NORTH SMITHFIELD
Rich in history & community spirit

Land Development Narrative Report

Pursuant to North Smithfield Land Development Regulations Article 6

August 6, 2020

Project Location:
Holliston Sand Co., Inc.
77 Tifft Road, North Smithfield, RI

Assessors Plat/Lots:
Plat 4, Lots 35, 42, 43, 45, 46, & 223
Plat 7, Lot 64

Applicant:
Holliston Sand Co., Inc.
P.O. Box 1168
Slatersville, RI 02830

Owner:
Holliston Sand Co., Inc.
P.O. Box 1168
Slatersville, RI 02830

Prepared By:
Andrews Survey & Engineering, Inc.
104 Mendon Street
Uxbridge, MA 01569

ASE Job #2020-005

HOLLISTON SAND

Andrews Survey & Engineering, Inc.

Land Surveying ● Civil Engineering ● Site Planning

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TOWN of NORTH SMITHFIELD
PLANNING DEPARTMENT

One Main Street
Slatersville, RI 02876
Phone: 767-2200 Fax: 766-0016

APPENDIX B: APPLICATION FOR SUBDIVISION AND LAND DEVELOPMENT PROJECTS

The undersigned owner of land hereby requests to be placed on the agenda of the North Smithfield Planning Board and state that the required information detailed in the Subdivision Regulations of the Town of North Smithfield have been presented to the Administrative Officer.

_____ of _____
is hereby designated as the person to whom legal process may be served in condition with any proceedings arising out of this application. I/We also certify that the undersigned is the owner of the property designed below:

Name of Project: Holliston Sand Solar Installation **Date:** 8/6/2020

Classification

- ☐ Minor
- ☑ Major

Type of Project

- ☐ Administrative
- ☐ Subdivision
- ☑ Land Development Project

Review Stage

- ☐ Pre-Application/Concept
- ☑ Master Plan
- ☐ Preliminary Plan
- ☐ Final Plan

1. Assessor's Plat(s) 4 & 7 Assessor's Lot(s) 4/35, 42,43,45, 46 & 223; 7/64
2. Number of Lots: 1 (NEW LOT) 3. Zoning Designation(s): REA
4. Street Name: Tifft Road
5. Divider/ Developer: Holliston Sand Co, Inc.
6. Divider's/ Developer's Name: Holliston Sand Co, Inc.
(Please Print)

Divider's/ Developer's Name: _____
(Signature)

7. Names, addresses, and signatures of all persons with 10% or more interest:

_____ _____
(Signature) (Please Print)

_____ _____
(Signature) (Please Print)

8. Surveyor/ Engineer/ Attorney/ Representative: Michael P. DeFrancesco, PE
Name: Michael P. DeFrancesco
Address: c/o Andrews Survey & Engineering, Inc., 104 Mendon Street, Uxbridge, MA 01569
Daytime Telephone # 401-742-1968 Facsimile # n/a

(The owner hereby grants permission to Planning Board members and other Town officials to enter the designated property for the purpose of inspection after notifying the owner 48 hours in advance of site visit.)

Andrews Survey & Engineering, Inc.

Land Surveying ● Civil Engineering ● Site Planning

August 4, 2020

Mr. Gary Palardy, Chairman
Planning Board
Town Hall
83 Green Street
Slatersville, RI 02896

RE: Holliston Sand Co. Net Metering Project
Major Land Development Project Master Plan Application

Dear Mr. Palardy,

On behalf of our client, Holliston Sand Company, Inc., Andrews Survey & Engineering, Inc. is pleased to submit an application to the North Smithfield Planning Board for purposes of a Major Development associated with the development of a net metering (a behind-the-meter system to generate power for on-site consumption) solar installation on property located off Tifft Road, North Smithfield, RI.

THE SITE:

SITE CONTEXT AND HISTORY:

The subject parcel contains 47.39 acres and is currently used as a sand quarry, stockpile area and storage area for the ongoing sand and gravel excavation operations of Holliston Sand Co., as shown above and on the Site Plan sheet C2. It is bordered on the west by Slatersville Reservoir, on the north by forested terrain and on the east and south by a continuation of the quarrying operations. The eastern portion of the parcel consists of an open sand and gravel surface and contains several buildings and storage containers. Elevations vary from approximately 316 ft. on the northeasterly portion of the lot to 250 ft. on the westerly portion. The western portion of the parcel is forested and is adjacent to the Slatersville Reservoir on land of Dudley Development to the west. The project area was formerly used for material storage.

EXISTING STRUCTURES AND ROAD NETWORKS:

Several storage buildings exist on the site and are used for the sand processing operations. Two gravel access roads bisect the parcel and are used in the sand processing operations. Both roads are to remain intact, although a small section of one of the roads will be moved approximately 50 feet to accommodate the proposed building. There are no public ways or public access points on or directly adjacent to the parcel. All construction vehicles shall enter from State Route 7.

EXISTING UTILITIES:

Aboveground 13.8 kVA electric utilities currently service the site.

GEOLOGY AND SOILS:

The soils consist of stratified layers of loamy sand and gravelly coarse sand. They are the result of glacial outwash approximately 13,000 to 15,000 years ago. The USDA-NRCS Soil Survey of Rhode Island classifies it as Hinkley soils. The area of the solar field is to be loamed and seeded following construction.

GROUNDWATER:

The site is within a Groundwater Recharge Area and a Community Wellhead Protection Area. Due to the nature of the solar installation, no pollutants are expected to be generated or discharged during solar operations. The proposed net metering solar development is not anticipated to have any negative impact on the groundwater resource of the community. See the Natural Resource Services, Inc. (NRS) Written Narrative (pg. 13).

HISTORICAL AND ARCHEOLOGICAL FEATURES:

Based on available RIGIS data, there are no known archaeological or historic sites or features in the vicinity of the project area.

OPEN SPACE:

No known abutting properties are designated as Open Space areas. The property abuts the Slatersville Reservoir on its westerly boundary.

UTILITY INTERCONNECTION INFORMATION:
The proposed net metering system shall connect to the 13.8 kVA utility line, whose point of origin begins at Tifft Road.

FLOOD ZONES:

The FEMA Floodway and Flood Insurance Rate Map (FIRM) indicate that the project area is located within Flood Zone X, which is not a special flood hazard area. See the NRS Narrative (pg. 13), FEMA Firmette (Exhibit 6, pg. 16) and Elevation Certification (pg. 17).

ECOLOGY:

Wetlands and Water Resources:

The applicant has completed a full wetland delineation included in this report, and will obtain RIDEM approvals, as necessary, prior to start of construction. See Site Plan Sheet C2 and NRS Narrative (pg. 13).

Vegetation:

The western portion of the parcel consists of mature forest.

Rare or Endangered Plant or Animal Species:

Based on available RIGIS data, the project area does not lie within a natural heritage area. The biological impacts on the wetlands are addressed in the NRS Narrative (Exhibit 5, pg. 11). The NRS Narrative has also been provided as part of the RIPDES application. Also see RIGIS Map (pg. 18).

