APPLICATION FOR SITE PLAN REVIEW

27 Charge Pond Road PV+ES Project

27 Charge Pond Road (aka 67 Tihonet Road)
Wareham, Massachusetts

Prepared for:

Borrego Solar Systems, Inc.
55 Technology Dr. #102
Lowell, MA 01851

Prepared by:

BEALS + THOMAS
BEALS AND THOMAS, INC.
32 Court Street
Plymouth, Massachusetts
02360-3866

Submitted in Compliance with the Zoning By-laws of the Town of Wareham, Massachusetts

May 28, 2020

1833109PT001

May 28, 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*

Reference: 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 Application for Site Plan Review for the construction, installation, and operation of a proposed large ground-mounted solar energy facility at 27 Charge Pond Road (aka 67 Tihonet Road) in Wareham, Massachusetts (the Project). The Project is designed to comply with applicable zoning criteria in the October 2019 revision to the Zoning By-laws of the Town of Wareham, Massachusetts (the Zoning By-laws), including Section 590: Solar Energy Generation Facilities.

The proposed Project consists of an approximately ±5 megawatt (MW) AC/±12.2 MW DC solar array and energy storage system including site access and interconnection to the electrical grid. The Project is proposed within a ±44 -acre area (the Site) on a portion of a larger ±130 acre overall parcel of land (the Property) owned by A D Makepeace Co (aka A.D. Makepeace Company, ADM). The Site can be further identified as a portion of Wareham Assessor's Map 110, Lot 1015 (address indicated as 67 Tihonet Road in Assessors' database). More specifically, the Site is located to the east of Parker Mills Pond and south of Route 25.

B+T is pleased to participate in the approval process for another renewable/sustainable energy project in the Town of Wareham, following the successful review of multiple other BSSI solar projects on ADM land in recent years. BSSI is currently also proposing two separate solar projects off Tihonet Road to the north, which will be submitted to the Planning Board for review.

Enclosed are three hard copies of the Site Plan Review application package, plus a complete electronic copy on a USB drive. We understand that the Planning Office will coordinate with the Town Clerk to confirm receipt of these materials pursuant to Section 17(b)(i) of Chapter 53 of the Acts of 2020, and will forward one of the hard copies to the peer review consultant. The following information is included for your review:

Section 1.0: Site Plan Application Forms
Section 2.0: Project Narrative
Section 3.0: Parties in Interest
Section 4.0: Stormwater Management Information
Section 5.0: Solar Documentation
Section 6.0: Plans

Please note that a waiver from Section 1531.11, photographs of the site at size of 8” by 10” is requested. Photographs are included in Section 2, but do not meet the specified size due to their orientation. Additionally, waivers are requested 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).” 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. Furthermore, Subsection 1532: “Existing Features” requires that plans be at a scale of 1” = 20’, 40’, or 100’ where practical and appropriate. Plans have been submitted at various scales appropriate to the Project Site. Finally, a waiver is requested from Section 1532.1 “Existing Natural Features” 2. “Individual trees 18” dbh or over.” Due to the size of the Property and the character of the Project, it is infeasible to locate all trees greater than 18 inches.

Enclosed is a check payable to the Town of Wareham in the amount of $750.00 for the appropriate filing fee as required by the Zoning By-laws. An additional check in the amount of $180.20 to cover abutter notification expenses has been forwarded to the Town under separate cover. We understand that the Planning Board will be responsible for notification to abutters via Certified Mail. We further understand that the Planning Board will be responsible for publishing the notice of public hearing in the Wareham Week, for which an additional $80.00 check is included. Lastly, a check in the amount of $200.00 payable to the Wareham Fire Department is enclosed to facilitate its review.

Should you have any questions regarding this matter or require additional information, please contact us at (508) 366-0560. We thank you for your consideration of this request and look forward to meeting with the Board at the June 22, 2020 public hearing.

Very truly yours,

BEALS AND THOMAS, INC.

Stacy H. Minihane

Stacy H. Minihane, PWS
Senior Associate

Jeffrey R Murphy

Jeffrey R. Murphy, PE
Civil Engineer

Enclosures

cc: Borrego Solar Systems, Inc. (via Box upload)
A.D. Makepeace Company, James Kane (1 copy via US Mail w/o Stormwater Report and with reduced plans; full copy via email)
Charles L. Rowley PE, PLS (via email)

MKS/shm/jrm/aak/1833109PT001

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Map 110, Lot 1015

PLANNING BOARD
TAX VERIFICATION FORM

This verifies that Borrego Solar Systems, Inc. (name of applicant) is up-to-date on the taxes for the property(ies) he/she owns in Wareham. If the applicant is not the current owner of the property that the application addresses, the current owner A D Makepeace Co (name of property owner) is up-to-date on taxes and on all properties he/she owns in the Town of Wareham.

John Foster

John Foster, Tax Collector

APPLICATION FOR SITE PLAN REVIEW

Applicant: Name: Borrego Solar Systems, Inc.

Mailing address: 55 Technology Drive, #102, Lowell, MA 01851

Telephone: (888) 898-6273

Project: Street & Number: 27 Charge Pond Road (aka 67 Tihonet Road per Assessor's database)

Assessor's Map: 110 Lot(s) 1015

Dwelling Units # None

Parking Spaces # None

Acres: ±44 Square Feet Commercial Space: 0

Briefly describe project: Construction, installation, and operation of a large-scale ground-mounted solar energy facility

Date: 5/27/2020

Signature of Applicant:

APPLICATION FOR SITE PLAN REVIEW

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List of abutters:

Please list the names of all abutters, owners of land directly opposite on any public or private street or way, and abutters to the abutters within three hundred feet of the property line of the petitioner as they appear on the most recent applicable tax list.

See list enclosed in Section 3.0

SITE PLAN REVIEW CHECKLIST

Plans shall be prepared by a registered architect, landscape architect, or Professional Engineer. 14 complete sets are required with the following information included:

1. GENERAL INFORMATION

__X__ Developer name, address, telephone number

__X__ Property owner name, address, telephone number, legal relationship between developer and property owner

__X__ Date of application

__X__ Statement briefly describing project

__X__ Locus map (1" = 2,000')

__X__ Location of property to surrounding area (this plan shall show at a scale of not less than 1" = 100' the general characteristics of all lands within 200' of the proposed site and shall include structures, parking areas, driveways, pedestrian ways and natural characteristics)

__X__ Zoning district (square feet within each district if more than one district)

__X__ Total area of project in square feet to include wetland and 100 year flood plain (both in square feet)

______ All contiguous land owned by the applicant or by the owner of the property. At the discretion of the Planning Board photographs of the site at size 8" x 10"

2. EXISTING FEATURES

Plans shall be accurately drawn to a scale of 1" = 20, 1" = 40', or 1" = 100' where practical and appropriate to the size of the proposal and shall show all existing natural, manmade, and legal features of the site. Such plans are to include but not be limited to the following:

__X__ Tree line of wooded area

______ Individual trees 18" dbh or over

__N/A__ Bogs or agricultural areas

x ______ All wetlands protected under CMR 10.02 (1) (a-d)

x ______ Flood plain (100 years) with base flood elevation data

x (1') ______ Contour lines (2' intervals)

x ______ General soil types

2b. EXISTING MANMADE FEATURES

x ______ Vehicle accommodation areas

x ______ Street, roads, private ways, walkways

x ______ Curbs, gutters, curb cuts, drainage grates

x ______ Storm drainage facilities, including manholes

x ______ Utility lines, including water, sewer, electric, telephone, gas, cable TV

N/A ______ Fire hydrants and location of dumpsters

N/A ______ Building, structures, and signs (free standing), including dimensions of each

N/A ______ Existing light fixtures

2C. EXISTING LEGAL FEATURES

x ______ Zoning of property (district lines)

x ______ Property lines (with dimensions identified)

x ______ Street right of way lines

x ______ Utility or other easement lines

x ______ Monuments

3. THE DEVELOPMENT PLAN

The development plan shall show proposed changes in the (a) existing natural features; (b) existing man made features and (c) existing legal features.

The Development Plan shall include:

N/A ______ Square feet in every new lot

x ______ Lot dimensions

N/A ______ Location and dimensions of all buildings and free standing signs as well as the distances from all buildings to lot lines, streets, or street right of way

N/A ______ Building elevations (side, front, and back for a typical unit) showing building height and any proposed wall signs

N/A ______ Location, dimensions, and designated use for all recreation areas

N/A ______ Location and dimension of all open space; indicate whether open space is to be dedicated to public use or to remain private

N/A ______ Streets (including street names) which conform to the design standards of the Planning Board's Rules and Regulations Governing the Subdivision of Land

N/A ______ Curbs and gutters, curb cuts, drainage grates

x ______ Drainage facilities including manholes, pipes, drainage ditches, and retention ponds

N/A ______ Sidewalks and walkways showing widths and materials

x ______ Outdoor illumination with lighting fixture size and type identified

x ______ Utilities; water, sewer, electric, telephone, gas, cable TV

N/A ______ Fire hydrant location

N/A ______ Dumpster (trash collection facilities)

x ______ New contour lines resulting from earth movement (at 2' intervals) and indications of types of ground cover and other precautions to stabilize slopes

N/A ______ Vehicle parking, loading, and circulation areas showing dimensions

x ______ Proposed new plantings by size and location or construction of other devices to comply with screening and shading requirements

4. IMPACT STATEMENT

In order to evaluate the impact of the proposed development to Town services and the welfare of the community, there shall be submitted an impact statement in two parts.

X ______ All applicable Town services including but not limited to schools, sewer services, water systems, parks, fire, and police.

X ______ The roads in the immediate vicinity of the proposed development (including an estimate of both peak and average daily counts)

X ______ The ecology of the area within the site and any significant off-site impacts

Part Two shall describe what actions have been taken to mitigate the impacts described in Part One

This application constitutes the applicant's willingness to work under the Town of Wareham's Zoning Bylaws. Any errors or omissions from this checklist or the Zoning Bylaw may result in the application not being placed on a Planning Board Agenda or denial of the Site Plan.

Site Plan Review
Application Checklist

Note to Applicant(s): The following checklist serves as an instrument to help ensure that all necessary information and materials are submitted with the application for Site Plan Review. Please verify that all related items listed below have been accounted for in your submission. (Refer to Article 15 of the Zoning By-Law of the Town of Wareham, Massachusetts, adopted October 2004).

Name of site: 27 Charge Pond Road PV+ES Date: May 28, 2020
Owner(s): A D Makepeace Co
Address: 158 Tihonet Road, Wareham, MA 02571
Telephone Number: (508) 295-1000 Cell Phone: ______

Developer(s): Borrego Solar Systems, Inc.
Address: 55 Technology Drive, #102, Lowell, MA 01851
Telephone Number: (888) 898-6273 Cell Phone: ______

Relationship between Developer & Property Owner: Owner is leasing development rights to developer

Surveyor: Northeast Survey Consultants
Engineer: Beals and Thomas, Inc.
Architect: Not Applicable
Landscape Architect: Beals and Thomas, Inc.

ITEM	Complete
Application for Site Plan Review – Special Permit filed with Planning Board	Yes
(14 copies of application and supplementary materials)	Yes
Application for Special Permit – Residential Cluster Development filed with Planning Board	N/A
(11copies of application and supplementary materials)	N/A
Copies filed with Town Clerk	Yes
Filing Fees	Yes
GENERAL INFORMATION	
Developer Name, address, telephone number	Yes
Property Owner Name, address, telephone number	Yes
Date of Application	Yes
Statement briefly describing project	Yes
Locus Map (1” = 2,000’)	Yes
Location of property to surrounding area (scale should be no less than 1” = 100’) and general characteristics of all lands within 200’ of the proposed site including structures, parking areas, driveways, pedestrian ways, and natural characteristics	Yes

Zoning district (sq. feet within each district if more than one)	Yes
Total area of project to include wetland and 100 year floodplain (both in sq. feet)	N/A
All contiguous land owned by the applicant or by owner of property	Waiver
Photographs of site (8” by 10”) – at discretion of Permitting Authority	Waiver
List of abutters, certified by Board of Assessors	Yes
Number of dwellings which could be constructed by means of a conventional development plan, considering the whole tract, exclusive of water bodies and land prohibited from development by legally enforceable restrictions, easements, or covenants. This includes: • Any bank, freshwater wetland, coastal wetland, beach, dune, flat, marsh, or swamp bordering the ocean, any estuary, creek, river, stream, pond, or lake • Lake under any of the water bodies listed above; • Land subject to tidal action • Land subject to coastal storm flowage or slopes in excess of fifteen (15) percent are not to be counted in figuring the number of permissible units of conventional development.	N/A
EXISTING FEATURES	
(Scale 1” = 20’, 1” = 40’,or 1” = 100’ where practical and appropriate to the size of the proposal) Must include a minimum of the following:	Waiver
1. Existing Natural Features a. Tree line of natural area; b. Individual trees 18” dbh or over; (waiver requested) c. Bogs or agricultural areas; d. All wetlands protected under 310 CMR 10.01 (1) (a-d); floodplain (100 year) with base flood elevation data; e. Contour lines (2’ intervals); f. General soil types.	Yes, as applicable, except b.
2. Existing Man-Made Features a. Vehicle accommodation areas; streets, roads, private ways, walkways; b. Curbs, gutters, curb cuts, drainage grates; c. Storm drainage facilities including manholes; d. Utility lines including water, sewer, electric, telephone, gas, cable TV; e. Fire hydrants and location of dumpsters; f. Buildings, structures, and signs (free standing) including dimensions of each; g. Exterior lighting features.	Yes, as applicable
3. Existing Legal Features a. Zoning of property (district lines); b. Property lines (with dimensions identified); c. Street right-of-way lines; d. Utility or other easement lines; e. Monuments.	Yes

DEVELOPMENT PLAN	
Proposed changes to existing natural features, existing man-made features, and existing legal features including the following;	Yes, as
• Area of each new lot in square feet;	N/A
• Lot dimensions;	Yes
• Location and dimensions of all buildings and freestanding signs as well as the distances from all buildings to lot lines, streets, or street;	N/A
• Location, dimension, and designated use for all recreation areas;	N/A
• Location and dimension of all open space (indicate whether such open space is to be dedicated to public use or remain private);	N/A
• Streets (including street names) which conform to the design standards of the Planning Board's Rules and Regulations Governing the Subdivision of Land;	N/A
• Curbs and gutters, curb cuts, drainage grates;	N/A
• Drainage facilities including manholes, pipes, drainage ditches, and retention ponds;	Yes
• Sidewalks and walkways showing widths and materials;	N/A
• Outdoor illumination with lighting fixture size and type identified;	Yes
• Utilities – Water, sewer, electric, telephone, gas, cable TV;	Yes
• Fire hydrant locations;	N/A
• Dumpster (trash collection facilities);	N/A
• New contour lines resulting from earth movement (2' intervals) and indications of types of ground cover and other precautions to stabilize slopes;	Yes
• Vehicle parking, loading, and circulation areas showing dimensions and layout of parking spaces, travel lanes, aisles, and driveways;	N/A
• Proposed new plantings by size and location or construction of other devices to comply with screening and shading requirements.	Yes
IMPACT STATEMENT	
Part One: Description of neighborhood and impact of proposed development on all applicable town services including but not limited to schools, sewer service, water system, parks, fire, and police protection;	X
Traffic report of existing and future traffic within and adjacent to proposed development. (Include estimate of both peak and average daily traffic count);	N/A
Analysis of site in regards to wetlands, coastal wetlands, slopes, soil conditions, 100 year flood plain, and other natural features as Planning Board may request;	X
Environmental Impact Assessment Report relating to proposed plan and copy of environmental impact report if otherwise required in order to illustrate the ecology of the area within the site and any significant off-site impacts;	N/A
Evaluation of open land proposed within cluster, with respect to size, shape, location, natural resource value, and accessibility by residents of the Town or of the cluster;	N/A

Part Two: Description of actions that have been taken to mitigate the impacts described in Part One.	X

TOWN OF WAREHAM
ANR/SUBIDIVISION/SITE PLAN REVIEW FORM

Check one: ANR ______ Form B ______ Form C ______ Site Plan Review __X__

Date stamped in ___________________ Date decision in due ____________________

Applicant's name(s) Borrego Solar Systems, Inc.

Applicant's address 55 Technology Drive, #102, Lowell, MA 01851

Telephone number (888) 898-6273

Address of property 27 Charge Pond Road (aka 67 Tihonet Road per Assessors' database)

Landowner's name A D Makepeace Co

Owner's address 158 Tihonet Road, Wareham, MA 02571

Telephone number (508) 295-1000

Contact person Stacy H. Minihane, PWS, B+T Telephone (508) 366-0560

Map # 110 Lot # 1015 Zone R-60

Date Approved ____________________________ Date Denied ____________________________

Comments (state reasons for denial or stipulations of approval)

____
____
____
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____
____
____

Conditions for: ____
____
____
____
____
____
____

RECORD OF PLANNING BOARD PROCEEDINGS AND DECISIONS
Town of Wareham Planning Board

Name of Subdivision or Project: 27 Charge Pond Road PV+ES Project

APPLICATION: FORM A ________ FORM B ________ FORM C ________
SITE PLAN REVIEW X OTHER ________

DATE SUBMITTED: ____________

DATE DECISION IS DUE: ____________

DATE OF PUBLIC HEARING(S): ____________

DECISION DATE: ____________

DATE DECISION SENT TO TOWN CLERK: ____________

DATE APPEALS PERIOD BEGINS ____________ ENDS ____________

PLANNING BOARD DECISIONS: (yes or no or abstention) if abstaining, appropriate recusal form should accompany decision.

FORM A:
M. Baptiste ________ G. Barrett ________ M. Fitzgerald ________ B. Reed ________
J. Cronan ________ A. Slavin ________

FORM B:
M. Baptiste ________ G. Barrett ________ M. Fitzgerald ________ B. Reed ________
J. Cronan ________ A. Slavin ________

FORM C:
M. Baptiste ________ G. Barrett ________ M. Fitzgerald ________ B. Reed ________
J. Cronan ________ A. Slavin ________

SITE PLAN:
M. Baptiste ________ G. Barrett ________ M. Fitzgerald ________ B. Reed ________
J. Cronan ________ A. Slavin ________

COMMENTS OR STIPULATIONS ON DECISION: ____________

____

STREET NAME PROPOSED AND ACCEPTED: ____

____

Conditions for: ____

____

____

____

____

____

TOWN OF WAREHAM
PLANNING BOARD
54 Marion Road
Wareham, Massachusetts 02571

NOTICE OF PUBLIC HEARING

In accordance with the provisions of Chapter 40-A, Section 5, Massachusetts General Laws, the Planning Board will hold a public hearing on January 25, 2010, at 7:00 p.m. in the Lower Level Cafeteria of Wareham Town Hall, 54 Marion Road, Wareham, MA to consider the following proposed revisions to the Subdivision Rules and Regulations;

SECTION VII FILING FEES – effective 01/26/10

A. APPROVAL NOT REQUIRED PLANS

Filing fee: $150.00 per plan sheet + $50.00 each newly-created lot

B. PRELIMINARY PLAN

Filing fee: $500.00 + $100.00 per lot + $80.00 advertising fee

C. DEFINITIVE PLAN

Filing fee:

$750.00 + $75.00 per lot if Form B has been submitted, plus $1.00 per linear foot of road + $80.00 advertising fee.

$1,500.00 + $50.00 per lot if Form B has not been submitted, plus $1.00 per linear foot of road + $80.00 advertising fee.

COVENANT RELEASE/BOND RELEASE

Filing fee: $100.00 per request

Subdivision Modifications

Filing fees for subdivision modifications shall be the same as listed above for an original application. Review Fees shall also be the same.

D. REVIEW FEES REQUIRED

Where specific conditions arising from the land or the nature of the proposal necessitates the assistance of planning, engineering, legal, traffic, soils, hydrologic or other consultants, the Planning Board may engage such consultant services to assist the Board in analyzing the project to ensure compliance with all relevant laws, by-laws, regulations, good design principles and best available practices. In these instances the Board will require the applicant to pay a review fee consisting of the reasonable costs to be incurred by the Board for these services (The provisions for this language, MLG Ch. 44, Sec. 53G, were adopted at the October 22, 2002 Town Meeting).

Funds received by the Board pursuant to this section shall be deposited with the Town Treasurer who shall establish a special individual account for this purpose. Expenditures from this special account may be made at the direction of the Board. Expenditure from this account shall be made only in connection with the review of a specific project or projects for which a review fee has been, or will be collected, from the applicant. Failure of an applicant to pay all review fees shall be grounds for denial of the application or permit.

Review fees may only be spent for services rendered in connection with the specific project for which they were collected. Accrued interest may also be spent for this purpose. At the completion of a Board's review of a project, any excess amount of funds in the account, including any interest, attributable to a specific project, shall be repaid to the applicant or the applicant's successor in interest. The applicant must submit a written request for these funds. Upon request, a final report for said account shall be made available to the applicant, or the applicant's successor in interest. For the purpose of this regulation, any person or entity claiming to be an applicant's successor in interest shall provide the Board with the documentation establishing such succession in interest.

Any applicant may take an administrative appeal from the selection of the outside consultant to the Board of Selectmen, providing that such appeal is taken within 14 days of notification of the Board's appointment to the consultant. The grounds for such an appeal shall be limited to the claims that the selected consultant has a conflict of interest or does not possess the minimum required qualifications as may be set by the Board. The minimum qualifications shall consist of a licensed professional in a related field. The required time limit for action upon an application by the Board shall be extended by the duration of the administrative appeal. In the event that no decision is made by the Board of Selectmen within one month following the filing of the appeal, the selection made by the Board will stand.

***Amended 01/25/10 by majority vote; The Board may waive fees if deemed modification is to be minor. The Board, in its discretion, may waive or adjust the fees if it deems the modification to be a minor modification.**

OTHER COST AND EXPENSES

All expenses for professional services, ancillary report reviews, supplemental studies, advertising, publication of notices, postage and mailings and all other expenses in connection with the proposed subdivision, including without limitation sampling and/or testing, shall be borne by the applicant. Re-inspection fees shall be the reasonable costs to be incurred to observe and inspect the construction of the proposed improvements and shall be based on an estimate provided by the Town's engineer.

The Planning Board shall not accept an application or schedule a public hearing for any application without receipt of a dollar deposit as listed in the Consulting Fee Schedule to be used only for payment of engineering, legal and other consulting services related to the proposed project.

The Planning Board may request supplemental payments, as needed, which shall be due and payable within fourteen (14) days of the request. Failure to pay the deposit amount or any supplemental payment shall be grounds for denial of the application. Any person interested or wishing to be heard on the proposed revisions to the Subdivision Rules and Regulations should appear at the time and place designated.

George T. Barrett
Chairman

NOTICE PUBLICATION DATES:

First Notice:	January 7, 2010
Second Notice:	January 14, 2010

Section 2.0
Project Narrative

2.0 PROJECT NARRATIVE

2.1 Introduction

The proposed 27 Charge Pond Road PV+ES Project (the Project) is located off Charge Pond Road and south of Route 25. The Site can be further identified as a ±44-acre portion of Map 110, Lot 1015 owned by A D Makepeace Co (A.D. Makepeace Company, ADM). The ±130 acre overall parcel of land is referred to herein as the Property. More specifically, the Site is located to the east of Parker Mills Pond, to the west of the ballfields constructed atop the capped Wareham Landfill, and to the north of the natural gas storage enclosure owned by Colonial Gas Company, based on available assessor's information. Refer to the Locus and Aerial Maps enclosed in Section 6.0.

The Site is located in the R-60 District as indicated on the Town of Wareham Zoning Map. According to Section 320: Table of Principal Use Regulations, large ground mounted solar energy projects are allowed by Site Plan Review from the Permit Granting Authority. Accordingly, Site Plan Approval from the Planning Board is requested pursuant to Section 590 of the Zoning By-laws.

Aerial Photograph. The proposed solar array will be located east of Parker Mills Pond, south of Route 25, and west of Charge Pond Road, as depicted in the above aerial photograph. Also refer to the Locus and Aerial Maps included in Section 6.0.

As defined in Article 16 of the Zoning By-laws, Large Ground-Mounted Solar Photovoltaic Installations (LGMSPI) are arrays that generate a minimum capacity of 250 kW and are structurally mounted on the ground. The proposed system size is a ±5 MW AC (±12.2 MW DC) facility with panels installed on a racking system within existing upland areas. Laydown areas and supporting utility structures (inverters, batteries, etc.) also are located within upland areas.

2.2 Existing Conditions

The Site is part of the land holdings of ADM, and 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. Parker Mills Pond was formed by the damming of Wankinco River off-site to the southwest. The majority of the Site is vegetated with a mixed canopy of oak (*Quercus rubra* and *Quercus alba*) and pine (*Pinus rigida* and *Pinus alba*) with varying shrub communities throughout. Closest to the shore of Parker Mills Pond, the dominant shrub is sweet pepperbush (*Clethra alnifolia*). Vines prevalent throughout the upland areas closest to the Parker Mills Pond are exclusive to greenbrier (*Smilax rotundifolia*).

Typical view of Site. Photograph taken February 14, 2020.

A Notice of Intent (NOI) is being filed with the Wareham Conservation Commission concurrent with this application for work proposed within the 100-foot buffer zone to wetland resource areas.

The Site is not located within areas identified by the Natural Heritage and Endangered Species Program (NHESP) as Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife.

2.3 Proposed Conditions

The Project includes the construction, installation, and operation of a large ground-mounted solar array and energy storage facility, including site access and interconnection to the electrical grid. The fenced area surrounding the ±5 MW AC (±12.2 MW DC) solar array will occupy approximately ±39 acres of upland area. The proposed array is comprised of approximately 30,078 solar modules, which is subject to change and will be finalized upon issuance of construction drawings prior to issuance of building and electrical permits. The system will include appurtenant inverters and battery storage structures, as described in Section 5.0 and depicted on the plans enclosed in Section 6.0. The Site will be enclosed by a security fence as detailed in the accompanying plan set.

The interconnection to the electrical grid is proposed at an existing utility pole across Charge Pond Road from the Site. Access will be provided from Charge Pond Road, and new access roads will surround the perimeter of the array. The new access roads will be located within the limits of the proposed security fence, which will be secured with knox boxes and gates.

Disturbed areas will be stabilized with herbaceous species following construction. In addition, erosion and sedimentation controls will surround the work area where needed during construction as depicted on the plans in Section 6.0.

The proposed Project will not result in the development impacts generally associated with typical residential, commercial, or industrial development. The Project will not generate water or sewer demands, increase traffic, create greenhouse gas (GHG) emissions, or contribute to acid rain or smog. In fact, the Project will create a source of renewable energy consistent with the Commonwealth’s net-zero emissions goal for 2050.

2.4 Compliance with the Zoning By-laws of the Town of Wareham

BSSI proposes this Project in accordance with M.G.L. c. 40A, s. 3 of the Massachusetts Zoning law, which states that no zoning ordinance or by-law shall prohibit or unreasonably regulate solar energy systems except where necessary to protect public health, safety, or welfare. The Project is sited appropriately and complies with applicable zoning criteria and does not endanger public health, safety or welfare. The Project further complies with the local Zoning By-laws as follows:

2.4.1 Section 590: Solar Energy Generation Facilities

Proposed large ground-mounted solar energy facilities are required to undergo Site Plan Review under the authority of the Planning Board pursuant to Section 592.3 of the Zoning By-laws. The Project complies with the applicable requirements of Section 590 as follows:

Section 593: Application for Site Plan Review

Compliance with Article 15: Site Plan Review of the Zoning By-laws is addressed in Section 2.4.2 herein. We have provided below the list of requested information pursuant to Section 593 of the Zoning By-laws:

593.1 Landscape plan including sizes, types and numbers of plantings and details. Existing vegetation and other unique land features shall be preserved where feasible.

Landscape information has been included on the plan set, including the location of existing treed areas and details regarding the proposed seed mix. Additional plantings are not proposed given the nature of the Project. The proposed location of the Project is approximately ±330 feet from the nearest residential lot/home.

The Project limits earthwork and vegetation clearing to the extent feasible; however, an area of clearing beyond the arrays is required to accommodate stormwater facilities, and also to avoid shading impacts to the arrays, as well as to maintain a fall hazard safety zone around the array. Clearing outside of the array area is limited to the minimum necessary, stumps will be left in place, and the area will be allowed to re-vegetate.

593.2 Plans of the large ground-mounted solar energy facilities signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system and any potential shading from nearby structures.

Plans stamped by a Massachusetts Professional Engineer depicting the system layout are enclosed in Section 6.0. Potential shading from nearby structures is not depicted as there are no existing structures that would shade the arrays.

593.3 Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, screening vegetation or structures.

These items are depicted on the plans enclosed in Section 6.0.

593.4 A stormwater management plan detailing the existing environmental and hydrological conditions of the site, proposed alterations of the site and all proposed components of the drainage system and any measures for the detention, retention, or infiltration of water, for the protection of water quality and protection from flooding.

A Stormwater Management Report is enclosed in Section 4.0.

593.5 A description of the solar energy facility and the technical, economic and other reasons for the proposed location and design shall be prepared and signed by a registered professional engineer.

The technical and other reasons for the proposed location largely consist of the availability of interconnection. After evaluating various available sites, BSSI and ADM identified solar and energy storage as the highest and best use of this site.

593.6 Confirmation prepared and signed by a registered professional engineer that the large ground-mounted solar energy facilities comply with all applicable Federal and State standards.

The facility will comply with applicable federal and state standards.

593.7 One or three line electrical diagram detailing the solar photovoltaic installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and over current devices.

AC single line diagrams are enclosed in Section 5.0: Solar Documentation.

593.8 Documentation of the major system components to be used, including the photovoltaic panels, mounting system, inverters.

Typical rack cross-sections/elevations are depicted on the plans enclosed in Section 6.0. It is not feasible to commit to specific equipment now, given the time that will pass before construction begins with associated potential technology advances and/or geotechnical or other evaluations that may be undertaken, including coordination with Eversource for interconnection. However, anticipated equipment information (for solar modules, inverters, etc.) is included in Section 5.0: Solar Documentation.

593.9 Documentation of the sound generated by equipment used in the production of electrical energy, including any proprietary documentation.

Generally, sound levels are in the <79 decibel range for inverters and up to 76 decibels for some of the energy storage equipment; however, sound levels reduce to ambient within 100 feet. Additional information regarding sound levels is enclosed in Section 5.0: Solar Documentation.

593.10 An operation and maintenance plan (see also section 595 on decommissioning)

An operation and maintenance plan is included in Section 5.0: Solar Documentation.

593.11 The Planning Board may require the proponent to pay for professional services to evaluate the proposal.

BSSI acknowledges this requirement.

Section 594: Design Standards

The proposed large ground-mounted solar energy facility and appurtenant structures will comply as applicable with the standards detailed in Section 594.1, which generally addresses minimum lot size, yard depth, fencing, operation and maintenance plan, and utility company notification (evidence of notification to the utility company is included in Section 5.0: Solar Documentation). The proposed clearing, as well as the solar panels and associated equipment, adhere to the required property line setbacks. Disturbance of the 50-foot zoning setback for site access is allowed under Section 594.3.7.

Section 594.2 does not apply to the Project, as it relates to on-site solar energy facilities as an accessory use.

The Project will comply as applicable with the provisions of 594.3, which generally addresses appurtenant structures, lighting, signage, utility connections, sound, and clear-cutting of trees. Additional discussion is provided elsewhere herein for sound, visual, and tree clearing provisions.

Section 595: Abandonment or Decommissioning

The proposed Project will comply with the abandonment and decommissioning requirements as described in Section 595. Decommissioning information and cost estimates are included in Section 5.0: Solar Documentation. This plan also includes information regarding disposal of refuse, in concert with the purposes of Site Plan Review discussed in Section 2.4.2 herein.

2.4.2 Article 15: Site Plan Review

The Project has been prepared with consideration of the purposes of Site Plan Review outlined in Section 1510 of the By-law, including: protection against detrimental uses; convenience and safety of vehicular and pedestrian movement; disposal of refuse; protection of environmental features; arrangement of structures; adequacy of vehicular and pedestrian access, drainage, water supply, sewage disposal, lighting, landscaping, wetlands, water courses, buildings and other features that support the neighborhood; and compliance with applicable sections of the Zoning By-Laws. The requirements of Article 15 address conformance with the purposes listed above (with the exception of refuse, which is addressed by the decommissioning plan noted above), and therefore the applicable sections of Article 15 are discussed in additional detail below.

Section 1530: Information Required

Section 1531: General Information, Section 1532: Existing Features, and Section 1533: The Development Plan

The plans enclosed in Section 6.0 provide the applicable information noted in these sections. Please also refer to the Site Plan Review Checklist enclosed in Section 1.0 for additional detail. Please note that waivers from the photograph size, plan scale, and certain existing feature requirements are requested; refer to Section 2.5 for additional detail.

Section 1534: Impact Statement
<u>*Part 1: Impact of the Proposed Development on…*</u>

<u>*All applicable town services including but not limited to schools, sewer service, water systems, parks, fire, and police protection*</u>

The Project is not anticipated to have an adverse impact to municipal services such as schools, sewer service, water systems, parks, or fire/police protection. The Project is a large ground-mounted solar energy facility, which will generate clean, renewable energy. The Project will not generate school-age children, does not require connection to water or wastewater systems, and will require minimal, if any, fire and/or police protection. Fire and/or police protection will only be necessary should there be an emergency situation.

<u>*The roads in the immediate vicinity of the proposed development*</u>

The Project is not anticipated to have an adverse impact on the roadways in the vicinity of the Site. The Project is not anticipated to generate regular vehicle trips outside of the construction period. The Site will have an emergency/maintenance access roadway connecting to Charge Pond Road; however, this will only be used for maintenance or emergency situations.

The ecology of the area within the site and any significant off-site impacts

The Site is not located within areas identified by NHESP as Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife.

Work within areas subject to Conservation Commission jurisdiction is limited to the 100-foot buffer zone associated with Bank to Parkers Mill Pond, as well as bordering and isolated vegetated wetlands throughout Site. The proposed arrays are nearly entirely located outside of the 100-foot buffer zone. Appurtenant structures, excepting the fence but including inverters and battery storage, are located outside of the 100-foot buffer zone. Stormwater facilities lie within the buffer zone in some areas. In all cases the minimum 50' No Activity Zone from wetlands has been maintained, and a 100-foot setback to potential vernal pools has been maintained, in accordance with the Wareham Wetland Protective By-Law. A Notice of Intent is being filed concurrently with the Wareham Conservation Commission for this work.

No off-site impacts to the ecology of the area are anticipated from the Project.

Part 2: Proposed Mitigation

Mitigation is not proposed, as the overall anticipated impacts of this renewable energy project are minimal. The Project will provide benefits of its own.

Section 1540: Evaluation Standards
Pursuant to Section 1540, an evaluation of the listed objectives is provided for the Planning Board's consideration.

Section 1541: Natural Features
Although tree clearing is necessary to accommodate the array, the area within the fence will be vegetated with an herbaceous seed mix, and the area exterior to the fence will be cleared but stumps will remain so as to provide a brush/early successional vegetative area.

"Reduce the volume of cut and fill"
The proposed volume of cut and fill associated with the solar Project has been reduced to the extent practicable, while addressing stormwater management.

"Reduce the number of removed trees"
Clearing outside of the array area is limited to the minimum necessary, stumps will be left in place, and the area will be allowed to re-vegetate.

"Reduce the pollutants reaching the water table"
Vehicular traffic will not be regularly occurring and, therefore, will not increase the potential for pollutants on the Site. Sanding and salting of the access roads are not proposed.

The materials within the solar arrays are inert and, therefore, are not potential pollutants. Some inverters and batteries are solid-state with no internal fluids and will be properly housed per electric code standards so as to avoid potential pollution. The central inverters will contain biodegradable coolant, and will be housed with appropriate oil containment measures.

There is no sewage disposal system proposed or required for the Site.

"Reduce the area of wetland vegetation displaced"
No wetland vegetation will be displaced. The project has maintained appropriate buffer zones to wetland resource areas such that wetlands will not be impacted.

"Reduce soil erosion"
Soil erosion will be addressed both during the construction of the project and after it is complete. During construction, the Site will be managed in accordance with the Stormwater Pollution Prevention Plan included in the Stormwater Management Report in Section 4.0. Additionally, rip-rap check dams are proposed in swales along the Site access roads. Disturbed areas of the Site will be revegetated with an herbaceous seed mix which will help hold soils in place and reduce erosion. The pile base to support the array structures will be hydraulically advanced into the ground to reduce the excavation and exposure of soil associated with normal construction practices. In addition, sedimentation controls will be implemented to protect adjacent resource areas and existing infrastructure features during construction. Please refer to the Stormwater Management Report enclosed in Section 4.0 for detailed information regarding the best management practices to be used to control soil erosion and sedimentation required by the National Pollutant Discharge Elimination System (NPDES) construction permitting program.

"Reduce the area of impervious surface"
The amount of impervious surface has been minimized by limiting impervious areas to concrete pads for the required inverters and energy storage equipment. The remainder of the Project will be pervious, and vegetated with low-growing herbaceous species, with the exception of gravel access roadways.

"Reduce the amount of stormwater runoff from the site"
Refer to Section 4.0 of this Application for a detailed plan to manage stormwater runoff.

Section 1542: Relation of Buildings to Environment

This section is not directly applicable to the Project, as no buildings are proposed as part of this work. The proposed solar use is in harmony with the adjacent agricultural uses and sustainable practices in general on the larger land holdings of ADM. In addition, the Project will not be generally visible from public ways and will not visually impact neighborhoods due to its distance from residences and generally low height profile. Refer to the Site Context Exhibit enclosed in Section 6.0 for additional information.

Section 1543: Vehicular Circulation

The Project will not result in an increase in traffic trips to or from the Site outside of the construction period. An estimated 4 to 5 maximum truck trips are anticipated per day over the course of construction of the solar facility. The Project will be accessed from Charge Pond Road.

The proposed Site circulation considers input from the Wareham Fire Department on prior similar projects, and includes a 20-foot wide perimeter gravel access road constructed to meet Wareham Fire Standards. Electrical equipment pads will also be readily accessible via 20-foot wide access roads. Knox boxes will be provided at the gates to facilitate emergency access.

Subsection 1544: Pedestrian Circulation

This section is not applicable, as the Site is not intended to be accessible to pedestrians or to the general public at large.

Section 1545: Parking

This section is not applicable, as the proposed use does not require parking spaces. There is adequate space provided on the Site for the occasional vehicle to service the facility.

Section 1546: Landscaping

This subsection indicates that all site plans are subject to the requirements of the Zoning By-laws. Article 10: "Landscaping", applies to all new non-residential development, pursuant to Section 1020. Pursuant to Section 1030, the Planning Board is responsible for determining acceptable landscaping standards where not otherwise provided in Article 10.

Landscaping information has been included on the plan sets, including the location of existing treed areas and details regarding the proposed seed mix. Additional plantings are not proposed given the nature of the Project.

2.5 Waiver Request

Please note that the Applicant respectfully requests the following waivers:

- A waiver from Section 1531.11, photographs of the site at size of 8” by 10” is requested. Photographs are included in Section 2, but do not meet the specified size due to their orientation.
- Waivers are requested 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).” 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.
- A waiver is requested from the provisions of Subsection 1532: “Existing Features” that require that plans be at a scale of 1” = 20’, 40’, or 100’ where practical and appropriate. Plans have been submitted at various scales appropriate to the Project Site.
- A waiver is requested from Section 1532.1 “Existing Natural Features” 2. “Individual trees 18” dbh or over.” Due to the size of the Property and the character of the Project, it is infeasible to locate all trees greater than 18 inches.

Section 3.0
Parties in Interest

List of Abutting Town Planning Boards

Certified List of Abutters

3.0 PARTIES IN INTEREST

In accordance with the requirements of M.G.L. Chapter 40A, a list of the addresses of Planning Boards in municipalities within the Commonwealth that abut Wareham is as follows:

Bourne Planning Board
Bourne Town Hall
24 Perry Avenue - Room 201
Buzzards Bay, MA 02532-3441

Carver Planning Board
Carver Town Hall
108 Main Street
Carver MA 02330

Marion Planning Board
2 Spring Street
Marion Town House
Marion, MA 02738

Middleborough Planning Board
Town Hall Annex
20 Center Street
Middleborough, MA 02346

Plymouth Planning Board
26 Court Street
Plymouth, MA 02360

Rochester Planning Board
Town Hall Annex
37 Marion Road
Rochester, MA 02770

TOWN OF WAREHAM ABUTTERS
MAP 110 LOT 1015
OWNER MAKEPEACE. CO A D

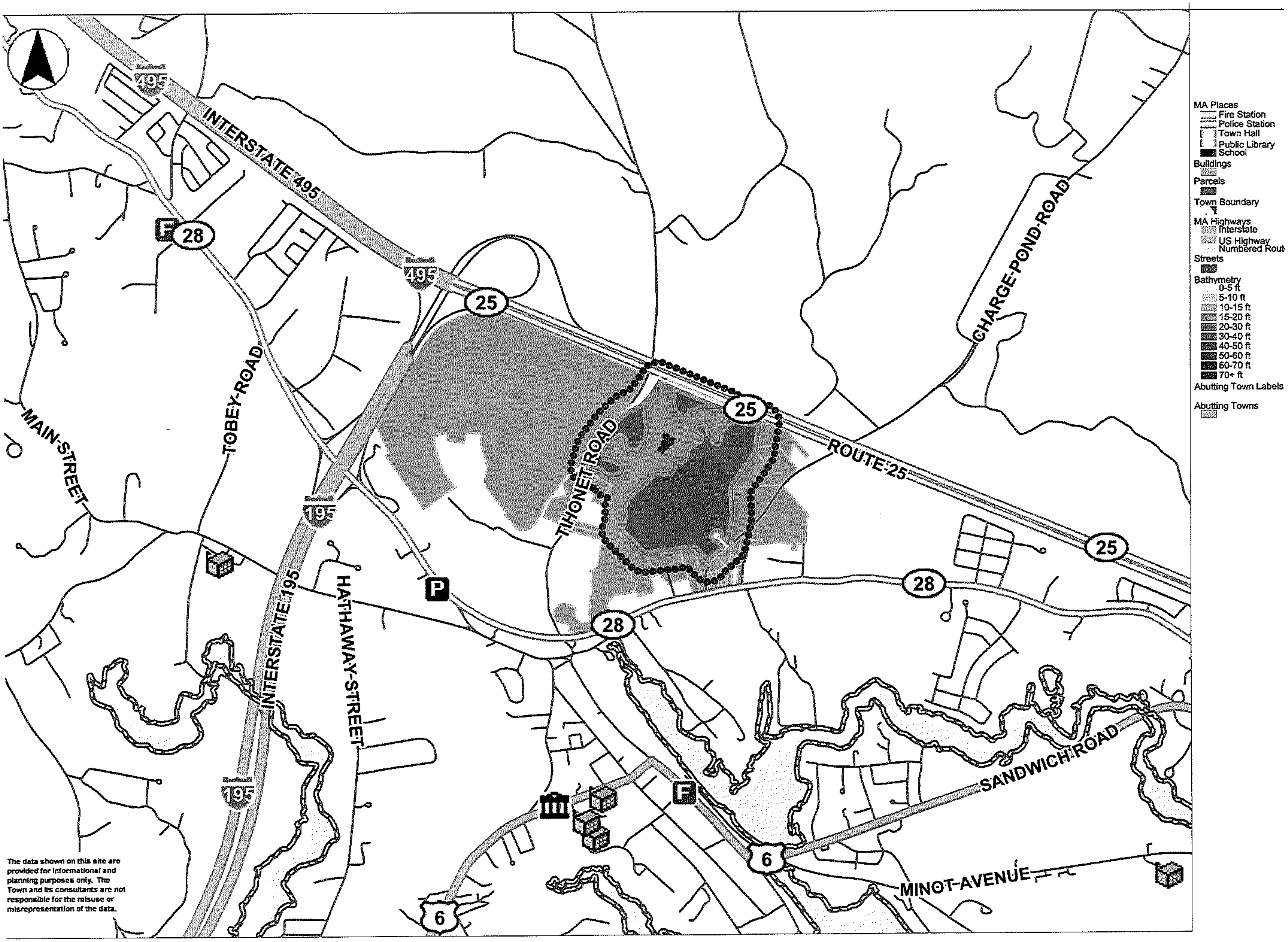
MAP & LOT	OWNER	CO-OWNER	STREET ADDRESS	TOWN	MA	ZIP CODE
109-1001/A	TOWN OF WAREHAM		54 MARION RD	WAREHAM	MA	02571
110-H1	BARROWS GERALD & DONNA M LIFE EST	C/O AD MAKEPEACE COMPANY	158 TIHONET RD	WAREHAM	MA	02571
110-H2	MAKEPEACE COMPANY A D		158 TIHONET RD	WAREHAM	MA	02571
110-1012	STEC JUNE E LIFE ESTATE		55 TIHONET RD	WAREHAM	MA	02571
110-1034	COLONIAL GAS COMPANY	C/O NATIONAL GRID	40 SYLVAN RD	WALTHAM	MA	02451
110-1035	LEE WILLIAM JR	LEE BARBARA ANN	70 FULLER RD	TRUMBULL	CT	06611
110-1032	SVEDINE LAWRENCE C JR	SVEDINE LISA M	2606 CRANBERRY HWY	WAREHAM	MA	02571
110-1033	SAVARY PETER J	SAVARY ANGELA M	143 GREAT NECK RD	WAREHAM	MA	02571
110-1046	ANDREWS STANLEY	ANDREWS SARA H	2610 CRANBERRY HWY	WAREHAM	MA	02571
110-1047	ILIFFE JESSICA L		2612 CRANBERRY HWY	WAREHAM	MA	02571
110-1050/B	BARRASSO DEREK A	BARRASSO KELLY A	18 CENTRAL AVE	WAREHAM	MA	02571
110-1048	CONTI CHRISTOPHER J	FERREIRA NEAL	2614 CRANBERRY HWY	WAREHAM	MA	02571
110-1050/A	BARRASSO DEREK A	BARRASSO KELLY A	18 CENTRAL AVE	WAREHAM	MA	02571
110-1051	BRIGGS STEVEN		1108 POINT RD	MARION	MA	02738
110-Y1	GLENN ADAM D		19 CHARGE POND RD	WAREHAM	MA	02571
110-1075/A	ROUNDS WALDO C JR	CO CAROL R GIFUNE EXECUTRIX	6 CABRAL WAY	WAREHAM	MA	02571
110-1075	GIFUNE GREG	GIFUNE CAROL R	6 CABRAL WAY	WAREHAM	MA	02571
110-1053	LACHANCE CAROL A		4 CABRAL WAY	WAREHAM	MA	02571
110-Y2	MENDES MARCIO M	MENDES ANDREIA	23 CHARGE POND RD	WAREHAM	MA	02571
110-1062	CABRAL THERESA S		9 CABRAL WAY	WAREHAM	MA	02571
110-1037	WAREHAM LITTLE LEAGUE INC	C/O JOSEPH MONTIERO TREAS	PO BOX 614	WAREHAM	MA	02571
110-1039	TWEEDY & BARNES CO		31 HOME DEPOT DR #228	PLYMOUTH	MA	02360
110-Y3	YOUNG MEN'S CHRISTIAN	ASSOCIATION SOUTHCOAST INC	25 S WATER ST	NEW BEDFORD	MA	02740

CERTIFIED ABUTTERS AS
THEY APPEAR ON OUR TAX ROLLS
AS OF 03/31/2020

M. Rea Atkins

ASSESSORS OFFICE

REQUESTED BY
BEALS & THOMAS, INC
C/O MARY KATE SCHNEEWEIS
MSCHNEEWEIS@BEALSANDTHOMAS.COM



2900 5800 ft

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MapsOnline by PeopleGIS

Section 4.0
Stormwater Management Information

Stormwater Management Report
(Under Separate Cover)

Stormwater Management Report

27 Charge Pond Road PV+ES Project

27 Charge Pond Road
Wareham, Massachusetts

Prepared for:

BORREGO SOLAR

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

May 28, 2020

Calculated by: **Nathaniel B. Bautz, EIT**

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

Approved by:

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

Jeffrey R. Murphy 5/28/2020

Jeffrey R. Murphy, PE

1833109RP001

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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*	0.36	*8.64*	5.03
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*	0.07
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.

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[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.

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

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

Jeffrey R Murphy 5/28/2020

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 (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 (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 (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 (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 (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.

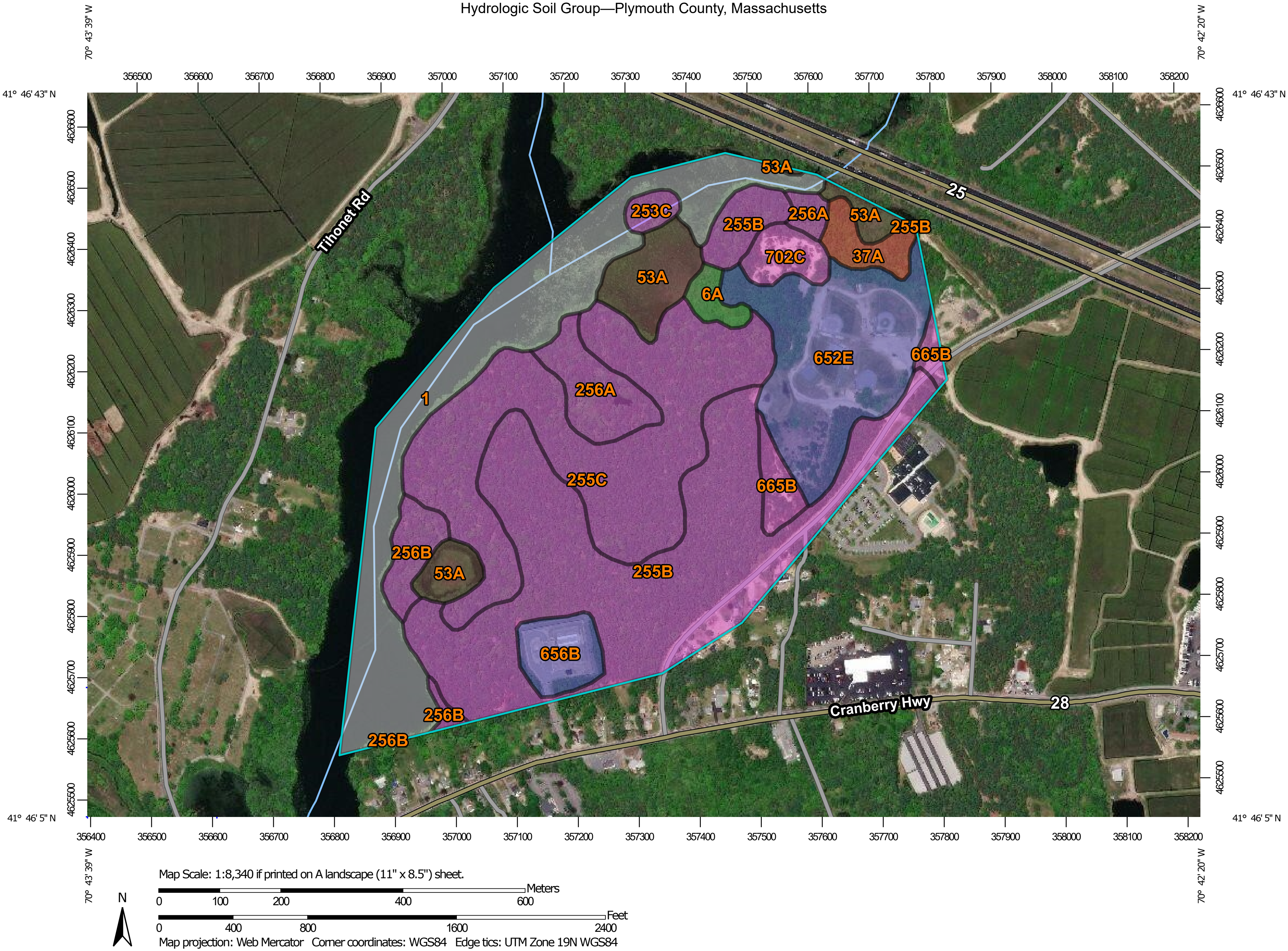
Standard 10: Prohibition of Illicit Discharges

☒ 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
Tihonet Rd
25
28
Cranberry Hwy
53A
253C
255B
256A
37A
702C
6A
652E
665B
1
256A
255C
256B
255B
656B
Map Scale: 1:8,340 if printed on A landscape (11" x 8.5") sheet.
Meters
Feet
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

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

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

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

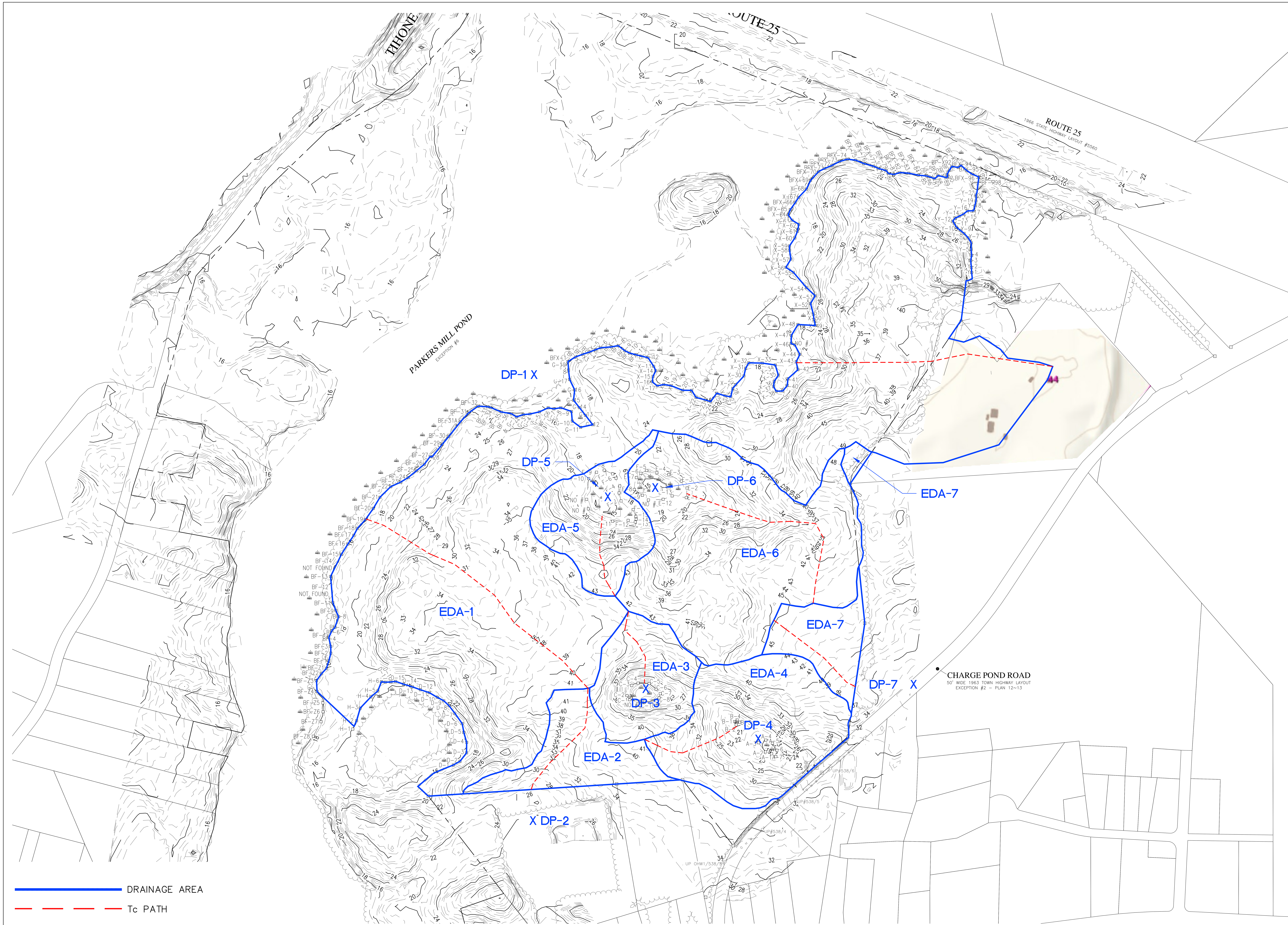
CALCULATION SUMMARY

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

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

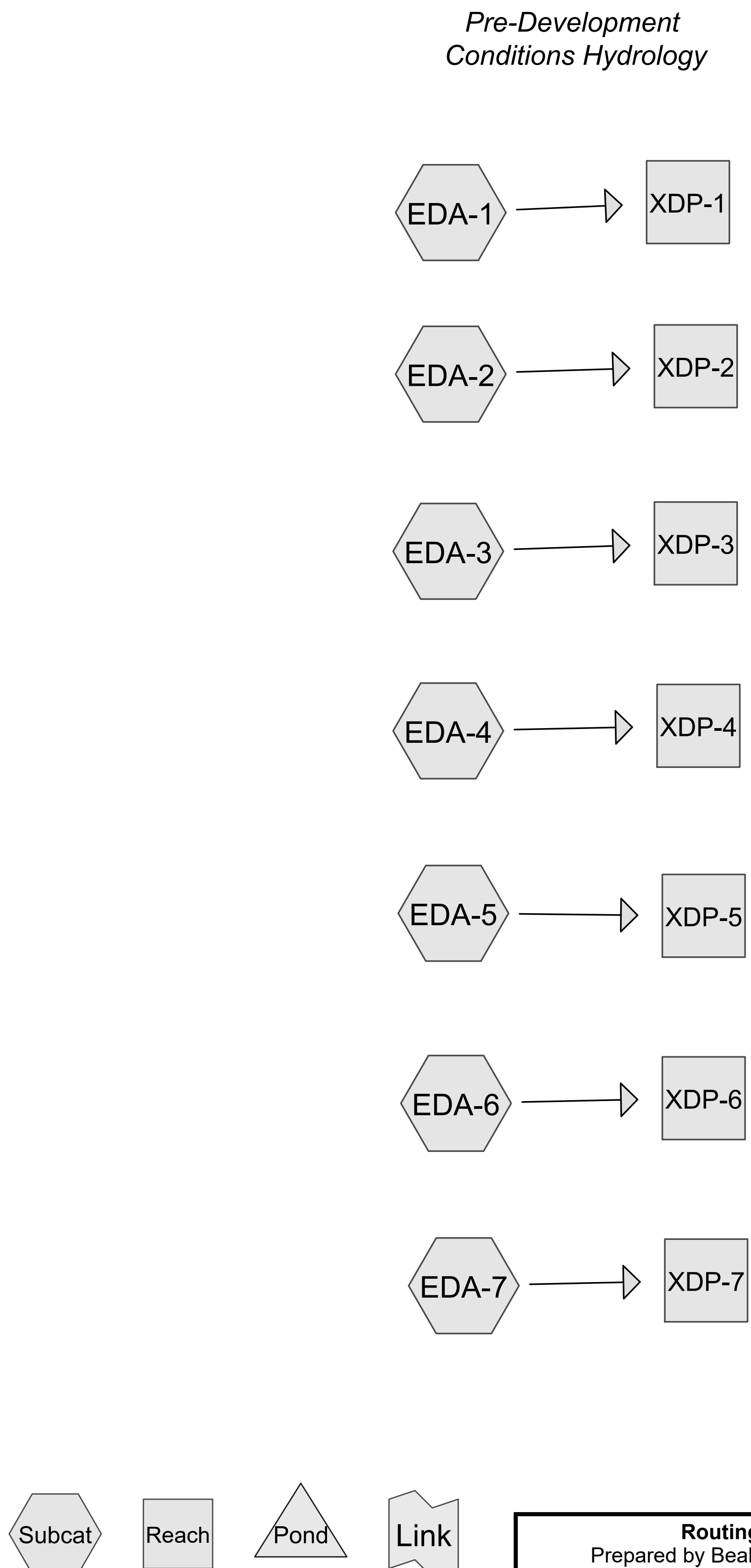
Borrego Solar Systems, Inc.

