfs 0.054 af

Reach XDP-4: Inflow=0.18 cfs 0.108 af
Outflow=0.18 cfs 0.108 af

Reach XDP-5: Inflow=0.09 cfs 0.058 af
Outflow=0.09 cfs 0.058 af

Reach XDP-6: Inflow=0.33 cfs 0.201 af
Outflow=0.33 cfs 0.201 af

Reach XDP-7: Inflow=0.08 cfs 0.046 af
Outflow=0.08 cfs 0.046 af

Total Runoff Area = 71.074 ac Runoff Volume = 2.730 af Average Runoff Depth = 0.46"
99.93% Pervious = 71.021 ac 0.07% Impervious = 0.053 ac

Summary for Subcatchment EDA-1:

Runoff = 8.64 cfs @ 12.69 hrs, Volume= 2.215 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
32.524	30	Woods, Good, HSG A
2.936	55	Woods, Good, HSG B
0.998	77	Woods, Good, HSG D
1.793	39	>75% Grass cover, Good, HSG A
3.716	61	>75% Grass cover, Good, HSG B
0.413	96	Gravel surface, HSG B
0.049	98	Roofs, HSG B
42.429	37	Weighted Average
42.380		99.88% Pervious Area
0.049		0.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
17.7	694	0.0170	0.65		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
4.2	280	0.0500	1.12		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
32.1	1,024	Total			

Summary for Subcatchment EDA-2:

Runoff = 0.08 cfs @ 13.94 hrs, Volume= 0.048 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
2.708	30	Woods, Good, HSG A
2.708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
6.8	392	0.0370	0.96		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.0	442	Total			

Summary for Subcatchment EDA-3:

Runoff = 0.09 cfs @ 13.87 hrs, Volume= 0.054 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
3.078	30	Woods, Good, HSG A
3.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	81	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
0.8	63	0.0630	1.25		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
0.8	96	0.1560	1.97		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
12.4	290	Total			

Summary for Subcatchment EDA-4:

Runoff = 0.18 cfs @ 13.91 hrs, Volume= 0.108 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
6.071	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
6.130	30	Weighted Average
6.130		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	99	0.0400	1.00		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
14.6	367	Total			

Summary for Subcatchment EDA-5:

Runoff = 0.09 cfs @ 13.89 hrs, Volume= 0.058 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
3.277	30	Woods, Good, HSG A
3.277		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	70	0.0140	0.59		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
1.7	183	0.1260	1.77		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
13.9	303	Total			

Summary for Subcatchment EDA-6:

Runoff = 0.33 cfs @ 14.05 hrs, Volume= 0.201 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
11.289	30	Woods, Good, HSG A
0.059	39	>75% Grass cover, Good, HSG A
11.348	30	Weighted Average
11.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.1	339	0.0250	0.79		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
3.2	217	0.0510	1.13		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
3.6	176	0.0260	0.81		**Shallow Concentrated Flow, Tc-4** Woodland Kv= 5.0 fps
24.1	782	Total			

Summary for Subcatchment EDA-7:

Runoff = 0.08 cfs @ 13.02 hrs, Volume= 0.046 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.997	30	Woods, Good, HSG A
0.087	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.004	98	Roofs, HSG A
2.104	31	Weighted Average
2.100		99.81% Pervious Area
0.004		0.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
7.6	332	0.0210	0.72		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
17.8	382	Total			

Summary for Reach XDP-1:

Inflow Area = 42.429 ac, 0.12% Impervious, Inflow Depth = 0.63" for 100-Year event
Inflow = 8.64 cfs @ 12.69 hrs, Volume= 2.215 af
Outflow = 8.64 cfs @ 12.69 hrs, Volume= 2.215 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-2:

Inflow Area = 2.708 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.08 cfs @ 13.94 hrs, Volume= 0.048 af
Outflow = 0.08 cfs @ 13.94 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-3:

Inflow Area = 3.078 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.09 cfs @ 13.87 hrs, Volume= 0.054 af
Outflow = 0.09 cfs @ 13.87 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-4:

Inflow Area = 6.130 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.18 cfs @ 13.91 hrs, Volume= 0.108 af
Outflow = 0.18 cfs @ 13.91 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-5:

Inflow Area = 3.277 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.09 cfs @ 13.89 hrs, Volume= 0.058 af
Outflow = 0.09 cfs @ 13.89 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-6:

Inflow Area = 11.348 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.33 cfs @ 14.05 hrs, Volume= 0.201 af
Outflow = 0.33 cfs @ 14.05 hrs, Volume= 0.201 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach XDP-7:

Inflow Area = 2.104 ac, 0.19% Impervious, Inflow Depth = 0.26" for 100-Year event
Inflow = 0.08 cfs @ 13.02 hrs, Volume= 0.046 af
Outflow = 0.08 cfs @ 13.02 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Attachment 3
Post-Development Hydrologic Analysis

B E A L S + T H O M A S
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

1833.109
Wareham, MA

CLIENT/PROJECT:

Borrego Solar Systems, Inc.
27 Charge Pond Road PV+ES Project

SUBJECT/TITLE:

Post Development Hydrologic Calculations

OBJECTIVE OF CALCULATION:

- To determine the post-development peak rates of runoff from the site for the 2, 10, & 100-year storm events at design points DP-1 through 7.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- Autodesk Civil 3D 2019 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.

ASSUMPTIONS:

- The ground cover types were determined using MassGIS aerial imagery and hydrologic soil groups based on United States Department of Agriculture, NRCS Soil Survey map information.
- Watershed boundaries have been estimated based upon a combination of existing contour information depicted on the Existing Conditions Plan as well as MassGIS contours in offsite areas outside limits of those shown on the existing conditions plan, and those shown on the grading and erosion control plans.
- Wetland systems that were included in the hydrologic analysis were modeled as Woods, Good.
- Proposed solar panel area were modeled as Grass, Good.

SOURCES OF DATA/EQUATIONS:

- Post-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 1833109P600B-002.
- NRCS Soil Survey for Plymouth County, hydrologic soil group report, downloaded from Web Soil Survey on 4/15/2020, and 5/21/2020.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Massachusetts DEP Stormwater Management Handbook, February 2008

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020
1	E. Ennis	09/15/2020	J. Murphy	09/15/2020	J. Murphy	09/15/2020

BEALS + THOMAS
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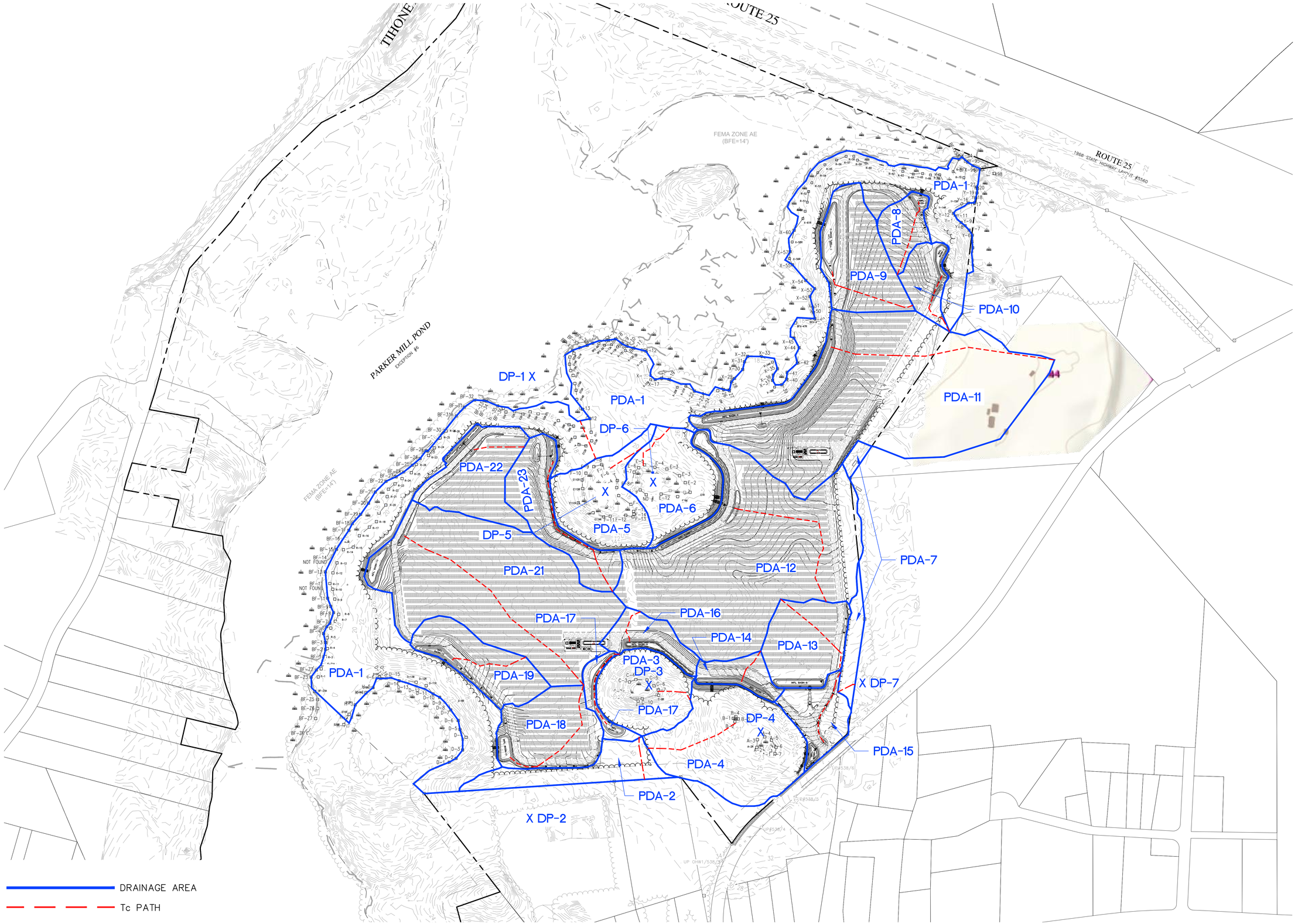
Regional Office: Plymouth, MA

CONCLUSIONS:

Storm Event	2-Year	10-Year	100-Year
DP-1 (cfs)	0.00	0.41	5.98
DP-2 (cfs)	0.00	0.00	0.04
DP-3 (cfs)	0.00	0.00	0.08
DP-4 (cfs)	0.00	0.00	0.11
DP-5 (cfs)	0.00	0.00	0.06
DP-6 (cfs)	0.00	0.00	0.33
DP-7 (cfs)	0.00	0.00	0.06

- Post-development peak runoff rates are less than or equal to pre-development rates in accordance with the Mass DEP Stormwater Handbook.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020
1	E. Ennis	09/15/2020	J. Murphy	09/15/2020	J. Murphy	09/15/2020



Post-Development Conditions
Hydrologic Areas Map
Figure Number 002

~~Scale: 1" = 150'~~

Date: 09/15/2020

Plan 1833109P600B-002

B+T Project No. 1833.109

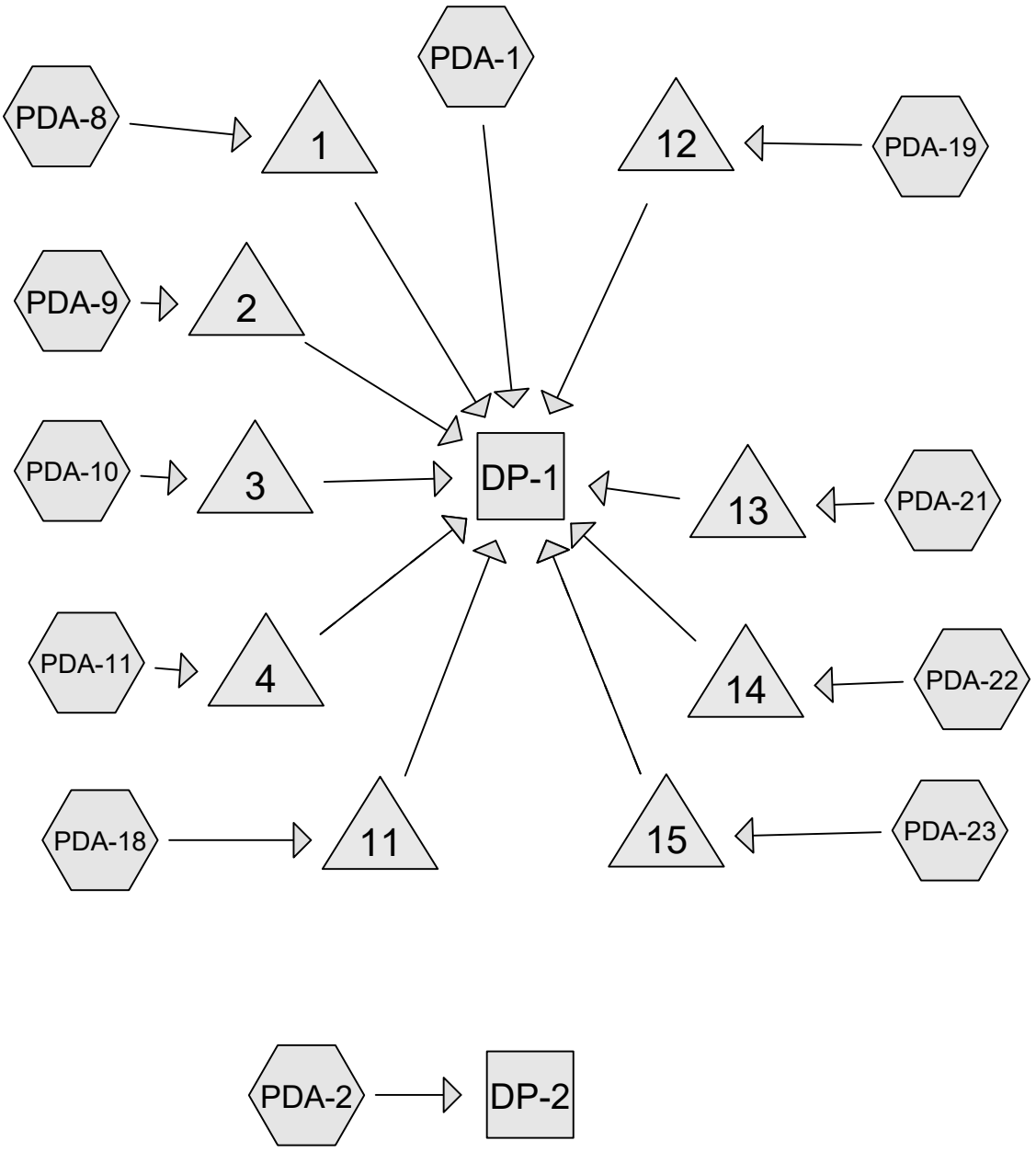
27 Charge Pond Road
PV+ES Project
Wareham, Massachusetts

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, Massachusetts

North Arrow

NORTH

Post-Development
Conditions Hydrology



Subcat Reach Pond Link

Routing Diagram for 1833109HC002B
Prepared by Beals and Thomas, Inc., Printed 9/15/2020

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
20.929	39	>75% Grass cover, Good, HSG A (PDA-1, PDA-10, PDA-11, PDA-18, PDA-19, PDA-2, PDA-21, PDA-22, PDA-23, PDA-8, PDA-9)
4.934	61	>75% Grass cover, Good, HSG B (PDA-1, PDA-10, PDA-11, PDA-9)
0.182	80	>75% Grass cover, Good, HSG D (PDA-1, PDA-11)
3.475	30	Brush, Good, HSG A (PDA-1, PDA-10, PDA-11, PDA-18, PDA-2)
0.433	48	Brush, Good, HSG B (PDA-1, PDA-10, PDA-11)
0.039	65	Brush, Good, HSG C (PDA-1)
0.069	98	Equipment Pad Areas, HSG A (PDA-11, PDA-21)
0.407	96	Existing Gravel surface, HSG B (PDA-1, PDA-10, PDA-11)
2.549	96	Gravel surface, HSG A (PDA-1, PDA-10, PDA-11, PDA-18, PDA-19, PDA-21, PDA-22, PDA-23, PDA-8, PDA-9)
0.236	96	Gravel surface, HSG B (PDA-10, PDA-11, PDA-9)
0.056	96	Gravel surface, HSG D (PDA-11)
0.049	98	Roofs, HSG B (PDA-11)
11.171	30	Woods, Good, HSG A (PDA-1, PDA-11, PDA-2)
1.056	55	Woods, Good, HSG B (PDA-1, PDA-10, PDA-11)
0.721	77	Woods, Good, HSG D (PDA-1)
46.306	**44**	**TOTAL AREA**

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-1: Runoff Area=15.554 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=147' Tc=18.6 min CN=34 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-10: Runoff Area=0.815 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=244' Tc=8.7 min CN=53 Runoff=0.08 cfs 0.017 af

Subcatchment PDA-11: Runoff Area=10.137 ac 0.80% Impervious Runoff Depth=0.38"
Flow Length=819' Tc=30.1 min CN=57 Runoff=1.51 cfs 0.320 af

Subcatchment PDA-18: Runoff Area=2.111 ac 0.00% Impervious Runoff Depth=0.11"
Flow Length=476' Tc=10.2 min CN=47 Runoff=0.03 cfs 0.019 af

Subcatchment PDA-19: Runoff Area=1.721 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=281' Tc=8.1 min CN=46 Runoff=0.02 cfs 0.012 af

Subcatchment PDA-2: Runoff Area=1.351 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=153' Tc=6.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-21: Runoff Area=7.713 ac 0.48% Impervious Runoff Depth=0.03"
Flow Length=846' Tc=18.3 min CN=42 Runoff=0.03 cfs 0.018 af

Subcatchment PDA-22: Runoff Area=2.070 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=178' Tc=7.9 min CN=45 Runoff=0.02 cfs 0.012 af

Subcatchment PDA-23: Runoff Area=1.817 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=568' Tc=9.8 min CN=48 Runoff=0.03 cfs 0.019 af

Subcatchment PDA-8: Runoff Area=0.788 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=278' Tc=7.4 min CN=45 Runoff=0.01 cfs 0.005 af

Subcatchment PDA-9: Runoff Area=2.229 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=343' Tc=10.3 min CN=48 Runoff=0.04 cfs 0.023 af

Reach DP-1: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-2: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1: Peak Elev=21.00' Storage=3 cf Inflow=0.01 cfs 0.005 af
Discarded=0.01 cfs 0.005 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.005 af

Pond 2: Peak Elev=23.00' Storage=14 cf Inflow=0.04 cfs 0.023 af
Discarded=0.04 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.023 af

Pond 3: Peak Elev=29.02' Storage=26 cf Inflow=0.08 cfs 0.017 af
Discarded=0.07 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.017 af

Pond 4: Peak Elev=21.76' Storage=4,040 cf Inflow=1.51 cfs 0.320 af
Discarded=0.37 cfs 0.320 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.37 cfs 0.320 af

Pond 11: Peak Elev=27.01' Storage=16 cf Inflow=0.03 cfs 0.019 af
Discarded=0.03 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.019 af

Pond 12: Peak Elev=26.01' Storage=10 cf Inflow=0.02 cfs 0.012 af
Discarded=0.02 cfs 0.012 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.012 af

Pond 13: Peak Elev=20.51' Storage=16 cf Inflow=0.03 cfs 0.018 af
Discarded=0.03 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.018 af

Pond 14: Peak Elev=21.51' Storage=8 cf Inflow=0.02 cfs 0.012 af
Discarded=0.02 cfs 0.012 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.012 af

Pond 15: Peak Elev=21.08' Storage=39 cf Inflow=0.03 cfs 0.019 af
Discarded=0.03 cfs 0.019 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.019 af

Total Runoff Area = 46.306 ac Runoff Volume = 0.445 af Average Runoff Depth = 0.12"
99.75% Pervious = 46.188 ac 0.25% Impervious = 0.118 ac

Summary for Subcatchment PDA-1:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	10.235	30	Woods, Good, HSG A
	0.411	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	2.976	30	Brush, Good, HSG A
	0.055	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.883	39	>75% Grass cover, Good, HSG A
	0.005	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.093	96	Existing Gravel surface, HSG B
	0.102	96	Gravel surface, HSG A
	15.554	34	Weighted Average
	15.554		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	50	0.0100	0.05		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.8	97	0.0130	0.57		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
18.6	147	Total			

Summary for Subcatchment PDA-10:

Runoff = 0.08 cfs @ 12.39 hrs, Volume= 0.017 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.001	55	Woods, Good, HSG B
	0.012	30	Brush, Good, HSG A
	0.049	48	Brush, Good, HSG B
	0.465	39	>75% Grass cover, Good, HSG A
	0.145	61	>75% Grass cover, Good, HSG B
	0.088	96	Gravel surface, HSG A
	0.035	96	Gravel surface, HSG B
*	0.020	96	Existing Gravel surface, HSG B
	0.815	53	Weighted Average
	0.815		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	68	0.0290	1.19		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.5	126	0.0870	4.42		**Shallow Concentrated Flow, Tc-3** Grassed Waterway Kv= 15.0 fps
8.7	244	Total			

Summary for Subcatchment PDA-11:

Runoff = 1.51 cfs @ 12.61 hrs, Volume= 0.320 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.096	30	Woods, Good, HSG A
	0.644	55	Woods, Good, HSG B
	0.025	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.221	39	>75% Grass cover, Good, HSG A
	4.421	61	>75% Grass cover, Good, HSG B
	0.148	80	>75% Grass cover, Good, HSG D
	0.645	96	Gravel surface, HSG A
	0.177	96	Gravel surface, HSG B
	0.056	96	Gravel surface, HSG D
*	0.294	96	Existing Gravel surface, HSG B
	0.049	98	Roofs, HSG B
*	0.032	98	Equipment Pad Areas, HSG A
	10.137	57	Weighted Average
	10.056		99.20% Pervious Area
	0.081		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
13.3	394	0.0050	0.49		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.8	58	0.0520	1.14		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.3	23	0.0050	1.14		**Shallow Concentrated Flow, Tc-5** Unpaved Kv= 16.1 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow, Tc-6** Short Grass Pasture Kv= 7.0 fps
0.3	57	0.1930	3.08		**Shallow Concentrated Flow, Tc-7** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-8** Unpaved Kv= 16.1 fps
0.1	13	0.3100	3.90		**Shallow Concentrated Flow, Tc-9** Short Grass Pasture Kv= 7.0 fps
30.1	819	Total			

Summary for Subcatchment PDA-18:

Runoff = 0.03 cfs @ 13.81 hrs, Volume= 0.019 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.019	30	Brush, Good, HSG A
1.799	39	>75% Grass cover, Good, HSG A
0.293	96	Gravel surface, HSG A
2.111	47	Weighted Average
2.111		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
3.7	267	0.0300	1.21		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	35	0.0290	2.74		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.7	107	0.0280	2.51		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.2	476	Total			

Summary for Subcatchment PDA-19:

Runoff = 0.02 cfs @ 14.70 hrs, Volume= 0.012 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.520	39	>75% Grass cover, Good, HSG A
0.201	96	Gravel surface, HSG A
1.721	46	Weighted Average
1.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.4	89	0.0220	1.04		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.9	86	0.0580	1.69		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0290	2.74		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	22	0.1360	2.58		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
8.1	281	Total			

Summary for Subcatchment PDA-2:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.840	30	Woods, Good, HSG A
0.068	39	>75% Grass cover, Good, HSG A
0.443	30	Brush, Good, HSG A
1.351	30	Weighted Average
1.351		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.6	53	0.0400	1.40		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.0	50	0.0300	0.87		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
6.2	153	Total			

Summary for Subcatchment PDA-21:

Runoff = 0.03 cfs @ 17.09 hrs, Volume= 0.018 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
7.254	39	>75% Grass cover, Good, HSG A
0.422	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
7.713	42	Weighted Average
7.676		99.52% Pervious Area
0.037		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
12.6	691	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.1	105	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
18.3	846	Total			

Summary for Subcatchment PDA-22:

Runoff = 0.02 cfs @ 14.95 hrs, Volume= 0.012 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.840	39	>75% Grass cover, Good, HSG A
0.230	96	Gravel surface, HSG A
2.070	45	Weighted Average
2.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.4	128	0.0160	0.89		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
7.9	178	Total			

Summary for Subcatchment PDA-23:

Runoff = 0.03 cfs @ 12.57 hrs, Volume= 0.019 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.529	39	>75% Grass cover, Good, HSG A
0.288	96	Gravel surface, HSG A
1.817	48	Weighted Average
1.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.8	82	0.0120	0.77		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	10	0.2000	3.13		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
2.3	401	0.0390	2.96		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
9.8	568	Total			

Summary for Subcatchment PDA-8:

Runoff = 0.01 cfs @ 14.94 hrs, Volume= 0.005 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.707	39	>75% Grass cover, Good, HSG A
0.081	96	Gravel surface, HSG A
0.788	45	Weighted Average
0.788		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0670	4.17		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	16	0.1880	3.04		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1560	5.92		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
7.4	278	Total			

Summary for Subcatchment PDA-9:

Runoff = 0.04 cfs @ 12.57 hrs, Volume= 0.023 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.643	39	>75% Grass cover, Good, HSG A
0.363	61	>75% Grass cover, Good, HSG B
0.199	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.229	48	Weighted Average
2.229		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.3	159	0.0280	1.17		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.1500	2.71		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0360	3.05		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	24	0.1250	2.47		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
0.3	49	0.0410	3.04		**Shallow Concentrated Flow, Tc-6** Grassed Waterway Kv= 15.0 fps
10.3	343	Total			

Summary for Reach DP-1:

Inflow Area = 44.955 ac, 0.26% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2:

Inflow Area = 1.351 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1:

Inflow Area = 0.788 ac, 0.00% Impervious, Inflow Depth = 0.07" for 2-Year event
Inflow = 0.01 cfs @ 14.94 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 15.04 hrs, Volume= 0.005 af, Atten= 0%, Lag= 6.1 min
Discarded = 0.01 cfs @ 15.04 hrs, Volume= 0.005 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.00' @ 15.04 hrs Surf.Area= 1,226 sf Storage= 3 cf

Plug-Flow detention time= 6.1 min calculated for 0.005 af (100% of inflow)
Center-of-Mass det. time= 6.0 min (1,078.2 - 1,072.2)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	3,477 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	1,225	0	0
22.00	1,715	1,470	1,470
23.00	2,299	2,007	3,477

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 15.04 hrs HW=21.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2:

Inflow Area = 2.229 ac, 0.00% Impervious, Inflow Depth = 0.13" for 2-Year event
Inflow = 0.04 cfs @ 12.57 hrs, Volume= 0.023 af
Outflow = 0.04 cfs @ 13.75 hrs, Volume= 0.023 af, Atten= 2%, Lag= 70.6 min
Discarded = 0.04 cfs @ 13.75 hrs, Volume= 0.023 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.00' @ 13.75 hrs Surf.Area= 6,718 sf Storage= 14 cf

Plug-Flow detention time= 6.1 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 6.0 min (1,026.9 - 1,021.0)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	16,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	6,714	0	0
24.00	8,416	7,565	7,565
25.00	10,370	9,393	16,958

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.37 cfs @ 13.75 hrs HW=23.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=23.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3:

Inflow Area = 0.815 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2-Year event
Inflow = 0.08 cfs @ 12.39 hrs, Volume= 0.017 af
Outflow = 0.07 cfs @ 12.49 hrs, Volume= 0.017 af, Atten= 9%, Lag= 5.8 min
Discarded = 0.07 cfs @ 12.49 hrs, Volume= 0.017 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 29.02' @ 12.49 hrs Surf.Area= 1,537 sf Storage= 26 cf

Plug-Flow detention time= 5.9 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (968.1 - 962.2)

Volume	Invert	Avail.Storage	Storage Description
#1	29.00'	4,836 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	1,522	0	0
30.00	2,397	1,960	1,960
31.00	3,356	2,877	4,836

Device	Routing	Invert	Outlet Devices
#1	Discarded	29.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	30.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.09 cfs @ 12.49 hrs HW=29.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=29.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4:

Inflow Area = 10.137 ac, 0.80% Impervious, Inflow Depth = 0.38" for 2-Year event
Inflow = 1.51 cfs @ 12.61 hrs, Volume= 0.320 af
Outflow = 0.37 cfs @ 15.46 hrs, Volume= 0.320 af, Atten= 75%, Lag= 171.3 min
Discarded = 0.37 cfs @ 15.46 hrs, Volume= 0.320 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.76' @ 15.46 hrs Surf.Area= 6,715 sf Storage= 4,040 cf

Plug-Flow detention time= 126.2 min calculated for 0.320 af (100% of inflow)
Center-of-Mass det. time= 126.0 min (1,078.0 - 952.0)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	45,910 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	3,942	0	0
22.00	7,600	5,771	5,771
23.00	11,389	9,495	15,266
24.00	15,291	13,340	28,606
25.00	19,318	17,305	45,910

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3 Primary 22.50' **12.0" Round Culvert**
L= 25.0' CPP, projecting, no headwall, Ke= 0.900
Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.37 cfs @ 15.46 hrs HW=21.76' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 11:

Inflow Area = 2.111 ac, 0.00% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.03 cfs @ 13.81 hrs, Volume= 0.019 af
Outflow = 0.03 cfs @ 13.96 hrs, Volume= 0.019 af, Atten= 1%, Lag= 9.1 min
Discarded = 0.03 cfs @ 13.96 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.01' @ 13.96 hrs Surf.Area= 2,416 sf Storage= 16 cf

Plug-Flow detention time= 8.9 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (1,045.6 - 1,036.7)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	11,612 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	2,410	0	0
28.00	3,246	2,828	2,828
29.00	4,312	3,779	6,607
30.00	5,698	5,005	11,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	29.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.13 cfs @ 13.96 hrs HW=27.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 12:

Inflow Area = 1.721 ac, 0.00% Impervious, Inflow Depth = 0.09" for 2-Year event
Inflow = 0.02 cfs @ 14.70 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 14.84 hrs, Volume= 0.012 af, Atten= 0%, Lag= 8.4 min
Discarded = 0.02 cfs @ 14.84 hrs, Volume= 0.012 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 26.01' @ 14.84 hrs Surf.Area= 1,074 sf Storage= 10 cf

Plug-Flow detention time= 9.1 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 8.8 min (1,061.4 - 1,052.6)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	8,138 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.00	1,064	0	0
27.00	2,045	1,555	1,555
28.00	3,224	2,635	4,189
29.00	4,674	3,949	8,138

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	28.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 14.84 hrs HW=26.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=26.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 13:

Inflow Area = 7.713 ac, 0.48% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.03 cfs @ 17.09 hrs, Volume= 0.018 af
Outflow = 0.03 cfs @ 17.27 hrs, Volume= 0.018 af, Atten= 0%, Lag= 10.6 min
Discarded = 0.03 cfs @ 17.27 hrs, Volume= 0.018 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 20.51' @ 17.27 hrs Surf.Area= 2,893 sf Storage= 16 cf

Plug-Flow detention time= 10.4 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (1,174.6 - 1,164.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.50'	16,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	2,888	0	0
21.00	3,361	1,562	1,562
22.00	4,309	3,835	5,397
23.00	5,422	4,866	10,263
24.00	6,586	6,004	16,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.16 cfs @ 17.27 hrs HW=20.51' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 14:

Inflow Area = 2.070 ac, 0.00% Impervious, Inflow Depth = 0.07" for 2-Year event
Inflow = 0.02 cfs @ 14.95 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 15.07 hrs, Volume= 0.012 af, Atten= 0%, Lag= 7.4 min
Discarded = 0.02 cfs @ 15.07 hrs, Volume= 0.012 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.51' @ 15.07 hrs Surf.Area= 969 sf Storage= 8 cf

Plug-Flow detention time= 7.4 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 7.4 min (1,080.1 - 1,072.7)

Volume	Invert	Avail.Storage	Storage Description
#1	21.50'	5,673 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.50	960	0	0
22.00	1,467	607	607
23.00	2,519	1,993	2,600
24.00	3,628	3,074	5,673

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 15.07 hrs HW=21.51' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 15:

Inflow Area = 1.817 ac, 0.00% Impervious, Inflow Depth = 0.13" for 2-Year event
Inflow = 0.03 cfs @ 12.57 hrs, Volume= 0.019 af
Outflow = 0.03 cfs @ 15.06 hrs, Volume= 0.019 af, Atten= 13%, Lag= 150.0 min
Discarded = 0.03 cfs @ 15.06 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.08' @ 15.06 hrs Surf.Area= 523 sf Storage= 39 cf

Plug-Flow detention time= 13.2 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 13.2 min (1,033.7 - 1,020.5)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	5,009 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	470	0	0
22.00	1,154	812	812
23.00	2,038	1,596	2,408
24.00	3,164	2,601	5,009

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	22.50'	**15.0" Round Culvert** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.03 cfs @ 15.06 hrs HW=21.08' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-1: Runoff Area=15.554 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=147' Tc=18.6 min CN=34 Runoff=0.06 cfs 0.043 af

Subcatchment PDA-10: Runoff Area=0.815 ac 0.00% Impervious Runoff Depth=0.73"
Flow Length=244' Tc=8.7 min CN=53 Runoff=0.43 cfs 0.049 af

Subcatchment PDA-11: Runoff Area=10.137 ac 0.80% Impervious Runoff Depth=0.95"
Flow Length=819' Tc=30.1 min CN=57 Runoff=5.22 cfs 0.801 af

Subcatchment PDA-18: Runoff Area=2.111 ac 0.00% Impervious Runoff Depth=0.44"
Flow Length=476' Tc=10.2 min CN=47 Runoff=0.41 cfs 0.077 af

Subcatchment PDA-19: Runoff Area=1.721 ac 0.00% Impervious Runoff Depth=0.39"
Flow Length=281' Tc=8.1 min CN=46 Runoff=0.29 cfs 0.056 af

Subcatchment PDA-2: Runoff Area=1.351 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=153' Tc=6.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-21: Runoff Area=7.713 ac 0.48% Impervious Runoff Depth=0.24"
Flow Length=846' Tc=18.3 min CN=42 Runoff=0.41 cfs 0.153 af

Subcatchment PDA-22: Runoff Area=2.070 ac 0.00% Impervious Runoff Depth=0.35"
Flow Length=178' Tc=7.9 min CN=45 Runoff=0.29 cfs 0.061 af

Subcatchment PDA-23: Runoff Area=1.817 ac 0.00% Impervious Runoff Depth=0.48"
Flow Length=568' Tc=9.8 min CN=48 Runoff=0.42 cfs 0.073 af

Subcatchment PDA-8: Runoff Area=0.788 ac 0.00% Impervious Runoff Depth=0.35"
Flow Length=278' Tc=7.4 min CN=45 Runoff=0.11 cfs 0.023 af

Subcatchment PDA-9: Runoff Area=2.229 ac 0.00% Impervious Runoff Depth=0.48"
Flow Length=343' Tc=10.3 min CN=48 Runoff=0.51 cfs 0.089 af

Reach DP-1: Inflow=0.41 cfs 0.156 af
Outflow=0.41 cfs 0.156 af

Reach DP-2: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1: Peak Elev=21.04' Storage=54 cf Inflow=0.11 cfs 0.023 af
Discarded=0.07 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.023 af

Pond 2: Peak Elev=23.03' Storage=225 cf Inflow=0.51 cfs 0.089 af
Discarded=0.38 cfs 0.089 af Primary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.089 af

Pond 3: Peak Elev=29.29' Storage=474 cf Inflow=0.43 cfs 0.049 af
Discarded=0.10 cfs 0.049 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.049 af

Pond 4: Peak Elev=22.86' Storage=13,699 cf Inflow=5.22 cfs 0.801 af
Discarded=0.61 cfs 0.688 af Primary=0.41 cfs 0.113 af Secondary=0.00 cfs 0.000 af Outflow=1.02 cfs 0.801 af

Pond 11: Peak Elev=27.19' Storage=473 cf Inflow=0.41 cfs 0.077 af
Discarded=0.14 cfs 0.077 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.077 af

Pond 12: Peak Elev=26.38' Storage=474 cf Inflow=0.29 cfs 0.056 af
Discarded=0.08 cfs 0.056 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.056 af

Pond 13: Peak Elev=20.88' Storage=1,173 cf Inflow=0.41 cfs 0.153 af
Discarded=0.18 cfs 0.153 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.153 af

Pond 14: Peak Elev=21.96' Storage=545 cf Inflow=0.29 cfs 0.061 af
Discarded=0.08 cfs 0.061 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.061 af

Pond 15: Peak Elev=22.21' Storage=1,080 cf Inflow=0.42 cfs 0.073 af
Discarded=0.07 cfs 0.073 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.073 af

Total Runoff Area = 46.306 ac Runoff Volume = 1.425 af Average Runoff Depth = 0.37"
99.75% Pervious = 46.188 ac 0.25% Impervious = 0.118 ac

Summary for Subcatchment PDA-1:

Runoff = 0.06 cfs @ 17.34 hrs, Volume= 0.043 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (ac)	CN	Description
	10.235	30	Woods, Good, HSG A
	0.411	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	2.976	30	Brush, Good, HSG A
	0.055	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.883	39	>75% Grass cover, Good, HSG A
	0.005	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.093	96	Existing Gravel surface, HSG B
	0.102	96	Gravel surface, HSG A
	15.554	34	Weighted Average
	15.554		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	50	0.0100	0.05		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.8	97	0.0130	0.57		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
18.6	147	Total			

Summary for Subcatchment PDA-10:

Runoff = 0.43 cfs @ 12.17 hrs, Volume= 0.049 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (ac)	CN	Description
	0.001	55	Woods, Good, HSG B
	0.012	30	Brush, Good, HSG A
	0.049	48	Brush, Good, HSG B
	0.465	39	>75% Grass cover, Good, HSG A
	0.145	61	>75% Grass cover, Good, HSG B
	0.088	96	Gravel surface, HSG A
	0.035	96	Gravel surface, HSG B
*	0.020	96	Existing Gravel surface, HSG B
	0.815	53	Weighted Average
	0.815		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	68	0.0290	1.19		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.5	126	0.0870	4.42		**Shallow Concentrated Flow, Tc-3** Grassed Waterway Kv= 15.0 fps
8.7	244	Total			

Summary for Subcatchment PDA-11:

Runoff = 5.22 cfs @ 12.51 hrs, Volume= 0.801 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (ac)	CN	Description
	0.096	30	Woods, Good, HSG A
	0.644	55	Woods, Good, HSG B
	0.025	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.221	39	>75% Grass cover, Good, HSG A
	4.421	61	>75% Grass cover, Good, HSG B
	0.148	80	>75% Grass cover, Good, HSG D
	0.645	96	Gravel surface, HSG A
	0.177	96	Gravel surface, HSG B
	0.056	96	Gravel surface, HSG D
*	0.294	96	Existing Gravel surface, HSG B
	0.049	98	Roofs, HSG B
*	0.032	98	Equipment Pad Areas, HSG A
	10.137	57	Weighted Average
	10.056		99.20% Pervious Area
	0.081		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
13.3	394	0.0050	0.49		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.8	58	0.0520	1.14		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.3	23	0.0050	1.14		**Shallow Concentrated Flow, Tc-5** Unpaved Kv= 16.1 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow, Tc-6** Short Grass Pasture Kv= 7.0 fps
0.3	57	0.1930	3.08		**Shallow Concentrated Flow, Tc-7** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-8** Unpaved Kv= 16.1 fps
0.1	13	0.3100	3.90		**Shallow Concentrated Flow, Tc-9** Short Grass Pasture Kv= 7.0 fps
30.1	819	Total			

Summary for Subcatchment PDA-18:

Runoff = 0.41 cfs @ 12.36 hrs, Volume= 0.077 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.019	30	Brush, Good, HSG A
1.799	39	>75% Grass cover, Good, HSG A
0.293	96	Gravel surface, HSG A
2.111	47	Weighted Average
2.111		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
3.7	267	0.0300	1.21		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	35	0.0290	2.74		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.7	107	0.0280	2.51		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.2	476	Total			

Summary for Subcatchment PDA-19:

Runoff = 0.29 cfs @ 12.35 hrs, Volume= 0.056 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.520	39	>75% Grass cover, Good, HSG A
0.201	96	Gravel surface, HSG A
1.721	46	Weighted Average
1.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.4	89	0.0220	1.04		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.9	86	0.0580	1.69		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0290	2.74		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	22	0.1360	2.58		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
8.1	281	Total			

Summary for Subcatchment PDA-2:

Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.840	30	Woods, Good, HSG A
0.068	39	>75% Grass cover, Good, HSG A
0.443	30	Brush, Good, HSG A
1.351	30	Weighted Average
1.351		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.6	53	0.0400	1.40		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.0	50	0.0300	0.87		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
6.2	153	Total			

Summary for Subcatchment PDA-21:

Runoff = 0.41 cfs @ 12.61 hrs, Volume= 0.153 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
7.254	39	>75% Grass cover, Good, HSG A
0.422	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
7.713	42	Weighted Average
7.676		99.52% Pervious Area
0.037		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
12.6	691	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.1	105	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
18.3	846	Total			

Summary for Subcatchment PDA-22:

Runoff = 0.29 cfs @ 12.37 hrs, Volume= 0.061 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.840	39	>75% Grass cover, Good, HSG A
0.230	96	Gravel surface, HSG A
2.070	45	Weighted Average
2.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.4	128	0.0160	0.89		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
7.9	178	Total			

Summary for Subcatchment PDA-23:

Runoff = 0.42 cfs @ 12.32 hrs, Volume= 0.073 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.529	39	>75% Grass cover, Good, HSG A
0.288	96	Gravel surface, HSG A
1.817	48	Weighted Average
1.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.8	82	0.0120	0.77		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	10	0.2000	3.13		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
2.3	401	0.0390	2.96		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
9.8	568	Total			

Summary for Subcatchment PDA-8:

Runoff = 0.11 cfs @ 12.37 hrs, Volume= 0.023 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.707	39	>75% Grass cover, Good, HSG A
0.081	96	Gravel surface, HSG A
0.788	45	Weighted Average
0.788		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0670	4.17		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	16	0.1880	3.04		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1560	5.92		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
7.4	278	Total			

Summary for Subcatchment PDA-9:

Runoff = 0.51 cfs @ 12.33 hrs, Volume= 0.089 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.643	39	>75% Grass cover, Good, HSG A
0.363	61	>75% Grass cover, Good, HSG B
0.199	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.229	48	Weighted Average
2.229		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.3	159	0.0280	1.17		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.1500	2.71		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0360	3.05		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	24	0.1250	2.47		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
0.3	49	0.0410	3.04		**Shallow Concentrated Flow, Tc-6** Grassed Waterway Kv= 15.0 fps
10.3	343	Total			

Summary for Reach DP-1:

Inflow Area = 44.955 ac, 0.26% Impervious, Inflow Depth = 0.04" for 10-Year event
Inflow = 0.41 cfs @ 14.39 hrs, Volume= 0.156 af
Outflow = 0.41 cfs @ 14.39 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2:

Inflow Area = 1.351 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1:

Inflow Area = 0.788 ac, 0.00% Impervious, Inflow Depth = 0.35" for 10-Year event
Inflow = 0.11 cfs @ 12.37 hrs, Volume= 0.023 af
Outflow = 0.07 cfs @ 12.59 hrs, Volume= 0.023 af, Atten= 36%, Lag= 13.2 min
Discarded = 0.07 cfs @ 12.59 hrs, Volume= 0.023 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.04' @ 12.59 hrs Surf.Area= 1,247 sf Storage= 54 cf

Plug-Flow detention time= 6.8 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (967.1 - 960.3)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	3,477 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	1,225	0	0
22.00	1,715	1,470	1,470
23.00	2,299	2,007	3,477

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 12.59 hrs HW=21.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2:

Inflow Area = 2.229 ac, 0.00% Impervious, Inflow Depth = 0.48" for 10-Year event
Inflow = 0.51 cfs @ 12.33 hrs, Volume= 0.089 af
Outflow = 0.38 cfs @ 12.54 hrs, Volume= 0.089 af, Atten= 26%, Lag= 12.7 min
Discarded = 0.38 cfs @ 12.54 hrs, Volume= 0.089 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.03' @ 12.54 hrs Surf.Area= 6,771 sf Storage= 225 cf

Plug-Flow detention time= 6.5 min calculated for 0.089 af (100% of inflow)
Center-of-Mass det. time= 6.4 min (946.2 - 939.8)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	16,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	6,714	0	0
24.00	8,416	7,565	7,565
25.00	10,370	9,393	16,958

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.38 cfs @ 12.54 hrs HW=23.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=23.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3:

Inflow Area = 0.815 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Year event
Inflow = 0.43 cfs @ 12.17 hrs, Volume= 0.049 af
Outflow = 0.10 cfs @ 12.98 hrs, Volume= 0.049 af, Atten= 77%, Lag= 49.0 min
Discarded = 0.10 cfs @ 12.98 hrs, Volume= 0.049 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 29.29' @ 12.98 hrs Surf.Area= 1,774 sf Storage= 474 cf

Plug-Flow detention time= 40.0 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 40.0 min (950.2 - 910.2)

Volume	Invert	Avail.Storage	Storage Description
#1	29.00'	4,836 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	1,522	0	0
30.00	2,397	1,960	1,960
31.00	3,356	2,877	4,836

Device	Routing	Invert	Outlet Devices
#1	Discarded	29.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	30.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.10 cfs @ 12.98 hrs HW=29.29' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=29.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4:

Inflow Area = 10.137 ac, 0.80% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 5.22 cfs @ 12.51 hrs, Volume= 0.801 af
Outflow = 1.02 cfs @ 14.38 hrs, Volume= 0.801 af, Atten= 81%, Lag= 112.5 min
Discarded = 0.61 cfs @ 14.38 hrs, Volume= 0.688 af
Primary = 0.41 cfs @ 14.38 hrs, Volume= 0.113 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 22.86' @ 14.38 hrs Surf.Area= 10,855 sf Storage= 13,699 cf

Plug-Flow detention time= 243.6 min calculated for 0.801 af (100% of inflow)
Center-of-Mass det. time= 243.3 min (1,156.5 - 913.2)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	45,910 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	3,942	0	0
22.00	7,600	5,771	5,771
23.00	11,389	9,495	15,266
24.00	15,291	13,340	28,606
25.00	19,318	17,305	45,910

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	22.50'	**12.0" Round Culvert**
			L= 25.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0200 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.61 cfs @ 14.38 hrs HW=22.86' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.61 cfs)

Primary OutFlow Max=0.41 cfs @ 14.38 hrs HW=22.86' (Free Discharge)
└**3=Culvert** (Inlet Controls 0.41 cfs @ 1.61 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 11:

Inflow Area = 2.111 ac, 0.00% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 0.41 cfs @ 12.36 hrs, Volume= 0.077 af
Outflow = 0.14 cfs @ 13.17 hrs, Volume= 0.077 af, Atten= 65%, Lag= 48.6 min
Discarded = 0.14 cfs @ 13.17 hrs, Volume= 0.077 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.19' @ 13.17 hrs Surf.Area= 2,569 sf Storage= 473 cf

Plug-Flow detention time= 27.9 min calculated for 0.076 af (100% of inflow)
Center-of-Mass det. time= 27.9 min (974.7 - 946.8)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	11,612 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	2,410	0	0
28.00	3,246	2,828	2,828
29.00	4,312	3,779	6,607
30.00	5,698	5,005	11,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	29.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.14 cfs @ 13.17 hrs HW=27.19' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 12:

Inflow Area = 1.721 ac, 0.00% Impervious, Inflow Depth = 0.39" for 10-Year event
Inflow = 0.29 cfs @ 12.35 hrs, Volume= 0.056 af
Outflow = 0.08 cfs @ 14.48 hrs, Volume= 0.056 af, Atten= 72%, Lag= 127.8 min
Discarded = 0.08 cfs @ 14.48 hrs, Volume= 0.056 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 26.38' @ 14.48 hrs Surf.Area= 1,436 sf Storage= 474 cf

Plug-Flow detention time= 61.0 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 60.8 min (1,013.3 - 952.5)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	8,138 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.00	1,064	0	0
27.00	2,045	1,555	1,555
28.00	3,224	2,635	4,189
29.00	4,674	3,949	8,138

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	28.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.08 cfs @ 14.48 hrs HW=26.38' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=26.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 13:

Inflow Area = 7.713 ac, 0.48% Impervious, Inflow Depth = 0.24" for 10-Year event
Inflow = 0.41 cfs @ 12.61 hrs, Volume= 0.153 af
Outflow = 0.18 cfs @ 16.04 hrs, Volume= 0.153 af, Atten= 56%, Lag= 205.6 min
Discarded = 0.18 cfs @ 16.04 hrs, Volume= 0.153 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 20.88' @ 16.04 hrs Surf.Area= 3,250 sf Storage= 1,173 cf

Plug-Flow detention time= 65.3 min calculated for 0.153 af (100% of inflow)
Center-of-Mass det. time= 65.3 min (1,066.8 - 1,001.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.50'	16,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	2,888	0	0
21.00	3,361	1,562	1,562
22.00	4,309	3,835	5,397
23.00	5,422	4,866	10,263
24.00	6,586	6,004	16,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.18 cfs @ 16.04 hrs HW=20.88' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 14:

Inflow Area = 2.070 ac, 0.00% Impervious, Inflow Depth = 0.35" for 10-Year event
Inflow = 0.29 cfs @ 12.37 hrs, Volume= 0.061 af
Outflow = 0.08 cfs @ 15.10 hrs, Volume= 0.061 af, Atten= 72%, Lag= 163.3 min
Discarded = 0.08 cfs @ 15.10 hrs, Volume= 0.061 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.96' @ 15.10 hrs Surf.Area= 1,424 sf Storage= 545 cf

Plug-Flow detention time= 74.0 min calculated for 0.060 af (100% of inflow)
Center-of-Mass det. time= 73.8 min (1,034.6 - 960.8)

Volume	Invert	Avail.Storage	Storage Description
#1	21.50'	5,673 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.50	960	0	0
22.00	1,467	607	607
23.00	2,519	1,993	2,600
24.00	3,628	3,074	5,673

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.08 cfs @ 15.10 hrs HW=21.96' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 15:

Inflow Area = 1.817 ac, 0.00% Impervious, Inflow Depth = 0.48" for 10-Year event
Inflow = 0.42 cfs @ 12.32 hrs, Volume= 0.073 af
Outflow = 0.07 cfs @ 15.71 hrs, Volume= 0.073 af, Atten= 82%, Lag= 203.6 min
Discarded = 0.07 cfs @ 15.71 hrs, Volume= 0.073 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 22.21' @ 15.71 hrs Surf.Area= 1,343 sf Storage= 1,080 cf

Plug-Flow detention time= 190.3 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 190.3 min (1,129.6 - 939.4)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	5,009 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	470	0	0
22.00	1,154	812	812
23.00	2,038	1,596	2,408
24.00	3,164	2,601	5,009

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	22.50'	**15.0" Round Culvert** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.07 cfs @ 15.71 hrs HW=22.21' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
3=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-1: Runoff Area=15.554 ac 0.00% Impervious Runoff Depth=0.43"
Flow Length=147' Tc=18.6 min CN=34 Runoff=1.90 cfs 0.559 af

Subcatchment PDA-10: Runoff Area=0.815 ac 0.00% Impervious Runoff Depth=1.94"
Flow Length=244' Tc=8.7 min CN=53 Runoff=1.51 cfs 0.132 af

Subcatchment PDA-11: Runoff Area=10.137 ac 0.80% Impervious Runoff Depth=2.31"
Flow Length=819' Tc=30.1 min CN=57 Runoff=14.70 cfs 1.954 af

Subcatchment PDA-18: Runoff Area=2.111 ac 0.00% Impervious Runoff Depth=1.41"
Flow Length=476' Tc=10.2 min CN=47 Runoff=2.40 cfs 0.247 af

Subcatchment PDA-19: Runoff Area=1.721 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=281' Tc=8.1 min CN=46 Runoff=1.89 cfs 0.189 af

Subcatchment PDA-2: Runoff Area=1.351 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=153' Tc=6.2 min CN=30 Runoff=0.04 cfs 0.024 af

Subcatchment PDA-21: Runoff Area=7.713 ac 0.48% Impervious Runoff Depth=1.00"
Flow Length=846' Tc=18.3 min CN=42 Runoff=4.14 cfs 0.640 af

Subcatchment PDA-22: Runoff Area=2.070 ac 0.00% Impervious Runoff Depth=1.24"
Flow Length=178' Tc=7.9 min CN=45 Runoff=2.07 cfs 0.213 af