PROPOSED DEVELOPMENT:

The applicant is proposing to install a 977 kW behind-the-meter net metering solar development to generate power for on-site consumption, as well as an associated garage containing the transformer and other electrical equipment. The building will be staffed by a small number of existing personnel in the course of their normal work activities and will not involve an increase in traffic or personnel. As part of the development process, stormwater runoff will be handled in compliance with RIDEM Stormwater Policy. The surface stormwater will be directed into an infiltration basin, located at the southwesterly corner of the development area and it is anticipated that no stormwater will leave the site. Additional site work will include a fence enclosing the solar site. No impervious surfaces will be constructed as part of the solar project except those required for interconnection purposes. The total area of the solar array will be 4.89 acres, or 10.00% of the total lot area. The site will be loamed and seeded for site reclamation following construction.

FIRE PROTECTION & EMERGENCY RESPONSE:

The proposed solar development will not create a significant fire or emergency response risk to the Town. The proposed solar development will be constructed of materials with low flammability. Power generation will be remotely monitored, and the solar development company alerted to any interruptions in system.

Hazardous materials will not be used in construction. An access road will be constructed around the development for emergency vehicles. It will meet the requirements for emergency response and Utility. Fire suppression will be supplied by three existing cisterns. Two of the cisterns have a storage capacity of approximately 10,000 gallons and the other has a capacity of approximately 20,000 gallons.

We hope this serves your needs at this time. Should you have any questions or require additional information, please contact this office.

Very Truly Yours,
ANDREWS SURVEY & ENGINEERING, INC.

Byron J. Andrews
President

LAND DEVELOPMENT AND SUBDIVIDSION REGLATION WAIVERS:

The applicant is seeking waivers from the following Land Development and Subdivision Regulations (Section 4.1) due to their non-applicability:

1. *Section 4.1.(F) Site Context Map.*

   The site is located completely within the existing sand quarrying operational area. It is not visible to neighbors or from any public roads, recreational or residential areas and is not directly accessed from public ways. The existing topography and ground surface will not be altered. Existing lot lines, wetlands, flood hazard areas, soils, and topography adjacent to the development area are shown on the existing conditions map, Drawing C3. Due to these factors the Site Context Map is not relevant.

Section 4.1.(O) Existing Resources and Site Analysis Map

Due to the isolated nature of the site (as outlined above) there will be no significant cultural or recreational resources adversely impacted.

ZONING ORDINANCE WAIVERS:

The applicant is seeking waivers from the following Zoning Ordinance requirements (for Advisory Opinion purposes):

1. *Section 5.7.5 (g) Visual Buffer and Setback*

   The proposed project site is accessed only through a private road, is not visible by any abutters except Applicant and its related entities. Requested relief is waiver of required vegetated buffer.

2. *Section 5.7.5 (k)Utility Connections, Electrical Components.*

   The proposed project will have underground utilities within the proposed fence; beyond the proposed fence will be overhead connection to existing electric service.

3. *Section 5.7.5 (l) Appurtenant Structures.*

   Due to the unique nature of the abutting property use, certain project equipment will be housed within a metal building beyond the fence but on the solar parcel. Classification of the building as an appurtenant structure to the project is inaccurate as the standalone metal building's size and proposed uses necessitated the filing of the project as a Major Land Development Project.

H. MASTER PLAN CHECKLIST
MAJOR LAND DEVELOPMENT PROJECTS AND MAJOR SUBDIVISIONS
CONSERVATION DEVELOPMENTS

The applicant shall submit to the Administrative Officer at least ten (10) blueline or photocopies of all master plan maps and information required below. Plans must be no larger than 24" x 36". The scale and number of all plans shall be sufficient to clearly show all of the information required and shall be subject to the approval of the Administrative Officer. All plan sheets and related documents must be provided in portable document format (PDF) files as well. Plans shall include a certification that all plans and improvements conform to a minimum Class IV standard of the State of Rhode Island and Providence Plantations, Board of Registration for Professional Engineers and Board of Registration of Land Surveyors.

The following information shall be presented in the form of a written narrative report, supplemented as necessary with drawings, sketches or plans to convey intent. The narrative report shall include reduced sets of all drawings and plans required below on maximum 11" x 17" sheets. Initially, the applicant shall submit to the Administrative Officer at least ten (10) blueline or photocopies of preliminary plan maps required below. The number of reduced copies of the plans and narrative report shall be determined by the Administrative Officer, based upon the required distribution to the Planning Board, and other agencies listed in Supporting Materials, below.

Every submission must also be accompanied by an Application for Approval of a Major Land Development Project or Major Subdivision, as contained in Appendix B.

At a minimum, required information includes the following:

1. Site Base Map (see below).
2. Existing Resources and Site Analysis Map. See Section 4-1 (O).
3. Site Context Map. See Section 4-1 (F).
4. Sketch Plan Overlay Sheet. See Section 4-1 (E).*
5. Conventional Yield Plan. See Section 4-1 (H).*

* Required for Conservation Developments only

6. Proposed Conditions Map (Conventional Subdivisions only).

BASE MAP

All Master Plan Drawing(s) required by this Checklist shall show the following information (if applicable):

A. All maps required by this Checklist shall show the following information (if applicable):

1. X Name and location of the proposed subdivision.
2. X Name and address of property owner and applicant.
3. X Name, address and telephone number of engineer and/or land surveyor.
4. X Date of plan preparation, with revision date(s) (if any).

5. X Graphic scale and true north arrow. Legend to explain any graphic representations or symbols on the plan.

6. X Inset locus map at 1" = 2000' exact or approximate scale so labeled.

7. X Plat and lot number(s) of the land being subdivided.

8. X Zoning district(s) of the land being subdivided. (If more than one district, zoning boundary lines must be shown.)

9. X Perimeter boundary lines of the subdivision, in heavy shaded line, drawn so as to distinguish them from other property lines.

10. X Area of the subdivision parcel(s) and proposed number of buildable lots.

11. X Location and dimensions of existing property lines within or forming the perimeter of the subdivision parcel(s).

12. X Easements and rights-of-way within or adjacent to the subdivision parcel(s).

13. X Location, width and names of existing streets within and immediately adjacent to the subdivision parcel.

14. X Names of abutting property owners and property owners immediately across any adjacent streets.

EXISTING RESOURCES AND SITE ANALYSIS MAP

The information required in Section 4-1 (O) shall be shown on the Existing Resources and Site Analysis Map(s), and shall be subject to the approval of the Administrative Officer. This information may be based on the information provided at the Pre-application stage of review (Checklist C), with updates as required.

A. Topography and Slopes

15. X Existing contours at intervals of two or five feet elevation relative to sea level.
16. X Slope map, with slopes grouped according to three categories based on development suitability: <15%, 15-25% and over 25%. Steeper slopes should be shown in progressively darker colors or shades of gray.

B. Natural Resource Inventory

17. N/A Location of land unsuitable for development as defined in the Zoning Ordinance, including wetlands, ponds, streams, ditches, drains, special aquatic sites, vernal pools. Wetland locations do not need to be verified by RIDEM.
18. X Vegetative cover on the property, indicating any unfragmented forest tracts
19. X Soils map, indicating any prime farmland soils, and any land in active agricultural use.
20. N/A Geologic formations
21. N/A Ridge lines of existing hills
22. X Wellhead protection areas for public or community drinking water wells
23. X Groundwater Aquifer Overlay District (Town)
24. X 100-year floodplains as shown on federal flood protection maps

25. N/A State, regional, or community greenways and greenspace priorities
26. N/A State-designed Natural Heritage Sites (RIDEM)

C. Cultural Resource Inventory

27. X Approximate location of man-made features such as roads, structures, outbuildings, roads or trails, and other such features on the parcel
28. N/A Historically significant sites or structures
29. N/A State or locally-designated historic sites, districts, cemeteries or landscapes
30. N/A Location of any stone walls within or forming the perimeter of the site
31. N/A Archaeological sites
32. N/A Scenic road corridors and state-designated scenic areas
33. N/A Viewshed analysis

D. Recreational Resource Inventory

34. N/A Existing hiking, biking and bridle trails within and adjacent to site
35. N/A Boat launches, lake and stream access points, beaches and water trails
36. N/A Existing play fields and playgrounds on or adjacent to the site

E. Utilities and Infrastructure

37. N/A Size and approximate location of public or private water lines
38. N/A Size and approximate location of public or private sewer lines
39. N/A Gas service
40. X Electrical service
41. N/A Telephone, cable, and other communication services
42. X Width and surfacing material of existing road(s) at access points
43. X Existing drainage and drainage structures, such as culverts and pipes, etc.