55 Technology Drive, Suite 102
Lowell, Massachusetts

North Arrow

NORTH

BEALS AND THOMAS, INC.



Routing Diagram for 1833109HC001
Prepared by Beals and Thomas, Inc., Printed 5/23/2020
HydroCAD® 10.10-3a s/n 04493 © 2020 HydroCAD Software Solutions LLC

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

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. 1833109P600A-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

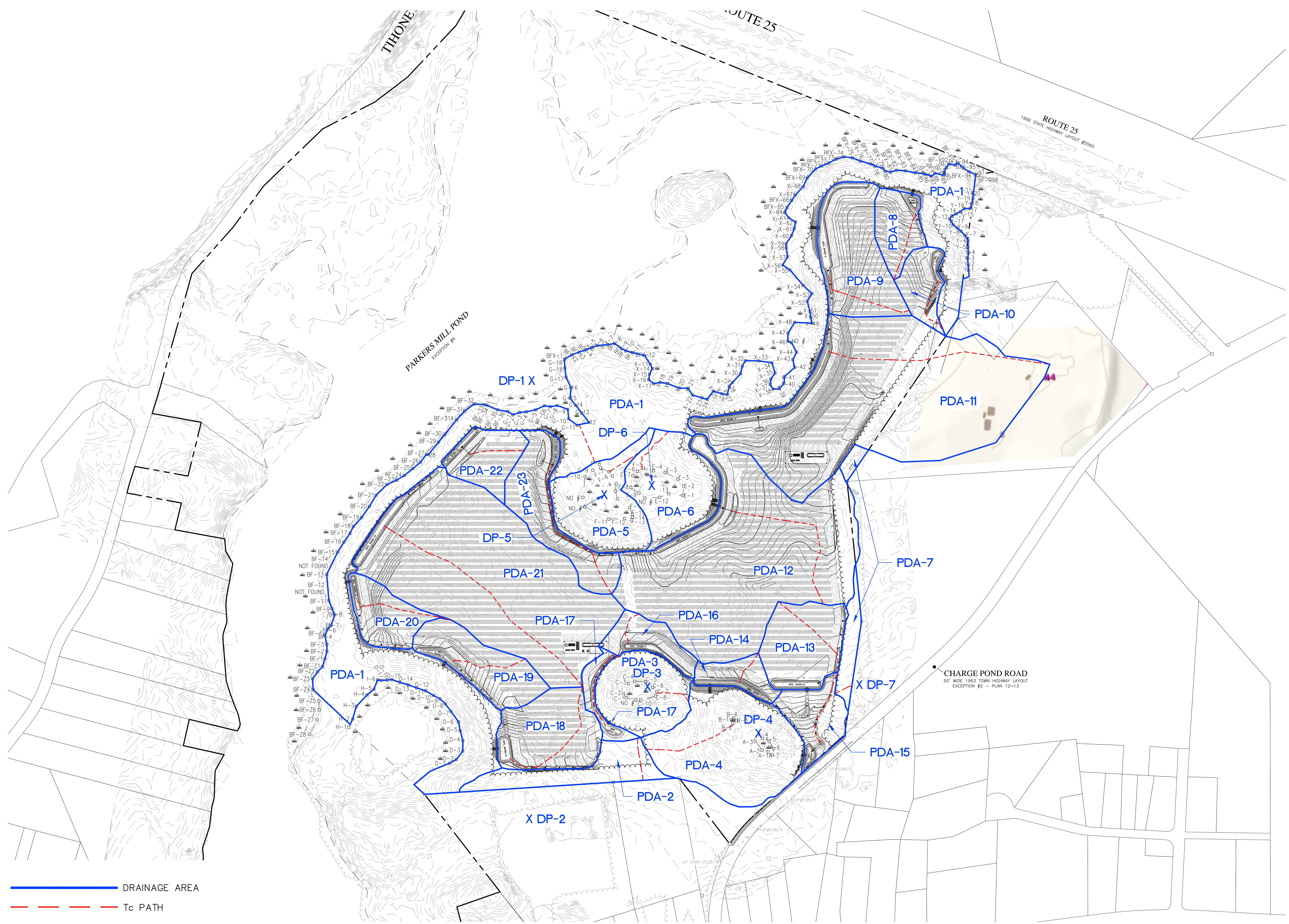
REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020

CONCLUSIONS:

Storm Event	2-Year	10-Year	100-Year
DP-1 (cfs)	0.00	0.36	5.03
DP-2 (cfs)	0.00	0.00	0.04
DP-3 (cfs)	0.00	0.00	0.07
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



Post-Development Conditions Hydrologic Areas Map

Figure Number 002

Scale: 1" = 150'

Date: 05/22/2020

Plan 1833109P600A-002

B+T Project No. 1833.109

27 Charge Pond Road PV+ES Project

Wareham, Massachusetts

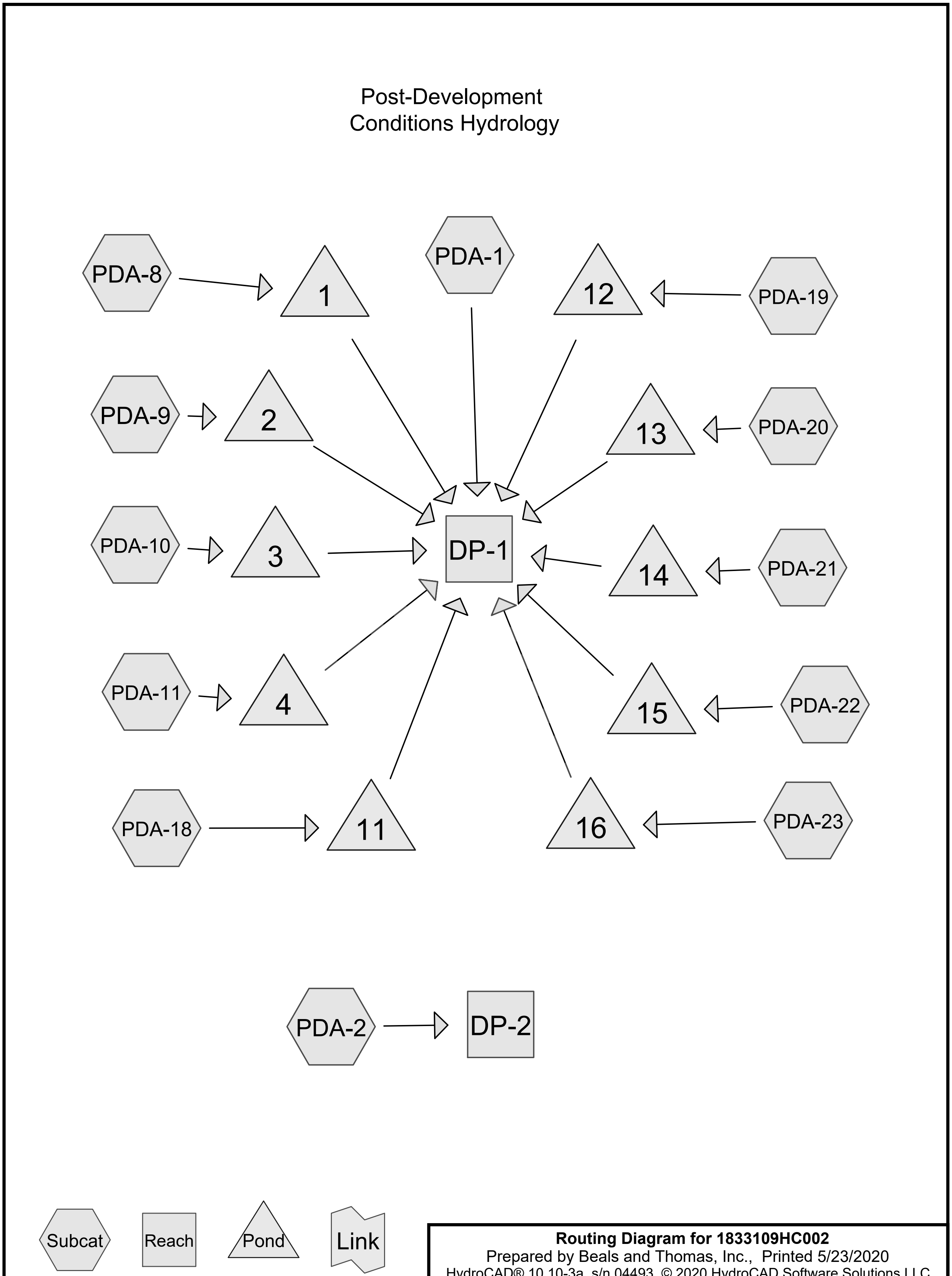
Borrego Solar Systems, Inc.

55 Technology Drive, Suite 102
Lowell, Massachusetts

North Arrow

NORTH

BEALS AND THOMAS, INC.



Routing Diagram for 1833109HC002
Prepared by Beals and Thomas, Inc., Printed 5/23/2020

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
22.674	39	>75% Grass cover, Good, HSG A (PDA-1, PDA-10, PDA-11, PDA-18, PDA-19, PDA-2, PDA-20, PDA-21, PDA-22, PDA-23, PDA-8, PDA-9)
4.990	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)
1.652	30	Brush, Good, HSG A (PDA-1, PDA-10, PDA-11, PDA-18, PDA-2, PDA-21)
0.413	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)
0.413	96	Existing Gravel surface, HSG B (PDA-1, PDA-10, PDA-11)
2.655	96	Gravel surface, HSG A (PDA-10, PDA-11, PDA-18, PDA-19, PDA-20, 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)
11.137	30	Woods, Good, HSG A (PDA-1, PDA-11, PDA-2)
1.014	55	Woods, Good, HSG B (PDA-1, PDA-10, PDA-11)
0.721	77	Woods, Good, HSG D (PDA-1)
46.300	**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=13.568 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=147' Tc=18.6 min CN=35 Runoff=0.00 cfs 0.000 af

Subcatchment PDA-10: Runoff Area=0.818 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=10.140 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=2.103 ac 0.00% Impervious Runoff Depth=0.11"
Flow Length=476' Tc=10.2 min CN=47 Runoff=0.03 cfs 0.018 af

Subcatchment PDA-19: Runoff Area=1.726 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=1.360 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-20: Runoff Area=1.130 ac 0.00% Impervious Runoff Depth=0.11"
Flow Length=370' Tc=10.5 min CN=47 Runoff=0.02 cfs 0.010 af

Subcatchment PDA-21: Runoff Area=8.929 ac 0.41% Impervious Runoff Depth=0.03"
Flow Length=936' Tc=19.2 min CN=42 Runoff=0.03 cfs 0.021 af

Subcatchment PDA-22: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.11"
Flow Length=195' Tc=8.0 min CN=47 Runoff=0.02 cfs 0.010 af

Subcatchment PDA-23: Runoff Area=1.927 ac 0.00% Impervious Runoff Depth=0.15"
Flow Length=568' Tc=9.8 min CN=49 Runoff=0.06 cfs 0.024 af

Subcatchment PDA-8: Runoff Area=0.959 ac 0.00% Impervious Runoff Depth=0.11"
Flow Length=278' Tc=7.4 min CN=47 Runoff=0.01 cfs 0.008 af

Subcatchment PDA-9: Runoff Area=2.520 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=343' Tc=10.3 min CN=48 Runoff=0.05 cfs 0.026 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=20.01' Storage=7 cf Inflow=0.01 cfs 0.008 af
Discarded=0.01 cfs 0.008 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.008 af

Pond 2: Peak Elev=23.00' Storage=16 cf Inflow=0.05 cfs 0.026 af
Discarded=0.05 cfs 0.026 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.026 af

Pond 3: Peak Elev=28.07' Storage=51 cf Inflow=0.08 cfs 0.017 af
Discarded=0.04 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.017 af

Pond 4: Peak Elev=21.68' Storage=3,838 cf Inflow=1.51 cfs 0.320 af
Discarded=0.39 cfs 0.320 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.320 af

Pond 11: Peak Elev=27.01' 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 12: Peak Elev=26.01' Storage=11 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=19.02' Storage=8 cf Inflow=0.02 cfs 0.010 af
Discarded=0.02 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.010 af

Pond 14: Peak Elev=16.51' Storage=18 cf Inflow=0.03 cfs 0.021 af
Discarded=0.03 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.021 af

Pond 15: Peak Elev=21.51' Storage=7 cf Inflow=0.02 cfs 0.010 af
Discarded=0.02 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.010 af

Pond 16: Peak Elev=21.20' Storage=106 cf Inflow=0.06 cfs 0.024 af
Discarded=0.03 cfs 0.024 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.024 af

Total Runoff Area = 46.300 ac Runoff Volume = 0.468 af Average Runoff Depth = 0.12"
99.75% Pervious = 46.182 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
	10.201	30	Woods, Good, HSG A
	0.370	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	1.141	30	Brush, Good, HSG A
	0.035	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.859	39	>75% Grass cover, Good, HSG A
	0.069	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.099	96	Existing Gravel surface, HSG B
	13.568	35	Weighted Average
	13.568		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
	0.468	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
	0.818	53	Weighted Average
	0.818		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
	0.643	55	Woods, Good, HSG B
	0.027	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.214	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
	0.654	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
	10.140	57	Weighted Average
	10.059		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= 0.018 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
1.795	39	>75% Grass cover, Good, HSG A
0.289	96	Gravel surface, HSG A
2.103	47	Weighted Average
2.103		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
1.523	39	>75% Grass cover, Good, HSG A
0.203	96	Gravel surface, HSG A
1.726	46	Weighted Average
1.726		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
0.452	30	Brush, Good, HSG A
1.360	30	Weighted Average
1.360		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-20:

Runoff = 0.02 cfs @ 13.82 hrs, Volume= 0.010 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
0.963	39	>75% Grass cover, Good, HSG A
0.167	96	Gravel surface, HSG A
1.130	47	Weighted Average
1.130		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"
2.8	212	0.0330	1.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	37	0.1890	3.04		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0380	3.14		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	51	0.0640	3.79		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.5	370	Total			

Summary for Subcatchment PDA-21:

Runoff = 0.03 cfs @ 17.12 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
0.001	30	Brush, Good, HSG A
8.497	39	>75% Grass cover, Good, HSG A
0.394	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
8.929	42	Weighted Average
8.892		99.59% Pervious Area
0.037		0.41% 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
1.8	163	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	12	0.2920	3.78		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
19.2	936	Total			

Summary for Subcatchment PDA-22:

Runoff = 0.02 cfs @ 13.78 hrs, Volume= 0.010 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
0.970	39	>75% Grass cover, Good, HSG A
0.150	96	Gravel surface, HSG A
1.120	47	Weighted Average
1.120		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
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
8.0	195	Total			

Summary for Subcatchment PDA-23:

Runoff = 0.06 cfs @ 12.52 hrs, Volume= 0.024 af, Depth= 0.15"

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
1.594	39	>75% Grass cover, Good, HSG A
0.333	96	Gravel surface, HSG A
1.927	49	Weighted Average
1.927		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 @ 13.77 hrs, Volume= 0.008 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
0.831	39	>75% Grass cover, Good, HSG A
0.128	96	Gravel surface, HSG A
0.959	47	Weighted Average
0.959		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 = 0.05 cfs @ 12.57 hrs, Volume= 0.026 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
1.892	39	>75% Grass cover, Good, HSG A
0.355	61	>75% Grass cover, Good, HSG B
0.249	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.520	48	Weighted Average
2.520		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 = 44.940 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 = 1.360 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 = 0.959 ac, 0.00% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.01 cfs @ 13.77 hrs, Volume= 0.008 af
Outflow = 0.01 cfs @ 13.92 hrs, Volume= 0.008 af, Atten= 1%, Lag= 9.0 min
Discarded = 0.01 cfs @ 13.92 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= 20.01' @ 13.92 hrs Surf.Area= 693 sf Storage= 7 cf

Plug-Flow detention time= 8.9 min calculated for 0.008 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (1,042.9 - 1,034.1)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	4,027 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	689	0	0
21.00	1,087	888	888
22.00	1,546	1,317	2,205
23.00	2,099	1,823	4,027

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	**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=0.04 cfs @ 13.92 hrs HW=20.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2:

Inflow Area =	2.520 ac,	0.00% Impervious,	Inflow Depth = 0.13"	for 2-Year event
Inflow =	0.05 cfs @	12.57 hrs, Volume=	0.026 af	
Outflow =	0.05 cfs @	13.75 hrs, Volume=	0.026 af,	Atten= 2%, Lag= 70.6 min
Discarded =	0.05 cfs @	13.75 hrs, Volume=	0.026 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= 5,654 sf Storage= 16 cf

Plug-Flow detention time= 5.9 min calculated for 0.026 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (1,026.9 - 1,021.0)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	17,326 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	5,646	0	0
24.00	8,608	7,127	7,127
25.00	11,790	10,199	17,326

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=0.32 cfs @ 13.75 hrs HW=23.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.32 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 = 0.818 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2-Year event
Inflow = 0.08 cfs @ 12.39 hrs, Volume= 0.017 af
Outflow = 0.04 cfs @ 12.67 hrs, Volume= 0.017 af, Atten= 44%, Lag= 16.9 min
Discarded = 0.04 cfs @ 12.67 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= 28.07' @ 12.67 hrs Surf.Area= 805 sf Storage= 51 cf

Plug-Flow detention time= 10.6 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (972.6 - 962.2)

Volume	Invert	Avail.Storage	Storage Description
#1	28.00'	5,975 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
28.00	755	0	0
29.00	1,522	1,139	1,139
30.00	2,397	1,960	3,098
31.00	3,356	2,877	5,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	28.00'	**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=0.04 cfs @ 12.67 hrs HW=28.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=28.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4:

Inflow Area =	10.140 ac,	0.80% Impervious,	Inflow Depth = 0.38"	for 2-Year event	
Inflow =	1.51 cfs @	12.61 hrs,	Volume=	0.320 af	
Outflow =	0.39 cfs @	15.28 hrs,	Volume=	0.320 af,	Atten= 74%, Lag= 160.5 min
Discarded =	0.39 cfs @	15.28 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= 21.68' @ 15.28 hrs Surf.Area= 6,997 sf Storage= 3,838 cf

Plug-Flow detention time= 111.8 min calculated for 0.320 af (100% of inflow)
Center-of-Mass det. time= 111.6 min (1,063.6 - 952.0)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	49,432 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	4,367	0	0
22.00	8,260	6,314	6,314
23.00	12,269	10,265	16,578
24.00	16,395	14,332	30,910
25.00	20,649	18,522	49,432

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=0.39 cfs @ 15.28 hrs HW=21.68' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 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 =	2.103 ac,	0.00% Impervious,	Inflow Depth = 0.11"	for 2-Year event	
Inflow =	0.03 cfs @	13.81 hrs,	Volume=	0.018 af	
Outflow =	0.03 cfs @	13.96 hrs,	Volume=	0.018 af,	Atten= 1%, Lag= 9.1 min
Discarded =	0.03 cfs @	13.96 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= 27.01' @ 13.96 hrs Surf.Area= 2,416 sf Storage= 16 cf

Plug-Flow detention time= 8.9 min calculated for 0.018 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'	11,588 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	5,650	4,981	11,588

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 = 1.726 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= 11 cf

Plug-Flow detention time= 8.8 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'	8,123 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	4,644	3,934	8,123

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 = 1.130 ac, 0.00% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.02 cfs @ 13.82 hrs, Volume= 0.010 af
Outflow = 0.02 cfs @ 13.96 hrs, Volume= 0.010 af, Atten= 1%, Lag= 8.8 min
Discarded = 0.02 cfs @ 13.96 hrs, Volume= 0.010 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= 19.02' @ 13.96 hrs Surf.Area= 558 sf Storage= 8 cf

Plug-Flow detention time= 8.7 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 8.7 min (1,045.6 - 1,036.9)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	6,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	542	0	0
20.00	1,598	1,070	1,070
21.00	2,655	2,127	3,197
22.00	3,773	3,214	6,411

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	21.00'	**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=0.03 cfs @ 13.96 hrs HW=19.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 14:

Inflow Area = 8.929 ac, 0.41% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.03 cfs @ 17.12 hrs, Volume= 0.021 af
Outflow = 0.03 cfs @ 17.28 hrs, Volume= 0.021 af, Atten= 0%, Lag= 9.4 min
Discarded = 0.03 cfs @ 17.28 hrs, Volume= 0.021 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= 16.51' @ 17.28 hrs Surf.Area= 3,222 sf Storage= 18 cf

Plug-Flow detention time= 10.3 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 10.3 min (1,175.4 - 1,165.1)

Volume	Invert	Avail.Storage	Storage Description
#1	16.50'	23,501 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.50	3,211	0	0
17.00	4,184	1,849	1,849
18.00	6,070	5,127	6,976
19.00	8,203	7,137	14,112
20.00	10,574	9,389	23,501

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.00'	**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 @ 17.28 hrs HW=16.51' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=16.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 15:

Inflow Area = 1.120 ac, 0.00% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.02 cfs @ 13.78 hrs, Volume= 0.010 af
Outflow = 0.02 cfs @ 13.90 hrs, Volume= 0.010 af, Atten= 0%, Lag= 7.6 min
Discarded = 0.02 cfs @ 13.90 hrs, Volume= 0.010 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' @ 13.90 hrs Surf.Area= 967 sf Storage= 7 cf

Plug-Flow detention time= 7.4 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 7.4 min (1,042.0 - 1,034.6)

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 @ 13.90 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 16:

Inflow Area = 1.927 ac, 0.00% Impervious, Inflow Depth = 0.15" for 2-Year event
Inflow = 0.06 cfs @ 12.52 hrs, Volume= 0.024 af
Outflow = 0.03 cfs @ 15.34 hrs, Volume= 0.024 af, Atten= 42%, Lag= 169.5 min
Discarded = 0.03 cfs @ 15.34 hrs, Volume= 0.024 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= 21.20' @ 15.34 hrs Surf.Area= 605 sf Storage= 106 cf

Plug-Flow detention time= 29.9 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 29.9 min (1,036.3 - 1,006.5)

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 @ 15.34 hrs HW=21.20' (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=13.568 ac 0.00% Impervious Runoff Depth=0.05"
Flow Length=147' Tc=18.6 min CN=35 Runoff=0.08 cfs 0.056 af

Subcatchment PDA-10: Runoff Area=0.818 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=10.140 ac 0.80% Impervious Runoff Depth=0.95"
Flow Length=819' Tc=30.1 min CN=57 Runoff=5.22 cfs 0.802 af

Subcatchment PDA-18: Runoff Area=2.103 ac 0.00% Impervious Runoff Depth=0.44"
Flow Length=476' Tc=10.2 min CN=47 Runoff=0.41 cfs 0.076 af

Subcatchment PDA-19: Runoff Area=1.726 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=1.360 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-20: Runoff Area=1.130 ac 0.00% Impervious Runoff Depth=0.44"
Flow Length=370' Tc=10.5 min CN=47 Runoff=0.22 cfs 0.041 af

Subcatchment PDA-21: Runoff Area=8.929 ac 0.41% Impervious Runoff Depth=0.24"
Flow Length=936' Tc=19.2 min CN=42 Runoff=0.47 cfs 0.177 af

Subcatchment PDA-22: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.44"
Flow Length=195' Tc=8.0 min CN=47 Runoff=0.22 cfs 0.041 af

Subcatchment PDA-23: Runoff Area=1.927 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=568' Tc=9.8 min CN=49 Runoff=0.52 cfs 0.085 af

Subcatchment PDA-8: Runoff Area=0.959 ac 0.00% Impervious Runoff Depth=0.44"
Flow Length=278' Tc=7.4 min CN=47 Runoff=0.19 cfs 0.035 af

Subcatchment PDA-9: Runoff Area=2.520 ac 0.00% Impervious Runoff Depth=0.48"
Flow Length=343' Tc=10.3 min CN=48 Runoff=0.58 cfs 0.101 af

Reach DP-1: Inflow=0.36 cfs 0.135 af
Outflow=0.36 cfs 0.135 af

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

Pond 1: Peak Elev=20.42' Storage=328 cf Inflow=0.19 cfs 0.035 af
Discarded=0.05 cfs 0.035 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.035 af

Pond 2: Peak Elev=23.07' Storage=379 cf Inflow=0.58 cfs 0.101 af
Discarded=0.33 cfs 0.101 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 0.101 af

Pond 3: Peak Elev=28.64' Storage=635 cf Inflow=0.43 cfs 0.049 af
Discarded=0.07 cfs 0.049 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.049 af

Pond 4: Peak Elev=22.80' Storage=14,201 cf Inflow=5.22 cfs 0.802 af
Discarded=0.64 cfs 0.723 af Primary=0.29 cfs 0.078 af Secondary=0.00 cfs 0.000 af Outflow=0.93 cfs 0.802 af

Pond 11: Peak Elev=27.19' Storage=469 cf Inflow=0.41 cfs 0.076 af
Discarded=0.14 cfs 0.076 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.076 af

Pond 12: Peak Elev=26.38' Storage=476 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=19.48' Storage=384 cf Inflow=0.22 cfs 0.041 af
Discarded=0.06 cfs 0.041 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.041 af

Pond 14: Peak Elev=16.86' Storage=1,292 cf Inflow=0.47 cfs 0.177 af
Discarded=0.22 cfs 0.177 af Primary=0.00 cfs 0.000 af Outflow=0.22 cfs 0.177 af

Pond 15: Peak Elev=21.77' Storage=293 cf Inflow=0.22 cfs 0.041 af
Discarded=0.07 cfs 0.041 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.041 af

Pond 16: Peak Elev=22.40' Storage=1,339 cf Inflow=0.52 cfs 0.085 af
Discarded=0.08 cfs 0.085 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.085 af

Total Runoff Area = 46.300 ac Runoff Volume = 1.519 af Average Runoff Depth = 0.39"
99.75% Pervious = 46.182 ac 0.25% Impervious = 0.118 ac

Summary for Subcatchment PDA-1:

Runoff = 0.08 cfs @ 15.83 hrs, Volume= 0.056 af, Depth= 0.05"

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
	10.201	30	Woods, Good, HSG A
	0.370	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	1.141	30	Brush, Good, HSG A
	0.035	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.859	39	>75% Grass cover, Good, HSG A
	0.069	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.099	96	Existing Gravel surface, HSG B
	13.568	35	Weighted Average
	13.568		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
	0.468	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
	0.818	53	Weighted Average
	0.818		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= 0.802 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
	0.643	55	Woods, Good, HSG B
	0.027	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.214	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
	0.654	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
	10.140	57	Weighted Average
	10.059		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= 0.076 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
1.795	39	>75% Grass cover, Good, HSG A
0.289	96	Gravel surface, HSG A
2.103	47	Weighted Average
2.103		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
1.523	39	>75% Grass cover, Good, HSG A
0.203	96	Gravel surface, HSG A
1.726	46	Weighted Average
1.726		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
0.452	30	Brush, Good, HSG A
1.360	30	Weighted Average
1.360		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-20:

Runoff = 0.22 cfs @ 12.36 hrs, Volume= 0.041 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
0.963	39	>75% Grass cover, Good, HSG A
0.167	96	Gravel surface, HSG A
1.130	47	Weighted Average
1.130		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"
2.8	212	0.0330	1.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	37	0.1890	3.04		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0380	3.14		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	51	0.0640	3.79		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.5	370	Total			

Summary for Subcatchment PDA-21:

Runoff = 0.47 cfs @ 12.63 hrs, Volume= 0.177 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
0.001	30	Brush, Good, HSG A
8.497	39	>75% Grass cover, Good, HSG A
0.394	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
8.929	42	Weighted Average
8.892		99.59% Pervious Area
0.037		0.41% 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
1.8	163	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	12	0.2920	3.78		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
19.2	936	Total			

Summary for Subcatchment PDA-22:

Runoff = 0.22 cfs @ 12.32 hrs, Volume= 0.041 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
0.970	39	>75% Grass cover, Good, HSG A
0.150	96	Gravel surface, HSG A
1.120	47	Weighted Average
1.120		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
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
8.0	195	Total			

Summary for Subcatchment PDA-23:

Runoff = 0.52 cfs @ 12.26 hrs, Volume= 0.085 af, Depth= 0.53"

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
1.594	39	>75% Grass cover, Good, HSG A
0.333	96	Gravel surface, HSG A
1.927	49	Weighted Average
1.927		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 = 0.19 cfs @ 12.31 hrs, Volume= 0.035 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
0.831	39	>75% Grass cover, Good, HSG A
0.128	96	Gravel surface, HSG A
0.959	47	Weighted Average
0.959		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 = 0.58 cfs @ 12.33 hrs, Volume= 0.101 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
1.892	39	>75% Grass cover, Good, HSG A
0.355	61	>75% Grass cover, Good, HSG B
0.249	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.520	48	Weighted Average
2.520		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 = 44.940 ac, 0.26% Impervious, Inflow Depth = 0.04" for 10-Year event
Inflow = 0.36 cfs @ 15.05 hrs, Volume= 0.135 af
Outflow = 0.36 cfs @ 15.05 hrs, Volume= 0.135 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 = 1.360 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 = 0.959 ac, 0.00% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 0.19 cfs @ 12.31 hrs, Volume= 0.035 af
Outflow = 0.05 cfs @ 14.55 hrs, Volume= 0.035 af, Atten= 75%, Lag= 133.9 min
Discarded = 0.05 cfs @ 14.55 hrs, Volume= 0.035 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= 20.42' @ 14.55 hrs Surf.Area= 858 sf Storage= 328 cf

Plug-Flow detention time= 70.6 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 70.5 min (1,014.7 - 944.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	4,027 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	689	0	0
21.00	1,087	888	888
22.00	1,546	1,317	2,205
23.00	2,099	1,823	4,027

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	**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=0.05 cfs @ 14.55 hrs HW=20.42' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=20.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2:

Inflow Area = 2.520 ac, 0.00% Impervious, Inflow Depth = 0.48" for 10-Year event
Inflow = 0.58 cfs @ 12.33 hrs, Volume= 0.101 af
Outflow = 0.33 cfs @ 12.63 hrs, Volume= 0.101 af, Atten= 43%, Lag= 18.0 min
Discarded = 0.33 cfs @ 12.63 hrs, Volume= 0.101 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= 23.07' @ 12.63 hrs Surf.Area= 5,842 sf Storage= 379 cf

Plug-Flow detention time= 8.4 min calculated for 0.101 af (100% of inflow)
Center-of-Mass det. time= 8.4 min (948.2 - 939.8)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	17,326 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	5,646	0	0
24.00	8,608	7,127	7,127
25.00	11,790	10,199	17,326

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=0.33 cfs @ 12.63 hrs HW=23.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.33 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 = 0.818 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Year event
Inflow = 0.43 cfs @ 12.17 hrs, Volume= 0.049 af
Outflow = 0.07 cfs @ 13.94 hrs, Volume= 0.049 af, Atten= 84%, Lag= 106.4 min
Discarded = 0.07 cfs @ 13.94 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= 28.64' @ 13.94 hrs Surf.Area= 1,242 sf Storage= 635 cf

Plug-Flow detention time= 100.5 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 100.3 min (1,010.5 - 910.2)

Volume	Invert	Avail.Storage	Storage Description
#1	28.00'	5,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
28.00	755	0	0
29.00	1,522	1,139	1,139
30.00	2,397	1,960	3,098
31.00	3,356	2,877	5,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	28.00'	**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=0.07 cfs @ 13.94 hrs HW=28.64' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=28.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4:

Inflow Area = 10.140 ac, 0.80% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 5.22 cfs @ 12.51 hrs, Volume= 0.802 af
Outflow = 0.93 cfs @ 14.74 hrs, Volume= 0.802 af, Atten= 82%, Lag= 133.7 min
Discarded = 0.64 cfs @ 14.74 hrs, Volume= 0.723 af
Primary = 0.29 cfs @ 14.74 hrs, Volume= 0.078 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= 22.80' @ 14.74 hrs Surf.Area= 11,466 sf Storage= 14,201 cf

Plug-Flow detention time= 251.7 min calculated for 0.802 af (100% of inflow)
Center-of-Mass det. time= 251.7 min (1,164.9 - 913.2)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	49,432 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	4,367	0	0
22.00	8,260	6,314	6,314
23.00	12,269	10,265	16,578
24.00	16,395	14,332	30,910
25.00	20,649	18,522	49,432

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=0.64 cfs @ 14.74 hrs HW=22.80' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.29 cfs @ 14.74 hrs HW=22.80' (Free Discharge)
3=Culvert (Inlet Controls 0.29 cfs @ 1.47 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 = 2.103 ac, 0.00% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 0.41 cfs @ 12.36 hrs, Volume= 0.076 af
Outflow = 0.14 cfs @ 13.16 hrs, Volume= 0.076 af, Atten= 65%, Lag= 48.2 min
Discarded = 0.14 cfs @ 13.16 hrs, Volume= 0.076 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' @ 13.16 hrs Surf.Area= 2,568 sf Storage= 469 cf

Plug-Flow detention time= 27.7 min calculated for 0.076 af (100% of inflow)
Center-of-Mass det. time= 27.6 min (974.4 - 946.8)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	11,588 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	5,650	4,981	11,588

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 @ 13.16 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 =	1.726 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 @	14.49 hrs, Volume=	0.056 af, Atten= 72%, Lag= 128.5 min
Discarded =	0.08 cfs @	14.49 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' @ 14.49 hrs Surf.Area= 1,438 sf Storage= 476 cf

Plug-Flow detention time= 61.3 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 61.1 min (1,013.7 - 952.5)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	8,123 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	4,644	3,934	8,123

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 @ 14.49 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 = 1.130 ac, 0.00% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 0.22 cfs @ 12.36 hrs, Volume= 0.041 af
Outflow = 0.06 cfs @ 14.33 hrs, Volume= 0.041 af, Atten= 73%, Lag= 117.7 min
Discarded = 0.06 cfs @ 14.33 hrs, Volume= 0.041 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= 19.48' @ 14.33 hrs Surf.Area= 1,051 sf Storage= 384 cf

Plug-Flow detention time= 72.6 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 72.4 min (1,019.5 - 947.1)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	6,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	542	0	0
20.00	1,598	1,070	1,070
21.00	2,655	2,127	3,197
22.00	3,773	3,214	6,411

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	21.00'	**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 @ 14.33 hrs HW=19.48' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 14:

Inflow Area =	8.929 ac,	0.41% Impervious,	Inflow Depth = 0.24"	for 10-Year event
Inflow =	0.47 cfs @	12.63 hrs, Volume=	0.177 af	
Outflow =	0.22 cfs @	15.92 hrs, Volume=	0.177 af,	Atten= 53%, Lag= 197.6 min
Discarded =	0.22 cfs @	15.92 hrs, Volume=	0.177 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= 16.86' @ 15.92 hrs Surf.Area= 3,917 sf Storage= 1,292 cf

Plug-Flow detention time= 60.1 min calculated for 0.177 af (100% of inflow)
Center-of-Mass det. time= 59.9 min (1,062.2 - 1,002.3)

Volume	Invert	Avail.Storage	Storage Description
#1	16.50'	23,501 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.50	3,211	0	0
17.00	4,184	1,849	1,849
18.00	6,070	5,127	6,976
19.00	8,203	7,137	14,112
20.00	10,574	9,389	23,501

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.00'	**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=0.22 cfs @ 15.92 hrs HW=16.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=16.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 15:

Inflow Area =	1.120 ac,	0.00% Impervious,	Inflow Depth = 0.44"	for 10-Year event
Inflow =	0.22 cfs @	12.32 hrs, Volume=	0.041 af	
Outflow =	0.07 cfs @	13.62 hrs, Volume=	0.041 af,	Atten= 69%, Lag= 77.8 min
Discarded =	0.07 cfs @	13.62 hrs, Volume=	0.041 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= 21.77' @ 13.62 hrs Surf.Area= 1,231 sf Storage= 293 cf

Plug-Flow detention time= 39.8 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 39.7 min (984.5 - 944.7)

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=0.07 cfs @ 13.62 hrs HW=21.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 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 16:

Inflow Area = 1.927 ac, 0.00% Impervious, Inflow Depth = 0.53" for 10-Year event
Inflow = 0.52 cfs @ 12.26 hrs, Volume= 0.085 af
Outflow = 0.08 cfs @ 15.74 hrs, Volume= 0.085 af, Atten= 84%, Lag= 208.9 min
Discarded = 0.08 cfs @ 15.74 hrs, Volume= 0.085 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= 22.40' @ 15.74 hrs Surf.Area= 1,504 sf Storage= 1,339 cf

Plug-Flow detention time= 213.1 min calculated for 0.085 af (100% of inflow)
Center-of-Mass det. time= 213.1 min (1,145.9 - 932.9)

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=0.08 cfs @ 15.74 hrs HW=22.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 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=13.568 ac 0.00% Impervious Runoff Depth=0.49"
Flow Length=147' Tc=18.6 min CN=35 Runoff=2.17 cfs 0.558 af

Subcatchment PDA-10: Runoff Area=0.818 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=10.140 ac 0.80% Impervious Runoff Depth=2.31"
Flow Length=819' Tc=30.1 min CN=57 Runoff=14.70 cfs 1.955 af

Subcatchment PDA-18: Runoff Area=2.103 ac 0.00% Impervious Runoff Depth=1.41"
Flow Length=476' Tc=10.2 min CN=47 Runoff=2.39 cfs 0.246 af

Subcatchment PDA-19: Runoff Area=1.726 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=281' Tc=8.1 min CN=46 Runoff=1.90 cfs 0.190 af

Subcatchment PDA-2: Runoff Area=1.360 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-20: Runoff Area=1.130 ac 0.00% Impervious Runoff Depth=1.41"
Flow Length=370' Tc=10.5 min CN=47 Runoff=1.27 cfs 0.132 af

Subcatchment PDA-21: Runoff Area=8.929 ac 0.41% Impervious Runoff Depth=1.00"
Flow Length=936' Tc=19.2 min CN=42 Runoff=4.72 cfs 0.741 af

Subcatchment PDA-22: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=1.41"
Flow Length=195' Tc=8.0 min CN=47 Runoff=1.36 cfs 0.131 af

Subcatchment PDA-23: Runoff Area=1.927 ac 0.00% Impervious Runoff Depth=1.58"
Flow Length=568' Tc=9.8 min CN=49 Runoff=2.63 cfs 0.253 af

Subcatchment PDA-8: Runoff Area=0.959 ac 0.00% Impervious Runoff Depth=1.41"
Flow Length=278' Tc=7.4 min CN=47 Runoff=1.18 cfs 0.112 af

Subcatchment PDA-9: Runoff Area=2.520 ac 0.00% Impervious Runoff Depth=1.49"
Flow Length=343' Tc=10.3 min CN=48 Runoff=3.12 cfs 0.313 af

Reach DP-1: Inflow=5.03 cfs 1.708 af
Outflow=5.03 cfs 1.708 af

Reach DP-2: Inflow=0.04 cfs 0.024 af
Outflow=0.04 cfs 0.024 af

Pond 1: Peak Elev=22.01' Storage=2,222 cf Inflow=1.18 cfs 0.112 af
Discarded=0.09 cfs 0.107 af Primary=0.04 cfs 0.003 af Outflow=0.12 cfs 0.110 af

Pond 2: Peak Elev=23.68' Storage=4,558 cf Inflow=3.12 cfs 0.313 af
Discarded=0.43 cfs 0.313 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.313 af

Pond 3: Peak Elev=29.80' Storage=2,641 cf Inflow=1.51 cfs 0.132 af
Discarded=0.12 cfs 0.132 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.132 af

Pond 4: Peak Elev=24.02' Storage=31,314 cf Inflow=14.70 cfs 1.955 af
Discarded=0.92 cfs 0.935 af Primary=3.02 cfs 0.970 af Secondary=0.14 cfs 0.003 af Outflow=4.08 cfs 1.908 af

Pond 11: Peak Elev=28.55' Storage=4,767 cf Inflow=2.39 cfs 0.246 af
Discarded=0.21 cfs 0.246 af Primary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.246 af

Pond 12: Peak Elev=27.83' Storage=3,661 cf Inflow=1.90 cfs 0.190 af
Discarded=0.17 cfs 0.190 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.190 af

Pond 13: Peak Elev=20.69' Storage=2,434 cf Inflow=1.27 cfs 0.132 af
Discarded=0.13 cfs 0.132 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.132 af

Pond 14: Peak Elev=19.05' Storage=14,541 cf Inflow=4.72 cfs 0.741 af
Discarded=0.46 cfs 0.601 af Primary=0.34 cfs 0.047 af Outflow=0.80 cfs 0.649 af

Pond 15: Peak Elev=22.89' Storage=2,330 cf Inflow=1.36 cfs 0.131 af
Discarded=0.13 cfs 0.131 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.131 af

Pond 16: Peak Elev=23.05' Storage=2,517 cf Inflow=2.63 cfs 0.253 af
Discarded=0.12 cfs 0.124 af Primary=1.05 cfs 0.121 af Secondary=0.35 cfs 0.005 af Outflow=1.51 cfs 0.250 af

Total Runoff Area = 46.300 ac Runoff Volume = 4.788 af Average Runoff Depth = 1.24"
99.75% Pervious = 46.182 ac 0.25% Impervious = 0.118 ac

Summary for Subcatchment PDA-1:

Runoff = 2.17 cfs @ 12.55 hrs, Volume= 0.558 af, Depth= 0.49"

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
	10.201	30	Woods, Good, HSG A
	0.370	55	Woods, Good, HSG B
	0.721	77	Woods, Good, HSG D
	1.141	30	Brush, Good, HSG A
	0.035	48	Brush, Good, HSG B
	0.039	65	Brush, Good, HSG C
	0.859	39	>75% Grass cover, Good, HSG A
	0.069	61	>75% Grass cover, Good, HSG B
	0.034	80	>75% Grass cover, Good, HSG D
*	0.099	96	Existing Gravel surface, HSG B
	13.568	35	Weighted Average
	13.568		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
	0.468	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
	0.818	53	Weighted Average
	0.818		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= 1.955 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
	0.643	55	Woods, Good, HSG B
	0.027	30	Brush, Good, HSG A
	0.329	48	Brush, Good, HSG B
	3.214	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
	0.654	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
	10.140	57	Weighted Average
	10.059		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 = 2.39 cfs @ 12.17 hrs, Volume= 0.246 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
1.795	39	>75% Grass cover, Good, HSG A
0.289	96	Gravel surface, HSG A
2.103	47	Weighted Average
2.103		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 = 1.90 cfs @ 12.15 hrs, Volume= 0.190 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
1.523	39	>75% Grass cover, Good, HSG A
0.203	96	Gravel surface, HSG A
1.726	46	Weighted Average
1.726		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
0.452	30	Brush, Good, HSG A
1.360	30	Weighted Average
1.360		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-20:

Runoff = 1.27 cfs @ 12.17 hrs, Volume= 0.132 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
0.963	39	>75% Grass cover, Good, HSG A
0.167	96	Gravel surface, HSG A
1.130	47	Weighted Average
1.130		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"
2.8	212	0.0330	1.27		**Shallow Concentrated Flow, Tc-2** Short Grass Pasture Kv= 7.0 fps
0.2	37	0.1890	3.04		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0380	3.14		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.2	51	0.0640	3.79		**Shallow Concentrated Flow, Tc-5** Grassed Waterway Kv= 15.0 fps
10.5	370	Total			

Summary for Subcatchment PDA-21:

Runoff = 4.72 cfs @ 12.38 hrs, Volume= 0.741 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
0.001	30	Brush, Good, HSG A
8.497	39	>75% Grass cover, Good, HSG A
0.394	96	Gravel surface, HSG A
0.037	98	Equipment Pad Areas, HSG A
8.929	42	Weighted Average
8.892		99.59% Pervious Area
0.037		0.41% 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
1.8	163	0.0490	1.55		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0500	3.60		**Shallow Concentrated Flow, Tc-4** Unpaved Kv= 16.1 fps
0.1	12	0.2920	3.78		**Shallow Concentrated Flow, Tc-5** Short Grass Pasture Kv= 7.0 fps
19.2	936	Total			

Summary for Subcatchment PDA-22:

Runoff = 1.36 cfs @ 12.14 hrs, Volume= 0.131 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
0.970	39	>75% Grass cover, Good, HSG A
0.150	96	Gravel surface, HSG A
1.120	47	Weighted Average
1.120		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
0.1	17	0.1180	2.40		**Shallow Concentrated Flow, Tc-3** Short Grass Pasture Kv= 7.0 fps
8.0	195	Total			

Summary for Subcatchment PDA-23:

Runoff = 2.63 cfs @ 12.16 hrs, Volume= 0.253 af, Depth= 1.58"

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
1.594	39	>75% Grass cover, Good, HSG A
0.333	96	Gravel surface, HSG A
1.927	49	Weighted Average
1.927		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 = 1.18 cfs @ 12.13 hrs, Volume= 0.112 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
0.831	39	>75% Grass cover, Good, HSG A
0.128	96	Gravel surface, HSG A
0.959	47	Weighted Average
0.959		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 = 3.12 cfs @ 12.17 hrs, Volume= 0.313 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
1.892	39	>75% Grass cover, Good, HSG A
0.355	61	>75% Grass cover, Good, HSG B
0.249	96	Gravel surface, HSG A
0.024	96	Gravel surface, HSG B
2.520	48	Weighted Average
2.520		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 = 44.940 ac, 0.26% Impervious, Inflow Depth = 0.46" for 100-Year event
Inflow = 5.03 cfs @ 12.65 hrs, Volume= 1.708 af
Outflow = 5.03 cfs @ 12.65 hrs, Volume= 1.708 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 = 1.360 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 = 0.959 ac, 0.00% Impervious, Inflow Depth = 1.41" for 100-Year event
Inflow = 1.18 cfs @ 12.13 hrs, Volume= 0.112 af
Outflow = 0.12 cfs @ 14.63 hrs, Volume= 0.110 af, Atten= 89%, Lag= 150.0 min
Discarded = 0.09 cfs @ 14.63 hrs, Volume= 0.107 af
Primary = 0.04 cfs @ 14.63 hrs, Volume= 0.003 af

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

Peak Elev= 22.01' @ 14.63 hrs Surf.Area= 1,552 sf Storage= 2,222 cf

Plug-Flow detention time= 317.7 min calculated for 0.110 af (98% of inflow)
Center-of-Mass det. time= 307.2 min (1,199.7 - 892.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	4,027 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	689	0	0
21.00	1,087	888	888
22.00	1,546	1,317	2,205
23.00	2,099	1,823	4,027

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	**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 @ 14.63 hrs HW=22.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.03 cfs @ 14.63 hrs HW=22.01' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.30 fps)

Summary for Pond 2:

Inflow Area =	2.520 ac,	0.00% Impervious, Inflow Depth =	1.49"	for 100-Year event
Inflow =	3.12 cfs @	12.17 hrs, Volume=	0.313 af	
Outflow =	0.43 cfs @	13.81 hrs, Volume=	0.313 af,	Atten= 86%, Lag= 98.2 min
Discarded =	0.43 cfs @	13.81 hrs, Volume=	0.313 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= 23.68' @ 13.81 hrs Surf.Area= 7,673 sf Storage= 4,558 cf

Plug-Flow detention time= 111.9 min calculated for 0.313 af (100% of inflow)
Center-of-Mass det. time= 111.7 min (1,003.2 - 891.5)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	17,326 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	5,646	0	0
24.00	8,608	7,127	7,127
25.00	11,790	10,199	17,326

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=0.43 cfs @ 13.81 hrs HW=23.68' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.43 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 = 0.818 ac, 0.00% Impervious, Inflow Depth = 1.94" for 100-Year event
Inflow = 1.51 cfs @ 12.14 hrs, Volume= 0.132 af
Outflow = 0.12 cfs @ 14.91 hrs, Volume= 0.132 af, Atten= 92%, Lag= 165.9 min
Discarded = 0.12 cfs @ 14.91 hrs, Volume= 0.132 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= 29.80' @ 14.91 hrs Surf.Area= 2,224 sf Storage= 2,641 cf

Plug-Flow detention time= 270.8 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 270.7 min (1,144.9 - 874.2)

Volume	Invert	Avail.Storage	Storage Description
#1	28.00'	5,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
28.00	755	0	0
29.00	1,522	1,139	1,139
30.00	2,397	1,960	3,098
31.00	3,356	2,877	5,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	28.00'	**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=0.12 cfs @ 14.91 hrs HW=29.80' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=28.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4:

Inflow Area =	10.140 ac,	0.80% Impervious,	Inflow Depth = 2.31"	for 100-Year event	
Inflow =	14.70 cfs @	12.46 hrs,	Volume=	1.955 af	
Outflow =	4.08 cfs @	13.26 hrs,	Volume=	1.908 af,	Atten= 72%, Lag= 48.0 min
Discarded =	0.92 cfs @	13.26 hrs,	Volume=	0.935 af	
Primary =	3.02 cfs @	13.26 hrs,	Volume=	0.970 af	
Secondary =	0.14 cfs @	13.26 hrs,	Volume=	0.003 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 24.02' @ 13.26 hrs Surf.Area= 16,500 sf Storage= 31,314 cf

Plug-Flow detention time= 171.7 min calculated for 1.908 af (98% of inflow)
Center-of-Mass det. time= 158.2 min (1,041.5 - 883.3)

Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	49,432 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.00	4,367	0	0
22.00	8,260	6,314	6,314
23.00	12,269	10,265	16,578
24.00	16,395	14,332	30,910
25.00	20,649	18,522	49,432

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=0.92 cfs @ 13.26 hrs HW=24.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=3.02 cfs @ 13.26 hrs HW=24.02' (Free Discharge)
└─**3=Culvert** (Inlet Controls 3.02 cfs @ 3.85 fps)

Secondary OutFlow Max=0.11 cfs @ 13.26 hrs HW=24.02' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.44 fps)

Summary for Pond 11:

Inflow Area =	2.103 ac,	0.00% Impervious,	Inflow Depth = 1.41"	for 100-Year event	
Inflow =	2.39 cfs @	12.17 hrs,	Volume=	0.246 af	
Outflow =	0.21 cfs @	15.59 hrs,	Volume=	0.246 af,	Atten= 91%, Lag= 205.2 min
Discarded =	0.21 cfs @	15.59 hrs,	Volume=	0.246 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' @ 15.59 hrs Surf.Area= 3,830 sf Storage= 4,767 cf

Plug-Flow detention time= 273.1 min calculated for 0.246 af (100% of inflow)
Center-of-Mass det. time= 273.1 min (1,168.1 - 895.1)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	11,588 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	5,650	4,981	11,588

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 @ 15.59 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 = 1.726 ac, 0.00% Impervious, Inflow Depth = 1.32" for 100-Year event
Inflow = 1.90 cfs @ 12.15 hrs, Volume= 0.190 af
Outflow = 0.17 cfs @ 15.55 hrs, Volume= 0.190 af, Atten= 91%, Lag= 204.1 min
Discarded = 0.17 cfs @ 15.55 hrs, Volume= 0.190 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= 3,025 sf Storage= 3,661 cf

Plug-Flow detention time= 281.8 min calculated for 0.190 af (100% of inflow)
Center-of-Mass det. time= 281.8 min (1,178.7 - 897.0)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	8,123 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	4,644	3,934	8,123

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 = 1.130 ac, 0.00% Impervious, Inflow Depth = 1.41" for 100-Year event
Inflow = 1.27 cfs @ 12.17 hrs, Volume= 0.132 af
Outflow = 0.13 cfs @ 15.16 hrs, Volume= 0.132 af, Atten= 90%, Lag= 179.2 min
Discarded = 0.13 cfs @ 15.16 hrs, Volume= 0.132 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= 20.69' @ 15.16 hrs Surf.Area= 2,332 sf Storage= 2,434 cf

Plug-Flow detention time= 243.6 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 243.5 min (1,138.9 - 895.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	6,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	542	0	0
20.00	1,598	1,070	1,070
21.00	2,655	2,127	3,197
22.00	3,773	3,214	6,411

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	21.00'	**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 @ 15.16 hrs HW=20.69' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=19.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 14:

Inflow Area =	8.929 ac,	0.41% Impervious,	Inflow Depth = 1.00"	for 100-Year event
Inflow =	4.72 cfs @	12.38 hrs, Volume=	0.741 af	
Outflow =	0.80 cfs @	15.34 hrs, Volume=	0.649 af,	Atten= 83%, Lag= 177.3 min
Discarded =	0.46 cfs @	15.34 hrs, Volume=	0.601 af	
Primary =	0.34 cfs @	15.34 hrs, Volume=	0.047 af	

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 19.05' @ 15.34 hrs Surf.Area= 8,326 sf Storage= 14,541 cf

Plug-Flow detention time= 349.5 min calculated for 0.649 af (88% of inflow)
Center-of-Mass det. time= 292.3 min (1,217.7 - 925.4)

Volume	Invert	Avail.Storage	Storage Description
#1	16.50'	23,501 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
16.50	3,211	0	0
17.00	4,184	1,849	1,849
18.00	6,070	5,127	6,976
19.00	8,203	7,137	14,112
20.00	10,574	9,389	23,501