Subcatchment PDA-23: Runoff Area=1.817 ac 0.00% Impervious Runoff Depth=1.49"
Flow Length=568' Tc=9.8 min CN=48 Runoff=2.29 cfs 0.226 af

Subcatchment PDA-8: Runoff Area=0.788 ac 0.00% Impervious Runoff Depth=1.24"
Flow Length=278' Tc=7.4 min CN=45 Runoff=0.80 cfs 0.081 af

Subcatchment PDA-9: Runoff Area=2.229 ac 0.00% Impervious Runoff Depth=1.49"
Flow Length=343' Tc=10.3 min CN=48 Runoff=2.76 cfs 0.277 af

Reach DP-1: Inflow=5.98 cfs 1.876 af
Outflow=5.98 cfs 1.876 af

Reach DP-2: Inflow=0.04 cfs 0.024 af
Outflow=0.04 cfs 0.024 af

Pond 1: Peak Elev=21.87' Storage=1,259 cf Inflow=0.80 cfs 0.081 af
Discarded=0.09 cfs 0.081 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.081 af

Pond 2: Peak Elev=23.52' Storage=3,697 cf Inflow=2.76 cfs 0.277 af
Discarded=0.42 cfs 0.277 af Primary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.277 af

Pond 3: Peak Elev=30.03' Storage=2,033 cf Inflow=1.51 cfs 0.132 af
Discarded=0.14 cfs 0.121 af Primary=0.16 cfs 0.010 af Outflow=0.29 cfs 0.132 af

Pond 4: Peak Elev=24.10' Storage=30,154 cf Inflow=14.70 cfs 1.954 af
Discarded=0.88 cfs 0.874 af Primary=3.13 cfs 1.000 af Secondary=0.90 cfs 0.033 af Outflow=4.91 cfs 1.907 af

Pond 11: Peak Elev=28.55' Storage=4,791 cf Inflow=2.40 cfs 0.247 af
Discarded=0.21 cfs 0.247 af Primary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.247 af

Pond 12: Peak Elev=27.83' Storage=3,648 cf Inflow=1.89 cfs 0.189 af
Discarded=0.17 cfs 0.189 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.189 af

Pond 13: Peak Elev=23.08' Storage=10,696 cf Inflow=4.14 cfs 0.640 af
Discarded=0.31 cfs 0.421 af Primary=0.64 cfs 0.126 af Outflow=0.94 cfs 0.547 af

Pond 14: Peak Elev=23.06' Storage=2,751 cf Inflow=2.07 cfs 0.213 af
Discarded=0.14 cfs 0.168 af Primary=0.41 cfs 0.046 af Outflow=0.55 cfs 0.213 af

Pond 15: Peak Elev=23.01' Storage=2,436 cf Inflow=2.29 cfs 0.226 af
Discarded=0.11 cfs 0.122 af Primary=0.92 cfs 0.101 af Secondary=0.05 cfs 0.000 af Outflow=1.08 cfs 0.223 af

Total Runoff Area = 46.306 ac Runoff Volume = 4.542 af Average Runoff Depth = 1.18"
99.75% Pervious = 46.188 ac 0.25% Impervious = 0.118 ac

Summary for Subcatchment PDA-1:

Runoff = 1.90 cfs @ 12.57 hrs, Volume= 0.559 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (ac)	CN	Description
	10.235	30	Woods, Good, HSG A
	0.411	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	2.976	30	Brush, Good, HSG A
	0.055	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.883	39	>75% Grass cover, Good, HSG A
	0.005	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.093	96	Existing Gravel surface, HSG B
	0.102	96	Gravel surface, HSG A
	15.554	34	Weighted Average
	15.554		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	50	0.0100	0.05		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.8	97	0.0130	0.57		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
18.6	147	Total			

Summary for Subcatchment PDA-10:

Runoff = 1.51 cfs @ 12.14 hrs, Volume= 0.132 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (ac)	CN	Description
	0.001	55	Woods, Good, HSG B
	0.012	30	Brush, Good, HSG A
	0.049	48	Brush, Good, HSG B
	0.465	39	>75% Grass cover, Good, HSG A
	0.145	61	>75% Grass cover, Good, HSG B
	0.088	96	Gravel surface, HSG A
	0.035	96	Gravel surface, HSG B
*	0.020	96	Existing Gravel surface, HSG B
	0.815	53	Weighted Average
	0.815		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	68	0.0290	1.19		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.5	126	0.0870	4.42		**Shallow Concentrated Flow, Tc-3** Grassed Waterway Kv= 15.0 fps
8.7	244	Total			

Summary for Subcatchment PDA-11:

Runoff = 14.70 cfs @ 12.46 hrs, Volume= 1.954 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (ac)	CN	Description
	0.096	30	Woods, Good, HSG A
	0.644	55	Woods, Good, HSG B
	0.025	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.221	39	>75% Grass cover, Good, HSG A
	4.421	61	>75% Grass cover, Good, HSG B
	0.148	80	>75% Grass cover, Good, HSG D
	0.645	96	Gravel surface, HSG A
	0.177	96	Gravel surface, HSG B
	0.056	96	Gravel surface, HSG D
*	0.294	96	Existing Gravel surface, HSG B
	0.049	98	Roofs, HSG B
*	0.032	98	Equipment Pad Areas, HSG A
	10.137	57	Weighted Average
	10.056		99.20% Pervious Area
	0.081		0.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
13.3	394	0.0050	0.49		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.8	58	0.0520	1.14		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.3	23	0.0050	1.14		**Shallow Concentrated Flow, Tc-5** Unpaved Kv= 16.1 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow, Tc-6** Short Grass Pasture Kv= 7.0 fps
0.3	57	0.1930	3.08		**Shallow Concentrated Flow, Tc-7** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-8** Unpaved Kv= 16.1 fps
0.1	13	0.3100	3.90		**Shallow Concentrated Flow, Tc-9** Short Grass Pasture Kv= 7.0 fps
30.1	819	Total			

Summary for Subcatchment PDA-18:

Runoff = 2.40 cfs @ 12.17 hrs, Volume= 0.247 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.019	30	Brush, Good, HSG A
1.799	39	>75% Grass cover, Good, HSG A
0.293	96	Gravel surface, HSG A
2.111	47	Weighted Average
2.111		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
3.7	267	0.0300	1.21		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	35	0.0290	2.74		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.7	107	0.0280	2.51		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.2	476	Total			

Summary for Subcatchment PDA-19:

Runoff = 1.89 cfs @ 12.15 hrs, Volume= 0.189 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.520	39	>75% Grass cover, Good, HSG A
0.201	96	Gravel surface, HSG A
1.721	46	Weighted Average
1.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.4	89	0.0220	1.04		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.9	86	0.0580	1.69		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0290	2.74		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	22	0.1360	2.58		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
8.1	281	Total			

Summary for Subcatchment PDA-2:

Runoff = 0.04 cfs @ 13.77 hrs, Volume= 0.024 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.840	30	Woods, Good, HSG A
0.068	39	>75% Grass cover, Good, HSG A
0.443	30	Brush, Good, HSG A
1.351	30	Weighted Average
1.351		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.6	53	0.0400	1.40		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.0	50	0.0300	0.87		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
6.2	153	Total			

Summary for Subcatchment PDA-21:

Runoff = 4.14 cfs @ 12.37 hrs, Volume= 0.640 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
7.254	39	>75% Grass cover, Good, HSG A
0.422	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
7.713	42	Weighted Average
7.676		99.52% Pervious Area
0.037		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0300	0.18		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
12.6	691	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
1.1	105	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
18.3	846	Total			

Summary for Subcatchment PDA-22:

Runoff = 2.07 cfs @ 12.15 hrs, Volume= 0.213 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.840	39	>75% Grass cover, Good, HSG A
0.230	96	Gravel surface, HSG A
2.070	45	Weighted Average
2.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.4	128	0.0160	0.89		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
7.9	178	Total			

Summary for Subcatchment PDA-23:

Runoff = 2.29 cfs @ 12.16 hrs, Volume= 0.226 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.529	39	>75% Grass cover, Good, HSG A
0.288	96	Gravel surface, HSG A
1.817	48	Weighted Average
1.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.8	82	0.0120	0.77		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.0400	3.22		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	10	0.2000	3.13		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
2.3	401	0.0390	2.96		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
9.8	568	Total			

Summary for Subcatchment PDA-8:

Runoff = 0.80 cfs @ 12.14 hrs, Volume= 0.081 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.707	39	>75% Grass cover, Good, HSG A
0.081	96	Gravel surface, HSG A
0.788	45	Weighted Average
0.788		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0670	4.17		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	16	0.1880	3.04		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
0.1	32	0.1560	5.92		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
7.4	278	Total			

Summary for Subcatchment PDA-9:

Runoff = 2.76 cfs @ 12.17 hrs, Volume= 0.277 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.643	39	>75% Grass cover, Good, HSG A
0.363	61	>75% Grass cover, Good, HSG B
0.199	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.229	48	Weighted Average
2.229		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.3	159	0.0280	1.17		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.1500	2.71		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0360	3.05		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	24	0.1250	2.47		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
0.3	49	0.0410	3.04		**Shallow Concentrated Flow, Tc-6** Grassed Waterway Kv= 15.0 fps
10.3	343	Total			

Summary for Reach DP-1:

Inflow Area = 44.955 ac, 0.26% Impervious, Inflow Depth = 0.50" for 100-Year event
Inflow = 5.98 cfs @ 13.06 hrs, Volume= 1.876 af
Outflow = 5.98 cfs @ 13.06 hrs, Volume= 1.876 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2:

Inflow Area = 1.351 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.04 cfs @ 13.77 hrs, Volume= 0.024 af
Outflow = 0.04 cfs @ 13.77 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1:

Inflow Area = 0.788 ac, 0.00% Impervious, Inflow Depth = 1.24" for 100-Year event
Inflow = 0.80 cfs @ 12.14 hrs, Volume= 0.081 af
Outflow = 0.09 cfs @ 14.66 hrs, Volume= 0.081 af, Atten= 88%, Lag= 151.5 min
Discarded = 0.09 cfs @ 14.66 hrs, Volume= 0.081 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 21.87' @ 14.66 hrs Surf.Area= 1,654 sf Storage= 1,259 cf

Plug-Flow detention time= 154.4 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 154.1 min (1,054.5 - 900.4)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	3,477 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	1,225	0	0
22.00	1,715	1,470	1,470
23.00	2,299	2,007	3,477

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.09 cfs @ 14.66 hrs HW=21.87' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=21.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2:

Inflow Area = 2.229 ac, 0.00% Impervious, Inflow Depth = 1.49" for 100-Year event
Inflow = 2.76 cfs @ 12.17 hrs, Volume= 0.277 af
Outflow = 0.42 cfs @ 13.43 hrs, Volume= 0.277 af, Atten= 85%, Lag= 75.9 min
Discarded = 0.42 cfs @ 13.43 hrs, Volume= 0.277 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.52' @ 13.43 hrs Surf.Area= 7,594 sf Storage= 3,697 cf

Plug-Flow detention time= 83.9 min calculated for 0.276 af (100% of inflow)
Center-of-Mass det. time= 83.7 min (975.3 - 891.5)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	16,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	6,714	0	0
24.00	8,416	7,565	7,565
25.00	10,370	9,393	16,958

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.42 cfs @ 13.43 hrs HW=23.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=23.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3:

Inflow Area = 0.815 ac, 0.00% Impervious, Inflow Depth = 1.94" for 100-Year event
Inflow = 1.51 cfs @ 12.14 hrs, Volume= 0.132 af
Outflow = 0.29 cfs @ 12.77 hrs, Volume= 0.132 af, Atten= 81%, Lag= 37.6 min
Discarded = 0.14 cfs @ 12.77 hrs, Volume= 0.121 af
Primary = 0.16 cfs @ 12.77 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 30.03' @ 12.77 hrs Surf.Area= 2,426 sf Storage= 2,033 cf

Plug-Flow detention time= 158.8 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 158.5 min (1,032.7 - 874.2)

Volume	Invert	Avail.Storage	Storage Description
#1	29.00'	4,836 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	1,522	0	0
30.00	2,397	1,960	1,960
31.00	3,356	2,877	4,836

Device	Routing	Invert	Outlet Devices
#1	Discarded	29.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	30.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.14 cfs @ 12.77 hrs HW=30.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.15 cfs @ 12.77 hrs HW=30.03' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.15 cfs @ 0.49 fps)

Summary for Pond 4:

Inflow Area = 10.137 ac, 0.80% Impervious, Inflow Depth = 2.31" for 100-Year event
Inflow = 14.70 cfs @ 12.46 hrs, Volume= 1.954 af
Outflow = 4.91 cfs @ 13.12 hrs, Volume= 1.907 af, Atten= 67%, Lag= 40.1 min
Discarded = 0.88 cfs @ 13.12 hrs, Volume= 0.874 af
Primary = 3.13 cfs @ 13.12 hrs, Volume= 1.000 af
Secondary = 0.90 cfs @ 13.12 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 24.10' @ 13.12 hrs Surf.Area= 15,694 sf Storage= 30,154 cf

Plug-Flow detention time= 160.4 min calculated for 1.904 af (97% of inflow)
Center-of-Mass det. time= 147.5 min (1,030.7 - 883.3)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	45,910 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	3,942	0	0
22.00	7,600	5,771	5,771
23.00	11,389	9,495	15,266
24.00	15,291	13,340	28,606
25.00	19,318	17,305	45,910

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	24.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3 Primary 22.50' **12.0" Round Culvert**
L= 25.0' CPP, projecting, no headwall, Ke= 0.900
Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.88 cfs @ 13.12 hrs HW=24.10' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=3.13 cfs @ 13.12 hrs HW=24.10' (Free Discharge)
3=Culvert (Inlet Controls 3.13 cfs @ 3.99 fps)

Secondary OutFlow Max=0.88 cfs @ 13.12 hrs HW=24.10' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.88 cfs @ 0.88 fps)

Summary for Pond 11:

Inflow Area = 2.111 ac, 0.00% Impervious, Inflow Depth = 1.41" for 100-Year event
Inflow = 2.40 cfs @ 12.17 hrs, Volume= 0.247 af
Outflow = 0.21 cfs @ 15.60 hrs, Volume= 0.247 af, Atten= 91%, Lag= 205.6 min
Discarded = 0.21 cfs @ 15.60 hrs, Volume= 0.247 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 28.55' @ 15.60 hrs Surf.Area= 3,837 sf Storage= 4,791 cf

Plug-Flow detention time= 274.1 min calculated for 0.247 af (100% of inflow)
Center-of-Mass det. time= 274.1 min (1,169.1 - 895.1)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	11,612 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.00	2,410	0	0
28.00	3,246	2,828	2,828
29.00	4,312	3,779	6,607
30.00	5,698	5,005	11,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	29.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.21 cfs @ 15.60 hrs HW=28.55' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 12:

Inflow Area = 1.721 ac, 0.00% Impervious, Inflow Depth = 1.32" for 100-Year event
Inflow = 1.89 cfs @ 12.15 hrs, Volume= 0.189 af
Outflow = 0.17 cfs @ 15.55 hrs, Volume= 0.189 af, Atten= 91%, Lag= 203.9 min
Discarded = 0.17 cfs @ 15.55 hrs, Volume= 0.189 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.83' @ 15.55 hrs Surf.Area= 3,020 sf Storage= 3,648 cf

Plug-Flow detention time= 281.1 min calculated for 0.189 af (100% of inflow)
Center-of-Mass det. time= 281.2 min (1,178.2 - 897.0)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	8,138 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.00	1,064	0	0
27.00	2,045	1,555	1,555
28.00	3,224	2,635	4,189
29.00	4,674	3,949	8,138

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	28.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.17 cfs @ 15.55 hrs HW=27.83' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=26.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 13:

Inflow Area = 7.713 ac, 0.48% Impervious, Inflow Depth = 1.00" for 100-Year event
Inflow = 4.14 cfs @ 12.37 hrs, Volume= 0.640 af
Outflow = 0.94 cfs @ 13.99 hrs, Volume= 0.547 af, Atten= 77%, Lag= 97.6 min
Discarded = 0.31 cfs @ 13.99 hrs, Volume= 0.421 af
Primary = 0.64 cfs @ 13.99 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.08' @ 13.99 hrs Surf.Area= 5,514 sf Storage= 10,696 cf

Plug-Flow detention time= 312.2 min calculated for 0.547 af (85% of inflow)
Center-of-Mass det. time= 246.9 min (1,171.4 - 924.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.50'	16,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.50	2,888	0	0
21.00	3,361	1,562	1,562
22.00	4,309	3,835	5,397
23.00	5,422	4,866	10,263
24.00	6,586	6,004	16,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.31 cfs @ 13.99 hrs HW=23.08' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.62 cfs @ 13.99 hrs HW=23.08' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.62 cfs @ 0.79 fps)

Summary for Pond 14:

Inflow Area = 2.070 ac, 0.00% Impervious, Inflow Depth = 1.24" for 100-Year event
Inflow = 2.07 cfs @ 12.15 hrs, Volume= 0.213 af
Outflow = 0.55 cfs @ 12.68 hrs, Volume= 0.213 af, Atten= 73%, Lag= 31.7 min
Discarded = 0.14 cfs @ 12.68 hrs, Volume= 0.168 af
Primary = 0.41 cfs @ 12.68 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.06' @ 12.68 hrs Surf.Area= 2,585 sf Storage= 2,751 cf

Plug-Flow detention time= 200.6 min calculated for 0.213 af (100% of inflow)
Center-of-Mass det. time= 200.6 min (1,101.5 - 900.9)

Volume	Invert	Avail.Storage	Storage Description
#1	21.50'	5,673 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.50	960	0	0
22.00	1,467	607	607
23.00	2,519	1,993	2,600
24.00	3,628	3,074	5,673

Device	Routing	Invert	Outlet Devices
#1	Discarded	21.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.14 cfs @ 12.68 hrs HW=23.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.40 cfs @ 12.68 hrs HW=23.06' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.40 cfs @ 0.68 fps)

Summary for Pond 15:

Inflow Area = 1.817 ac, 0.00% Impervious, Inflow Depth = 1.49" for 100-Year event
Inflow = 2.29 cfs @ 12.16 hrs, Volume= 0.226 af
Outflow = 1.08 cfs @ 12.51 hrs, Volume= 0.223 af, Atten= 53%, Lag= 20.9 min
Discarded = 0.11 cfs @ 12.51 hrs, Volume= 0.122 af
Primary = 0.92 cfs @ 12.51 hrs, Volume= 0.101 af
Secondary = 0.05 cfs @ 12.51 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.01' @ 12.51 hrs Surf.Area= 2,053 sf Storage= 2,436 cf

Plug-Flow detention time= 142.6 min calculated for 0.223 af (99% of inflow)
Center-of-Mass det. time= 136.9 min (1,028.0 - 891.0)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	5,009 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	470	0	0
22.00	1,154	812	812
23.00	2,038	1,596	2,408
24.00	3,164	2,601	5,009

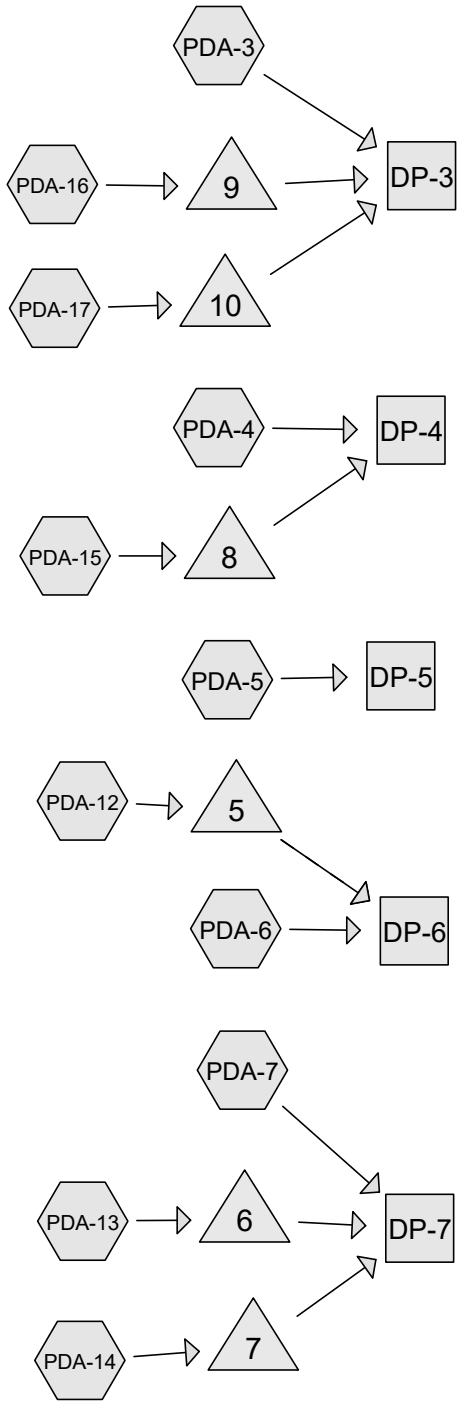
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	22.50'	**15.0" Round Culvert** L= 15.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.50' / 22.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.11 cfs @ 12.51 hrs HW=23.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.91 cfs @ 12.51 hrs HW=23.01' (Free Discharge)
3=Culvert (Inlet Controls 0.91 cfs @ 1.92 fps)

Secondary OutFlow Max=0.04 cfs @ 12.51 hrs HW=23.01' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.04 cfs @ 0.31 fps)

Post-Development
Conditions Hydrology



Subcat Reach Pond Link

Routing Diagram for 1833109HC003B
Prepared by Beals and Thomas, Inc., Printed 9/15/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.149	39	>75% Grass cover, Good, HSG A (PDA-12, PDA-13, PDA-14, PDA-15, PDA-16, PDA-17, PDA-3, PDA-4, PDA-5, PDA-6, PDA-7)
0.016	61	>75% Grass cover, Good, HSG B (PDA-7)
1.019	30	Brush, Good, HSG A (PDA-12, PDA-13, PDA-15, PDA-17, PDA-3, PDA-4, PDA-5, PDA-6, PDA-7)
0.004	98	Equipment Pad Areas, HSG A (PDA-16)
0.004	98	Existing Roofs, HSG B (PDA-7)
1.388	96	Gravel surface, HSG A (PDA-12, PDA-13, PDA-14, PDA-15, PDA-16, PDA-17)
10.188	30	Woods, Good, HSG A (PDA-12, PDA-15, PDA-3, PDA-4, PDA-5, PDA-6, PDA-7)
24.768	**38**	**TOTAL AREA**

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-12: Runoff Area=9.014 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=607' Tc=16.2 min CN=42 Runoff=0.03 cfs 0.021 af

Subcatchment PDA-13: Runoff Area=1.883 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=342' Tc=10.0 min CN=42 Runoff=0.01 cfs 0.004 af

Subcatchment PDA-14: Runoff Area=0.672 ac 0.00% Impervious Runoff Depth=0.22"
Flow Length=132' Tc=7.7 min CN=52 Runoff=0.05 cfs 0.013 af

Subcatchment PDA-15: Runoff Area=1.117 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=274' Tc=6.0 min CN=50 Runoff=0.05 cfs 0.016 af

Subcatchment PDA-16: Runoff Area=0.860 ac 0.47% Impervious Runoff Depth=0.28"
Tc=6.0 min CN=54 Runoff=0.10 cfs 0.020 af

Subcatchment PDA-17: Runoff Area=0.416 ac 0.00% Impervious Runoff Depth=0.22"
Flow Length=307' Tc=7.3 min CN=52 Runoff=0.03 cfs 0.008 af

Subcatchment PDA-3: Runoff Area=1.900 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=131' Tc=10.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-4: Runoff Area=3.855 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=336' Tc=12.9 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-5: Runoff Area=2.167 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=132' Tc=13.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-6: Runoff Area=2.243 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=181' Tc=11.1 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-7: Runoff Area=0.641 ac 0.62% Impervious Runoff Depth=0.00"
Flow Length=68' Tc=13.7 min CN=33 Runoff=0.00 cfs 0.000 af

Reach DP-3: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-6: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-7: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 5: Peak Elev=27.50' Storage=13 cf Inflow=0.03 cfs 0.021 af
Discarded=0.03 cfs 0.021 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.021 af

Pond 6: Peak Elev=38.00' Storage=2 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond 7: Peak Elev=33.01' Storage=17 cf Inflow=0.05 cfs 0.013 af
Discarded=0.05 cfs 0.013 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.013 af

Pond 8: Peak Elev=22.53' Storage=24 cf Inflow=0.05 cfs 0.016 af
Discarded=0.04 cfs 0.016 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.016 af

Pond 9: Peak Elev=33.02' Storage=35 cf Inflow=0.10 cfs 0.020 af
Discarded=0.09 cfs 0.020 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.020 af

Pond 10: Peak Elev=36.01' Storage=10 cf Inflow=0.03 cfs 0.008 af
Discarded=0.03 cfs 0.008 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.008 af

Total Runoff Area = 24.768 ac Runoff Volume = 0.082 af Average Runoff Depth = 0.04"
99.97% Pervious = 24.760 ac 0.03% Impervious = 0.008 ac

Summary for Subcatchment PDA-12:

Runoff = 0.03 cfs @ 17.08 hrs, Volume= 0.021 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.536	30	Woods, Good, HSG A
0.144	30	Brush, Good, HSG A
7.814	39	>75% Grass cover, Good, HSG A
0.520	96	Gravel surface, HSG A
9.014	42	Weighted Average
9.014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
6.6	362	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.3	179	0.0340	1.29		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
16.2	607	Total			

Summary for Subcatchment PDA-13:

Runoff = 0.01 cfs @ 16.96 hrs, Volume= 0.004 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.011	30	Brush, Good, HSG A
1.755	39	>75% Grass cover, Good, HSG A
0.117	96	Gravel surface, HSG A
1.883	42	Weighted Average
1.883		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
4.0	205	0.0150	0.86		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.0200	2.28		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.3	62	0.0480	3.29		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
10.0	342	Total			

Summary for Subcatchment PDA-14:

Runoff = 0.05 cfs @ 12.40 hrs, Volume= 0.013 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.521	39	>75% Grass cover, Good, HSG A
0.151	96	Gravel surface, HSG A
0.672	52	Weighted Average
0.672		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.3	36	0.0830	2.02		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0480	3.53		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
7.7	132	Total			

Summary for Subcatchment PDA-15:

Runoff = 0.05 cfs @ 12.42 hrs, Volume= 0.016 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.169	30	Woods, Good, HSG A
0.133	30	Brush, Good, HSG A
0.547	39	>75% Grass cover, Good, HSG A
0.268	96	Gravel surface, HSG A
1.117	50	Weighted Average
1.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	224	0.0610	3.70		**Shallow Concentrated Flow, Tc-2** Grassed Waterway Kv= 15.0 fps
6.0	274	Total			

Summary for Subcatchment PDA-16:

Runoff = 0.10 cfs @ 12.32 hrs, Volume= 0.020 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.631	39	>75% Grass cover, Good, HSG A
0.225	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.860	54	Weighted Average
0.856		99.53% Pervious Area
0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 Min.**

Summary for Subcatchment PDA-17:

Runoff = 0.03 cfs @ 12.39 hrs, Volume= 0.008 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.069	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.107	96	Gravel surface, HSG A
0.416	52	Weighted Average
0.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.3	257	0.0150	1.84		**Shallow Concentrated Flow, Tc-2** Grassed Waterway Kv= 15.0 fps
7.3	307	Total			

Summary for Subcatchment PDA-3:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.697	30	Woods, Good, HSG A
0.124	30	Brush, Good, HSG A
0.079	39	>75% Grass cover, Good, HSG A
1.900	30	Weighted Average
1.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
0.9	81	0.0860	1.47		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
10.0	131	Total			

Summary for Subcatchment PDA-4:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
3.537	30	Woods, Good, HSG A
0.138	30	Brush, Good, HSG A
0.180	39	>75% Grass cover, Good, HSG A
3.855	30	Weighted Average
3.855		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	68	0.0440	1.05		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
12.9	336	Total			

Summary for Subcatchment PDA-5:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.917	30	Woods, Good, HSG A
0.151	30	Brush, Good, HSG A
0.099	39	>75% Grass cover, Good, HSG A
2.167	30	Weighted Average
2.167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.8	132	Total			

Summary for Subcatchment PDA-6:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.843	30	Woods, Good, HSG A
0.187	39	>75% Grass cover, Good, HSG A
0.213	30	Brush, Good, HSG A
2.243	31	Weighted Average
2.243		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	131	0.0460	1.07		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
11.1	181	Total			

Summary for Subcatchment PDA-7:

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.489	30	Woods, Good, HSG A
	0.096	39	>75% Grass cover, Good, HSG A
	0.016	61	>75% Grass cover, Good, HSG B
*	0.004	98	Existing Roofs, HSG B
	0.036	30	Brush, Good, HSG A
	0.641	33	Weighted Average
	0.637		99.38% Pervious Area
	0.004		0.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	50	0.0150	0.06		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	18	0.0420	1.02		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.7	68	Total			

Summary for Reach DP-3:

Inflow Area = 3.176 ac, 0.13% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4:

Inflow Area = 4.972 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-5:

Inflow Area = 2.167 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-6:

Inflow Area = 11.257 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-7:

Inflow Area = 3.196 ac, 0.13% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 5:

Inflow Area = 9.014 ac, 0.00% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.03 cfs @ 17.08 hrs, Volume= 0.021 af
Outflow = 0.03 cfs @ 17.19 hrs, Volume= 0.021 af, Atten= 0%, Lag= 6.1 min
Discarded = 0.03 cfs @ 17.19 hrs, Volume= 0.021 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.50' @ 17.19 hrs Surf.Area= 4,179 sf Storage= 13 cf

Plug-Flow detention time= 7.4 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 7.4 min (1,169.7 - 1,162.3)

Volume	Invert	Avail.Storage	Storage Description
#1	27.50'	21,697 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.50	4,168	0	0
28.00	5,929	2,524	2,524
29.00	9,548	7,739	10,263
30.00	13,320	11,434	21,697

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	29.25'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	29.00'	**6.0" Round Culvert X 2.00**
			L= 17.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 29.00' / 28.76' S= 0.0141 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.23 cfs @ 17.19 hrs HW=27.50' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.50' (Free Discharge)
↑—**3=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6:

Inflow Area = 1.883 ac, 0.00% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.01 cfs @ 16.96 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 17.07 hrs, Volume= 0.004 af, Atten= 0%, Lag= 6.6 min
Discarded = 0.01 cfs @ 17.07 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.00' @ 17.07 hrs Surf.Area= 2,413 sf Storage= 2 cf

Plug-Flow detention time= 5.9 min calculated for 0.004 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (1,162.5 - 1,156.5)

Volume	Invert	Avail.Storage	Storage Description
#1	38.00'	7,083 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.00	2,412	0	0
39.00	3,533	2,973	2,973
40.00	4,688	4,111	7,083

Device	Routing	Invert	Outlet Devices
#1	Discarded	38.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	39.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.13 cfs @ 17.07 hrs HW=38.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=38.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 7:

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 0.22" for 2-Year event
Inflow = 0.05 cfs @ 12.40 hrs, Volume= 0.013 af
Outflow = 0.05 cfs @ 12.49 hrs, Volume= 0.013 af, Atten= 10%, Lag= 5.8 min
Discarded = 0.05 cfs @ 12.49 hrs, Volume= 0.013 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 33.01' @ 12.49 hrs Surf.Area= 1,392 sf Storage= 17 cf

Plug-Flow detention time= 6.0 min calculated for 0.013 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (976.4 - 970.5)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,185 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,371	0	0
34.00	3,067	2,219	2,219
35.00	4,864	3,966	6,185

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.08 cfs @ 12.49 hrs HW=33.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=33.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 8:

Inflow Area = 1.117 ac, 0.00% Impervious, Inflow Depth = 0.17" for 2-Year event
Inflow = 0.05 cfs @ 12.42 hrs, Volume= 0.016 af
Outflow = 0.04 cfs @ 12.57 hrs, Volume= 0.016 af, Atten= 25%, Lag= 8.8 min
Discarded = 0.04 cfs @ 12.57 hrs, Volume= 0.016 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 22.53' @ 12.57 hrs Surf.Area= 756 sf Storage= 24 cf

Plug-Flow detention time= 10.3 min calculated for 0.016 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (1,000.8 - 990.4)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	5,806 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.50	742	0	0
23.00	959	425	425
24.00	1,468	1,214	1,639
25.00	2,060	1,764	3,403
26.00	2,746	2,403	5,806

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	25.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 12.57 hrs HW=22.53' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=22.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 9:

Inflow Area = 0.860 ac, 0.47% Impervious, Inflow Depth = 0.28" for 2-Year event
Inflow = 0.10 cfs @ 12.32 hrs, Volume= 0.020 af
Outflow = 0.09 cfs @ 12.45 hrs, Volume= 0.020 af, Atten= 14%, Lag= 7.7 min
Discarded = 0.09 cfs @ 12.45 hrs, Volume= 0.020 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 33.02' @ 12.45 hrs Surf.Area= 1,595 sf Storage= 35 cf

Plug-Flow detention time= 5.9 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (957.1 - 951.2)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,365 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,552	0	0
33.50	2,513	1,016	1,016
34.00	3,207	1,430	2,446
35.00	4,630	3,919	6,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.09 cfs @ 12.45 hrs HW=33.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=33.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10:

Inflow Area = 0.416 ac, 0.00% Impervious, Inflow Depth = 0.22" for 2-Year event
Inflow = 0.03 cfs @ 12.39 hrs, Volume= 0.008 af
Outflow = 0.03 cfs @ 12.49 hrs, Volume= 0.008 af, Atten= 10%, Lag= 5.8 min
Discarded = 0.03 cfs @ 12.49 hrs, Volume= 0.008 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 36.01' @ 12.49 hrs Surf.Area= 949 sf Storage= 10 cf

Plug-Flow detention time= 6.0 min calculated for 0.008 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (976.0 - 970.1)

Volume	Invert	Avail.Storage	Storage Description
#1	36.00'	4,552 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.00	935	0	0
37.00	2,173	1,554	1,554
38.00	3,823	2,998	4,552

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	37.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 12.49 hrs HW=36.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=36.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-12: Runoff Area=9.014 ac 0.00% Impervious Runoff Depth=0.24"
Flow Length=607' Tc=16.2 min CN=42 Runoff=0.50 cfs 0.179 af

Subcatchment PDA-13: Runoff Area=1.883 ac 0.00% Impervious Runoff Depth=0.24"
Flow Length=342' Tc=10.0 min CN=42 Runoff=0.12 cfs 0.037 af

Subcatchment PDA-14: Runoff Area=0.672 ac 0.00% Impervious Runoff Depth=0.67"
Flow Length=132' Tc=7.7 min CN=52 Runoff=0.32 cfs 0.038 af

Subcatchment PDA-15: Runoff Area=1.117 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=274' Tc=6.0 min CN=50 Runoff=0.40 cfs 0.053 af

Subcatchment PDA-16: Runoff Area=0.860 ac 0.47% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=54 Runoff=0.56 cfs 0.056 af

Subcatchment PDA-17: Runoff Area=0.416 ac 0.00% Impervious Runoff Depth=0.67"
Flow Length=307' Tc=7.3 min CN=52 Runoff=0.20 cfs 0.023 af

Subcatchment PDA-3: Runoff Area=1.900 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=131' Tc=10.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-4: Runoff Area=3.855 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=336' Tc=12.9 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-5: Runoff Area=2.167 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=132' Tc=13.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-6: Runoff Area=2.243 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=181' Tc=11.1 min CN=31 Runoff=0.00 cfs 0.001 af

Subcatchment PDA-7: Runoff Area=0.641 ac 0.62% Impervious Runoff Depth=0.02"
Flow Length=68' Tc=13.7 min CN=33 Runoff=0.00 cfs 0.001 af

Reach DP-3: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-6: Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-7: Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond 5: Peak Elev=27.67' Storage=751 cf Inflow=0.50 cfs 0.179 af
Discarded=0.27 cfs 0.179 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.179 af

Pond 6: Peak Elev=38.02' Storage=36 cf Inflow=0.12 cfs 0.037 af
Discarded=0.10 cfs 0.037 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.037 af

Pond 7: Peak Elev=33.19' Storage=296 cf Inflow=0.32 cfs 0.038 af
Discarded=0.09 cfs 0.038 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.038 af

Pond 8: Peak Elev=23.29' Storage=727 cf Inflow=0.40 cfs 0.053 af
Discarded=0.06 cfs 0.053 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.053 af

Pond 9: Peak Elev=33.30' Storage=557 cf Inflow=0.56 cfs 0.056 af
Discarded=0.12 cfs 0.056 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.056 af

Pond 10: Peak Elev=36.17' Storage=173 cf Inflow=0.20 cfs 0.023 af
Discarded=0.06 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.023 af

Total Runoff Area = 24.768 ac Runoff Volume = 0.389 af Average Runoff Depth = 0.19"
99.97% Pervious = 24.760 ac 0.03% Impervious = 0.008 ac

Summary for Subcatchment PDA-12:

Runoff = 0.50 cfs @ 12.58 hrs, Volume= 0.179 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.536	30	Woods, Good, HSG A
0.144	30	Brush, Good, HSG A
7.814	39	>75% Grass cover, Good, HSG A
0.520	96	Gravel surface, HSG A
9.014	42	Weighted Average
9.014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
6.6	362	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.3	179	0.0340	1.29		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
16.2	607	Total			

Summary for Subcatchment PDA-13:

Runoff = 0.12 cfs @ 12.49 hrs, Volume= 0.037 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.011	30	Brush, Good, HSG A
1.755	39	>75% Grass cover, Good, HSG A
0.117	96	Gravel surface, HSG A
1.883	42	Weighted Average
1.883		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
4.0	205	0.0150	0.86		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.0200	2.28		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.3	62	0.0480	3.29		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
10.0	342	Total			

Summary for Subcatchment PDA-14:

Runoff = 0.32 cfs @ 12.16 hrs, Volume= 0.038 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.521	39	>75% Grass cover, Good, HSG A
0.151	96	Gravel surface, HSG A
0.672	52	Weighted Average
0.672		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.3	36	0.0830	2.02		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0480	3.53		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
7.7	132	Total			

Summary for Subcatchment PDA-15:

Runoff = 0.40 cfs @ 12.15 hrs, Volume= 0.053 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.169	30	Woods, Good, HSG A
0.133	30	Brush, Good, HSG A
0.547	39	>75% Grass cover, Good, HSG A
0.268	96	Gravel surface, HSG A
1.117	50	Weighted Average
1.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	224	0.0610	3.70		**Shallow Concentrated Flow, Tc-2** Grassed Waterway Kv= 15.0 fps
6.0	274	Total			

Summary for Subcatchment PDA-16:

Runoff = 0.56 cfs @ 12.12 hrs, Volume= 0.056 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.631	39	>75% Grass cover, Good, HSG A
0.225	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.860	54	Weighted Average
0.856		99.53% Pervious Area
0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 Min.**

Summary for Subcatchment PDA-17:

Runoff = 0.20 cfs @ 12.15 hrs, Volume= 0.023 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
0.069	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.107	96	Gravel surface, HSG A
0.416	52	Weighted Average
0.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
2.3	257	0.0150	1.84		**Shallow Concentrated Flow, Tc-2** Grassed Waterway Kv= 15.0 fps
7.3	307	Total			

Summary for Subcatchment PDA-3:

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.697	30	Woods, Good, HSG A
0.124	30	Brush, Good, HSG A
0.079	39	>75% Grass cover, Good, HSG A
1.900	30	Weighted Average
1.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
0.9	81	0.0860	1.47		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
10.0	131	Total			

Summary for Subcatchment PDA-4:

Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
3.537	30	Woods, Good, HSG A
0.138	30	Brush, Good, HSG A
0.180	39	>75% Grass cover, Good, HSG A
3.855	30	Weighted Average
3.855		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	68	0.0440	1.05		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
12.9	336	Total			

Summary for Subcatchment PDA-5:

Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.917	30	Woods, Good, HSG A
0.151	30	Brush, Good, HSG A
0.099	39	>75% Grass cover, Good, HSG A
2.167	30	Weighted Average
2.167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.8	132	Total			

Summary for Subcatchment PDA-6:

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (ac)	CN	Description
1.843	30	Woods, Good, HSG A
0.187	39	>75% Grass cover, Good, HSG A
0.213	30	Brush, Good, HSG A
2.243	31	Weighted Average
2.243		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	131	0.0460	1.07		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
11.1	181	Total			

Summary for Subcatchment PDA-7:

Runoff = 0.00 cfs @ 21.66 hrs, Volume= 0.001 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (ac)	CN	Description
	0.489	30	Woods, Good, HSG A
	0.096	39	>75% Grass cover, Good, HSG A
	0.016	61	>75% Grass cover, Good, HSG B
*	0.004	98	Existing Roofs, HSG B
	0.036	30	Brush, Good, HSG A
	0.641	33	Weighted Average
	0.637		99.38% Pervious Area
	0.004		0.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	50	0.0150	0.06		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	18	0.0420	1.02		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.7	68	Total			

Summary for Reach DP-3:

Inflow Area = 3.176 ac, 0.13% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4:

Inflow Area = 4.972 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-5:

Inflow Area = 2.167 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-6:

Inflow Area = 11.257 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-7:

Inflow Area = 3.196 ac, 0.13% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 21.66 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 21.66 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 5:

Inflow Area = 9.014 ac, 0.00% Impervious, Inflow Depth = 0.24" for 10-Year event
Inflow = 0.50 cfs @ 12.58 hrs, Volume= 0.179 af
Outflow = 0.27 cfs @ 15.01 hrs, Volume= 0.179 af, Atten= 46%, Lag= 145.8 min
Discarded = 0.27 cfs @ 15.01 hrs, Volume= 0.179 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.67' @ 15.01 hrs Surf.Area= 4,760 sf Storage= 751 cf

Plug-Flow detention time= 26.1 min calculated for 0.179 af (100% of inflow)
Center-of-Mass det. time= 25.9 min (1,025.5 - 999.6)

Volume	Invert	Avail.Storage	Storage Description
#1	27.50'	21,697 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.50	4,168	0	0
28.00	5,929	2,524	2,524
29.00	9,548	7,739	10,263
30.00	13,320	11,434	21,697

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	29.25'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	29.00'	**6.0" Round Culvert X 2.00**
			L= 17.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 29.00' / 28.76' S= 0.0141 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.27 cfs @ 15.01 hrs HW=27.67' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.50' (Free Discharge)
↑—**3=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6:

Inflow Area = 1.883 ac, 0.00% Impervious, Inflow Depth = 0.24" for 10-Year event
Inflow = 0.12 cfs @ 12.49 hrs, Volume= 0.037 af
Outflow = 0.10 cfs @ 12.59 hrs, Volume= 0.037 af, Atten= 12%, Lag= 6.0 min
Discarded = 0.10 cfs @ 12.59 hrs, Volume= 0.037 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.02' @ 12.59 hrs Surf.Area= 2,429 sf Storage= 36 cf

Plug-Flow detention time= 5.9 min calculated for 0.037 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (999.8 - 993.8)

Volume	Invert	Avail.Storage	Storage Description
#1	38.00'	7,083 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.00	2,412	0	0
39.00	3,533	2,973	2,973
40.00	4,688	4,111	7,083

Device	Routing	Invert	Outlet Devices
#1	Discarded	38.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	39.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.14 cfs @ 12.59 hrs HW=38.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=38.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 7:

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 0.67" for 10-Year event
Inflow = 0.32 cfs @ 12.16 hrs, Volume= 0.038 af
Outflow = 0.09 cfs @ 12.71 hrs, Volume= 0.038 af, Atten= 70%, Lag= 32.9 min
Discarded = 0.09 cfs @ 12.71 hrs, Volume= 0.038 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 33.19' @ 12.71 hrs Surf.Area= 1,698 sf Storage= 296 cf

Plug-Flow detention time= 23.1 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 23.1 min (937.3 - 914.2)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,185 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,371	0	0
34.00	3,067	2,219	2,219
35.00	4,864	3,966	6,185

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.09 cfs @ 12.71 hrs HW=33.19' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=33.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 8:

Inflow Area = 1.117 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-Year event
Inflow = 0.40 cfs @ 12.15 hrs, Volume= 0.053 af
Outflow = 0.06 cfs @ 15.04 hrs, Volume= 0.053 af, Atten= 85%, Lag= 173.4 min
Discarded = 0.06 cfs @ 15.04 hrs, Volume= 0.053 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 23.29' @ 15.04 hrs Surf.Area= 1,108 sf Storage= 727 cf

Plug-Flow detention time= 137.6 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 137.4 min (1,060.7 - 923.4)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	5,806 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.50	742	0	0
23.00	959	425	425
24.00	1,468	1,214	1,639
25.00	2,060	1,764	3,403
26.00	2,746	2,403	5,806

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	25.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 15.04 hrs HW=23.29' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=22.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 9:

Inflow Area = 0.860 ac, 0.47% Impervious, Inflow Depth = 0.78" for 10-Year event
Inflow = 0.56 cfs @ 12.12 hrs, Volume= 0.056 af
Outflow = 0.12 cfs @ 12.86 hrs, Volume= 0.056 af, Atten= 79%, Lag= 44.5 min
Discarded = 0.12 cfs @ 12.86 hrs, Volume= 0.056 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 33.30' @ 12.86 hrs Surf.Area= 2,133 sf Storage= 557 cf

Plug-Flow detention time= 40.0 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 40.0 min (943.1 - 903.1)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,365 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,552	0	0
33.50	2,513	1,016	1,016
34.00	3,207	1,430	2,446
35.00	4,630	3,919	6,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.12 cfs @ 12.86 hrs HW=33.30' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=33.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10:

Inflow Area = 0.416 ac, 0.00% Impervious, Inflow Depth = 0.67" for 10-Year event
Inflow = 0.20 cfs @ 12.15 hrs, Volume= 0.023 af
Outflow = 0.06 cfs @ 12.64 hrs, Volume= 0.023 af, Atten= 68%, Lag= 29.5 min
Discarded = 0.06 cfs @ 12.64 hrs, Volume= 0.023 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 36.17' @ 12.64 hrs Surf.Area= 1,141 sf Storage= 173 cf

Plug-Flow detention time= 19.2 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 19.2 min (933.0 - 913.8)

Volume	Invert	Avail.Storage	Storage Description
#1	36.00'	4,552 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.00	935	0	0
37.00	2,173	1,554	1,554
38.00	3,823	2,998	4,552

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	37.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 12.64 hrs HW=36.17' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=36.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 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 PDA-12: Runoff Area=9.014 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=607' Tc=16.2 min CN=42 Runoff=5.02 cfs 0.748 af

Subcatchment PDA-13: Runoff Area=1.883 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=342' Tc=10.0 min CN=42 Runoff=1.20 cfs 0.156 af

Subcatchment PDA-14: Runoff Area=0.672 ac 0.00% Impervious Runoff Depth=1.85"
Flow Length=132' Tc=7.7 min CN=52 Runoff=1.21 cfs 0.103 af

Subcatchment PDA-15: Runoff Area=1.117 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=274' Tc=6.0 min CN=50 Runoff=1.87 cfs 0.155 af

Subcatchment PDA-16: Runoff Area=0.860 ac 0.47% Impervious Runoff Depth=2.03"
Tc=6.0 min CN=54 Runoff=1.86 cfs 0.146 af

Subcatchment PDA-17: Runoff Area=0.416 ac 0.00% Impervious Runoff Depth=1.85"
Flow Length=307' Tc=7.3 min CN=52 Runoff=0.76 cfs 0.064 af

Subcatchment PDA-3: Runoff Area=1.900 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=131' Tc=10.0 min CN=30 Runoff=0.05 cfs 0.034 af

Subcatchment PDA-4: Runoff Area=3.855 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=336' Tc=12.9 min CN=30 Runoff=0.11 cfs 0.068 af

Subcatchment PDA-5: Runoff Area=2.167 ac 0.00% Impervious Runoff Depth=0.21"
Flow Length=132' Tc=13.8 min CN=30 Runoff=0.06 cfs 0.038 af

Subcatchment PDA-6: Runoff Area=2.243 ac 0.00% Impervious Runoff Depth=0.26"
Flow Length=181' Tc=11.1 min CN=31 Runoff=0.08 cfs 0.049 af

Subcatchment PDA-7: Runoff Area=0.641 ac 0.62% Impervious Runoff Depth=0.37"
Flow Length=68' Tc=13.7 min CN=33 Runoff=0.06 cfs 0.020 af

Reach DP-3: Inflow=0.08 cfs 0.035 af
Outflow=0.08 cfs 0.035 af

Reach DP-4: Inflow=0.11 cfs 0.069 af
Outflow=0.11 cfs 0.069 af

Reach DP-5: Inflow=0.06 cfs 0.038 af
Outflow=0.06 cfs 0.038 af

Reach DP-6: Inflow=0.33 cfs 0.114 af
Outflow=0.33 cfs 0.114 af

Reach DP-7: Inflow=0.06 cfs 0.020 af
Outflow=0.06 cfs 0.020 af

Pond 5: Peak Elev=29.24' Storage=12,698 cf Inflow=5.02 cfs 0.748 af
Discarded=0.58 cfs 0.682 af Primary=0.25 cfs 0.065 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.748 af

Pond 6: Peak Elev=38.77' Storage=2,189 cf Inflow=1.20 cfs 0.156 af
Discarded=0.18 cfs 0.156 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.156 af

Pond 7: Peak Elev=33.78' Storage=1,597 cf Inflow=1.21 cfs 0.103 af
Discarded=0.15 cfs 0.103 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.103 af

Pond 8: Peak Elev=25.00' Storage=3,409 cf Inflow=1.87 cfs 0.155 af
Discarded=0.12 cfs 0.143 af Primary=0.01 cfs 0.000 af Outflow=0.13 cfs 0.143 af

Pond 9: Peak Elev=34.01' Storage=2,465 cf Inflow=1.86 cfs 0.146 af
Discarded=0.18 cfs 0.144 af Primary=0.02 cfs 0.001 af Outflow=0.20 cfs 0.146 af

Pond 10: Peak Elev=36.70' Storage=953 cf Inflow=0.76 cfs 0.064 af
Discarded=0.10 cfs 0.064 af Primary=0.00 cfs 0.000 af Outflow=0.10 cfs 0.064 af

Total Runoff Area = 24.768 ac Runoff Volume = 1.581 af Average Runoff Depth = 0.77"
99.97% Pervious = 24.760 ac 0.03% Impervious = 0.008 ac

Summary for Subcatchment PDA-12:

Runoff = 5.02 cfs @ 12.32 hrs, Volume= 0.748 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.536	30	Woods, Good, HSG A
0.144	30	Brush, Good, HSG A
7.814	39	>75% Grass cover, Good, HSG A
0.520	96	Gravel surface, HSG A
9.014	42	Weighted Average
9.014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
6.6	362	0.0170	0.91		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
2.3	179	0.0340	1.29		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
16.2	607	Total			

Summary for Subcatchment PDA-13:

Runoff = 1.20 cfs @ 12.20 hrs, Volume= 0.156 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.011	30	Brush, Good, HSG A
1.755	39	>75% Grass cover, Good, HSG A
0.117	96	Gravel surface, HSG A
1.883	42	Weighted Average
1.883		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
4.0	205	0.0150	0.86		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.0200	2.28		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.3	62	0.0480	3.29		**Shallow Concentrated Flow, Tc-4** Grassed Waterway Kv= 15.0 fps
10.0	342	Total			

Summary for Subcatchment PDA-14:

Runoff = 1.21 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.521	39	>75% Grass cover, Good, HSG A
0.151	96	Gravel surface, HSG A
0.672	52	Weighted Average
0.672		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
0.3	36	0.0830	2.02		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0480	3.53		**Shallow Concentrated Flow, Tc-3** Unpaved Kv= 16.1 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow, Tc-4** Short Grass Pasture Kv= 7.0 fps
7.7	132	Total			

Summary for Subcatchment PDA-15:

Runoff = 1.87 cfs @ 12.11 hrs, Volume= 0.155 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.169	30	Woods, Good, HSG A
0.133	30	Brush, Good, HSG A
0.547	39	>75% Grass cover, Good, HSG A
0.268	96	Gravel surface, HSG A
1.117	50	Weighted Average
1.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1** Grass: Short n= 0.150 P2= 3.40"
1.0	224	0.0610	3.70		**Shallow Concentrated Flow, Tc-2** Grassed Waterway Kv= 15.0 fps
6.0	274	Total			

Summary for Subcatchment PDA-16:

Runoff = 1.86 cfs @ 12.10 hrs, Volume= 0.146 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.631	39	>75% Grass cover, Good, HSG A
0.225	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.860	54	Weighted Average
0.856		99.53% Pervious Area
0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 Min.**

Summary for Subcatchment PDA-17:

Runoff = 0.76 cfs @ 12.12 hrs, Volume= 0.064 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.069	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.107	96	Gravel surface, HSG A
0.416	52	Weighted Average
0.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.0250	0.17		**Sheet Flow, Tc-1**
					Grass: Short n= 0.150 P2= 3.40"
2.3	257	0.0150	1.84		**Shallow Concentrated Flow, Tc-2**
					Grassed Waterway Kv= 15.0 fps
7.3	307	Total			

Summary for Subcatchment PDA-3:

Runoff = 0.05 cfs @ 13.83 hrs, Volume= 0.034 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.697	30	Woods, Good, HSG A
0.124	30	Brush, Good, HSG A
0.079	39	>75% Grass cover, Good, HSG A
1.900	30	Weighted Average
1.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1**
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.9	81	0.0860	1.47		**Shallow Concentrated Flow, Tc-2**
					Woodland Kv= 5.0 fps
10.0	131	Total			

Summary for Subcatchment PDA-4:

Runoff = 0.11 cfs @ 13.88 hrs, Volume= 0.068 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
3.537	30	Woods, Good, HSG A
0.138	30	Brush, Good, HSG A
0.180	39	>75% Grass cover, Good, HSG A
3.855	30	Weighted Average
3.855		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	68	0.0440	1.05		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
2.7	218	0.0730	1.35		**Shallow Concentrated Flow, Tc-3** Woodland Kv= 5.0 fps
12.9	336	Total			

Summary for Subcatchment PDA-5:

Runoff = 0.06 cfs @ 13.89 hrs, Volume= 0.038 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.917	30	Woods, Good, HSG A
0.151	30	Brush, Good, HSG A
0.099	39	>75% Grass cover, Good, HSG A
2.167	30	Weighted Average
2.167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
1.8	82	0.0240	0.77		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.8	132	Total			

Summary for Subcatchment PDA-6:

Runoff = 0.08 cfs @ 12.59 hrs, Volume= 0.049 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
1.843	30	Woods, Good, HSG A
0.187	39	>75% Grass cover, Good, HSG A
0.213	30	Brush, Good, HSG A
2.243	31	Weighted Average
2.243		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
2.0	131	0.0460	1.07		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
11.1	181	Total			

Summary for Subcatchment PDA-7:

Runoff = 0.06 cfs @ 12.53 hrs, Volume= 0.020 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (ac)	CN	Description
	0.489	30	Woods, Good, HSG A
	0.096	39	>75% Grass cover, Good, HSG A
	0.016	61	>75% Grass cover, Good, HSG B
*	0.004	98	Existing Roofs, HSG B
	0.036	30	Brush, Good, HSG A
	0.641	33	Weighted Average
	0.637		99.38% Pervious Area
	0.004		0.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	50	0.0150	0.06		**Sheet Flow, Tc-1** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	18	0.0420	1.02		**Shallow Concentrated Flow, Tc-2** Woodland Kv= 5.0 fps
13.7	68	Total			

Summary for Reach DP-3:

Inflow Area = 3.176 ac, 0.13% Impervious, Inflow Depth = 0.13" for 100-Year event
Inflow = 0.08 cfs @ 13.48 hrs, Volume= 0.035 af
Outflow = 0.08 cfs @ 13.48 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-4:

Inflow Area = 4.972 ac, 0.00% Impervious, Inflow Depth = 0.17" for 100-Year event
Inflow = 0.11 cfs @ 15.46 hrs, Volume= 0.069 af
Outflow = 0.11 cfs @ 15.46 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-5:

Inflow Area = 2.167 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-Year event
Inflow = 0.06 cfs @ 13.89 hrs, Volume= 0.038 af
Outflow = 0.06 cfs @ 13.89 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-6:

Inflow Area = 11.257 ac, 0.00% Impervious, Inflow Depth = 0.12" for 100-Year event
Inflow = 0.33 cfs @ 15.07 hrs, Volume= 0.114 af
Outflow = 0.33 cfs @ 15.07 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP-7:

Inflow Area = 3.196 ac, 0.13% Impervious, Inflow Depth = 0.07" for 100-Year event
Inflow = 0.06 cfs @ 12.53 hrs, Volume= 0.020 af
Outflow = 0.06 cfs @ 12.53 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 5:

Inflow Area = 9.014 ac, 0.00% Impervious, Inflow Depth = 1.00" for 100-Year event
Inflow = 5.02 cfs @ 12.32 hrs, Volume= 0.748 af
Outflow = 0.84 cfs @ 15.15 hrs, Volume= 0.748 af, Atten= 83%, Lag= 169.9 min
Discarded = 0.58 cfs @ 15.15 hrs, Volume= 0.682 af
Primary = 0.25 cfs @ 15.15 hrs, Volume= 0.065 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 29.24' @ 15.15 hrs Surf.Area= 10,466 sf Storage= 12,698 cf

Plug-Flow detention time= 254.3 min calculated for 0.746 af (100% of inflow)
Center-of-Mass det. time= 254.4 min (1,177.0 - 922.6)

Volume	Invert	Avail.Storage	Storage Description
#1	27.50'	21,697 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
27.50	4,168	0	0
28.00	5,929	2,524	2,524
29.00	9,548	7,739	10,263
30.00	13,320	11,434	21,697

Device	Routing	Invert	Outlet Devices
#1	Discarded	27.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	29.25'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	29.00'	**6.0" Round Culvert X 2.00**
			L= 17.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 29.00' / 28.76' S= 0.0141 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.58 cfs @ 15.15 hrs HW=29.24' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.58 cfs)

Primary OutFlow Max=0.25 cfs @ 15.15 hrs HW=29.24' (Free Discharge)
↑**3=Culvert** (Inlet Controls 0.25 cfs @ 1.33 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=27.50' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6:

Inflow Area = 1.883 ac, 0.00% Impervious, Inflow Depth = 1.00" for 100-Year event
Inflow = 1.20 cfs @ 12.20 hrs, Volume= 0.156 af
Outflow = 0.18 cfs @ 14.86 hrs, Volume= 0.156 af, Atten= 85%, Lag= 159.3 min
Discarded = 0.18 cfs @ 14.86 hrs, Volume= 0.156 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.77' @ 14.86 hrs Surf.Area= 3,275 sf Storage= 2,189 cf

Plug-Flow detention time= 134.8 min calculated for 0.156 af (100% of inflow)
Center-of-Mass det. time= 134.6 min (1,051.4 - 916.9)

Volume	Invert	Avail.Storage	Storage Description
#1	38.00'	7,083 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.00	2,412	0	0
39.00	3,533	2,973	2,973
40.00	4,688	4,111	7,083

Device	Routing	Invert	Outlet Devices
#1	Discarded	38.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	39.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.18 cfs @ 14.86 hrs HW=38.77' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=38.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 7:

Inflow Area = 0.672 ac, 0.00% Impervious, Inflow Depth = 1.85" for 100-Year event
Inflow = 1.21 cfs @ 12.12 hrs, Volume= 0.103 af
Outflow = 0.15 cfs @ 13.39 hrs, Volume= 0.103 af, Atten= 88%, Lag= 75.7 min
Discarded = 0.15 cfs @ 13.39 hrs, Volume= 0.103 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 33.78' @ 13.39 hrs Surf.Area= 2,701 sf Storage= 1,597 cf

Plug-Flow detention time= 115.9 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 115.7 min (991.9 - 876.2)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,185 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,371	0	0
34.00	3,067	2,219	2,219
35.00	4,864	3,966	6,185

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.15 cfs @ 13.39 hrs HW=33.78' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=33.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 8:

Inflow Area = 1.117 ac, 0.00% Impervious, Inflow Depth = 1.67" for 100-Year event
Inflow = 1.87 cfs @ 12.11 hrs, Volume= 0.155 af
Outflow = 0.13 cfs @ 15.51 hrs, Volume= 0.143 af, Atten= 93%, Lag= 204.5 min
Discarded = 0.12 cfs @ 15.51 hrs, Volume= 0.143 af
Primary = 0.01 cfs @ 15.51 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 25.00' @ 15.51 hrs Surf.Area= 2,062 sf Storage= 3,409 cf

Plug-Flow detention time= 365.6 min calculated for 0.143 af (92% of inflow)
Center-of-Mass det. time= 327.2 min (1,207.9 - 880.8)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	5,806 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.50	742	0	0
23.00	959	425	425
24.00	1,468	1,214	1,639
25.00	2,060	1,764	3,403
26.00	2,746	2,403	5,806

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	25.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.12 cfs @ 15.51 hrs HW=25.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.01 cfs @ 15.51 hrs HW=25.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.16 fps)

Summary for Pond 9:

Inflow Area = 0.860 ac, 0.47% Impervious, Inflow Depth = 2.03" for 100-Year event
Inflow = 1.86 cfs @ 12.10 hrs, Volume= 0.146 af
Outflow = 0.20 cfs @ 13.44 hrs, Volume= 0.146 af, Atten= 89%, Lag= 80.1 min
Discarded = 0.18 cfs @ 13.44 hrs, Volume= 0.144 af
Primary = 0.02 cfs @ 13.44 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 34.01' @ 13.44 hrs Surf.Area= 3,215 sf Storage= 2,465 cf

Plug-Flow detention time= 154.1 min calculated for 0.145 af (100% of inflow)
Center-of-Mass det. time= 153.8 min (1,022.7 - 868.9)

Volume	Invert	Avail.Storage	Storage Description
#1	33.00'	6,365 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
33.00	1,552	0	0
33.50	2,513	1,016	1,016
34.00	3,207	1,430	2,446
35.00	4,630	3,919	6,365

Device	Routing	Invert	Outlet Devices
#1	Discarded	33.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	34.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.18 cfs @ 13.44 hrs HW=34.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.01 cfs @ 13.44 hrs HW=34.01' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.21 fps)

Summary for Pond 10:

Inflow Area = 0.416 ac, 0.00% Impervious, Inflow Depth = 1.85" for 100-Year event
Inflow = 0.76 cfs @ 12.12 hrs, Volume= 0.064 af
Outflow = 0.10 cfs @ 13.15 hrs, Volume= 0.064 af, Atten= 87%, Lag= 61.6 min
Discarded = 0.10 cfs @ 13.15 hrs, Volume= 0.064 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 36.70' @ 13.15 hrs Surf.Area= 1,799 sf Storage= 953 cf

Plug-Flow detention time= 100.8 min calculated for 0.064 af (100% of inflow)
Center-of-Mass det. time= 100.6 min (976.4 - 875.8)

Volume	Invert	Avail.Storage	Storage Description
#1	36.00'	4,552 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.00	935	0	0
37.00	2,173	1,554	1,554
38.00	3,823	2,998	4,552

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	37.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.10 cfs @ 13.15 hrs HW=36.70' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=36.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Attachment 4
Hydraulics, Drawdown, and Groundwater Recharge Calculations

B E A L S + T H O M A S
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

1833.109
Wareham, MA

CLIENT/PROJECT:

Borrego Solar Systems, Inc.
27 Charge Pond Road PV+ES Project

SUBJECT/TITLE:

Hydraulic Calculations

OBJECTIVE OF CALCULATION:

- To size culvert pipes to adequately convey flows from the proposed project and to meet the design standards of the Massachusetts DEP Stormwater Handbook for inlet capacity, pipe flow, and scour.

CALCULATION METHOD(S):

- Culverts are designed using the Rational Formula, based on a 50-year storm event for the Town of Barnstable (see attached IDF curve).

ASSUMPTIONS:

- Runoff coefficient C=0.3 for pervious areas and C=0.9 for impervious areas.
- Manning's n=0.012 for HDPE pipe.
- The times of concentration for contributing subcatchments are approximately 19 minutes for flows to FE-2 and FE-19, 16 minutes for flows to FE-4, 10 minutes for flows to FE-8, 6 minutes for flows to FE-10 and FE-12, and 8 minutes for flows to FE-14 and FE-16.
- The minimum full-flow (scour) velocity is 2 feet per second.
- The maximum full-flow (scour) velocity is 10 feet per second.

SOURCES OF DATA/EQUATIONS:

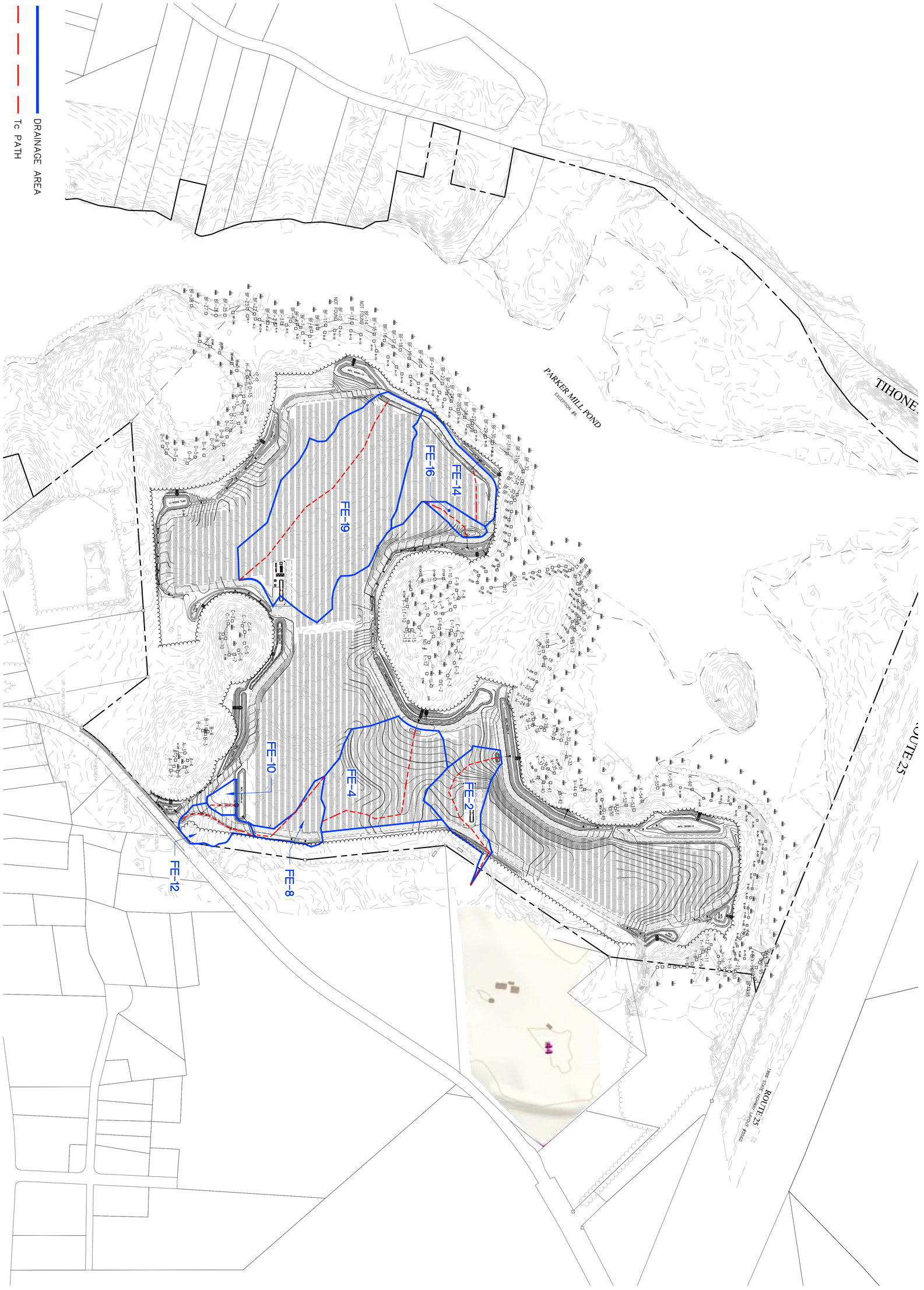
- 27 Charge Pond Road PV+ES Project Grading and Erosion Control Plans, prepared by Borrego Solar Systems, Inc., plan numbers C-4.0 - C-4.5.
- Rational Method (Q=CiA) was used to calculate peak runoff rates tributary to FE-2, FE-4, and FE-8, FE-10, FE-12, FE-14, and FE-16 and 18.
- Manning's Equation was used to determine pipe capacities.
- 50-year storm intensity obtained from the Intensity/Duration rainfall curve for Barnstable, MA in S.C.S Technical Report No. 40.
- Massachusetts DEP Stormwater Management Handbook, February 2008.

CONCLUSIONS:

- The proposed culvert pipes will adequately convey the 50-year storm event runoff rates.
- The proposed stormwater management design has been reviewed for compliance with the stormwater management standards described in the Massachusetts DEP Stormwater Management Handbook.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	J. Murphy	9/14/2020				

BEALS AND THOMAS, INC.



North Arrow

NORTH

27 Charge Pond Road
PV+ES Project
Wareham, Massachusetts

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, Massachusetts

Hydraulic Areas Map

Figure Number 003

~~Scale: 1" = 150'~~ Date: 09/14/2020

Plan 1833109P600B-003

B+T Project No. 1833.109

B E A L S + T H O M A S

Hydraulic Drainage Areas & Corresponding Rational Method Flows

Using the Rational Method:

$$Q = CIA$$

Where:

Q = flow (cfs)
C = Runoff Coefficient (0.9 for impervious areas)
I = Rainfall Intensity, 50-year storm (in/hr) (from Barnstable IDF curve, see attache
A = Contributing Area (acres)

Assumptions: - Coefficient of runoff for Gravel Surfaces = 0.9
- Coefficient of runoff for Pervious Surfaces = 0.3

Inlet	Contributing Area (Acres)	Weighted Average Rational Coefficients	Rainfall Intensity for Barnstable (in/hr)	Contributing Flow (cfs)
FE-2	1.363	0.30	4.30	1.76
FE-4	3.175	0.30	4.70	4.48
FE-8	0.630	0.53	5.60	1.87
FE-10	0.219	0.30	6.60	0.43
FE-12	0.582	0.33	6.60	1.27
FE-14	1.930	0.45	6.00	5.21
FE-16	0.285	0.30	6.20	0.53
FE-19	6.650	0.35	4.20	9.78

JOB NO. 1833.109
FILE 27 Charge Pond Road PV+ES

COMPUTED BY JRM
DATE 9/14/2020
CHECKED BY
DATE

B E A L S + T H O M A S

Hydraulic Pipe Sizing Calculations

Using the Manning Equation to Verify Pipe Capacities Versus Pipe Flows:

$$Q = \frac{1.49}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where:

Q = flow (cfs)
n = Manning's roughness coefficient
A = Cross Sectional Area (sf)
R = Hydraulic Radius (ft)
S = Pipe Slope

Assumptions: n = 0.012 for HDPE pipe
Pipe velocity shall be between 2.0 ft/sec and 10 ft/sec

Pipe Connection	Contributing Flow-50 Year Storm(cfs)	Proposed Pipe Size and Material	Proposed Pipe Slope (rise/run)	Full-Flow Capacity of Pipe from Manning Equation (cfs)	Adequate	Full Flow Velocity (ft/sec)
FE-2 to FE-3	1.76	8" HDPE	0.038	2.58	OK	7.4
FE-4 to FE-5	4.48	12" HDPE	0.014	4.58	OK	5.8
FE-8 to FE-9	1.87	10" HDPE	0.013	2.71	OK	5.0
FE-10 to FE-11	0.43	8" HDPE	0.022	1.96	OK	5.6
FE-12 to FE-13	1.27	8" HDPE	0.027	2.17	OK	6.2
FE-14 to FE-15	5.21	12" HDPE	0.020	5.47	OK	7.0
FE-16 to FE-17	0.53	8" HDPE	0.025	2.09	OK	6.0
FE-19 to FE-20	9.78	15" HDPE	0.023	10.64	OK	8.7

JOB NO. 1833.109 COMPUTED BY JRM CHECKED BY _____

FILE 27 Charge Pond Road PV+ES DATE 9/14/2020 DATE _____

Storm Data Detailed Report: Barnstable Rainfall

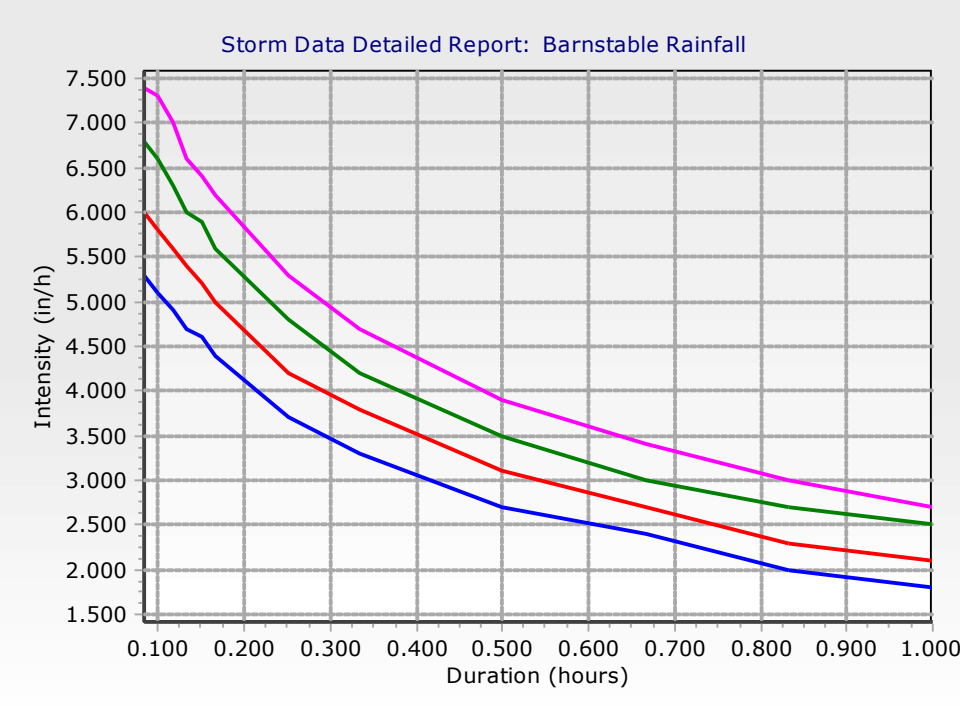
Element Details		
ID	30	Notes
Label	Barnstable Rainfall	

Duration (hours)	10 Year (in/h)	25 Year (in/h)	50 Year (in/h)	100 Year (in/h)
0.083	5.300	6.000	6.800	7.400
0.100	5.100	5.800	6.600	7.300
0.117	4.900	5.600	6.300	7.000
0.133	4.700	5.400	6.000	6.600
0.150	4.600	5.200	5.900	6.400
0.167	4.400	5.000	5.600	6.200
0.250	3.700	4.200	4.800	5.300
0.333	3.300	3.800	4.200	4.700
0.500	2.700	3.100	3.500	3.900
0.667	2.400	2.700	3.000	3.400
0.833	2.000	2.300	2.700	3.000
1.000	1.800	2.100	2.500	2.700

Library Status Summary

	Synchronization Details
ID	30
Label	Barnstable Rainfall
Modified Date	3/11/2020 4:13:38 PM
Library Source	G:\Corp-Data\Qags\StormCAD\8 XM\Rainfall .xml
Library Modified Date	10/16/2008 3:19:18 PM
Synchronization Status	Synchronize to Library
Engineering Reference Guid	686ed606-a18a-4e03-9cab-f4a1ec6f02ac

Storm Data Detailed Report: Barnstable Rainfall



B E A L S + T H O M A S

Standard 3: Drawdown

$$\text{Drawdown Time} = \frac{Rv}{(K)\,(\text{Bottom Area})}$$

where:

Rv = Storage Volume Below Outlet [Ac-ft]
K= Infiltration Rate [in/hr]
Bottom Area= Bottom Area of Recharge System [Ac]

Infiltration Basin-1

Rv =	0.034	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.028	Acres	
Drawdown Time =	**6.046**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-2

Rv =	0.174	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.154	Acres	
Drawdown Time =	**5.626**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-3

Rv =	0.071	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.017	Acres	
Drawdown Time =	**20.796**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-4

Rv =	0.132	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.090	Acres	
Drawdown Time =	**7.303**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-5

Rv =	0.235	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.096	Acres	
Drawdown Time =	**12.189**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-6

Rv =	0.068	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.055	Acres	
Drawdown Time =	**6.156**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-7

Rv =	0.051	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.031	Acres	
Drawdown Time =	**8.192**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-8

Rv =	0.078	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.017	Acres	
Drawdown Time =	**22.846**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-9

Rv =	0.056	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.036	Acres	
Drawdown Time =	**7.746**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-10

Rv =	0.036	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.021	Acres	
Drawdown Time =	**8.536**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-11

Rv =	0.152	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.055	Acres	
Drawdown Time =	**13.761**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-12

Rv =	0.096	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.024	Acres	
Drawdown Time =	**19.917**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-13

Rv =	0.232	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.053	Acres	
Drawdown Time =	**21.796**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-14

Rv =	0.060	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.022	Acres	
Drawdown Time =	**13.580**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-15

Rv =	0.051	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.021	Acres	
Drawdown Time =	**12.092**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Note:

1. The infiltration BMPs have been designed to fully drain within 72 hours, therefore the proposed stormwater management design is in compliance with Standard 3 .

2. Infiltration Rate based on Volume 3, Chapter 1, Table 2.3.3 *Rawls Rates* from the 2008 MA DEP Stormwater Management Handbook.

JOB NO. 1833.109 COMPUTED BY: JRM CHECKED BY:

JOB: 27 Charge Pond Road PV+ES DATE: 9/14/2020 DATE:

Stage-Area-Storage for Pond 1:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.00	0.028	0.000
21.02	0.028	0.001
21.04	0.028	0.001
21.06	0.029	0.002
21.08	0.029	0.002
21.10	0.029	0.003
21.12	0.029	0.003
21.14	0.030	0.004
21.16	0.030	0.005
21.18	0.030	0.005
21.20	0.030	0.006
21.22	0.030	0.006
21.24	0.031	0.007
21.26	0.031	0.008
21.28	0.031	0.008
21.30	0.031	0.009
21.32	0.032	0.010
21.34	0.032	0.010
21.36	0.032	0.011
21.38	0.032	0.011
21.40	0.032	0.012
21.42	0.033	0.013
21.44	0.033	0.013
21.46	0.033	0.014
21.48	0.033	0.015
21.50	0.034	0.015
21.52	0.034	0.016
21.54	0.034	0.017
21.56	0.034	0.017
21.58	0.034	0.018
21.60	0.035	0.019
21.62	0.035	0.019
21.64	0.035	0.020
21.66	0.035	0.021
21.68	0.035	0.022
21.70	0.036	0.022
21.72	0.036	0.023
21.74	0.036	0.024
21.76	0.036	0.024
21.78	0.037	0.025
21.80	0.037	0.026
21.82	0.037	0.027
21.84	0.037	0.027
21.86	0.037	0.028
21.88	0.038	0.029
21.90	0.038	0.030
21.92	0.038	0.030
21.94	0.038	0.031
21.96	0.039	0.032
21.98	0.039	0.033
22.00	0.039	0.034
22.02	0.039	0.034
22.04	0.040	0.035
22.06	0.040	0.036
22.08	0.040	0.037
22.10	0.040	0.037
22.12	0.041	0.038
22.14	0.041	0.039
22.16	0.041	0.040
22.18	0.042	0.041
22.20	0.042	0.042
22.22	0.042	0.042
22.24	0.042	0.043
22.26	0.043	0.044
22.28	0.043	0.045
22.30	0.043	0.046
22.32	0.043	0.047
22.34	0.044	0.048
22.36	0.044	0.048
22.38	0.044	0.049
22.40	0.045	0.050
22.42	0.045	0.051
22.44	0.045	0.052
22.46	0.045	0.053
22.48	0.046	0.054
22.50	0.046	0.055
22.52	0.046	0.056
22.54	0.047	0.057
22.56	0.047	0.058
22.58	0.047	0.058
22.60	0.047	0.059
22.62	0.048	0.060
22.64	0.048	0.061
22.66	0.048	0.062
22.68	0.049	0.063
22.70	0.049	0.064
22.72	0.049	0.065
22.74	0.049	0.066
22.76	0.050	0.067
22.78	0.050	0.068
22.80	0.050	0.069
22.82	0.050	0.070
22.84	0.051	0.071
22.86	0.051	0.072
22.88	0.051	0.073
22.90	0.052	0.074
22.92	0.052	0.075
22.94	0.052	0.076
22.96	0.052	0.077
22.98	0.053	0.078
23.00	**0.053**	**0.080**

Stage-Area-Storage for Pond 2:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
23.00	0.154	0.000
23.02	0.155	0.003
23.04	0.156	0.006
23.06	0.156	0.009
23.08	0.157	0.012
23.10	0.158	0.016
23.12	0.159	0.019
23.14	0.159	0.022
23.16	0.160	0.025
23.18	0.161	0.028
23.20	0.162	0.032
23.22	0.163	0.035
23.24	0.163	0.038
23.26	0.164	0.041
23.28	0.165	0.045
23.30	0.166	0.048
23.32	0.166	0.051
23.34	0.167	0.055
23.36	0.168	0.058
23.38	0.169	0.061
23.40	0.170	0.065
23.42	0.170	0.068
23.44	0.171	0.072
23.46	0.172	0.075
23.48	0.173	0.078
23.50	0.173	0.082
23.52	0.174	0.085
23.54	0.175	0.089
23.56	0.176	0.092
23.58	0.177	0.096
23.60	0.177	0.099
23.62	0.178	0.103
23.64	0.179	0.107
23.66	0.180	0.110
23.68	0.181	0.114
23.70	0.181	0.117
23.72	0.182	0.121
23.74	0.183	0.125
23.76	0.184	0.128
23.78	0.184	0.132
23.80	0.185	0.136
23.82	0.186	0.139
23.84	0.187	0.143
23.86	0.188	0.147
23.88	0.188	0.151
23.90	0.189	0.154
23.92	0.190	0.158
23.94	0.191	0.162
23.96	0.191	0.166
23.98	0.192	0.170
24.00	0.193	0.173
24.02	0.194	0.177
24.04	0.195	0.181
24.06	0.196	0.185
24.08	0.197	0.189
24.10	0.198	0.193
24.12	0.198	0.197
24.14	0.199	0.201
24.16	0.200	0.205
24.18	0.201	0.209
24.20	0.202	0.213
24.22	0.203	0.217
24.24	0.204	0.221
24.26	0.205	0.225
24.28	0.206	0.229
24.30	0.207	0.233
24.32	0.207	0.238
24.34	0.208	0.242
24.36	0.209	0.246
24.38	0.210	0.250
24.40	0.211	0.254
24.42	0.212	0.259
24.44	0.213	0.263
24.46	0.214	0.267
24.48	0.215	0.271
24.50	0.215	0.276
24.52	0.216	0.280
24.54	0.217	0.284
24.56	0.218	0.289
24.58	0.219	0.293
24.60	0.220	0.297
24.62	0.221	0.302
24.64	0.222	0.306
24.66	0.223	0.311
24.68	0.224	0.315
24.70	0.224	0.320
24.72	0.225	0.324
24.74	0.226	0.329
24.76	0.227	0.333
24.78	0.228	0.338
24.80	0.229	0.342
24.82	0.230	0.347
24.84	0.231	0.351
24.86	0.232	0.356
24.88	0.233	0.361
24.90	0.233	0.365
24.92	0.234	0.370
24.94	0.235	0.375
24.96	0.236	0.380
24.98	0.237	0.384
25.00	**0.238**	**0.389**

Stage-Area-Storage for Pond 3:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
28.00	0.017	0.000
28.05	0.018	0.001
28.10	0.019	0.002
28.15	0.020	0.003
28.20	0.021	0.004
28.25	0.022	0.005
28.30	0.023	0.006
28.35	0.023	0.007
28.40	0.024	0.008
28.45	0.025	0.010
28.50	0.026	0.011
28.55	0.027	0.012
28.60	0.028	0.014
28.65	0.029	0.015
28.70	0.030	0.016
28.75	0.031	0.018
28.80	0.031	0.020
28.85	0.032	0.021
28.90	0.033	0.023
28.95	0.034	0.024
29.00	0.035	0.026
29.05	0.036	0.028
29.10	0.037	0.030
29.15	0.038	0.032
29.20	0.039	0.034
29.25	0.040	0.035
29.30	0.041	0.038
29.35	0.042	0.040
29.40	0.043	0.042
29.45	0.044	0.044
29.50	0.045	0.046
29.55	0.046	0.048
29.60	0.047	0.051
29.65	0.048	0.053
29.70	0.049	0.056
29.75	0.050	0.058
29.80	0.051	0.061
29.85	0.052	0.063
29.90	0.053	0.066
29.95	0.054	0.068
30.00	0.055	0.071
30.05	0.056	0.074
30.10	0.057	0.077
30.15	0.058	0.080
30.20	0.059	0.083
30.25	0.061	0.086
30.30	0.062	0.089
30.35	0.063	0.092
30.40	0.064	0.095
30.45	0.065	0.098
30.50	0.066	0.101
30.55	0.067	0.105
30.60	0.068	0.108
30.65	0.069	0.112
30.70	0.070	0.115
30.75	0.072	0.119
30.80	0.073	0.122
30.85	0.074	0.126
30.90	0.075	0.130
30.95	0.076	0.133
31.00	**0.077**	**0.137**

Stage-Area-Storage for Pond 4:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.00	0.090	0.000
21.05	0.094	0.005
21.10	0.098	0.009
21.15	0.103	0.014
21.20	0.107	0.020
21.25	0.111	0.025
21.30	0.115	0.031
21.35	0.119	0.037
21.40	0.124	0.043
21.45	0.128	0.049
21.50	0.132	0.056
21.55	0.136	0.062
21.60	0.140	0.069
21.65	0.145	0.076
21.70	0.149	0.084
21.75	0.153	0.091
21.80	0.157	0.099
21.85	0.161	0.107
21.90	0.166	0.115
21.95	0.170	0.123
22.00	0.174	0.132
22.05	0.178	0.141
22.10	0.183	0.150
22.15	0.187	0.159
22.20	0.191	0.169
22.25	0.196	0.178
22.30	0.200	0.188
22.35	0.204	0.198
22.40	0.209	0.209
22.45	0.213	0.219
22.50	0.218	0.230
22.55	0.222	0.241
22.60	0.226	0.252
22.65	0.231	0.263
22.70	0.235	0.275
22.75	0.239	0.287
22.80	0.244	0.299
22.85	0.248	0.311
22.90	0.252	0.324
22.95	0.257	0.337
23.00	0.261	0.350
23.05	0.266	0.363
23.10	0.270	0.376
23.15	0.274	0.390
23.20	0.279	0.403
23.25	0.284	0.418
23.30	0.288	0.432
23.35	0.293	0.446
23.40	0.297	0.461
23.45	0.301	0.476
23.50	0.306	0.491
23.55	0.311	0.507
23.60	0.315	0.522
23.65	0.319	0.538
23.70	0.324	0.554
23.75	0.329	0.571
23.80	0.333	0.587
23.85	0.338	0.604
23.90	0.342	0.621
23.95	0.346	0.638
24.00	0.351	0.656
24.05	0.356	0.673
24.10	0.360	0.691
24.15	0.365	0.709
24.20	0.369	0.728
24.25	0.374	0.746
24.30	0.379	0.765
24.35	0.383	0.784
24.40	0.388	0.803
24.45	0.392	0.823
24.50	0.397	0.843
24.55	0.402	0.862
24.60	0.406	0.883
24.65	0.411	0.903
24.70	0.415	0.924
24.75	0.420	0.945
24.80	0.425	0.966
24.85	0.429	0.987
24.90	0.434	1.009
24.95	0.438	1.030
25.00	**0.443**	**1.052**

Stage-Area-Storage for Pond 5:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
27.50	0.096	0.000
27.55	0.100	0.005
27.60	0.104	0.010
27.65	0.108	0.015
27.70	0.112	0.021
27.75	0.116	0.026
27.80	0.120	0.032
27.85	0.124	0.038
27.90	0.128	0.045
27.95	0.132	0.051
28.00	0.136	0.058
28.05	0.140	0.065
28.10	0.144	0.072
28.15	0.149	0.079
28.20	0.153	0.087
28.25	0.157	0.095
28.30	0.161	0.103
28.35	0.165	0.111
28.40	0.169	0.119
28.45	0.174	0.128
28.50	0.178	0.136
28.55	0.182	0.145
28.60	0.186	0.155
28.65	0.190	0.164
28.70	0.194	0.174
28.75	0.198	0.183
28.80	0.203	0.193
28.85	0.207	0.204
28.90	0.211	0.214
28.95	0.215	0.225
29.00	0.219	0.236
29.05	0.223	0.247
29.10	0.228	0.258
29.15	0.232	0.269
29.20	0.236	0.281
29.25	0.241	0.293
29.30	0.245	0.305
29.35	0.249	0.318
29.40	0.253	0.330
29.45	0.258	0.343
29.50	0.262	0.356
29.55	0.266	0.369
29.60	0.271	0.383
29.65	0.275	0.396
29.70	0.279	0.410
29.75	0.283	0.424
29.80	0.288	0.438
29.85	0.292	0.453
29.90	0.296	0.468
29.95	0.300	0.482
30.00	**0.305**	**0.498**

Stage-Area-Storage for Pond 6:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
38.00	0.055	0.000
38.02	0.056	0.001
38.04	0.056	0.002
38.06	0.057	0.003
38.08	0.057	0.005
38.10	0.058	0.006
38.12	0.058	0.007
38.14	0.059	0.008
38.16	0.059	0.009
38.18	0.060	0.010
38.20	0.061	0.012
38.22	0.061	0.013
38.24	0.062	0.014
38.26	0.062	0.015
38.28	0.063	0.017
38.30	0.063	0.018
38.32	0.064	0.019
38.34	0.064	0.020
38.36	0.065	0.022
38.38	0.065	0.023
38.40	0.066	0.024
38.42	0.066	0.026
38.44	0.067	0.027
38.46	0.067	0.028
38.48	0.068	0.030
38.50	0.068	0.031
38.52	0.069	0.032
38.54	0.069	0.034
38.56	0.070	0.035
38.58	0.070	0.036
38.60	0.071	0.038
38.62	0.071	0.039
38.64	0.072	0.041
38.66	0.072	0.042
38.68	0.073	0.044
38.70	0.073	0.045
38.72	0.074	0.047
38.74	0.074	0.048
38.76	0.075	0.050
38.78	0.075	0.051
38.80	0.076	0.053
38.82	0.076	0.054
38.84	0.077	0.056
38.86	0.078	0.057
38.88	0.078	0.059
38.90	0.079	0.060
38.92	0.079	0.062
38.94	0.080	0.063
38.96	0.080	0.065
38.98	0.081	0.067
39.00	0.081	0.068
39.02	0.082	0.070
39.04	0.082	0.072
39.06	0.083	0.073
39.08	0.083	0.075
39.10	0.084	0.076
39.12	0.084	0.078
39.14	0.085	0.080
39.16	0.085	0.082
39.18	0.086	0.083
39.20	0.086	0.085
39.22	0.087	0.087
39.24	0.087	0.088
39.26	0.088	0.090
39.28	0.089	0.092
39.30	0.089	0.094
39.32	0.090	0.096
39.34	0.090	0.097
39.36	0.091	0.099
39.38	0.091	0.101
39.40	0.092	0.103
39.42	0.092	0.105
39.44	0.093	0.106
39.46	0.093	0.108
39.48	0.094	0.110
39.50	0.094	0.112
39.52	0.095	0.114
39.54	0.095	0.116
39.56	0.096	0.118
39.58	0.096	0.120
39.60	0.097	0.122
39.62	0.098	0.124
39.64	0.098	0.126
39.66	0.099	0.128
39.68	0.099	0.130
39.70	0.100	0.132
39.72	0.100	0.134
39.74	0.101	0.136
39.76	0.101	0.138
39.78	0.102	0.140
39.80	0.102	0.142
39.82	0.103	0.144
39.84	0.103	0.146
39.86	0.104	0.148
39.88	0.104	0.150
39.90	0.105	0.152
39.92	0.106	0.154
39.94	0.106	0.156
39.96	0.107	0.158
39.98	0.107	0.160
40.00	**0.108**	**0.163**

Stage-Area-Storage for Pond 7:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
33.00	0.031	0.000
33.02	0.032	0.001
33.04	0.033	0.001
33.06	0.034	0.002
33.08	0.035	0.003
33.10	0.035	0.003
33.12	0.036	0.004
33.14	0.037	0.005
33.16	0.038	0.006
33.18	0.038	0.006
33.20	0.039	0.007
33.22	0.040	0.008
33.24	0.041	0.009
33.26	0.042	0.009
33.28	0.042	0.010
33.30	0.043	0.011
33.32	0.044	0.012
33.34	0.045	0.013
33.36	0.045	0.014
33.38	0.046	0.015
33.40	0.047	0.016
33.42	0.048	0.017
33.44	0.049	0.018
33.46	0.049	0.019
33.48	0.050	0.020
33.50	0.051	0.021
33.52	0.052	0.022
33.54	0.052	0.023
33.56	0.053	0.024
33.58	0.054	0.025
33.60	0.055	0.026
33.62	0.056	0.027
33.64	0.056	0.028
33.66	0.057	0.029
33.68	0.058	0.030
33.70	0.059	0.032
33.72	0.060	0.033
33.74	0.060	0.034
33.76	0.061	0.035
33.78	0.062	0.036
33.80	0.063	0.038
33.82	0.063	0.039
33.84	0.064	0.040
33.86	0.065	0.041
33.88	0.066	0.043
33.90	0.067	0.044
33.92	0.067	0.045
33.94	0.068	0.047
33.96	0.069	0.048
33.98	0.070	0.050
34.00	0.070	0.051
34.02	0.071	0.052
34.04	0.072	0.054
34.06	0.073	0.055
34.08	0.074	0.057
34.10	0.075	0.058
34.12	0.075	0.060
34.14	0.076	0.061
34.16	0.077	0.063
34.18	0.078	0.064
34.20	0.079	0.066
34.22	0.079	0.067
34.24	0.080	0.069
34.26	0.081	0.071
34.28	0.082	0.072
34.30	0.083	0.074
34.32	0.084	0.076
34.34	0.084	0.077
34.36	0.085	0.079
34.38	0.086	0.081
34.40	0.087	0.082
34.42	0.088	0.084
34.44	0.089	0.086
34.46	0.089	0.088
34.48	0.090	0.089
34.50	0.091	0.091
34.52	0.092	0.093
34.54	0.093	0.095
34.56	0.094	0.097
34.58	0.094	0.099
34.60	0.095	0.101
34.62	0.096	0.103
34.64	0.097	0.104
34.66	0.098	0.106
34.68	0.098	0.108
34.70	0.099	0.110
34.72	0.100	0.112
34.74	0.101	0.114
34.76	0.102	0.116
34.78	0.103	0.118
34.80	0.103	0.120
34.82	0.104	0.123
34.84	0.105	0.125
34.86	0.106	0.127
34.88	0.107	0.129
34.90	0.108	0.131
34.92	0.108	0.133
34.94	0.109	0.135
34.96	0.110	0.138
34.98	0.111	0.140
35.00	**0.112**	**0.142**

Stage-Area-Storage for Pond 8:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
22.50	0.017	0.000
22.55	0.018	0.001
22.60	0.018	0.002
22.65	0.019	0.003
22.70	0.019	0.004
22.75	0.020	0.005
22.80	0.020	0.006
22.85	0.021	0.007
22.90	0.021	0.008
22.95	0.022	0.009
23.00	0.022	0.010
23.05	0.023	0.011
23.10	0.023	0.012
23.15	0.024	0.013
23.20	0.024	0.014
23.25	0.025	0.016
23.30	0.026	0.017
23.35	0.026	0.018
23.40	0.027	0.020
23.45	0.027	0.021
23.50	0.028	0.022
23.55	0.028	0.024
23.60	0.029	0.025
23.65	0.030	0.027
23.70	0.030	0.028
23.75	0.031	0.030
23.80	0.031	0.031
23.85	0.032	0.033
23.90	0.033	0.034
23.95	0.033	0.036
24.00	0.034	0.038
24.05	0.034	0.039
24.10	0.035	0.041
24.15	0.036	0.043
24.20	0.036	0.045
24.25	0.037	0.046
24.30	0.038	0.048
24.35	0.038	0.050
24.40	0.039	0.052
24.45	0.040	0.054
24.50	0.040	0.056
24.55	0.041	0.058
24.60	0.042	0.060
24.65	0.043	0.062
24.70	0.043	0.065
24.75	0.044	0.067
24.80	0.045	0.069
24.85	0.045	0.071
24.90	0.046	0.073
24.95	0.047	0.076
25.00	0.047	0.078
25.05	0.048	0.081
25.10	0.049	0.083
25.15	0.050	0.085
25.20	0.050	0.088
25.25	0.051	0.090
25.30	0.052	0.093
25.35	0.053	0.096
25.40	0.054	0.098
25.45	0.054	0.101
25.50	0.055	0.104
25.55	0.056	0.107
25.60	0.057	0.109
25.65	0.058	0.112
25.70	0.058	0.115
25.75	0.059	0.118
25.80	0.060	0.121
25.85	0.061	0.124
25.90	0.061	0.127
25.95	0.062	0.130
26.00	**0.063**	**0.133**

Stage-Area-Storage for Pond 9:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
33.00	0.036	0.000
33.02	0.037	0.001
33.04	0.037	0.001
33.06	0.038	0.002
33.08	0.039	0.003
33.10	0.040	0.004
33.12	0.041	0.005
33.14	0.042	0.005
33.16	0.043	0.006
33.18	0.044	0.007
33.20	0.044	0.008
33.22	0.045	0.009
33.24	0.046	0.010
33.26	0.047	0.011
33.28	0.048	0.012
33.30	0.049	0.013
33.32	0.050	0.014
33.34	0.051	0.015
33.36	0.052	0.016
33.38	0.052	0.017
33.40	0.053	0.018
33.42	0.054	0.019
33.44	0.055	0.020
33.46	0.056	0.021
33.48	0.057	0.022
33.50	0.058	0.023
33.52	0.058	0.024
33.54	0.059	0.026
33.56	0.060	0.027
33.58	0.060	0.028
33.60	0.061	0.029
33.62	0.062	0.030
33.64	0.062	0.032
33.66	0.063	0.033
33.68	0.063	0.034
33.70	0.064	0.036
33.72	0.065	0.037
33.74	0.065	0.038
33.76	0.066	0.039
33.78	0.067	0.041
33.80	0.067	0.042
33.82	0.068	0.043
33.84	0.069	0.045
33.86	0.069	0.046
33.88	0.070	0.048
33.90	0.070	0.049
33.92	0.071	0.050
33.94	0.072	0.052
33.96	0.072	0.053
33.98	0.073	0.055
34.00	0.074	0.056
34.02	0.074	0.058
34.04	0.075	0.059
34.06	0.076	0.061
34.08	0.076	0.062
34.10	0.077	0.064
34.12	0.078	0.065
34.14	0.078	0.067
34.16	0.079	0.068
34.18	0.080	0.070
34.20	0.080	0.072
34.22	0.081	0.073
34.24	0.081	0.075
34.26	0.082	0.076
34.28	0.083	0.078
34.30	0.083	0.080
34.32	0.084	0.081
34.34	0.085	0.083
34.36	0.085	0.085
34.38	0.086	0.086
34.40	0.087	0.088
34.42	0.087	0.090
34.44	0.088	0.092
34.46	0.089	0.093
34.48	0.089	0.095
34.50	0.090	0.097
34.52	0.091	0.099
34.54	0.091	0.101
34.56	0.092	0.103
34.58	0.093	0.104
34.60	0.093	0.106
34.62	0.094	0.108
34.64	0.095	0.110
34.66	0.095	0.112
34.68	0.096	0.114
34.70	0.096	0.116
34.72	0.097	0.118
34.74	0.098	0.120
34.76	0.098	0.122
34.78	0.099	0.124
34.80	0.100	0.126
34.82	0.100	0.128
34.84	0.101	0.130
34.86	0.102	0.132
34.88	0.102	0.134
34.90	0.103	0.136
34.92	0.104	0.138
34.94	0.104	0.140
34.96	0.105	0.142
34.98	0.106	0.144
35.00	**0.106**	**0.146**

Stage-Area-Storage for Pond 10:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
36.00	0.021	0.000
36.02	0.022	0.000
36.04	0.023	0.001
36.06	0.023	0.001
36.08	0.024	0.002
36.10	0.024	0.002
36.12	0.025	0.003
36.14	0.025	0.003
36.16	0.026	0.004
36.18	0.027	0.004
36.20	0.027	0.005
36.22	0.028	0.005
36.24	0.028	0.006
36.26	0.029	0.007
36.28	0.029	0.007
36.30	0.030	0.008
36.32	0.031	0.008
36.34	0.031	0.009
36.36	0.032	0.010
36.38	0.032	0.010
36.40	0.033	0.011
36.42	0.033	0.012
36.44	0.034	0.012
36.46	0.035	0.013
36.48	0.035	0.014
36.50	0.036	0.014
36.52	0.036	0.015
36.54	0.037	0.016
36.56	0.037	0.016
36.58	0.038	0.017
36.60	0.039	0.018
36.62	0.039	0.019
36.64	0.040	0.020
36.66	0.040	0.020
36.68	0.041	0.021
36.70	0.041	0.022
36.72	0.042	0.023
36.74	0.042	0.024
36.76	0.043	0.025
36.78	0.044	0.025
36.80	0.044	0.026
36.82	0.045	0.027
36.84	0.045	0.028
36.86	0.046	0.029
36.88	0.046	0.030
36.90	0.047	0.031
36.92	0.048	0.032
36.94	0.048	0.033
36.96	0.049	0.034
36.98	0.049	0.035
37.00	0.050	0.036
37.02	0.051	0.037
37.04	0.051	0.038
37.06	0.052	0.039
37.08	0.053	0.040
37.10	0.054	0.041
37.12	0.054	0.042
37.14	0.055	0.043
37.16	0.056	0.044
37.18	0.057	0.045
37.20	0.057	0.046
37.22	0.058	0.048
37.24	0.059	0.049
37.26	0.060	0.050
37.28	0.060	0.051
37.30	0.061	0.052
37.32	0.062	0.054
37.34	0.063	0.055
37.36	0.064	0.056
37.38	0.064	0.057
37.40	0.065	0.059
37.42	0.066	0.060
37.44	0.067	0.061
37.46	0.067	0.063
37.48	0.068	0.064
37.50	0.069	0.065
37.52	0.070	0.067
37.54	0.070	0.068
37.56	0.071	0.070
37.58	0.072	0.071
37.60	0.073	0.072
37.62	0.073	0.074
37.64	0.074	0.075
37.66	0.075	0.077
37.68	0.076	0.078
37.70	0.076	0.080
37.72	0.077	0.081
37.74	0.078	0.083
37.76	0.079	0.085
37.78	0.079	0.086
37.80	0.080	0.088
37.82	0.081	0.089
37.84	0.082	0.091
37.86	0.082	0.093
37.88	0.083	0.094
37.90	0.084	0.096
37.92	0.085	0.098
37.94	0.085	0.099
37.96	0.086	0.101
37.98	0.087	0.103
38.00	**0.088**	**0.104**

Stage-Area-Storage for Pond 11:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
27.00	0.055	0.000
27.05	0.056	0.003
27.10	0.057	0.006
27.15	0.058	0.009
27.20	0.059	0.011
27.25	0.060	0.014
27.30	0.061	0.017
27.35	0.062	0.021
27.40	0.063	0.024
27.45	0.064	0.027
27.50	0.065	0.030
27.55	0.066	0.033
27.60	0.067	0.037
27.65	0.068	0.040
27.70	0.069	0.043
27.75	0.070	0.047
27.80	0.071	0.050
27.85	0.072	0.054
27.90	0.073	0.058
27.95	0.074	0.061
28.00	0.075	0.065
28.05	0.076	0.069
28.10	0.077	0.072
28.15	0.078	0.076
28.20	0.079	0.080
28.25	0.081	0.084
28.30	0.082	0.088
28.35	0.083	0.093
28.40	0.084	0.097
28.45	0.086	0.101
28.50	0.087	0.105
28.55	0.088	0.110
28.60	0.089	0.114
28.65	0.090	0.119
28.70	0.092	0.123
28.75	0.093	0.128
28.80	0.094	0.132
28.85	0.095	0.137
28.90	0.097	0.142
28.95	0.098	0.147
29.00	0.099	0.152
29.05	0.101	0.157
29.10	0.102	0.162
29.15	0.104	0.167
29.20	0.105	0.172
29.25	0.107	0.177
29.30	0.108	0.183
29.35	0.110	0.188
29.40	0.111	0.194
29.45	0.113	0.199
29.50	0.114	0.205
29.55	0.116	0.211
29.60	0.117	0.217
29.65	0.119	0.223
29.70	0.120	0.228
29.75	0.122	0.235
29.80	0.124	0.241
29.85	0.125	0.247
29.90	0.127	0.253
29.95	0.128	0.260
30.00	**0.130**	**0.266**

Stage-Area-Storage for Pond 12:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
26.00	0.024	0.000
26.05	0.026	0.001
26.10	0.027	0.003
26.15	0.028	0.004
26.20	0.029	0.005
26.25	0.030	0.007
26.30	0.031	0.008
26.35	0.032	0.010
26.40	0.033	0.012
26.45	0.035	0.013
26.50	0.036	0.015
26.55	0.037	0.017
26.60	0.038	0.019
26.65	0.039	0.021
26.70	0.040	0.023
26.75	0.041	0.025
26.80	0.042	0.027
26.85	0.044	0.029
26.90	0.045	0.031
26.95	0.046	0.033
27.00	0.047	0.036
27.05	0.048	0.038
27.10	0.050	0.041
27.15	0.051	0.043
27.20	0.052	0.046
27.25	0.054	0.048
27.30	0.055	0.051
27.35	0.056	0.054
27.40	0.058	0.057
27.45	0.059	0.060
27.50	0.060	0.063
27.55	0.062	0.066
27.60	0.063	0.069
27.65	0.065	0.072
27.70	0.066	0.075
27.75	0.067	0.079
27.80	0.069	0.082
27.85	0.070	0.085
27.90	0.071	0.089
27.95	0.073	0.092
28.00	0.074	0.096
28.05	0.076	0.100
28.10	0.077	0.104
28.15	0.079	0.108
28.20	0.081	0.112
28.25	0.082	0.116
28.30	0.084	0.120
28.35	0.085	0.124
28.40	0.087	0.128
28.45	0.089	0.133
28.50	0.090	0.137
28.55	0.092	0.142
28.60	0.094	0.146
28.65	0.095	0.151
28.70	0.097	0.156
28.75	0.098	0.161
28.80	0.100	0.166
28.85	0.102	0.171
28.90	0.103	0.176
28.95	0.105	0.181
29.00	**0.107**	**0.186**

Stage-Area-Storage for Pond 13:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
20.50	0.053	0.000
20.55	0.055	0.003
20.60	0.058	0.006
20.65	0.060	0.008
20.70	0.063	0.012
20.75	0.065	0.015
20.80	0.067	0.018
20.85	0.070	0.021
20.90	0.072	0.025
20.95	0.075	0.029
21.00	0.077	0.032
21.05	0.078	0.036
21.10	0.079	0.040
21.15	0.080	0.044
21.20	0.081	0.048
21.25	0.082	0.052
21.30	0.084	0.057
21.35	0.085	0.061
21.40	0.086	0.065
21.45	0.087	0.069
21.50	0.088	0.074
21.55	0.089	0.078
21.60	0.090	0.083
21.65	0.091	0.087
21.70	0.092	0.092
21.75	0.094	0.096
21.80	0.095	0.101
21.85	0.096	0.106
21.90	0.097	0.111
21.95	0.098	0.116
22.00	0.099	0.120
22.05	0.100	0.125
22.10	0.102	0.131
22.15	0.103	0.136
22.20	0.104	0.141
22.25	0.105	0.146
22.30	0.107	0.151
22.35	0.108	0.157
22.40	0.109	0.162
22.45	0.110	0.168
22.50	0.112	0.173
22.55	0.113	0.179
22.60	0.114	0.184
22.65	0.115	0.190
22.70	0.116	0.196
22.75	0.118	0.202
22.80	0.119	0.208
22.85	0.120	0.214
22.90	0.121	0.220
22.95	0.123	0.226
23.00	0.124	0.232
23.05	0.125	0.238
23.10	0.127	0.245
23.15	0.128	0.251
23.20	0.129	0.257
23.25	0.131	0.264
23.30	0.132	0.270
23.35	0.133	0.277
23.40	0.135	0.284
23.45	0.136	0.291
23.50	0.137	0.297
23.55	0.139	0.304
23.60	0.140	0.311
23.65	0.142	0.318
23.70	0.143	0.325
23.75	0.144	0.333
23.80	0.146	0.340
23.85	0.147	0.347
23.90	0.148	0.355
23.95	0.150	0.362
24.00	**0.151**	**0.369**

Stage-Area-Storage for Pond 14:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.50	0.022	0.000
21.55	0.023	0.001
21.60	0.024	0.002
21.65	0.026	0.004
21.70	0.027	0.005
21.75	0.028	0.006
21.80	0.029	0.008
21.85	0.030	0.009
21.90	0.032	0.011
21.95	0.033	0.012
22.00	0.034	0.014
22.05	0.035	0.016
22.10	0.036	0.018
22.15	0.038	0.019
22.20	0.039	0.021
22.25	0.040	0.023
22.30	0.041	0.025
22.35	0.042	0.027
22.40	0.044	0.030
22.45	0.045	0.032
22.50	0.046	0.034
22.55	0.047	0.036
22.60	0.048	0.039
22.65	0.050	0.041
22.70	0.051	0.044
22.75	0.052	0.046
22.80	0.053	0.049
22.85	0.054	0.052
22.90	0.056	0.054
22.95	0.057	0.057
23.00	0.058	0.060
23.05	0.059	0.063
23.10	0.061	0.066
23.15	0.062	0.069
23.20	0.063	0.072
23.25	0.064	0.075
23.30	0.066	0.079
23.35	0.067	0.082
23.40	0.068	0.085
23.45	0.069	0.089
23.50	0.071	0.092
23.55	0.072	0.096
23.60	0.073	0.099
23.65	0.074	0.103
23.70	0.075	0.107
23.75	0.077	0.111
23.80	0.078	0.114
23.85	0.079	0.118
23.90	0.080	0.122
23.95	0.082	0.126
24.00	**0.083**	**0.131**

Stage-Area-Storage for Pond 15:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.00	0.021	0.000
21.05	0.022	0.001
21.10	0.023	0.002
21.15	0.024	0.003
21.20	0.024	0.005
21.25	0.025	0.006
21.30	0.026	0.007
21.35	0.027	0.008
21.40	0.028	0.010
21.45	0.029	0.011
21.50	0.029	0.013
21.55	0.030	0.014
21.60	0.031	0.016
21.65	0.032	0.017
21.70	0.033	0.019
21.75	0.034	0.021
21.80	0.035	0.022
21.85	0.035	0.024
21.90	0.036	0.026
21.95	0.037	0.028
22.00	0.038	0.029
22.05	0.039	0.031
22.10	0.040	0.033
22.15	0.041	0.035
22.20	0.042	0.038
22.25	0.043	0.040
22.30	0.045	0.042
22.35	0.046	0.044
22.40	0.047	0.046
22.45	0.048	0.049
22.50	0.049	0.051
22.55	0.050	0.054
22.60	0.051	0.056
22.65	0.052	0.059
22.70	0.053	0.061
22.75	0.054	0.064
22.80	0.056	0.067
22.85	0.057	0.070
22.90	0.058	0.073
22.95	0.059	0.076
23.00	0.060	0.078
23.05	0.061	0.082
23.10	0.062	0.085
23.15	0.064	0.088
23.20	0.065	0.091
23.25	0.066	0.094
23.30	0.067	0.098
23.35	0.068	0.101
23.40	0.070	0.104
23.45	0.071	0.108
23.50	0.072	0.112
23.55	0.073	0.115
23.60	0.074	0.119
23.65	0.076	0.123
23.70	0.077	0.126
23.75	0.078	0.130
23.80	0.079	0.134
23.85	0.080	0.138
23.90	0.082	0.142
23.95	0.083	0.146
24.00	**0.084**	**0.151**

B E A L S + T H O M A S

Standard 3: Groundwater Recharge

Groundwater Recharge Volume Required:

Rv = F x Impervious Area, where:

Rv = Required Recharge Volume [Ac-ft]

F = Target Depth Factor associated with each Hydrologic Soil Group (HSG) [in]

Impervious Area = Total Impervious Area under Post-development Conditions [Ac] (equipment pads)

			Impervious Area [Acres]	Required Recharge Volume [Ac-ft]	
HSG "A", use F =	0.6	in	0.073	0.004	
HSG "B", use F =	0.35	in	0.000	0.000	
HSG "C", use F =	0.25	in	0.000	0.000	
HSG "D", use F =	0.1	in	0.000	0.000	
Total Required Recharge Volume (Rv) =				**0.004**	**Ac-ft**

Capture Area Adjustment: (Ref: DEP Handbook V.3 Ch.1 P.27-28)

Total Site Impervious Area (Total)=	0.073	Acres
Impervious Area Draining to Infiltrative BMPs (infil) =	0.073	Acres
Percent Imp. Area Draining to Infiltrative BMPs =	100.0%	
Capture Area Adjustment Factor = (Total)/(Infil) = Ca =	1.00	
Adjusted Required Recharge Volume = Ca x Rv	**0.004**	**Ac-ft**

Groundwater Recharge Volume Provided :

BMP	Provided Recharge Volume [Ac-ft] (Below Lowest Basin Outlet)	
Infiltration Basin 1 =	0.034	
Infiltration Basin 2 =	0.174	
Infiltration Basin 3 =	0.071	
Infiltration Basin 4 =	0.132	
Infiltration Basin 5 =	0.235	
Infiltration Basin 6 =	0.068	
Infiltration Basin 7=	0.051	
Infiltration Basin 8 =	0.078	
Infiltration Basin 9=	0.056	
Infiltration Basin 10 =	0.036	
Infiltration Basin 11 =	0.152	
Infiltration Basin 12 =	0.096	
Infiltration Basin 13 =	0.232	
Infiltration Basin 14 =	0.060	
Infiltration Basin 15 =	0.051	
Total Provided Recharge Volume =	**1.526**	**Ac-ft**

PROVIDED GROUNDWATER RECHARGE VOLUME IS GREATER THAN OR EQUAL TO THE REQUIRED RECHARGE VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 3.

JOB NO. 1833.109 COMPUTED BY: JRM CHECKED BY:

JOB: 27 Charge Pond Road PV+ES DATE: 09/14/20 DATE:

Attachment 5
Site Owner's Manual

Site Owner's Manual

27 Charge Pond Road PV+ES Project

27 Charge Pond Road
Wareham, Massachusetts

Prepared for:

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, MA 01851

Prepared by:

B E A L S + T H O M A S

BEALS AND THOMAS, INC.
32 Court Street
Plymouth, MA 02360

September 15, 2020

1833109RP002A

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APPENDICES

1.0 INTRODUCTION

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Handbook. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

2.0 SITE OWNER'S AGREEMENT

2.1 Operation and Maintenance Compliance Statement

Site Owner: Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, MA 01851

Responsible Party: Borrego Solar Systems, Inc.

Borrego Solar Systems, Inc. or their successors shall maintain ownership of the on-site stormwater management system as well as the responsibility for operation and maintenance during the post-development stages of the project. The site has been inspected for erosion and appropriate measures have been taken to permanently stabilize any eroded areas. All aspects of stormwater best management practices (BMPs) have been inspected for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the stormwater at the site may be managed in accordance with the Stormwater Management Standards. Future responsible parties shall be notified of their continuing legal responsibility to operate and maintain the BMPs. The operation and maintenance plan for the stormwater BMPs is being implemented.

_____ _____
Responsible Party Signature Date

2.2 Stormwater Maintenance Easements

The Site Owner will have access to all stormwater practices for inspection and maintenance, including direct maintenance access by heavy equipment to structures requiring regular maintenance.

2.3 Record Keeping

The Site Owner shall maintain a rolling log in which all inspections and maintenance activities for the past three years shall be recorded. The Operation and Maintenance Log includes information pertaining to inspections, repairs, and disposal relevant to the project's stormwater management system. The Log is located in Appendix A.

The Operation and Maintenance Log shall be made available to the Conservation Commission and the DEP upon request. The Conservation Commission and the DEP shall be allowed to enter and inspect the premises to evaluate and ensure that the responsible party complies with the maintenance requirements for each BMP.

2.4 Training

Employees involved in grounds maintenance and emergency response will be educated on the general concepts of stormwater management and groundwater protection. The Site Owner's Manual will be reviewed with the maintenance staff. The staff will be trained on the proper course of action for specific events expected to be incurred during routine maintenance or emergency situations.

3.0 LONG-TERM POLLUTION PREVENTION PLAN

In compliance with Standard 4 of the 2008 DEP Stormwater Management Handbook, this section outlines source control and pollution prevention measures to be employed on-site after construction.

3.1 Storage of Materials and Waste

The site shall be kept clear of trash and debris at all times. Certain materials and waste products shall be stored inside or outside upon an impervious surface and covered, as required by local and state regulations.

3.2 Vehicle Washing

No commercial vehicle washing shall take place on-site.

3.3 Routine Inspections and Maintenance of Stormwater BMPs

See Section 4.0 Long-Term Operation and Maintenance Plan, for routine inspection and maintenance requirements for all proposed stormwater BMPs.

3.4 Spill Prevention and Response

A contingency plan shall be implemented to address the spill or release of petroleum products and hazardous materials and will include the following measures:

1. Equipment necessary to quickly attend to inadvertent spills or leaks shall be stored on-site in a secure but accessible location. Such equipment shall include but not be limited to the following: safety goggles, chemically resistant gloves and overshoe boots, water and chemical fire extinguishers, sand and shovels, suitable absorbent materials, storage containers and first aid equipment (i.e. Indian Valley Industries, Inc. 55-gallon Spill Containment kit or approved equivalent).

2. Spills or leaks shall be treated properly according to material type, volume of spillage and location of spill. Mitigation shall include preventing further spillage, containing the spilled material in the smallest practical area, removing spilled material in a safe and environmentally-friendly manner, and remediation of any damage to the environment.

3. For large spills, MassDEP Hazardous Waste Incident Response Group shall be notified immediately at 888-304-1133 and an emergency response contractor shall be consulted.

3.5 Maintenance of Grassed Areas

Grassed areas shall be maintained regularly by the facility operator. Vegetated and landscaped BMPs will be maintained as outlined in Section 4.0.

3.6 Snow and Deicing Chemical Management

Snow removal at the site shall comply with the following requirements:

- Plowed snow shall not be placed in wetland resource areas or associated buffer zones. The following maintenance measures shall be undertaken at all snow disposal sites:
  - Debris shall be cleared from an area prior to using it for snow disposal.
  - Debris and accumulated sediments shall be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.
- The use of deicing materials and sand shall not be used at the proposed project site to protect off-site areas.

4.0 LONG-TERM OPERATION AND MAINTENANCE PLAN

This section outlines the general maintenance activities for the stormwater best management practices (BMPs) associated with the proposed stormwater management system and identifies the long-term inspection and maintenance requirements for each BMP.

4.1 Stormwater Management System Components

The following table outlines the type and quantity of the BMPs and their general location. Please reference the approved site plans for exact locations.

BMP Type	Quantity	Location
Infiltration Basin	15	Throughout the site

4.2 Inspection and Maintenance Schedules

4.2.1 Infiltration Basins

Infiltration basins shall be inspected and maintained after major storm events (rainfall totals greater than 2.5 inches in 24 hours) during the first three months of operation and twice a year and when there are discharges through the outlet control structure thereafter. Additionally, all pretreatment BMPs shall be inspected in accordance with the minimal requirements specified for those practices and after all major storm events. Inspections shall include the following measures:

- During and after major storm events, the length of time standing water remains in the basin shall be recorded.
    - If the time is greater than 72 hours, thoroughly inspect the basin for signs of clogging.
    - A corrective action plan shall be developed by a qualified professional to restore infiltrative function. The Site Owner shall take immediate action to implement these corrective measures.
- Examine the outlet structure for evidence of clogging or outflow release velocities that are greater than the design velocity.
- Identify areas of sediment accumulation, differential settlement, cracking, and erosion within the basin.
- Inspect embankments for leakage and tree growth.
- Examine the health of the vegetation within the basin and on the embankments.

Corrective measures shall be taken immediately as warranted by the inspections. If any evidence of hydrocarbons is found during inspection, the

material shall be immediately removed using absorbent pads or other suitable measures and legally disposed.

Preventative maintenance shall include the following activities:

- Mow the buffer area and basin bottom and side slopes, if vegetated.
- Remove trash, debris, and accumulated organic matter.
- Remove clippings after mowing.

4.2.2 Stormwater Outfalls

Flared end sections and associated riprap aprons, and overflow spillways shall be inspected at least once per year and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) to ensure that the stability of the outlet area is maintained. The outfall area shall be kept clear of debris such as trash, branches, and sediment. Repairs shall be made immediately if riprap displacement or downstream channel scour is observed.

4.3 Estimated Operation and Maintenance Budget

An operations and maintenance budget was prepared to approximate the annual cost of the inspections required in compliance with the DEP Stormwater Management Policy. The table below estimates the annual cost to inspect and maintain each proposed BMP, based on the requirements in Section 4.2.

BMP Type	# of BMPS	Annual O&M Cost (per BMP)[1]	Total Cost
Infiltration Basin	15	$50-$100	$750-$1500
Riprap Spillway/Flared Ends	15	$200-$400	$3000-$6000
		Total	$3750-$7500

4.4 Public Safety Features

The site is not open to the public. A locked vehicle gate will be located at the entrance to the gravel access driveway. In addition, a 7' chain-link-fence will surround the array. Operation and maintenance of the facility will be conducted in accordance with the safety requirements of the facility operator and applicable OSHA regulations.

[1] Annual maintenance cost is based on estimate of the cost to complete all inspection and maintenance measures outlined in Section 4.2. For BMPs that require sediment removal at regular intervals (i.e. every 5 or 10 years), the annual cost includes the annual percentage of that cost.

Appendices

Appendix A

Operation and Maintenance Log

OPERATION AND MAINTENANCE LOG

This template is intended to comply with the operation and maintenance log requirements of the 2008 MassDEP Stormwater Management Handbook. Copies of this log should be made for all inspections and kept on file for three years from the inspection date.

Name/Company of Inspector:
Date/Time of Inspection:
Weather Conditions: (Note current weather and any recent precipitation events)

Stormwater BMP	Inspection Observations	Actions Required

Appendix B

List of Emergency Contacts

List of Emergency Contacts

MassDEP Hazardous Waste Incident Response Group
(617) 792-7653

Town of Wareham Municipal Maintenance
95 Charge Pond Road
Wareham, MA 02571
(508) 295-5300

Town of Wareham Fire Department
20 Church Street
Wareham, MA 02571
(508) 295-2973

Town of Wareham Police Department
2515 Cranberry Highway
Wareham, MA 02571
(508) 295-1212

Attachment 6
Draft Stormwater Pollution Prevention Plan

Draft Stormwater Pollution Prevention Plan

27 Charge Pond Road PV+ES Project

27 Charge Pond Road
Wareham, Massachusetts

Prepared for:

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, MA 01851

Prepared by:

BEALS AND THOMAS, INC.
32 Court Street
Plymouth, MA 02360

September 15, 2020

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LIST OF APPENDICES

1.0 CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 OPERATOR(S)/ SUBCONTRACTORS

Operator(s)

Company:	Borrego Solar Systems, Inc.				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Subcontractor(s)

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			
Area of Control:		Site Work Contractor			

24-Hour Emergency Contact

Company:	TBD
Name:	
Telephone:	

1.2 STORMWATER TEAM

SWPPP Preparer

Company:	Beals and Thomas, Inc.				
Name:	Nathaniel Bautz, EIT				
Address:	144 Turnpike Road				
City:	Southborough	State:	MA	ZIP Code:	01772
Telephone:	508-366-0560	Email:			

Personnel Responsible for Installation & Maintenance of Stormwater BMPs

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Inspection Personnel

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Personnel Responsible for Taking Corrective Actions

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

2.0 SITE EVALUATION, ASSESSMENT AND PLANNING

2.1 PROJECT/SITE INFORMATION

Project/Site Name:	27 Charge Pond Road PV+ES Project				
Project Street/Location:	27 Charge Pond Road				
City:	Wareham	State:	MA	ZIP Code:	02571
County or Similar Subdivision:		Plymouth			

Latitude:	41°46’28” N	Longitude:	70°43’02”W
Method for Determining Latitude/Longitude: ☐ USGS Topographic Map (specify scale: _____) ☐ EPA Website ☐ GPS ☒ Other (please specify): Google Earth			
Horizontal Reference Datum: ☐ NAD 27 ☐ WGS 84 ☒ NAD 83 ☐ Unknown			

Is the project located on Indian country lands, or located on a property of religious of cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

_____

Is this project considered a federal facility? ☐ Yes ☒ No

Are you applying for permit coverage as a “federal operator” as defined in Appendix A of the 2017 CGP? ☐ Yes ☒ No

NPDES project or permit tracking number: TBD

2.1.1 Emergency-Related Projects

Is this project in response to a public emergency? ☐ Yes ☒ No

If yes, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

2.2 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

2.2.1 Function of the Construction Activity

Function of the construction activity:

☐ Single-Family Residential
☐ Multi-Family Residential
☐ Institutional
☐ Utility
☐ Commercial
☐ Industrial
☐ Highway or Road Construction
☒ Other (please specify): Renew. Energy

2.2.2 Building Demolition

Will there be demolition of any structure built or renovated before January 1, 1980? ☐ Yes ☒ No

If yes, do any of the structures being demolished have at least 10,000 square feet of floor space? ☐ Yes ☒ No

2.2.3 Agricultural Land

Was the pre-development land use used for agriculture? ☐ Yes ☒ No

2.2.4 Estimated Project Dates

Estimated Project Start Date: TBD
Estimated Project Completion Date: TBD

Estimated Timeline of Activity	Construction Activity and BMP Descriptions
TBD	***Before any site grading activities begin*** 1. Stake Limit of Construction. Workers shall be informed that no construction activity is to occur beyond this limit at any time. 2. Install sediment controls as shown on the plans. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair silt fences, compost mulch tubes, or any other devices planned for use during construction. 3. Construct stabilized construction exits. 4. Construct staging and materials storage area. 5. Install temporary sanitary facilities and dumpsters.
TBD	***Site grading*** 1. Begin overall site grading. 2. Establish topsoil stockpile. 3. Install silt fences around stockpile. 4. Build stormwater basins and complete overall site grading. 5. Disturbed areas where construction will cease for more than 14 days shall be stabilized with erosion controls.
TBD	***Infrastructure (utilities, solar panels, etc.)*** 1. Construct temporary concrete washout area. 2. Install utilities, solar panels.
TBD	***Final stabilization and landscaping*** 1. Finalize grading activities. 2. Remove all temporary erosion control BMPs and stabilize any areas disturbed by their removal with erosion controls. 3. Monitor stabilized areas until final stabilization is reached.

2.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil type(s): The Natural Resources Conservation Service (NRCS) lists the on-site soils types as predominantly hydrologic soil class A. These soil groups include Windsor loamy sand, Deerfield loamy fine sand, and Udipsamments. Another area partially on site but mostly in the Town's ball fields, is mapped as Udorthents, refuse substratum, which is considered hydrologic soil class B. Finally, a small area of hydrologic soil class D soils is present at the southwestern corner of the proposed project locus, which is mapped as Scarboro muck, coastal lowland.

Windsor loamy sand is an excessively drained soil comprised of loose sandy glaciofluvial deposits. Generally, this soil is in outwash plains, dunes and terrace landforms, and has a loamy sand top and subsoil layer over top of sand. Deerfield loamy sand is a moderately well drained soil that is characterized by sandy outwash deposits. Udorthents, refuse substratum is filled loamy land over man made land. Udipsamments are areas of sandy human transported material over gravelly glaciofluvial deposits. Scarboro muck is poorly drained soil found in outwash terrace depressions and drainage ways.

Slopes: 1-30%

Drainage Patterns: Runoff from the site drains to the north, south, east, and west.

Vegetation: The existing site is comprised of woodland area.

2.4 CONSTRUCTION SITE ESTIMATES

Total construction site area to be disturbed:	±43.8 acres
Maximum area to be disturbed at one time:	±43.8 acres
Percentage impervious area before construction:	<1%
Runoff curve number before construction:	34
Percentage impervious area after construction:	<1%
Runoff curve number after construction:	42

2.5 DISCHARGE INFORMATION

2.5.1 Description of Receiving Storm Sewer Systems

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

2.5.2 Receiving Waters

Runoff from the site drains to Parker Mills Pond which is tributary to the Wareham River.

2.5.3 Impaired Waters/ TMDLs

Has the surface water been listed as "impaired?" ☐ Yes ☒ No

If yes, list the pollutant(s) causing the impairment: N/A

Describe the method(s) used to determine whether or not your project site discharges to an impaired water:

Has a TMDL been completed? ☐ Yes ☒ No

If yes, list the title of the TMDL document: N/A

List the pollutant(s) for which there is a TMDL: N/A

2.5.4 Tier 2, 2.5, or 3 Waters

Is this surface water designated as a Tier 2, 2.5 or 3 water? ☐ Yes ☐ No

If yes specify which Tier the surface water is designated as:
☐ Tier 2 ☐ Tier 2.5 ☐ Tier 3

2.6 UNIQUE SITE FEATURES AND SENSITIVE AREAS

The site contain wetlands and a potential vernal pool; these features will not be impacted by the project. The hydrology of these areas is maintained by the proposed stormwater design. Additionally, they will be protected by sediment control barriers as needed to avoid potential sedimentation.

2.7 CONSTRUCTION SUPPORT ACTIVITIES

Construction support activities are not required for the project.

2.8 POTENTIAL SOURCES OF POLLUTION

2.8.1 Potential Sources of Sediment

- Grading and site excavation operations
- Vehicle tracking
- Soil stripping and stockpiling

2.8.2 Potential Sources of Non-Sediment Pollutants

- Combined Staging Area — small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area — general building materials, solvents, adhesives, paints, aggregates, trash, and so on.
- Construction Activity — concrete pouring, and array construction
- Concrete Washout Area

Material/ Chemical	Physical Description	Stormwater Pollutants	Location[1]
[2]Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Curing compounds	Creamy white liquid	Naphtha	Concrete Equipment Pads
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Contractor staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Contractor staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Contractor staging area
Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment
Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging area

[1] Area where material/chemical is used on-site.
[2] Use of fertilizers containing nitrogen and/or phosphorus in ratios greater than recommended by the manufacture must be documented.

2.9 SITE PLANS

The Existing Conditions Plan shows the undeveloped site and its current features. The Site Plans show the developed site.

These Site Plans include:

- ☐ Delineation of construction phasing, if applicable
- ☒ Areas of soil disturbance and areas that will not be disturbed
- ☒ Direction(s) of stormwater flow and approximate slopes before and after major grading activities
- ☒ Natural features to be preserved
- ☒ Locations of major structural and non-structural BMPs identified in the SWPPP
- ☐ Location(s) of sediment, soil or other construction materials will be stockpiled
- ☐ Locations of stabilization measures
- ☐ Locations of off-site material, waste, borrow, or equipment storage areas
- ☒ Location of all waters of the U.S., including wetlands on or near the site. Indicate if water bodies are listed as impaired, or are identified as Tier 2, 2.5 or 3 waters.
- ☒ Boundary lines of any natural buffers,
- ☒ Locations of stormwater discharges and/ or locations where authorized non-stormwater will be discharged to surface water(s)
- ☒ Locations of storm drain inlets and stormwater control measures on the site and in the immediate vicinity of the site
- ☐ Locations of all pollutant-generating activities
- ☐ Locations where polymers, flocculants, or other treatment chemicals will be used and stored
- ☐ Areas of federally listed critical habitat for endangered or threatened species

See Appendix B: Site Plans

3.0 COMPLIANCE WITH APPLICABLE FEDERAL & STATE REQUIREMENTS

3.1 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near the project area?
☐ Yes ☐ No

Describe how this determination was made:
PLACEHOLDER LANGUAGE PENDING SITE SPECIFIC REVIEW: A project review package was submitted to USFWS on DATE, addressing Northern Long-Eared Bat (NLEB) and Plymouth Red-Belly Turtle. In summary:

A habitat assessment for Northern Long-Eared Bat was performed on DATE by GZA GeoEnvironmental, Inc. (GZA) and concluded that the project site does not provide important habitat for NLEB, and hibernacula or maternity roosting tree habitat are not known within ¼ mile of the site. The assessment also indicates that the closest location of documented overwintering for this species is located ># miles from the site, and further, that summer forage habitat is not present within the proposed work area.

GZA also performed a Plymouth Red-Belly Turtle assessment of the site, dated DATE. The assessment found that the project site does not occur within mapped Critical Habitat for the turtle, and a general habitat assessment and limited site survey found that the project site has low to moderate potential to support this species and no individual turtles were found. Accordingly, a "may affect, but is unlikely to adversely affect" concurrence letter was issued by USFWS on April 10, 2019.

If yes, describe the species and/or critical habitat:

If yes, describe or refer to documentation that determines the likelihood of an impact on the identified species and/or habitat and the steps taken to address that impact.

3.2 HISTORIC PRESERVATION

Step 1
Will stormwater controls that require subsurface earth disturbance be installed on the site?
☒ Yes ☐ No

Step 2
If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?
☐ Yes ☐ No

Step 3
If you answered no in Step 2, has it been determined that the installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?

☐ Yes ☐ No

PLACEHOLDER LANGUAGE PENDING SITE SPECIFIC REVIEW: Historic sites are not present. See Appendix M: Historic Preservation Documentation.

Step 4
If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?

☐ Yes ☐ No

If no, no further documentation is required. If yes, describe the nature of their response and include documentation in the Appendix:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 SAFE DRINKING WATER ACT UNDERGROUND INJECTION CONTROL REQUIREMENTS

Do you plan to install any of the following controls?

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, attach documentation of contact between you and the applicable state agency or EPA Regional Office responsible for implementing the requirements for underground

injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.

3.4 APPLICABLE STATE OR LOCAL PROGRAMS

This SWPPP complies with the requirements of Standard 8 of the Massachusetts Department of Environmental Protection Stormwater Handbook, which states:

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plans) shall be developed and implemented.

4.0 EROSION AND SEDIMENT CONTROL BMPS

This SWPPP contains a listing of the erosion and sediment control best management practices (BMPs) that will be implemented to control pollutants in stormwater discharges. The BMPs are categorized under one of the areas of BMP activity as described below:

- Natural Buffers or Equivalent Sediment Controls
- Phased construction activity
- Control stormwater flowing onto and through the project
- Stabilize soils
- Protect slopes
- Protect storm drain inlets
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits

4.1 NATURAL BUFFERS OR EQUIVALENT SEDIMENT CONTROLS

Are there any surface waters located within 50 feet of your construction disturbances that receive stormwater discharges from the site? ☐ Yes ☒ No

4.2 PHASED CONSTRUCTION ACTIVITY

Phased construction is not proposed. To minimize erosion during grading activities, grading and site work shall be conducted after snowmelt and during periods of predicted dry weather. The areas of the site that will remain vegetated after construction shall be stabilized with hydromulch or seeding immediately after grading activities are completed. All other areas of the construction site shall be stabilized if site work is not planned for more than 14 days. Disturbed areas shall be stabilized immediately after construction but no later than 14 days after construction ceases. Areas graded shall be stabilized with hydromulch immediately after construction but no later than 14 days after construction ceases.

4.3 STABILIZE SOIL

4.3.1 Temporary Stabilization

Description:	Initiation of temporary vegetative cover shall occur immediately where construction will cease for more than 7 days. Temporary vegetative cover shall be established using hydroseeding for areas of exposed soil (including stockpiles).
Installation Schedule:	Temporary stabilization measures shall be initiated immediately where construction activities will temporarily cease for more than 14 days. Stabilization will be completed as soon as practicable, but no later than 7 calendar days after stabilization has been initiated.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and after storm events until a dense cover of vegetation has become established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately.

4.3.2 Hydromulching

Description:	Hydromulching shall provide immediate protection to exposed soils during short periods of disturbance. Hydromulch shall also be applied in areas that have been seeded for temporary or permanent stabilization.
Installation Schedule:	Hydromulch shall be applied to soil exposed temporarily for >14 days during construction.
Maintenance and Inspection:	Hydromulched areas shall be inspected weekly and after storm events to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, the surface shall be repaired, and new hydromulch shall be applied to the damaged area.

4.3.3 Permanent Stabilization

Description:	Initiation of permanent stabilization measures shall occur immediately after the final design grades are achieved and earth moving activities cease. Vegetative cover shall be established on exposed soils. Permanent stabilization shall be completed in accordance with the procedures outlined in Section 6.0 Final Stabilization.
Installation Schedule:	Portions of the site where construction activities have permanently ceased shall be stabilized as soon as possible, but no later than 7 calendar days after stabilization has been initiated.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded in accordance with the plans. Care shall be taken to avoid compacting newly placed topsoil. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

4.3.4 Dust Control

Description:	Dust from the site shall be controlled by using a mobile pressure-type distributor truck to apply water to disturbed areas. The mobile unit shall apply water at a maximum rate of 300 gallons per acre and minimized as necessary to prevent runoff and ponding.
Installation Schedule:	Dust control shall be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. Spraying of water shall be performed no more than three times a day during the months of May–September and once per day during the months of October–April or whenever the dryness of the soil warrants it.
Maintenance and Inspection:	At least one mobile unit shall be available at all times to distribute water to control dust on the site. Each mobile unit shall be equipped with a positive shutoff valve to prevent over watering of the disturbed area.

4.4 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

4.4.1 Sediment Control Barrier

☐ Permanent ☒ Temporary

Description:	A sediment control barrier, consisting of silt fence and compost mulch tube shall be installed along the down-gradient side of the proposed project to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Sediment Control Barrier shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Sediment Control Barrier shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing or tubes shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches, or one-half of the above ground height of the barrier, whichever is less. Deteriorated sediment control material shall be replaced. Used mulch tubes and fencing shall be properly disposed of.

4.5 ESTABLISH STABILIZED CONSTRUCTION ENTRANCE/EXIT

☐ Permanent ☒ Temporary

Description:	Temporary gravel or crushed stone construction entrance/exit or other means shall be used to minimize off-site movement of soil with vehicles. Construction access points shall be maintained to minimize tracking of soil onto public roads. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.
Installation Schedule:	Stabilized construction entrance shall be installed prior to earthmoving activities.
Maintenance and Inspection:	Stabilized construction entrances shall be inspected daily. Gravel or crushed stone shall be added if the pad is no longer in accordance with the specifications. If the rock entrance is not working to keep public streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected. When sediment has been tracked off of the site onto public roads, it shall be removed by the end of the same working day, or by the end of the next working day if track-out occurs on a non-work day. Remove sediment by sweeping, shoveling or vacuuming public roadways were sediment has been tracked-out.

4.6 DEWATERING PRACTICES

Description:	All groundwater or stormwater discharged from excavations, trenches, or other similar points shall be treated by sediment basins, sediment traps, sediment socks, dewatering tanks, tube settlers or filtration systems specifically designed to remove sediment from the excavations. All dewatering practices shall conform to the following: • Visible floating solids or foam shall not be discharged; • An oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove oil, grease, or other products if dewatering water is found to contain these materials shall be used; • To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area; • Velocity dissipaters shall be installed at all points where dewatering activities are discharged to the surface. • With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and • Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
Installation Schedule:	Install settling or filtration methods prior to commencing dewatering. Engineer is required to approve settling of filtration method design prior to installation.
Maintenance and Inspection:	Settling of filtration controls shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less.

5.0 GOOD HOUSEKEEPING BMPS

This SWPPP contains a listing of the good housekeeping best management practices (BMPs) that shall be implemented to control pollutants in stormwater discharges during construction-related work. The BMPs are categorized below:

- Material Handling and Waste Management
- Establish Proper Building Material Staging Areas
- Designate Washout Areas
- Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
- Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
- Spill Prevention and Control Plan

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Several management procedures and practices are proposed to prevent and/or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at the site. These measures are grouped into the following categories: (1) solid or construction waste disposal, (2) recycling, (3) sanitary and septic waste, and (4) hazardous materials.

5.1.1 Solid or Construction Waste Disposal

Description:	All waste materials shall be collected and disposed of into metal trash dumpsters or enclosed trash containers in the materials storage area. Dumpsters shall have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site shall be deposited in the dumpster. No construction materials shall be buried on-site unless authorized by a program for recycling/beneficial use. All personnel shall be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these practices are followed.
Installation Schedule:	Trash dumpsters shall be installed once the materials storage area has been established.

Maintenance and Inspection:	The dumpsters shall be inspected weekly and immediately after storm events. The dumpsters shall be emptied weekly and taken to an approved landfill or recycling facility. If trash and construction debris are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently. Waste container lids shall be closed when not in use and at the end of the business day. For waste containers that do not have lids, provide cover or a similarly effective means to minimize the discharge of pollutants.

5.1.2 Recycling

Description:	Wood pallets, cardboard boxes, and other recyclable construction scraps shall be disposed of in a designated dumpster for recycling. The dumpster shall have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site shall be deposited in the dumpster. All personnel shall be instructed regarding the correct procedure for disposal of recyclable construction scraps. Notices that state these procedures shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Designated recycling dumpsters shall be installed when building materials arrive on-site.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and immediately after storm events. The recycling dumpster shall be emptied weekly and taken to an approved recycling center. If recyclable construction wastes are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.3 Sanitary and Septic Waste

Description:	Temporary sanitary facilities (portable toilets) shall be provided at the site throughout the construction phase. The portable toilets shall be located in the staging area, away from concentrated flow paths and traffic flow.
Installation Schedule:	The portable toilets shall be brought to the site once the staging area has been established.
Maintenance and Inspection:	All sanitary waste shall be collected from the portable facilities on a regular basis. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks shall be removed from the site and replaced with new portable toilets.

5.1.4 Hazardous Materials and Waste

Description:	All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment shall be provided for all waste materials in the hazardous materials storage area and shall consist of commercially available spill pallets. Additionally, all hazardous waste materials shall be disposed of in accordance with federal, state, and municipal regulations. Hazardous waste materials shall not be disposed of into the on-site dumpsters. All personnel shall be instructed regarding proper procedures for hazardous waste disposal. Notices that state these procedures shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Shipping containers used to store hazardous waste materials shall be installed once such materials arrive on-site.
Maintenance and Inspection:	The hazardous waste material storage areas shall be inspected weekly and after storm events. The storage areas shall be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

Description:	Construction equipment and maintenance materials shall be stored at the combined staging area and materials storage areas. A watertight shipping container shall be used to store hand tools, small parts, and other construction materials. Nonhazardous building materials such as packaging material (wood, plastic, and glass), and construction scrap material (steel, metal scraps, and pipe cuttings) shall be stored in a separate covered storage facility adjacent to the shipping container. All hazardous-waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers under cover within the storage area. Very large items, shall be stored in the open in the materials storage area. Such materials shall be elevated on blocks to minimize contact with runoff.

Installation Schedule:	The materials storage area shall be installed after grading and before any infrastructure is constructed at the site.
Maintenance and Inspection:	The storage area shall be inspected weekly and after storm events. The storage area shall be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

5.3 DESIGNATE WASHOUT AREAS

5.3.1 Concrete Washout

Description:	A designated temporary, above-grade concrete washout area shall be constructed. The temporary concrete washout area shall be constructed with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area shall be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs shall be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours shall not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes shall be washed in the designated area or concrete wastes shall be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area shall be removed and disposed of according to the maintenance section below, and the area shall be stabilized.
Installation Schedule:	The washout area shall be constructed before concrete pours occur at the site.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Once 75% of the area's holding capacity has been reached, the concrete wastes shall be allowed to harden; the concrete shall be broken up, removed, and taken to an approved landfill for disposal or recycled on-site or off-site in accordance with applicable laws. The plastic sheeting shall be replaced if tears occur during removal of concrete wastes from the washout area.

Design Specifications:

1. Temporary concrete washout type Above Grade shall be constructed as detailed above.
2. The washout shall be a minimum of 50 feet from storm drain inlets.
3. Plastic lining shall be free of holes, tears, or other defects that compromise the impermeability of the material.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

Description:	Several types of vehicles and equipment will likely be used on-site throughout the project, including graders, scrapers, excavators, loaders, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling and maintenance shall be performed outside of wetland resource areas and associated buffer zones. When vehicle fueling must occur on-site, the fueling activity shall occur in the staging area. Only minor equipment maintenance shall occur on-site. All equipment fluids generated from maintenance activities shall be disposed of into designated drums stored on spill pallets in accordance with the Material Handling and Waste Management Section 5.1. Absorbent, spill-cleanup materials and spill kits shall be available at the combined staging and materials storage area. Drip pans shall be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.
Installation Schedule:	BMPs implemented for equipment and vehicle maintenance and fueling activities shall begin at the start of the project.
Maintenance and Inspection:	Inspect equipment/vehicle storage areas weekly and after storm events. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately, using dry cleanup measures where possible and eliminating the source of the discharge. Problem vehicle(s) or equipment shall be removed from the project site. Keep ample supply of spill-cleanup materials on-site and immediately clean up spills and dispose of materials properly. Do not clean surfaces by hosing-down the area.

5.5 ALLOWABLE NON-STORMWATER DISCHARGES AND CONTROL EQUIPMENT / VEHICLE WASHING

Description:	All equipment and vehicle washing shall be performed off-site, except as required for wheel washes and concrete washout areas.
Installation Schedule:	N/A
Maintenance and Inspection:	N/A

5.6 SPILL PREVENTION AND CONTROL PLAN

Description:	i.	Employee Training: All employees shall be trained as detailed in the Inspection and Maintenance Section 8.0 of this report.
	ii.	Vehicle Maintenance: Vehicles and equipment shall be maintained off-site, except for minor maintenance as needed. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluids shall not be allowed on-site.
	iii.	Hazardous Material Storage: Hazardous materials shall be stored in accordance with this report and applicable regulations.
	iv.	Spill Kits: Spill kits shall be kept within the materials storage area. Spills: All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned up for disposal at an approved landfill. Spills shall be reported to the National Response Center at 1-800-424-8802 and MassDEP at 888-304-1133 as applicable in accordance with state and federal requirements.
	v.	Material safety data sheets: A material inventory and emergency contact information shall be maintained at the on-site project trailer.
Installation Schedule:	The spill prevention and control procedures shall be implemented once construction begins on-site.	
Maintenance and Inspection:	All personnel shall be instructed on the correct procedures for spill prevention and control. Notices that state these practices shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.	

5.7 FERTILIZER DISCHARGE RESTRICTIONS

Description:	Discharges from fertilizers containing nitrogen and phosphorus shall be minimized. Fertilizers shall be applied at rates and amounts consistent with the manufacture's specification, and shall at no time exceed local, state, or federal specifications. See project landscape specifications for acceptable fertilizers that can be used for the project.
Installation Schedule:	Fertilizers shall be applied at an appropriate time of year, timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Avoid applying fertilizers before heavy rains. Do not apply fertilizers to frozen ground or stormwater conveyance channels flowing with water.
Maintenance and Inspection:	N/A

5.8 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Any changes in construction activities that produce other allowable non-stormwater discharges shall be identified, and the SWPPP shall be amended and the appropriate erosion and sediment control shall be implemented.

The following is a list of allowable non-stormwater discharges:

- Water Used to Control Dust
- Uncontaminated Excavation Dewatering
- Firefighting
- Non-Detergent Laden Vehicle Wash Water

Except for water used to control dust and irrigation water, the above discharges shall not be routed to areas of exposed soil.

6.0 FINAL STABILIZATION

In compliance with the Construction General Permit, soil stabilization measures must be implemented immediately whenever earth-disturbing activities are temporarily or permanently ceased on any portion of the site. Earth-disturbing activities are temporarily ceased when clearing, grading, and excavation within any area of a site that will not include a permanent structure will not resume for a period of 7 or more calendar days, but such activities will resume in the future.

In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased. The following activities constitute the initiation of stabilization:

- Preparing the soil for vegetative or non-vegetative stabilization;
- Applying mulch or other non-vegetative product to the exposed area;
- Seeding or planting the exposed area;
- Starting any of the activities in listed above on a portion of the area to be stabilized, but not on the entire area; and
- Finalizing arrangements to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization.

As soon as practicable, but no later than 7 calendar days after the initiation of soil stabilization measures the following activities are required to be completed:

- For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

The following sections detail the management practices proposed to achieve final stabilization of the site.

6.1 PERMANENT SEEDING

Description:	Permanent seeding shall be applied immediately after the final design grades are achieved on portions of the site but no later than 7 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated shall be removed and hauled off-site for disposal at an approved landfill. Construction debris, trash and temporary BMPs (including sedimentation controls, material storage areas, sanitary toilets, and inlet protection) shall also be removed and any areas disturbed during removal shall be seeded immediately. Seeding shall be performed in accordance to the Site Plans and Landscape Specifications for the project.
Installation Schedule:	Seeding shall occur at portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible but no later than 7 days after construction ceases.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities for failure and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded in accordance with the plans. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is achieved.

7.0 INSPECTIONS AND MAINTENANCE

7.1 INSPECTIONS

7.1.1 Inspection Schedule and Procedures

Inspections of the site will be performed once every 7 days and within 24 hours of the end of a storm event of 0.25-inch) or greater unless otherwise specified. The inspections will verify that all BMPs required are implemented, maintained, and effectively minimizing erosion and preventing stormwater contamination from construction materials.

To determine if a storm event of 0.25 inches or greater has occurred on the site, either a properly maintained rain gauge will be kept on the site or the storm event information will be obtained from a weather station that is representative of the location. If an inspection is conducted because of rainfall measuring 0.25 inches or greater, the applicable rain gauge or weather station readings that triggered the inspection will be noted in the inspection report.

Inspections shall include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors shall look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP shall be observed to ensure proper operation. Discharge locations shall be inspected to ascertain whether sediment and erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream location shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

For detailed inspection procedures, see Sections 4 and 5.

All inspections shall be coordinated with a representative from Owner Company. An Owner Company representative shall accompany the Inspector, when possible, during inspections.

Inspection reports are required to be completed within 24-hours of an inspection. If corrective actions are identified by the Inspector during the inspection, he/she shall notify and submit a copy of the inspection report to the Operator(s). For corrective actions identified, the Site Owner/Site Operator shall be responsible for initiating the corrective action within 24 hours of the report and completing maintenance as soon as possible or before the next storm event. For any corrective actions requiring

a SWPPP amendment or change to a stormwater conveyance or control design, the Site Owner/Site Operator shall notify Owner, as soon as possible, before initiating the corrective action.

The business days for the project construction are ***7:00 am to 5:00 pm***, ***Monday through Friday***.

For a copy of the inspection report template, see Appendix E.

7.2 REDUCTIONS IN INSPECTION FREQUENCY

Once an area is stabilized, inspections may be reduced to twice per month for the first month, no more than 14 calendar days apart, then once per month. If construction resumes at the stabilized area the inspection frequency shall increase as outlined in Section 7.1.

If earth-disturbing activities are suspended due to frozen conditions inspections can be temporarily suspended until a thaw occurs.

7.3 CORRECTIVE ACTION LOG

The corrective action log describes repairs, replacements, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures. Additionally, remedies of permit violations and clean and proper disposal of spills, releases other deposits should be recorded.

If it is determined the stormwater controls have not been installed as required, or that they are not functioning adequately corrective action is required within 7 calendar days.

The operator will document the completion of the corrective action within 24 hours.

See Appendix F – Corrective Action Log.

8.0 RECORDKEEPING AND TRAINING

8.1 RECORDKEEPING

A copy of the SWPPP, along with all inspection reports and corrective action logs are required to be stored at an accessible location at the site or other location easily accessible during normal business hours, and shall be made available upon request of the EPA, or state or local agency approving stormwater management plans.

The following records shall be kept at the project site and shall be available for inspectors to review. These records shall be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when construction activities temporarily or permanently cease on a portion of the site:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when an area is either temporarily or permanently stabilized:
See Appendix I – Grading and Stabilization Activities Log

8.2 LOG OF CHANGES TO THE SWPPP

The log of changes to the SWPPP is maintained in Appendix G and includes additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures and updates to site plans.

8.3 TRAINING

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, training on the pollution prevention measures outlined in this SWPPP shall be provided to staff and subcontractors.

8.3.1 Individual(s) Responsible for Training

Company/Organization: TBD

Name: TBD

8.3.2 Description of Training Conducted

Informal training shall be conducted for all staff, including subcontractors, on the site. The training shall be conducted primarily via tailgate sessions and shall focus on avoiding damage to stormwater BMPs and preventing illicit discharges. The tailgate sessions shall be conducted biweekly and shall address the following topics: Erosion Control BMPs, Sediment Control BMPs, Non-Stormwater BMPs, Waste Management and Materials Storage BMPs, and Emergency Procedures specific to the construction site. (See Appendix J – Training Log)

Formal training shall be provided to all staff and subcontractors with specific stormwater responsibilities, such as installing and maintaining BMPs. The formal training shall cover all design and construction specifications for installing the BMPs and proper procedures for maintaining each BMP. Training shall also cover inspection schedules and procedures for personnel whose job duties are related to inspections. Formal training shall occur before any BMPs are installed on the site. (See Appendix J – Training Log)

9.0 CERTIFICATION AND NOTIFICATION

9.1 SIGNATURE, PLAN REVIEW, AND MAKING PLANS AVAILABLE

A copy of the SWPPP (including a copy of the Construction General Permit, NOI, and acknowledgement letter from EPA) shall be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. A copy of the SWPPP shall be available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location shall be posted near the main entrance at the construction site.

9.2 NOTICE OF PERMIT COVERAGE

A sign must be posted at a safe, publicly accessible location in close proximity to the construction site detailing the permit coverage. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way. At a minimum, the notice must include:

- The NPDES Permit Tracking Number,
- A contact name and phone number for obtaining additional construction site information,
- The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional 1 Office at (617) 918-1038,
- The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

9.3 OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:_____ Title:_____

Signature:_____ Date:_____

9.4 OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:_____ Title:_____

Signature:_____ Date:_____

APPENDICES

Appendix A

General Location Map

Appendix B

Site Plans

Appendix C

Construction General Permit

https://www.epa.gov/sites/production/files/2017-02/documents/2017_cgp_final_permit_508.pdf

Appendix D

NOI and Acknowledgement Letter from EPA

Appendix E

Inspection Reports

Inspections under this SWPPP shall be conducted in accordance with each installed BMPs recommended maintenance requirements. This inspection frequency may be reduced to at least once every month if: a) the entire site is temporarily stabilized, b) runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or the ground is frozen), or c) construction is occurring during seasonal arid periods in arid areas and semi-arid areas. If an inspection report is filed according to this modified schedule it shall be noted at the end of the report under the "NOTES" section.

The following pages should be copied and completed for each inspection. All inspection forms should be compiled in a binder to prove compliance with this SWPPP.

Stormwater Pollution Prevention Plan: Inspection Checklist

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approx. Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title:

_____

Signature:_____

Date:_____

Appendix F

Corrective Action Log

Corrective Action Log

Use this form to note the date and activity for accurate record keeping (make additional copies as necessary). Examples include the restaking or reinforcement of the erosion control barrier, site watering to prevent dust erosion, street sweeping, equipment and machinery repair, etc.

Date	Activity Description	Additional Action Items

Appendix G

SWPPP Amendment Log

The SWPPP, including the site plans, shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP shall be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

Based on the results of an inspection, the SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs shall be accomplished as described in Subpart 3.6B of the Construction General Permit (located in Appendix C).

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name(s) and Title)

Appendix H

Subcontractor Certifications/Agreements

Sample Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix I

Grading and Stabilization Activities Log

Site Plans in Appendix B should be annotated to indicate areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

The following records are to be kept by each Site Operator throughout the construction period and maintained in the SWPPP. Insert additional documentation for record keeping as necessary.

Grading and Stabilization Activities Log

Date	Location on Property	Description

Appendix J

Training Log

Training Log

Date	Training Topic	Attendee	Signature of Training Coordinator

Appendix K

Delegation of Authority

Sample Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix L

Endangered Species Documentation

Appendix M

Historic Preservation Documentation

3.5 Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a stormwater management system that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. A Site Owner's Manual is included, which contains the Long Term Pollution Prevention Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Signature: _____

Owner's Name