SITE CONTEXT MAP

The Contextual Analysis process is described in detail in Section 4-1 (F) and in the design process Section 4-1 (D), Step 2 of these Regulations. This information may be based on the information provided at the Pre-application stage of review (Checklist C), with updates as required.

44. N/A Site Context Map
45. N/A Soils Map of surrounding area. See Supporting Materials, No. 4.

SKETCH PLAN OVERLAY SHEET (Conservation Developments)

The applicant shall present initial proposals for development, using a conceptual sketch plan(s) for development. This information may be based on the information provided at the Pre-application stage of review (Checklist C), with updates as required.

46. X Identification of areas proposed for development
47. N/A Location of proposed open space areas
48. N/A Initial layout of streets
49. N/A Land Unsuitable for Development, as defined in the Zoning Ordinance

CONVENTIONAL YIELD PLAN (Conservation Developments)

An updated Conventional Yield Plan, as discussed at the Pre-application stage of review shall be presented for further review by the Planning Board, if required.
50.N/A Conventional Yield Plan, if modified from Pre-application review

PROPOSED CONDITIONS MAP(S) (Conventional Subdivisions)

For conventional subdivisions, the applicant shall submit the following information in lieu of a Sketch Plan Overlay Sheet and Conventional Yield Plan:

1.N/A Proposed improvement including streets, lots, lot lines, with approximate lot areas and dimensions. Proposed lot lines shall be drawn so as to distinguish them from existing property lines.

2.N/A Grading plan in sufficient detail to show proposed contours for all grading proposed for onsite construction of drainage facilities and grading upon individual lots if part of proposed subdivision improvements (if applicable).

3.N/A Proposed utilities plan, including sewer, water, gas, electric, phone, cable TV, fire alarm, hydrant, utility poles, or other proposed above or underground utilities, as applicable.

4.N/A Location, dimension and area of any land proposed to be dedicated to the Town for use as open space, conservation or recreation.

5.N/A Base flood elevation data

6.N/A Certification by a Registered Land Surveyor that all interior and perimeter lot lines and street lines of the land being subdivided have been designed to conform to Class 1 survey requirement and are certified as being correct

7. N/ARectangular box showing zoning district(s), dimensional requirements for each district, and the minimum dimensions actually provided.

SUPPORTING MATERIALS

The applicant shall submit to the Administrative Officer a narrative report providing a general description of the existing physical environment and existing use(s) of the property along with a general description of the uses and type of development proposed by the applicant. The narrative report shall include reduced copies of all plan required above plus items 3-11, below:

1.____ Administrative (filing) Fee: _____ Plus No. of Lots _____ x Per/lot Fee $25.00= _____ Total Fee

2.____ Project Review Fee (if required)

3.X An aerial photograph or blue line copy of an existing aerial photograph of the proposed subdivision parcel and surrounding area

4.X A copy of the soils map of the subdivisions parcel and surrounding area, and general analysis of soil types and suitability for the development proposed. If any prime agricultural soils are within the subdivision parcel(s), the soils map shall be marked to show the location of said prime agricultural soils

5. N/A An estimate of the approximate population of the proposed subdivision

6. N/A An estimate of the number of school-aged children to be housed in the proposed subdivision

7. N/A Fiscal impact statement (if required)

8. N/A Proposed phasing, if any

9. X A narrative detailing potential neighborhood impacts

10. N/A Open Space Use and Management Plan. See Section 4-1 (K) 5. (Required for Conservation Developments only)

11. X Written request for waivers of subdivision standards as per Section 7-2.

12. X Copy of Plan in digital format. (AutoCAD 2007 or newer)

13. ____ Initial written comments on the Master Plan from the following agencies

A.____	Planning Department	Date:_____
B.____	Public Works Department	Date:_____
C.____	Sewer Department	Date:_____
D.____	Building Inspector	Date:_____
E.____	Fire Department	Date:_____
F.____	Town Solicitor	Date:_____
G.____	Conservation Commission	Date:_____
H.____	Police Department	Date:_____
I.____	Other (specify)_____	Date:_____

Adjacent Communities (specify):

A. _____ Date:_____
B. _____ Date:_____
C. _____ Date:_____
D. _____ Date:_____
E. _____ Date:_____

State Agencies:

A.____ Environmental Management	Date:_____
B.____ Transportation	Date:_____
C.____ Other (specify)	Date:_____

Federal Agencies:

A.____ U.S. Army Corps Engineers	Date:_____
B.____ FEMA	Date:_____

Natural Resource Services, Inc.

Written Narrative
Special Use Permit Application

32 Old Forge Road
A.P. 4, Lot 42
North Smithfield, Rhode Island

Prepared for:
Carmine Iacuone
Dudley Development Corp.
PO Box 1168
Slatersville, RI 02876

Prepared by:

Edward Avizinis, CPSS

March 13, 2020

P.O. Box 311 Harrisville, RI 02830 401-568-7390 FAX 401-568-7490

Purpose

Section 6.19.8.2(3) of the North Smithfield Zoning Ordinance requires an analysis that demonstrates that the proposed activity will not be detrimental to the purpose of the district

The purpose of the Section 6.19, Water Supply Protection Overlay District is to (A) Protect the quality and supply of future and present sources of drinking water for the residents of the Town of North Smithfield and adjacent communities by regulating the use and development of land to protect major stratified drift aquifers and their recharge areas, surface drinking water supplies and their watersheds, community and non-community wellhead protection areas and to prevent uses of land detrimental thereto; (B) to protect the integrity of natural systems; and (C) To protect the health, safety and general welfare of the public.

Existing Conditions

The site of the proposed solar array is within a historically mined sand/gravel pit south of the Slatersville Reservoir. A review of historic aerial photographs show the area of the proposed solar array actively mined and completely cleared of vegetation as of 1997. The land is currently cleared with only subsoil exposed. A gravelly sand soil texture is observed on the immediate ground surface.

Geologically, the site is situated on the summit of an outwash terrace. The soil here consists of coarse particles that were deposited via glacio-fluvial processes. The soil particles that comprise the land were deposited by glacial melt waters as the glaciers receded northward from the last glaciation approximately 13,000 to 15,000 years ago. This resulted in the deposition of coarse sand particles which were seasonally deposited relative to the amount of energy in the meltwater during a given season. In other words, only heavy coarse particles could settle out during the summer when meltwater energy was high, and finer sand would settle out in the spring and fall when meltwater energy was low. As such the soil texture is generally stratified ranging from loamy sand to gravelly coarse sand. The site is mapped by the USDA-NRCS Soil Survey of Rhode Island as Hinckley soil which reflects these characteristics. The soil survey characterizes Hinckley soil as excessively drained. The saturated hydraulic conductivity (kSat), which measures the capacity of the most limiting layer of the soil to transmit water, has a wide range from 1.42 in/hr up to 99.90 in/hr. Even the low end of the kSat range is still considered highly permeable.