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.00'	**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=0.46 cfs @ 15.34 hrs HW=19.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

Primary OutFlow Max=0.33 cfs @ 15.34 hrs HW=19.05' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.64 fps)

Summary for Pond 15:

Inflow Area =	1.120 ac,	0.00% Impervious,	Inflow Depth = 1.41"	for 100-Year event
Inflow =	1.36 cfs @	12.14 hrs, Volume=	0.131 af	
Outflow =	0.13 cfs @	14.97 hrs, Volume=	0.131 af,	Atten= 90%, Lag= 169.5 min
Discarded =	0.13 cfs @	14.97 hrs, Volume=	0.131 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= 22.89' @ 14.97 hrs Surf.Area= 2,404 sf Storage= 2,330 cf

Plug-Flow detention time= 219.3 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 219.2 min (1,112.2 - 893.0)

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=0.13 cfs @ 14.97 hrs HW=22.89' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.13 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 16:

Inflow Area = 1.927 ac, 0.00% Impervious, Inflow Depth = 1.58" for 100-Year event
Inflow = 2.63 cfs @ 12.16 hrs, Volume= 0.253 af
Outflow = 1.51 cfs @ 12.43 hrs, Volume= 0.250 af, Atten= 43%, Lag= 16.1 min
Discarded = 0.12 cfs @ 12.43 hrs, Volume= 0.124 af
Primary = 1.05 cfs @ 12.43 hrs, Volume= 0.121 af
Secondary = 0.35 cfs @ 12.43 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 23.05' @ 12.43 hrs Surf.Area= 2,097 sf Storage= 2,517 cf

Plug-Flow detention time= 130.4 min calculated for 0.250 af (99% of inflow)
Center-of-Mass det. time= 124.1 min (1,011.7 - 887.6)

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

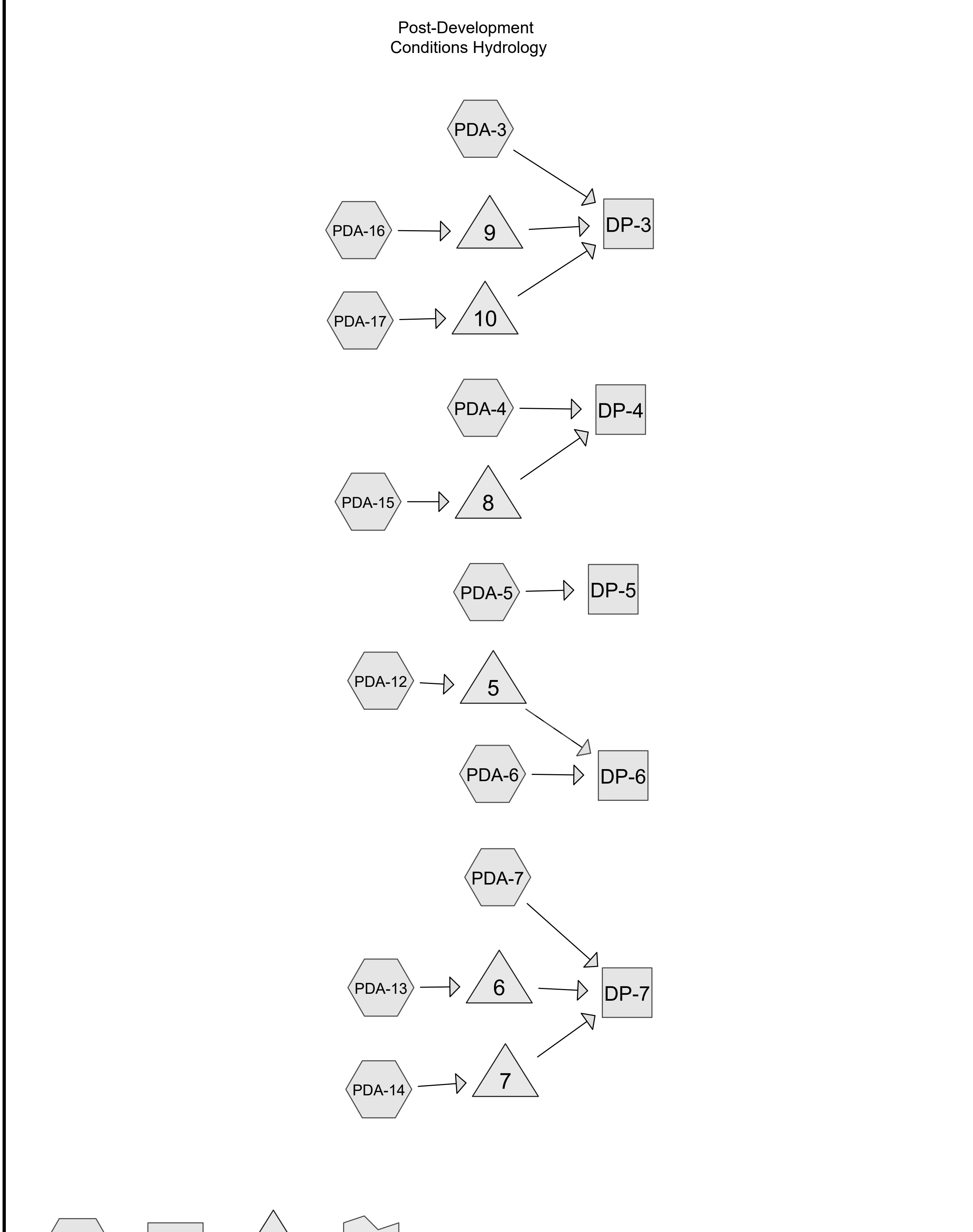
Device	Routing	Invert	Outlet Devices
#1	Discarded	21.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	23.00'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

			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=0.12 cfs @ 12.43 hrs HW=23.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=1.04 cfs @ 12.43 hrs HW=23.05' (Free Discharge)
└─**3=Culvert** (Inlet Controls 1.04 cfs @ 2.00 fps)

Secondary OutFlow Max=0.33 cfs @ 12.43 hrs HW=23.05' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.33 cfs @ 0.63 fps)



Routing Diagram for 1833109HC003
Prepared by Beals and Thomas, Inc., Printed 5/23/2020
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.159	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)
1.010	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)
1.393	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)
24.774	**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=9.015 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=0.856 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=0.425 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=307' Tc=7.3 min CN=54 Runoff=0.05 cfs 0.010 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=36.02' Storage=16 cf Inflow=0.05 cfs 0.010 af
Discarded=0.05 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.010 af

Total Runoff Area = 24.774 ac Runoff Volume = 0.084 af Average Runoff Depth = 0.04"
99.97% Pervious = 24.766 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
7.824	39	>75% Grass cover, Good, HSG A
0.511	96	Gravel surface, HSG A
9.015	42	Weighted Average
9.015		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
0.221	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.856	54	Weighted Average
0.852		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 = 0.05 cfs @ 12.34 hrs, Volume= 0.010 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
0.060	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.125	96	Gravel surface, HSG A
0.425	54	Weighted Average
0.425		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 = 3.181 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 = 11.258 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 = 9.015 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= 7.5 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'	21,674 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	9,549	7,739	10,263
30.00	13,273	11,411	21,674

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' / 28.00' S= 0.0588 '/' 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 =	0.856 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= 7.6 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 = 0.425 ac, 0.00% Impervious, Inflow Depth = 0.28" for 2-Year event
Inflow = 0.05 cfs @ 12.34 hrs, Volume= 0.010 af
Outflow = 0.05 cfs @ 12.44 hrs, Volume= 0.010 af, Atten= 8%, Lag= 6.0 min
Discarded = 0.05 cfs @ 12.44 hrs, Volume= 0.010 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= 36.02' @ 12.44 hrs Surf.Area= 957 sf Storage= 16 cf

Plug-Flow detention time= 5.9 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (958.3 - 952.4)

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 @ 12.44 hrs HW=36.02' (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=9.015 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=0.856 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=0.425 ac 0.00% Impervious Runoff Depth=0.78" Flow Length=307' Tc=7.3 min CN=54 Runoff=0.26 cfs 0.028 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=553 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=36.23' Storage=248 cf Inflow=0.26 cfs 0.028 af
Discarded=0.07 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.028 af

Total Runoff Area = 24.774 ac Runoff Volume = 0.393 af Average Runoff Depth = 0.19"
99.97% Pervious = 24.766 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
7.824	39	>75% Grass cover, Good, HSG A
0.511	96	Gravel surface, HSG A
9.015	42	Weighted Average
9.015		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
0.221	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.856	54	Weighted Average
0.852		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 = 0.26 cfs @ 12.14 hrs, Volume= 0.028 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
0.060	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.125	96	Gravel surface, HSG A
0.425	54	Weighted Average
0.425		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 = 3.181 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 = 11.258 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 = 9.015 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= 4,761 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'	21,674 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	9,549	7,739	10,263
30.00	13,273	11,411	21,674

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' / 28.00' S= 0.0588 '/' 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 =	0.856 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 @	12.85 hrs, Volume=	0.056 af, Atten= 79%, Lag= 44.2 min
Discarded =	0.12 cfs @	12.85 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' @ 12.85 hrs Surf.Area= 2,130 sf Storage= 553 cf

Plug-Flow detention time= 39.7 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 39.7 min (942.8 - 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 @ 12.85 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 = 0.425 ac, 0.00% Impervious, Inflow Depth = 0.78" for 10-Year event
Inflow = 0.26 cfs @ 12.14 hrs, Volume= 0.028 af
Outflow = 0.07 cfs @ 12.70 hrs, Volume= 0.028 af, Atten= 74%, Lag= 33.7 min
Discarded = 0.07 cfs @ 12.70 hrs, Volume= 0.028 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= 36.23' @ 12.70 hrs Surf.Area= 1,220 sf Storage= 248 cf

Plug-Flow detention time= 28.3 min calculated for 0.028 af (100% of inflow)
Center-of-Mass det. time= 28.2 min (932.5 - 904.3)

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=0.07 cfs @ 12.70 hrs HW=36.23' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 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=9.015 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=0.856 ac 0.47% Impervious Runoff Depth=2.03"
Tc=6.0 min CN=54 Runoff=1.86 cfs 0.145 af

Subcatchment PDA-17: Runoff Area=0.425 ac 0.00% Impervious Runoff Depth=2.03"
Flow Length=307' Tc=7.3 min CN=54 Runoff=0.88 cfs 0.072 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=0.07 cfs 0.034 af
Outflow=0.07 cfs 0.034 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=12,701 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=34.00' Storage=2,461 cf Inflow=1.86 cfs 0.145 af
Discarded=0.18 cfs 0.144 af Primary=0.02 cfs 0.001 af Outflow=0.20 cfs 0.145 af

Pond 10: Peak Elev=36.79' Storage=1,132 cf Inflow=0.88 cfs 0.072 af
Discarded=0.11 cfs 0.072 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.072 af

Total Runoff Area = 24.774 ac Runoff Volume = 1.588 af Average Runoff Depth = 0.77"
99.97% Pervious = 24.766 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
7.824	39	>75% Grass cover, Good, HSG A
0.511	96	Gravel surface, HSG A
9.015	42	Weighted Average
9.015		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= 0.145 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
0.221	96	Gravel surface, HSG A
0.004	98	Equipment Pad Areas, HSG A
0.856	54	Weighted Average
0.852		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 = 0.88 cfs @ 12.12 hrs, Volume= 0.072 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
0.060	30	Brush, Good, HSG A
0.240	39	>75% Grass cover, Good, HSG A
0.125	96	Gravel surface, HSG A
0.425	54	Weighted Average
0.425		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 = 3.181 ac, 0.13% Impervious, Inflow Depth = 0.13" for 100-Year event
Inflow = 0.07 cfs @ 13.54 hrs, Volume= 0.034 af
Outflow = 0.07 cfs @ 13.54 hrs, Volume= 0.034 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 = 11.258 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 = 9.015 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= 10,456 sf Storage= 12,701 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'	21,674 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	9,549	7,739	10,263
30.00	13,273	11,411	21,674

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' / 28.00' S= 0.0588 '/' 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 = 0.856 ac, 0.47% Impervious, Inflow Depth = 2.03" for 100-Year event
Inflow = 1.86 cfs @ 12.10 hrs, Volume= 0.145 af
Outflow = 0.20 cfs @ 13.51 hrs, Volume= 0.145 af, Atten= 89%, Lag= 84.2 min
Discarded = 0.18 cfs @ 13.51 hrs, Volume= 0.144 af
Primary = 0.02 cfs @ 13.51 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 34.00' @ 13.51 hrs Surf.Area= 3,213 sf Storage= 2,461 cf

Plug-Flow detention time= 154.2 min calculated for 0.145 af (100% of inflow)
Center-of-Mass det. time= 153.9 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 @ 13.51 hrs HW=34.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.01 cfs @ 13.51 hrs HW=34.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.19 fps)

Summary for Pond 10:

Inflow Area = 0.425 ac, 0.00% Impervious, Inflow Depth = 2.03" for 100-Year event
Inflow = 0.88 cfs @ 12.12 hrs, Volume= 0.072 af
Outflow = 0.11 cfs @ 13.22 hrs, Volume= 0.072 af, Atten= 88%, Lag= 66.4 min
Discarded = 0.11 cfs @ 13.22 hrs, Volume= 0.072 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= 36.79' @ 13.22 hrs Surf.Area= 1,917 sf Storage= 1,132 cf

Plug-Flow detention time= 114.9 min calculated for 0.072 af (100% of inflow)
Center-of-Mass det. time= 114.7 min (984.7 - 870.1)

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=0.11 cfs @ 13.22 hrs HW=36.79' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.11 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

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

CALCULATION SUMMARY

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, 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.

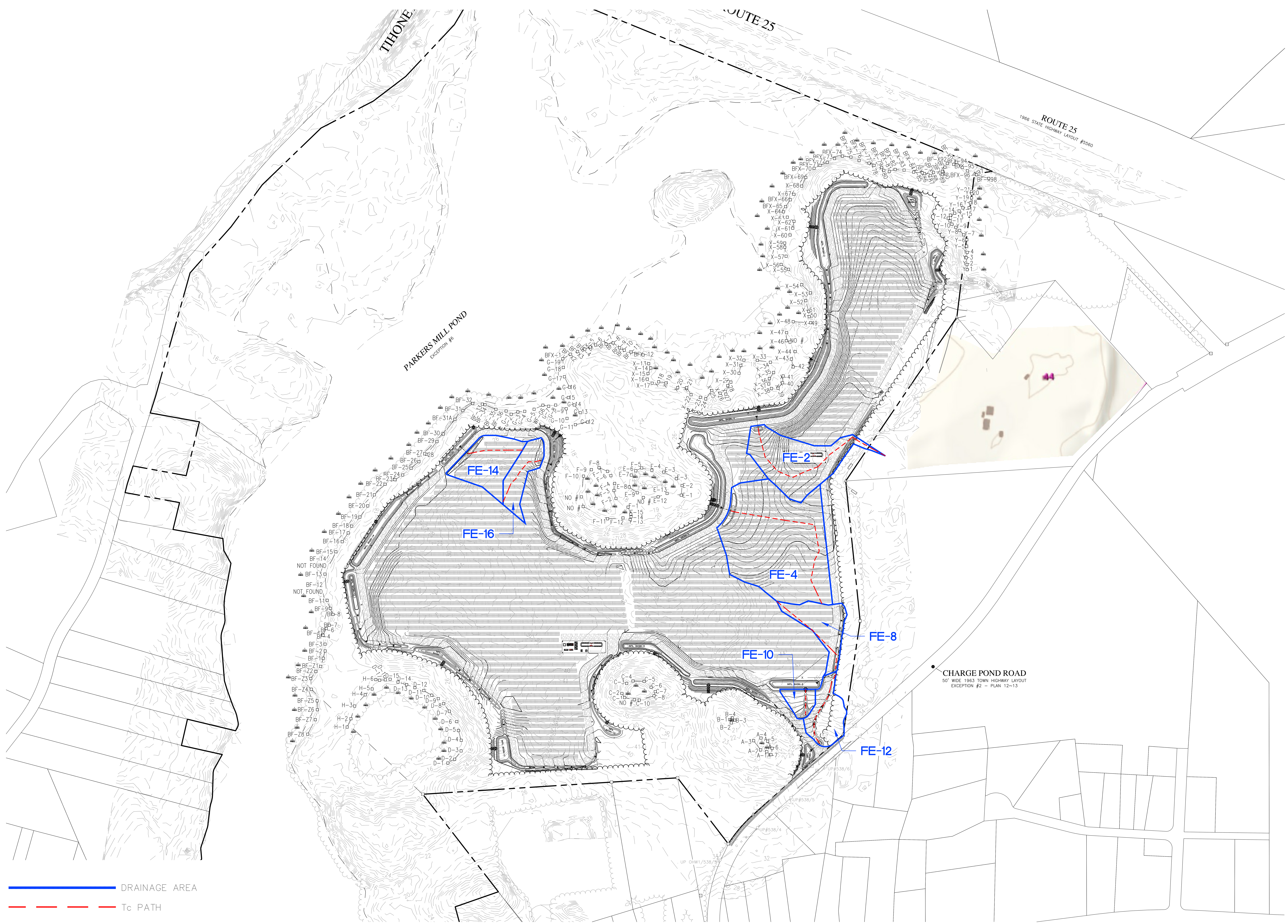
SOURCES OF DATA/EQUATIONS:

- 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.
- 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	N. Bautz	05/22/2020	J. Murphy	05/22/2020	J. Murphy	05/22/2020



Hydraulic Areas Map

Figure Number 003

~~Scale: 1" = 150'~~

Date: 05/22/2020

Plan 1833109P600A-003

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

BEALS + THOMAS

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	0.30	5.60	1.06
FE-10	0.219	0.30	6.60	0.43
FE-12	0.582	0.33	6.60	1.27
FE-14	0.822	0.30	6.00	1.48
FE-16	0.464	0.30	6.00	0.84

JOB NO. 1833.109

FILE 27 Charge Pond Road PV+ES

COMPUTED BY NBB

DATE 5/15/2020

CHECKED BY JRM

DATE 5/22/2020

BEALS + THOMAS

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	1.06	8" HDPE	0.013	1.51	OK	4.3
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	1.48	8" HDPE	0.029	2.25	OK	6.4
FE-16 to FE-17	0.84	8" HDPE	0.025	2.09	OK	6.0

JOB NO. 1833.109　　COMPUTED BY NBB　　CHECKED BY JRM

FILE 27 Charge Pond Road PV+ES　　DATE 5/15/2020　　DATE 5/22/2020

Storm Data Detailed Report: Barnstable Rainfall

Element Details

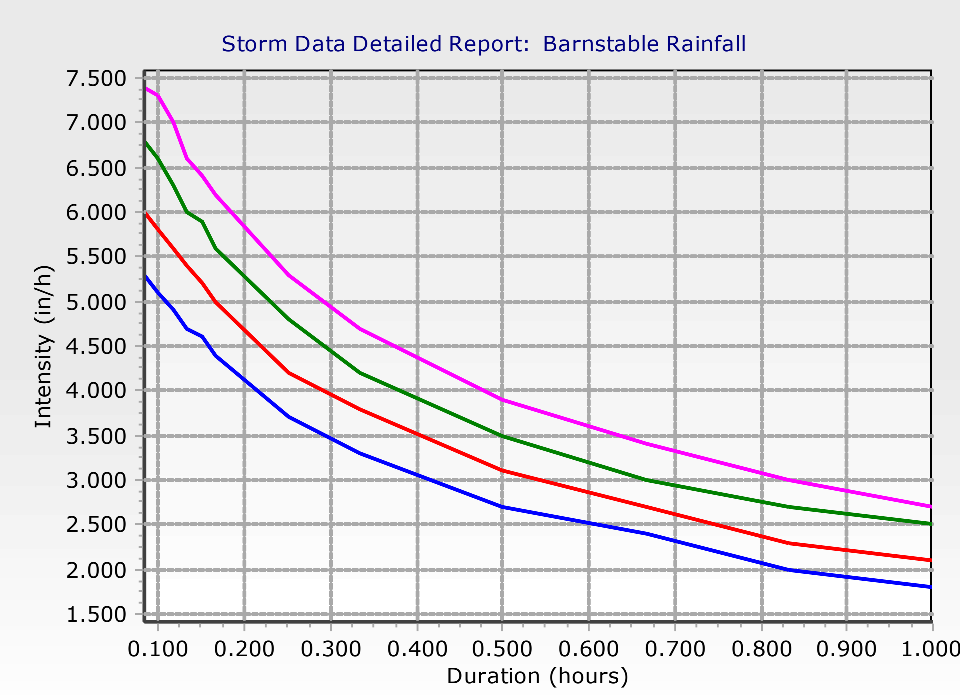
ID	30	Notes	
Label	Barnstable Rainfall		

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

$$\textbf{Drawdown Time} = \frac{\textbf{Rv}}{\textbf{(K) (Bottom Area)}}$$

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 =	0.051	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.016	Acres	
Drawdown Time =	**15.871**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-2

Rv =	0.164	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.130	Acres	
Drawdown Time =	**6.282**	**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 =	0.251	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.100	Acres	
Drawdown Time =	**12.498**	**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 =	0.073	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.012	Acres	
Drawdown Time =	**30.290**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-14

Rv =	0.324	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.074	Acres	
Drawdown Time =	**21.801**	**Hours**	*< 72 Hours, Design is in compliance with the standard.*

Infiltration Basin-15

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-16

Rv =	0.034	Ac-ft	
K =	2.410	in/hr	
Bottom Area =	0.011	Acres	
Drawdown Time =	**15.390**	**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:	NBB	CHECKED BY:	JRM
JOB:	27 Charge Pond Road PV+ES	DATE:	5/15/2020	DATE:	5/22/2020

Stage-Area-Storage for Pond 1:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
20.00	0.016	0.000
20.05	0.016	0.001
20.10	0.017	0.002
20.15	0.017	0.002
20.20	0.018	0.003
20.25	0.018	0.004
20.30	0.019	0.005
20.35	0.019	0.006
20.40	0.019	0.007
20.45	0.020	0.008
20.50	0.020	0.009
20.55	0.021	0.010
20.60	0.021	0.011
20.65	0.022	0.012
20.70	0.022	0.013
20.75	0.023	0.014
20.80	0.023	0.016
20.85	0.024	0.017
20.90	0.024	0.018
20.95	0.024	0.019
21.00	0.025	0.020
21.05	0.025	0.022
21.10	0.026	0.023
21.15	0.027	0.024
21.20	0.027	0.026
21.25	0.028	0.027
21.30	0.028	0.028
21.35	0.029	0.030
21.40	0.029	0.031
21.45	0.030	0.033
21.50	0.030	0.034
21.55	0.031	0.036
21.60	0.031	0.037
21.65	0.032	0.039
21.70	0.032	0.040
21.75	0.033	0.042
21.80	0.033	0.044
21.85	0.034	0.045
21.90	0.034	0.047
21.95	0.035	0.049
22.00	0.035	0.051
22.05	0.036	0.052
22.10	0.037	0.054
22.15	0.037	0.056
22.20	0.038	0.058
22.25	0.039	0.060
22.30	0.039	0.062
22.35	0.040	0.064
22.40	0.041	0.066
22.45	0.041	0.068
22.50	0.042	0.070
22.55	0.042	0.072
22.60	0.043	0.074
22.65	0.044	0.076
22.70	0.044	0.079
22.75	0.045	0.081
22.80	0.046	0.083
22.85	0.046	0.085
22.90	0.047	0.088
22.95	0.048	0.090
23.00	**0.048**	**0.092**

Stage-Area-Storage for Pond 2:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
23.00	0.130	0.000	24.06	0.202	0.176
23.02	0.131	0.003	24.08	0.203	0.180
23.04	0.132	0.005	24.10	0.205	0.184
23.06	0.134	0.008	24.12	0.206	0.188
23.08	0.135	0.011	24.14	0.208	0.192
23.10	0.136	0.013	24.16	0.209	0.196
23.12	0.138	0.016	24.18	0.211	0.200
23.14	0.139	0.019	24.20	0.212	0.205
23.16	0.140	0.022	24.22	0.214	0.209
23.18	0.142	0.024	24.24	0.215	0.213
23.20	0.143	0.027	24.26	0.217	0.217
23.22	0.145	0.030	24.28	0.218	0.222
23.24	0.146	0.033	24.30	0.220	0.226
23.26	0.147	0.036	24.32	0.221	0.231
23.28	0.149	0.039	24.34	0.222	0.235
23.30	0.150	0.042	24.36	0.224	0.239
23.32	0.151	0.045	24.38	0.225	0.244
23.34	0.153	0.048	24.40	0.227	0.249
23.36	0.154	0.051	24.42	0.228	0.253
23.38	0.155	0.054	24.44	0.230	0.258
23.40	0.157	0.057	24.46	0.231	0.262
23.42	0.158	0.060	24.48	0.233	0.267
23.44	0.160	0.064	24.50	0.234	0.272
23.46	0.161	0.067	24.52	0.236	0.276
23.48	0.162	0.070	24.54	0.237	0.281
23.50	0.164	0.073	24.56	0.239	0.286
23.52	0.165	0.077	24.58	0.240	0.291
23.54	0.166	0.080	24.60	0.241	0.295
23.56	0.168	0.083	24.62	0.243	0.300
23.58	0.169	0.087	24.64	0.244	0.305
23.60	0.170	0.090	24.66	0.246	0.310
23.62	0.172	0.093	24.68	0.247	0.315
23.64	0.173	0.097	24.70	0.249	0.320
23.66	0.174	0.100	24.72	0.250	0.325
23.68	0.176	0.104	24.74	0.252	0.330
23.70	0.177	0.107	24.76	0.253	0.335
23.72	0.179	0.111	24.78	0.255	0.340
23.74	0.180	0.115	24.80	0.256	0.345
23.76	0.181	0.118	24.82	0.258	0.350
23.78	0.183	0.122	24.84	0.259	0.355
23.80	0.184	0.125	24.86	0.260	0.361
23.82	0.185	0.129	24.88	0.262	0.366
23.84	0.187	0.133	24.90	0.263	0.371
23.86	0.188	0.137	24.92	0.265	0.376
23.88	0.189	0.140	24.94	0.266	0.382
23.90	0.191	0.144	24.96	0.268	0.387
23.92	0.192	0.148	24.98	0.269	0.392
23.94	0.194	0.152	25.00	**0.271**	**0.398**
23.96	0.195	0.156			
23.98	0.196	0.160			
24.00	0.198	0.164			
24.02	0.199	0.168			
24.04	0.201	0.172			

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)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.00	0.100	0.000	23.65	0.343	0.584
21.05	0.105	0.005	23.70	0.348	0.601
21.10	0.109	0.010	23.75	0.353	0.618
21.15	0.114	0.016	23.80	0.357	0.636
21.20	0.118	0.022	23.85	0.362	0.654
21.25	0.123	0.028	23.90	0.367	0.672
21.30	0.127	0.034	23.95	0.372	0.691
21.35	0.132	0.041	24.00	0.376	0.710
21.40	0.136	0.047	24.05	0.381	0.729
21.45	0.140	0.054	24.10	0.386	0.748
21.50	0.145	0.061	24.15	0.391	0.767
21.55	0.149	0.069	24.20	0.396	0.787
21.60	0.154	0.076	24.25	0.401	0.807
21.65	0.158	0.084	24.30	0.406	0.827
21.70	0.163	0.092	24.35	0.411	0.847
21.75	0.167	0.100	24.40	0.415	0.868
21.80	0.172	0.109	24.45	0.420	0.889
21.85	0.176	0.117	24.50	0.425	0.910
21.90	0.181	0.126	24.55	0.430	0.931
21.95	0.185	0.136	24.60	0.435	0.953
22.00	0.190	0.145	24.65	0.440	0.975
22.05	0.194	0.155	24.70	0.445	0.997
22.10	0.199	0.164	24.75	0.450	1.019
22.15	0.203	0.174	24.80	0.455	1.042
22.20	0.208	0.185	24.85	0.459	1.065
22.25	0.213	0.195	24.90	0.464	1.088
22.30	0.217	0.206	24.95	0.469	1.111
22.35	0.222	0.217	25.00	**0.474**	**1.135**
22.40	0.226	0.228			
22.45	0.231	0.240			
22.50	0.236	0.251			
22.55	0.240	0.263			
22.60	0.245	0.275			
22.65	0.249	0.288			
22.70	0.254	0.300			
22.75	0.259	0.313			
22.80	0.263	0.326			
22.85	0.268	0.339			
22.90	0.272	0.353			
22.95	0.277	0.367			
23.00	0.282	0.381			
23.05	0.286	0.395			
23.10	0.291	0.409			
23.15	0.296	0.424			
23.20	0.301	0.439			
23.25	0.305	0.454			
23.30	0.310	0.469			
23.35	0.315	0.485			
23.40	0.320	0.501			
23.45	0.324	0.517			
23.50	0.329	0.533			
23.55	0.334	0.550			
23.60	0.338	0.567			

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)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
38.00	0.055	0.000	39.06	0.083	0.073
38.02	0.056	0.001	39.08	0.083	0.075
38.04	0.056	0.002	39.10	0.084	0.076
38.06	0.057	0.003	39.12	0.084	0.078
38.08	0.057	0.005	39.14	0.085	0.080
38.10	0.058	0.006	39.16	0.085	0.082
38.12	0.058	0.007	39.18	0.086	0.083
38.14	0.059	0.008	39.20	0.086	0.085
38.16	0.059	0.009	39.22	0.087	0.087
38.18	0.060	0.010	39.24	0.087	0.088
38.20	0.061	0.012	39.26	0.088	0.090
38.22	0.061	0.013	39.28	0.089	0.092
38.24	0.062	0.014	39.30	0.089	0.094
38.26	0.062	0.015	39.32	0.090	0.096
38.28	0.063	0.017	39.34	0.090	0.097
38.30	0.063	0.018	39.36	0.091	0.099
38.32	0.064	0.019	39.38	0.091	0.101
38.34	0.064	0.020	39.40	0.092	0.103
38.36	0.065	0.022	39.42	0.092	0.105
38.38	0.065	0.023	39.44	0.093	0.106
38.40	0.066	0.024	39.46	0.093	0.108
38.42	0.066	0.026	39.48	0.094	0.110
38.44	0.067	0.027	39.50	0.094	0.112
38.46	0.067	0.028	39.52	0.095	0.114
38.48	0.068	0.030	39.54	0.095	0.116
38.50	0.068	0.031	39.56	0.096	0.118
38.52	0.069	0.032	39.58	0.096	0.120
38.54	0.069	0.034	39.60	0.097	0.122
38.56	0.070	0.035	39.62	0.098	0.124
38.58	0.070	0.036	39.64	0.098	0.126
38.60	0.071	0.038	39.66	0.099	0.128
38.62	0.071	0.039	39.68	0.099	0.130
38.64	0.072	0.041	39.70	0.100	0.132
38.66	0.072	0.042	39.72	0.100	0.134
38.68	0.073	0.044	39.74	0.101	0.136
38.70	0.073	0.045	39.76	0.101	0.138
38.72	0.074	0.047	39.78	0.102	0.140
38.74	0.074	0.048	39.80	0.102	0.142
38.76	0.075	0.050	39.82	0.103	0.144
38.78	0.075	0.051	39.84	0.103	0.146
38.80	0.076	0.053	39.86	0.104	0.148
38.82	0.076	0.054	39.88	0.104	0.150
38.84	0.077	0.056	39.90	0.105	0.152
38.86	0.078	0.057	39.92	0.106	0.154
38.88	0.078	0.059	39.94	0.106	0.156
38.90	0.079	0.060	39.96	0.107	0.158
38.92	0.079	0.062	39.98	0.107	0.160
38.94	0.080	0.063	40.00	**0.108**	**0.163**
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			

Stage-Area-Storage for Pond 7:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
33.00	0.031	0.000	34.06	0.073	0.055
33.02	0.032	0.001	34.08	0.074	0.057
33.04	0.033	0.001	34.10	0.075	0.058
33.06	0.034	0.002	34.12	0.075	0.060
33.08	0.035	0.003	34.14	0.076	0.061
33.10	0.035	0.003	34.16	0.077	0.063
33.12	0.036	0.004	34.18	0.078	0.064
33.14	0.037	0.005	34.20	0.079	0.066
33.16	0.038	0.006	34.22	0.079	0.067
33.18	0.038	0.006	34.24	0.080	0.069
33.20	0.039	0.007	34.26	0.081	0.071
33.22	0.040	0.008	34.28	0.082	0.072
33.24	0.041	0.009	34.30	0.083	0.074
33.26	0.042	0.009	34.32	0.084	0.076
33.28	0.042	0.010	34.34	0.084	0.077
33.30	0.043	0.011	34.36	0.085	0.079
33.32	0.044	0.012	34.38	0.086	0.081
33.34	0.045	0.013	34.40	0.087	0.082
33.36	0.045	0.014	34.42	0.088	0.084
33.38	0.046	0.015	34.44	0.089	0.086
33.40	0.047	0.016	34.46	0.089	0.088
33.42	0.048	0.017	34.48	0.090	0.089
33.44	0.049	0.018	34.50	0.091	0.091
33.46	0.049	0.019	34.52	0.092	0.093
33.48	0.050	0.020	34.54	0.093	0.095
33.50	0.051	0.021	34.56	0.094	0.097
33.52	0.052	0.022	34.58	0.094	0.099
33.54	0.052	0.023	34.60	0.095	0.101
33.56	0.053	0.024	34.62	0.096	0.103
33.58	0.054	0.025	34.64	0.097	0.104
33.60	0.055	0.026	34.66	0.098	0.106
33.62	0.056	0.027	34.68	0.098	0.108
33.64	0.056	0.028	34.70	0.099	0.110
33.66	0.057	0.029	34.72	0.100	0.112
33.68	0.058	0.030	34.74	0.101	0.114
33.70	0.059	0.032	34.76	0.102	0.116
33.72	0.060	0.033	34.78	0.103	0.118
33.74	0.060	0.034	34.80	0.103	0.120
33.76	0.061	0.035	34.82	0.104	0.123
33.78	0.062	0.036	34.84	0.105	0.125
33.80	0.063	0.038	34.86	0.106	0.127
33.82	0.063	0.039	34.88	0.107	0.129
33.84	0.064	0.040	34.90	0.108	0.131
33.86	0.065	0.041	34.92	0.108	0.133
33.88	0.066	0.043	34.94	0.109	0.135
33.90	0.067	0.044	34.96	0.110	0.138
33.92	0.067	0.045	34.98	0.111	0.140
33.94	0.068	0.047	35.00	**0.112**	**0.142**
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			

Stage-Area-Storage for Pond 8:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
22.50	0.017	0.000	25.15	0.050	0.085
22.55	0.018	0.001	25.20	0.050	0.088
22.60	0.018	0.002	25.25	0.051	0.090
22.65	0.019	0.003	25.30	0.052	0.093
22.70	0.019	0.004	25.35	0.053	0.096
22.75	0.020	0.005	25.40	0.054	0.098
22.80	0.020	0.006	25.45	0.054	0.101
22.85	0.021	0.007	25.50	0.055	0.104
22.90	0.021	0.008	25.55	0.056	0.107
22.95	0.022	0.009	25.60	0.057	0.109
23.00	0.022	0.010	25.65	0.058	0.112
23.05	0.023	0.011	25.70	0.058	0.115
23.10	0.023	0.012	25.75	0.059	0.118
23.15	0.024	0.013	25.80	0.060	0.121
23.20	0.024	0.014	25.85	0.061	0.124
23.25	0.025	0.016	25.90	0.061	0.127
23.30	0.026	0.017	25.95	0.062	0.130
23.35	0.026	0.018	26.00	**0.063**	**0.133**
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			

Stage-Area-Storage for Pond 9:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
33.00	0.036	0.000	34.06	0.076	0.061
33.02	0.037	0.001	34.08	0.076	0.062
33.04	0.037	0.001	34.10	0.077	0.064
33.06	0.038	0.002	34.12	0.078	0.065
33.08	0.039	0.003	34.14	0.078	0.067
33.10	0.040	0.004	34.16	0.079	0.068
33.12	0.041	0.005	34.18	0.080	0.070
33.14	0.042	0.005	34.20	0.080	0.072
33.16	0.043	0.006	34.22	0.081	0.073
33.18	0.044	0.007	34.24	0.081	0.075
33.20	0.044	0.008	34.26	0.082	0.076
33.22	0.045	0.009	34.28	0.083	0.078
33.24	0.046	0.010	34.30	0.083	0.080
33.26	0.047	0.011	34.32	0.084	0.081
33.28	0.048	0.012	34.34	0.085	0.083
33.30	0.049	0.013	34.36	0.085	0.085
33.32	0.050	0.014	34.38	0.086	0.086
33.34	0.051	0.015	34.40	0.087	0.088
33.36	0.052	0.016	34.42	0.087	0.090
33.38	0.052	0.017	34.44	0.088	0.092
33.40	0.053	0.018	34.46	0.089	0.093
33.42	0.054	0.019	34.48	0.089	0.095
33.44	0.055	0.020	34.50	0.090	0.097
33.46	0.056	0.021	34.52	0.091	0.099
33.48	0.057	0.022	34.54	0.091	0.101
33.50	0.058	0.023	34.56	0.092	0.103
33.52	0.058	0.024	34.58	0.093	0.104
33.54	0.059	0.026	34.60	0.093	0.106
33.56	0.060	0.027	34.62	0.094	0.108
33.58	0.060	0.028	34.64	0.095	0.110
33.60	0.061	0.029	34.66	0.095	0.112
33.62	0.062	0.030	34.68	0.096	0.114
33.64	0.062	0.032	34.70	0.096	0.116
33.66	0.063	0.033	34.72	0.097	0.118
33.68	0.063	0.034	34.74	0.098	0.120
33.70	0.064	0.036	34.76	0.098	0.122
33.72	0.065	0.037	34.78	0.099	0.124
33.74	0.065	0.038	34.80	0.100	0.126
33.76	0.066	0.039	34.82	0.100	0.128
33.78	0.067	0.041	34.84	0.101	0.130
33.80	0.067	0.042	34.86	0.102	0.132
33.82	0.068	0.043	34.88	0.102	0.134
33.84	0.069	0.045	34.90	0.103	0.136
33.86	0.069	0.046	34.92	0.104	0.138
33.88	0.070	0.048	34.94	0.104	0.140
33.90	0.070	0.049	34.96	0.105	0.142
33.92	0.071	0.050	34.98	0.106	0.144
33.94	0.072	0.052	35.00	**0.106**	**0.146**
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			

Stage-Area-Storage for Pond 10:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
36.00	0.021	0.000	37.06	0.052	0.039
36.02	0.022	0.000	37.08	0.053	0.040
36.04	0.023	0.001	37.10	0.054	0.041
36.06	0.023	0.001	37.12	0.054	0.042
36.08	0.024	0.002	37.14	0.055	0.043
36.10	0.024	0.002	37.16	0.056	0.044
36.12	0.025	0.003	37.18	0.057	0.045
36.14	0.025	0.003	37.20	0.057	0.046
36.16	0.026	0.004	37.22	0.058	0.048
36.18	0.027	0.004	37.24	0.059	0.049
36.20	0.027	0.005	37.26	0.060	0.050
36.22	0.028	0.005	37.28	0.060	0.051
36.24	0.028	0.006	37.30	0.061	0.052
36.26	0.029	0.007	37.32	0.062	0.054
36.28	0.029	0.007	37.34	0.063	0.055
36.30	0.030	0.008	37.36	0.064	0.056
36.32	0.031	0.008	37.38	0.064	0.057
36.34	0.031	0.009	37.40	0.065	0.059
36.36	0.032	0.010	37.42	0.066	0.060
36.38	0.032	0.010	37.44	0.067	0.061
36.40	0.033	0.011	37.46	0.067	0.063
36.42	0.033	0.012	37.48	0.068	0.064
36.44	0.034	0.012	37.50	0.069	0.065
36.46	0.035	0.013	37.52	0.070	0.067
36.48	0.035	0.014	37.54	0.070	0.068
36.50	0.036	0.014	37.56	0.071	0.070
36.52	0.036	0.015	37.58	0.072	0.071
36.54	0.037	0.016	37.60	0.073	0.072
36.56	0.037	0.016	37.62	0.073	0.074
36.58	0.038	0.017	37.64	0.074	0.075
36.60	0.039	0.018	37.66	0.075	0.077
36.62	0.039	0.019	37.68	0.076	0.078
36.64	0.040	0.020	37.70	0.076	0.080
36.66	0.040	0.020	37.72	0.077	0.081
36.68	0.041	0.021	37.74	0.078	0.083
36.70	0.041	0.022	37.76	0.079	0.085
36.72	0.042	0.023	37.78	0.079	0.086
36.74	0.042	0.024	37.80	0.080	0.088
36.76	0.043	0.025	37.82	0.081	0.089
36.78	0.044	0.025	37.84	0.082	0.091
36.80	0.044	0.026	37.86	0.082	0.093
36.82	0.045	0.027	37.88	0.083	0.094
36.84	0.045	0.028	37.90	0.084	0.096
36.86	0.046	0.029	37.92	0.085	0.098
36.88	0.046	0.030	37.94	0.085	0.099
36.90	0.047	0.031	37.96	0.086	0.101
36.92	0.048	0.032	37.98	0.087	0.103
36.94	0.048	0.033	38.00	**0.088**	**0.104**
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			

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)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
26.00	0.024	0.000	28.65	0.095	0.151
26.05	0.026	0.001	28.70	0.097	0.156
26.10	0.027	0.003	28.75	0.098	0.161
26.15	0.028	0.004	28.80	0.100	0.166
26.20	0.029	0.005	28.85	0.102	0.171
26.25	0.030	0.007	28.90	0.103	0.176
26.30	0.031	0.008	28.95	0.105	0.181
26.35	0.032	0.010	29.00	**0.107**	**0.186**
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			

Stage-Area-Storage for Pond 13:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
19.00	0.012	0.000	21.65	0.078	0.118
19.05	0.014	0.001	21.70	0.079	0.122
19.10	0.015	0.001	21.75	0.080	0.126
19.15	0.016	0.002	21.80	0.081	0.130
19.20	0.017	0.003	21.85	0.083	0.134
19.25	0.019	0.004	21.90	0.084	0.139
19.30	0.020	0.005	21.95	0.085	0.143
19.35	0.021	0.006	22.00	**0.087**	**0.147**
19.40	0.022	0.007			
19.45	0.023	0.008			
19.50	0.025	0.009			
19.55	0.026	0.011			
19.60	0.027	0.012			
19.65	0.028	0.013			
19.70	0.029	0.015			
19.75	0.031	0.016			
19.80	0.032	0.018			
19.85	0.033	0.019			
19.90	0.034	0.021			
19.95	0.035	0.023			
20.00	0.037	0.025			
20.05	0.038	0.026			
20.10	0.039	0.028			
20.15	0.040	0.030			
20.20	0.042	0.032			
20.25	0.043	0.034			
20.30	0.044	0.037			
20.35	0.045	0.039			
20.40	0.046	0.041			
20.45	0.048	0.044			
20.50	0.049	0.046			
20.55	0.050	0.048			
20.60	0.051	0.051			
20.65	0.052	0.054			
20.70	0.054	0.056			
20.75	0.055	0.059			
20.80	0.056	0.062			
20.85	0.057	0.065			
20.90	0.059	0.067			
20.95	0.060	0.070			
21.00	0.061	0.073			
21.05	0.062	0.076			
21.10	0.064	0.080			
21.15	0.065	0.083			
21.20	0.066	0.086			
21.25	0.067	0.089			
21.30	0.069	0.093			
21.35	0.070	0.096			
21.40	0.071	0.100			
21.45	0.072	0.103			
21.50	0.074	0.107			
21.55	0.075	0.111			
21.60	0.076	0.115			

Stage-Area-Storage for Pond 14:

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
16.50	0.074	0.000	19.15	0.196	0.353
16.55	0.076	0.004	19.20	0.199	0.363
16.60	0.078	0.008	19.25	0.202	0.373
16.65	0.080	0.012	19.30	0.205	0.383
16.70	0.083	0.016	19.35	0.207	0.393
16.75	0.085	0.020	19.40	0.210	0.404
16.80	0.087	0.024	19.45	0.213	0.414
16.85	0.089	0.029	19.50	0.216	0.425
16.90	0.092	0.033	19.55	0.218	0.436
16.95	0.094	0.038	19.60	0.221	0.447
17.00	0.096	0.042	19.65	0.224	0.458
17.05	0.098	0.047	19.70	0.226	0.469
17.10	0.100	0.052	19.75	0.229	0.481
17.15	0.103	0.057	19.80	0.232	0.492
17.20	0.105	0.063	19.85	0.235	0.504
17.25	0.107	0.068	19.90	0.237	0.516
17.30	0.109	0.073	19.95	0.240	0.527
17.35	0.111	0.079	20.00	**0.243**	**0.540**
17.40	0.113	0.084			
17.45	0.116	0.090			
17.50	0.118	0.096			
17.55	0.120	0.102			
17.60	0.122	0.108			
17.65	0.124	0.114			
17.70	0.126	0.120			
17.75	0.129	0.127			
17.80	0.131	0.133			
17.85	0.133	0.140			
17.90	0.135	0.146			
17.95	0.137	0.153			
18.00	0.139	0.160			
18.05	0.142	0.167			
18.10	0.144	0.174			
18.15	0.147	0.182			
18.20	0.149	0.189			
18.25	0.152	0.197			
18.30	0.154	0.204			
18.35	0.156	0.212			
18.40	0.159	0.220			
18.45	0.161	0.228			
18.50	0.164	0.236			
18.55	0.166	0.244			
18.60	0.169	0.253			
18.65	0.171	0.261			
18.70	0.174	0.270			
18.75	0.176	0.278			
18.80	0.179	0.287			
18.85	0.181	0.296			
18.90	0.183	0.305			
18.95	0.186	0.315			
19.00	0.188	0.324			
19.05	0.191	0.333			
19.10	0.194	0.343			

Stage-Area-Storage for Pond 15:

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	0.031	0.011
21.95	0.033	0.012
22.00	0.034	0.014
22.05	0.035	0.016
22.10	0.036	0.017
22.15	0.037	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	0.043	0.029
22.45	0.045	0.032
22.50	0.046	0.034
22.55	0.047	0.036
22.60	0.048	0.038
22.65	0.049	0.041
22.70	0.051	0.043
22.75	0.052	0.046
22.80	0.053	0.049
22.85	0.054	0.051
22.90	0.055	0.054
22.95	0.057	0.057
23.00	0.058	0.060
23.05	0.059	0.063
23.10	0.060	0.066
23.15	0.062	0.069
23.20	0.063	0.072
23.25	0.064	0.075
23.30	0.065	0.078
23.35	0.067	0.081
23.40	0.068	0.085
23.45	0.069	0.088
23.50	0.071	0.092
23.55	0.072	0.095
23.60	0.073	0.099
23.65	0.074	0.103
23.70	0.076	0.106
23.75	0.077	0.110
23.80	0.078	0.114
23.85	0.079	0.118
23.90	0.081	0.122
23.95	0.082	0.126
24.00	**0.083**	**0.130**

Stage-Area-Storage for Pond 16:

Elevation (feet)	Surface (acres)	Storage (acre-feet)
21.00	0.011	0.000
21.05	0.012	0.001
21.10	0.012	0.001
21.15	0.013	0.002
21.20	0.014	0.002
21.25	0.015	0.003
21.30	0.016	0.004
21.35	0.016	0.005
21.40	0.017	0.006
21.45	0.018	0.006
21.50	0.019	0.007
21.55	0.019	0.008
21.60	0.020	0.009
21.65	0.021	0.010
21.70	0.022	0.011
21.75	0.023	0.013
21.80	0.023	0.014
21.85	0.024	0.015
21.90	0.025	0.016
21.95	0.026	0.017
22.00	0.026	0.019
22.05	0.028	0.020
22.10	0.029	0.021
22.15	0.030	0.023
22.20	0.031	0.024
22.25	0.032	0.026
22.30	0.033	0.028
22.35	0.034	0.029
22.40	0.035	0.031
22.45	0.036	0.033
22.50	0.037	0.034
22.55	0.038	0.036
22.60	0.039	0.038
22.65	0.040	0.040
22.70	0.041	0.042
22.75	0.042	0.044
22.80	0.043	0.046
22.85	0.044	0.048
22.90	0.045	0.051
22.95	0.046	0.053
23.00	0.047	0.055
23.05	0.048	0.058
23.10	0.049	0.060
23.15	0.051	0.063
23.20	0.052	0.065
23.25	0.053	0.068
23.30	0.055	0.070
23.35	0.056	0.073
23.40	0.057	0.076
23.45	0.058	0.079
23.50	0.060	0.082
23.55	0.061	0.085
23.60	0.062	0.088
23.65	0.064	0.091
23.70	0.065	0.094
23.75	0.066	0.098
23.80	0.067	0.101
23.85	0.069	0.104
23.90	0.070	0.108
23.95	0.071	0.111
24.00	**0.073**	**0.115**

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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) =	0.07	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 =	0.051	
Infiltration Basin 2 =	0.164	
Infiltration Basin 3 =	0.071	
Infiltration Basin 4 =	0.251	
Infiltration Basin 5 =	0.236	
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 =	0.073	
Infiltration Basin 14 =	0.324	
Infiltration Basin 15 =	0.060	
Infiltration Basin 16 =	0.034	
Total Provided Recharge Volume =	**1.801**	**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:	NBB	CHECKED BY:	JRM
JOB:	27 Charge Pond Road PV+ES	DATE:	05/15/20	DATE:	5/22/2020

Attachment 5
Site Owner's Manual

BEALS + THOMAS

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:

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

May 28, 2020

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FIGURES

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 site plan(s) provided in the Figures section for exact location.

BMP Type	Quantity	Location
Infiltration Basin	16	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	16	$50-$100	$800-$1600
Riprap Spillway/Flared Ends	16	$200-$400	$3200-$6400
		Total	$4000-$8000

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.

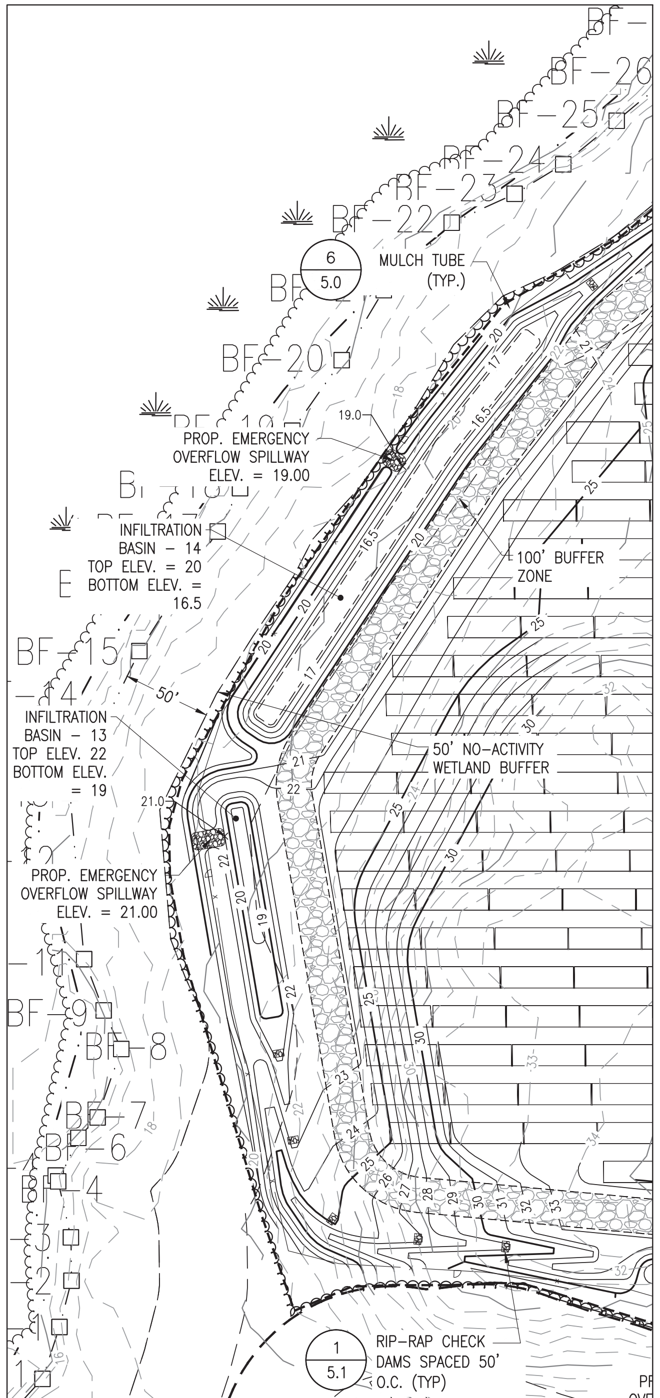
[1] Annual maintenance cost is based on estimate of the cost to complete all inspection and maintenance measures outlined in Section 4.2. For BMPs that require sediment removal at regular intervals (i.e. every 5 or 10 years), the annual cost includes the annual percentage of that cost.

Figures

Figure 1: Site Plans

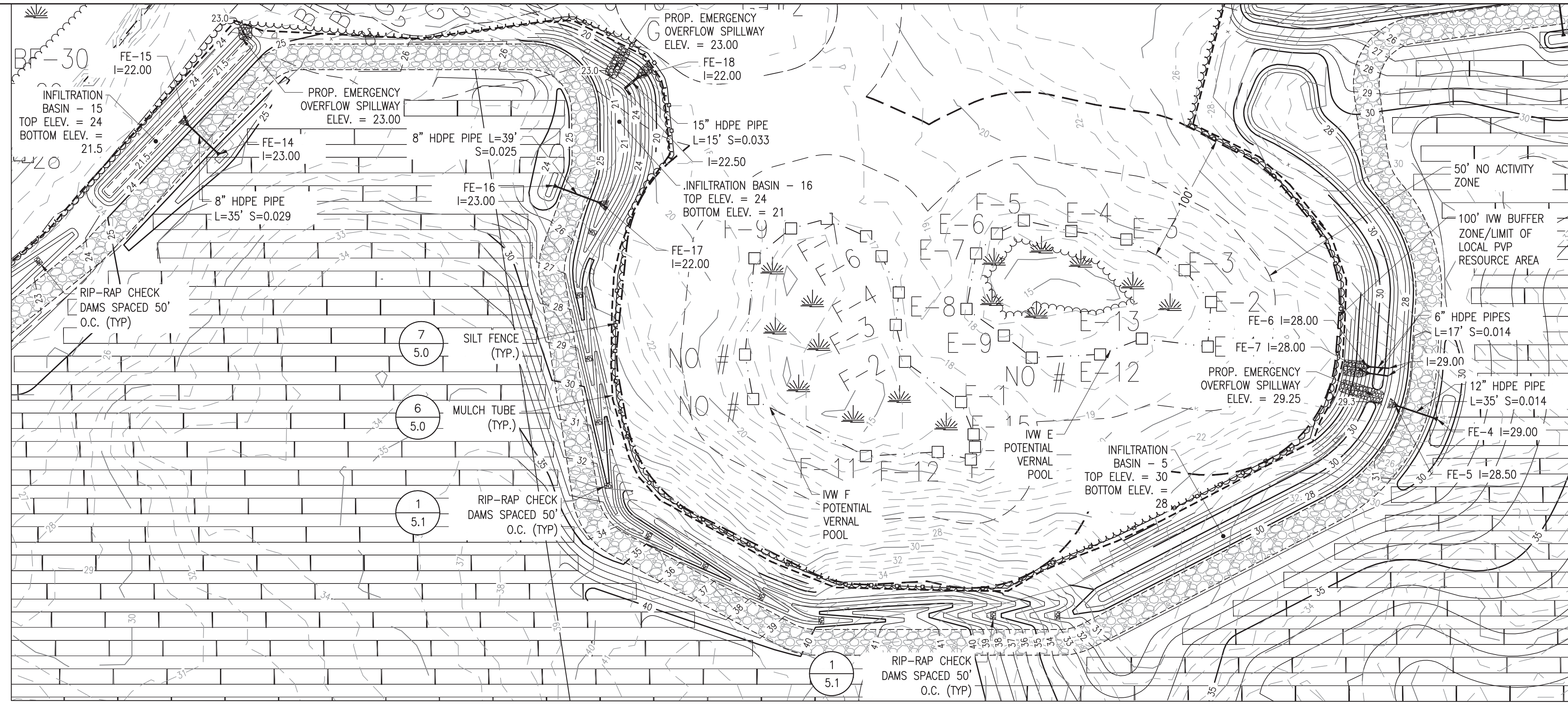
NOTE:

1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
2. THE PROPOSED ARRAY IS COMPRISED OF APPROX. 30078 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 43.9 ACRES.
4. LOAM AND SEED AREAS WITHIN THE LIMIT 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.