Due to the coarse texture and stratification of outwash soils, areas mapped as such are generally considered highly important for groundwater recharge. During rain events water easily passes through the pore space to infiltrate back to the groundwater reservoir. Rhode Island DEM Environmental Resource Maps also show the site within a community and non-community wellhead protection area.

The slope of the land is nearly level where the solar array is sited. North of the proposed array the land slopes downward to Slatersville Reservoir. This surface water resource is defined as a pond and is identified as waterbody ID – RI0001002L-09 by the Rhode Island Department of Environmental Management Water Quality Regulations. The reservoir is a warm water fishery

and is slightly more than 200 feet away from the proposed solar field at its closest point. The USGS Topographic Map shows the pond elevation at 249 feet asl. The prepared site plan shows the proposed solar array between 290 and 304 feet asl., a difference in elevation of 41 – 55 feet. The seasonally high groundwater elevation in the vicinity of the solar array is likely consistent with the pond elevation due to the high permeability of the soil. This would suggest that the seasonally high water table in the vicinity of the solar array is between 41 and 55 feet below the ground surface.

Impacts

The first of three standards for protection under the town ordinance is to protect the quality and supply of future and present sources of drinking water for the residents of the Town of North Smithfield and adjacent communities by regulating the use and development of land to protect major stratified drift aquifers and their recharge areas, surface drinking water supplies and their watersheds, community and non-community wellhead protection areas and to prevent uses of land detrimental thereto. The two concerns in regard to protection of groundwater systems is water quality and water volume.

Water quality refers to ensuring that there are no contaminants in the surface water that will recharge into the groundwater supplies. Water volume refers to the ability of a recharge site to incorporate a given volume of surface water into the groundwater aquifer. Negative impacts to a groundwater aquifer occur when either of these parameters are impacted.

Water quality impacts are not anticipated as a result of this project. The solar panels proposed are primarily silica based which is the most abundant element in sand. The glass covered panels allow water to flow off unencumbered and free of pollutants. The RI DEM does not have a specific standard when it comes to solar arrays. The Massachusetts Department of Environmental Protection has a Stormwater Program Policy (17-1) for Photovoltaic System Solar Array Review which provides recommendations for water volume but not quality. The lack of regulations demonstrate that state agencies do not consider runoff from solar panels as potentially impacting groundwater quality.

The current volume of water infiltrating at the site will not be impacted by the proposed solar array. As previously discussed the high kSat of the Hinckley soil will allow large volumes of water to infiltrate back into the aquifer. Furthermore, the ground surface will be loamed and seeded after panel installation with a native conservation grass seed mix. The roots of the grass allow water to percolate into the subsoil at a faster rate by creating macro-pores for the water to move through. The surface blades of grass slow the movement of water over the landscape and allow for a greater rate of infiltration. Lastly there is a stormwater mitigation system proposed near the array that will collect and attenuate any overland flow and allow a secondary opportunity for infiltration. Therefore, based upon our preliminary investigation, it is anticipated that water quality will not be impacted by the proposed solar array and that the sites ability to provided aquifer recharge will be sustained at current levels.

The second of the three standards is to protect the integrity of natural systems. The proposed site is currently disturbed having been mined for sand and gravel over the past thirty years. This

makes the siting of this proposal ideal since no natural environment will be impacted (i.e. no tree clearing, excessive grade changes, loss of habitat, et cetera). In addition, as previously discussed water quality and water volume will not be impacted by the proposal thus the hydrologic regime that supports the nearby reservoir will also not be impacted.

The third and final of the three standards is to protect the health, safety and general welfare of the public. Given the reasons above, the proposed solar array is not anticipated to have any negative impact on the groundwater resources of the community.

Appendix

National Flood Hazard Layer FIRMette

FEMA

71°35'52"W 41°59'31"N

71°35'15"W 41°59'5"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/27/2020 at 8:28 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Andrews Survey & Engineering, Inc.

Land Surveying • Civil Engineering • Site Planning

July 28, 2020

Mr. Gary Palardy, Chairman
Planning Board
Town Hall
83 Green Street
Slatersville, RI 02896

RE: Flood Zone Status
Holliston Sand Co. Net Metering Project
Major Land Development Project Master Plan Application

Dear Sir:

My name is Holland E. Shaw. I am a Land Surveyor licensed in the State of Rhode Island and am the Surveyor of Record for a project for the Holliston Sand Co. Net Metering Project.

The nearest flood hazard area is associated with the Slatersville Reservoir and the Flood Insurance Rate Map Panel 44007C0151G lists the flood elevation as 254 feet above sea level (Flood Zone AE). The existing and proposed elevations for the solar project vary from 284 feet to 308 feet above sea level. The lowest elevation of the project is 30 feet above the maximum flood elevation of Flood Zone AE. In addition, the area within the project perimeter is not within Flood Zone AE as depicted graphically on FIRM Panel 44007C0151G. I certify that the area of the net metering project is not within an area of elevated flood hazard risk.

I hope this serves your needs at this time. Should you have any questions or require additional information, please contact Andrews Survey & Engineering, Inc. at the above address. Thank you.

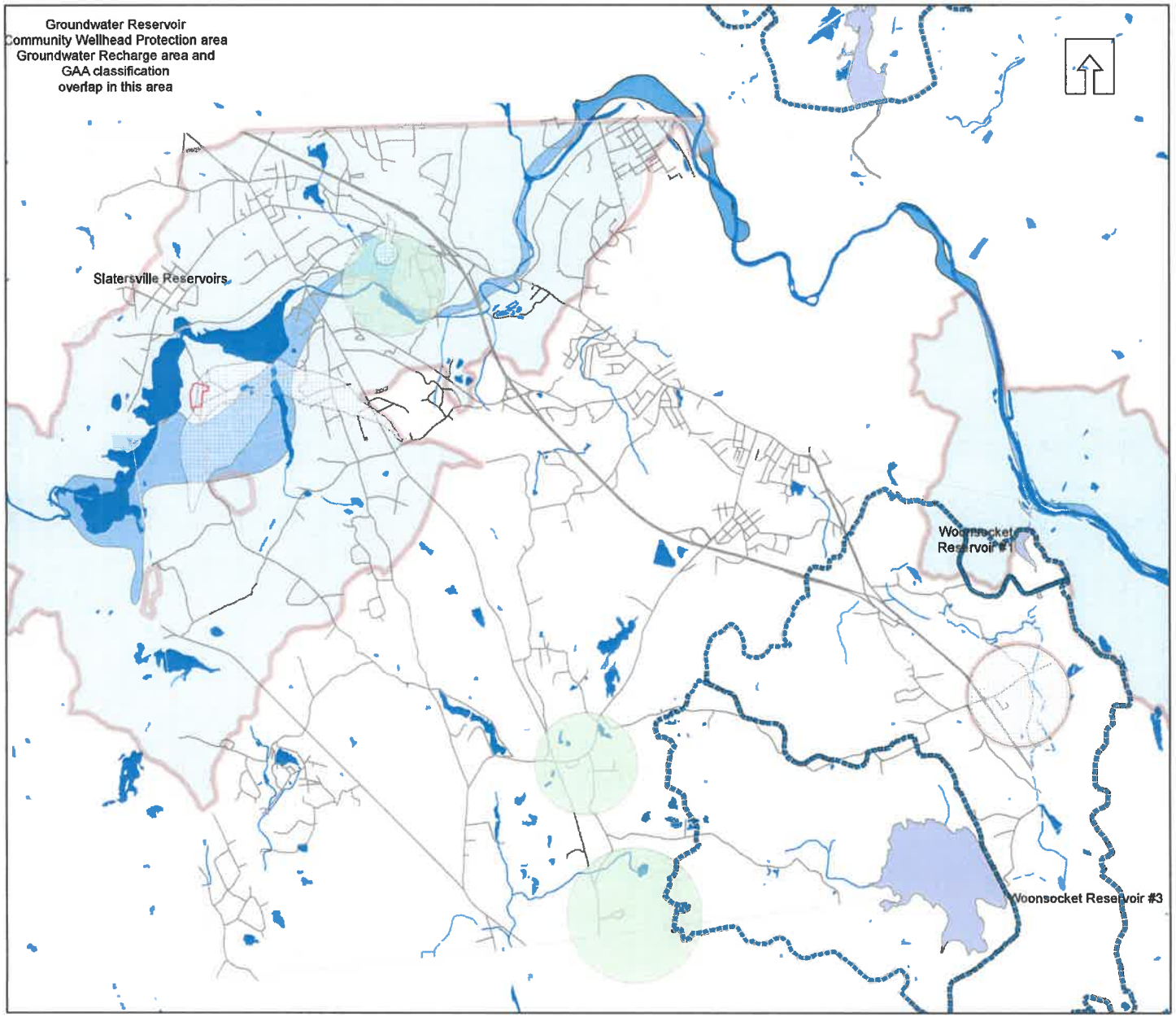
Very truly yours,

Holland E. Shaw, PLS
President

HOLLAND E. SHAW
No. 1911
Aug 17, 2020
PROFESSIONAL LAND SURVEYOR

ASE

Holliston Sand Co.
Tifft Road, North Smithfield, RI
17



2

North Smithfield, RI Zoning Ordinance Map: Water Supply Protection Overlay District

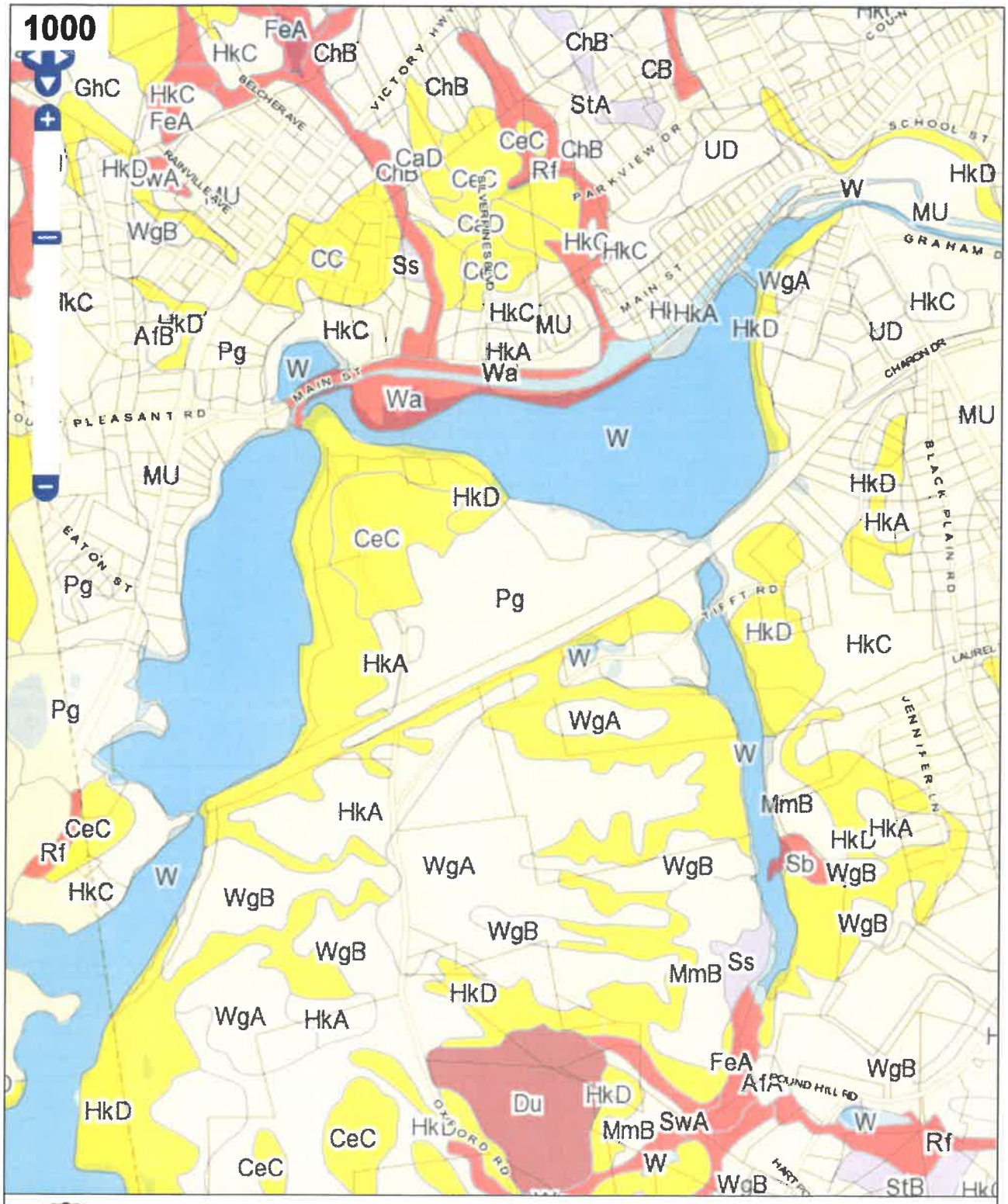
Legend

- Surface_Water_Protection_Areas
- Public_Water_Reservoirs
- MS wellhead
- Stream_Aquifermap
- GAA Classification
- Community Wellhead Protection Areas
- Wellhead Protection Areas - Schools
- StreetLines
- Groundwater_Reservoirs
- Lakes_and_Ponds_5k
- Water Supply Basin Boundary
- Groundwater_Recharge_Areas

0 1,500 3,000 6,000 9,000 12,000 Feet

RIGIS

Parcel data - Town of North Smithfield, RI
Well data - RIGIS
Map produced by Town of North Smithfield, RI
2/14/12
Map revised 1/31/13



Town of North Smithfield, Rhode Island

200 m
1000 ft

N

MainStreetMaps
MainStreetGIS, LLC
www.mainstreetgis.com

Printed 8/17/2020 from http://www.mainstreetmaps.com/ri/northsmithfield/public.asp

NORTH SMITHFIELD
Rich in history & community spirit

STORMWATER MANAGEMENT REPORT

August 6, 2020

Project Location:
Holliston Sand Co., Inc.
77 Tifft Road, North Smithfield, RI

Assessors Plat/Lots:
Plat 4, Lots 35, 42, 43, 45, 46, & 223
Plat 7, Lot 64

Applicant:
Holliston Sand Co., Inc.
P.O. Box 1168
Slatersville, RI 02830

Owner:
Holliston Sand Co., Inc.
P.O. Box 1168
Slatersville, RI 02830

Prepared By:
Andrews Survey & Engineering, Inc.
104 Mendon Street
Uxbridge, MA 01569