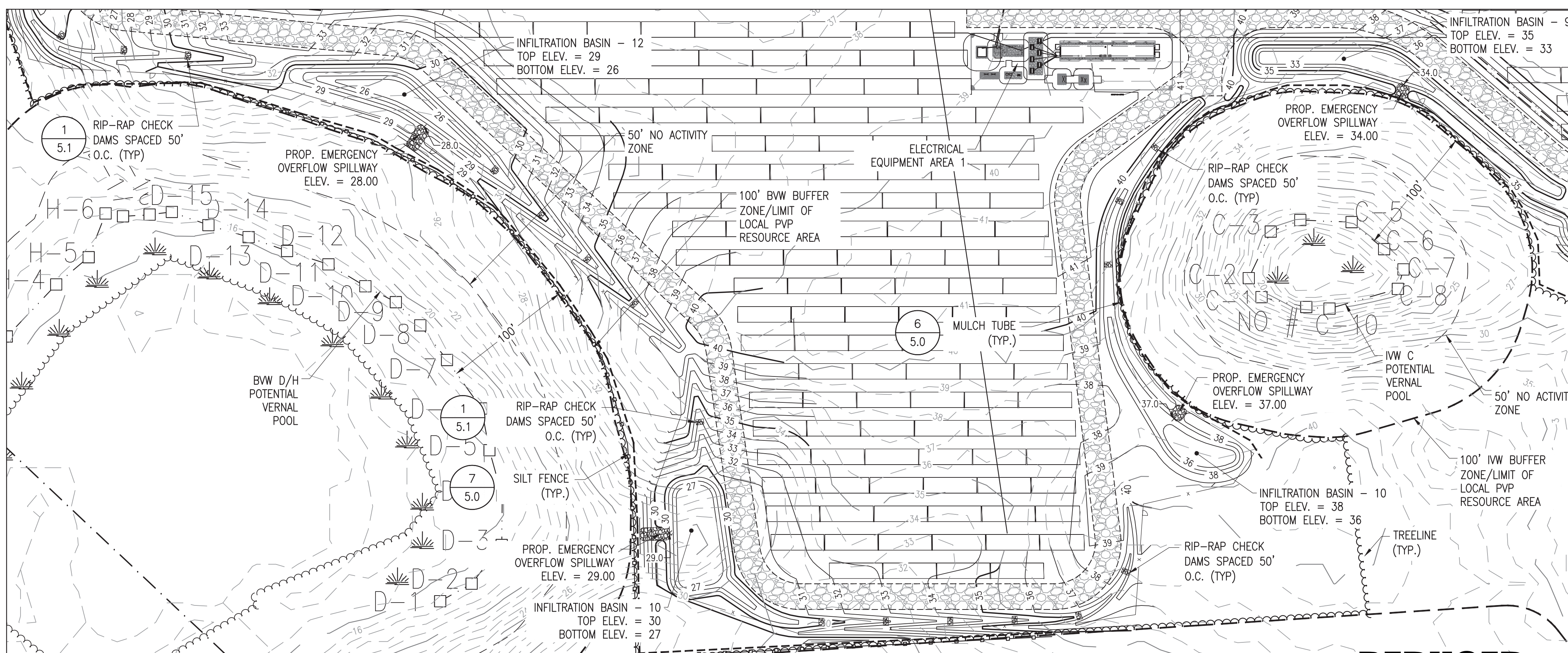


BASINS - 13, 14

SCALE: 1" = 50'



BASINS - 15, 16, 5



BASINS - 12, 11, 10, 9

REDUCED

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

Jeffrey R. Murphy 5/28/2020

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

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

C-4.3

GRADING AND EROSION CONTROL PLAN - BASINS 9 - 16

NOTE:
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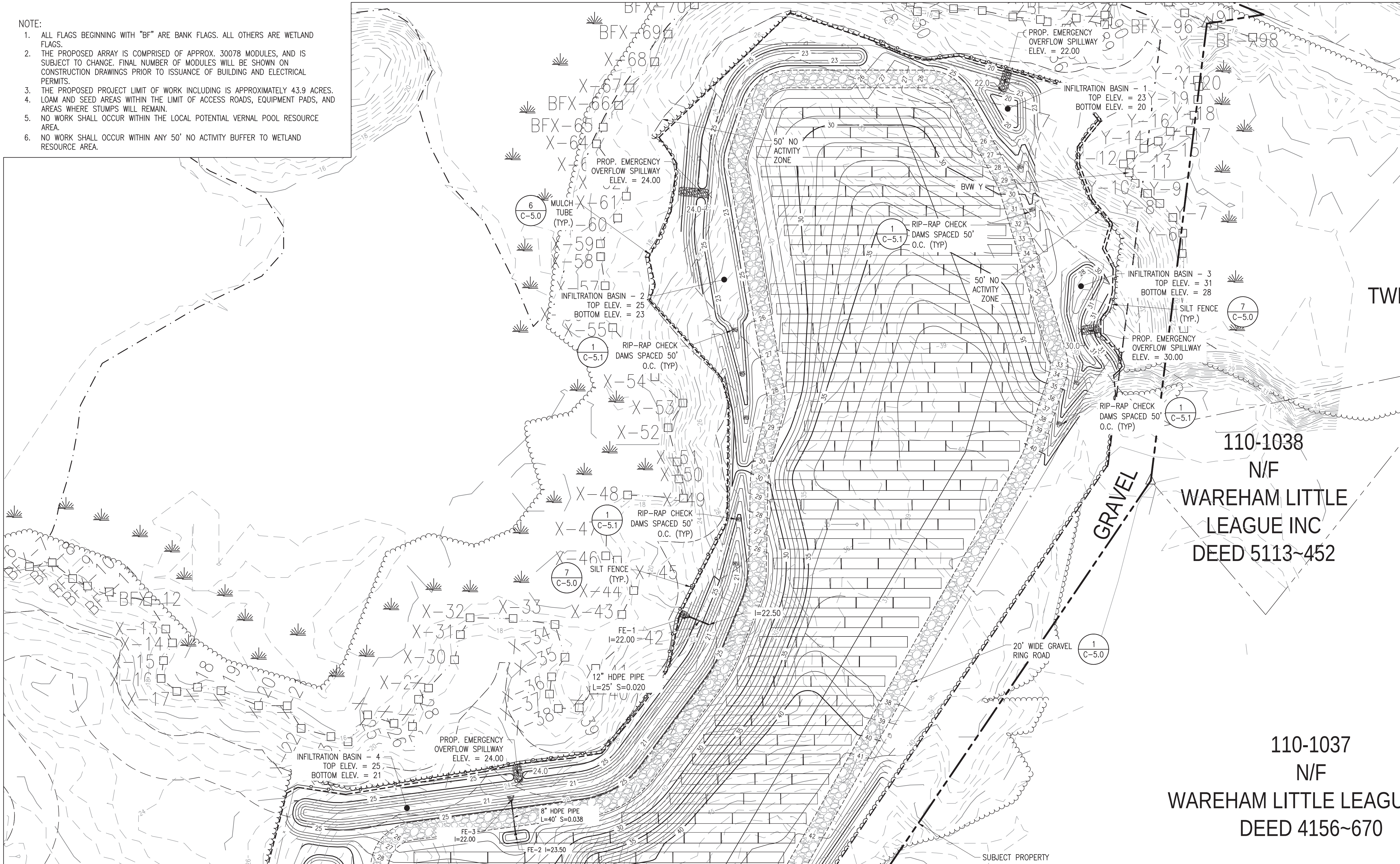
3. THE PROPOSED PROJECT LIMIT OF WORK INCLUDING IS APPROXIMATELY 43.9 ACRES.
4. LOAM AND SEED AREAS WITHIN THE LIMIT OF ACCESS ROADS, EQUIPMENT PADS, AND AREAS WHERE STUMPS WILL REMAIN.
5. NO WORK SHALL OCCUR WITHIN THE LOCAL POTENTIAL VERNAL POOL RESOURCE AREA.
6. NO WORK SHALL OCCUR WITHIN ANY 50' NO ACTIVITY BUFFER TO WETLAND RESOURCE AREA.



REDUCED

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

SCALE: 1" = 50'

0 50' 100'

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

C-4.4

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

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

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COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
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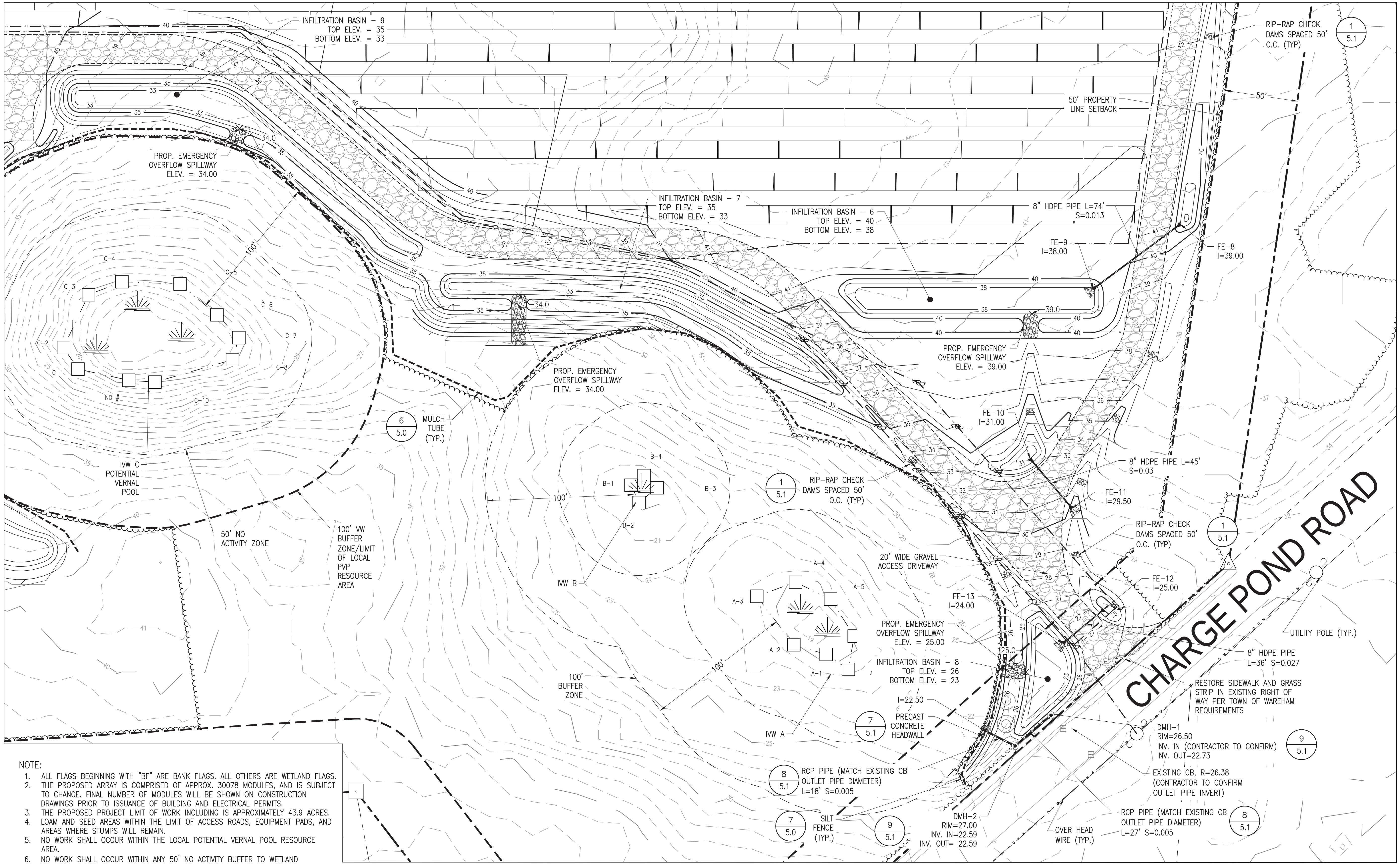
Jeffrey R. Murphy
5/28/2020



NOTE:
1. ALL FLAGS BEGINNING WITH "BF" ARE BANK FLAGS. ALL OTHERS ARE WETLAND FLAGS.
2. THE PROPOSED ARRAY IS COMPRISED OF APPROX. 30078 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 43.9 ACRES.
4. LOAM AND SEED AREAS WITHIN THE LIMIT 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.

N

REDUCED

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

SCALE: 1" = 30'

0 30' 60'

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

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

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

May 28, 2020

TABLE OF CONTENTS

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

DRAFT

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

<table>
<tr><th colspan="4">General Information</th></tr>
<tr><td>Project Name</td><td colspan="3"></td></tr>
<tr><td>NPDES Tracking No.</td><td></td><td>Location</td><td></td></tr>
<tr><td>Date of Inspection</td><td></td><td>Start/End Time</td><td></td></tr>
<tr><td>Inspector’s Name(s)</td><td colspan="3"></td></tr>
<tr><td>Inspector’s Title(s)</td><td colspan="3"></td></tr>
<tr><td>Inspector’s Contact Information</td><td colspan="3"></td></tr>
<tr><td>Inspector’s Qualifications</td><td colspan="3"></td></tr>
<tr><td>Describe present phase of construction</td><td colspan="3"></td></tr>
<tr><td colspan="4">Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event</td></tr>
<tr><th colspan="4">Weather Information</th></tr>
<tr><td colspan="4">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):</td></tr>
<tr><td colspan="4">Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:</td></tr>
<tr><td colspan="4">Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:</td></tr>
<tr><td colspan="4">Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:</td></tr>
</table>

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

Section 5.0
Solar Documentation

Operation and Maintenance Plan

Decommissioning Plan

Proof of Notification to Utility Company

Documentation of Major System Components

One-Line Electrical Diagram

5.0 SOLAR DOCUMENTATION

Standard Operation and Maintenance Procedures

Item	Preventative Maintenance Service Description	Frequency/Months Assigned
1	Visual inspection of general site conditions, PV arrays, electrical equipment, mounting structure, fence, gate, shading, vegetation, animal damage, erosion, corrosion, and discolored panels.	Bi-Annually
2	Visual inspection and correction of facility for loose electrical connections and ground connections.	Bi-Annually
3	Visual inspection of all medium voltage transformers, including meters, oil gage, and temperature gauge.	Annually
4	String level open circuit voltage, DC operating current tests, and I-V curve traces on 10% of strings.	Annually
5	Switches and disconnects test to ensure they are not jammed.	Bi-Annually
6	Infrared scans on all combiner and re-combiner boxes; tighten connections; report broken terminal blocks.	Bi-Annually
7	Sensors and meters, including pyranometers, anemometers, and tilt sensors.	Annually
8	Inverter preventative maintenance for inverters per manufacturer’s operating guidelines.	Bi-Annually
9	PV array module maintenance.	See below
10	Wash all panels with clear water.	Bi-Annually
11	Perform infrared scan of 10% of modules indicated above for two types of circuitry connections: cells on the front and junction boxes on the back.	Annually
12	Vegetation mitigation within facility area, as applicable.	Annually
13	Written preventative maintenance report.	Bi-Annually
14	Inspect screening trees, as applicable. Replace as necessary.	Annually
15	Snow removal on access road.	6”+ accumulation

Decommissioning Estimate

Date: 05/26/20

27 Charge Pond Road
Wareham, MA

This Decommissioning Estimate has been prepared by Borrego Solar in an attempt to predict the cost associated with the removal of the proposed solar facility. Key assumptions used include the fact that the fencing, electrical cabinetry, solar racks, solar panels, wiring and all other equipment are all one hundred percent recyclable, therefore, the primary cost of decommissioning is the labor to dismantle and load as well as the cost of trucking. No salvage values have been assumed in these calculations. The concrete pads will be broken up at the site and hauled to the nearest transfer station where it will be accepted without a charge.

The following values were used in this Decommissioning Estimate:

System Specifications	
Number of Modules	30,078
Number of Racks	1,253
Number of Inverters	2
Number of Transformers	2
Electrical Wiring Length (ft)	6,500
Number of Foundation Screws	5,013
Length of Perimeter Fence (ft)	8,342
Number of Power Poles	12
Access Rd Material Volume (YD)	6,400
Total Disturbed Area (SF)	175,693
Total Fence Weight (lbs)	5,923
Total Racking Weight (lbs)	1,065,263
Total Foundation Screw Weight (lbs)	200,520

Labor and Equipment Costs		
Labor Rate ($/hr)	$	25.00
Bobcat Cost ($/hr)	$	50.00
Front End Loader Cost ($/Day)	$	1,000.00
Excavator Cost ($/Day)	$	1,000.00
Trucking Cost ($/hr)	$	120.00
Backhoe Cost ($/hr)	$	245.00
Power Pole Removal Cost ($/pole)	$	1,500.00
Grader Cost ($/day)	$	1,800.00
Gravel Export Cost ($/YD)	$	10.00
Loam Import Cost ($/YD)	$	25.00
Seeding Cost ($/SF)	$	0.08
Fuel Cost ($/mile)	$	0.25

Equipment & Material Removal Rates	
Module Removal Rate (min/module)	1
Rack Wiring Rem. Rate (min/mod)	0.5
Racking Dismantling Rate (min/rack)	30
Inverter Removal Rate (units/hr)	1
Transformer Removal Rate (units/hr)	0.5
Rack Loading Rate (min/Rack)	15
Elect. Wiring Removal Rate (min/LF)	0.5
Screw Rem. Rate (screws/day)	500
Fence Removal Rate (min/LF)	0.5
Days req. to break up concrete pads	3
Days req. with Rough Grader	3
Days req. with Fine Grader	5
Total Truckloads Required	79
Round-Trip Dist. to Trans. Sta.(miles)	7
Round-Trip Time to Trans. Sta. (hr)	0.25

Energy Storage Decommissioning		
Number of Energy Storage Units		2
Battery Disposal Fee	$	2,000.00
Battery Loading Prep Time (hr)		32
Battery Loading Time (hr)		8

BORREGO SOLAR

27 Charge Pond Road
Wareham, MA

Labor, Material, and Equipment Costs

1. Remove Modules

The solar modules are fastened to racking with clamps. They slide in a track. A laborer needs only unclamp the module and reach over and slide the module out of the track.

Module Removal Rate • Total Number of Solar Modules • Labor Rate =
Module Removal Cost

Total = $ 12,532.50

2. Remove Rack Wiring

The modules are plugged together in the same manner as an electrical cord from a light is plugged into a wall socket. The string wires are in a tray. A laborer needs only unplug the module, reach into the tray and remove the strands of wire.

Wire Removal Rate • Total Number of Solar Modules • Labor Rate =
Rack Wiring Removal Cost

Total = $ 6,266.25

3. Dismantle Racks

The racking is supported by screw foundations. The racking will be disconnected from the foundation and removed seperately.

Number of Racks • Rack Dismantling Rate • Labor Rate =
Rack Dismantling Cost

Total = $ 15,665.63

4. Remove and Load Electrical Equipment

Electrical equipment includes transformers and inverters.

(Number of Inverters • Inverter Removal Rate + Number of Transformers • Transformer Removal Rate) • (Labor Rate + Bobcat Cost) =
Electrical Equipment Removal Cost

Total = $ 225.00

5. Break Up Concrete Pads

Concrede pads are broken up using an excavator and jackhammer.

Number of Demolition Days • (Excavator Cost + Labor Cost) =
Total Concrete Pad Removal

Total = $ 3,600.00

BORREGO SOLAR

27 Charge Pond Road
Wareham, MA

6. Load Racks

Once the racks have been dismantled, they will be loaded onto trucks for removal from the site. The trucking cost associated with this line item represents the additional time a truck will be needed during loading. Please see item # 13 for additional trucking costs.

Number of Racks • Rack Loading Rate • (Labor Cost + Front End Loader Cost + Trucking Cost) = Total Rack Removal Cost

Total = $ 61,095.94

7. Remove Electrical Wiring

Electrical wiring will be removed from all underground conduits.

Cable Length • Cable Removal Rate • (Labor Cost + Backhoe Cost) = Total Cable Removal Cost

Total = $ 14,625.00

8. Remove Foundation Screws

Foundation screws will be backed out of the ground and loaded onto a truck to be removed from site.

(Total Number of Screws / Daily Screw Removal Rate) • (Labor Rate + Excavator Cost) = Total Screw Removal Cost

Total = $ 12,031.20

9. Remove Fencing

Fencing posts, mesh, and foundations will be loaded onto a truck and removed from site. Trucking costs included in this line item are for the removal process. Trucking to a recycling facility are included in item #13.

(Total Length of Fence • Fence Removal Rate) • (Labor Rate + Bobcat Cost + Trucking Cost) =

Total = $ 13,555.75

10. Remove Power Poles

Power poles will be removed and shipped off site.

Number of Power Poles • Pole Removal cost = Total Power Pole Removal Cost

Total = $ 18,000.00

11. Seed Disturbed Areas

Seeding cost includes labor and materials for reseeding all disturbed areas including the reclaimed gravel road area, former electrical areas, and areas disturbed by racking foundation removal.

Seeding Cost • Disturbed Area =
Total Seeding Cost

Total = $ 14,055.46

12. Truck to Transfer Station

All material will be trucked to the nearest Transfer station that accepts construction material.

The nearest transfer station is Wareham Town Recycling

(Total Truckloads • Roundtrip Distance • Fuel Cost) + (Total Truckloads • Round Trip Time • Trucking Cost) =
Total Trucking Cost to Transfer Station

Total = $ 2,508.25

13. Remove and Dispose of Energy Storage Equipment

The battery units will be prepared for shipment and loaded onto a truck. A disposal fee will also be required for the disposal company to accept the batteries.

Number of Battery Units • ((Loading Prep Time • Labor Cost) + Loading Time • (Labor Rate + Bobcat Cost + Trucking Cost) + Disposal Fee) =
Total Energy Storage Removal and Disposal Cost

Total = $ 8,720.00

27 Charge Pond Road
Wareham, MA

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27 Charge Pond Road
Wareham, MA

Summary of Decommissioning Costs

Line Item	Task	Cost
1	Module Removal	$ 12,532.50
2	Rack Wiring Removal	$ 6,266.25
3	Rack Dismantling	$ 15,665.63
4	Electrical Equipment Loading and Removal	$ 225.00
5	Break Up Concrete Pads	$ 3,600.00
6	Load Racks	$ 61,095.94
7	Electrical Wiring Removal	$ 14,625.00
8	Foundation Screw Removal	$ 12,031.20
9	Fence Removal	$ 13,555.75
10	Power Pole Removal	$ 18,000.00
11	Seed Disturbed Areas	$ 14,055.46
12	Trucking to Transfer Station	$ 2,508.25
13	Energy Storage System Removal	$ 8,720.00
	Subtotal =	$ 182,880.97

Present Value Total with 1.25% Adder = $ 228,601.21

Total after 20 years @ 1.5% Inflation

Present Value • (1+ Inflation Rate)^Number of Years = Future Value

Grand Total = $307,892.69

EVERSOURCE

Generating Facility Expedited/Standard Process

Interconnection Application

Contact Information: Date Prepared: _____

Legal Name and address of Interconnecting Customer

Interconnecting Customer (print): 510 PV Project Development, LLC_Contact Person: Brendan Neagle

Mailing Address: 360 22nd St, Suite 600 ____

City: Oakland____________________________State: CA____________ Zip Code: 94612____________

Telephone (Daytime): 978-513-2613_______________ (Evening): _________________________________

Facsimile Number: 888-843-6778_________________ E-Mail Address: bneagle@BorregoSolar.com___

Customer name (if Customer is not Interconnecting Customer) __________________________________

Customer email: _____________________________ Customer telephone: ___________________________

Customer Mailing Address: ____

City: _____________________________________State: __________________ Zip Code: ________________

Landowner name (if neither Interconnecting Customer nor Customer) ___________________________

Landowner email: __________________________Landowner telephone: ___________________________

Landowner Mailing Address: ____

City: ____________________________________State: _________________ Zip Code: __________________

Alternative Contact Information
(e.g., system installation contractor or coordinating company, if appropriate):

Name: Borrego Solar Systems, Inc. - Contact Person: Christian Bain ________________________

Mailing Address: 55 Technology Dr. Suite 102 ____

City: Lowell____________________________State: MA___________ Zip Code: 01851 ________

Telephone (Daytime): 978-221-3102_____________ (Evening): ___________________________

Facsimile Number: 888-843-6778_______________ E-Mail Address: intx-ma@BorregoSolar.com

Ownership (include % ownership by any electric utility): 100 ______________________________

Site Control? (Y/N) Y

Will Facility be constructed on a single parcel of land? (Y/N) Y

Authorized/Proposed generation capacity already exists (check all that apply):

☐ On Current Account ☐ On Same Legal Parcel of Land ☐ In Same Building/Structure

If any apply, include existing generation capacity on design diagrams, and provide Application Number(s): ____

Confidentiality Statement: "I agree to allow information regarding the processing of my application (without my name and address) to be reviewed by the Massachusetts DG Working Group that is exploring ways to further expedite future interconnections." Yes ☒ No ☐

Group Study Agreement: "I understand and agree if my project becomes part of a Group Study, the Company is authorized to share my contact information and project details with other parties that are also involved in the Group Study."

Generating Facility Information

Please provide all Pre-Application Reports (either mandatory or optional) as attachments. This is mandatory for systems greater than or equal to 500 kW.

Address of Facility: 27 CHARGE POND RD ____

City: WAREHAM____________________________State: MA___________ Zip Code: 02571 ___

Electric Distribution Company: Eversource ____

Account Number: ____

Meter Number: ____

EVERSOURCE

System Design Capacity: Nominal 5000 (kW) 5000 (kVA)

Maximum 5000 (kW) 5000 (kVA)

For Solar PV provide the DC-STC rating: 7,515.59 (kW_{DC})

Type of Generating Unit: Synchronous _____ Induction _____ Inverter x

Manufacturer: Power Electronics________________________ Model: HEMK / PCSK _________

Prime Mover: ☐ Fuel Cell ☐ Reciprocating Engine ☐ Gas Turbine ☐ Steam Turbine

☐ Microturbine ☒ Photovoltaic Other Energy Storage______________________

Energy Source: ☒Solar ☐ Wind ☐Hydro ☐ Diesel ☐ Natural Gas ☐ Fuel Oil

Other Li-ion______________________ (Please Specify)

For Solar PV provide the DC-STC rating: 7,515.59 (kW)

IEEE 1547.1 (UL 1741) Listed? Yes ☒___________ No ☐___________

1) Generating Unit Type 1

Manufacturer: Power Electronics_____ Model Name and Number: HEMK FS3000_ Quantity: 1

Single ☐ or Three ☒ Phase

AC Rating: Nominal: 3000 (kW) 3000 (kVA) 600 (AC Volts)

Maximum: 3000 (kW) 3000 (kVA) 600 (AC Volts)

2) Generating Unit Type 2 (if applicable)

Manufacturer: Power Electronics_____ Model Name and Number: HEMK FS2000_ Quantity: 1

Single ☐ or Three ☒ Phase

AC Rating: Nominal: 2000 (kW) 2000 (kVA) 600 (AC Volts)

Maximum: 2000 (kW) 2000 (kVA) 600 (AC Volts)

3) Generating Unit Type 3 (if applicable)

Manufacturer: Power Electronics__ Model Name and Number: PCSK FP3000K____ Quantity: 1

Single ☐ or Three ☒ Phase

AC Rating: Nominal: 3000 (kW) 3000 (kVA) 600 (AC Volts)

Maximum: 3000 (kW) 3000 (kVA) 600 (AC Volts)

Need an air quality permit from DEP? Yes ☐ No ☒ Not Sure ☐

If "yes", have you applied for it? Yes ☐ No ☐

Planning to Export Power? Yes ☒ No ☐ A Cogeneration Facility? Yes☐ No ☒

Anticipated Export Power Purchaser: EVERSOURCE ____________________________________

Export Form? Simultaneous Purchase/Sale ☐ Net Purchase/Sale ☐ Net Metering ☒

Other (Specify) ____

If net metering, please refer to Schedule Z of the Standards for Interconnection of Distributed Generation.Please note that if under the public cap, all off-takers must be a Municipality or Other Governmental Entity (as defined in 220 C.M.R. 18.02) and therefore be certified by the DPU.

Est. Install Date: 8/29/19___ Est. In-Service Date: 10/29/19__ Agreement Needed By: 6/29/19 __

Application Process

I am opting to forego the Expedited Process. Please review this application under the Standard Process.   Yes ☒   No ☐

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true:

Interconnecting Customer
Signature: Christian Bain Title: Interconnection Coordinator Date: 5/8/19

The information provided in this application is complete:

Company
Signature: Christian Bain Title: Interconnection Coordinator Date: 5/8/19

Generating Facility Technical Detail

Information on components of the generating facility that are currently Listed

	Equipment Type	Manufacturer	Model	National Standard
1.	Modules	JA SOLAR	JAM72S01-385	UL1703
2.	Inverters	Power Electronics	HEMK / PCSK	UL1741
3.	GSU Transformers	Cooper Power	Padmount	ANSI C57
4.	Protective Relay	Schweitzer	SEL-651R	ANSI C37.90,C37.90.1
5.				
6.				

Total Number of Generating Units in Facility? 3

Generator Unit Power Factor Rating: >99%

Max Adjustable Leading Power Factor? 0.8 Max Adjustable Lagging Power Factor? 0.8

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? 5295 Instantaneous ☐ or RMS? ☒

Harmonics Characteristics: <3%

Start-up power requirements: ______

Generator Characteristic Data (for all rotating machines)

Rotating Frequency: _____ (rpm)   Neutral Grounding Resistor (If Applicable): _____

Additional Information for Synchronous Generating Units

Synchronous Reactance, Xd: _____ (PU)   Transient Reactance, X'd: _____ (PU)
Subtransient Reactance, X'd: _____ (PU)   Neg Sequence Reactance, X2: _____ (PU)
Zero Sequence Reactance, Xo: _____ (PU)   kVA Base: _____
Field Voltage: _____ (Volts)   Field Current: _____ (Amps)

Additional information for Induction Generating Units

Rotor Resistance, Rr: _____   Stator Resistance, Rs: _____
Rotor Reactance, Xr: _____   Stator Reactance, Xs: _____
Magnetizing Reactance, Xm: _____   Short Circuit Reactance, Xd": _____
Exciting Current: _____   Temperature Rise: _____
Frame Size: _____
Total Rotating Inertia, H: _____   Per Unit on kVA Base: _____
Reactive Power Required In Vars (No Load): _____
Reactive Power Required In Vars (Full Load): _____

Additional information for Induction Generating Units that are started by motoring

Motoring Power: _____ (kW)   Design Letter: _____

Interconnection Equipment Technical Detail   Date:______

Will a transformer be used between the generator and the point of interconnection?
Yes ☐   No ☐

Will the transformer be provided by Interconnecting Customer?   Yes ☐   No ☐

Transformer Data (if applicable, for Interconnecting Customer-Owned Transformer):

Nameplate Rating: _____ (kVA)   Single ☐ or Three ☐ Phase

Transformer Impedance: _____ (%) on a _____ kVA Base

If Three Phase:
Transformer Primary: _____ (Volts) ☐ Delta ☐ Wye ☐ Wye-Grounded _____ Other
Transformer Secondary: _____ (Volts) ☐ Delta ☐ Wye ☐ Wye-Grounded _____ Other
PCS Secondary: _____ (Volts) ☐ Delta ☐ Wye ☐ Wye-Grounded _____ Other

Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):
(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

Manufacturer: _____ Type: _____ Size: _____ Speed: _____

Interconnecting Circuit Breaker (if applicable):

Manufacturer: _____________ Type: ______________ Load Rating: _____ (Amps)

Interrupting Rating: _____ (Amps) Trip Speed: _____ (Cycles)

Interconnection Protective Relays (if applicable):
(If microprocessor-controlled)

List of Functions and Adjustable Setpoints for the protective equipment or software:

	Setpoint Function	Minimum	Maximum
1.	Under Frequency	57.0Hz (0.16 sec)	58.5 Hz (100 sec)
2.	Over Frequency	60.5 Hz (0.16 sec)	65.0 Hz (inst)
3.	Under Voltage	50% nom (0.16 sec)	88% nom (2 sec)
4.	Over Voltage	110% nom (1 sec)	120% nom (0.16 sec)
5.			
6.			

(If discrete components)

(Enclose copy of any proposed Time-Overcurrent Coordination Curves)

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

Manufacturer: ________ Type: _______ Style/Catalog No.: ______ Proposed Setting: _____

<u>Current Transformer Data (if applicable):</u>

(Enclose copy of Manufacturer's Excitation & Ratio Correction Curves)

Manufacturer: ________ Type: ______ Accuracy Class: _____

Proposed Ratio Connection: _____

Manufacturer: ________ Type: ______ Accuracy Class: _____

Proposed Ratio Connection: _____

<u>Potential Transformer Data (if applicable):</u>

Manufacturer: ________ Type: _______ Accuracy Class: ______

Proposed Ratio Connection: ____

Manufacturer: ________ Type: ______ Accuracy Class: _____

Proposed Ratio Connection: _____

General Technical Detail Date: _____

Enclose 3 copies, or send 1 electronic copy, of site electrical One-Line Diagram showing the configuration of all generating facility equipment, current and potential circuits, and protection and control schemes with a Massachusetts registered professional engineer (PE) stamp. Enclose 3 copies, or send 1 electronic copy, of any applicable site documentation that indicates the precise physical location of the proposed generating facility (e.g., USGS topographic map or other diagram or documentation).

Proposed Location of Protective Interface Equipment on Property:
(Include Address if Different from Application Address)

See Site Layout ____

____

Enclose copy of any applicable site documentation that describes and details the operation of the protection and control schemes.

Enclose copies of applicable schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).

When mailing application fee checks, please enclose a copy of this signed interconnection application form with the payment.Please enclose any other information pertinent to this Facility.

TECHNICAL CHARACTERISTICS HEMK 600V

		FRAME 1	FRAME 2
REFERENCE		**FS2125K**	**FS3190K**
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	2125	3190
	AC Output Power(kVA/kW) @40°C [1]	2200	3300
	Max. AC Output Current (A) @40°C	2117	3175
	Operating Grid Voltage(VAC) [2]	600V ±10%	
	Operating Grid Frequency(Hz)	50Hz/60Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi) [3]	0.5 leading … 0.5 lagging adjustable / Reactive Power injection at night	
INPUT	MPPt @full power (VDC)	849V-1310V	
	Maximum DC voltage	1500V	
	Number of PV inputs [2]	Up to 36	
	Number of Freemaq DC/DC inputs [4]	Up to 6	
	Max. DC continuous current (A) [4]	2645 / 5000 optional	3970 / 6000 optional
	Max. DC short circuit current (A) [4]	4000 / 10000 optional	6000 / 12000 optional
EFFICIENCY & AUXILIARY SUPPLY	Efficiency (Max) (η)	98.8% (preliminary)	
	Euroeta (η)	98.4% (preliminary)	98.6% (preliminary)
	Max. Power Consumption (KVA)	8	10
CABINET	Dimensions [WxDxH] (ft)	12 x 7 x 7	
	Dimensions [WxDxH] (m)	3.7 x 2.2 x 2.2	
	Weight (lb)	12125	12677
	Weight (kg)	5500	5750
	Type of ventilation	Forced air cooling	
ENVIRONMENT	Degree of protection	NEMA 3R - IP54	
	Permissible Ambient Temperature	-35°C to +60°C / >50°C Active Power derating	
	Relative Humidity	4% to 100% non condensing	
	Max. Altitude (above sea level)	2000m; >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display	
	Communication protocol	Modbus TCP	
	Plant Controller Communication	Optional	
	Keyed ON/OFF switch	Standard	
PROTECTIONS	Ground Fault Protection	GFDI and Isolation monitoring device	
	General AC Protection	Circuit Breaker	
	General DC Protection	Fuses	
	Overvoltage Protection	AC, DC Inverter and auxiliary supply type 2	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-16, UL62109-1, IEC62109-1, IEC62109-2	
	Compliance	NEC 2017 / IEC	
	Utility interconnect	EEE 1547.1-2005 / UL1741SA-Feb. 2018 / IEC62116:2014	

Marvair® ComPac® I ComPac® II

PRODUCT DATA SHEET

1 to 6 Ton Vertical Wall Mount Air Conditioners

Models AVPA12-20-24-30-36-42-48-60-72 (Single Stage Compressor)
Models AVHA20-24-30-36-42-48-60-72 (Single Stage Compressor)
Models HVEA24-30-36-42-49-60 (Single Stage Compressor)
Models HVESA36-42-49-60 (2-Stage Compressor)

Designed, Engineered & Assembled In the USA

AVPA36ACA-100C

General Description

Used primarily to cool electronic and communication equipment shelters, Marvair® ComPac® I and ComPac® II air conditioners are problem solvers for a wide range of conditions and applications. Due to the high internal heat load, these shelters require cooling even when outside temperatures drop below 60°F (15°C). The ComPac I and ComPac II air conditioners have the necessary controls and components for operation during these (less than 60°F [15°C]) temperatures. All models use the non-ozone depleting R-410A refrigerant.

The primary difference between the ComPac I and the ComPac II units is that the ComPac® II air conditioner has a factory installed economizer. When ambient conditions are cool and dry, the economizer uses outside air to cool the shelter. The economizer provides temperature control, energy cost savings, and increased reliability by decreasing the operating hours of the compressor and the condenser fan. To insure proper operation and optimum performance, all economizers are non-removable, factory installed and tested. In addition, factory and field installed accessories can be used to meet specific requirements.

➤ Standard Efficiency Models

AVPA: Marvair's most popular model with an Energy Efficiency Ratio (EER) of 9.0 to 10.0. The ComPac AVPA is available in cooling capacities of 1, 1.5, 2, 2.5, 3, 3.5, 4, 5 and 6 tons (12,000 BTUH to 72,000 BTUH).

➤ High Efficiency Models

HVEA: Marvair's most efficient wall mount air conditioners. Electronically commutated indoor fan motors combined with highly efficient scroll compressors result in Energy Efficiency Ratios (EER's) of up to 11.75.

AVHA: ComPac models with an EER of 10.0. The AVPA72 is also rated 10 EER.

➤ 2-Stage Compressor Models

HVESA: ComPac models 36-42-49-60 have a 2-stage compressor with first stage cooling approximately 65% of the total cooling capacity. The 2-stage compressor provides lower start-up amps which can be critical when operating with a generator. The two stage compressor can also reduce energy costs and is able to more precisely match the cooling capacity of the air conditioner with the heat load in the shelter. *Both ComPac I and ComPac II units are available with 2 stage compressors.*

AHRI CERTIFIED® www.ahridirectory.org

Intertek

Registered to ISO 9001

Features and Benefits

Built-In Energy Savings

- *Optional Factory Installed Economizer*
- *Three Model Lines to Meet Any Budget and Efficiency Requirements*
- *Available EER of up to 11.75*
- *Available 2-Stage Compressor on HVESA Models*

R-410A Refrigerant

- *Efficient Heat Release*
- *Non-Ozone Depleting Refrigerant*
- *Synthetic Lubricant*
- *Reduced Compressor Wear*

High Efficiency and Reliability

- *High Efficiency Compressor and Lanced Coil Fins*
- *High/Low Pressure Switches with Lockout & Short Cycle Protection*

Ease of Installation and Service

- *Side Access Panels for Power Connections*
- *Built-In Mounting Flanges and Iternal Disconnect*
- *Standard Access Valves and Filters, Status LEDs*

Safety Listed and Energy Certified

All ComPac air conditioners are built to UL standard 1995, 4th edition and CAN/CSA C22.2, No. 236-11. For energy efficiency and performance, the units are tested and rated in accordance to the ANSI/ARI (Air-Conditioning and Refrigeration Institute) Standard 390- 2003 (Single Package Vertical Units). All units meet or exceed the efficiency requirements of ANSI/ASHRAE/IESNA 90.1.2010. The ComPac I and ComPac II air conditioners are commercial units and are not intended for use in residential applications.

Standard Features

➤ Designed for Operation in Low Ambient Conditions

- Low ambient control cycles condenser fan to maintain proper refrigerant pressures. Allows operation in mechanical cooling (compressor) of our standard air conditioners down to 20°F (-7°C). With the Extreme Duty option, the units will operate down to 0°F (-18°C). Note: low temperature operation is affected by ambient conditions, e.g. wind and humidity.
- Three minute by-pass of the low pressure switch for start-up of compressor when outdoor temperatures are below 55°F (13°C).
- Factory built-in economizer.*

➤ High Efficiency

- High efficiency compressor.
- Lanced fins standard on all evaporator and condenser coils.

➤ Built-in Reliability

- High pressure switch and low pressure switch with lockout protects refrigerant circuit.
- Adjustable .03 to ten minute delay on make for short cycle protection.

➤ Remote Alarm Capability

- Dry contacts can be used for remote alarm or notification upon air conditioner lockout.

➤ Ease of Service

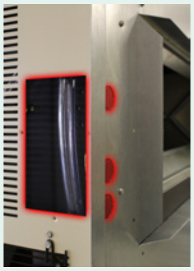
- Service access valves are standard.
- Standard 2" (50 mm) pleated filter with a MERV rating of 8 changeable from outside.
- All major components are readily accessible.
- Front Control Panel allows easy access and complies with NEC clearance codes on redundant side-by-side systems.
- LEDs indicate operational status and fault conditions.
- Foil backed insulation on the indoor air path.
- A minimum position potentiometer that can be adjusted to prevent the economizer damper from closing completely. This control ensures that whenever the evaporator fan is operating, fresh air is being introduced into the building.

➤ Rugged Construction

- Copper tube, aluminum fin evaporator & condenser coils.
- Field or factory installed heaters on discharge side of evaporator coil (optional)
- Baked on neutral beige finish over galvanneal steel for maximum cabinet life. (Other finishes are available.)

➤ Ease of Installation

- Sloped top with flashing eliminates need of rainhood.
- Built-in mounting flanges facilitate installation and minimize chance of water leaks.
- Supply and return openings exactly match previous models.
- Factory installed disconnect on all units.
- Single Point Power Entry complies with latest edition of U.L. Standard 1995.
- Side access panels for easy access to electrical connections.



*ComPac® II air conditioner only

A Marvair® First – Factory Installed Economizer

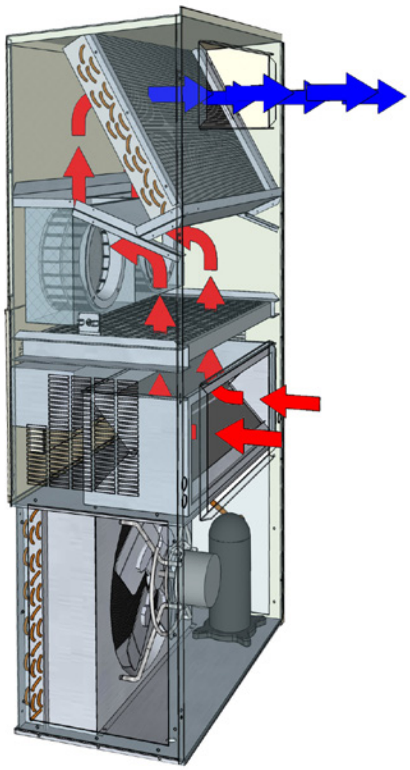
Marvair's ComPac® II air conditioner has been the industry standard since its introduction in 1986. Tens of thousands of ComPac II air conditioners are in operation from the metropolitan areas of North America to the deserts of the Mid-East to the Siberian tundra. Here's how the economizer works:

On a signal from the wall mounted indoor thermostat that cooling is required, either mechanical cooling with the compressor or free cooling with the economizer is provided. A factory installed enthalpy controller determines whether the outside air is sufficiently cool and dry to be used for cooling. If suitable, the compressor is locked out and the economizer damper opens to bring in outside air. Integral pressure relief allows the interior air to exit the shelter, permitting outside air to enter the shelter. The temperature at which the economizer opens is adjustable from 63°F (17°C) at 50% Relative Humidity to 73°F (23°C) at 50% Relative Humidity.

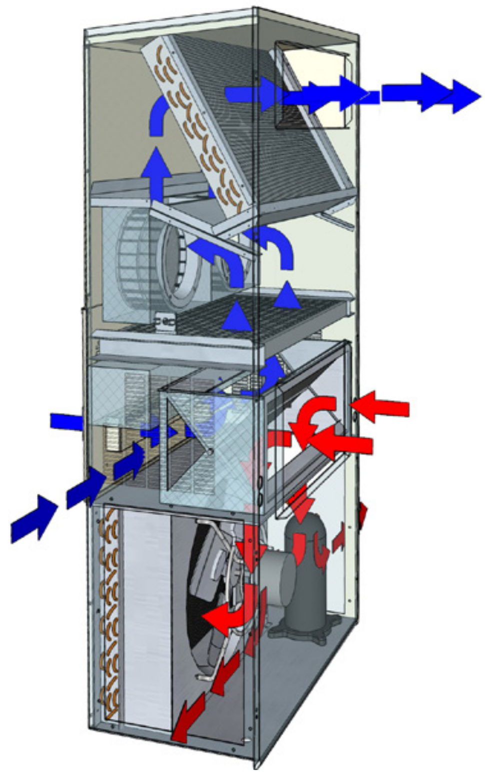
After the enthalpy control has activated and outside air is being brought into the building, the mixed air sensor measures the temperature of the air entering the indoor blower and then modulates the economizer damper to mix the right proportion of cool outside air with warm indoor air to maintain 50-63°F (10 - 17°C) air being delivered to the building. This prevents shocking the electronic components with cold outside air. The compressor is not permitted to operate when the economizer is functioning.

If the outside air becomes too hot or humid, the economizer damper closes completely, or to a field selectable minimum open position, and mechanical cooling is activated.

In all ComPac II air conditioners, the supply air flow in the economizer mode is the same or greater than the rated air flow. (The rated air flow is the AHRI certified air flow when the unit is in mechanical cooling.) The “full flow” economizer reduces electrical costs by maximizing the use of outside air for cooling.



100% Mechanical Cooling



100% Economizer Cooling

Note: *This graphical representation is for illustrative purposes only. The actual appearance of internal components may vary depending on the model, installed options and configuration.*

Savings with an Economizer

The following table shows the annual electrical cost of cooling a 10 ft. x 20 ft. x 9 ft. (3m x 6m x 2.7m) shelter in twelve cities in the US. Costs are shown for an air conditioner without an economizer (ComPac I units), for an air conditioner with an economizer (ComPac II units) and the savings. The savings do not include any demand charges. The savings are based on the electrical usage of a five ton air conditioner and an electric rate of $.10 per kilowatt-hour, the approximate average commercial rate in the US.

Hours of Operation	Atlanta, GA	Boston, MA	Chicago, IL	Dallas, TX	Denver, CO	Houston, TX
Annual Compressor & Condenser Motor Run Time without Economizer (Hrs.)	6,531	6,348	6,361	6,628	6,472	6,655
Annual Compressor & Condenser Motor Run Time with Economizer (Hrs.)	3,841	2,153	2,424	3,798	750	4,970
Run Time Savings with the Economizer (Hrs.)	2,690	4,195	3,937	2,830	5,722	1,685
Estimated Annual Costs Saving ($) of 9.0 EER unit with an Economizer (ComPac II)						
Annual Operating Cost 9.0 EER Unit without Economizer ($)	$4,100.00	$3,985.00	$4,792.00	$4,161.00	$3,657.00	$4,178.00
Annual Operating Cost 9.0 EER with Economizer	$2,685.00	$1,784.00	$2,315.00	$2,671.00	$940.00	$3,291.00
Annual Savings using 9.0 EER Unit with Economizer	$1,415.00	$2,201.00	$2,477.00	$1,490.00	$2,717.00	$887.00

Hours of Operation	Los Angeles, CA	Miami, FL	Phoenix, AZ	Pittsburgh, PA	Seattle, WA	St. Louis, MO
Annual Compressor & Condenser Motor Run Time without Economizer (Hrs.)	6,467	6,779	6,765	6,386	6,465	6,472
Annual Compressor & Condenser Motor Run Time with Economizer (Hrs.)	3,862	6,391	3,106	1,929	1,654	2,716
Run Time Savings with the Economizer (Hrs.)	2,605	388	3,659	4,457	4,811	3,756
Estimated Annual Costs Saving ($) of 9.0 EER unit with an Economizer (ComPac II)						
Annual Operating Cost 9.0 EER Unit without Economizer ($)	$4,060.00	$4,255.00	$4,247.00	$4,009.00	$3,653.00	$4,063.00
Annual Operating Cost 9.0 EER with Economizer	$2,686.00	$4,051.00	$2,315.00	$1,667.00	$1,368.00	$2,090.00
Annual Savings using 9.0 EER Unit with Economizer	$1,374.00	$204.00	$1,932.00	$2,342.00	$2,285.00	$1,973.00

Shelter Metrics:
•10’ x 20’ x 9’ building
•Internal heat gain (electronics load): 12,000 watts.
•Building surface area (excluding floor area): 740 ft²
•R-Value of walls and ceiling: R-12
•Internal shelter temperature (Thermostat set point): 75ºF

Air Conditioner Metrics:
•ComPac II Economizer setting: 57ºF (dry bulb or enthalpy sensor)
•A/C unit capacity: 60,000 BTUH (5 tons) with 1-stage compressor
•Nominal EER (unit efficiency): 9.0 (models AVPA)
•Cost of power: $.10 per KWH

Operation of the 2-Stage Compressor Air Conditioners with a CommStat 4™ or CommStat 6 Lead/Lag Thermostat Controller

Marvair's HVESA air conditioners have 2-stage compressors. These units can provide substantial energy savings and better control of temperature and humidity by matching the cooling requirement with the performance of the air conditioner. First stage is typically 65% of the total (2-stage) capacity of the air conditioner. When operated from power supplied by a generator, starting the air conditioner in 1-stage means lower start-up amps.

- **CommStat™ 4 Controller:** When two, 2-stage air conditioners are controlled by a CommStat 4 lead/lag controller in a redundant application, one of the air conditioners is the lead unit and the second is the lag unit. On a call for cooling, the lead unit starts operation in the 1-stage (low capacity). If the temperature in the building continues to rise above the set point temperature, the 1-stage (low capacity) of the lag unit will be initiated. When the temperature in the building drops to the set point, the air conditioners will turn off. On a subsequent call for cooling the process will repeat.

  If the set point temperature is not reached with 1-stage capacity operation of both air conditioners, the lead air conditioner will commence operation in 2-stage (full capacity). If the temperature in the building continues to rise past the setpoint, the lag unit will switch to 2-stage cooling operation. At that time, both air conditioners are operating in maximum capacity.

- **CommStat™ 6 Controller:** When two, 2-stage air conditioners are controlled by a CommStat 6 lead/lag controller in a redundant application, one of the air conditioners is the lead unit and the second is the lag unit. On a call for cooling, the lead unit starts operation in the 1st-stage (LOW capacity). If the temperature in the building continues to rise above the set point temperature, the 2nd-stage (FULL capacity) of the LEAD unit will be initiated. When the temperature in the building drops to the set point, the unit will turn off. On a subsequent call for cooling the process will repeat.

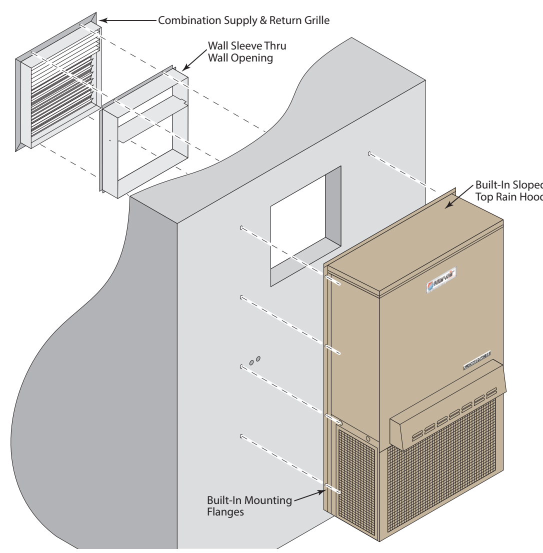
  If the set point temperature is not reached with 2nd-stage capacity operation of the LEAD air conditioner, the LAG air conditioner will commence operation in 1st-stage (LOW capacity). If the temperature in the building continues to rise past the setpoint, the lag unit will switch to 2-stage cooling operation. At that time, both air conditioners are operating in maximum capacity

When the temperature in the building is satisfied with either controller, both units will turn off.

If the units have economizers (ComPac II air conditioners), the enthalpy sensor determines whether to use outside air or use mechanical cooling. When the economizer is used, the compressors do not operate.

Marvair's AVPA12 One Ton Air Conditioner

Ideal Replacement for Old Window Air Conditioners or New Construction



The electronic/communication shelter requires cooling virtually year-round because of the heat load generated by the internal electronic equipment (i.e., switching and transmission gear). Residential window room air conditioners are not designed to operate when outside air temperatures are moderate to cold, i.e., below 65°F (18°C). Typical problems are freezing of the coil, diminished capacity and compressor damage which all contribute to high maintenance and short operating life.

The Marvair® One Ton ComPac® I and ComPac® II air conditioners are designed for the electronic/ communication shelter to provide a commercial grade air conditioner for years of operation. The Marvair One Ton is built to operate continuously and efficiently in a variety of outside conditions. For existing shelters with window air conditioners, upgrading to the commercial grade Marvair air conditioners is made easy by the design of the One Ton ComPac II unit with the factory installed economizer. The back panel is designed for either a 19" x 19" (483 mm x 483 mm) or 28" x 19" (711 mm x 483 mm) opening, standard opening sizes for many window units. The unit is shipped from the factory for mounting on a 19" x 19" (483 mm x 483 mm) opening, but can be easily changed at site to fit in a 28" x 19" (711 mm x 483 mm) opening. With the built-in mounting flanges, the air conditioner mounts quickly and simply to the exterior of the building. The single piece supply and return grille attaches easily to the wall sleeve to complete the installation. The ComPac I (non-economizer) unit has separate supply and return grilles. (See the Accessories section for the part numbers of the grilles and wall sleeves). Factory installed electric heat is available in the Marvair One Ton Air Conditioner thus eliminating baseboard heat and a second power source.

Controllers and Thermostats

➤ Controllers

CommStat 6 2/4 Telecom HVAC Controller NEW! .... *P/N 70705*
CommStat 6 4/8 Telecom HVAC Controller NEW! .... *P/N S/12087-04*
CommStat 6 6/12 Telecom HVAC Controller NEW! .... *P/N S/12087-06*

The CommStat 6 is an HVAC controller, is available in three configurations, and is designed specifically for controlling up to six redundant air conditioners with two stage compressors in a telecommunications shelter or enclosure. The **CommStat 6 2/4** controls up to two single or 2-stage air conditioners (4 Stages max.), the **CommStat 6 4/8** controls up to four single or 2-stage air conditioners (8 Stages max.) and the **CommStat 6 6/12** controls up to six single or 2-stage air conditioners (12 Stages max.)

In addition to the control of the air conditioners, the CommStat 6 has multiple configurable outputs for remote alarms or notification. The CommStat 6 is factory programmed with standard industry set points, but can be configured on site. Settings are retained indefinitely in the event of a power loss.

CommStat 4 Telecom HVAC Controller .... P/N *S/7846*

The CommStat 4 HVAC controller is designed specifically for controlling two redundant air conditioners or heat pumps with single or 2-stage compressors. The CommStat 4 has seven outputs for remote alarms or notification. Status LED's indicate HEAT, COOL, POWER and the LEAD unit. When a fault is detected, an alarm LED flashes and the LCD screen displays the fault.

The CommStat 4 uses RS-485 communications via a RJ11 jack. It can be daisy chained with a second CommStat 4 controllers for controlling up to four air conditioners in one shelter. When two CommStat 4 controllers are daisy chained together, one is the MASTER and the other controller is the SLAVE. Any settings to the MASTER unit immediately take effect on the SLAVE unit. See the CommStat 4 Product Data Sheet for complete details.