ASE Job #2020-005

HOLLISTON SAND

PART 1 – SUMMARY

1.0 Project Description

The applicant is proposing to install a 977 kW behind-the-meter net metering solar development to generate power for on-site consumption, as well as an associated garage containing the transformer and other electrical equipment. The building will be staffed by a small number of existing personnel in the course of their normal work activities and will not involve an increase in traffic or personnel. As part of the development process, stormwater runoff will be handled in compliance with RIDEM Stormwater Policy. Surface stormwater within the project area is currently directed into an existing infiltration basin, located at the southwesterly corner of the development area. It is anticipated that no stormwater will leave the site because the project area, which is currently barren soil, will be loamed and seeded. No impervious surfaces will be constructed as part of the solar project except those required for interconnection purposes. Additional site work will include a fence enclosing the solar site. The total area of the solar array will be 4.89 acres.

2.0 Background Data

The subject parcel contains 47.39 acres and is currently used as a sand quarry, stockpile area and storage area for the ongoing sand and gravel excavation operations of Holliston Sand Co., as shown on the Site Plan sheet C2. It is bordered on the west by Slatersville Reservoir, on the north by forested terrain and on the east and south by a continuation of the quarrying operations. The eastern portion of the parcel consists of an open sand and gravel surface and contains several buildings and storage containers. Elevations vary from approximately 316 ft. on the northeasterly portion of the lot to 250 ft. on the westerly portion. The western portion of the parcel is forested and is adjacent to the Slatersville Reservoir on land of Dudley Development to the west. The project area was formerly used for material storage.

The soils consist of stratified layers of loamy sand and gravelly coarse sand. They are the result of glacial outwash approximately 13,000 to 15,000 years ago. The USDA-NRCS Soil Survey of Rhode Island classifies it as Hinkley soils. The area of the solar field is to be loamed and seeded following construction.

The site is within a Groundwater Recharge Area and a Community Wellhead Protection Area. Due to the nature of the solar installation, no pollutants are expected to be generated or discharged during solar operations. The proposed net metering solar development is not anticipated to have any negative impact on the groundwater resource of the community. See the Natural Resource Services, Inc. (NRS) Written Narrative.

Based on available RIGIS data, there are no known archaeological or historic sites or features in the vicinity of the project area.

Soils information was taken from U.S.D.A. Natural Resource Conservation Service (NRCS) Soil Survey Report. Soils mapping indicated that the soils on the site are generally categorized as Canton and Canton and Charlton complex series soils. These soil types have a hydrologic soil group rating of B. This entire site is rated as a Hydrologic Soil Group "B".

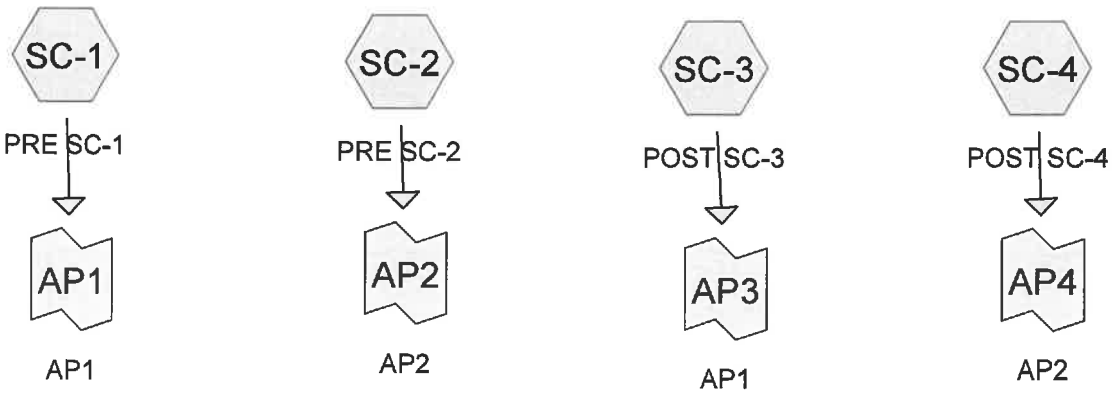
3.0 Stormwater Management

The area of the solar installation is currently barren soil and will be loamed and seeded for site reclamation following construction. Loaming and seeding will reduce peak stormwater rates and will improve water quality compared to current conditions. Operations and maintenance can then be limited to biannual mowing. It is not anticipated that additional stormwater mitigation measures will be required.

PART 1I – Pre- & Post-Construction Computations

3.0 Stormwater Peak Rate Summary

Stormwater Peak Rate Summary				
Pre-Development (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 1	0.3	1.2	2.0	4.0
AP 2	1.5	5.6	9.6	19.0
Post Development (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 3	0.0	0.0	0.1	1.2
AP 4	0.0	0.1	0.6	5.6
Pre-Development vs. Post Developed (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 1/AP 3	**-0.3**	**-1.2**	**-1.9**	**-2.8**
AP 2/AP4	**-1.5**	**-5.5**	**-9.0**	**-13.4**



Subcat Reach Pond Link

Routing Diagram for 2019-005
Prepared by {enter your company name here}, Printed 12/3/2019
HydroCAD® 10.00-22 s/n 02271 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
175,568	60	(SC-2)
217,982	39	>75% Grass cover, Good, HSG A (SC-3, SC-4)
42,414	60	Fallow, bare soil, HSG A (SC-1)
435,964	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
260,396	HSG A	SC-1, SC-3, SC-4
0	HSG B	
0	HSG C	
0	HSG D	
175,568	Other	SC-2
435,964		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	0	0	175,568	175,568		
217,982	0	0	0	0	217,982	>75% Grass cover, Good	
42,414	0	0	0	0	42,414	Fallow, bare soil	
260,396	**0**	**0**	**0**	**175,568**	**435,964**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC-1: PRE SC-1 Runoff Area=42,414 sf 0.00% Impervious Runoff Depth=0.42"
Flow Length=362' Tc=6.0 min CN=60 Runoff=0.34 cfs 1,499 cf

SubcatchmentSC-2: PRE SC-2 Runoff Area=175,568 sf 0.00% Impervious Runoff Depth=0.42"
Flow Length=426' Tc=6.0 min CN=60 Runoff=1.42 cfs 6,204 cf

SubcatchmentSC-3: POST SC-3 Runoff Area=38,182 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=403' Tc=6.0 min CN=39 Runoff=0.00 cfs 3 cf

SubcatchmentSC-4: POST SC-4 Runoff Area=179,800 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=431' Tc=6.0 min CN=39 Runoff=0.00 cfs 12 cf

Link AP1: AP1 Inflow=0.34 cfs 1,499 cf
Primary=0.34 cfs 1,499 cf

Link AP2: AP2 Inflow=1.42 cfs 6,204 cf
Primary=1.42 cfs 6,204 cf

Link AP3: AP1 Inflow=0.00 cfs 3 cf
Primary=0.00 cfs 3 cf

Link AP4: AP2 Inflow=0.00 cfs 12 cf
Primary=0.00 cfs 12 cf

Total Runoff Area = 435,964 sf Runoff Volume = 7,717 cf Average Runoff Depth = 0.21"
100.00% Pervious = 435,964 sf 0.00% Impervious = 0 sf