CommStat3™ Lead/Lag Microprocessor Controller .... *P/N S/04581*

Solid state controller designed to operate a fully or partially redundant air conditioning system. Ensures equal wear on both air conditioners while allowing the lag unit to assist upon demand. Lead/ lag changeover is factory set at 7 days, but is field programmable in 1/2 day increments from 1/2 to 7 days. The CommStat 3™ Controller has LED's to indicate status & function, digital display of temperature, a comfort override button for energy savings, five alarm relays, a built in temperature sensor and is fully programmable. See CommStat 3™ Controller Product Data Sheet for details on operation & installation.

➤ Thermostats & Thermostat Guards

Note: *All air conditioners with 2-stage compressors (models HVESA) require a 2-stage cooling thermostat.*

Thermostat .... *P/N 50123*
Digital thermostat. 1-stage heat, 1-stage cooling. 7 day programmable. Fan switch: Auto & On. Auto-change over. Keypad lockout. Non-volatile program memory.

Thermostat .... *P/N 50107*
Digital thermostat. 2-stage heat, 2-stage cooling. 7 day programmable. Fan switch: Auto & On. Auto-change over. Status LED's. Backlit display. Programmable fan. Non-volatile program memory.

Thermostat Guard .... *P/N 50092*
Thermostat guard for use with the 50123 and 50107 thermostats.

Thermostat .... *P/N 50218*
Digital, non-programmable thermostat. 1-stage cooling and 1-stage heat. Auto-changeover.

Digital Humidistat .... *P/N 50254*
To be used with units with hot gas or electric reheat. Programmable dehumidistat and ventilation controller. Permanent memory retention of set points.Humidity sensor can be field calibrated. High & low dehumidification set points. Outdoor temperature and humidity sensor included. °F or °C selectable.

Thermostat .... *P/N 50252*
Non-programmable digital thermostat with backlit display. 2 stage heat and 2-stage cooling. Auto changeover.

Accessories

➤ Supply Grilles

For AVPA20/24..P/N 80674
20" x 8" (508 mm x 203 mm)
For AVPA/AVHA20,24,30,36 and HVEA24..P/N 80675
28" x 8" (711 mm x 203 mm)
For AVPA/AVHA42,48,60, AVPA72 and HVEA30,36,42,49,60..P/N 80676
30" x 10" (762 mm x 254 mm)

➤ Return Grilles

For AVPA20/24..P/N 80677
20" x 12" (508 mm x 305 mm)
For AVPA/AVHA20,24,30,36 and HVEA24..P/N 80678
28" x 14" (711 mm x 356 mm)
For AVPA/AVHA42,48,60, AVPA72 and HVEA30,36,42,49,60..P/N 80679
30" x 16" (762 mm x 406 mm)

➤ Return Filter Grilles

Used when filter must be changed from the interior. Not recommended for ComPac® II air conditioner.
Note: Filter used in Return Filter Grille is 1" (25 mm) thick.

For AVPA20/24..P/N 80671
20" x 12" (508 mm x 305 mm)
For AVPA/AVHA20,24,30,36 and HVEA24..P/N 80672
28" x 14" (711 mm x 356 mm)
For AVPA/AVHA42,48,60, AVPA72 and HVEA30, 36, 42, 49, 60..P/N 80673
30" x 16" (762 mm x 406 mm)

➤ AVPA12 Grilles and Wall Sleeves

For AVPA12 ComPac I (non-economizer)..P/N 80682
Supply Grille 17" x 5" (432 mm x 127 mm)
Return Air Grilles For AVPA12 (non-economizer unit)..P/N 92352
17" x 10" (432 mm x 25)
AVPA12 ComPac I (non-economizer) unit Return Air Filter Grille..P/N 80683
17" x 10" (432 mm x 25)
AVPA12 ComPac I (non-economizer) Special Combination Supply/Return Air Grille .... P/N 80669
26" x 17" (660 mm x 432 mm)

➤ For AVPA12 ComPac II with Factory Installed Economizer

Combination Supply and Return Air Grille and Wall Sleeve for 19" x 19" Opening
Wall Sleeve for 19" x 19" (483 mm x 483 mm) opening..P/N S/09392
Combination Supply and Return Air Grille for 19" x 19" (483 mm x 483 mm) opening..P/N 92379
Note: *Grille is 17" x 17" (432 mm x 432 mm)*
Combination Supply and Return Air Grille and Wall Sleeve for 28" x 19" Opening
Wall Sleeve for 28" x 19" (711 mm x 483 mm) opening.. P/N S/01784
Combination Supply and Return Air Grille for 28" x 19" (711 mm x 483 mm) opening.. P/N 80681
Note: Grille is 26" x 17" (660 mm x 432 mm)

Options

The ComPac® I and ComPac® II air conditioners were designed and are built to stringent requirements of the communications/electronic shelter. Applications occur that have special requirements. Numerous options are available for the ComPac I and ComPac II air conditioners that meet these special needs.

➤ Hard Start Kit

Used on single phase equipment to give the compressor higher starting torque under low voltage conditions. (Field installed only) (Note: Not recommended for use on scroll compressors.)

➤ Dehumidification

ComPac® I and ComPac® II A/C – Allows the electric heat to operate simultaneously with cooling. See Dehumidification Application Bulletin for details. Note: The electrical characteristics and requirements of air conditioners with the dehumidification option are different from standard air conditioners. Refer to the appropriate Summary Rating Charts for the electrical characteristics of units with Electric Reheat. Available on all units except the AVPA12. Units with reheat require a thermostat and a dehumidistat for proper operation.

➤ Protective Coating Packages

Typically, only the ComPac I is used in corrosive environments, but the ComPac II air conditioner is also available with corrosion protection. Two corrosion protection packages are offered - one for the condenser section (Coastal Environmental Package) and the other for the entire unit (Coat-All Package).

The Coastal Environmental Package includes:

- Corrosion resistant fasteners
- Sealed or partially sealed condenser fan motor
- Protective coating applied to all exposed internal copper and metal in the condenser section
- Protective coating on the condenser coil (Luvata Insitu®) contains ES2 (embedded stainless steel pigment) technology.

The Coat all Package includes all of the above, plus:

- Protective coating on the evaporator coil (Luvata Insitu®) contains ES2 (embedded stainless steel pigment) technology
- Protective coating on exterior and interior components and sheet metal. (***Note:*** the internal sheet metal which is insulated and the internal control box are not coated)

Note: The AVPA12 is available with the protective coatings and corrosion resistant fasteners, but does not have a sealed condenser fan motor.

➤ Protective Coil Coatings

The Condenser Coil or the Evaporator Coil or Both can be coated. Coating the Evaporator Coil in not common. For harsh conditions, e.g., power plants, paper mills or sites where the unit will be exposed to salt water, the coils should be protected by a protective coating.

Note: Cooling capacity may be reduced by up to 5% on units with coated coils.

➤ External Low Noise Blower (ELNB)

ComPac® I and ComPac® II A/C – A field installed kit that consists of a condenser air hood, centrifugal blowers, controls and a compressor jacket to reduce the sound level by up to 6 dbA of Marvair ComPac air conditioners. Available for models AVPA30-60. See External Low Noise Blower Product Data Sheet for details.

➤ ComPac® II Air Conditioner Transition Curb

ComPac II A/C only – A sheet metal curb that enables AVPA42/48/60 ComPac II air conditioner to replace an AVPA30/36 ComPac II unit. Curb transitions supply and return openings of the 3-1/2, 4 and 5 ton units to the smaller openings.

➤ Hot Gas By-Pass

ComPac® I A/C Only – Used in specialty applications; i.e., Magnetic Resonance Imaging (MRI) buildings, to prevent magnetic voltage disturbance caused by compressor cycling. Hot gas by-pass option packages are available to allow operation to 20°F (-7°C). Please refer to Hot Gas By-pass Application Bulletin for details. Not available on the AVPA12, 20 & 24.

➤ High Filtration

Selected units are built with larger blowers/motors for use with higher efficiency filters with MERV ratings of 11, 13 and 14 when tested to ASHRAE 52.2. Units with economizers have a prefilter on the outside air. Not available on the AVPA12. Contact your Marvair representative for specific models.

➤ Color

ComPac® I and ComPac® II air conditioners are available in five different cabinet colors -the standard Marvair® beige, white, gray, brown and dark bronze. The standard cabinet's sides, top and front panels are constructed of 20 gauge painted steel. As an option, these panels can be built of 16 gauge steel in beige & gray or .050 stucco aluminum. When the 16 gauge painted steel or the aluminum is used, only the side, top and front panels are 16 gauge or aluminum. Contact your Marvair representative for color chips. The cabinet can also be constructed of type 316 stainless steel. Two stainless steel cabinet constructions are available- the complete cabinet, including most internal sheet metal or only the exterior sheet metal.

➤ Extended Warranty

A first-year labor (Silver), and a two-year labor (Gold) are available. See *www.marvair.com* for optional warranty details.

➤ Dirty Filter Indicator

A factory installed option that measures the difference in pressure across the internal filter and illuminates a LED when the pressure exceeds the desired difference. Not available on the AVPA12.

- **Phase Monitor**
  Continuously measures the voltage of each of the three phases. The monitor separately senses low and high voltage, voltage unbalance including phase loss and phase reversal. A red LED glows to indicate a fault. When all voltages are acceptable, a green LED glows. Automatically resets when voltages and phases are within operating tolerances.
  Note: Not required on 1ø units.
- **Thermal Expansion Valve**
  Available on all ComPac air conditioners. Improves performance in hot ambient temperatures.
- **Sealed Condenser Fan Motors**
  Recommended on units to be installed in corrosive sites, e.g., near the ocean and in deserts with blowing sand. Available on all units except the AVPA12.
- **Compressor Sound Jacket**
  To reduce sound of compressor. Available on all units except the AVPA12
- **Extreme Duty Package** *(Not Available on AVPA12)*
  Allows Marvair® air conditioners to operate in extremely cold and hot ambient conditions. The Extreme Duty Kit is always factory installed and is available on all air conditioners. ComPac I units without an economizer will operate from 0°F to 130°F (-18° to 54°C). ComPac II units with an economizer will operate from -40°F to 130°F (-40° to 54°C).

  The Extreme Duty Package includes a suction line accumulator, thermal expansion valve (TXV), crankcase heater, hard start kit, an auto reset high pressure switch and an outdoor thermostat and fan cycle switch. The fan cycle control is standard on all ComPac air conditioners and operates based upon the liquid line pressure. The outside thermostat opens whenever the outside temperature is below 50°F (10°C) and closes when the outside temperature is 50°F (10°C) or higher. When the temperature is below 50°F (10°C), the fan cycle switch is in the circuit; when temperatures are 50°F (10°C) or higher, the fan cycle switch is not in the circuit. The outdoor thermostat is used with a TXV to prevent excessive cycling or “hunting” of the TXV.

- **Lockable Disconnect Access Cover Plate**
  The access plate to the service disconnect switch can be equipped with a lockable cover.
- **Desert Duty Package (Not available on the AVPA12)**
  Our standard air conditioners will operate in outside ambient temperatures up to 120°F (48.9°C) The Desert Duty package is a factory installed package of components and cabinet modifications to allow operation in ambient temperatures up 130°F (54°C). Standard features of the Desert Duty package include a thermal expansion valve and a sealed condenser fan motor. Cabinet modifications include a slotted panel in the base pan that improves condenser air flow and also provides access to the compressor and condenser fan motor. To prevent sand and dust infiltration, the electrical control box is sealed. A closed loop design on the ComPac I unit insures that no outside air is introduced into the shelter. Note: the ComPac II unit with the economizer may be ordered with the Desert Duty Package. If the ComPac II air conditioner is required with the Desert Duty Package, sand intrusion into the shelter should be considered.
- **Washable Filter**
  Spun aluminum construction allows cleaning of filters with water.
- **Hot Gas Reheat (HGR)**
  A Hot Gas Reheat coil and controls allow the indoor humidity of the controlled environment to be maintained at or below a certain humidity set point. These units do not have the ability to add humidity to the room. Dehumidification is achieved by operating mechanical cooling in conjunction with a hot gas reheat coil.
- **Right & Left Side Compressor Location**
  The air conditioners can be built with the compressor on the opposite side to facilitate service access when two units are installed side by side. In the AVPA20-24-30-36 & AVHA30/36, the standard location for the compressor is on the right hand side. In the AVPA12 and the AVPA42-48-60 & AVHA42-48-60, the standard location for the compressor is on the left hand side. In the 72, the compressor is accessed from the front of the unit and an opposing configuration is not required.

➤ Marvair Coil Cop® Theft Deterrent System

The Marvair Coil Cop® is a factory installed, multi-layered theft deterrent system designed for use in Marvair wall mounted air conditioners and heat pumps. It provides visual and audio warnings and remote notification in the event of an attempted theft or vandalism of the unit. It is especially useful for air conditioners located in remote or unsupervised locations, e.g., many cell sites, and can eliminate bulky and expensive cages. For a complete description of the components and operation of the Coil Cop system, please see the Coil Cop brochure (available for download at *www.marvair.com*).

Two variations of the Coil Cop theft deterrent system are available:

- **Coil Cop Variation T1** is the complete Coil Cop Package. Includes stainless steel channels to secure both the condenser and evaporator coils, warning labels, a speaker, tamper resistant fasteners, loss of charge switch, tri-axis accelerometer and operator panel with status lights.
- **Coil Cop Variation T2** includes stainless steel channels to secure the condenser coil, warning labels, a speaker, tamper resistant fasteners, loss of charge switch, tri-axis accelerometer and operator panel with status lights. Variation T2 does not include stainless steel channel on the evaporator coil.

Remote Access Data Points

Through the Ethernet connection, the network operations center can monitor and change various data points in the HVAC system and the shelter.

Data Points which can be monitored **and** changed:

- First Stage Cooling Set Point Temperature
- Second Stage Cooling Set Point Differential Temperature
- First Stage Heating Set Point Temperature
- Second Stage Heating Set Point Differential Temperature

Data points which can only be monitored:

- Inside Temperature - Current
- Outside Temperature - Current
- Outside Humidity - Current
- Dew point - Current
- Inside Temperature - Average Last Hour
- Outside Temperature - Average Last Hour
- Outside Humidity - Average Last Hour
- Dew point - Average Last Hour
- Unit 1 & Unit 2 Mechanical Cooling Time - Last Hour
- Unit 1 & Unit 2 Mechanical Cooling Requests - Last Hour
- Unit 1 & Unit 2 Free Air Cooling Time - Last Hour
- Unit 1 & Unit 2 Free Air Cooling Requests - Last Hour
- Unit 1 & Unit 2 Heating Time - Last Hour
- Unit 1 & Unit 2 Heating Requests - Last Hour

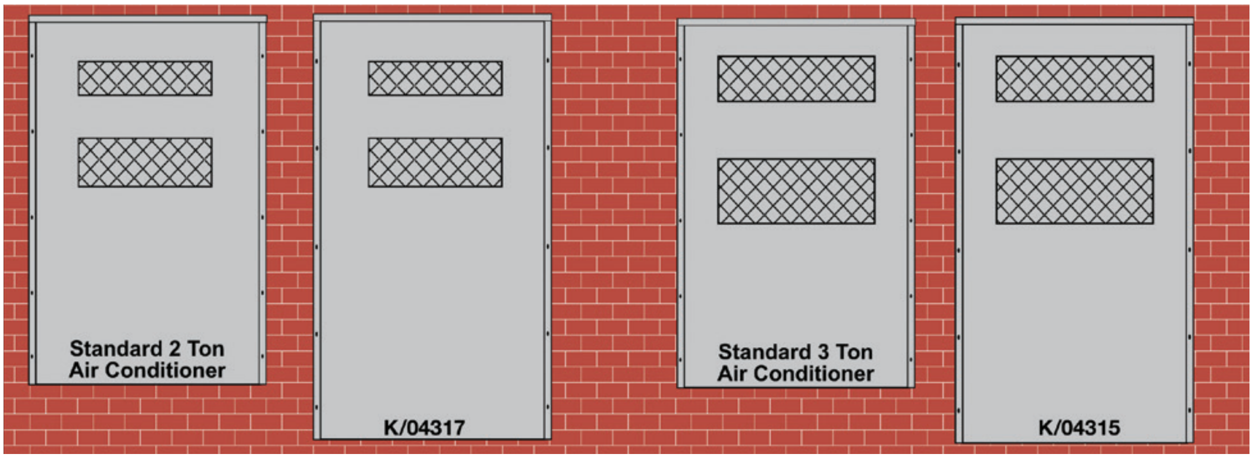
Dry Contacts Alarm Outputs

A dry contact is provided for each HVAC unit to indicate HVAC unit failure to the shelter alarm block. Unit failure is defined as 1) a high pressure lockout or 2) a low pressure lockout or 3) a loss of landline power. This dry contact is a normally open contact.

Back Panel Adapters for AVPA60 & AVHA60 Air Conditioners

These back panel adapters are factory installed on the AVPA60 & AVHA60 ComPac I air conditioners and to match the supply and return air openings on Marvair 2 and 3 ton air conditioners. This allows the AVPA60 & AVHA60 to be quickly and easily installed. No cutting or sawing of the shelter is required. The back panel, K/04317 has supply and return openings that match the openings of AVP24 & AVPA24 wall mounted air conditioners. The back panel, K/04315, has supply and return openings that match the openings of Marvair's AVP36 & AVPA36 air conditioners. In addition to matching the openings of Marvair units, the back panels will also match the openings of other brands.

When the K/04317 back panel adapter is used, a return filter grille, p/n 80671, must be used. When the K/04315 back panel adapter is used, a return filter grille, p/n 80672, must be used.



Control Box

The internal control board in the ComPac® air conditioners simplifies wiring, consolidates several of the electrical functions onto one device and improves the reliability of the air conditioner. In addition, the control board has LED's that indicate operational status and fault conditions.

➤ LED Indicator Lights

COLOR	TYPE	STATUS	DESCRIPTION
Green	Power	Constant On	24 VAC power has been applied
Red	Status	Constant On	Normal operation
		1 Blink	High pressure switch has opened twice
		2 Blinks	Low pressure switch has opened twice
		3 Blinks	Freeze stat (optional) - indoor coil temperature is below 35°F (1°C)

➤ Modes of Operation

Normal Start-up: On a call for cooling, and the with the high pressure switch closed, the cooling system (compressor, indoor blower motor and outdoor fan motor) will be energized. (Note: See the Delay on Make feature). The cooling system will remain energized during the three minute low pressure switch bypass cycle. If the low pressure is closed, the cooling system will continue to operate after the three-minute bypass. If the low pressure switch is open after the three-minute bypass, the cooling system will be de-energized.

Lockout Mode: If either the high or low pressure switch opens twice on the same call for cooling, the control board enters into and indicates the lockout mode. In the lockout mode, the compressor is turned off, the alarm output is energized and the status LED's will blink to indicate which fault has occurred. If there is a call for air flow, the indoor blower will remain energized. When the lockout condition has cleared, the unit will reset if the demand of the thermostat is removed or when power is reset. The lockout circuit is factory wired for normally open contacts. The user can select either normally closed or normally open remote alarm dry contacts.

Delay on Make: On initial power up or on resumption of power, the air conditioner will wait .03 to 10 minutes from a call for cooling before allowing the contactor to energize.

Model Identification

●●● S A ●● AC ● ●●● ● ● A5 ●●●

AVP
AVH
HVE

2-Stage Compressor

Refrigerant
A = R410A

Nominal Cooling
12 = 11,000 BTUH
20 = 20,000 BTUH
24 = 24,000 BTUH
30 = 30,000 BTUH
36 = 36,000 BTUH
42 = 42,000 BTUH
48/49 = 48,000 BTUH
60 = 60,000 BTUH
72 = 72,000 BTUH

System Type
Air Conditioner

Power Supply
A = 208/230V,1ø,60Hz
C = 208/230V,3ø,60Hz
D = 460V,3ø,60Hz **(3 wire)**
Z = 575V,3ø,60Hz

Electric Heat – kW
000 = No Heat
022 = 2.2 kW
036 = 3.6 kW
040 = 4 kW
050 = 5 kW
060 = 6 kW
080 = 8 kW
090 = 9 kW
100 = 10 kW
120 = 12 kW
150 = 15 kW

Configuration
N = ComPac® I A/C
C = ComPac® II A/C

Special Option Code
R = Electric Reheat
U = Scroll Compressor
X = Hot Gas Bypass
O = Opposite side compressor
E = Extreme Duty
D = Desert Duty
G = Hot Gas Reheat

A5 = Built in compliance with UL 1995, 4th edition

Cabinet Color
100 = Beige
200 = Gray
400 = White
500 = Stainless Steel (Exterior Only)
SS-500 = Stainless Steel
700 = Aluminum Stucco

ComPac I & ComPac II Ambient Temperature Operating Ranges

Basic Model	Special Option	AVPA	AVHA/HVEA/HVESA
ComPac I	Standard Unit (N)	20ºF - 120ºF (7ºC - 48.9ºC)	20ºF - 120ºF (7ºC - 48.9ºC)
	Desert Duty (ND)	20ºF - 130ºF (7ºC - 54ºC)	20ºF - 130ºF (7ºC - 54ºC)
	Extreme Duty Kit (NE)	0ºF - 130ºF (18ºC - 54ºC)	0ºF - 130ºF (18ºC - 54ºC)
ComPac II	Standard Unit (C)	-40ºF - 120ºF (-40ºC - 48.9ºC)	-40ºF - 120ºF (-29ºC - 48.9ºC)
	Desert Duty (CD)	-40ºF - 130ºF (-40ºF - 54ºC)	-40ºF - 130ºF (-29ºC - 54ºC)
	Extreme Duty Kit (CE)	-40ºF - 130ºF (-40ºF - 54ºC)	-40ºF - 130ºF (-29ºC - 54ºC)

EER Comparison by Model

Nominal Cooling Capacity (BTUH)	Basic Model	EER
12,000	AVPA12	9.00
20,000	AVPA20	9.00
	AVHA20	10.00
24,000	AVPA24	9.25
	AVHA24	10.00
	HVEA24	10.75
30,000	AVPA30	9.25
	AVHA30	10.00
	HVEA30	11.75
36,000	AVPA36	9.25
	AVHA36	10.00
	HVEA36	11.25
	HVESA36	11.25
42,000	AVPA42	9.25
	AVHA42	10.00
	HVEA42	10.50
	HVESA42	10.50

Nominal Cooling Capacity (BTUH)	Basic Model	EER
48,000	AVPA48	9.50
	AVHA48	10.00
	HVEA49	11.50
	HVESA49	11.50
60,000	AVPA60	9.25
	AVHA60	10.00
	HVEA60	10.50
	HVESA60	10.50
72,000	AVPA72	10.00

Note: HVESA models have 2-stage compressors.

ComPac® AVPA/AVHA Standard Efficiency Air Conditioners

Certified Efficiency and Capacity Ratings at ANSI/AHRI Standard 390 - AVPA/AVHA Air Conditioners

Model Number	AVPA12	AVPA20	AVPA24	AVPA30	AVPA36	AVPA42	AVPA48	AVPA60	AVPA72	
	ACA	ACA	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA	ACC ACD ACZ
Cooling BTUH[1]	10,800	19,600	24,000	29,000	35,000	42,000	46,000	54,500	62,000	70,000
EER[2]	9.00	9.00	9.25	9.25	9.25	9.25	9.50	9.25	10.00	10.00
Rated Air Flow (CFM[3])	400	755	840	1,000	1,100	1,575	1,725	1,850	1,925	1,925

Model Number	AVHA20	AVHA24	AVHA30	AVHA36	AVHA42	AVHA48	AVHA60
	ACA	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ
Cooling BTUH[1]	19,600	24,000	29,000	33,000	42,000	46,000	54,000
EER[2]	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Rated Air Flow (CFM[3])	755	840	1,000	1,100	1,575	1,725	1,850

[1]Cooling rated at 95°F (35°C) outdoor and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air. [2]EER=Energy Efficiency Ratio [3]CFM=Cubic Feet per Minute
Ratings are with no outside air. Performance will be affected by altitude.
Ratings are at 230 volts for 208/230 volt units ("A" & "C" models) and 460 volts for "D" models. Operation of units at a different voltage from that of the rating point will affect performance and air flow.

Sensible Total Heat Ratio @ 95°F (35°C) Outside Air Dry Bulb - AVPA/AVHA Air Conditioners

Model Number	AVPA12	AVPA20	AVPA24	AVPA30	AVPA36	AVPA42	AVPA48	AVPA60	AVPA72	
	ACA	ACA	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA	ACC ACD ACZ
Total Capacity	10,800	19,600	24,000	29,000	35,000	42,000	46,000	54,500	62,000	70,000
Sensible Heat Ratio	0.74	0.76	0.75	0.75	0.69	0.76	0.76	0.73	0.71	0.67
Sensible Capacity	8,000	14,800	18,000	21,740	24,155	31,900	34,940	39,800	43,815	46,800
Rated Air Flow (CFM[1])	400	755	840	1,000	1,100	1,575	1,725	1,850	1,925	1,925

Model Number	AVHA20	AVHA24	AVHA30	AVHA36	AVHA42	AVHA48	AVHA60
	ACA	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ	ACA ACC ACD ACZ
Total Capacity	19,600	24,000	29,000	33,000	42,000	46,000	54,000
Sensible Heat Ratio	0.76	0.75	0.75	0.74	0.74	0.76	0.72
Sensible Capacity	14,800	18,000	21,700	24,500	31,000	35,000	39,000
Rated Air Flow (CFM[1])	755	840	1,000	1,100	1,575	1,725	1,850

[1]CFM=Cubic Feet per Minute. Sensible heat ratios based upon ANSI/AHRI std. 390 outdoor air conditions of 95°F (35°C) and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air.

Cooling Performance (BTUH) at Various Outdoor Temperatures - AVPA/AVHA Air Conditioners

Model Number	Outdoor Temperature											
	75ºF / 24ºC	80ºF / 26.5ºC	85ºF / 29ºC	90ºF / 32ºC	95ºF / 35ºC	100ºF / 38ºC	105ºF / 40.5ºC	110ºF / 43.3ºC	115ºF / 46ºC	120ºF / 48.9ºC	125ºF / 51.7ºC	130ºF / 54.4ºC
AVPA12AC	12,525	12,095	11,660	11,230	10,800	10,365	9,9935	9,500	9,285	8,640	8,205	7,775
AVPA20AC	22,735	21,950	21,165	20,380	19,600	18,815	18,030	17,245	16,855	15,680	14,895	14,110
AVPA24AC	27,840	26,880	25,920	24,960	24,000	23,040	22,080	21,120	20,640	19,200	18,240	17,280
AVPA30AC	33,640	32,480	31,320	30,160	29,000	27,840	26,680	25,520	24,940	23,200	22,040	20,880
AVPA36AC	40,600	39,200	37,800	36,400	35,000	33,600	32,200	30,800	30,100	28,000	26,600	25,200
AVPA42AC	48,720	47,040	45,360	43,680	42,000	40,320	38,640	36,960	36,120	33,600	31,920	30,240
AVPA48AC	53,360	51,520	49,680	47,840	46,000	44,160	42,320	40,480	39,560	36,800	34,960	33,120
AVPA60AC	63,220	61,040	58,860	56,680	54,500	52,320	50,140	47,960	46,870	43,600	41,420	39,240
AVPA72ACA	71,920	69,440	66,960	64,480	62,000	59,520	57,040	54,560	53,320	49,600	47,120	44,640
AVPA72ACC, ACD, ACZ	81,200	78,400	75,600	72,800	70,000	67,200	64,400	61,600	60,200	56,000	53,200	50,400
AVHA20AC	22,735	21,950	21,165	20,380	19,600	18,815	18,030	17,245	16,855	15,680	14,895	14,110
AVHA24AC	27,840	26,880	25,920	24,960	24,000	23,040	22,080	21,120	20,640	19,200	18,240	17,280
AVHA30AC	33,640	32,480	31,320	30,160	29,000	27,840	26,680	25,520	24,940	23,200	22,040	20,880
AVHA36AC	38,280	36,960	35,640	34,320	33,000	31,680	30,360	29,040	28,380	26,400	25,080	23,760
AVHA42AC	48,720	47,040	45,360	43,680	42,000	40,320	38,640	36,960	36,120	33,600	31,920	30,240
AVHA48AC	53,360	51,520	49,680	47,840	46,000	44,160	42,320	40,480	39,560	36,800	34,960	33,120
AVHA60AC	63,220	61,040	58,860	56,680	54,500	52,320	50,140	47,960	46,870	43,600	41,420	39,240

Based upon ANSI/AHRI std. 390 return air conditions of 80°F DB/67° WB (26.5°C DB/19.5°C WB) at various outdoor temperatures.
Note: Operation of units above 120°F (48.9°C) requires the Desert Duty package.

Electrical Characteristics - Compressor, Fan & Blower Motors - AVPA/AVHA Air Conditioner

BASIC MODEL	COMPRESSOR				OUTDOOR FAN & INDOOR BLOWER MOTORS	OUTDOOR FAN MOTOR			INDOOR BLOWER MOTOR		
	TYPE	VOLTS / HZ / PH	RLA[1]	LRA[2]	VOLTS / HZ / PH	RPM[3]	FLA[4]	HP[5]	RPM[3]	FLA[4]	HP[5]
AVPA12ACA	ROTARY	208/230-60-1	4.7	25.0	208/230-60-1	1630	0.65	1/6	1650	0.85	1/5
AVPA/AVHA20ACA		208/230-60-1	8.3	43.0	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA/AVHA24ACA		208/230-60-1	10.6	54.0	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA30ACA		208/230-60-1	13.1	74.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA36ACA	RECIPROCATING	208/230-60-1	14.7	84.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA42ACA		208/230-60-1	15.7	84.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA48ACA		208/230-60-1	18.6	102.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA60ACA		208/230-60-1	23.0	130.0	208/230-60-1	825	2.8	1/3	1075	5.2	3/4
AVPA/AVHA24ACA		208/230-60-1	12.8	64.0	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA/AVHA30ACA		208/230-60-1	14.1	77.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA36ACA		208/230-60-1	17.9	112.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA42ACA	SCROLL	208/230-60-1	19.8	109.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA48ACA		208/230-60-1	21.8	117.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA60ACA		208/230-60-1	26.2	134.0	208/230-60-1	825	2.8	1/3	1075	5.2	3/4
AVPA72ACA		208/230-60-1	30.1	158.0	208/230-60-1	825	2.9	1/2	1075	5.2	3/4
AVPA/AVHA24ACC		208/230-60-3	8.3	61.0	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA/AVHA30ACC		208/230-60-3	9.0	71.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA36ACC		208/230-60-3	13.2	88.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA42ACC	SCROLL	208/230-60-3	13.6	83.1	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA48ACC		208/230-60-3	13.7	83.1	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA60ACC		208/230-60-3	15.6	111.0	208/230-60-1	825	2.8	1/3	1075	5.2	3/4
AVPA72ACC		208/230-60-3	22.4	149.0	208/230-60-1	825	2.9	1/2	1075	5.2	3/4
AVPA/AVHA24ACD		460-60-3	5.1	28.0	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA/AVHA30ACD		460-60-3	5.6	38.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA36ACD		460-60-3	6.0	44.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA42ACD	SCROLL	460-60-3	6.1	41.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA48ACD		460-60-3	6.2	41.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA60ACD		460-60-3	7.7	52.0	208/230-60-1	825	2.8	1/3	1075	5.2	3/4
AVPA72ACD		460-60-3	10.6	75.0	208/230-60-1	825	2.9	1/2	1075	5.2	3/4
AVPA/AVHA24ACZ		575-60-3	3.3	23.7	208/230-60-1	1075	1.5	1/5	1075	1.5	1/5
AVPA/AVHA30ACZ		575-60-3	3.8	36.5	208/230-60-1	1075	1.5	1/5	1075	1.5	1/4
AVPA/AVHA36ACZ		575-60-3	4.2	30.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/4
AVPA/AVHA42ACZ	SCROLL	575-60-3	4.2	33.0	208/230-60-1	1075	1.8	1/4	1075	2.5	1/2
AVPA/AVHA48ACZ		575-60-3	4.8	33.0	208/230-60-1	825	2.8	1/3	1075	3.1	1/2
AVPA/AVHA60ACZ		575-60-3	5.8	38.9	208/230-60-1	825	2.8	1/3	1075	3.1	3/4
AVPA72ACZ		575-60-3	7.7	54.0	208/230-60-1	825	2.8	1/3	1075	5.2	3/4

[1]RLA = Rated Load Amps [2]LRA = Locked Rotor Amps [3]RPM = Revolutions per Minute [4]FLA = Full Load Amps [5]HP = Horsepower
The 460 volt (ACD) units will have a step down transformer for the 230 volt motors.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) -
AVPA/AVHA Air Conditioners with Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N"), Economizer, Outside Air with Pressure Relief ("C")

ELECTRIC HEAT		000 = None		022 = 2.2 kw		036 = 3.6 kw		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
AVPA12ACA	208/230-1-60	7.4	15	12.4	15	19.7	20			26.9	30												
AVPA/AVHA20ACA	208/230-1-60	13.4	20					22.4	25	27.5	30	32.8	35	43.1	45			53.6	60				
AVPA/AVHA24ACA	208/230-1-60	19.0	30					22.4	30	27.5	30	32.8	35	43.1	45			53.6	60				
AVPA/AVHA30ACA	208/230-1-60	21.9	35					23.4	35	28.5	35	33.8	35	44.1	45			54.6	60	65.0	70	80.6	90
AVPA/AVHA36ACA	208/230-1-60	26.7	40					26.7	40	28.5	40	33.8	40	44.1	45			54.6	60	65.0	70	80.6	90
AVPA/AVHA42ACA	208/230-1-60	30.7	50							30.7	50							55.2	60	65.6	70	81.2	90
AVPA/AVHA48ACA	208/230-1-60	33.2	50							33.2	50							55.2	60	65.6	70	81.2	90
AVPA/AVHA60ACA	208/230-1-60	40.8	60							40.8	60							57.3	60	67.7	70	83.3	90
AVPA72ACA	208/230-1-60	45.6	60							45.6	60							57.3	60	67.7	70	83.3	90
AVPA/AVHA24ACC	208/230-3-60	13.4	20									19.5	20			28.6	30			37.6	40		
AVPA/AVHA30ACC	208/230-3-60	15.6	20									20.5	25			29.6	30			38.6	40	47.6	50
AVPA/AVHA36ACC	208/230-3-60	20.8	30									20.8	30			29.6	30			38.6	40	47.6	50
AVPA/AVHA42ACC	208/230-3-60	22.9	35									22.9	35			30.2	35			39.1	40	48.1	50
AVPA/AVHA48ACC	208/230-3-60	23.0	35									23.0	35			30.2	35			39.1	40	48.1	50
AVPA/AVHA60ACC	208/230-3-60	27.5	40									27.5	40			32.3	40			41.3	45	50.2	60
AVPA72ACC	208/230-3-60	36.1	50									36.1	50			36.1	50			41.3	50	50.2	60
AVPA/AVHA24ACD	460-3-60	7.9	15									9.8	15			14.3	15			18.8	20	23.3	25
AVPA/AVHA30ACD	460-3-60	9.2	15									10.3	15			14.8	15			19.3	20	23.8	25
AVPA/AVHA36ACD	460-3-60	9.7	15									10.3	15			14.8	15			19.3	20	23.8	25
AVPA/AVHA42ACD	460-3-60	10.6	15									10.9	15			15.1	20			19.6	20	24.1	25
AVPA/AVHA48ACD	460-3-60	10.7	15									10.9	15			15.1	20			19.6	20	24.1	25
AVPA/AVHA60ACD	460-3-60	13.6	20									13.6	20			16.1	20			20.6	25	25.1	30
AVPA72ACD	460-3-60	17.3	25									17.3	25			17.3	25			20.6	25	25.1	30
AVPA/AVHA24ACZ	575-3-60	5.3	16									7.9	16			11.5	16			15.0	16		
AVPA/AVHA30ACZ	575-3-60	6.5	16									8.3	16			11.5	16			15.4	20	19.0	20
AVPA/AVHA36ACZ	575-3-60	7.0	16									8.3	16			11.9	16			15.4	20	19.0	20
AVPA/AVHA42ACZ	575-3-60	7.6	16									8.5	16			12.1	16			16.6	20	19.2	20
AVPA/AVHA48ACZ	575-3-60	8.4	16									8.5	16			12.1	16			16.6	20	19.2	20
AVPA/AVHA60ACZ	575-3-60	10.5	16									10.5	16			13.0	16			16.5	20	20.1	25
AVPA/AVHA72ACZ	575-3-60	12.8	20									12.8	20			13.0	20			16.5	20	20.1	25

[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]MFS = Maximum Fuse or HACR Breaker Size [3]SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. The 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) -
AVPA/AVHA Air Conditioners with Elec. Reheat ("R") and Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N"), Economizer, Outside Air with Pressure Relief ("C")

ELECTRIC HEAT		000 = None		022 = 2.2 kw		036 = 3.6 kw		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
AVPA12ACA	208/230-1-60	7.4	15	18.9	20	26.2	30			33.4	35												
AVPA/AVHA20ACA	208/230-1-60	13.4	20					34.3	35	39.4	40	44.7	45					65.5	70				
AVPA/AVHA24ACA	208/230-1-60	19.0	30					39.9	40	45	45	50.3	60					71.1	80				
AVPA/AVHA30ACA	208/230-1-60	21.9	35					42.8	45	47.9	50	53.2	60					74	80	84.8	90	100	100
AVPA/AVHA36ACA	208/230-1-60	26.7	40					47.6	50	52.7	60	58	60					78.8	80	89.2	90	104.8	110
AVPA/AVHA42ACA	208/230-1-60	30.7	50							56.7	60							82.8	90	93.2	100	108.8	110
AVPA/AVHA48ACA	208/230-1-60	33.2	50							59.2	60							85.3	90	95.7	100	111.3	120
AVPA/AVHA60ACA	208/230-1-60	40.8	60							66.8	70							92.9	100	103.3	110	118.9	120
AVPA72ACA	208/230-1-60	45.6	60							71.6	80							97.7	100	108.1	110	123.7	130
AVPA/AVHA24ACC	208/230-3-60	13.4	20									31.4	35			40.5	45			49.5	50	58.5	60
AVPA/AVHA30ACC	208/230-3-60	15.6	20									33.6	35			42.7	45			51.7	60	60.7	70
AVPA/AVHA36ACC	208/230-3-60	20.8	30									38.8	40			47.9	50			56.9	60	65.9	70
AVPA/AVHA42ACC	208/230-3-60	22.9	35									40.9	45			50.0	50			59.0	60	68.0	70
AVPA/AVHA48ACC	208/230-3-60	23.0	35									41.0	45			50.1	60			59.1	60	68.1	70
AVPA/AVHA60ACC	208/230-3-60	27.5	40									45.5	50			54.6	60			63.6	70	72.6	80
AVPA72ACC	208/230-3-60	36.1	50									54.1	60			63.2	70			72.2	80	81.2	90
AVPA/AVHA24ACD	460-3-60	7.9	15									16.9	20			21.4	25			25.9	30	30.4	35
AVPA/AVHA30ACD	460-3-60	9.2	15									18.2	20			22.7	25			27.2	30	31.7	35
AVPA/AVHA36ACD	460-3-60	9.7	15									18.7	20			23.2	25			27.7	30	32.2	35
AVPA/AVHA42ACD	460-3-60	10.6	15									19.6	20			24.1	25			28.6	30	33.1	35
AVPA/AVHA48ACD	460-3-60	10.7	15									19.7	20			24.2	25			28.7	30	33.2	35
AVPA/AVHA60ACD	460-3-60	13.6	20									22.6	25			27.1	30			31.6	35	36.1	40
AVPA72ACD	460-3-60	17.3	25									26.3	30			30.8	35			35.3	40	39.8	40
AVPA/AVHA24ACZ	575-3-60	5.3	16									12.6	16			16.2	20			19.7	20		
AVPA/AVHA30ACZ	575-3-60	6.5	16									13.7	16			17.3	20			20.8	25	24.5	25
AVPA/AVHA36ACZ	575-3-60	7.0	16									14.2	16			17.8	20			21.3	25	25.0	25
AVPA/AVHA42ACZ	575-3-60	7.6	16									14.9	16			18.5	20			22.0	25	25.6	30
AVPA/AVHA48ACZ	575-3-60	8.4	16									15.6	20			19.2	20			22.7	25	26.4	30
AVPA/AVHA60ACZ	575-3-60	10.5	16									17.7	20			21.3	25			24.8	25	28.5	30
AVPA72ACZ	575-3-60	12.8	20									20.1	25			23.7	25			27.2	30	30.8	35

[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]2MFS = Maximum Fuse or HACR Breaker Size [3]SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. The 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Unit Load Amps - *AVPA/AVHA Air Conditioners with Ventilation Configurations:*
Manual Damper, up to 15% Outside Air (“N”)
Economizer, Outside Air with Pressure Relief (“C”)

BASIC MODEL NUMBER	VOLTAGE PHASE / HZ	CUR-RENT AMPS		LOAD OF RESISTIVE HEATING - ELEMENTS ONLY (AMPS) *(1) ALL HEATING ELEMENTS ARE ON A SEPARATE CIRCUIT (2) SHADED VALUES (12 & 15 kW) UTILIZE TWO CIRCUITS*										TOTAL MAXIMUM HEATING AMPS *INCLUDES AMPS FROM MOTOR(S) THAT ARE LOCATED ON AN ELECTRICAL CIRCUIT THAT DOES NOT HAVE HEATERS*									
		AC[1]	IBM[2]	2.2 kW	3.6 kW	04 kW	05 kW	06 kW	08 kW	09 kW	10 kW	12 kW	15 kW	2.2 kW	3.6 kW	04 kW	05 kW	06 kW	08 kW	09 kW	10 kW	12 kW	15 kW
AVPA12ACA	208/230-1-60	6.1	0.85	9.2	15.0		20.8							10.1	15.0		21.7						
AVPA/AVHA20ACA	208/230-1-60	11.3	1.5			16.7	20.8	25.0	33.3		41.7					18.2	22.3	26.5	34.8		43.2		
AVPA/AVHA24ACA	208/230-1-60	15.8	1.5			16.7	20.8	25.0	33.3		41.7					18.2	22.3	26.5	34.8		43.2		
AVPA/AVHA30ACA	208/230-1-60	18.4	2.5			16.7	20.8	25.0	33.3		41.7	50.0	62.5			19.2	23.3	27.5	35.8		44.2	52.5	65.0
AVPA/AVHA36ACA	208/230-1-60	22.2	2.5			16.7	20.8	25.0	33.3		41.7	50.0	62.5			19.2	23.3	27.5	35.8		44.2	52.5	65.0
AVPA/AVHA42ACA	208/230-1-60	25.7	3.1				20.8				41.7	50.0	62.5				23.9				44.8	53.1	65.6
AVPA/AVHA48ACA	208/230-1-60	27.7	3.1				20.8				41.7	50.0	62.5				23.9				44.8	53.1	65.6
AVPA/AVHA60ACA	208/230-1-60	34.2	5.2				20.8				41.7	50.0	62.5				26.0				46.9	55.2	67.7
AVPA72ACA	208/230-1-60	38.2	5.2				20.8				41.7	50.0	62.5				26.0				46.9	55.2	67.7
AVPA/AVHA24ACC	208/230-3-60	11.2	1.5					14.4		21.7		28.9	36.1					15.9		23.2		30.4	37.6
AVPA/AVHA30ACC	208/230-3-60	13.3	2.5					14.4		21.7		28.9	36.1					16.9		24.2		31.4	38.6
AVPA/AVHA36ACC	208/230-3-60	17.5	2.5					14.4		21.7		28.9	36.1					16.9		24.2		31.4	38.6
AVPA/AVHA42ACC	208/230-3-60	19.5	3.1					14.4		21.7		28.9	36.1					17.5		24.8		32.0	39.2
AVPA/AVHA48ACC	208/230-3-60	19.6	3.1					14.4		21.7		28.9	36.1					17.5		24.8		32.0	39.2
AVPA/AVHA60ACC	208/230-3-60	23.6	5.2					14.4		21.7		28.9	36.1					19.6		26.9		34.1	41.3
AVPA72ACC	208/230-3-60	30.5	5.2					14.4		21.7		28.9	36.1					19.6		26.9		34.1	41.3
AVPA24/AVHAACD	460-3-60	6.6	0.8					7.2		10.8		14.4	18.0					8.0		11.6		15.2	18.8
AVPA/AVHA30ACD	460-3-60	7.8	1.3					7.2		10.8		14.4	18.0					8.5		12.1		15.7	19.3
AVPA/AVHA36ACD	460-3-60	8.2	1.3					7.2		10.8		14.4	18.0					8.5		12.1		15.7	19.3
AVPA/AVHA42ACD	460-3-60	9.1	1.6					7.2		10.8		14.4	18.0					8.8		12.4		16.0	19.6
AVPA/AVHA48ACD	460-3-60	9.2	1.6					7.2		10.8		14.4	18.0					8.8		12.4		16.0	19.6
AVPA/AVHA60ACD	460-3-60	11.7	2.6					7.2		10.8		14.4	18.0					9.8		13.4		17.0	20.6
AVPA72ACD	460-3-60	14.7	2.6					7.2		10.8		14.4	18.0					9.8		13.4		17.0	20.6
AVPA/AVHA24ACZ	575-3-60	4.5	0.6					5.8		8.7		11.5						6.4		9.3		12.1	
AVPA/AVHA30ACZ	575-3-60	5.5	1.0					5.8		8.7		11.5	14.4					6.8		9.7		12.5	15.4
AVPA/AVHA36ACZ	575-3-60	5.9	1.0					5.8		8.7		11.5	14.4					6.8		9.7		12.5	15.4
AVPA/AVHA42ACZ	575-3-60	6.6	1.2					5.8		8.7		11.5	14.4					7.0		9.9		12.7	15.6
AVPA/AVHA48ACZ	575-3-60	7.2	1.2					5.8		8.7		11.5	14.4					7.0		9.9		12.7	15.6
AVPA/AVHA60ACZ	575-3-60	9.0	2.1					5.8		8.7		11.5	14.4					7.9		10.8		13.6	16.5
AVPA/AVHA72ACZ	575-3-60	10.9	2.1					5.8		8.7		11.5	14.4					7.9		10.8		13.6	16.5

[1]AC = Air Conditioner Unit Amps [2]IBM = Indoor Blower Motor
Heating kW is rated at 240 volts on the ACA & ACC models. Derate heater output by 25% for operation at 208 volts. Heating kW is rated at 480 volts on the ACD models. Total heating and cooling amps includes all motors. Three phase models contain single phase motor loads. Loads are not equally balanced on each phase and values shown are maximum phase loads.

ComPac® HVEA High Efficiency Air Conditioners

Certified Efficiency and Capacity Ratings at ANSI/AHRI Standard 390 for HVEA Air Conditioners with Single Stage Compressor

Model Number	HVEA24			HVEA30			HVEA36			HVEA42			HVEA49			HVEA60		
	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD
Cooling BTUH[1]	23,600			29,000			35,600			40,000			49,000			58,000		
EER[2]	10.75			11.75			11.25			10.50			11.50			10.50		
Rated Air Flow (CFM[3])	800			1,000			1,300			1,400			1,750			1,900		

[1]Cooling rated at 95°F (35°C) outdoor and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air [2]EER=Energy Efficiency Ratio [3]CFM=Cubic Feet per Minute
Ratings are with no outside air. Performance will be affected by altitude.
Ratings are at 230 volts for 208/230 volt units ("A" & "C" models) and 460 volts for "D" models. Operation of units at a different voltage from that of the rating point will affect performance and air flow.

Sensible Total Heat Ratio @ 95ºF (35ºC) Outside Air Dry Bulb - HVEA Air Conditioners with Single Stage Compressor

Model Number	HVEA24			HVEA30			HVEA36			HVEA42			HVEA49			HVEA60		
	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD
Total Capacity	23,600			29,000			35,600			40,000			49,000			58,000		
Sensible Heat Ratio	0.74			0.76			0.76			0.73			0.74			0.73		
Sensible Capacity	17,435			22,020			26,945			29,270			36,175			42,505		
Rated Air Flow (CFM[1])	800			1,000			1,300			1,400			1,750			1,900		

[1]CFM=Cubic Feet per Minute
Sensible heat ratios based upon ANSI/AHRI std. 390 outdoor air conditions of 95°F (35°C) and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air.

Cooling Performance (BTUH) at Various Outdoor Temperatures for HVEA Air Conditioners with Single Stage Compressor

Model Number	Outdoor Temperature											
	75ºF / 24ºC	80ºF / 26.5ºC	85ºF / 29ºC	90ºF / 32ºC	95ºF / 35ºC	100ºF / 38ºC	105ºF / 40.5ºC	110ºF / 43.3ºC	115ºF / 46.1ºC	120ºF / 48.9ºC	125ºF / 51.7ºC	130ºF / 54.4ºC
HVEA24AC	27,375	26,430	25,490	24,545	23,600	22,655	21,710	20,770	20,295	19,870	19,445	19,020
HVEA30AC	33,640	32,480	31,320	30,160	29,000	27,840	26,680	25,520	24,940	24,420	23,895	23,375
HVEA36AC	41,295	39,870	38,450	37,025	35,600	34,175	32,750	31,320	30,615	29,975	29,335	28,695
HVEA42AC	46,400	44,800	43,200	41,600	40,000	38,400	36,800	35,200	34,400	33,680	32,960	32,240
HVEA49AC	56,840	54,880	52,920	50,960	49,000	47,040	45,080	43,120	42,140	41,260	40,375	39,495
HVEA60AC	67,280	64,960	62,640	60,320	58,000	55,680	53,360	51,040	49,880	48,835	47,790	46,745

Based upon ANSI/AHRI std. 390 return air conditions of 80°F DB/67° WB (26.5°C DB/19.5°C WB) at various outdoor temperatures.

Electrical Characteristics - Compressor, Fan & Blower Motors - HVEA Air Conditioner with Single Stage Compressor

BASIC MODEL	COMPRESSOR				OUTDOOR FAN MOTOR				INDOOR FAN MOTOR (ECM)			
	Type	VOLTS-HZ-PH	RLA[1]	LRA[2]	VOLTS-HZ-PH	RPM[3]	FLA[4]	HP[5]	VOLTS-HZ-PH	RPM[3]	FLA[4]	HP[5]
HVEA24ACA	SCROLL	208/230-60-1	12.8	58.3	208/230-60-1	1075	1.8	1/4	208/230-60-1	1500	2.8	1/3
HVEA30ACA		208/230-60-1	12.8	64.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA36ACA		208/230-60-1	16.6	79.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA42ACA		208/230-60-1	19.8	109.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA49ACA		208/230-60-1	21.8	117.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVEA60ACA		208/230-60-1	26.4	134.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVEA24ACC	SCROLL	208/230-60-3	7.7	55.4	208/230-60-1	1075	1.8	1/4	208/230-60-1	1500	2.8	1/3
HVEA30ACC		208/230-60-3	8.3	61.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA36ACC		208/230-60-3	10.4	88.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA42ACC		208/230-60-3	13.6	83.1	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA49ACC		208/230-60-3	13.7	83.1	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVEA60ACC		208/230-60-3	15.9	111.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVEA24ACD	SCROLL	460-60-3	4.0	28.0	208/230-60-1	1075	1.8	1/4	208/230-60-1	1500	2.8	1/3
HVEA30ACD		460-60-3	5.1	28.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA36ACD		460-60-3	5.8	38.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA42ACD		460-60-3	6.1	41.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVEA49ACD		460-60-3	6.2	41.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVEA60ACD		460-60-3	7.7	52.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4

[1]RLA = Rated Load Amps [2]LRA = Locked Rotor Amps [3]RPM = Revolutions per Minute [4]FLA = Full Load Amps [5]HP = Horsepower
The 460 volt units will have a step down transformer for the 230 volt motors.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - *HVEA Air Conditioners with Single stage Compressors & Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N") Economizer, Outside Air with Pressure Relief ("C")*

ELECTRIC HEAT		000 = None		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
HVEA24ACA	208/230-1-60	20.6	30	23.1	30	28.8	30	34.1	35	44.4	45			54.9	60				
HVEA30ACA	208/230-1-60	21.6	30	23.1	30	28.8	30	34.1	35	44.4	45			54.9	60	65.3	70	80.9	90
HVEA36ACA	208/230-1-60	26.4	40	26.4	40	28.8	40	34.1	35	44.4	45			54.9	60	65.3	70	80.9	90
HVEA42ACA	208/230-1-60	30.4	50			30.4	50							54.9	60	65.3	70	80.9	90
HVEA49ACA	208/230-1-60	34.4	50			34.4	50							56.4	60	66.8	70	82.4	90
HVEA60ACA	208/230-1-60	40.1	60			40.1	60							56.4	60	66.8	70	82.4	90
HVEA24ACC	208/230-3-60	14.2	20					20.8	25			29.9	30			38.9	40		
HVEA30ACC	208/230-3-60	16.0	20					20.8	25			29.9	30			38.9	40	47.9	50
HVEA36ACC	208/230-3-60	18.6	25					20.8	25			29.9	30			38.9	40	47.9	50
HVEA42ACC	208/230-3-60	22.6	35					22.6	35			29.9	35			38.9	40	47.9	50
HVEA49ACC	208/230-3-60	24.2	35					24.2	35			31.4	35			40.4	50	49.4	50
HVEA60ACC	208/230-3-60	27.0	40					27.0	40			31.4	40			40.4	50	49.4	50
HVEA24ACD	460-3-60	7.3	15					10.4	15			14.9	15			19.4	20	23.9	25
HVEA30ACD	460-3-60	9.2	15					10.4	15			14.9	15			19.4	20	23.9	25
HVEA36ACD	460-3-60	10.1	15					10.4	15			14.9	15			19.4	20	23.9	25
HVEA42ACD	460-3-60	10.4	15					10.4	15			14.9	15			19.4	20	23.9	25
HVEA49ACD	460-3-60	11.3	15					11.3	15			15.7	20			20.2	25	24.7	25
HVEA60ACD	460-3-60	13.2	20					13.2	20			15.7	20			20.2	25	24.7	25

[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]MFS = Maximum Fuse or HACR Breaker Size [3]SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. he 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) -
HVEA Air Conditioners with Electric Reheat ("R") with Single stage Compressors and Ventilation Configurations:
Manual Damper, up to 15% Outside Air ("N")
Economizer, Outside Air with Pressure Relief ("C")

ELECTRIC HEAT		000 = None		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
HVEA24ACA	208/230-1-60	20.6	30	41.5	45	46.6	50	51.9	60					72.7	80				
HVEA30ACA	208/230-1-60	21.6	30	42.5	45	47.6	50	52.9	60					73.7	80	84.1	90	99.7	100
HVEA36ACA	208/230-1-60	26.4	40	47.3	50	52.4	60	57.7	60					78.5	80	88.9	90	104.5	110
HVEA42ACA	208/230-1-60	30.4	50			56.4	60							82.5	90	92.9	100	108.5	110
HVEA49ACA	208/230-1-60	34.4	50			60.4	70							86.5	90	96.9	100	112.5	120
HVEA60ACA	208/230-1-60	40.1	60			66.1	70							92.2	100	102.6	110	118.2	120
HVEA24ACC	208/230-3-60	14.2	20					32.2	35			41.3	45			50.3	60	59.3	60
HVEA30ACC	208/230-3-60	16.0	20					34.0	35			43.1	45			52.1	60	61.1	70
HVEA36ACC	208/230-3-60	18.6	25					36.6	40			45.7	50			54.7	60	63.7	70
HVEA42ACC	208/230-3-60	22.6	35					40.6	45			49.7	50			58.7	60	67.7	70
HVEA49ACC	208/230-3-60	24.2	35					42.2	45			51.3	60			60.3	70	69.3	70
HVEA60ACC	208/230-3-60	27.0	40					45.0	45			54.1	60			63.1	70	72.1	80
HVEA24ACD	460-3-60	7.3	15					16.3	20			20.8	25			25.3	30	29.8	30
HVEA30ACD	460-3-60	9.2	15					18.2	20			22.7	25			27.2	30	31.7	35
HVEA36ACD	460-3-60	10.1	15					19.1	20			23.6	25			28.1	30	32.6	35
HVEA42ACD	460-3-60	10.4	15					19.4	20			23.9	25			28.4	30	32.9	35
HVEA49ACD	460-3-60	11.3	15					20.3	25			24.8	25			29.3	30	33.8	35
HVEA60ACD	460-3-60	13.2	20					22.2	25			26.7	30			31.2	35	35.7	40

[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]2MFS = Maximum Fuse or HACR Breaker Size [3]3SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. The 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Unit Load Amps -
HVEA Air Conditioners with with Single stage Compressors and Ventilation Configurations:
Manual Damper, up to 15% Outside Air ("N")
Economizer, Outside Air with Pressure Relief ("C")

BASIC MODEL NUMBER	VOLTAGE PHASE / HZ	CURRENT AMPS		LOAD OF RESISTIVE HEATING - ELEMENTS ONLY (AMPS) *(1) ALL HEATING ELEMENTS ARE ON A SEPARATE CIRCUIT (2) SHADED VALUES (12 & 15 kW) UTILIZE TWO CIRCUITS*								TOTAL MAXIMUM HEATING AMPS *INCLUDES AMPS FROM MOTOR(S) THAT ARE LOCATED ON AN ELECTRICAL CIRCUIT THAT DOES NOT HAVE HEATERS*							
		AC[1]	IBM[2]	04 kW	05 kW	06 kW	08 kW	09 kW	10 kW	12 kW	15 kW	04 Kw	05 Kw	06 Kw	08 Kw	09 Kw	10 Kw	12 Kw	15 Kw
HVEA24ACA	208/230-1-60	17.4	2.8	16.7	20.8	25.0	33.3		41.7			19.5	23.6	27.8	36.1		44.5		
HVEA30ACA	208/230-1-60	18.4	2.8	16.7	20.8	25.0	33.3		41.7	50.0	62.5	19.5	23.6	27.8	36.1		44.5	52.8	65.3
HVEA36ACA	208/230-1-60	22.2	2.8	16.7	20.8	25.0	33.3		41.7	50.0	62.5	19.5	23.6	27.8	36.1		44.5	52.8	65.3
HVEA42ACA	208/230-1-60	25.4	2.8		20.8				41.7	50.0	62.5		23.6				44.5	52.8	65.3
HVEA49ACA	208/230-1-60	28.9	4.3		20.8				41.7	50.0	62.5		25.1				46.0	54.3	66.8
HVEA60ACA	208/230-1-60	33.5	4.3		20.8				41.7	50.0	62.5		25.1				46.0	54.3	66.8
HVEA24ACC	208/230-3-60	12.3	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVEA30ACC	208/230-3-60	13.9	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVEA36ACC	208/230-3-60	16.0	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVEA42ACC	208/230-3-60	19.2	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVEA49ACC	208/230-3-60	20.8	4.3			14.4		21.7		28.9	36.1			18.7		26.0		33.2	40.4
HVEA60ACC	208/230-3-60	23.0	4.3			14.4		21.7		28.9	36.1			18.7		26.0		33.2	40.4
HVEA24ACD	460-3-60	6.3	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVEA30ACD	460-3-60	7.9	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVEA36ACD	460-3-60	8.6	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVEA42ACD	460-3-60	8.9	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVEA49ACD	460-3-60	9.8	2.2			7.2		10.8		14.4	18.0			9.4		13.0		16.6	20.2
HVEA60ACD	460-3-60	11.3	2.2			7.2		10.8		14.4	18.0			9.4		13.0		16.6	20.2

[1]AC = Air Conditioner Unit Amps [2]IBM = Indoor Blower Motor
Heating kW is rated at 240 volts on the ACA & ACC models. Derate heater output by 25% for operation at 208 volts. Heating kW is rated at 480 volts on the ACD models.
Total heating and cooling amps includes all motors. Three phase models contain single phase motor loads. Loads are not equally balanced on each phase and values shown are maximum phase loads.

ComPac® HVESA Air Conditioners with 2-Stage Compressor

Certified Efficiency and Capacity Ratings at ANSI/AHRI Standard 390 for HVESA Air Conditioners with 2-Stage Compressors

Model Number	HVESA36			HVESA42			HVESA49			HVESA60		
	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD
Cooling BTUH[1] - 2nd Stage	35,000			39,000			47,000			56,000		
EER[2] - 2nd Stage	11.00			10.50			11.75			10.50		
Integrated Part Load Value[3]	16.0			14.1			16.0			14.8		
Rated Air Flow (CFM[4])	1,300			1,400			1,750			1,900		

[1]Cooling rated at 95°F (35°C) outdoor and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air. [2]EER=Energy Efficiency Ratio
[3]Integrated Part Load Value is an integrated efficiency measure from 1st and 2nd stage capacity modulation. [4]CFM=Cubic Feet per Minute
Ratings are with no outside air. Performance will be affected by altitude.
Ratings are at 230 volts for 208/230 volt units (“A” & “C” models) and 460 volts for “D” models. Operation of units at a different voltage from that of the rating point will affect performance and air flow.

Sensible Total Heat Ratio @ 95°F (35°C) Outside Air Dry Bulb - HVESA Air Conditioners with 2-Stage Compressors

Model Number	HVESA36			HVESA42			HVESA49			HVESA60		
	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD	ACA	ACC	ACD
Total Capacity	35,000			39,000			47,000			56,000		
Sensible Heat Ratio	0.70			0.71			0.79			0.77		
Sensible Capacity	24,445			27,590			36,920			43,235		
Rated Air Flow (CFM[1])	1,300			1,400			1,750			1,900		

[1]CFM=Cubic Feet per Minute
Sensible heat ratios based upon ANSI/AHRI std. 390 outdoor air conditions of 95°F (35°C) and 80°F DB/67° WB (26.5°C DB/19.5°C WB) return air.

Stage 2 Cooling Performance (BTUH) at Various Outdoor Temperatures

Model Number	Outdoor Temperature				
	75ºF / 24ºC	80ºF / 26.5ºC	85ºF / 29ºC	90ºF / 32ºC	95ºF / 35ºC
HVESA36AC	40,600	39,200	37,800	36,400	35,000
HVESA42AC	45,240	43,680	42,120	40,560	39,000
HVESA49AC	54,520	52,640	50,760	48,880	47,000
HVESA60AC	64,960	62,720	60,480	58,240	56,000

Based upon ANSI/AHRI std. 390 return air conditions of 80°F DB/67° WB (26.5°C DB/19.5°C WB) at various outdoor temperatures.

Stage 1 Cooling Performance (BTUH) at Various Outdoor Temperatures

Model Number	Outdoor Temperature				
	75ºF / 24ºC	80ºF / 26.5ºC	85ºF / 29ºC	90ºF / 32ºC	95ºF / 35ºC
HVESA36AC	30,856	29,792	28,728	27,664	26,600
HVESA42AC	34,336	33,152	31,968	30,784	29,600
HVESA49AC	44,080	42,560	41,040	39,520	38,000
HVESA60AC	51,040	49,280	47,520	45,760	44,000

Based upon ANSI/AHRI std. 390 return air conditions of 80°F DB/67° WB (26.5°C DB/19.5°C WB) at various outdoor temperatures.

Electrical Characteristics - Compressor, Fan & Blower Motors - HVESA Air Conditioner with 2-Stage Compressor

BASIC MODEL	Type	COMPRESSOR			OUTDOOR FAN MOTOR				INDOOR FAN MOTOR (ECM[6])			
		VOLTS-HZ-PH	RLA[1]	LRA[2]	VOLTS-HZ-PH	RPM[3]	FLA[4]	HP[5]	VOLTS-HZ-PH	RPM[3]	FLA[4]	HP[5]
HVESA36ACA	SCROLL	208/230-60-1	16.6	82.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA42ACA		208/230-60-1	16.6	96.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA49ACA		208/230-60-1	21.1	96.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVESA60ACA		208/230-60-1	25.6	118.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVESA36ACC	SCROLL	208/230-60-3	11.1	58.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA42ACC		208/230-60-3	13.4	88.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA49ACC		208/230-60-3	13.4	88.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVESA60ACC		208/230-60-3	17.6	123.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVESA36ACD	SCROLL	460-60-3	4.5	29.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA42ACD		460-60-3	6.1	44.0	208/230-60-1	825	2.8	1/3	208/230-60-1	1500	2.8	1/2
HVESA49ACD		460-60-3	6.4	41.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4
HVESA60ACD		460-60-3	9.0	62.0	208/230-60-1	825	2.8	1/2	208/230-60-1	1500	4.3	3/4

[1]RLA = Rated Load Amps [2]LRA = Locked Rotor Amps [3]RPM = Revolutions per Minute [4]FLA = Full Load Amps [5]HP = Horsepower [6]ECM = Electronically Commutated Motor
The 460 volt units have a step down transformer for the 230 volt motors.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - *HVESA Air Conditioners with Two Stage Compressor and Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N") Economizer, Outside Air with Pressure Relief ("C")*

ELECTRIC HEAT		000 = None		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
HVESA36ACA	208/230-1-60	24.6	35	24.6	35	28.8	35	34.1	35	44.4	45			54.9	60	65.3	70	80.9	90
HVESA42ACA	208/230-1-60	28.0	45			28.8	45							54.9	60	65.3	70	80.9	90
HVESA49ACA	208/230-1-60	33.5	50			33.5	50							56.4	60	66.8	70	82.4	90
HVESA60ACA	208/230-1-60	41.0	60			41.0	60							56.4	60	66.8	70	82.4	90
HVESA36ACC	208/230-3-60	20.1	30					20.8	25			29.9	30			38.9	40	47.9	50
HVESA42ACC	208/230-3-60	23.2	35					23.2	35			29.9	35			38.9	40	47.9	50
HVESA49ACC	208/230-3-60	24.6	35					24.6	35			31.4	35			40.4	50	49.4	50
HVESA60ACC	208/230-3-60	27.7	40					27.7	40			31.4	40			40.4	50	49.4	50
HVESA36ACD	460-3-60	9.9	15					10.4	15			14.9	15			19.4	20	23.9	25
HVESA42ACD	460-3-60	10.6	15					10.6	15			14.9	15			19.4	20	23.9	25
HVESA49ACD	460-3-60	11.6	15					11.6	15			15.7	20			20.2	25	24.7	25
HVESA60ACD	460-3-60	12.6	15					12.6	20			15.7	20			20.2	25	24.7	25

[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]2MFS = Maximum Fuse or HACR Breaker Size [3]3SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. The 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - *HVESA Air Conditioners with Two Stage Compressor, Electric Reheat ("R") and Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N") Economizer, Outside Air with Pressure Relief ("C")*

ELECTRIC HEAT		000 = None		040 = 4 kw		050 = 5 kw		060 = 6 kw		080 = 8 kw		090 = 9 kw		100 = 10 kw		120 = 12 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE PHASE / HZ	SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]		SPPE[3]	
		MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]	MCA[1]	MFS[2]
HVESA36ACA	208/230-1-60	24.6	35	45.5	50	50.6	60	55.9	60					76.7	80	87.1	90	102.7	110
HVESA42ACA	208/230-1-60	28.0	45			54.0	60							80.1	90	90.5	100	106.1	110
HVESA49ACA	208/230-1-60	33.5	50			59.5	60							85.6	90	96.0	100	111.6	120
HVESA60ACA	208/230-1-60	41.0	60			67.0	70							93.1	100	103.5	110	119.1	120
HVESA36ACC	208/230-3-60	20.1	30					38.1	40			47.2	50			56.2	60	65.2	70
HVESA42ACC	208/230-3-60	23.2	35					41.2	45			50.3	60			59.3	60	68.3	70
HVESA49ACC	208/230-3-60	24.6	35					42.6	45			51.7	60			60.7	70	69.7	70
HVESA60ACC	208/230-3-60	27.7	40					45.7	50			54.8	60			63.8	70	72.8	80
HVESA36ACD	460-3-60	9.9	15					18.9	20			23.4	25			27.9	30	32.4	35
HVESA42ACD	460-3-60	10.6	15					19.6	20			24.1	25			28.6	30	33.1	35
HVESA49ACD	460-3-60	11.6	15					20.6	25			25.1	30			29.6	30	34.1	35
HVESA60ACD	460-3-60	12.6	15					21.6	25			26.1	30			30.6	35	35.1	40

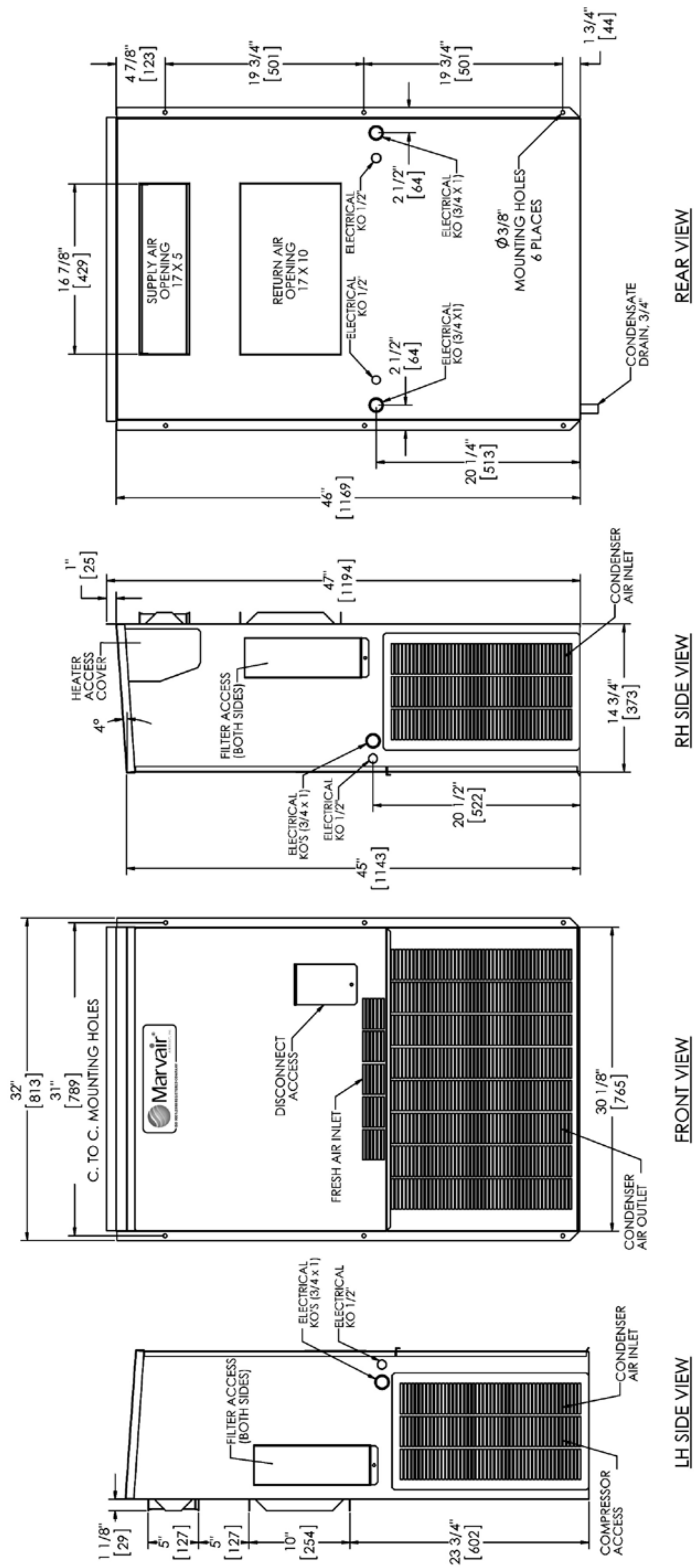
[1]MCA = Minimum Circuit Ampacity (Wiring Size Amps) [2]2MFS = Maximum Fuse or HACR Breaker Size [3]3SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the ACA & ACC models. The 460 volts ACD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Unit Load Amps - *HVESA Air Conditioners with Two Stage Compressor and Ventilation Configurations: Manual Damper, up to 15% Outside Air ("N") Economizer,Outside Air with Pressure Relief ("C")*

BASIC MODEL NUMBER	VOLTAGE PHASE / HZ	CURRENT AMPS		LOAD OF RESISTIVE HEATING - ELEMENTS ONLY (AMPS) *(1) ALL HEATING ELEMENTS ARE ON A SEPARATE CIRCUIT (2) SHADED VALUES (12 & 15 kW) UTILIZE TWO CIRCUITS*								TOTAL MAXIMUM HEATING AMPS *INCLUDES AMPS FROM MOTOR(S) THAT ARE LOCATED ON AN ELECTRICAL CIRCUIT THAT DOES NOT HAVE HEATERS*							
		AC[1]	IBM[2]	04 kW	05 kW	06 kW	08 kW	09 kW	10 kW	12 kW	15 kW	04 Kw	05 Kw	06 Kw	08 Kw	09 Kw	10 Kw	12 Kw	15 Kw
HVESA36ACA	208/230-1-60	20.8	2.8	16.7	20.8	25.0	33.3		41.7	50.0	62.5	19.5	23.6	27.8	36.1		44.5	52.8	65.3
HVESA42ACA	208/230-1-60	23.5	2.8		20.8				41.7	50.0	62.5		23.6				44.5	52.8	65.3
HVESA49ACA	208/230-1-60	28.2	4.3		20.8				41.7	50.0	62.5		25.1				46.0	54.3	66.8
HVESA60ACA	208/230-1-60	34.2	4.3		20.8				41.7	50.0	62.5		25.1				46.0	54.3	66.8
HVESA36ACC	208/230-3-60	17.2	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVESA42ACC	208/230-3-60	19.7	2.8			14.4		21.7		28.9	36.1			17.2		24.5		31.7	38.9
HVESA49ACC	208/230-3-60	21.1	4.3			14.4		21.7		28.9	36.1			18.7		26.0		33.2	40.4
HVESA60ACC	208/230-3-60	23.6	4.3			14.4		21.7		28.9	36.1			18.7		26.0		33.2	40.4
HVESA36ACD	460-3-60	8.5	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVESA42ACD	460-3-60	9.0	1.4			7.2		10.8		14.4	18.0			8.6		12.2		15.8	19.4
HVESA49ACD	460-3-60	9.2	2.2			7.2		10.8		14.4	18.0			9.4		13.0		16.6	20.2
HVESA60ACD	460-3-60	10.0	2.2			7.2		10.8		14.4	18.0			9.4		13.0		16.6	20.2

[1]AC = Air Conditioner Unit Amps [2]IBM = Indoor Blower Motor
Heating kW is rated at 240 volts on the ACA & ACC models. Derate heater output by 25% for operation at 208 volts. Heating kW is rated at 480 volts on the ACD models.
Total heating and cooling amps includes all motors. Three phase models contain single phase motor loads. Loads are not equally balanced on each phase and values shown are maximum phase loads.

Dimensional Data - AVPA12 ComPac® I Air Conditioners



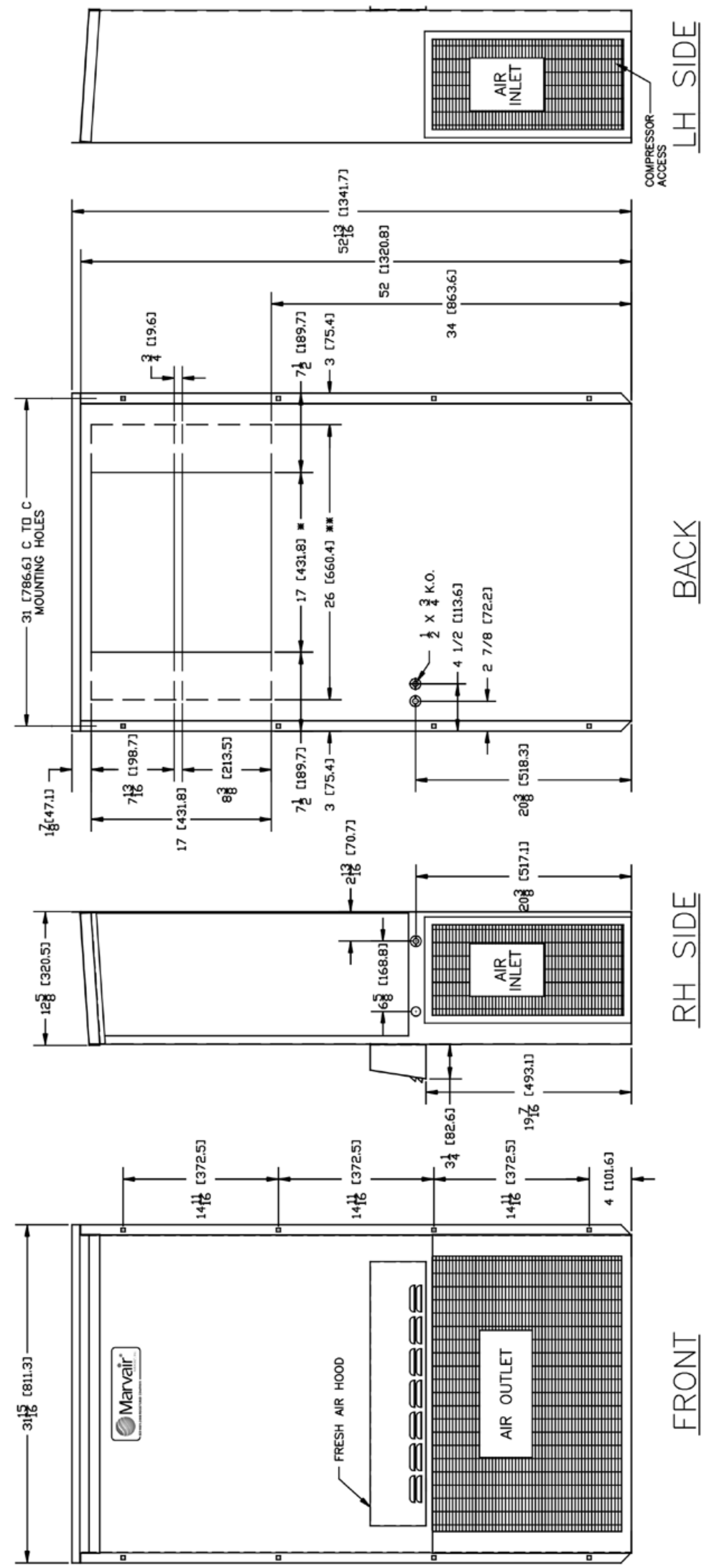
Shipping Weight (pounds/kilograms)

AVPA12	LBS/KGS
COMPAC I	185/84

Filter Size

AVPA12	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	10" x 20" x 2"	254 x 508 x 52	91974	1	7

Dimensional Data - AVPA12 ComPac® II Air Conditioners



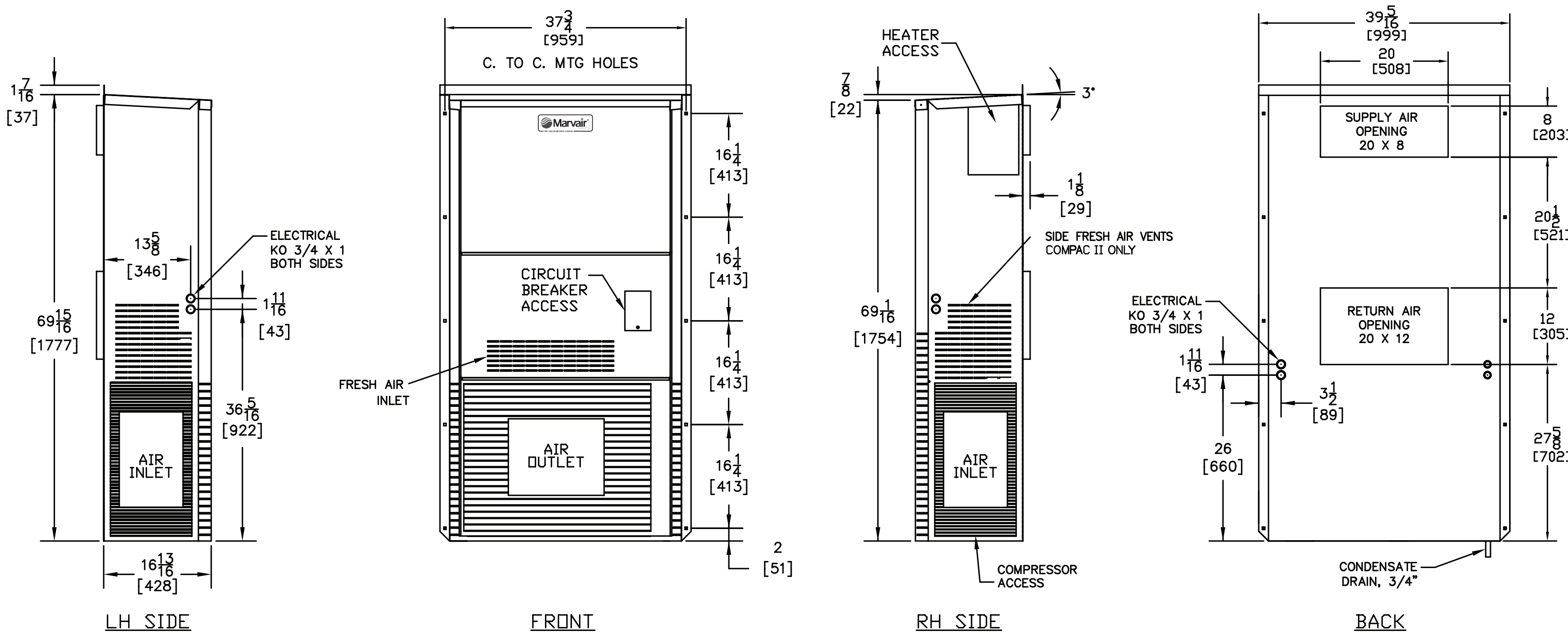
Shipping Weight (pounds/kilograms)

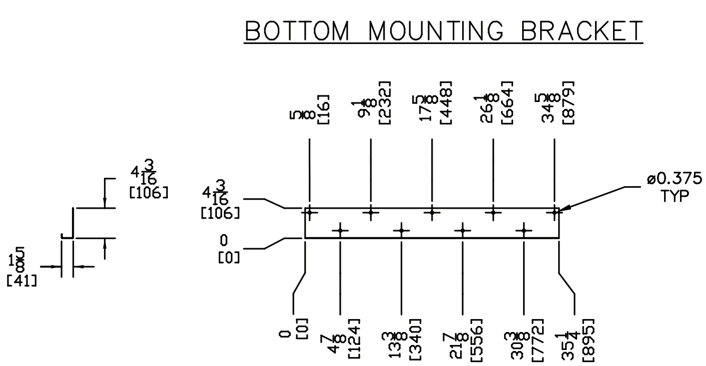
AVPA12	LBS/KGS
COMPAC II	194/88

Filter Size

AVPA12	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	6¼" x 22¼" x 2"	159 x 565 x 52	80172	1	7

Dimensional Data - AVPA/AVHA20/24 ComPac® I & II Air Conditioners





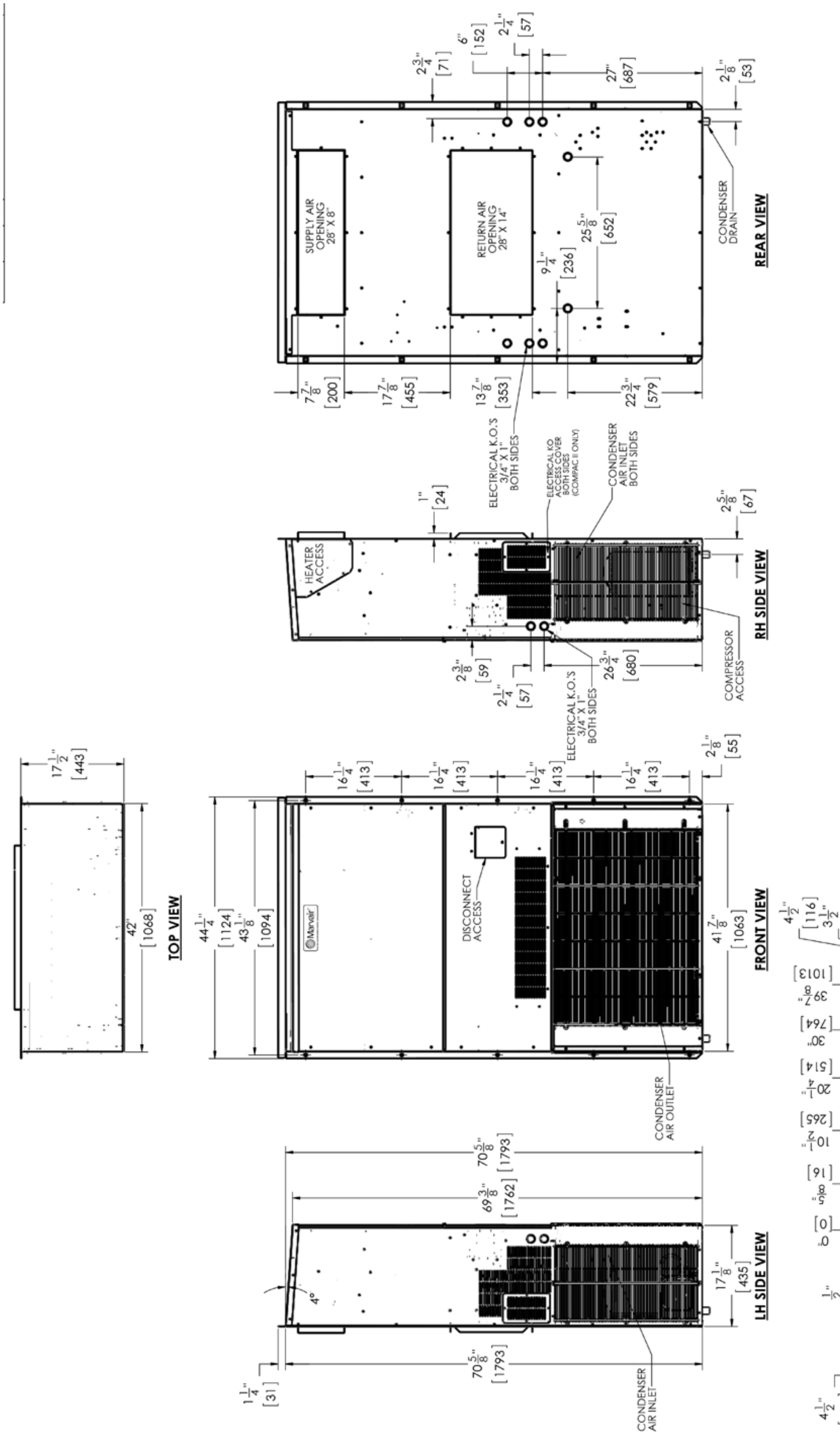
Shipping Weight (pounds/kilograms)

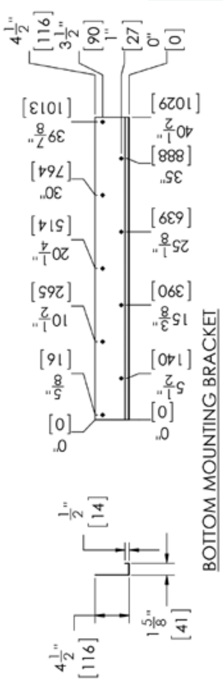
AVPA/AVHA20/24	LBS/KGS
COMPAC I	350/159
COMPAC II	375/170.5

Filter Size

AVPA/AVHA20/24	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	25″ x 16″ x 2″	635 x 406 x 51	80137	1	7

Dimensional Data - AVPA/AVHA30/36, and HVEA24 ComPac® I & II Air Conditioners





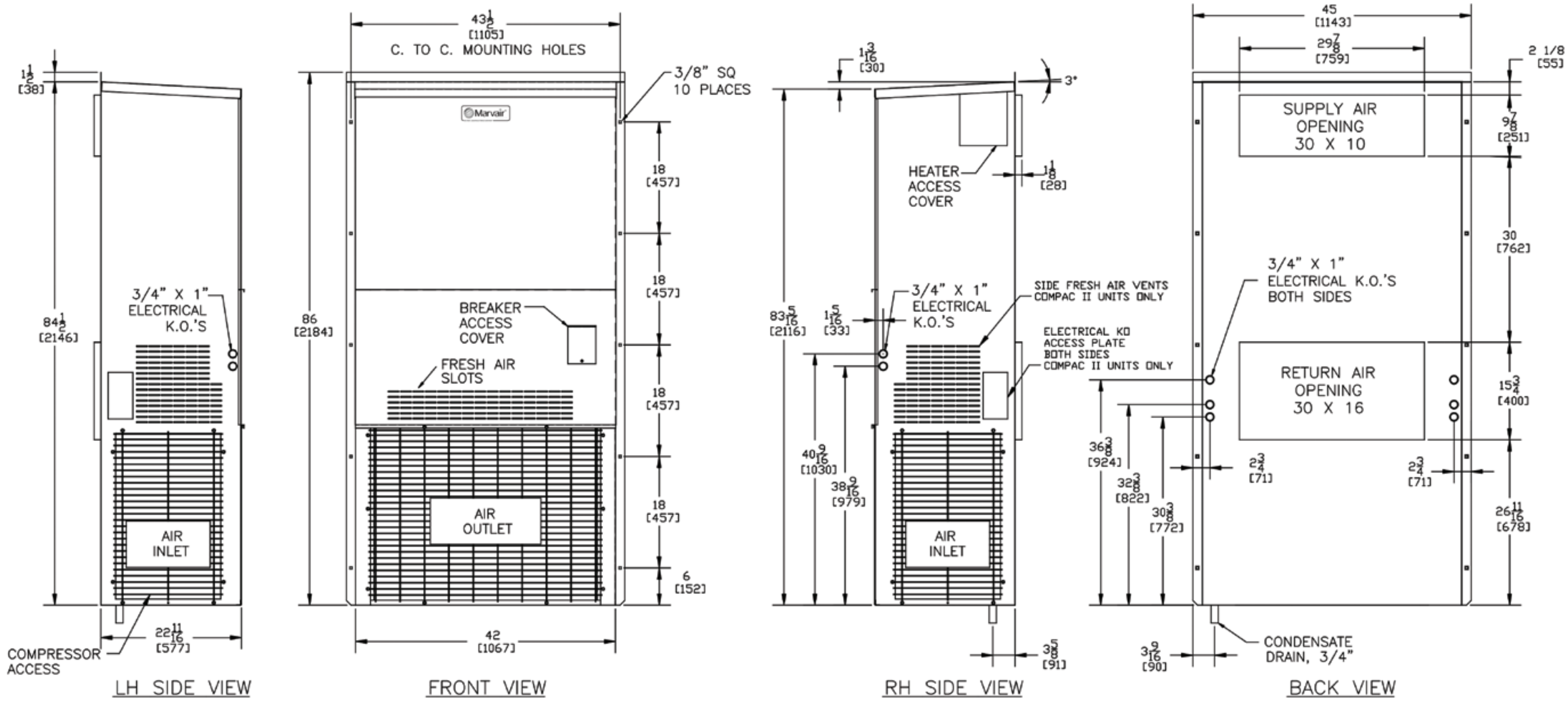
Shipping Weight (pounds/kilograms)

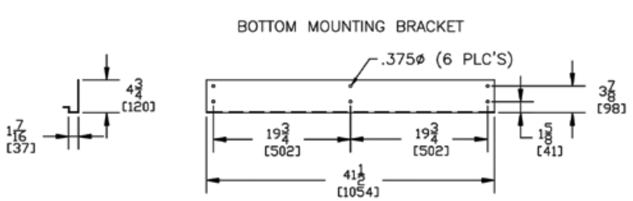
AVPA/AVHA30/36 & HVEA24	LBS/KGS
COMPAC I	420/191
COMPAC II	445/202.5

Filter Size

AVPA/AVHA30/36 & HVEA24	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	30 x 16 x 2	762 x 406 x 51	80138	1	7

Dimensional Data - AVPA/AVHA42/48/60, and HVEA30/36/42, HVESA30/36/42 ComPac® I & II Air Conditioners





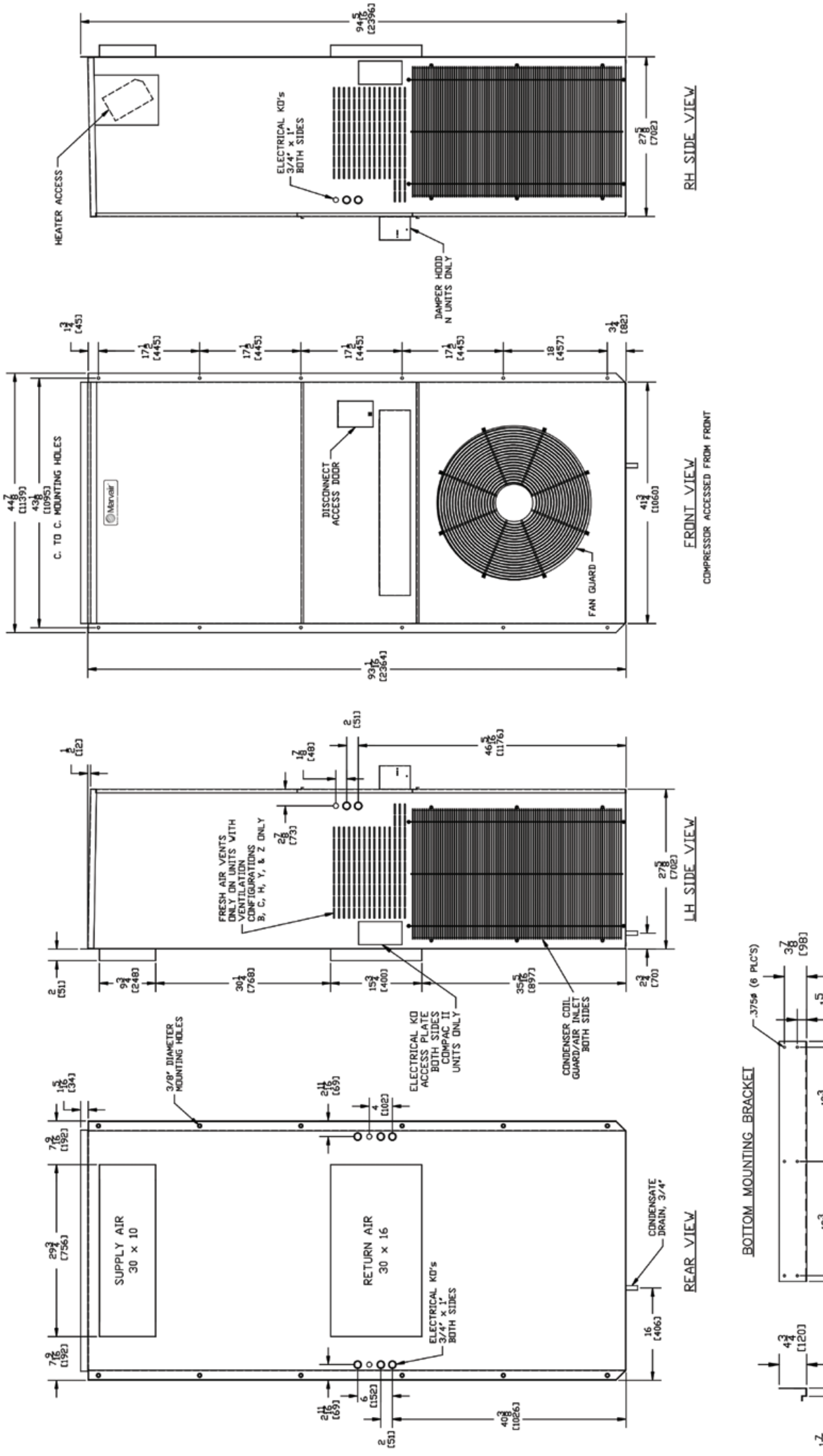
Shipping Weight (pounds/kilograms)

AVPA/AVHA42/48/60 and HVEA30/36/42, HVESA30/36/42	LBS/KGS
COMPAC I	540/245.5
COMPAC II	565/257

Filter Size

AVPA/AVHA42/48/60, HVEA30/36/42, & HVESA30/36/42	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	36½ x 22 x 2	927 x 559 x 51	80162	1	8

Dimensional Data - AVPA72, and HVEA49/60, HVESA49/60 ComPac® I & ComPac® II Air Conditioners



Shipping Weight (pounds/kilograms)

AVPA/AVHA72, and HVEA49/60, HVESA49/60	LBS/KGS
COMPAC I	680/309
COMPAC II	705/320.5

Filter Size

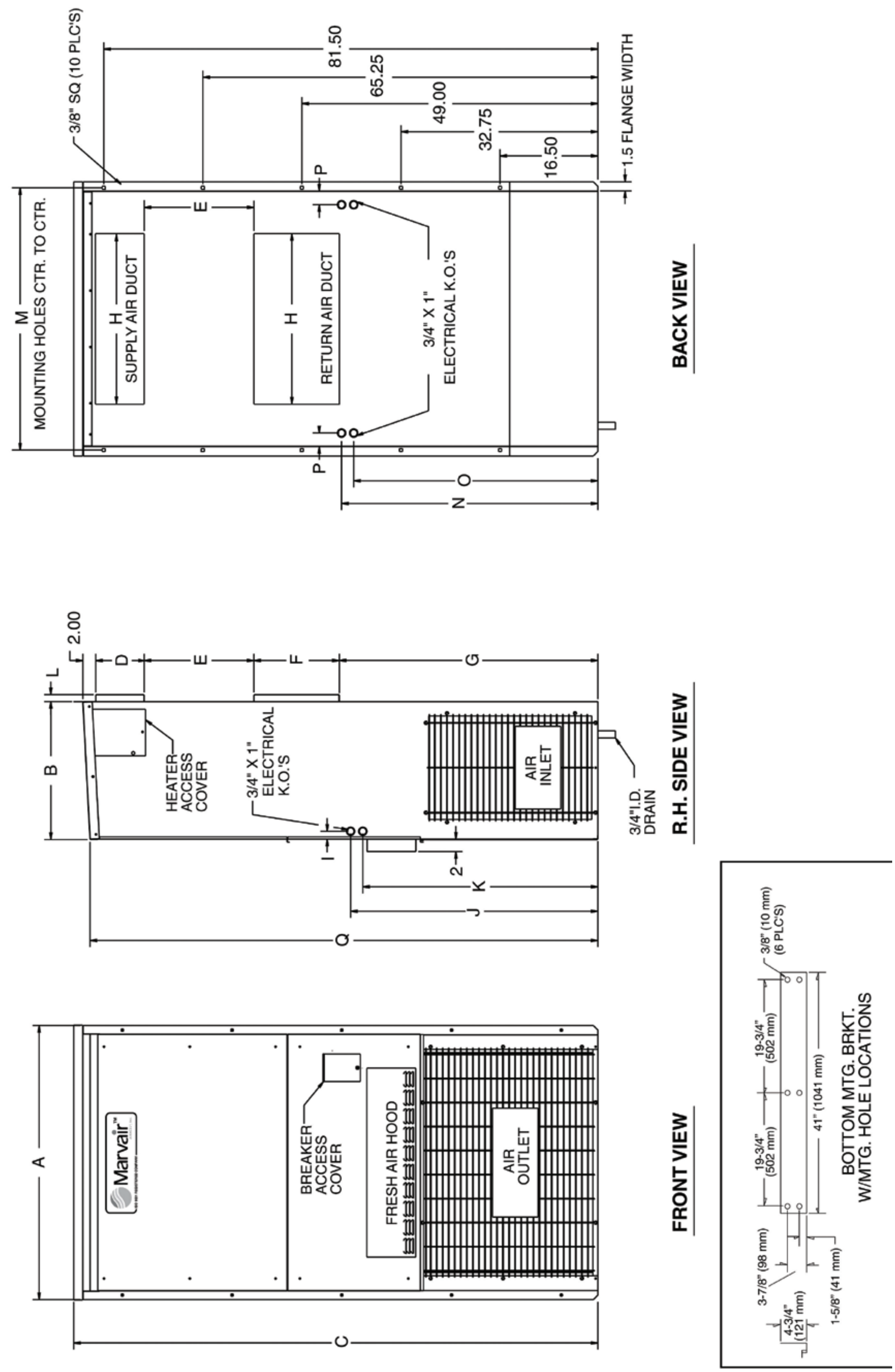
AVPA/AVHA72, HVEA49/60 & HVESA49/60	INCHES	MILLIMETERS	PART NUMBER	FILTERS PER UNIT	MERV RATING
RETURN AIR FILTER	18 x 24 x 2	457 x 610 x 51	81257	2	7

Dimensional Data - AVPA60/AVHA60 with K/04315 Back Panel - ComPac I Only

For matching existing AVP36 wall opening with new AVPA60/AVHA60
For ComPac I Only. For ComPac II use transition curb in Options section.

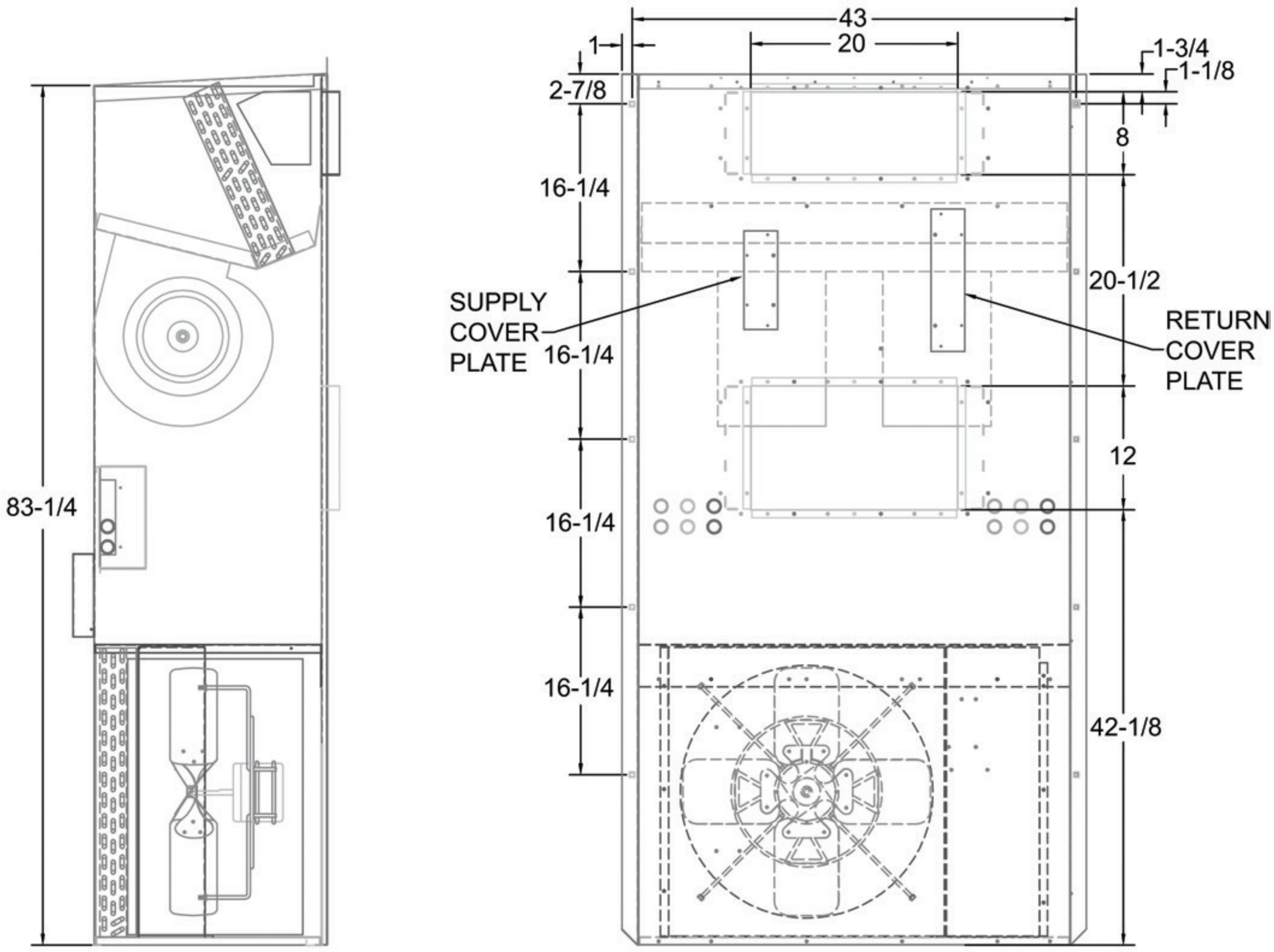
MODEL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
60 (inches)	45	22-5/8	86	8	18	14	42-1/2	28	1-5/16	40-9/16	38-9/16	1-1/8	43-1/8	42-3/16	40-1/2	2-1/4	83-5/16
60 (mm)	1143	575	2184	203	457	356	1080	711	33	1030	980	29	1095	1072	1029	57	2116

NOTE: Dimensional tolerance ± 1/16" (2 mm)



Dimensional Data - AVPA60 with K/04317 Back Panel - ComPac I Only

For matching existing AVP24 wall opening with new AVPA60/AVHA60
For ComPac I Only. For ComPac II use transition curb in Options section.



NOTES:
UNIT IS SHIPPED FROM THE FACTORY WITH SUPPLY AND RETURN LINES CENTERED LEFT TO RIGHT ON BACK PANEL. RETURN AND SUPPLY OPENINGS MAY BE SHIFTED 2-9/16" LEFT OR RIGHT TO ALLOW FOR A BETTER FIT. A SLOTTED HOLE PATTERN IS PROVIDED TO ASSIST WITH CUT OUT OF OPENINGS AND COVER PLATES ARE ALSO PROVIDED TO COVER EXCESSIVE HOLES LEFT IN BACK PANEL AFTER MAKING CUT OUTS.

P.O. Box 400 • Cordele, GA 31010
156 Seedling Drive • Cordele, GA 31015
Ph: 229-273-3636 • Fax: 229-273-5154
Email: marvair@airxcel.com • Internet: www.marvair.com

PRESALE AC SINGLE LINE DIAGRAM - 27 CHARGE POND RD - WAREHAM, MA 02571 - 4.99 MWAC 25.0 MWH - PV + ESS PROJECT

SCALE: NTS

ELECTRICAL EQUIPMENT SCHEDULE

REF. #	TOTAL	DESCRIPTION
1	31266	HANWHA Q.PEAK DUO LG-5.3 400 MODULES (27 MODULES PER STRING)
1A	2	ENERGY STORAGE SYSTEM, 5000kWAC/26000kWh
2	2	DC RECOMBINER
3	1	HEMK FS3190K CENTRAL INVERTER (FACTORY LIMITED TO 2990KW)
3A	1	HEMK FS2125K CENTRAL INVERTER (FACTORY LIMITED TO 2000KW)
4	1	3000KVA TRANSFORMER, 3 PHASE
4A	1	2000KVA TRANSFORMER, 3 PHASE
4B	2	AUXILIARY TRANSFORMER, 3 PHASE, FOR ENERGY STORAGE AUXILIARY LOADS ONLY
5	1	G&W POLE MOUNTED RECLOSER, VACUUM INTERRUPTER, WITH INTEGRATED SEL651R MULTIFUNCTION RELAY
6	1	25KV POLE MOUNTED, 900A, 65KAIC, DISCONNECT LOAD BREAK SWITCH, GANG OPERATED, LOCKABLE, VISIBLE, ACCESSIBLE BY UTILITY 24/7
7	2	NEUTRAL GROUNDING REACTOR, Z = 6 OHMS AND 100A CONTINUOUS RATING

TABLE F: FUSE SCHEUDLE

XFMR KVA	INVERTER	FUSE MODEL
≤ 500	ANY	4000358C10M
501 ≤ 1000	ANY	4000358C12M
1001 ≤ 2500	STRING	4038361C04CB
1001 ≤ 1500	CENTRAL	4000358C16M
1501 ≤ 2500	CENTRAL	4000358C17M
2501 ≤ 3000	ANY	4038361C05CB

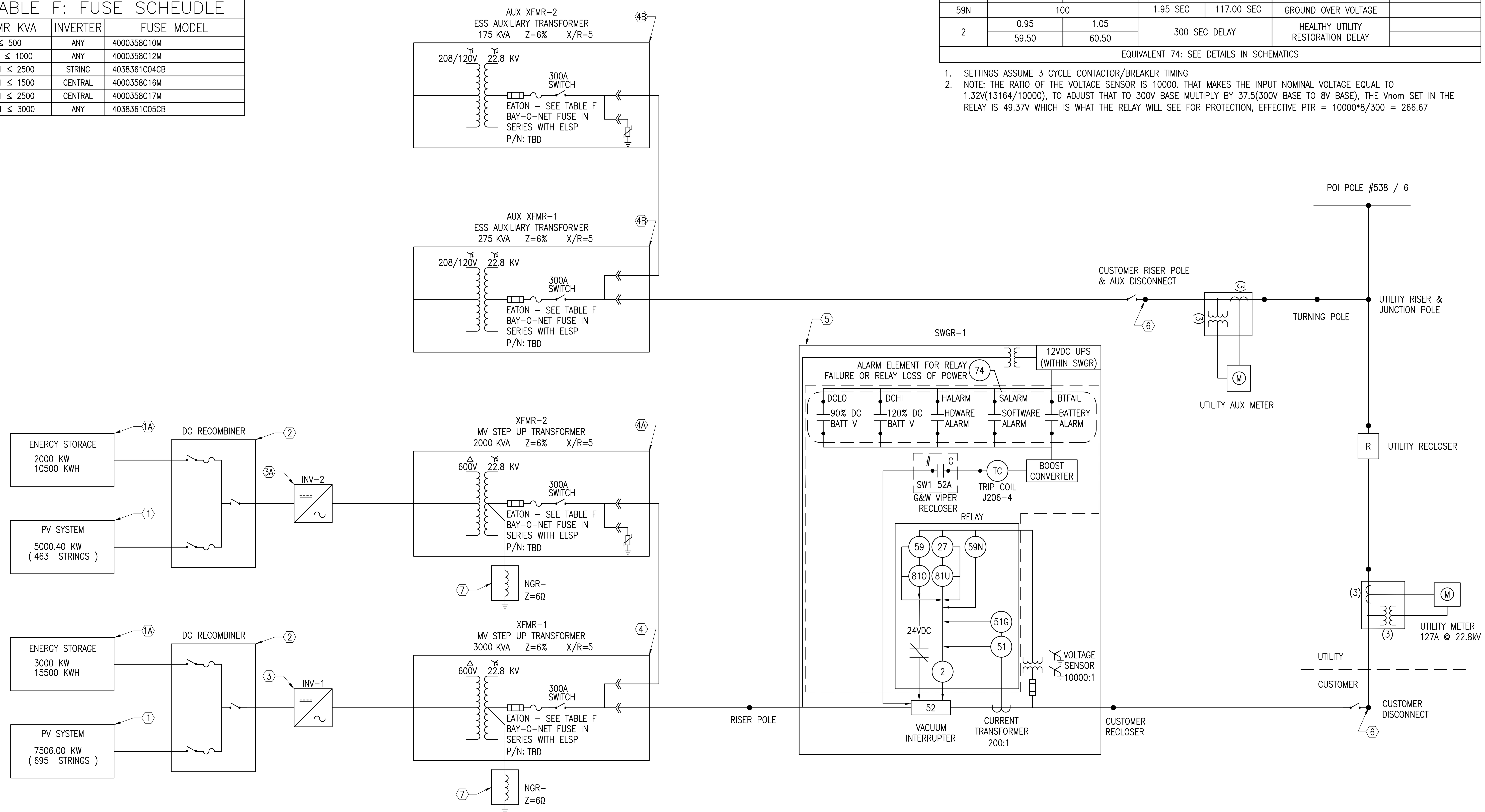
PROPOSED INVERTER SETTINGS

DEVICE	PICKUP	UNITS	TIME DELAY	DESCRIPTION
27-1	300	Volts	1.10	UNDERVOLTAGE RELAY
27-2	528	Volts	2.00	
59-1	660	Volts	2.00	OVERVOLTAGE RELAY
59-2	720	Volts	0.16	
81U-1	56.5	Hz	0.16	UNDERFREQUENCY
81U-2	58.5	Hz	300.00	
81O-1	61.2	Hz	300.00	OVERFREQUENCY
81O-2	62.0	Hz	0.16	

PROPOSED RELAY SETTINGS

DEVICE	SECONDARY PICKUP	PRIMARY PICKUP	TIME DELAY	TOTAL CLEARING TIME	DESCRIPTION	NOTE
27-1	24.68	6582	1.05 SEC	1.10 SEC	UNDERVOLTAGE RELAY	SETTING INCLUDES 3 CYCLE ESTIMATED TRIP DEVICE OPENING TIME
27-2	43.44	11584	1.95 SEC	2.00 SEC		
59-1	54.30	14480	1.95 SEC	2.00 SEC	OVERVOLTAGE RELAY	
59-2	59.24	15797	0.11 SEC	0.16 SEC		
81U-1	56.5		0.11 SEC	0.16 SEC	UNDERFREQUENCY	
81U-2	58.5		299.95 SEC	300.00 SEC		
81O-1	61.2		299.95 SEC	300.00 SEC	OVERFREQUENCY	
81O-2	62.0		0.11 SEC	0.16 SEC		
51	0.950	190	TD: 2.0 CURVE: U4		EXTREMELY INVERSE OVER CURRENT	
51G	0.475	95	TD: 1.5 CURVE: U4		EXTREMELY INVERSE GROUND OVER CURRENT	
59N	100		1.95 SEC	117.00 SEC	GROUND OVER VOLTAGE	
2	0.95	1.05	300 SEC DELAY		HEALTHY UTILITY RESTORATION DELAY	
	59.50	60.50				
EQUIVALENT 74: SEE DETAILS IN SCHEMATICS						

1. SETTINGS ASSUME 3 CYCLE CONTACTOR/BREAKER TIMING
2. NOTE: THE RATIO OF THE VOLTAGE SENSOR IS 10000. THAT MAKES THE INPUT NOMINAL VOLTAGE EQUAL TO 1.32V(13164/10000), TO ADJUST THAT TO 300V BASE MULTIPLY BY 37.5(300V BASE TO 8V BASE), THE Vnom SET IN THE RELAY IS 49.37V WHICH IS WHAT THE RELAY WILL SEE FOR PROTECTION, EFFECTIVE PTR = 10000*8/300 = 266.67



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
AHARON N. WRIGHT
ELECTRICAL
No. 54113
REGISTERED PROFESSIONAL ENGINEER
03/19/2020

PLAN SET
INTERCONNECTION SLD UPDATE
27 CHARGE POND RD, WAREHAM, MA 02571

PROJECT NUMBER:
XXX-XXXX

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
8	03/19/20	CC	JL	INTERCONNECTION APPLICATION

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

PV-L2

SINGLE LINE

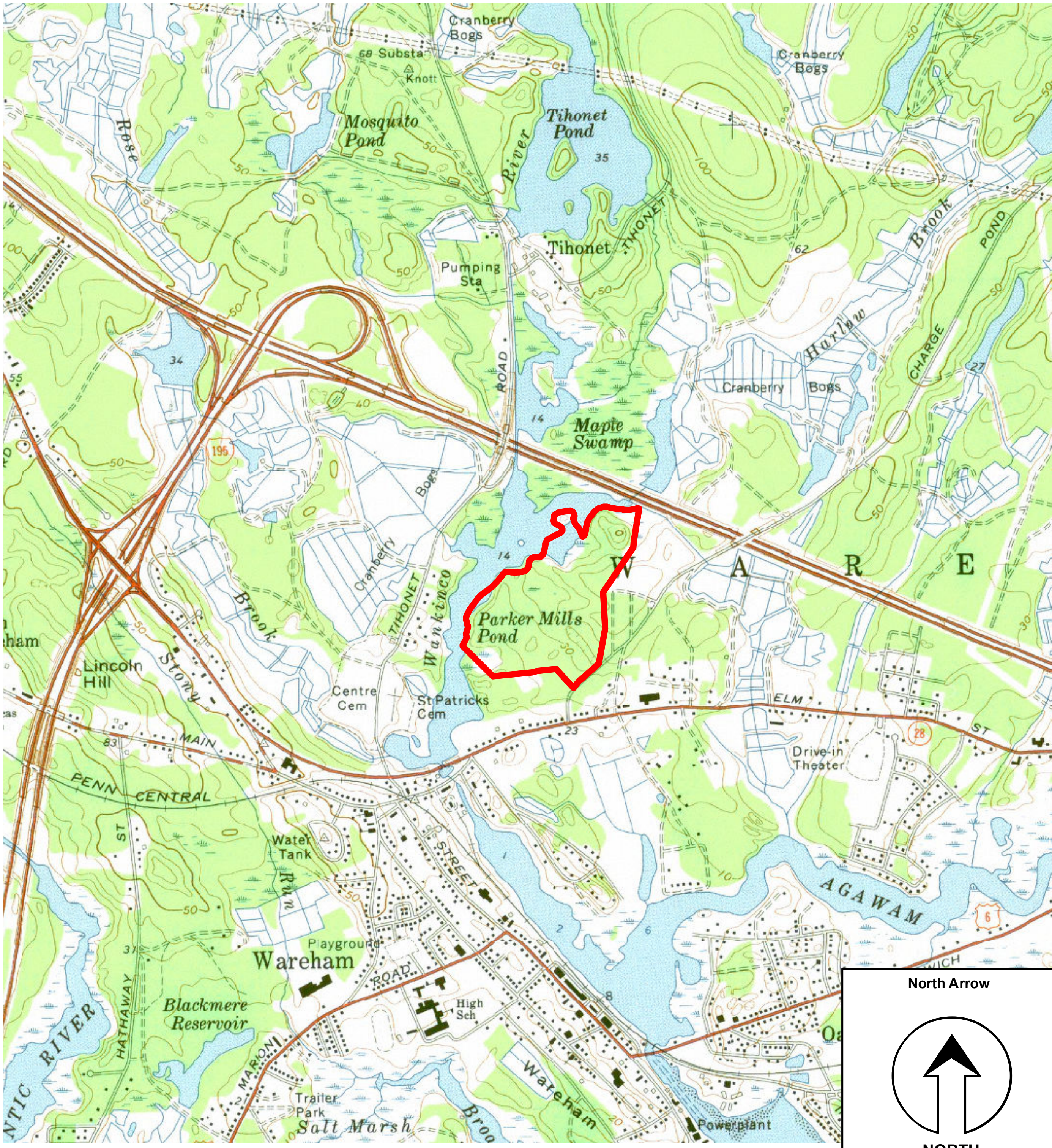
Section 6.0
Plans

Locus Map

Aerial Map

Site Context Exhibit

Entitled "Site Use Plan Submission, 27 Charge Pond Road, Wareham, MA 02571, Solar Photovoltaic and Energy Storage Electric System"
Prepared by Borrego Solar Systems, Inc. and Beals and Thomas, Inc.
In 14 Sheets
Last Revised May 28, 2020



Digital USGS Map of Wareham, MA, dated 1972, provided by the Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services.

0 1,000 2,000 4,000
FEET

North Arrow

NORTH

PROJECT: **27 Charge Pond Road PV+ES Project**

Wareham, Massachusetts

PREPARED FOR:

Borrego Solar Systems, Inc.
55 Technology Dr. #102
Lowell, MA 01851

Locus Map

Figure 1

Scale: 1" = 2,000'

Date: 05/20/2020

Source File 1833109P602A.mxd

B+T Project No. 1833.109

BEALS+THOMAS

Digital orthophotograph, dated 2019, provided by the Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services.

0 250 500 1,000
FEET

PROJECT: **27 Charge Pond Road PV+ES Project**

Wareham, Massachusetts

PREPARED FOR:

Borrego Solar Systems, Inc.
55 Technology Dr. #102
Lowell, MA 01851

Aerial Map

Figure 2

Scale: 1" = 500'

Date: 05/20/2020

Source File 1833109P603A.mxd

B+T Project No. 1833.109

BEALS+THOMAS

27 CHARGE POND ROAD PV+ES PROJECT (aka 67 Tihonet Road)

Warham, Massachusetts

BEALS + THOMAS
Civil Engineers + Landscape Architects + Land Surveyors + Planners + Environmental Specialists

B+T Drawing No. 1833109P606A-001 Date: 05/26/2020

SITE CONTEXT

APPLICANT: BORREGO SOLAR SYSTEMS, INC.

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)	12,181.59 KW	SYSTEM SIZE (AC)	5,000 KW
MODULES	(30,078) LG405N2T-J5	INVERTER(S)	POWER ELECTRONICS (1) HEMK FS2125K / (1) HEMK FS3190
STC RATING	405	CEC EFFICIENCY	98.5%
RACKING	TERRASMART TGP	AZIMUTH	180° (SOUTH = 180°)
TILT ANGLE	25°		

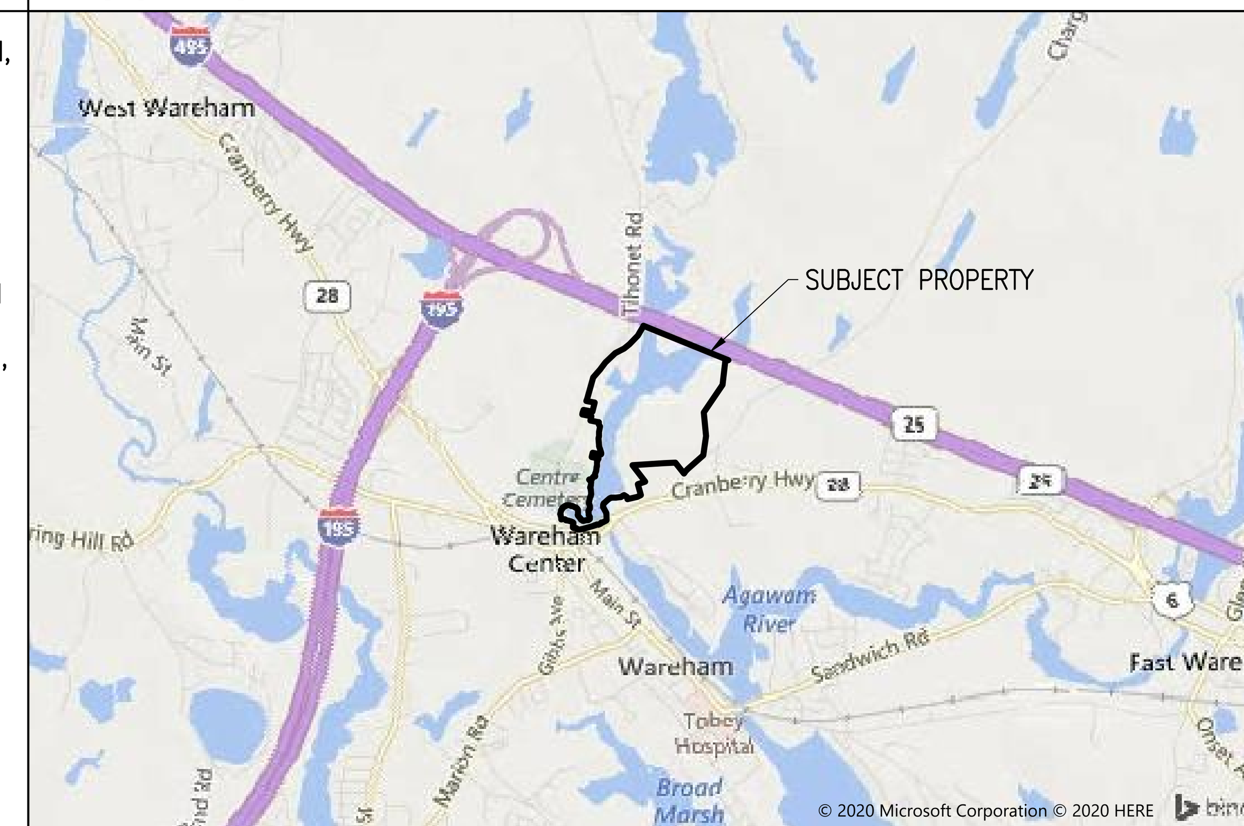
ENERGY STORAGE SYSTEM DESCRIPTION

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

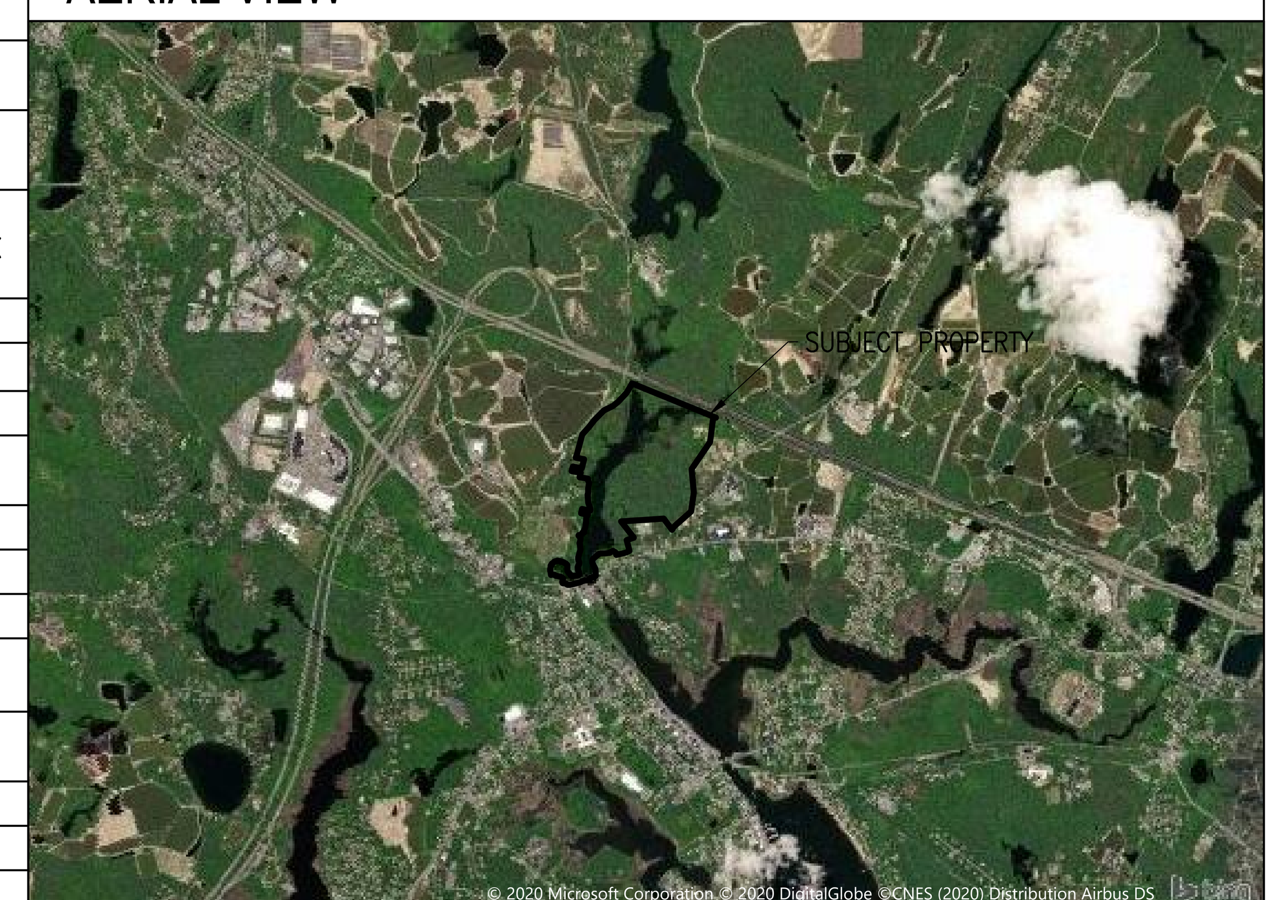
TOTAL SYSTEM DESCRIPTION

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

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

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

Jeffrey R. Murphy
5/28/2020

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

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.

N

EXISTING CONDITIONS PLAN

SCALE: 1" = 150'

0 150' 300'

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
CHARLES D. SMITH
CIVIL
No. 52136
REGISTERED PROFESSIONAL ENGINEER

Charles D. Smith
5/27/20

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

PROJECT NUMBER:
905-2712

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C-1.0
EXISTING CONDITIONS PLAN

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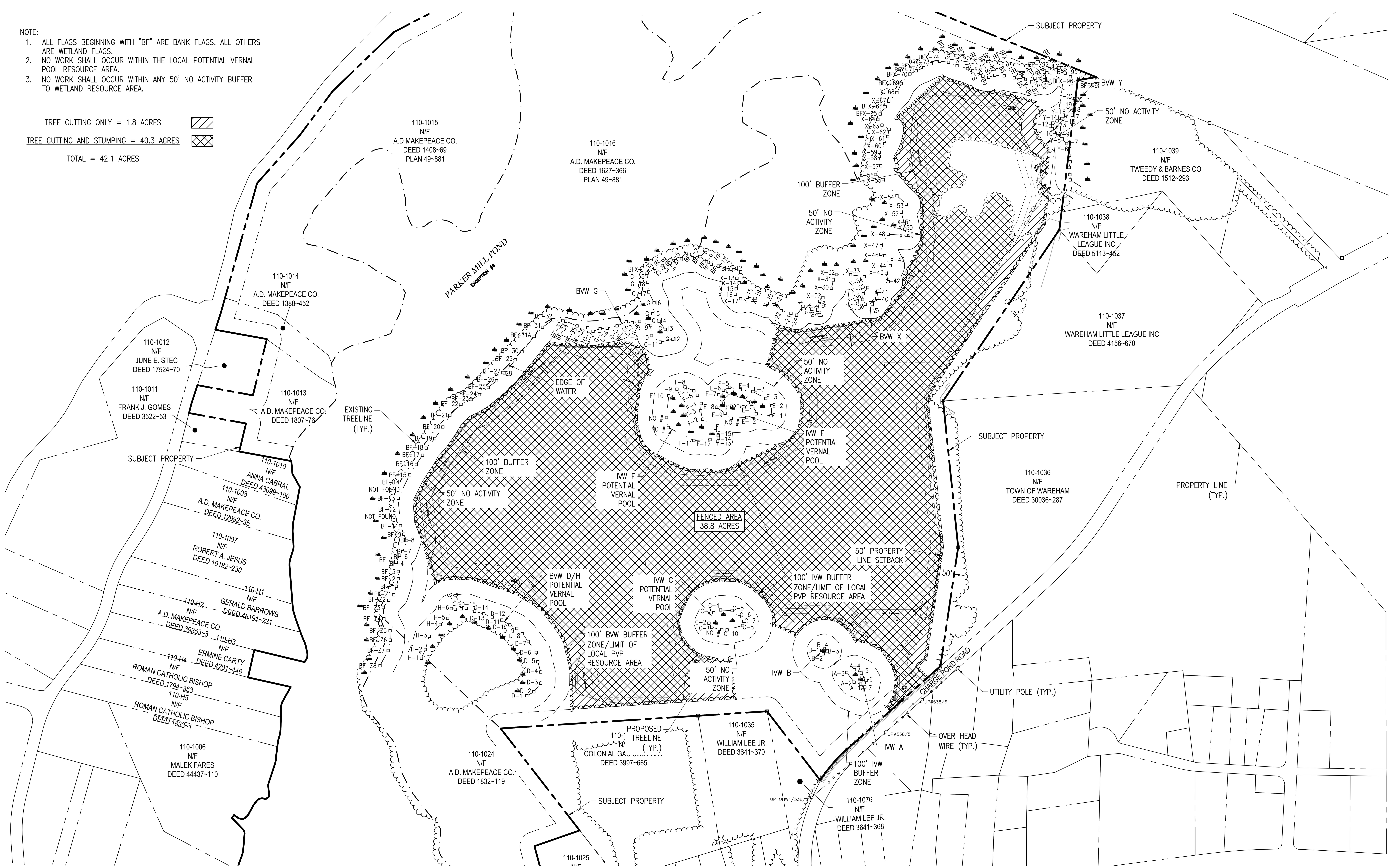
3. NO WORK SHALL OCCUR WITHIN ANY 50' NO ACTIVITY BUFFER TO WETLAND RESOURCE AREA.

TREE CUTTING ONLY = 1.8 ACRES

TREE CUTTING AND STUMPING = 40.3 ACRES

TOTAL = 42.1 ACRES



TREE CLEARING PLAN

SCALE: 1" = 150'

0 150' 300'

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NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
JEFFREY R. MURPHY
CIVIL
No. 51800
REGISTERED PROFESSIONAL ENGINEER
Jeffrey R. Murphy 5/28/2020

27 CHARGE POND RD
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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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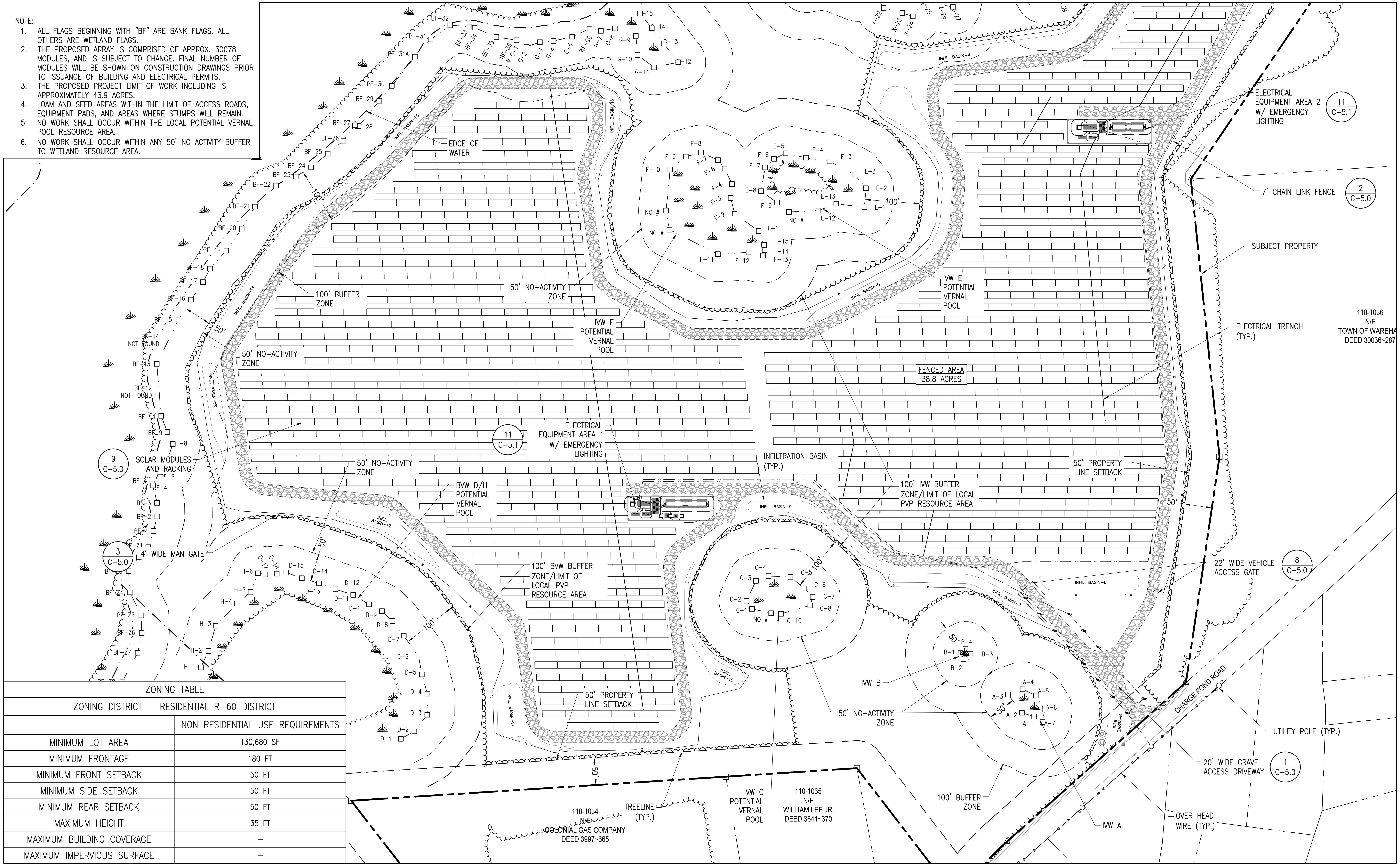

ZONING TABLE	
ZONING DISTRICT – RESIDENTIAL R-60 DISTRICT	
	NON RESIDENTIAL USE REQUIREMENTS
MINIMUM LOT AREA	130,680 SF
MINIMUM FRONTAGE	180 FT
MINIMUM FRONT SETBACK	50 FT
MINIMUM SIDE SETBACK	50 FT
MINIMUM REAR SETBACK	50 FT
MAXIMUM HEIGHT	35 FT
MAXIMUM BUILDING COVERAGE	–
MAXIMUM IMPERVIOUS SURFACE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

N

LAYOUT AND MATERIALS PLAN - SOUTHWEST

SCALE: 1" = 80'

0 80' 160'

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C-3.1

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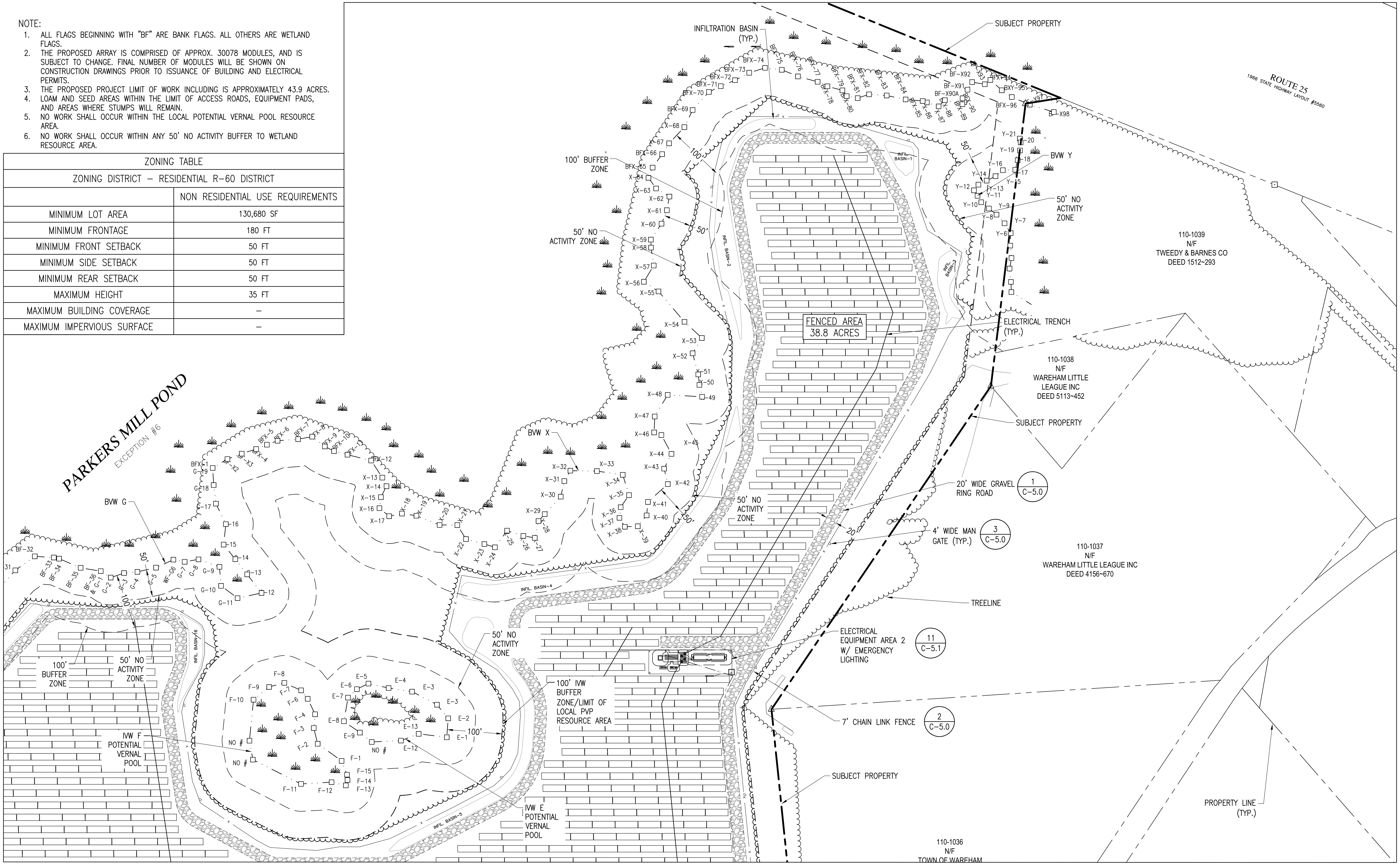

LAYOUT AND MATERIALS PLAN - NORTHEAST

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0 80' 160'

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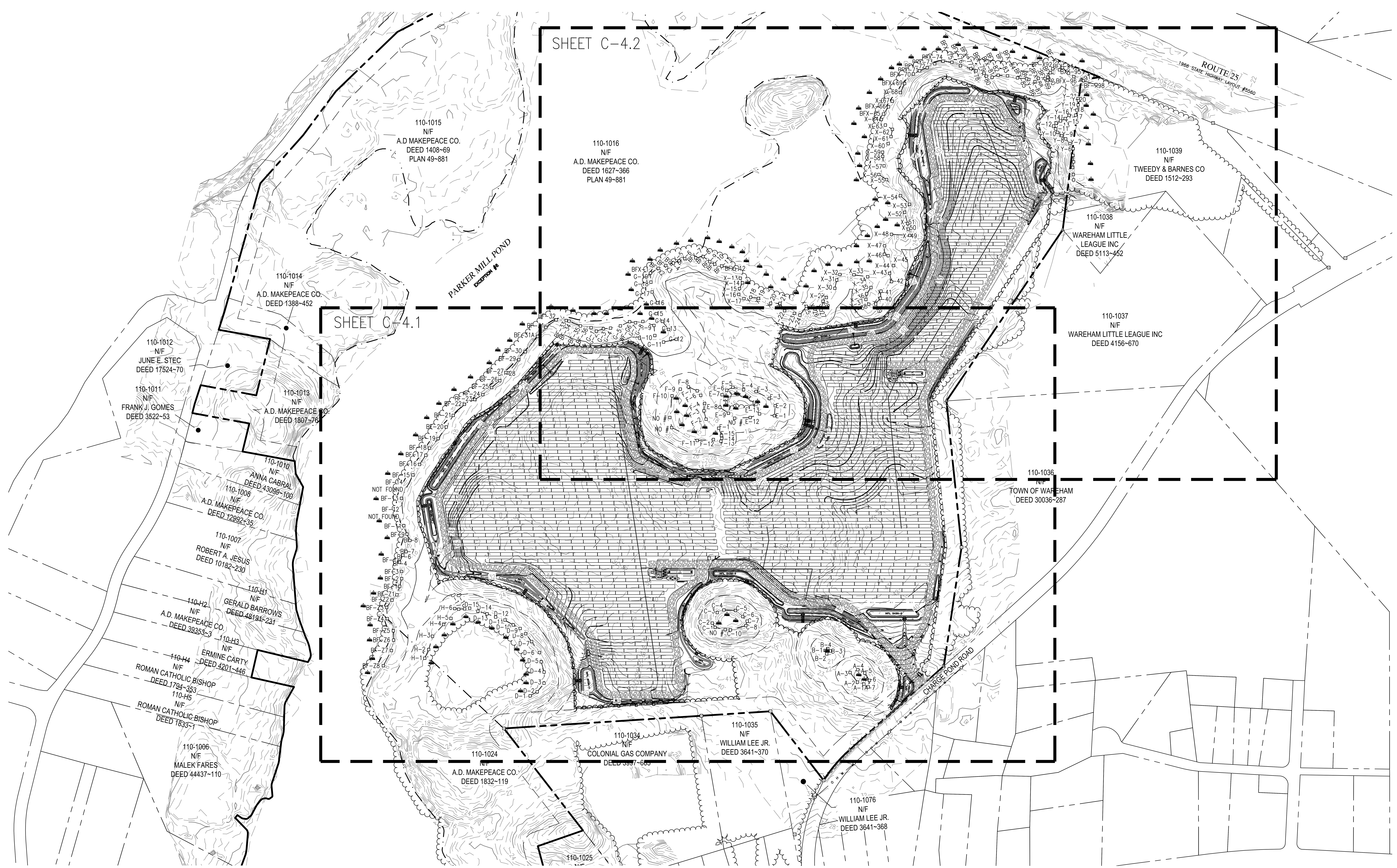
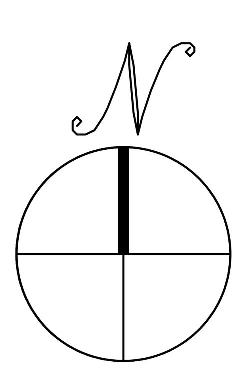
C-3.2

LAYOUT AND MATERIALS PLAN - NORTHEAST





GRADING AND EROSION CONTROL PLAN

SCALE: 1" = 150'

0 150' 300'

BORREGO SOLAR

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C-4.0

GRADING AND EROSION CONTROL PLAN

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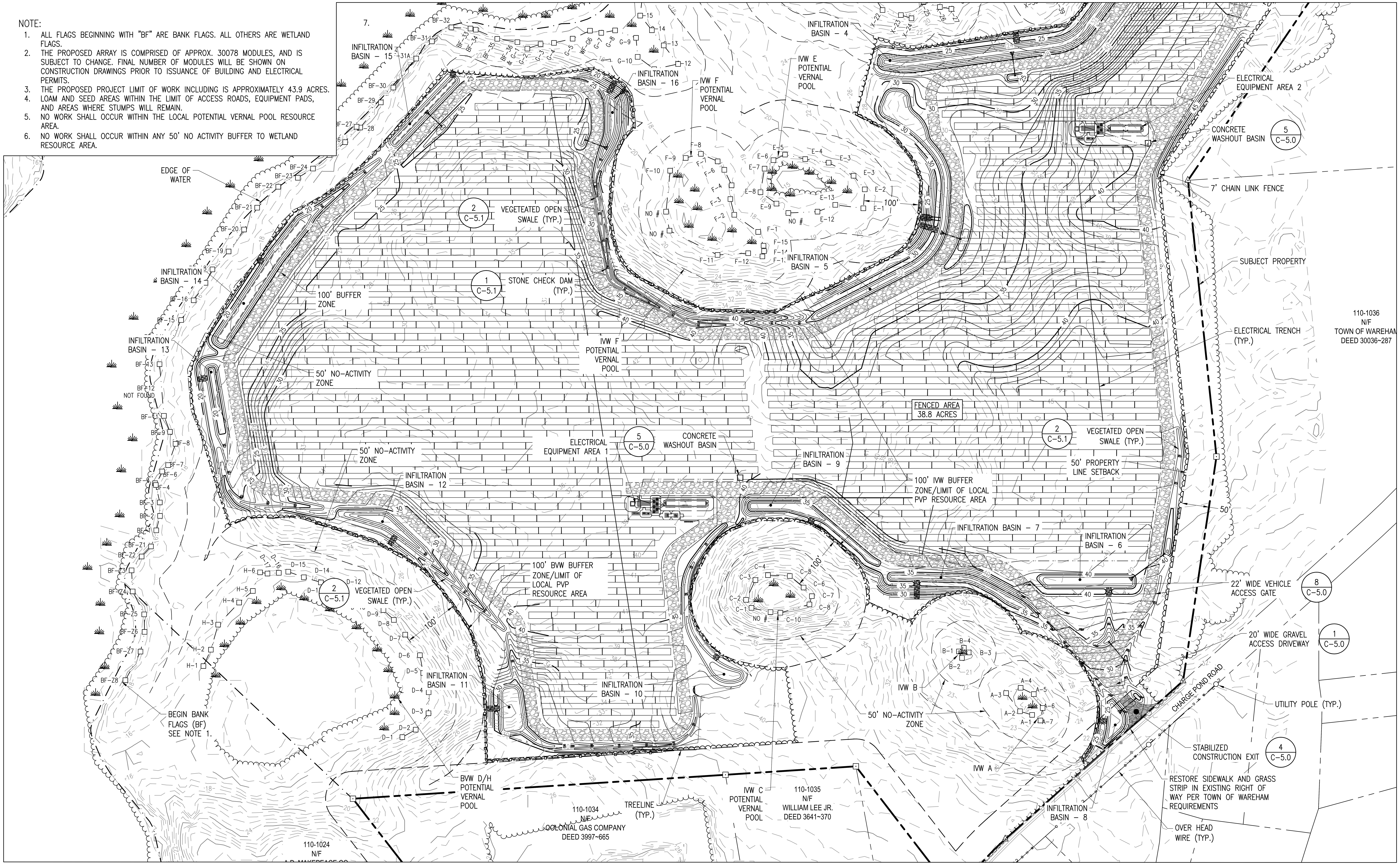

GRADING AND EROSION CONTROL PLAN - SOUTHWEST

SCALE: 1" = 80'

0 80' 160'

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C-4.1

GRADING AND EROSION CONTROL PLAN - SOUTHWEST

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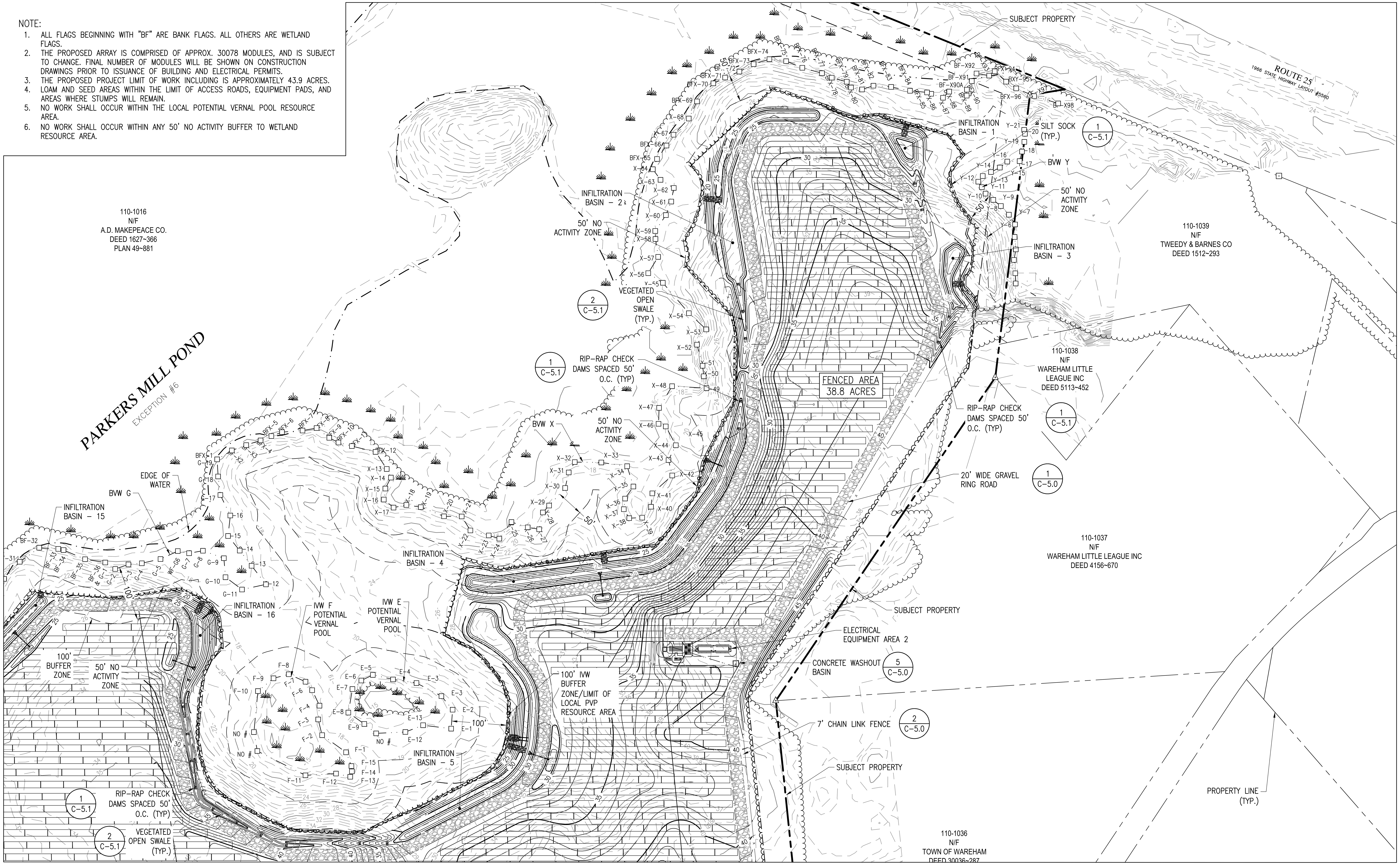

N

GRADING AND EROSION CONTROL PLAN - NORTHEAST

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0 80' 160'

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C-4.2

GRADING AND EROSION CONTROL PLAN - NORTHEAST

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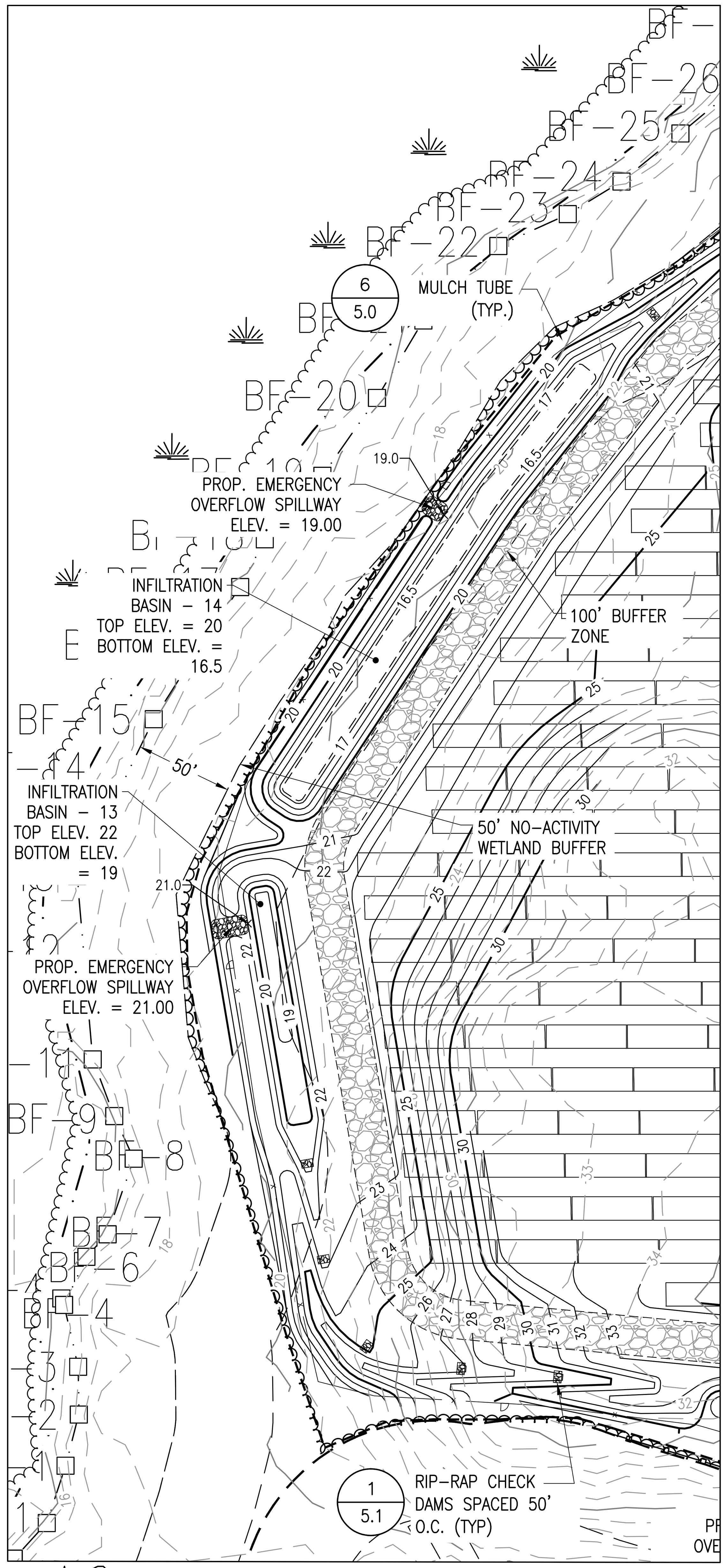
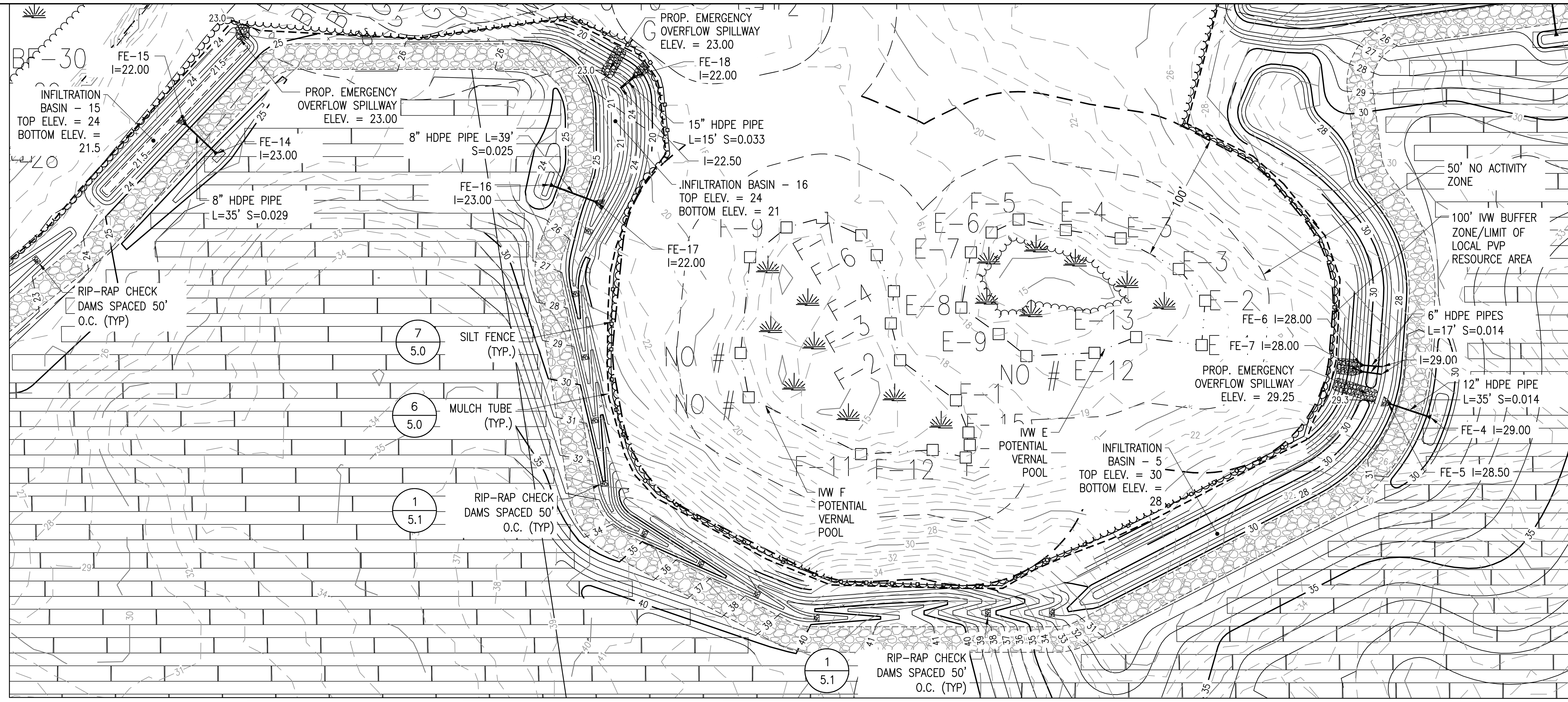


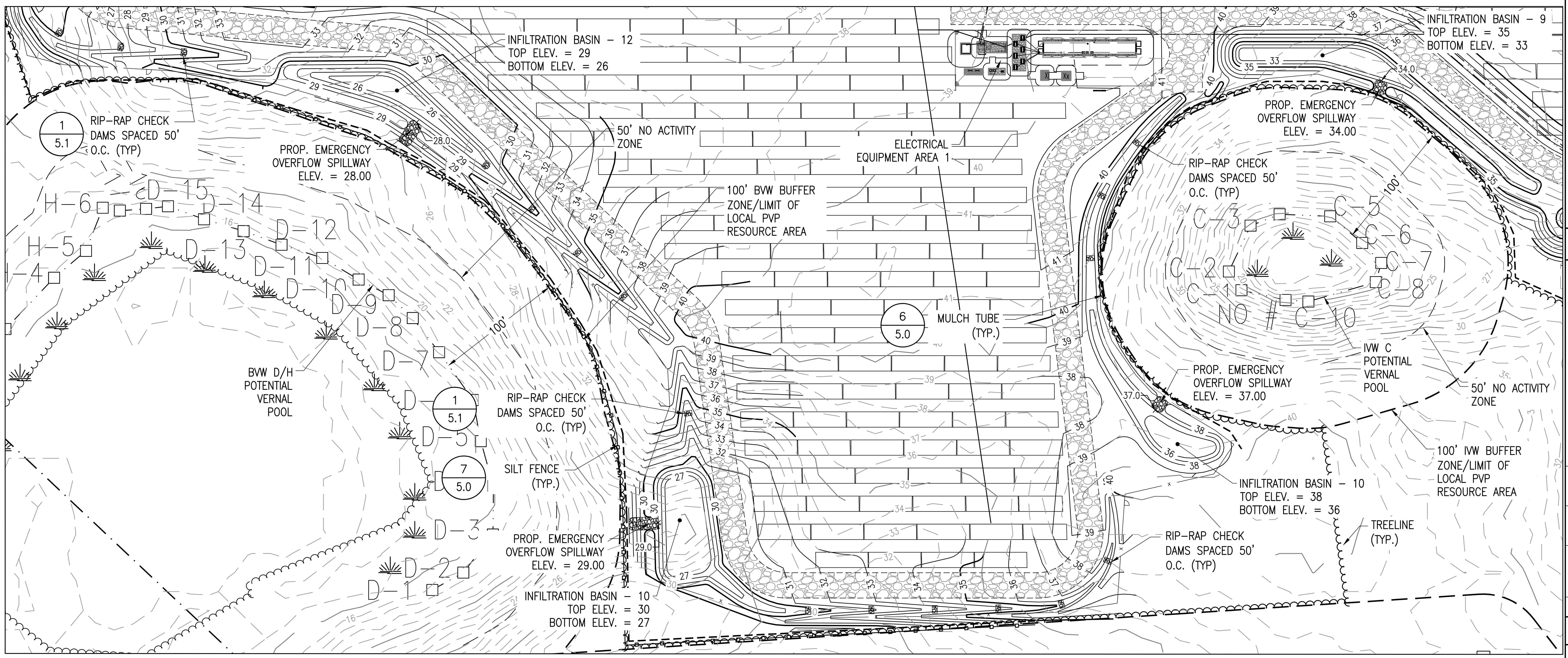
BASINS - 13, 14

SCALE: 1" = 50'

0 50' 100'



BASINS - 15, 16, 5



BASINS - 12, 11, 10, 9

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C-4.3

GRADING AND EROSION CONTROL PLAN - BASINS 9 - 16

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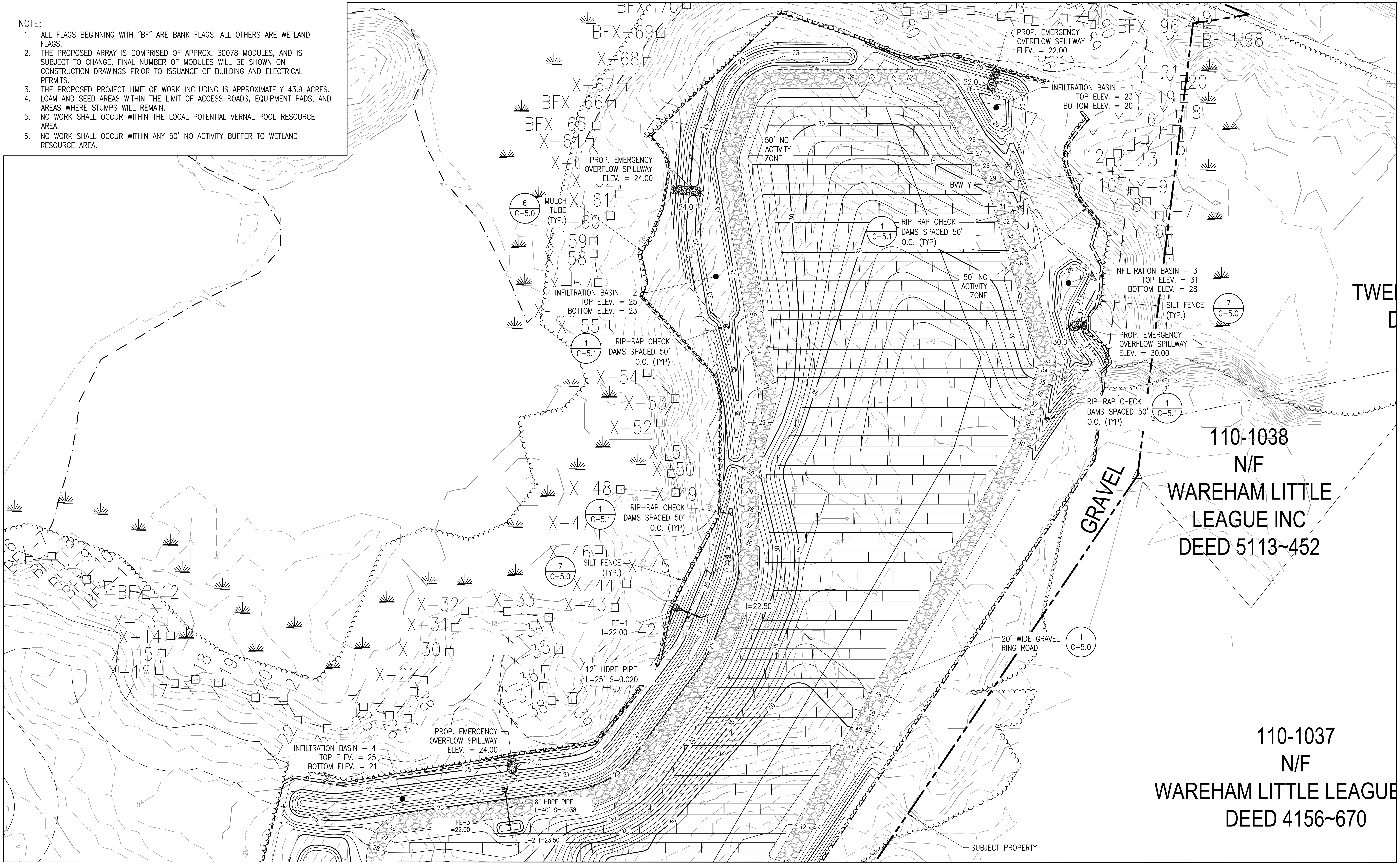

GRADING AND EROSION CONTROL PLAN - BASINS 1, 2, 3, 4

SCALE: 1" = 50'

0 50' 100'

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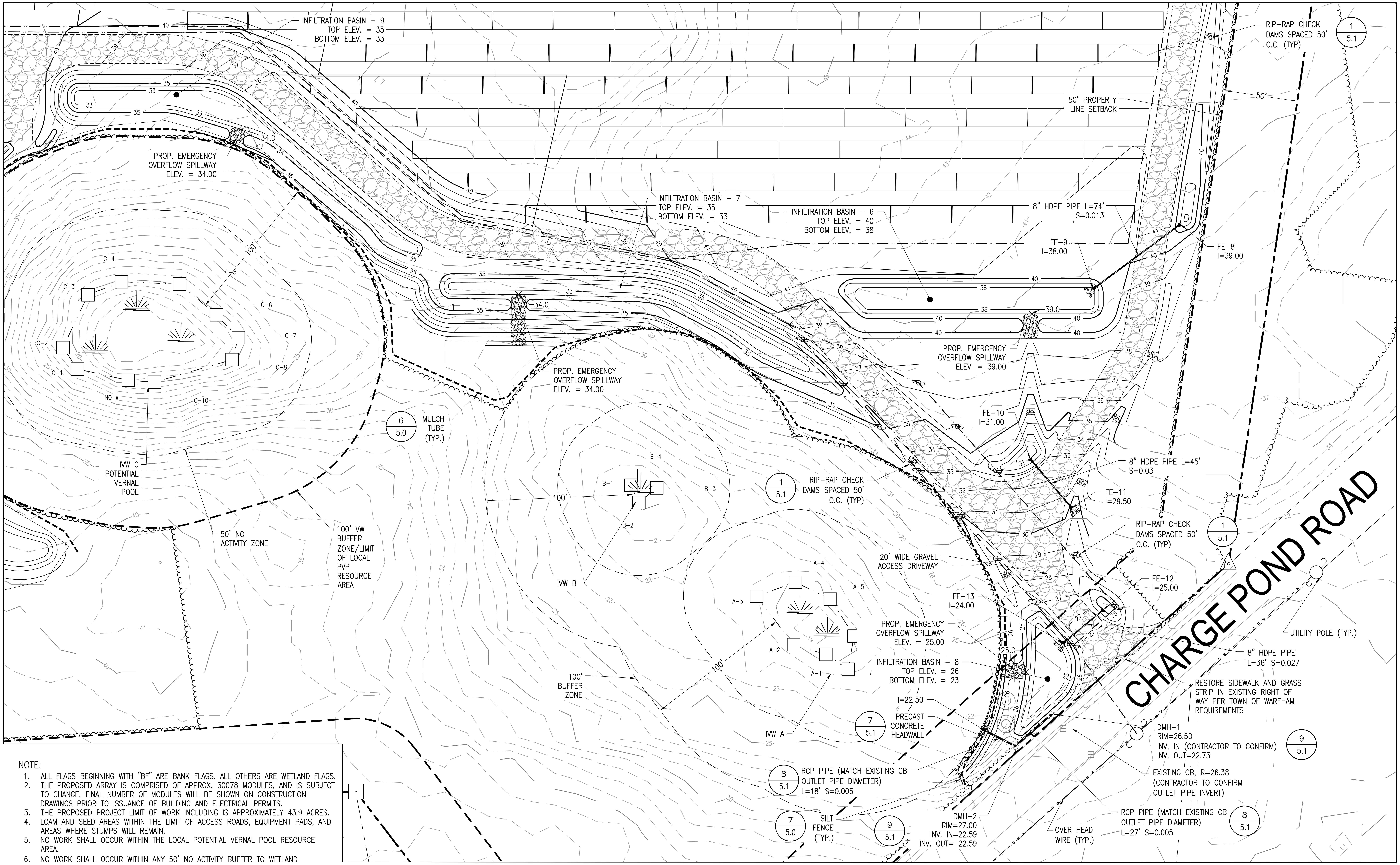
C-4.4

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



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N

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

SCALE: 1" = 30'

0 30' 60'

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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

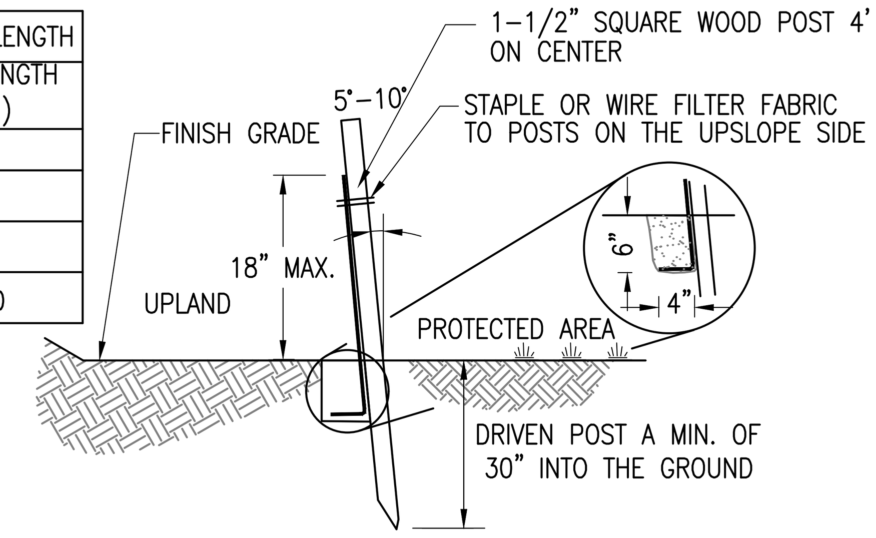
OTHER CROP SEEDS: 0.16%
INERT MATTER: 1.49%
WEED SEEDS: 0.09%
NOXIOUS WEED SEEDS NONE FOUND
* VARIETY NOT STATED

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

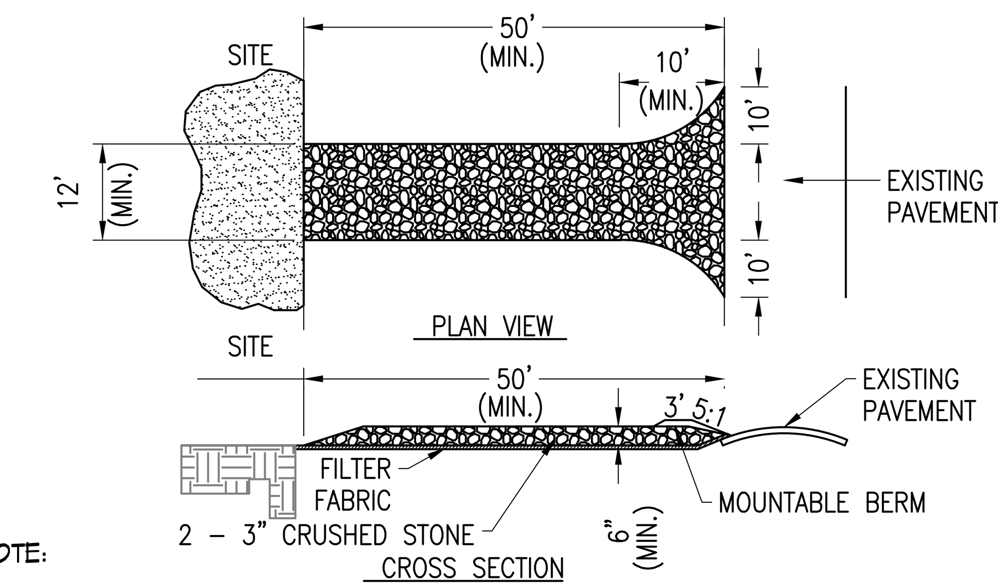


NOTES:

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

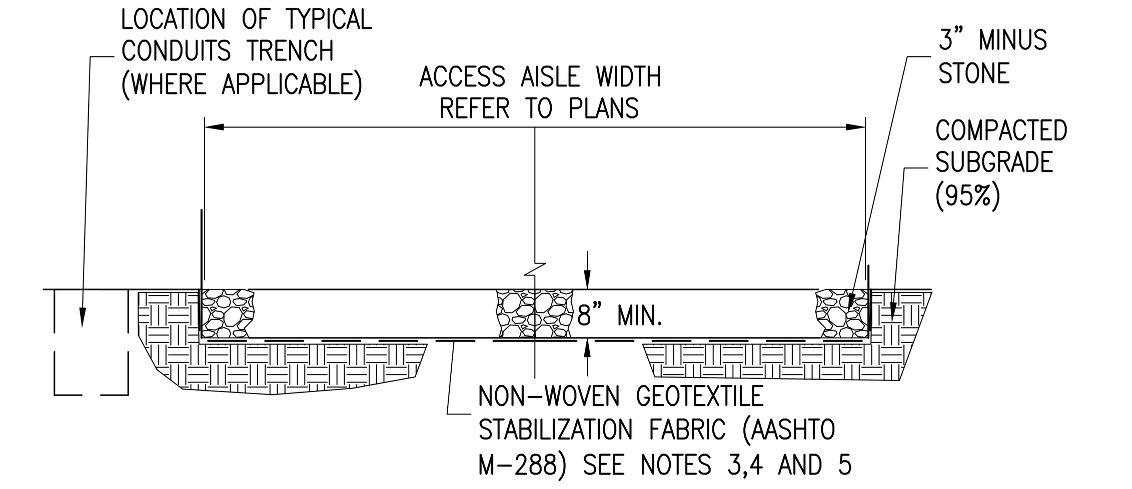


NOTE:

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

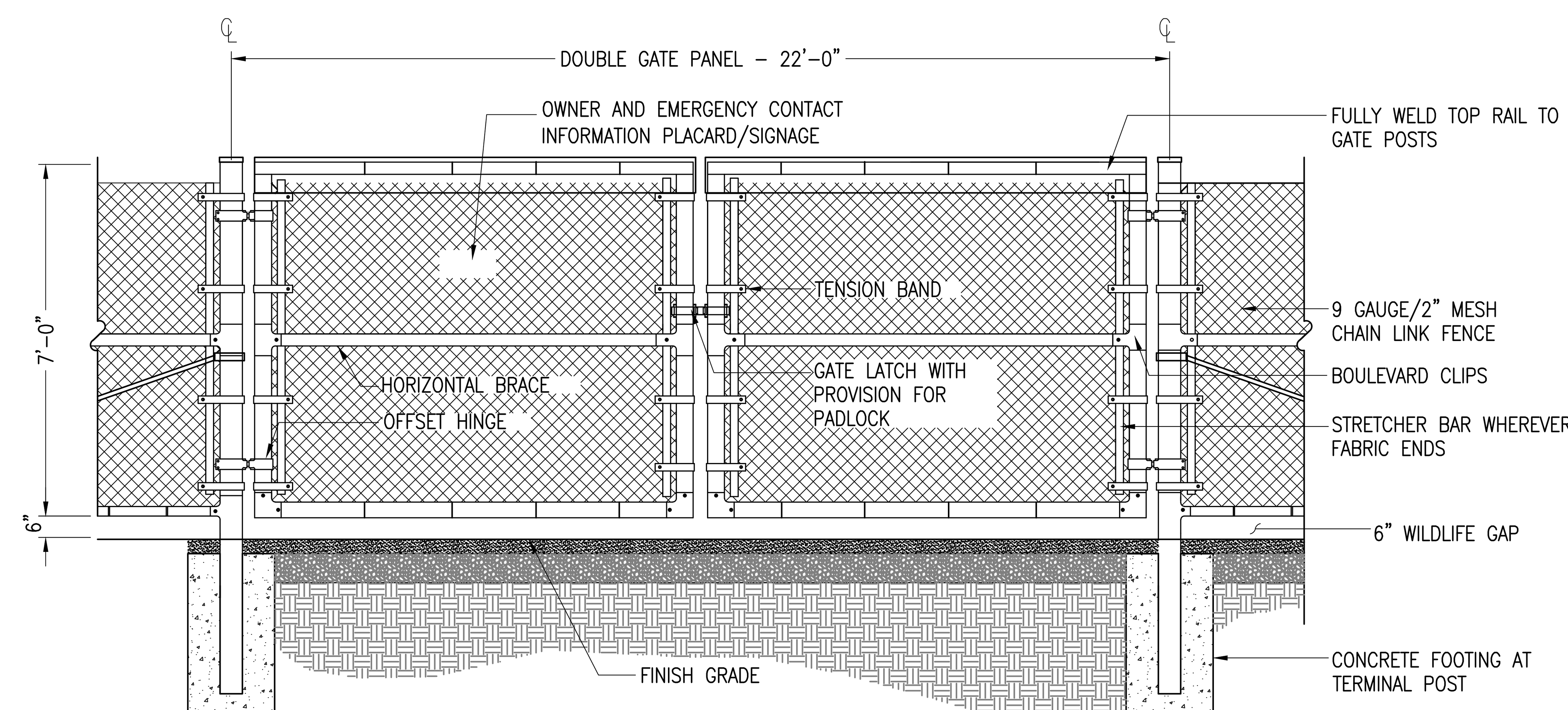


NOTES:

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 / FT^2
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

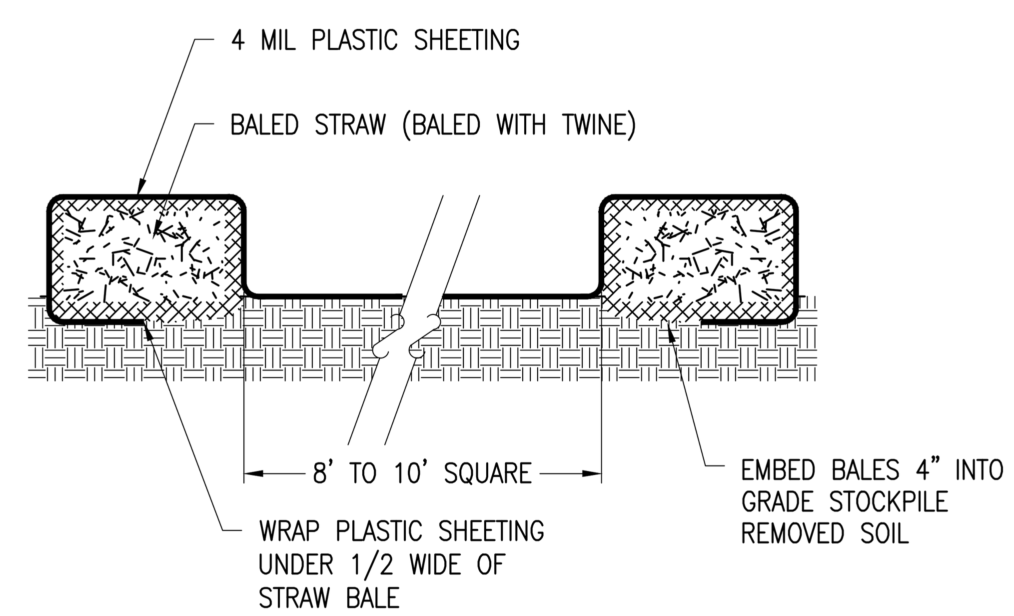


NOTE:

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

8 VEHICLE GATE - WILDLIFE GAP

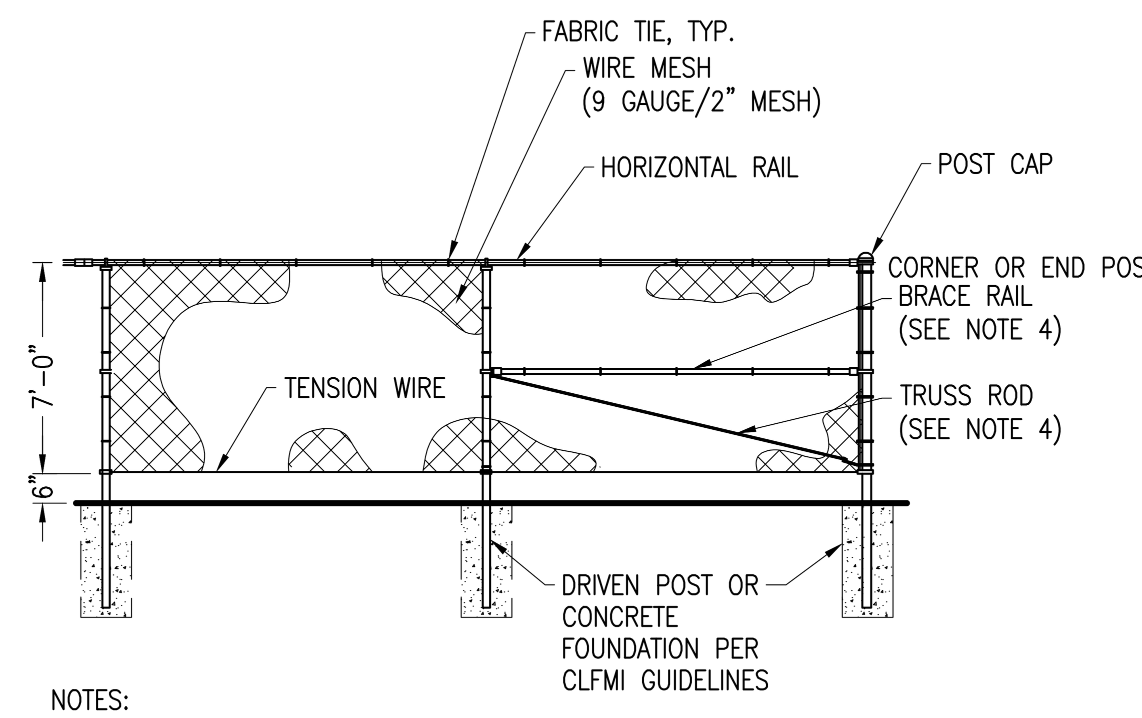
SCALE: NTS
XD_CIVIL_FENCE_VEHICLE GATE_7' 10-23-2018



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



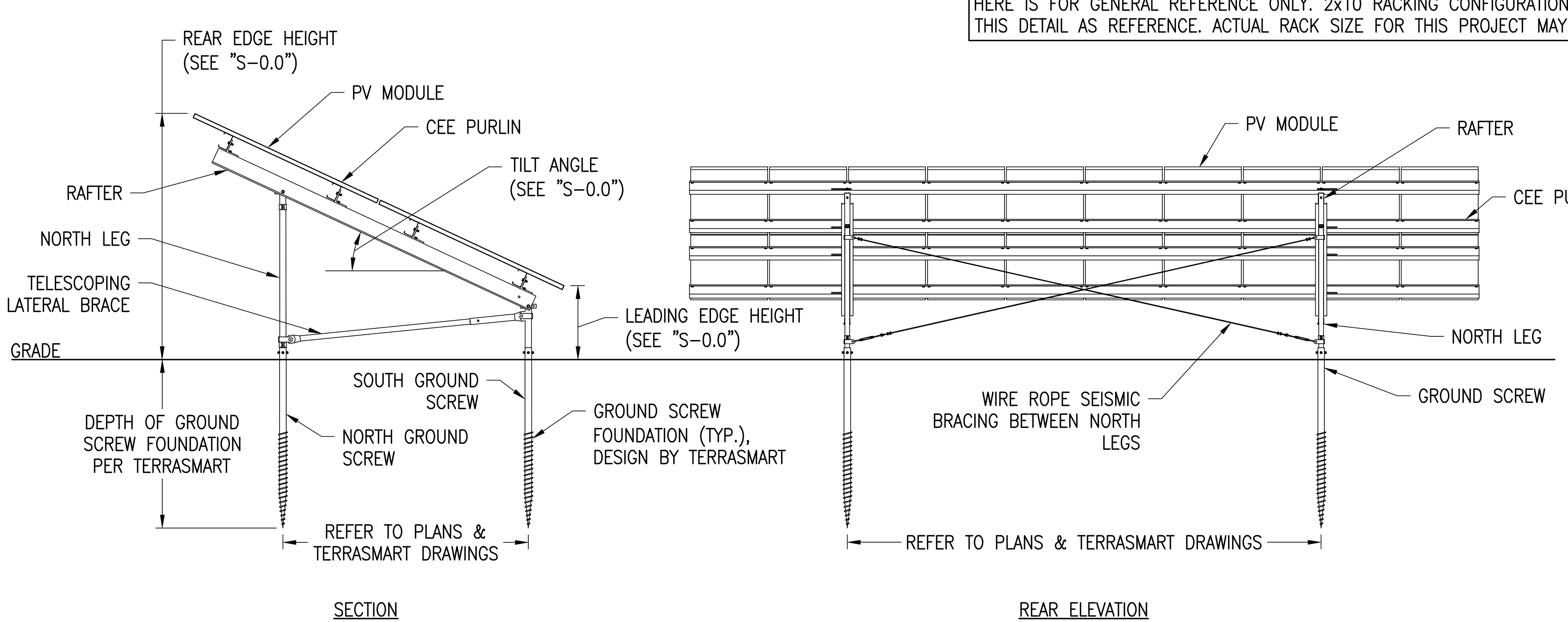
NOTES:

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

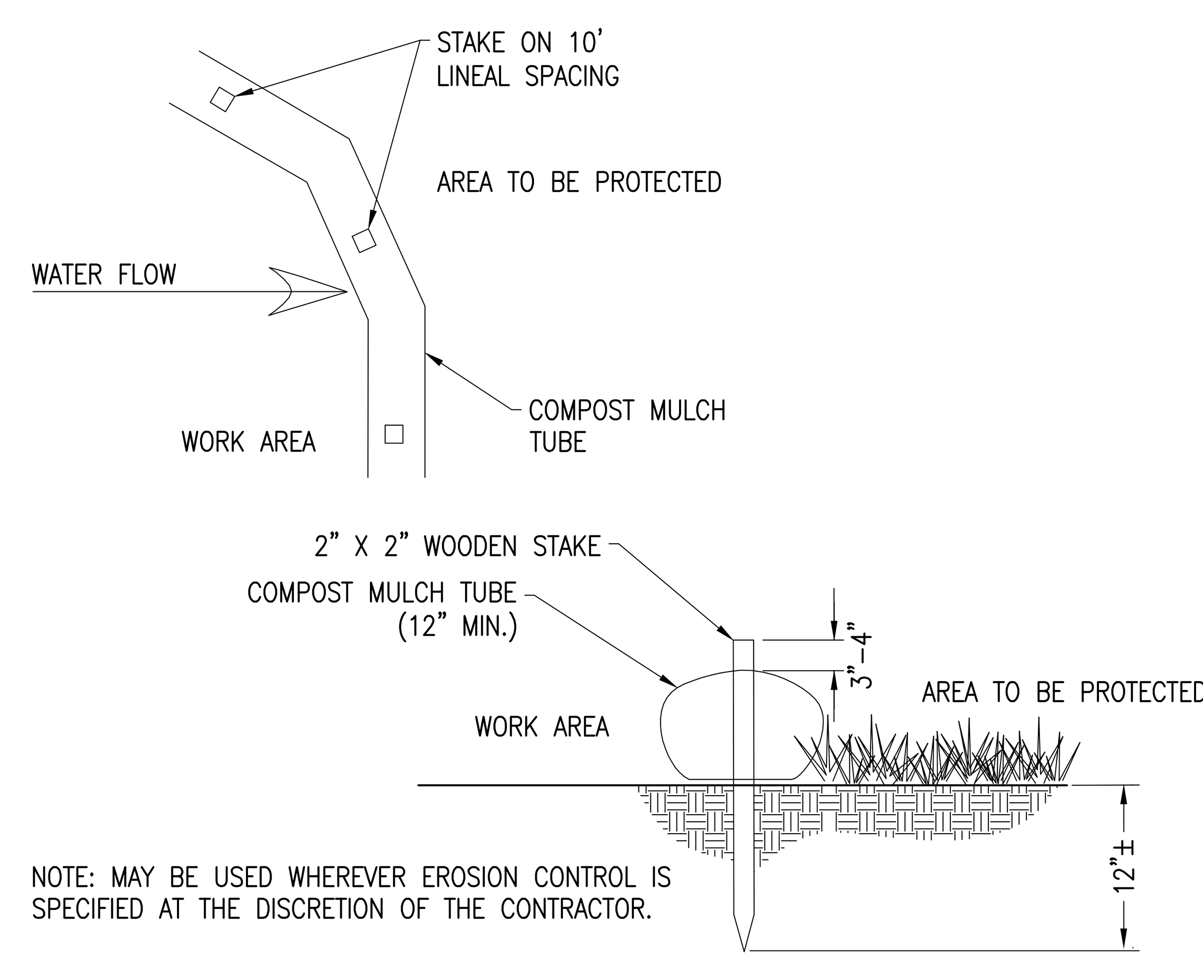
NOTE: THE "TERRAFARM" RACKING AND GROUND SCREW FOUNDATIONS ARE DESIGNED BY TERRASMART AND WILL BE A SUBMITTAL TO BORREGO. THE INFORMATION SHOWN HERE IS FOR GENERAL REFERENCE ONLY. 2x10 RACKING CONFIGURATION SHOWN IN THIS DETAIL AS REFERENCE. ACTUAL RACK SIZE FOR THIS PROJECT MAY VARY.



9 TYPICAL RACK SECTION & REAR ELEVATION

TERRASMART TF2P

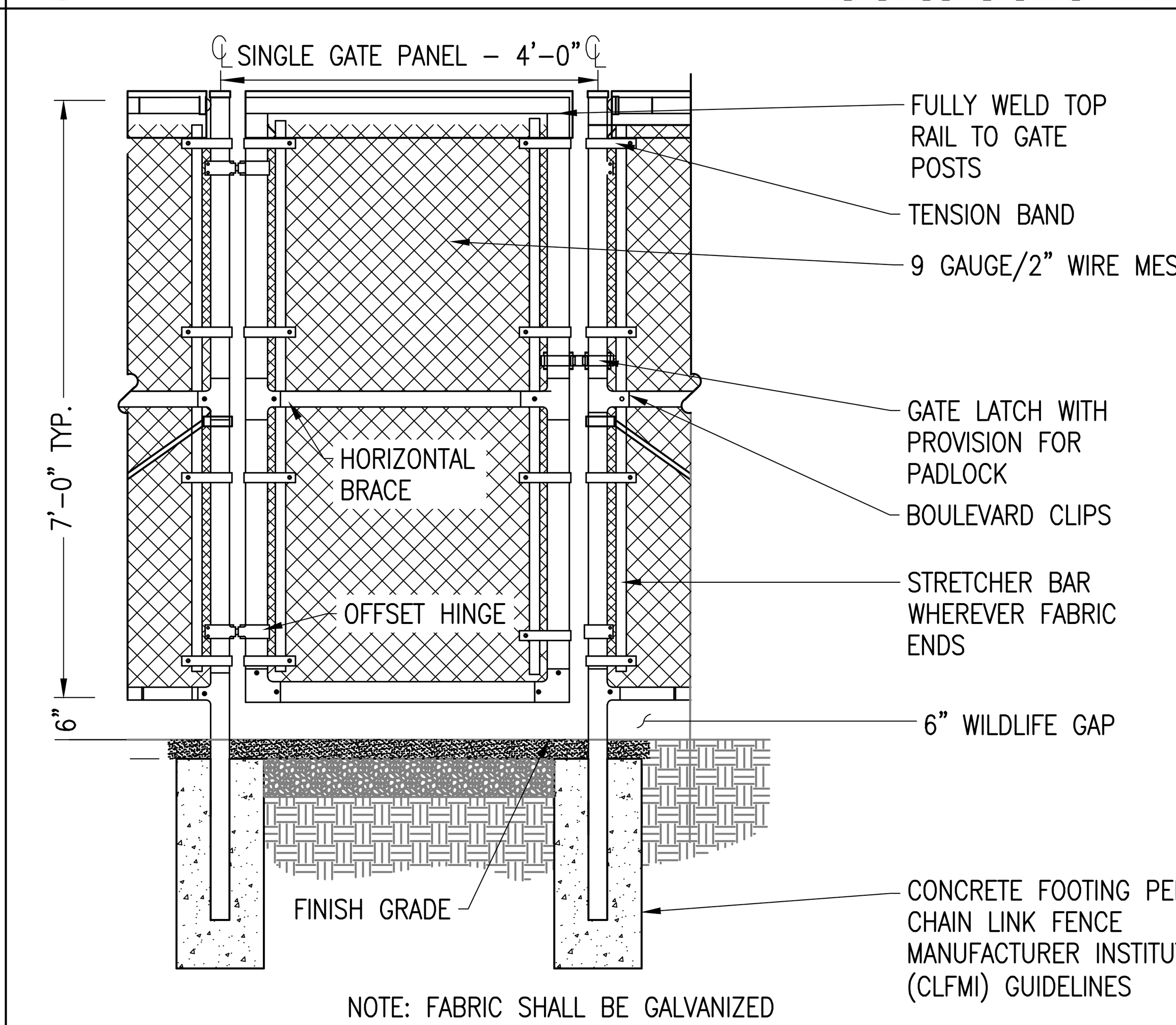
SCALE: NTS
XD_STRUC_TERRASMART_TF2P_RACK SECT & REAR ELEV 2017-12-04



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

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
Jeffrey R. Murphy
5/28/2020

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

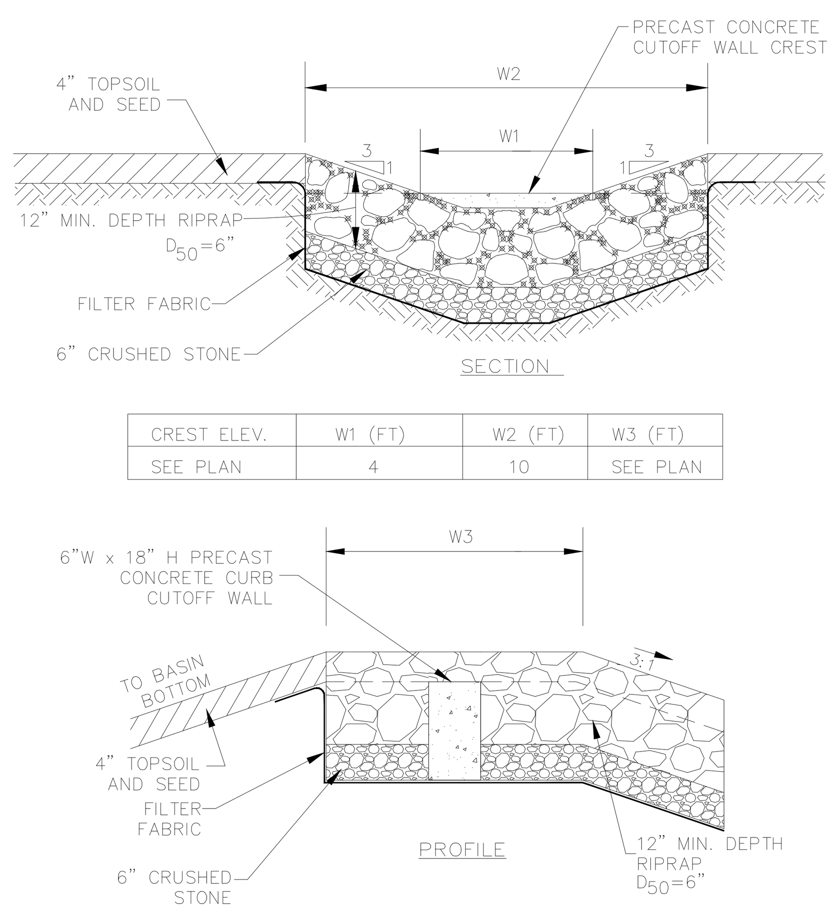
PROJECT NUMBER: 905-2712

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

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

C-5.0
CIVIL DETAILS

10

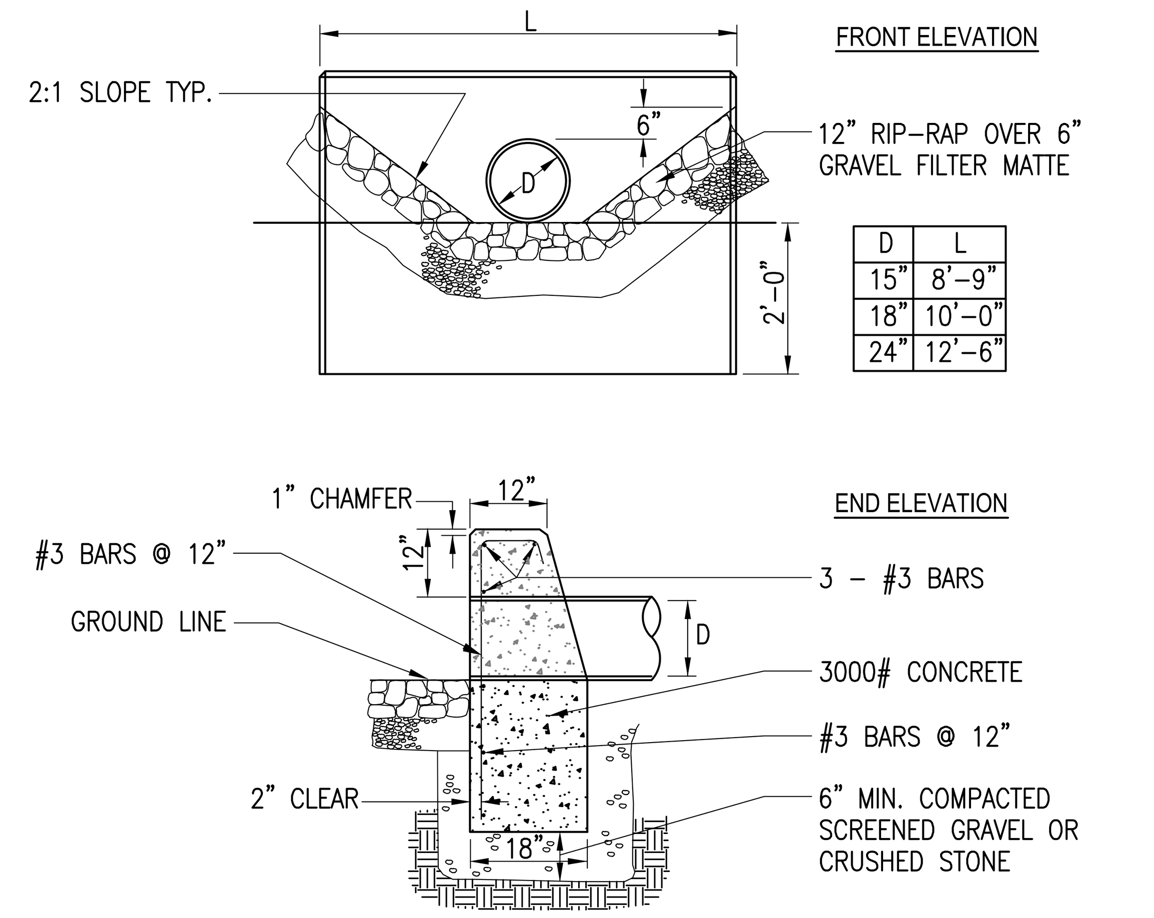


CREST ELEV.	W1 (FT)	W2 (FT)	W3 (FT)
SEE PLAN	4	10	SEE PLAN

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

EMERGENCY OVERFLOW SPILLWAY

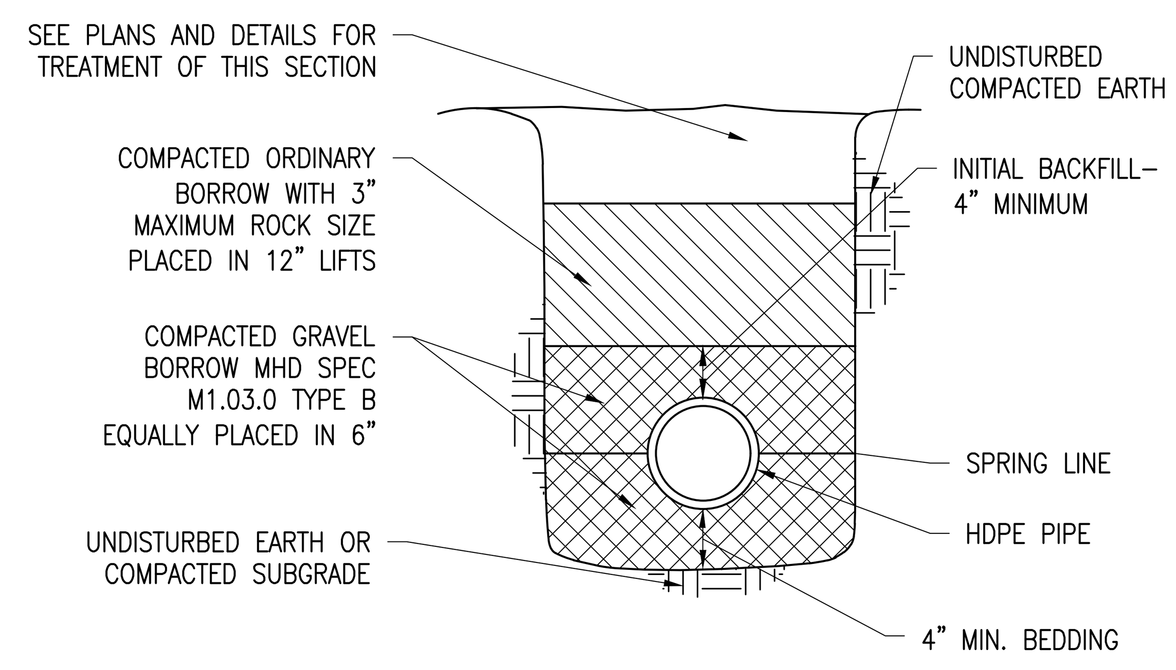
NOT TO SCALE



D	L
15"	8'-9"
18"	10'-0"
24"	12'-6"

7 HEADWALL

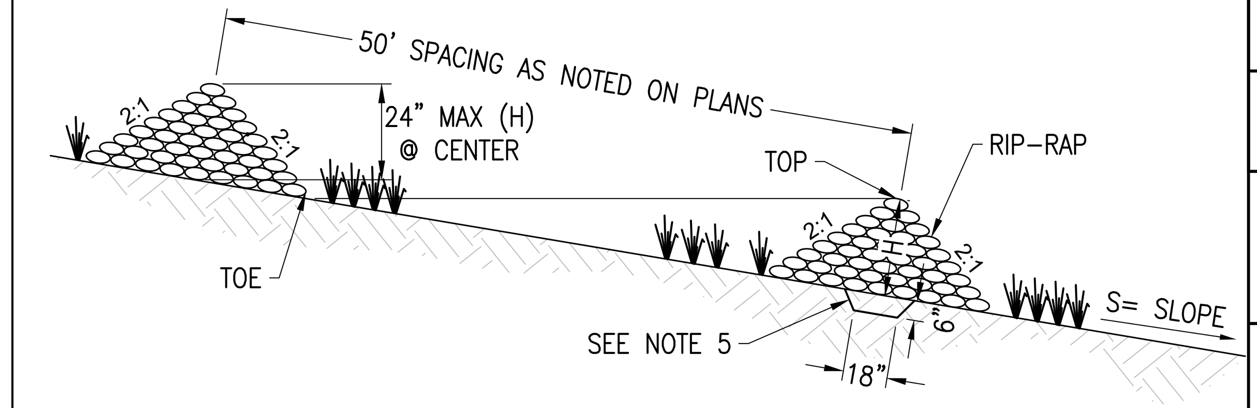
SCALE: NTS
2013-12-27



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

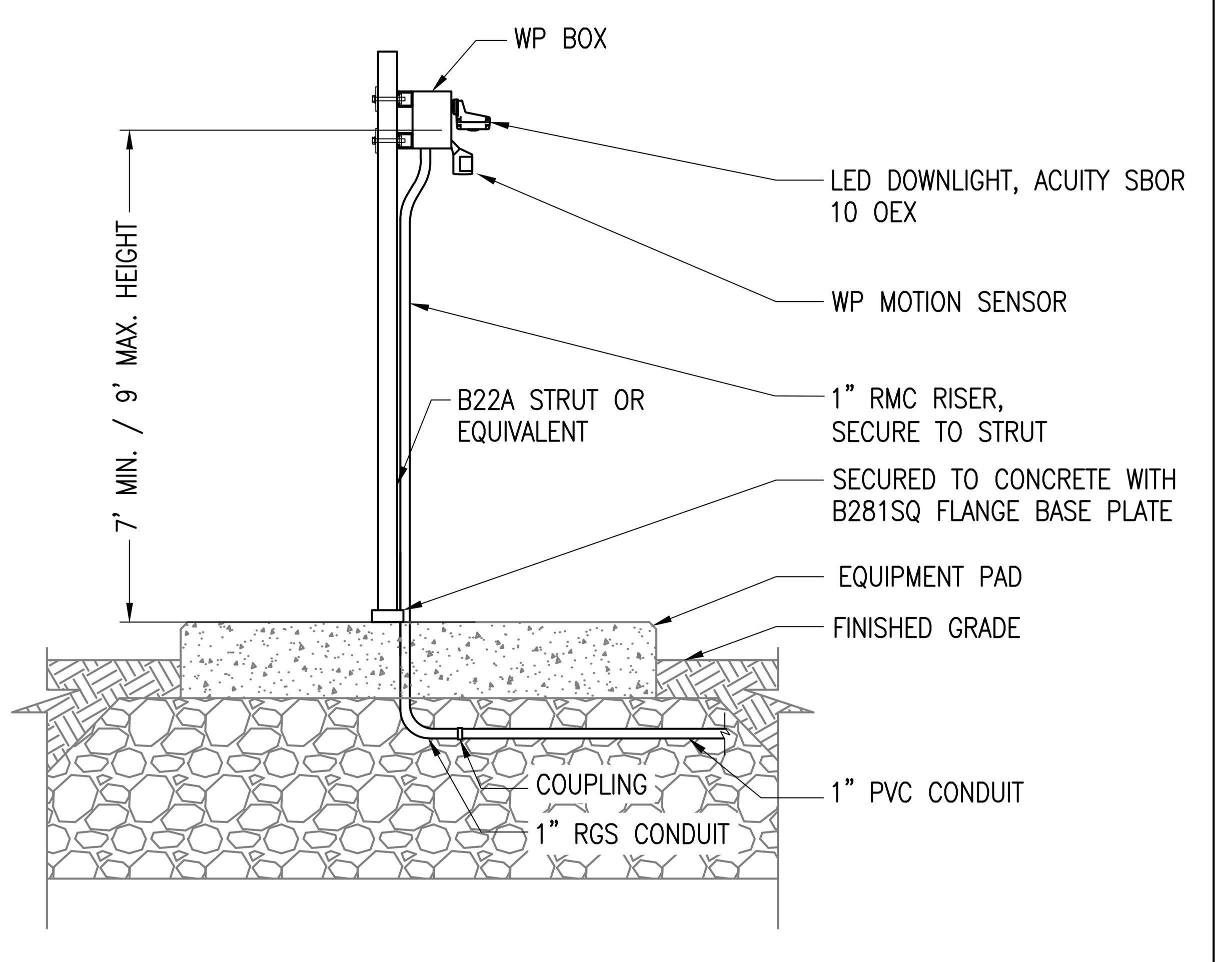
SCALE: NTS
XO_CIVIL_D_HDPE DRAIN PIPE BEDDING 06-28-2016



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

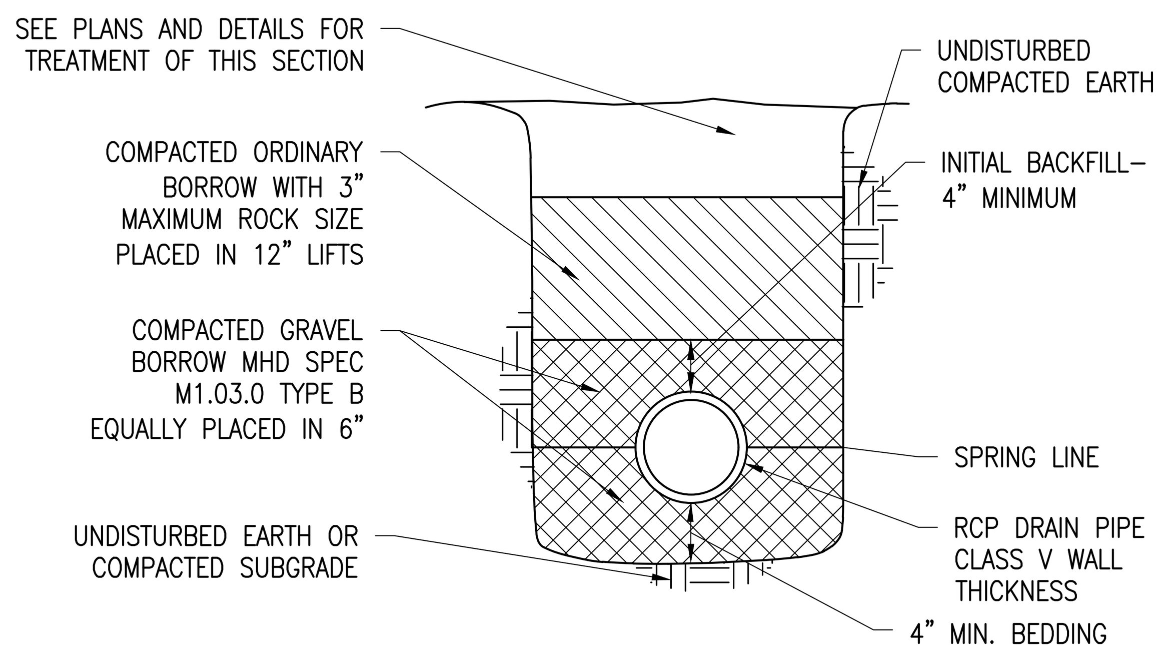
1 RIP-RAP CHECK DAM

SCALE: N.T.S.
XO_CIVIL_CHECK DAM 08-15-2016



11 LIGHTING MOUNTING - DOWNLIGHT

SCALE: NTS
XO_ELEC_ LIGHT MOUNTING-DOWNLIGHT 2018-06-22 JPL

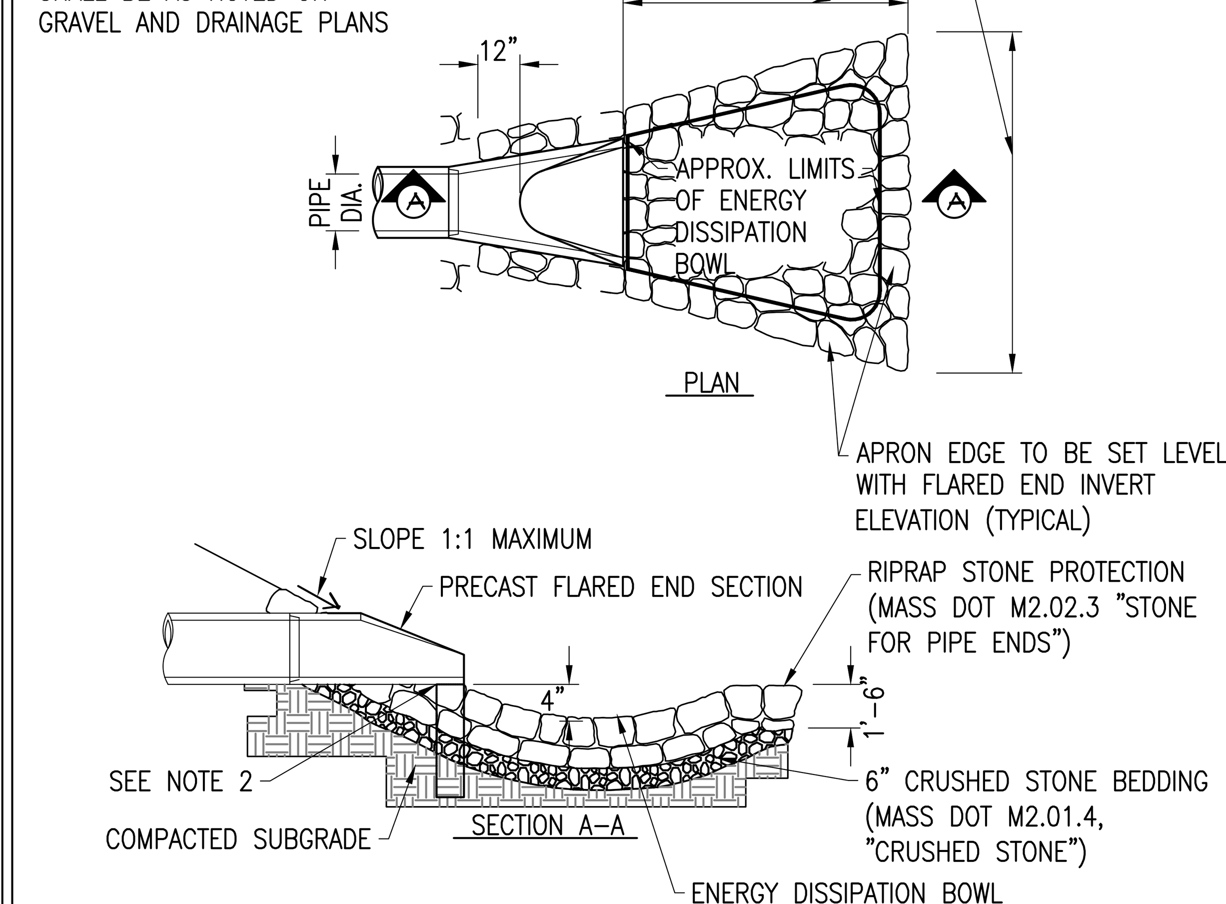


NOTES:
1. TRENCH EXCAVATION WIDTH TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.
2. ALL COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557 SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

8 REINFORCED CONCRETE DRAIN PIPE BEDDING

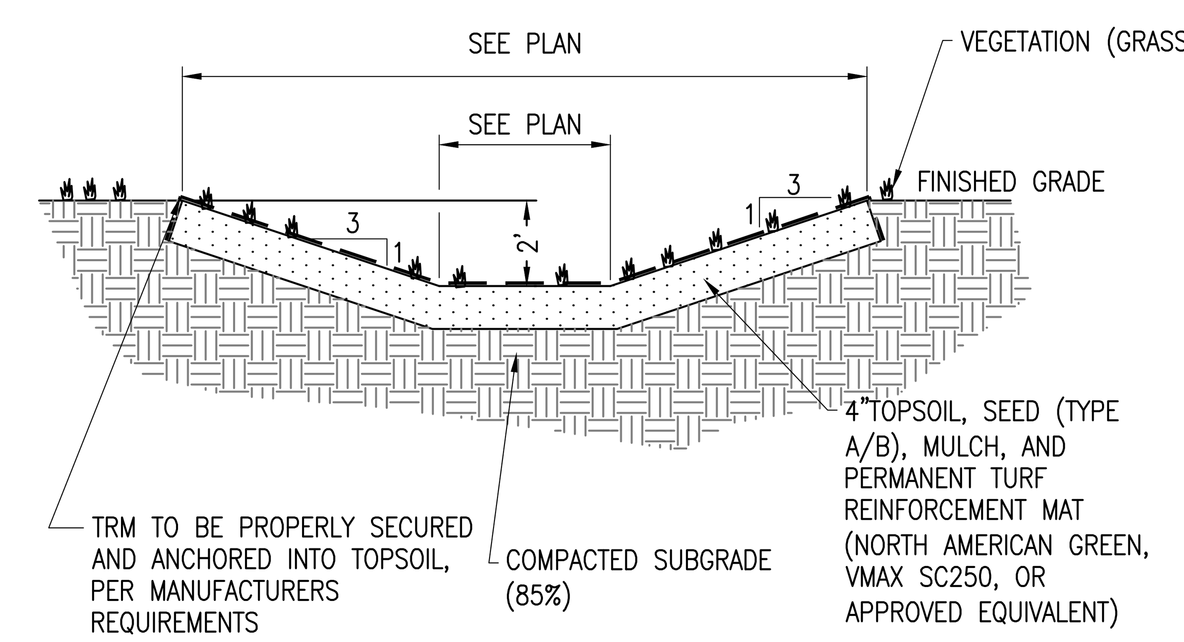
SCALE: NTS
XO_CIVIL_D_REINFORCED CONCRETE DRAIN PIPE BEDDING 06-28-2016

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



4 FLARED END SECTION/RIP-RAP APRON

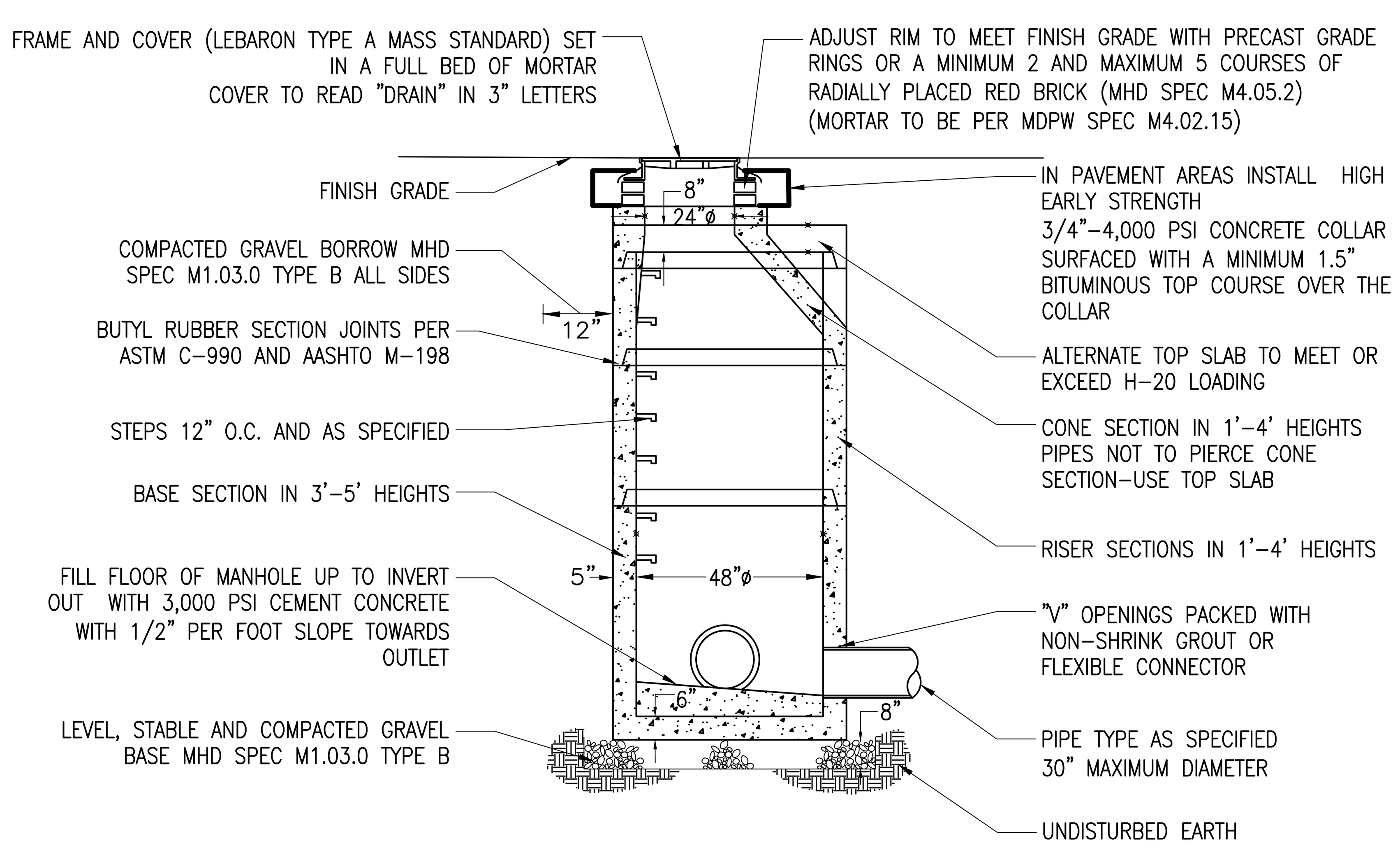
SCALE: NTS
XO_CIVIL_DRAINAGE_FLARED END SECTION RIP-RAP APRON 2016-08-15



2 VEGETATED OPEN SWALE

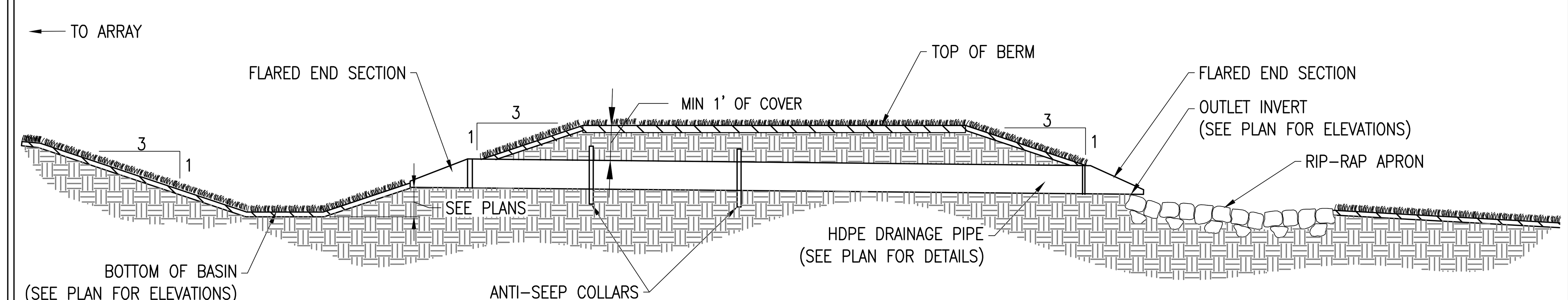
SCALE: NTS
XO_CIVIL_DRAINAGE_ROCK-LINED_SWALE 06-27-2016

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
XO_CIVIL_DRAINAGE_4' 10.DIAMETER PRECAST CONCRETE_DRAIN MANHOLE 03-10-2016



3 INFILTRATION BASIN AND POCKET POND OUTLET

SCALE: NTS
XO_CIVIL_DRAINAGE_DETENTION BASIN WITH RISER 08-16-2018

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

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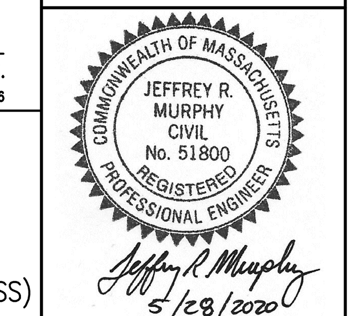

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C-5.1
CIVIL DETAILS