Summary for Subcatchment SC-1: PRE SC-1

Runoff = 0.34 cfs @ 12.15 hrs, Volume= 1,499 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	42,414	60	Fallow, bare soil, HSG A
	42,414		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	40	0.5721	1.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.5	10	0.0353	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	47	0.0353	3.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.2053	7.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	255	0.0237	2.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	362	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-2: PRE SC-2

Runoff = 1.42 cfs @ 12.15 hrs, Volume= 6,204 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	175,568	60	
	175,568		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0134	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	65	0.0457	3.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	311	0.0132	1.85		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.8	426	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-3: POST SC-3

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 3 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.24"

Area (sf)	CN	Description
38,182	39	>75% Grass cover, Good, HSG A
38,182		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0101	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.7	68	0.0101	1.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	285	0.0274	2.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	403	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-4: POST SC-4

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 12 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.24"

Area (sf)	CN	Description
179,800	39	>75% Grass cover, Good, HSG A
179,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0138	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.9	103	0.0138	1.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	140	0.0143	1.93		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	35	0.0574	3.86		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	62	0.0322	2.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	28	0.0704	4.27		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.2056	7.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	431	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP1: AP1

Inflow Area = 42,414 sf, 0.00% Impervious, Inflow Depth = 0.42" for 2-Year event
Inflow = 0.34 cfs @ 12.15 hrs, Volume= 1,499 cf
Primary = 0.34 cfs @ 12.15 hrs, Volume= 1,499 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP2: AP2

Inflow Area = 175,568 sf, 0.00% Impervious, Inflow Depth = 0.42" for 2-Year event
Inflow = 1.42 cfs @ 12.15 hrs, Volume= 6,204 cf
Primary = 1.42 cfs @ 12.15 hrs, Volume= 6,204 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP3: AP1

Inflow Area = 38,182 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 3 cf
Primary = 0.00 cfs @ 24.00 hrs, Volume= 3 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP4: AP2

Inflow Area = 179,800 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 12 cf
Primary = 0.00 cfs @ 24.00 hrs, Volume= 12 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC-1: PRE SC-1 Runoff Area=42,414 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=362' Tc=6.0 min CN=60 Runoff=1.33 cfs 4,232 cf

SubcatchmentSC-2: PRE SC-2 Runoff Area=175,568 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=426' Tc=6.0 min CN=60 Runoff=5.50 cfs 17,518 cf

SubcatchmentSC-3: POST SC-3 Runoff Area=38,182 sf 0.00% Impervious Runoff Depth=0.17"
Flow Length=403' Tc=6.0 min CN=39 Runoff=0.02 cfs 525 cf

SubcatchmentSC-4: POST SC-4 Runoff Area=179,800 sf 0.00% Impervious Runoff Depth=0.17"
Flow Length=431' Tc=6.0 min CN=39 Runoff=0.10 cfs 2,474 cf

Link AP1: AP1 Inflow=1.33 cfs 4,232 cf
Primary=1.33 cfs 4,232 cf

Link AP2: AP2 Inflow=5.50 cfs 17,518 cf
Primary=5.50 cfs 17,518 cf

Link AP3: AP1 Inflow=0.02 cfs 525 cf
Primary=0.02 cfs 525 cf

Link AP4: AP2 Inflow=0.10 cfs 2,474 cf
Primary=0.10 cfs 2,474 cf

Total Runoff Area = 435,964 sf Runoff Volume = 24,749 cf Average Runoff Depth = 0.68"
100.00% Pervious = 435,964 sf 0.00% Impervious = 0 sf

Summary for Subcatchment SC-1: PRE SC-1

Runoff = 1.33 cfs @ 12.14 hrs, Volume= 4,232 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.82"

	Area (sf)	CN	Description
*	42,414	60	Fallow, bare soil, HSG A
	42,414		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	40	0.5721	1.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.5	10	0.0353	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	47	0.0353	3.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.2053	7.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	255	0.0237	2.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	362	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-2: PRE SC-2

Runoff = 5.50 cfs @ 12.14 hrs, Volume= 17,518 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.82"

	Area (sf)	CN	Description
*	175,568	60	
	175,568		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0134	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	65	0.0457	3.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	311	0.0132	1.85		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.8	426	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-3: POST SC-3

Runoff = 0.02 cfs @ 13.04 hrs, Volume= 525 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.82"

Area (sf)	CN	Description
38,182	39	>75% Grass cover, Good, HSG A
38,182		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0101	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.7	68	0.0101	1.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	285	0.0274	2.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	403	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-4: POST SC-4

Runoff = 0.10 cfs @ 13.04 hrs, Volume= 2,474 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.82"

Area (sf)	CN	Description
179,800	39	>75% Grass cover, Good, HSG A
179,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0138	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.9	103	0.0138	1.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	140	0.0143	1.93		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	35	0.0574	3.86		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	62	0.0322	2.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	28	0.0704	4.27		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.2056	7.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	431	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP1: AP1

Inflow Area = 42,414 sf, 0.00% Impervious, Inflow Depth = 1.20" for 10-Year event
Inflow = 1.33 cfs @ 12.14 hrs, Volume= 4,232 cf
Primary = 1.33 cfs @ 12.14 hrs, Volume= 4,232 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP2: AP2

Inflow Area = 175,568 sf, 0.00% Impervious, Inflow Depth = 1.20" for 10-Year event
Inflow = 5.50 cfs @ 12.14 hrs, Volume= 17,518 cf
Primary = 5.50 cfs @ 12.14 hrs, Volume= 17,518 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP3: AP1

Inflow Area = 38,182 sf, 0.00% Impervious, Inflow Depth = 0.17" for 10-Year event
Inflow = 0.02 cfs @ 13.04 hrs, Volume= 525 cf
Primary = 0.02 cfs @ 13.04 hrs, Volume= 525 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP4: AP2

Inflow Area = 179,800 sf, 0.00% Impervious, Inflow Depth = 0.17" for 10-Year event
Inflow = 0.10 cfs @ 13.04 hrs, Volume= 2,474 cf
Primary = 0.10 cfs @ 13.04 hrs, Volume= 2,474 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC-1: PRE SC-1 Runoff Area=42,414 sf 0.00% Impervious Runoff Depth=1.95"
Flow Length=362' Tc=6.0 min CN=60 Runoff=2.27 cfs 6,884 cf

SubcatchmentSC-2: PRE SC-2 Runoff Area=175,568 sf 0.00% Impervious Runoff Depth=1.95"
Flow Length=426' Tc=6.0 min CN=60 Runoff=9.39 cfs 28,497 cf

SubcatchmentSC-3: POST SC-3 Runoff Area=38,182 sf 0.00% Impervious Runoff Depth=0.46"
Flow Length=403' Tc=6.0 min CN=39 Runoff=0.14 cfs 1,454 cf

SubcatchmentSC-4: POST SC-4 Runoff Area=179,800 sf 0.00% Impervious Runoff Depth=0.46"
Flow Length=431' Tc=6.0 min CN=39 Runoff=0.64 cfs 6,847 cf

Link AP1: AP1 Inflow=2.27 cfs 6,884 cf
Primary=2.27 cfs 6,884 cf

Link AP2: AP2 Inflow=9.39 cfs 28,497 cf
Primary=9.39 cfs 28,497 cf

Link AP3: AP1 Inflow=0.14 cfs 1,454 cf
Primary=0.14 cfs 1,454 cf

Link AP4: AP2 Inflow=0.64 cfs 6,847 cf
Primary=0.64 cfs 6,847 cf

Total Runoff Area = 435,964 sf Runoff Volume = 43,683 cf Average Runoff Depth = 1.20"
100.00% Pervious = 435,964 sf 0.00% Impervious = 0 sf

Summary for Subcatchment SC-1: PRE SC-1

Runoff = 2.27 cfs @ 12.14 hrs, Volume= 6,884 cf, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.04"

	Area (sf)	CN	Description
*	42,414	60	Fallow, bare soil, HSG A
	42,414		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	40	0.5721	1.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.5	10	0.0353	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	47	0.0353	3.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.2053	7.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	255	0.0237	2.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	362	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-2: PRE SC-2

Runoff = 9.39 cfs @ 12.14 hrs, Volume= 28,497 cf, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.04"

	Area (sf)	CN	Description
*	175,568	60	
	175,568		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0134	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	65	0.0457	3.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	311	0.0132	1.85		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.8	426	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-3: POST SC-3

Runoff = 0.14 cfs @ 12.22 hrs, Volume= 1,454 cf, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.04"

Area (sf)	CN	Description
38,182	39	>75% Grass cover, Good, HSG A
38,182		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0101	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.7	68	0.0101	1.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	285	0.0274	2.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	403	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-4: POST SC-4

Runoff = 0.64 cfs @ 12.22 hrs, Volume= 6,847 cf, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.04"

Area (sf)	CN	Description
179,800	39	>75% Grass cover, Good, HSG A
179,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0138	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.9	103	0.0138	1.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	140	0.0143	1.93		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	35	0.0574	3.86		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	62	0.0322	2.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	28	0.0704	4.27		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.2056	7.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	431	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP1: AP1

Inflow Area = 42,414 sf, 0.00% Impervious, Inflow Depth = 1.95" for 25-Year event
Inflow = 2.27 cfs @ 12.14 hrs, Volume= 6,884 cf
Primary = 2.27 cfs @ 12.14 hrs, Volume= 6,884 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP2: AP2

Inflow Area = 175,568 sf, 0.00% Impervious, Inflow Depth = 1.95" for 25-Year event
Inflow = 9.39 cfs @ 12.14 hrs, Volume= 28,497 cf
Primary = 9.39 cfs @ 12.14 hrs, Volume= 28,497 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP3: AP1

Inflow Area = 38,182 sf, 0.00% Impervious, Inflow Depth = 0.46" for 25-Year event
Inflow = 0.14 cfs @ 12.22 hrs, Volume= 1,454 cf
Primary = 0.14 cfs @ 12.22 hrs, Volume= 1,454 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP4: AP2

Inflow Area = 179,800 sf, 0.00% Impervious, Inflow Depth = 0.46" for 25-Year event
Inflow = 0.64 cfs @ 12.22 hrs, Volume= 6,847 cf
Primary = 0.64 cfs @ 12.22 hrs, Volume= 6,847 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentSC-1: PRE SC-1 Runoff Area=42,414 sf 0.00% Impervious Runoff Depth=3.74"
Flow Length=362' Tc=6.0 min CN=60 Runoff=4.47 cfs 13,232 cf

SubcatchmentSC-2: PRE SC-2 Runoff Area=175,568 sf 0.00% Impervious Runoff Depth=3.74"
Flow Length=426' Tc=6.0 min CN=60 Runoff=18.50 cfs 54,771 cf

SubcatchmentSC-3: POST SC-3 Runoff Area=38,182 sf 0.00% Impervious Runoff Depth=1.39"
Flow Length=403' Tc=6.0 min CN=39 Runoff=1.18 cfs 4,426 cf

SubcatchmentSC-4: POST SC-4 Runoff Area=179,800 sf 0.00% Impervious Runoff Depth=1.39"
Flow Length=431' Tc=6.0 min CN=39 Runoff=5.56 cfs 20,844 cf

Link AP1: AP1 Inflow=4.47 cfs 13,232 cf
Primary=4.47 cfs 13,232 cf

Link AP2: AP2 Inflow=18.50 cfs 54,771 cf
Primary=18.50 cfs 54,771 cf

Link AP3: AP1 Inflow=1.18 cfs 4,426 cf
Primary=1.18 cfs 4,426 cf

Link AP4: AP2 Inflow=5.56 cfs 20,844 cf
Primary=5.56 cfs 20,844 cf

Total Runoff Area = 435,964 sf Runoff Volume = 93,273 cf Average Runoff Depth = 2.57"
100.00% Pervious = 435,964 sf 0.00% Impervious = 0 sf

Summary for Subcatchment SC-1: PRE SC-1

Runoff = 4.47 cfs @ 12.13 hrs, Volume= 13,232 cf, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.54"

	Area (sf)	CN	Description
*	42,414	60	Fallow, bare soil, HSG A
	42,414		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	40	0.5721	1.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.5	10	0.0353	0.33		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	47	0.0353	3.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	10	0.2053	7.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.7	255	0.0237	2.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.0	362	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-2: PRE SC-2

Runoff = 18.50 cfs @ 12.13 hrs, Volume= 54,771 cf, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.54"

	Area (sf)	CN	Description
*	175,568	60	
	175,568		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0134	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.3	65	0.0457	3.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	311	0.0132	1.85		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.8	426	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-3: POST SC-3

Runoff = 1.18 cfs @ 12.15 hrs, Volume= 4,426 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.54"

Area (sf)	CN	Description
38,182	39	>75% Grass cover, Good, HSG A
38,182		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0101	0.27		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.7	68	0.0101	1.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	285	0.0274	2.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	403	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment SC-4: POST SC-4

Runoff = 5.56 cfs @ 12.15 hrs, Volume= 20,844 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.54"

Area (sf)	CN	Description
179,800	39	>75% Grass cover, Good, HSG A
179,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.0138	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.24"
0.9	103	0.0138	1.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	140	0.0143	1.93		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	35	0.0574	3.86		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	62	0.0322	2.89		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	28	0.0704	4.27		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.2056	7.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	431	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP1: AP1

Inflow Area = 42,414 sf, 0.00% Impervious, Inflow Depth = 3.74" for 100-Year event
Inflow = 4.47 cfs @ 12.13 hrs, Volume= 13,232 cf
Primary = 4.47 cfs @ 12.13 hrs, Volume= 13,232 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP2: AP2

Inflow Area = 175,568 sf, 0.00% Impervious, Inflow Depth = 3.74" for 100-Year event
Inflow = 18.50 cfs @ 12.13 hrs, Volume= 54,771 cf
Primary = 18.50 cfs @ 12.13 hrs, Volume= 54,771 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP3: AP1

Inflow Area = 38,182 sf, 0.00% Impervious, Inflow Depth = 1.39" for 100-Year event
Inflow = 1.18 cfs @ 12.15 hrs, Volume= 4,426 cf
Primary = 1.18 cfs @ 12.15 hrs, Volume= 4,426 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link AP4: AP2

Inflow Area = 179,800 sf, 0.00% Impervious, Inflow Depth = 1.39" for 100-Year event
Inflow = 5.56 cfs @ 12.15 hrs, Volume= 20,844 cf
Primary = 5.56 cfs @ 12.15 hrs, Volume= 20,844 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs