STATE OF CONNECTICUT SITING COUNCIL

PETITION OF LSE PICTOR LLC
FOR A DECLARATORY RULING
THAT NO CERTIFICATE OF ENVIRONMENTAL
COMPATIBILITY AND PUBLIC NEED IS
REQUIRED FOR THE CONSTRUCTION,
OPERATION, AND MAINTENANCE OF
A 1.99 MW AC SOLAR PHOTOVOLTAIC
FACILITY IN WINCHESTER, CONNECTICUT

PETITION NO. 1398A

April 7, 2021

PETITIONER LSE PICTOR LLC'S RESPONSES TO SITING COUNCIL INTERROGATORIES DATED MARCH 23, 2021 AND SUPPLEMENTAL SUBMISSION

1. What is the output of the revised facility at the point of interconnection?

The output of the Facility remains unchanged at 1.99 MW AC.

2. Referring to the Wetland Impact Assessment report, p. 11, it appears Table 3 – Fish and Shellfish Habitat, contains incomplete information. Please revise.

RESPONSE: Please see the table attached hereto as Exhibit 1.

3. Referring to the Wetland Impact Assessment report, p. 15:

- ***a. What types of wildlife are expected to use the 18-inch diameter HDPE pipes for wildlife passage?***
- ***b. What type of substrate would be installed within the pipe?***
- ***c. Would the pipes serve to transfer water during flood events and thus cause erosion on the downstream side?***
- ***d. What is the maintenance interval of the wildlife passages?***

RESPONSE: The Petitioner has updated the proposed Site plans, attached hereto as Exhibit 2, to utilize open-bottom box culverts in lieu of the proposed pipes to allow for the existing substrate to remain and increase wildlife passage. Small mammals and reptiles are anticipated to use these open-bottom areas. Larger wildlife can travel across the access road. The use of large open-bottom box culverts in lieu of closed-bottom circular pipes means that the natural stream course bottom will be maintained as it exists today, requiring no new substrate and maintaining current flows during flood events and alleviating any erosion impacts downstream. Quarterly maintenance will be conducted along with the planned maintenance of the stormwater basins.

4. Has any consideration been given to spanning both access road wetland crossings with a bridge structure to limit wetland disturbance? If not, why not?

RESPONSE: The Petitioner has updated the proposed Site plans, attached hereto as Exhibit 2, to utilize open-bottom box culverts in lieu of the originally-proposed pipes to allow for the existing substrate to remain and increase wildlife passage. Utilizing a bridge structure would result in a substantial increase in overall Site disturbance with the large foundations required to construct such a structure. Given the very limited use of the access drive once the Facility is constructed, Petitioner believes that the open-bottom box culverts proposed appropriately balance any potential impact of the access drive on wetlands disturbance and overall Site disturbance and vehicular requirements at the Site.

5. The July 5, 2005 Wetland letter from Penelope C. Sharp mentions the potential for vernal pools with the red maple swamp in the eastern portion of the property. Was the red maple swamp surveyed for the presence of vernal pools? If so, submit survey results. If not, why not?

RESPONSE: The Petitioner conducted a vernal pool investigation of the Site on April 1, 2021, a copy of which is attached hereto as Exhibit 3. As can be seen from Exhibit 3, four (4) areas of the Site were found to support breeding by obligate vernal species. However, only three (3) of those areas exhibited physical and biological vernal pool indicators. Two cryptic vernal pools determined as tier III breeding areas were identified specifically within the red maple shrub swamp. As noted in Exhibit 3, the vernal pools identified within the red maple swamp has sub-optimal breeding conditions and breeding attempts within areas that may contain fish or within areas with insufficient water depths are unlikely to be successful. Due to the location of the two (2) vernal pools within the red maple swamp—on the eastern property boundary, no portion of the Project will have any impact on the vernal pool or any portion of the vernal pool envelopes nor the 750-foot Critical Terrestrial Habitat ("CTH") associated with those two (2) cryptic vernal pools.

The remaining vernal pool, Vernal Pool 1, was already noted and assumed to be a vernal pool on Petitioner's Site plans and Wetland Impact Assessment prepared by VHB. Therefore, confirmation of this pool does not require any changes to the Site Plan. The Project will have an impact on 5% of the CTH, which is well-within best management practices.

6. Referring to the Stormwater Management Report p. 2, it states the solar array would be placed on slopes less than 15 percent. The response to Petition 1398 interrogatory 78 stated 1.25 acres of the solar array was located on slopes greater than 15 percent, please clarify.

RESPONSE: The Stormwater Management Report has been corrected, in the attached Exhibit 4, to confirm that 1.25 acres of the array are on slopes of 15% or greater.

7. Referring to The Council on Environmental Quality letter dated May 27, 2020, discuss the feasibility of accessing the project site from Dayton Road to avoid the proposed wetland crossing.

RESPONSE: Dayton Road (also referred to as Forest Avenue) at certain segments, is an unimproved road, with the area adjacent to the Site being dirt with significant washout channels making the existing road unusable for construction vehicles. Therefore, significant improvements would be required to Dayton Road itself in order for it to be utilized for primary access to the Site. The length of road requiring upgrades, from Platt Hill Road to the project Site, would be over 2,200 feet. In addition, the access drive on the Site from Dayton Road would be in close proximity to wetland areas and one (1) identified vernal pool in the northeast corner of the Site, including in the 750-foot CTH surrounding that vernal pool. As noted in Exhibit 3, this tier I rated vernal pool did have observed obligate vernal pool indicators. The driveway would also have to cross steeper slopes to access the Site, thus requiring more site disturbance and additional stormwater management systems than the current access driveway, which follows the natural slope.

In addition, utilizing Dayton Road for vehicular access will result in a significant increase in the total cleared and disturbed area at the Site. The Project's point of interconnection with Eversource's distribution grid is on Platt Hill Road, so the proposed clearing and access drive from Platt Hill Road to the Site would still be required to access interconnection equipment for construction and ongoing maintenance, even if vehicular access was moved to Dayton Road. The point of interconnection is dictated by Eversource and cannot be relocated to Dayton Road.

For all the reasons outlined above, Petitioner does not consider access from Dayton Road to be a feasible alternative for access to the Site.

8. Referring to the Stormwater Management Report p. 10:

- ***a. How will mounting posts be installed at the site?***
- ***b. To what depth will the mounting posts be installed?***
- ***c. How will the installation of hundreds of mounting posts impact the existing perched seasonal high groundwater table, and hydrology of the site in respect to seeps, wetlands, and the proposed "wet practice" detention basins?***

RESPONSE: It is currently anticipated that the foundation system will consist of 6 inch by 9 inch H-piles which would be installed by the use of piledriver equipment. An estimated embedment depth of ten (10) to fourteen (14) feet has been assumed until structural pull testing is performed at the Site to confirm the structural design. In the event that shallow ledge is encountered at any of the pile locations, ground screws may be substituted for those specific H-piles.

The 6 inch by 9 inch H-pile has a cross-sectional area of approximately 2.68 square inches and the Project will utilize approximately eight hundred (800) piles to construct the array, it is anticipated that the entire foundation design of the proposed array will disturb approximately 2,144 square inches – or approximately fifteen (15) total square feet at the Site. This fifteen (15) square feet represents only about 1/22,360 (0.0045%) of the total area of the proposed solar array area of the

Project. Accordingly, the Site disturbance resulting from the installation of mounting posts is insignificant and potential impact, if any, to the groundwater table will likewise be *de minimis*.

9. Due to the low height of the berms within the pond stormwater basins, what maintenance is required to prevent the berms from being covered in leaf matter/other organic matter so that the flow path is not impeded?

RESPONSE: The earthen berms/baffles were included into the design of the stormwater basins as a conservative, recommended measure to increase flow paths during low-flow storms across the bottoms of the basins. These baffles do not extend from one side of the basin to the other but instead have a gap at each end to allow stormwater to pass naturally. Accordingly, in the event that leaf little or debris accumulates in the bottom of the basin, the stormwater basins as a whole will continue to function as intended. That understanding aside, it is intended in the long-term operations & maintenance of the Facility to check the basins at least quarterly to ensure that proper functioning is maintained and any accumulated debris will be removed at that time.

10. Is a pre-treatment basin required for the southeast detention basin?

RESPONSE: Based upon this inquiry/request and out of an abundance of caution, the Petitioner has added a pre-treatment basin to the southeast detention basin, as shown in Exhibit 2 and Exhibit 4.

11. According to the site plans, the southern stormwater basin is located within 100 feet of a tributary to Taylor Brook, a cold water stream. Can the southern stormwater basin be re-located out of the 100-foot buffer to this cold water stream habitat, as recommended by the 2004 Connecticut Stormwater Quality Manual and the DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities?

RESPONSE: Yes and the revised Site Plans and Stormwater Report confirm that the Petitioner has relocated the southern stormwater basin outside of the one hundred (100) foot buffer to the western wetland boundary.

12. Has the manufacturer of the selected solar panels conducted Toxicity Characteristic Leaching Procedure (TCLP) testing to determine if the panels would be characterized as hazardous waste at the time of disposal? If so, please submit relevant information. If the project is approved, would the Petitioner commit to the installation of solar modules that are not classified as hazardous waste through TCLP testing?

RESPONSE:

TCLP testing has been conducted on Phono Sumec modules. These are standard polycrystalline silicon (PolySi) module types utilized throughout the solar industry and Petitioner anticipates utilizing this make/model of module for this Project. The associated TCLP report is attached as Exhibit 5. Within this report hazardous materials were tested and ultimately not detected. This includes arsenic, barium, chromium, selenium, cadmium, and mercury. Trace amounts of lead from the soldering process were found however the 4.3 mg/L result is below the level that qualifies a substance as "toxic" and does not require the material to be disposed of as "hazardous waste." Thin-film solar modules are composed on cadmium telluride (CdTe) and have been a source of concern with respect to disposal. If the Project is approved, the Petitioner commits to the installation of standard polycrystalline silicon (PolySi) modules that are not considered toxic or hazardous waste and align with the results of the Phono Sumec TCLP report.

13. The Greenhouse Gas (GHG) Assessment in Appendix M of Council Petition No. 1352 compared the life cycle GHG emissions from a solar project to a scenario where the solar project is avoided and an equivalent amount of natural gas-fired electric generation operated for the estimated life of the solar facility. For the proposed project, how would the net GHG emissions (or reduction) over the life of the solar facility and carbon debt payback be affected under this natural gas-fired generation versus proposed solar generation scenario?

RESPONSE:

See table below. Assuming a one-half percent (0.5%) degradation of solar output per year and a starting yearly output of 3,625 MWh for this Project, it is anticipated that approximately 71,956 MWh will be generated over a twenty (20) year period. Utilizing the conversion ratio described in Appendix M of Council Petition No. 1352 relating 744,038 MWh to 1,273,861 MT of CO2eq from natural gas generation emissions, it can be expected that 123,195 MT CO2eq would be generated by a natural gas-fired facility with this Project's 20-year MWh output. Utilizing the conversion ratio as described in appendix M of Council Petition No. 1352 we can equate the projects 1.99 MW array to produce 19,649 MT CO2e GHG emissions. Comparing this to the emissions of the natural gas-powered facility, emissions can be reduced by 103,546 MT or 84% with the installation of the proposed solar Project over the life of the Project.

	Solar	**Natural Gas**	**Difference**
Energy Output (MWh)	71,956	71,956	
CO2 (MT)	19,649	123,195	103,546

SUPPLEMENTAL INFORMATION

As noted in Petitioner's motion to re-open this Petition, Petitioner submitted a self-verification to the Army Corps of Engineers. The Army Corps' authorization of the Project is attached hereto as Exhibit 6.

As also noted in Petitioner's motion to re-open this Petition, Petitioner submitted the Project details to the Dam Safety division of DEEP to determine if the berms should be classified as dams and therefore require registration. As evidenced by the attached correspondence from the Dam Safety division and calculations prepared by Petitioner, no classification will be required. See Exhibit 7 attached hereto.

Finally, Petitioner submitted its Site plans included in its motion to re-open dated January 15, 2021 to the DEEP stormwater division to determine if Petitioner needs to re-file a stormwater permit for this Site or if the Project could move forward under the previously approved stormwater permit. The correspondence attached hereto as Exhibit 8 demonstrates that DEEP stormwater concurs that no new filing is required and the stormwater permit is ready to be issued upon receipt of the letter of credit required thereunder.

In the event the Petition is approved in accordance with the Site Plans and Stormwater Report attached hereto as Exhibits 2 and 4 respectively, Petitioner will re-submit those revisions to these agencies to confirm that these revisions comply with the previously-issued decisions.

Respectfully submitted,

Petitioner
LSE PICTOR LLC

By: Carrie Larson Ortolano
Jeffrey J. Macel, Manager
Carrie Larson Ortolano, Associate General Counsel
℅ Lodestar Energy LLC
40 Tower Lane, Suite 201
Avon, CT 06001

EXHIBIT 1

Amended Table 3: Wetland Impact Assessment Report, VHB, Jan 14, 2021 rev. April 6, 2021

Table 3 Site Wetland Functions and Values based on Army Corps Highway Methodology

Function/Value	Wetland 1
Groundwater Discharge/ Recharge	**P** – Wetland 1 primarily provides groundwater discharge as this wetland is associated with intermittent streams. Hillside seeps also provide groundwater discharge.
Floodflow Alteration	**SC** – The wetland receives and retains overland sheet flow from surrounding areas. However, there are reductions in the wetland's capabilities due to the intermittent watercourse functions.
Fish and Shellfish Habitat	Due to the lack of suitable habitat, the majority of wetlands on site do not support habitat for finfish, except for the farm pond in the northwest corner of the site, far removed from the proposed development. The majority of the development site drains southerly and easterly off the site to Taylor Brook ultimately reaching Highland Lake. The wetlands onsite contribute to the quality and functions of Taylor Brook as they are directly connected. While the majority of onsite wetlands do not provide this habitat function onsite, the wetlands do have the capacity to provide nutrients and food sources (detritus) to support the food web downstream influencing the quality of downstream fish and shellfish habitat.
Sediment/ Toxicant Retention	**SC** – The farm pond in the northwestern corner provides the capacity to provide this function from receiving and retaining drainage. Otherwise, there is limited capabilities to contribute to this function since the watercourses do not allow for slowing and much retention of sediment down gradient of the farm pond.
Nutrient Removal	**SC** – The farm pond in the northwestern corner provides an opportunity for nutrient trapping, however, the watercourses down-stream carry nutrients off site.
Production Export	**P** – Vegetation abundance and diversity within the wetland provides food sources for wildlife to support the food web. Because of the associated watercourses present there is direct connection to transport food sources.
Sediment/ Shoreline Stabilization	The wetland does not provide the capacity to contribute to this function, as shorelines do not exist for example.
Wildlife Habitat	**P -** The wetland is largely not degraded by human activity. Areas dense vegetation in areas of the wetland can provide habitat for small and medium sized animals. The wetland is bordered by large tracts of undeveloped woodland on and off site.
Recreation	Limited, private property, no off-road parking and accessibility to public
Educational/ Scientific Value	Limited, private property, no off-road parking and accessibility to public
Uniqueness/ Heritage	There are no cultural and archaeological resources of concern, based on the Raber Associates July 2020 report.

Function/Value	Wetland 1 (continued)
Visual Quality/ Aesthetics	While the forested environment does provide some visual quality, there is a limited capacity to contribute to this function due to the lack of multiple wetland classification types able to be viewed from primary viewing locations due to the density of the forested community for example.
Endangered Species Habitat	There were no rare species previously observed or an NDDB polygon is within the project site development.

P=Primary Function

SC= Secondary Function

EXHIBIT 2

SITE DEVELOPMENT PLANS
PROPOSED 1.99 MW SOLAR ARRAY
PLATT HILL ROAD
WINCHESTER, CONNECTICUT
PREPARED FOR LSE PICTOR LLC

PLAN LIST: 12/22/2020
TITLE PAGE
SHEET - 1: OVERALL PLAN
SHEET - 2: SITE DEVELOPMENT MAP
SHEET - 3: SITE DEVELOPMENT MAP
SHEET - 4: SITE DEVELOPMENT MAP
SHEET - 5: PROFILE OF ACCESS DRIVEWAY
SHEET - 6: PROFILE OF ACCESS DRIVEWAY
SHEET - 7: CONSTRUCTION DETAILS
SHEET - 8: VICINITY MAP
SHEET - 9: PHASING PLAN - PHASE I
SHEET - 10: PHASING PLAN - PHASE II
SHEET - 11: PHASING PLAN - PHASE III-A & III-B
SHEET - 12: EXISTING CONDITIONS MAP
SHEET - 13: CONSTRUCTION NARRATIVE
SHEET - 14: CROSS SECTIONS
SHEET - 15: CROSS SECTIONS
SHEET - 16: SITE PHOTOGRAPHS

Revised: 3/25/21 (SC)

LOW IMPACT SUSTAINABLE
LISD
DEVELOPMENT
TRINKAUS ENGINEERING

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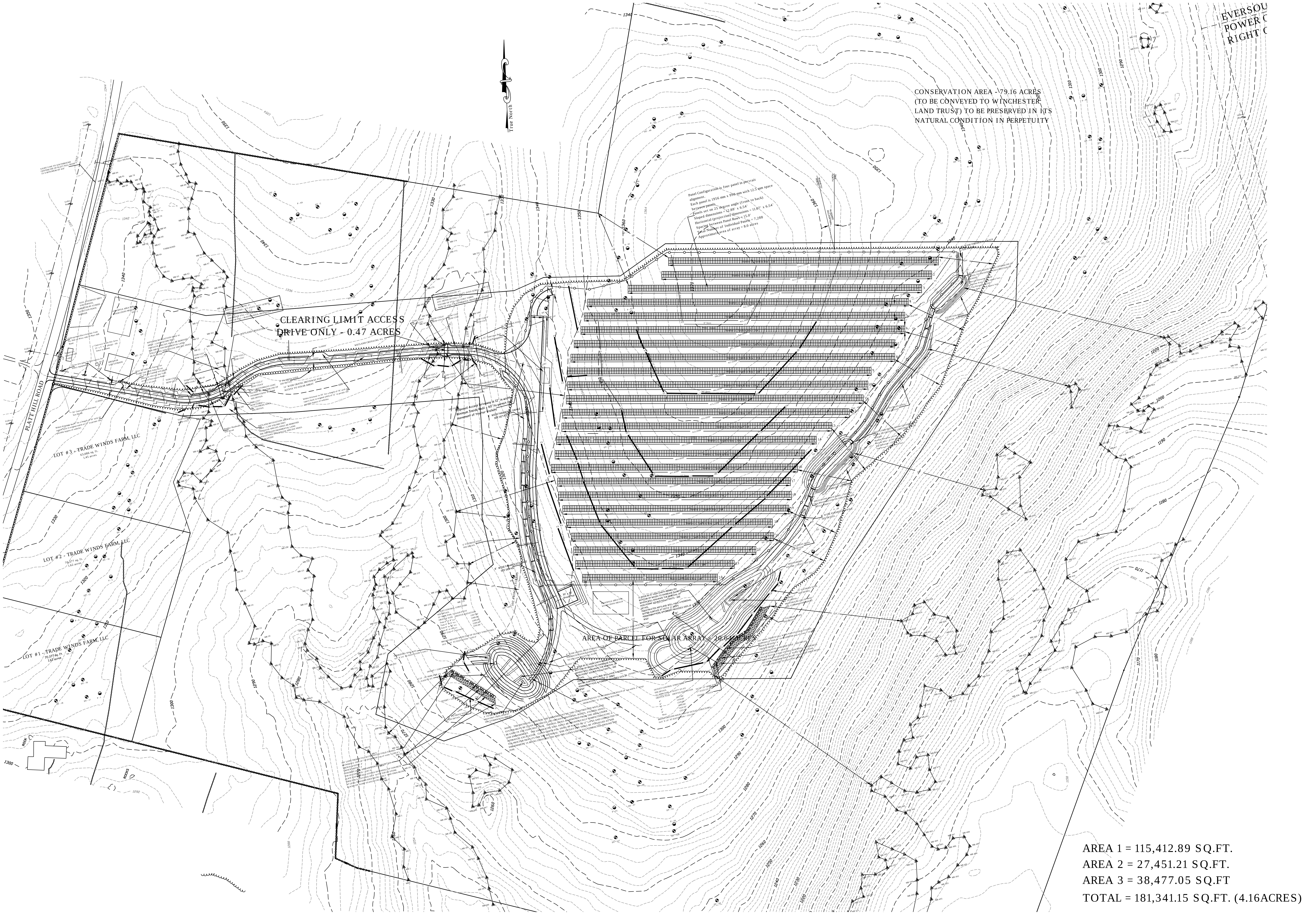

AREA 1 = 115,412.89 SQ.FT.
AREA 2 = 27,451.21 SQ.FT.
AREA 3 = 38,477.05 SQ.FT
TOTAL = 181,341.15 SQ.FT. (4.16ACRES)

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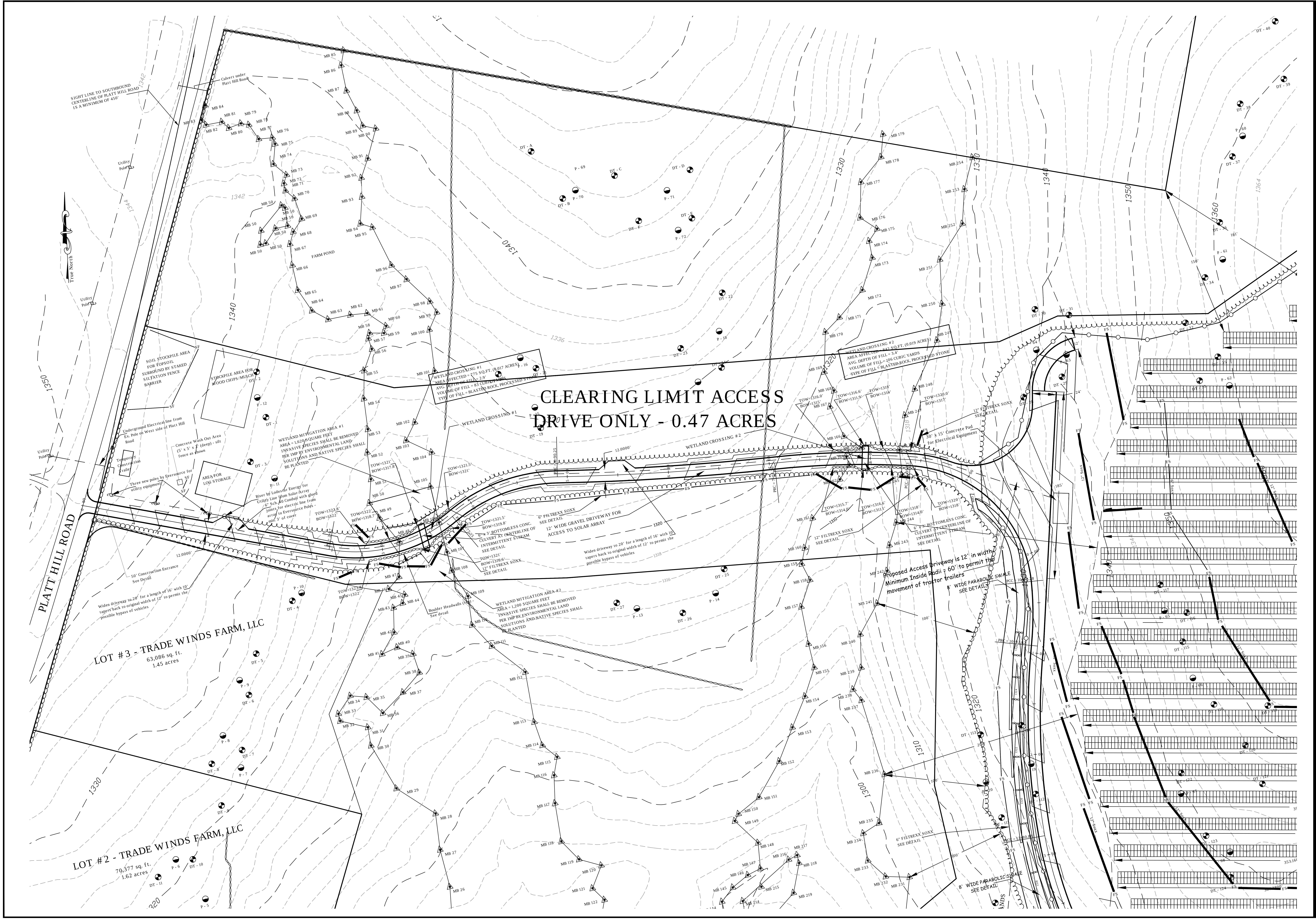
OVERALL PLAN
SHEET 1 OF 16
PROJECT #032-2019
SCALE: 1"= 80'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



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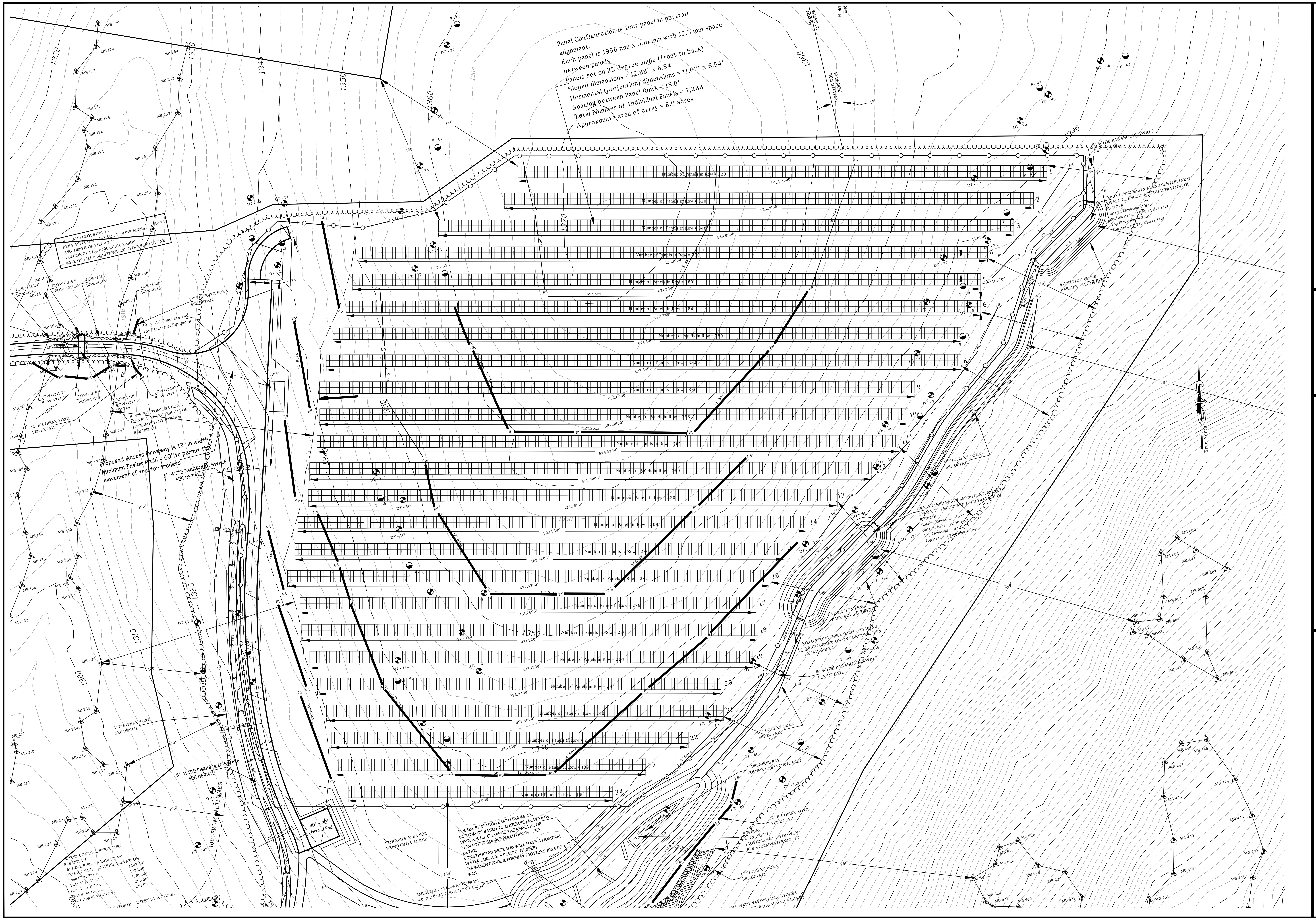
SITE DEVELOPMENT PLAN
SHEET 2 OF 16
PROJECT #032-2019
SCALE: 1"= 40'

DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



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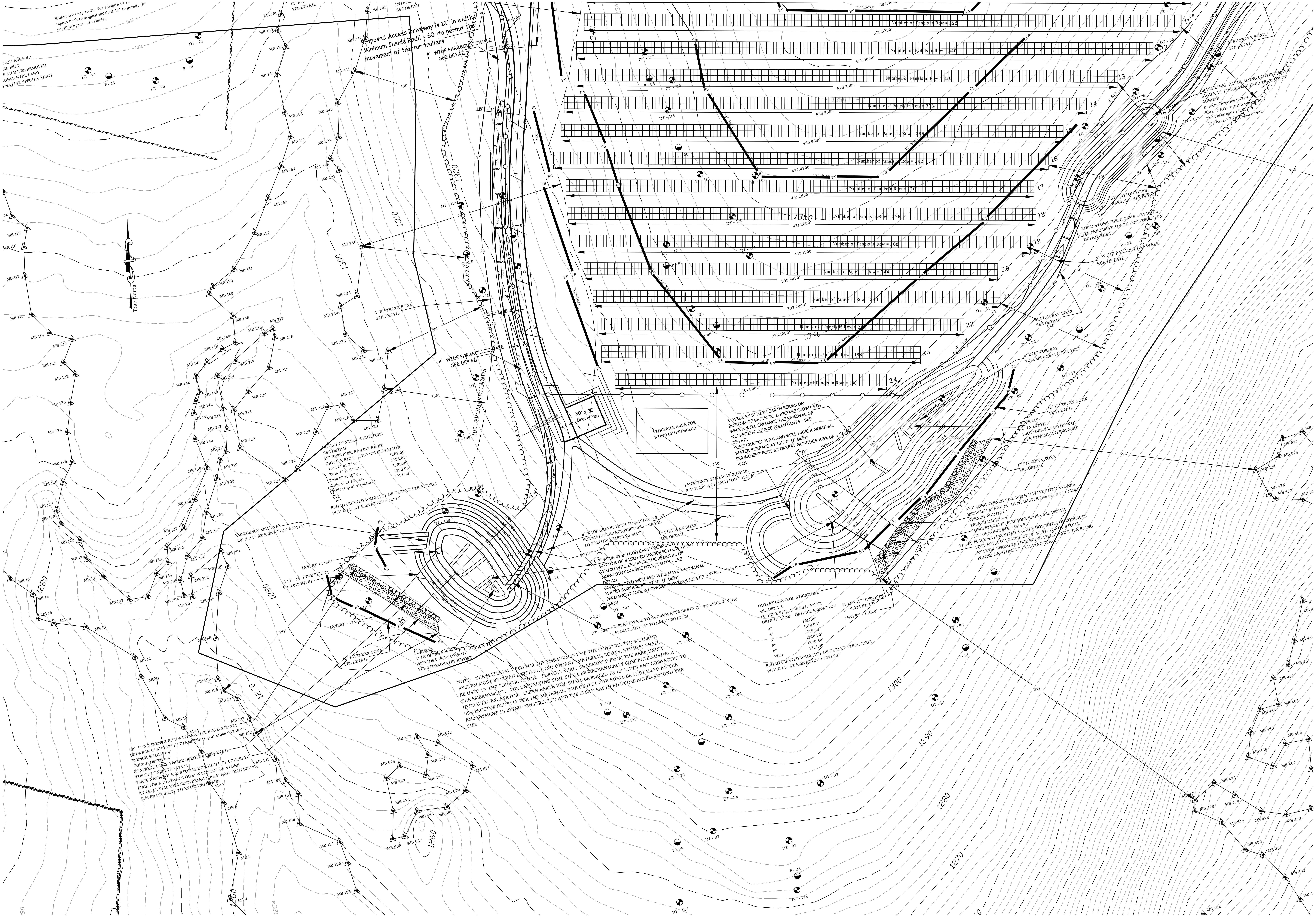
SITE DEVELOPMENT PLAN
SHEET 3 OF 16
PROJECT #032-2019
SCALE: 1"= 40'
DATE: 12/22/20, 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



NOTE: THE MATERIAL USED FOR THE EMBANKMENT OF THE CONSTRUCTED WETLAND SYSTEM MUST BE CLEAN EARTH FILL (NO ORGANIC MATERIAL, ROOTS, STUMPS) SHALL BE USED IN THE CONSTRUCTION. TOPSOIL SHALL BE REMOVED FROM THE AREA UNDER THE EMBANKMENT. THE UNDERLYING SOIL SHALL BE MECHANICALLY COMPACTED USING A HYDRAULIC EXCAVATOR. CLEAN EARTH FILL SHALL BE PLACED IN 12" LIFTS AND COMPACTED TO 95% PROCTOR DENSITY FOR THE MATERIAL. THE OUTLET PIPE SHALL BE INSTALLED AS THE EMBANKMENT IS BEING CONSTRUCTED AND THE CLEAN EARTH FILL COMPACTED AROUND THE PIPE.

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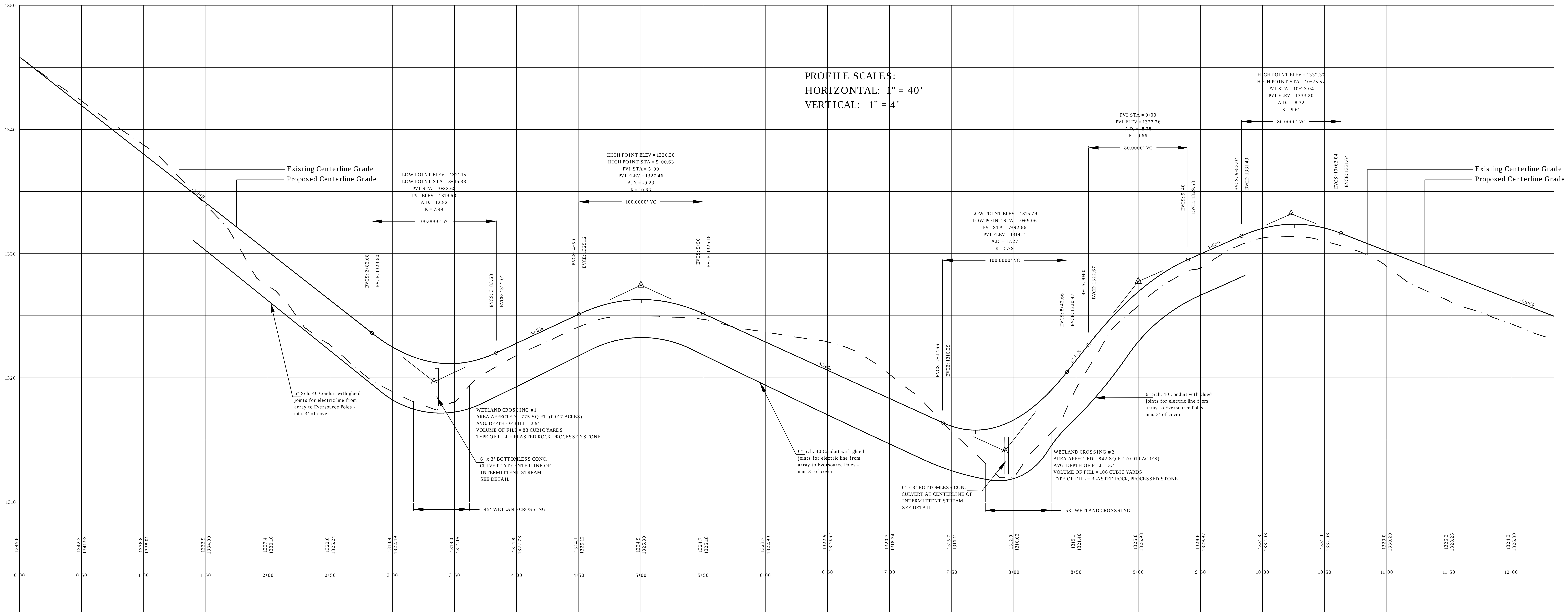
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

SITE DEVELOPMENT PLAN
SHEET 4 OF 16
PROJECT #032-2019
SCALE: 1"= 40'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



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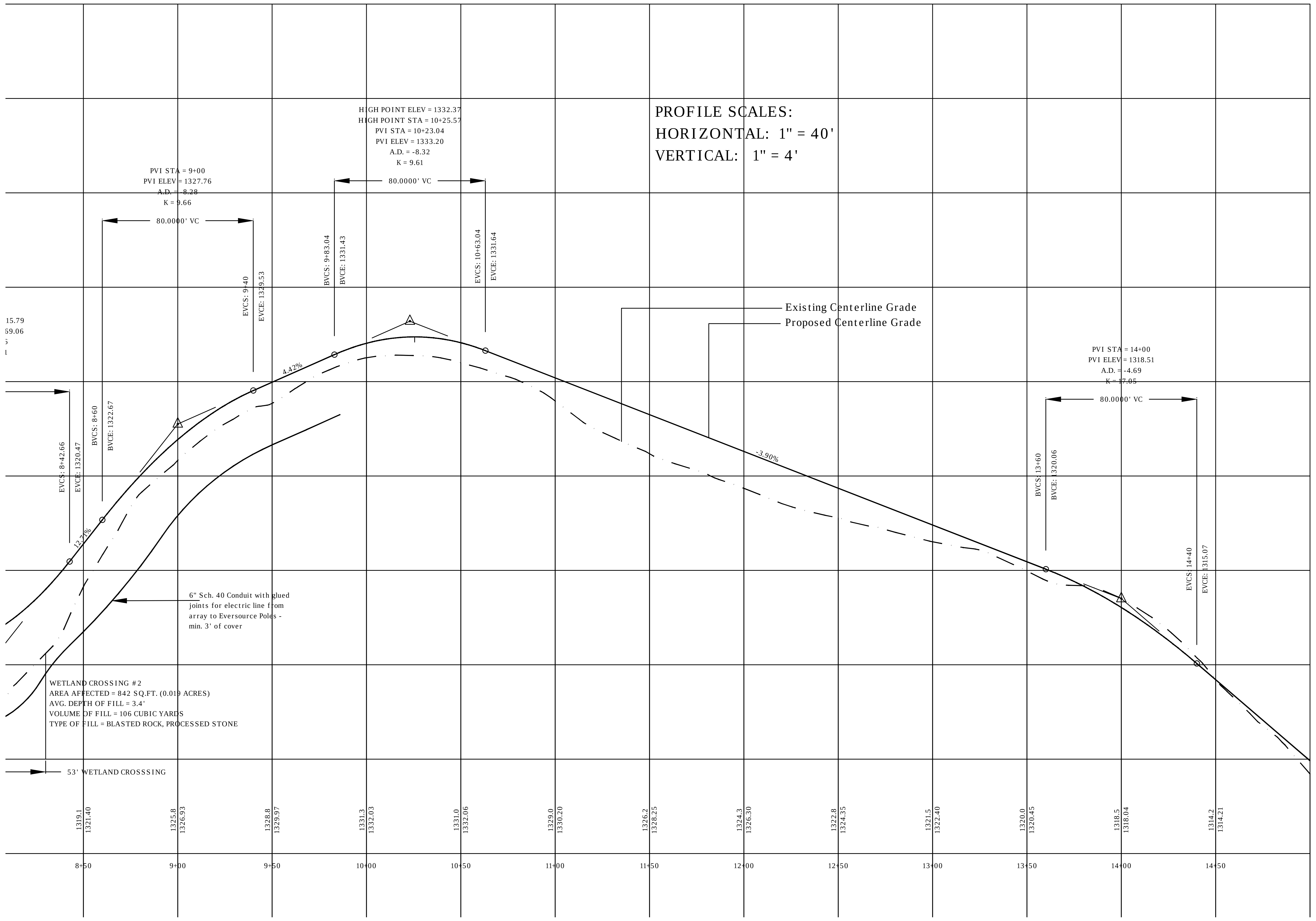
PROFILE OF ACCESS DRIVEWAY
SHEET 5 OF 16
PROJECT #032-2019
SCALES AS NOTED
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



PROFILE SCALES:
HORIZONTAL: 1" = 40'
VERTICAL: 1" = 4'

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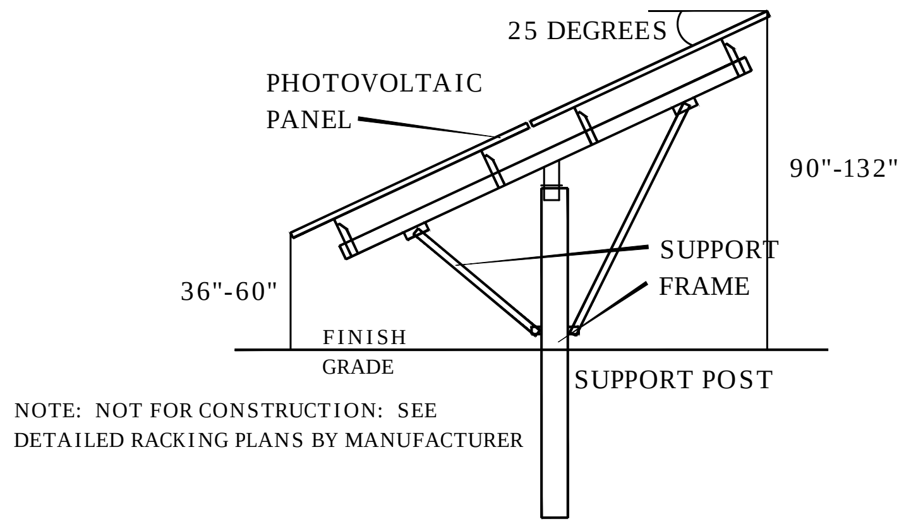
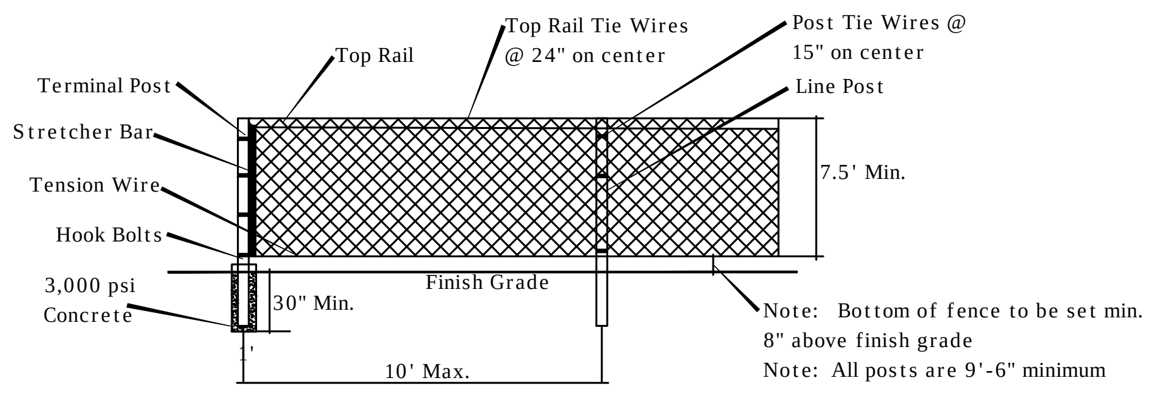
PROFILE OF ACCESS DRIVEWAY
SHEET 6 OF 16
PROJECT #032-2019
SCALES AS NOTED
DATE: 12/22/20

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



NOTE: NOT FOR CONSTRUCTION: SEE DETAILED RACKING PLANS BY MANUFACTURER

CROSS SECTION OF TYPICAL RAKING SYSTEM
NOT TO SCALE



Note: Bottom of fence to be set min. 8" above finish grade
Note: All posts are 9'-6" minimum

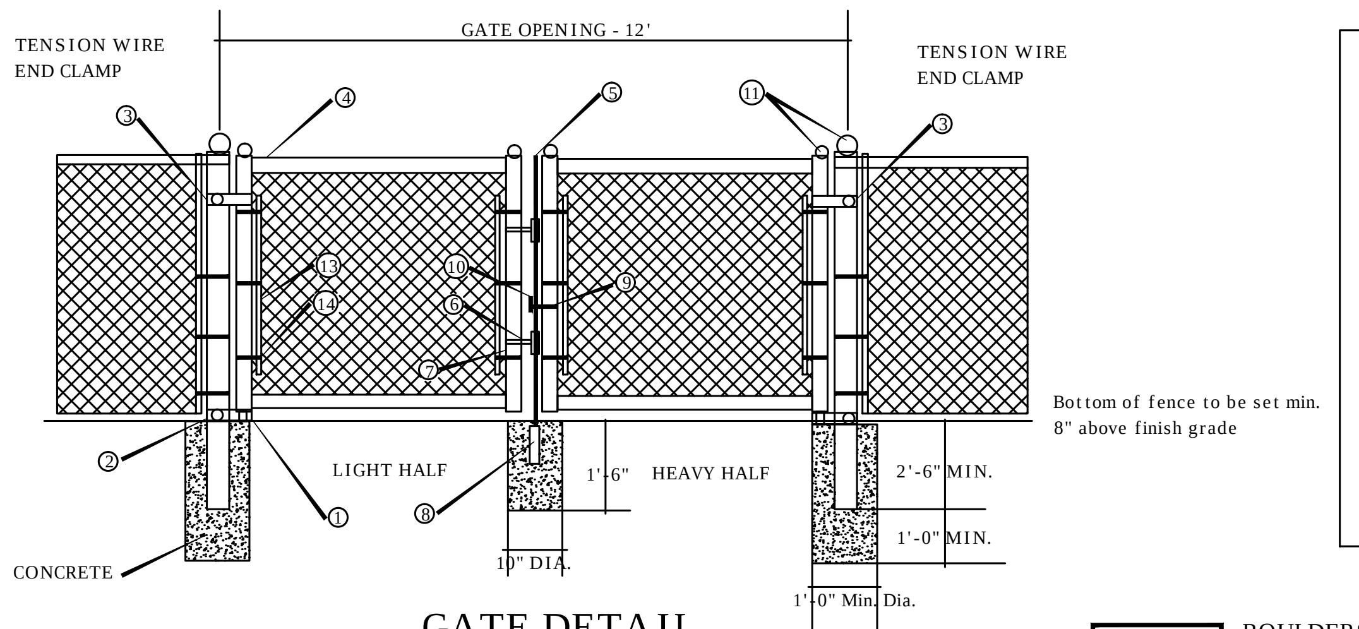
Note: Round 5" or 6" Pressure Treated Posts driven to a minimum depth of 30". All Terminal Posts shall be set in concrete

CONSTRUCTION NOTES:
1. MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE MANUFACTURER'S SPECIFICATIONS.
2. ALL POSTS SHALL BE INSTALLED VERTICALLY.
3. GRADUATED MESH OPENING UP TO 6" WIDE SPACES (SMALL SPACES AT BOTTOM TO KEEP SMALL ANIMALS OUT) SIZES 6" WIDE SPACING - CLASS 3, 6 LINES OF 3", 2 LINES OF 4", 2 LINES OF 5" (HOT DIP GALVANIZED - WOVEN WIRE)

SHAPE, SIZE AND WEIGHT REQUIREMENTS FOR FENCE POSTS AND RAILS

ITEM	SHAPE	OUTSIDE DIMENSIONS (INCHES)	WEIGHT LBS/LF
** TERMINAL	ROUND	5-6"	9.37
POST	*ROUND	5-6"	9.37
LINE	ROUND	1.90	2.72
POST	*ROUND	1.90	2.28
TOP &	ROUND	1.66	2.27
BRACE	* ROUND	1.66	1.84
RAILS			

* GRADE B HIGH STRENGTH STEEL
** INCLUDES END, CORNER, ANGLE, INTERSECTION AND INTERMEDIATE BRACED POSTS



Bottom of fence to be set min. 8" above finish grade

GATE DETAIL
NOT TO SCALE

GATE FRAME MEMBERS (SIZE & WEIGHT)

GATE FRAME	OUTSIDE DIMENSIONS (")	WEIGHT (LBS/LF)
ROUND	1.66	2.27
*ROUND	1.66	1.84

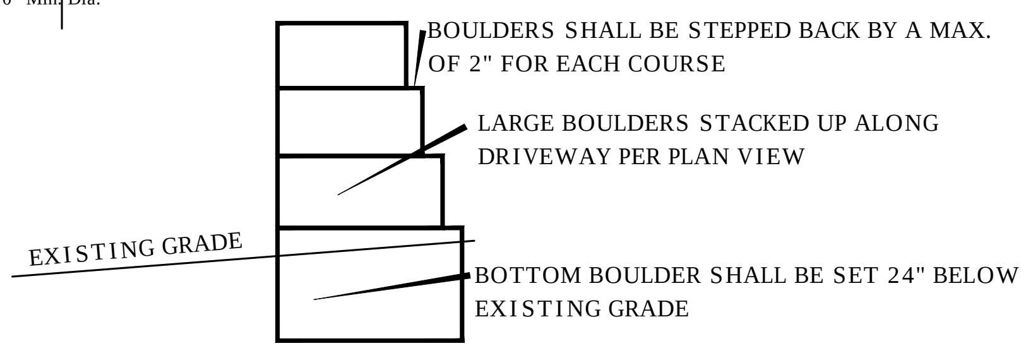
* GRADE B HIGH STRENGTH STEEL

GATE POST (SIZE & WEIGHT)

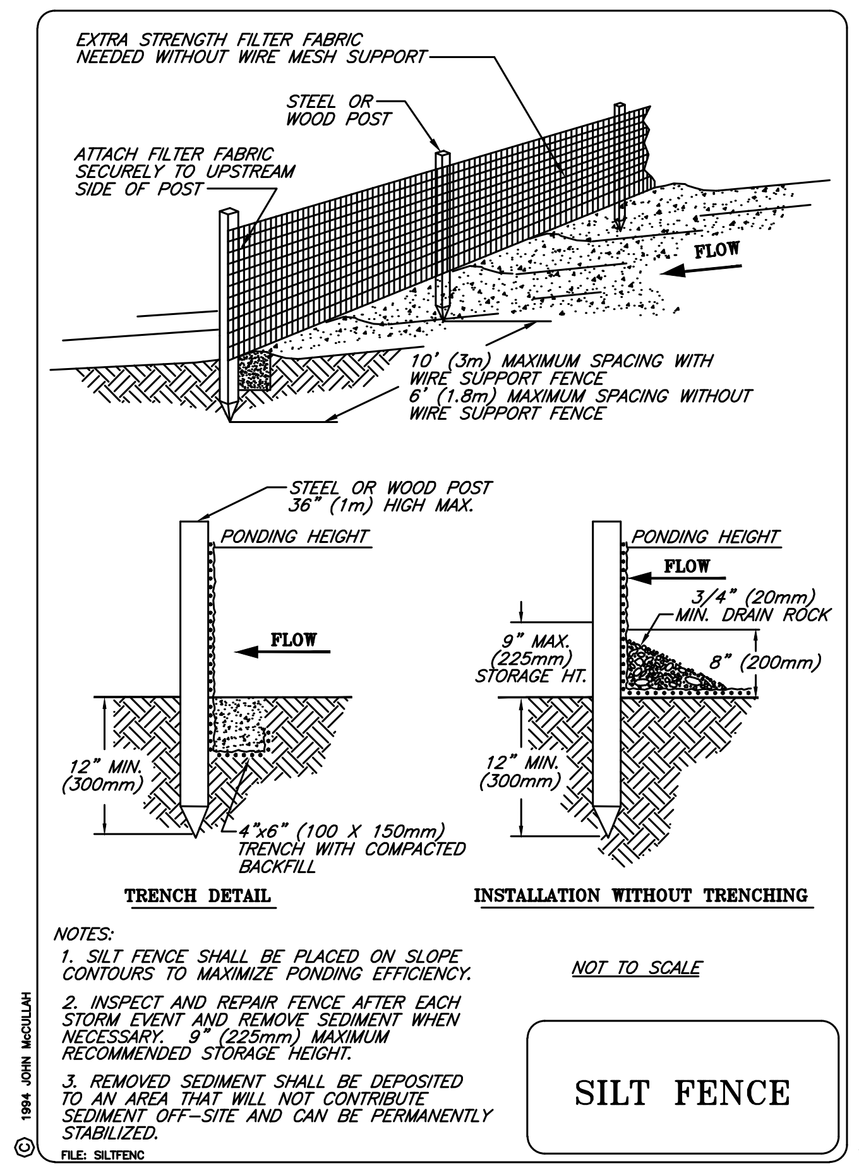
GATE WIDTH	OUTSIDE DIMENSIONS (")	WEIGHT (LBS/LF)
ROUND	2.875	5.79
*ROUND	2.875	4.64

* GRADE B HIGH STRENGTH STEEL

Part #	Description	Quantity
1	Straight Plug	2
2	Bottom Hinge	2
3	Top Hinge	2
4	Corner Elbow	8
5	Plunger Rod	1
6	Latch Fork	2
7	Fork Catch	2
8	Plunger Rod Catch	1
9	Lock Keeper Guide	1
10	Lock Keepter	1
11	Ornamental Tops	6
12	Truss Rods	4
13	Stretcher Bar	4
14	Hook Bolts	12



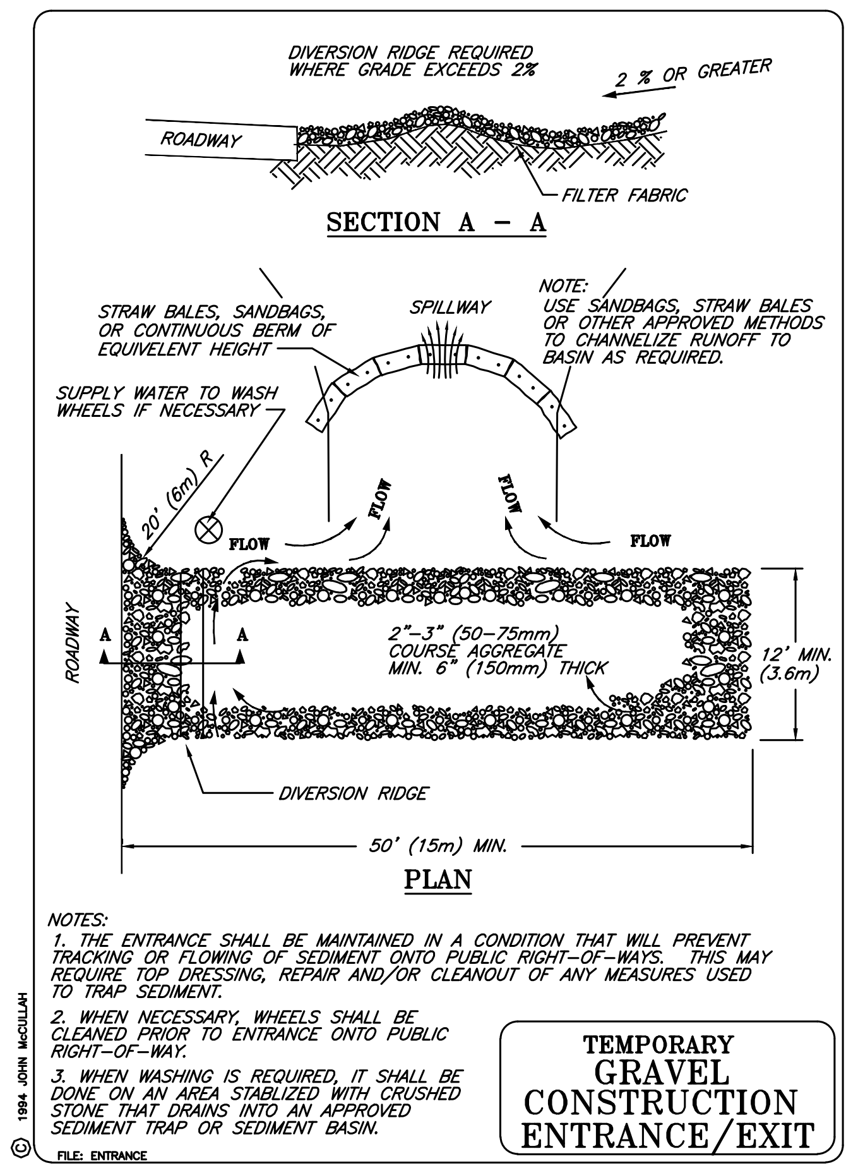
TYPICAL CROSS SECTION OF BOULDER RETAINING WALL - NOT TO SCALE



NOTES:
1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" (225mm) MAXIMUM RECOMMENDED STORAGE HEIGHT.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

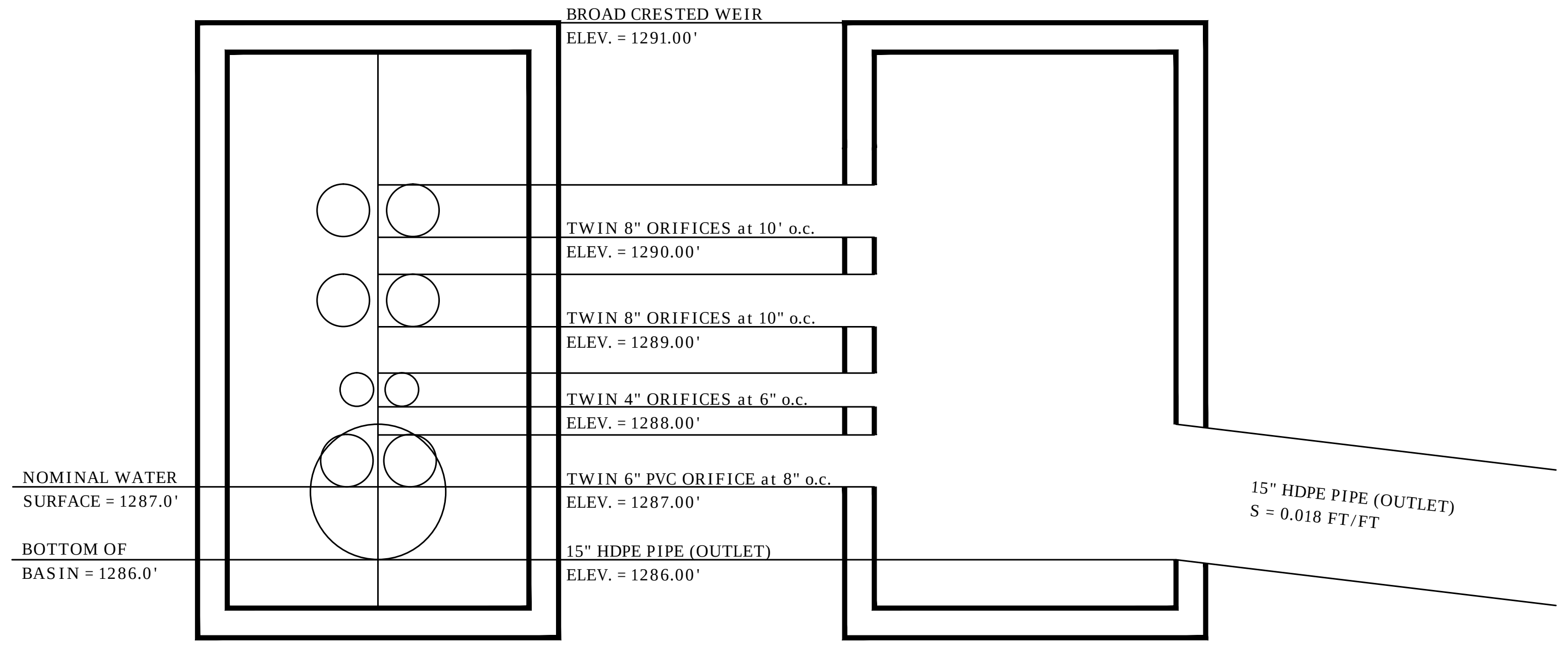
NOT TO SCALE

SILT FENCE



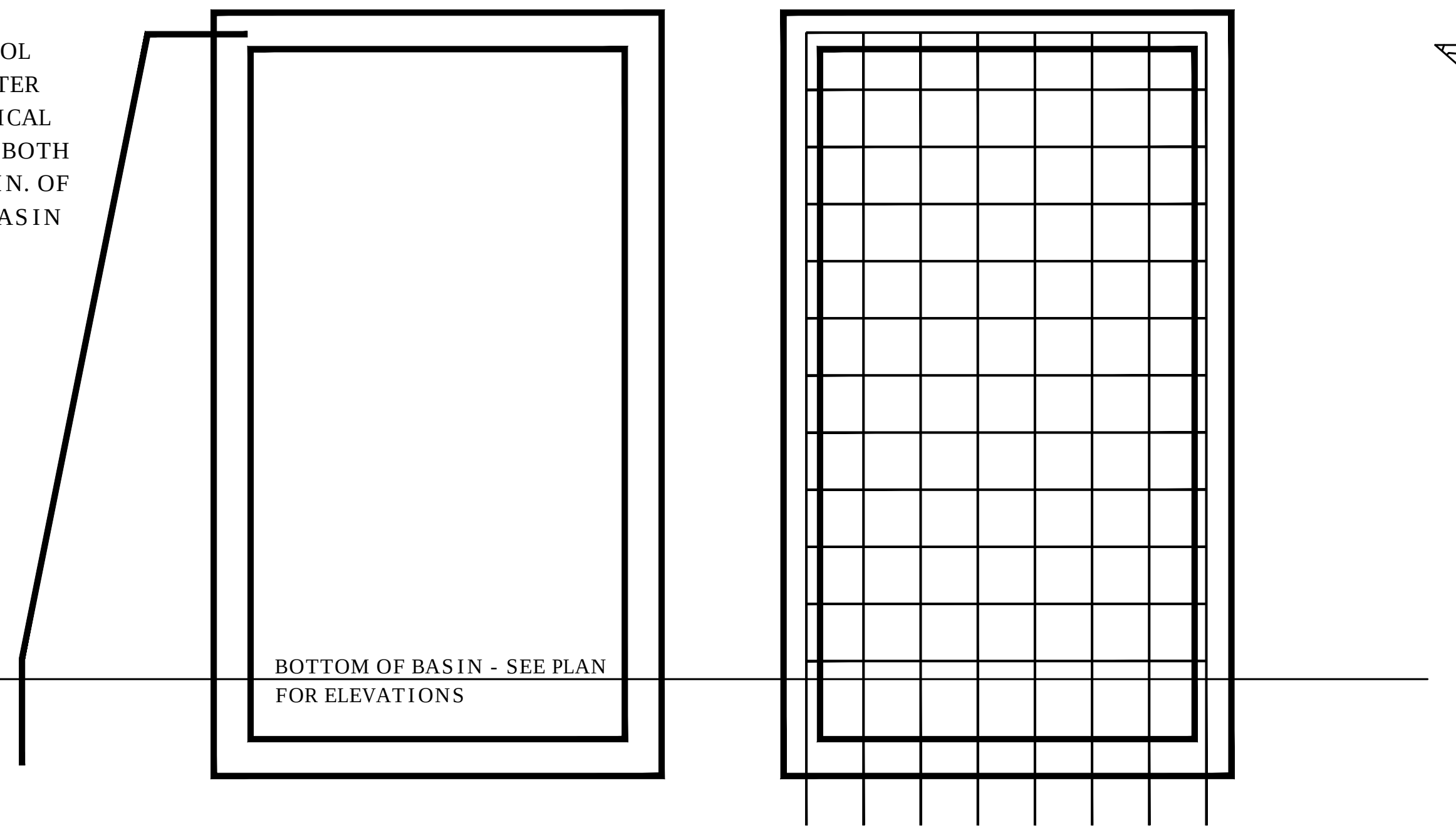
NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABLIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT

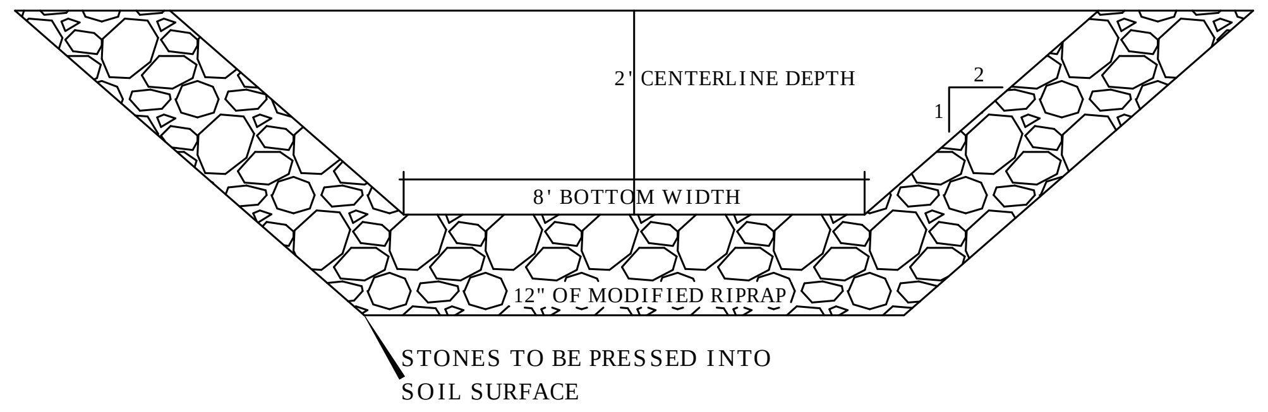


DETAIL OF OUTLET CONTROL STRUCTURE (BASIN #1)
NOT TO SCALE

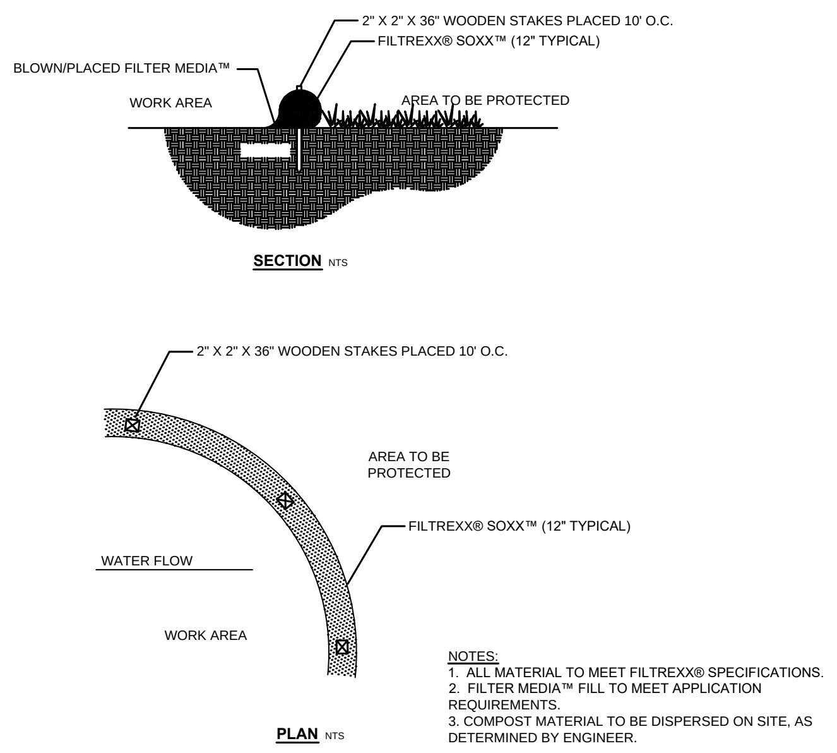
TRASH RACK FOR OUTLET CONTROL STRUCTURE: #3 RBAR AT 4" CENTER TO CENTER SPACING BOTH VERTICAL & HORIZONTAL - WRAP RBAR ON BOTH SIDES - RBAR SHALL BE SET A MIN. OF 12" INTO THE BOTTOM OF THE BASIN



DETAIL OF TRASH RACK FOR OUTLET CONTROL STRUCTURE (BASIN #1 & BASIN #2 - NOT TO SCALE)



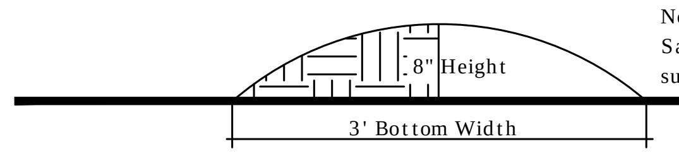
SECTION OF EMERGENCY SPILLWAY
NOT TO SCALE



NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

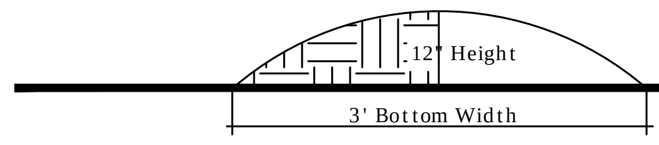
FILTREXX® SEDIMENT CONTROL
NTS

ALTERNATIVE COMPOST SOCKS WHICH ARE AN APPROVED EQUIVALENT TO THE FILTREXX SOXX MAY BE USED



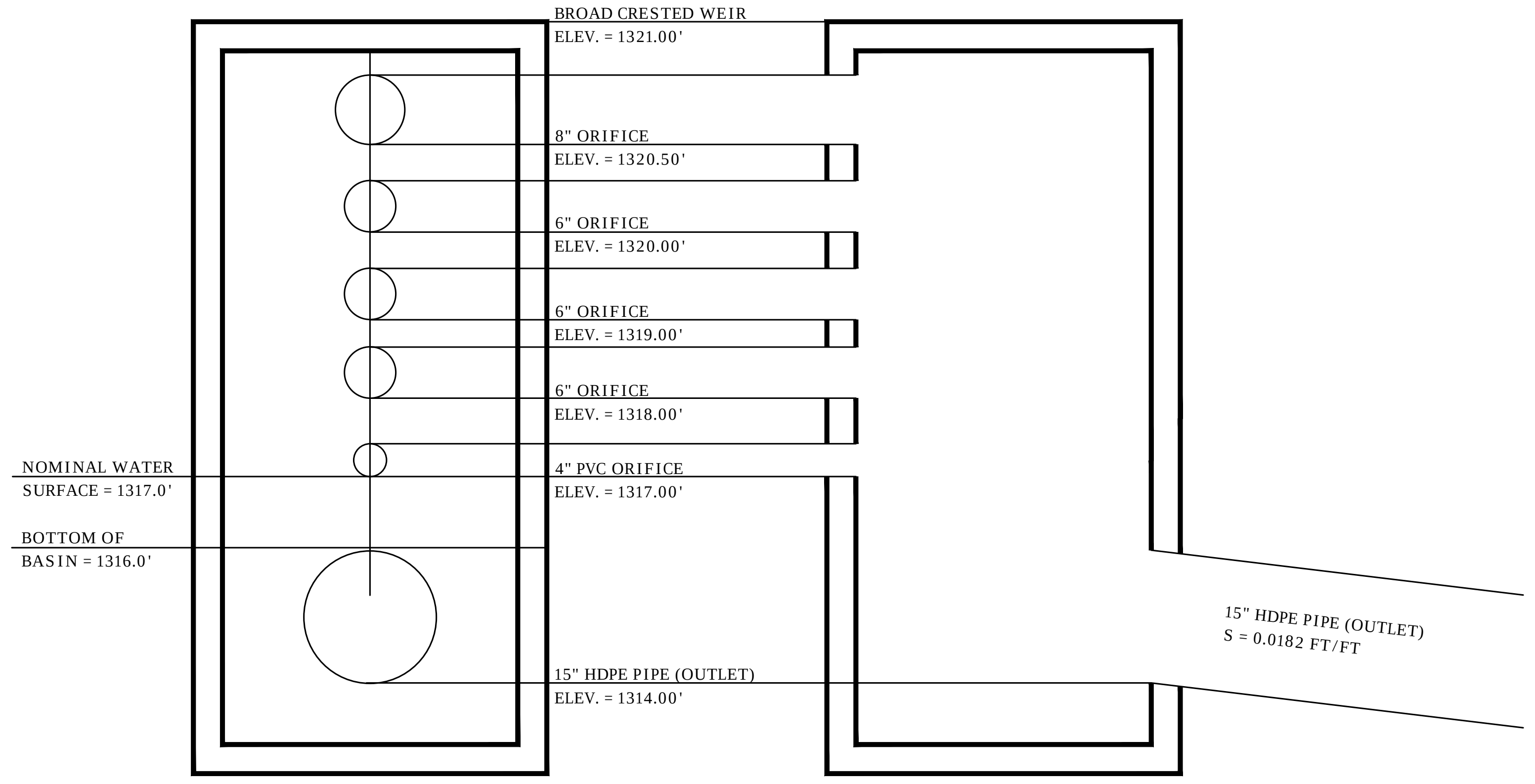
Note: Berms shall be made from topsoil or Sandy/silty loam from the site in order to support the establishment of vegetation

DETAIL OF EARTH BERMS IN CONSTRUCTED WETLAND SYSTEM - NOT TO SCALE

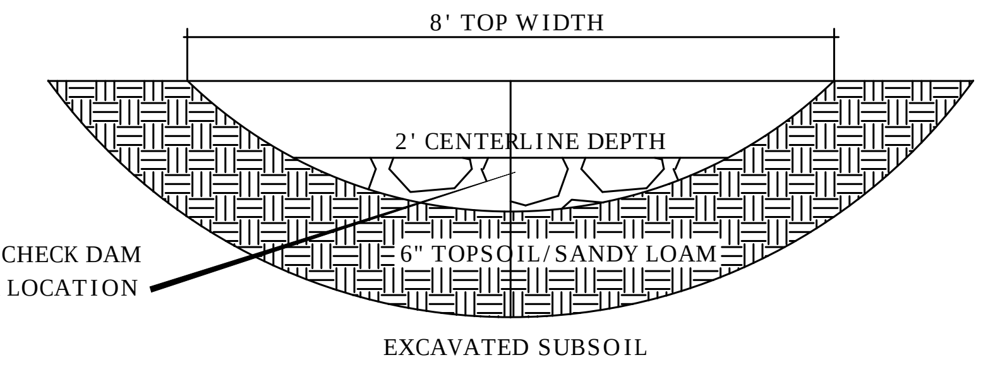


Note: Temporary wood chips berms shall be installed in the locations shown on the plan & in accord with this detail

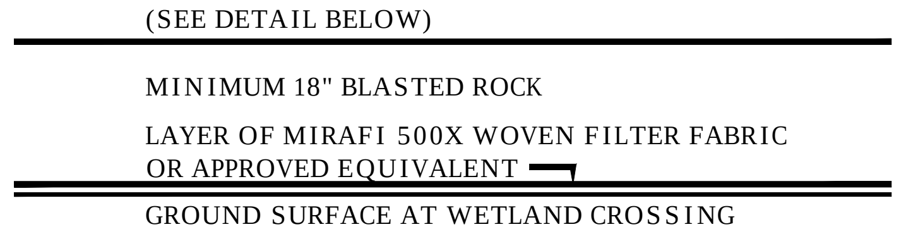
DETAIL OF TEMPORARY WOOD CHIP BERMS
NOT TO SCALE



DETAIL OF OUTLET CONTROL STRUCTURE (BASIN #2)
NOT TO SCALE

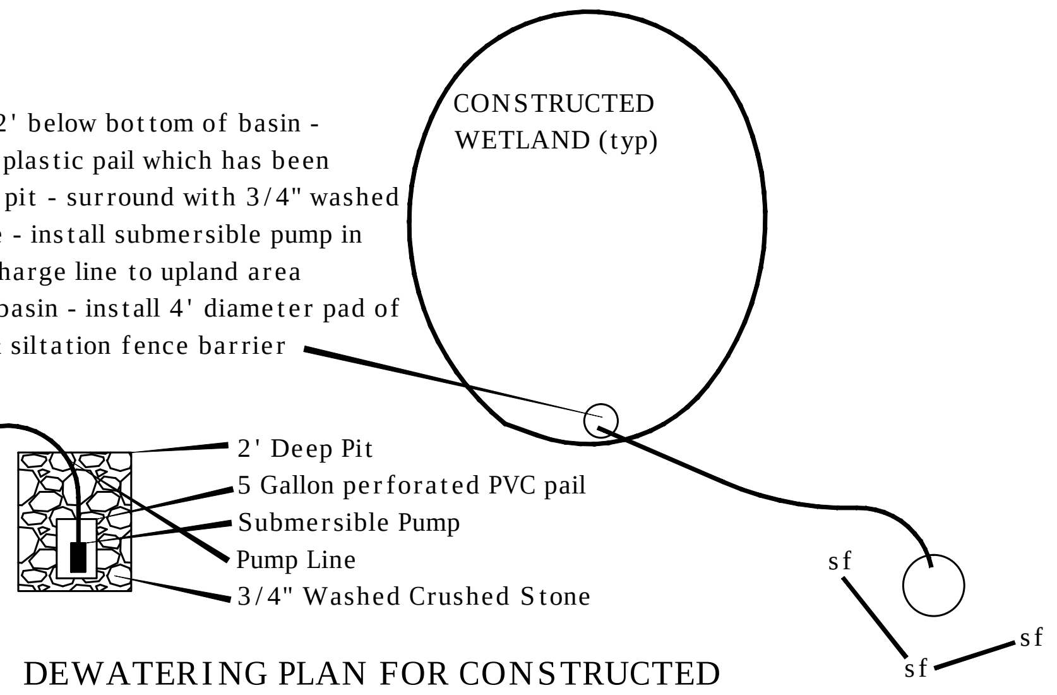


CROSS SECTION OF PARABOLIC GRASS SWALE ALONG EAST & WEST SIDES OF SOLAR ARRAY
NOT TO SCALE

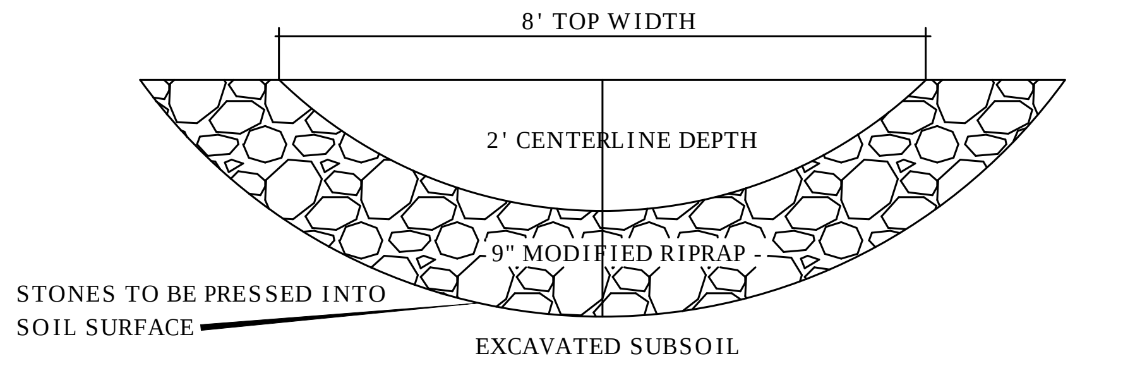


SECTION OF STONE ENVELOPE FOR WETLAND CROSSING
NOT TO SCALE

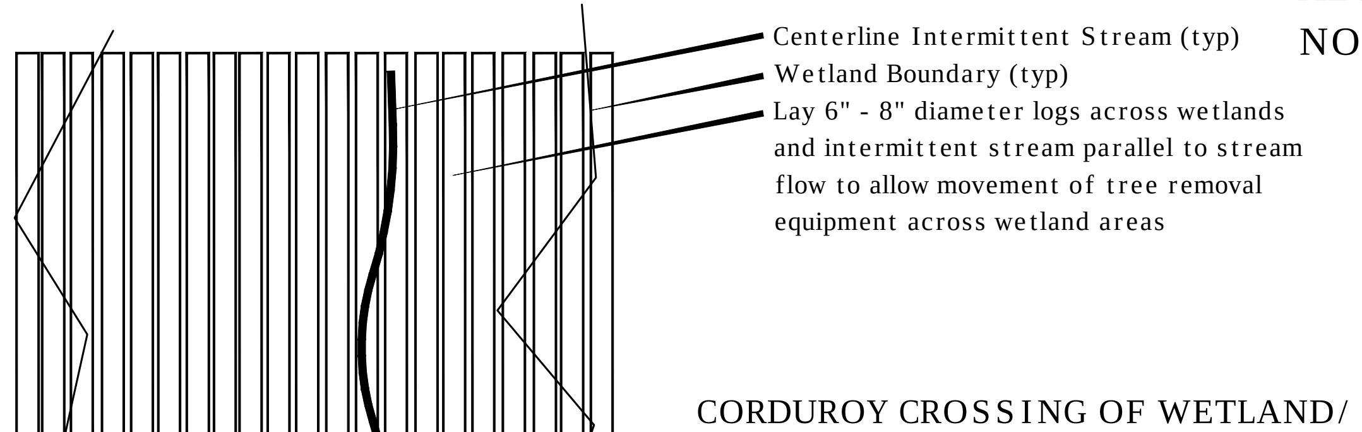
Excavate pit 2' below bottom of basin - place 5 gallon plastic pail which has been perforated in pit - surround with 3/4" washed crushed stone - install submersible pump in pail - run discharge line to upland area southeast of basin - install 4' diameter pad of field stones & siltation fence barrier



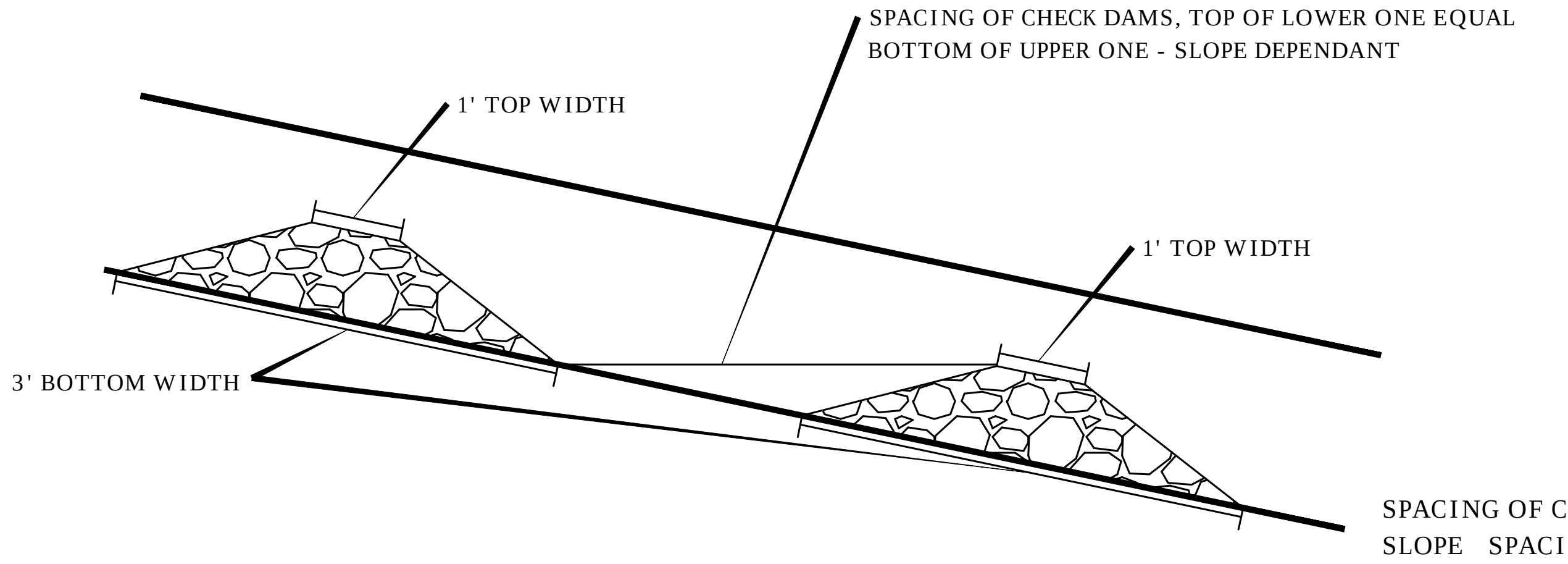
DEWATERING PLAN FOR CONSTRUCTED WETLANDS IF REQUIRED
NOT TO SCALE



CROSS SECTION OF PARABOLIC RIPRAP SWALE FROM SOLAR ARRAY TO CONSTRUCTED WETLANDS
NOT TO SCALE



CORDUROY CROSSING OF WETLAND/ WATERCOURSES FOR TIMBER CLEARING
NOT TO SCALE

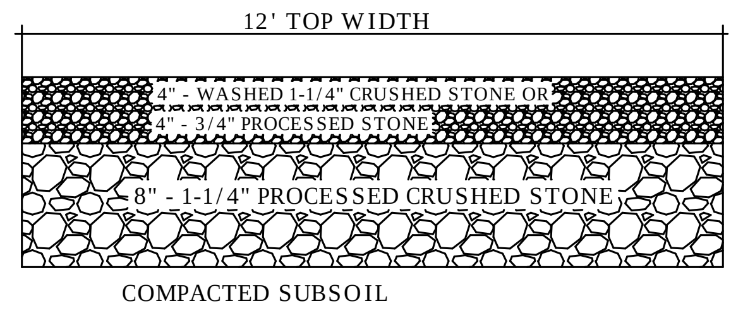


CROSS SECTION OF PARABOLIC GRASS SWALE WITH FIELD STONE CHECK DAM
NOT TO SCALE

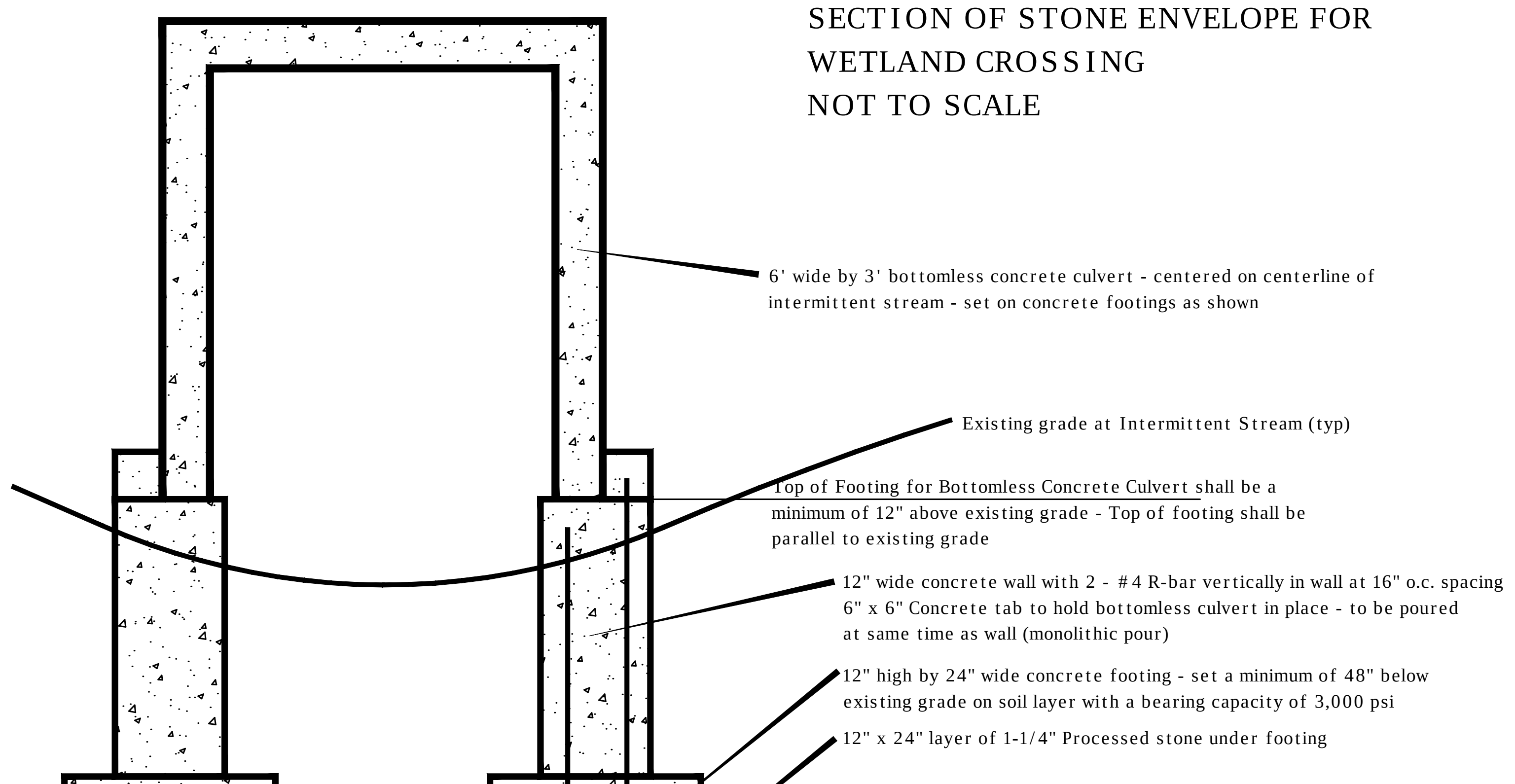
SPACING OF CHECK DAMS

SLOPE	SPACING
1%	100'
2%	50'
3%	33'
4%	25'
5%	20'
6%	16'
7%	14'

NOTE: TOP SURFACE SHALL HAVE 2.5% CROSS SLOPE PER PLAN



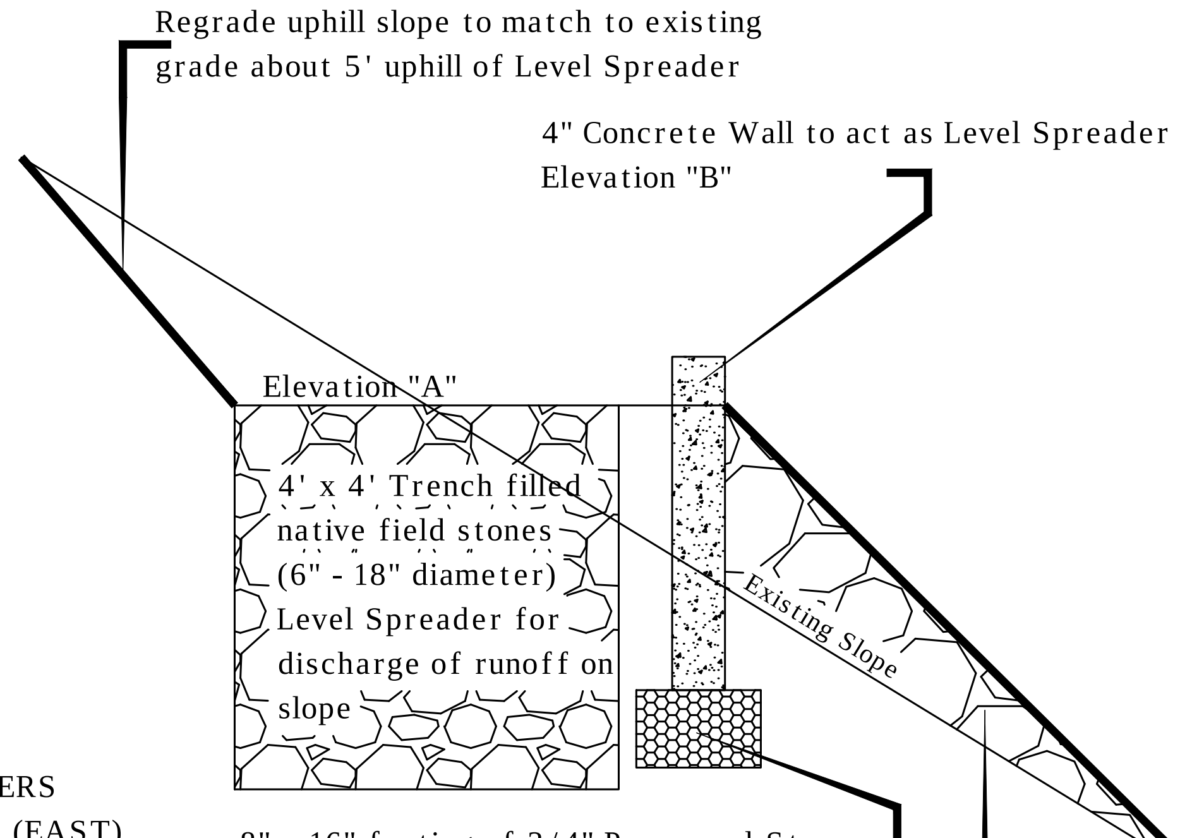
CROSS SECTION OF ACCESS DRIVEWAY
NOT TO SCALE



TYPICAL SECTION OF BOTTOMLESS CONCRETE CULVERT AT INTERMITTENT STREAM CROSSINGS
NOT TO SCALE

TABLE OF ELEVATIONS FOR LEVEL SPREADERS

	BASIN #1 (WEST)	BASIN #2 (EAST)
Elevation "A"	1286.00'	1314.0'
Elevation "B"	1287.00'	1314.50'
Elevation "C"	1286.50'	1314.0'



8" x 16" footing of 3/4" Processed Stone compacted to 95% Proctor Density)
Place native field stones downhill of Concrete Wall for a distance of 10'
Top of Stone at Concrete Wall = Elevation "C"

Detail of Level Spreader - Not to Scale

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LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

CONSTRUCTION DETAILS
SHEET 7 OF 16
PROJECT #032-2019
SCALES AS NOTED
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

ZONE OF SITE AND SURROUNDING AREA: RR - RURAL RESIDENTIAL
SOURCE: TOWN OF WINCHESTER ZONING MAP


NOTE: THE 24.8 ACRE PARCEL & THE 75.0 ACRE PARCEL ARE CURRENTLY COMPRISED OF LOTS #4 TO #24, THE PROPOSED SUBDIVISION ROAD AND ASSOCIATED OPEN SPACE OF THE TRADE WINDS FARM SUBDIVISION THE CURRENT OWNER OF THESE PARCELS ARE: TRADE WINDS FARM ASSOCIATION, INC.

Tax Map IDs:
043-154-022-4
043-154-022-5
043-154-022-6
043-154-022-7
043-154-022-8
043-154-022-9
043-154-022-10
043-154-022-11
043-154-022-12
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043-154-022-19
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043-154-022-22
043-154-022-23
043-154-022-24
043-154-022-25

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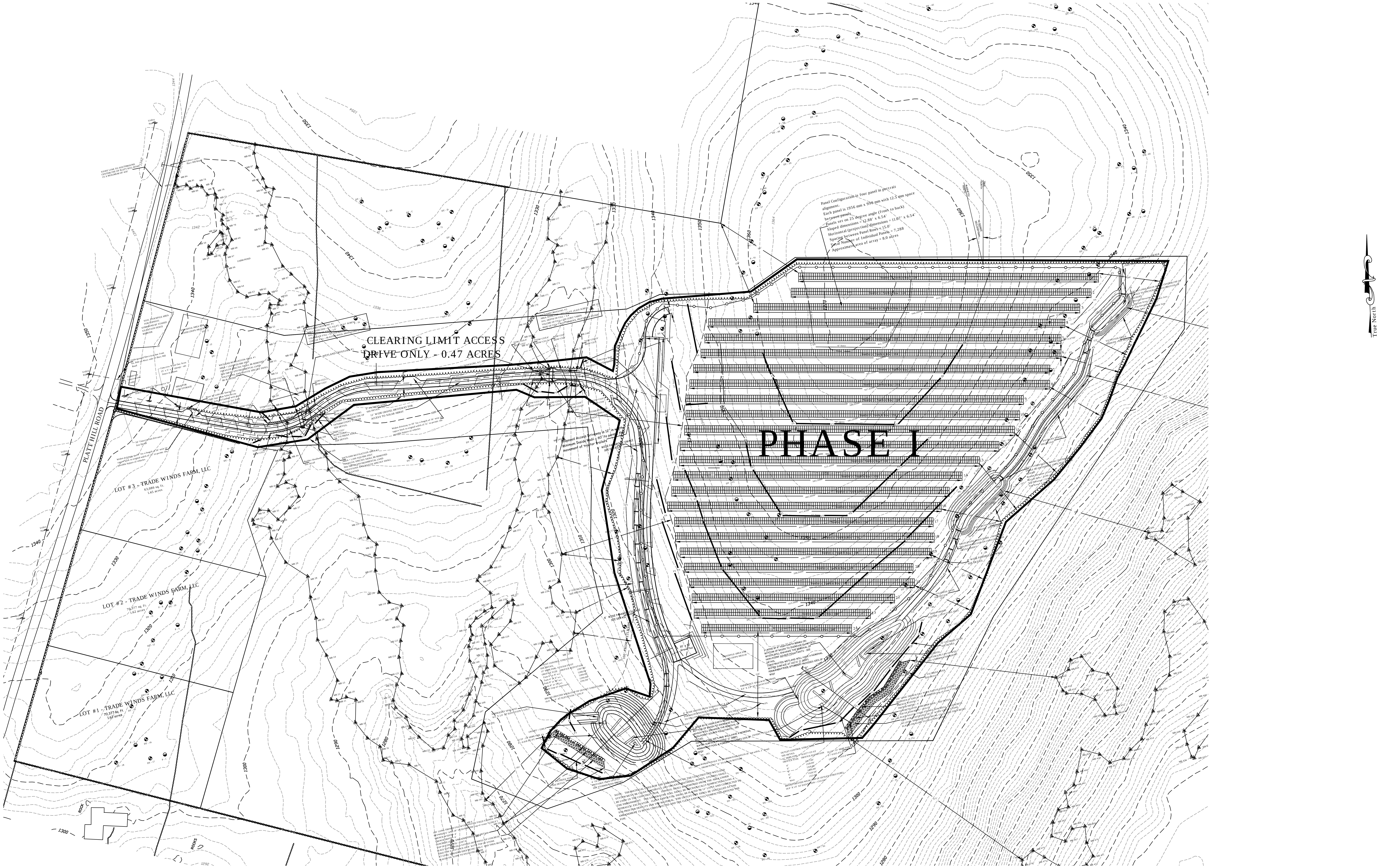
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

VICINITY MAP
SHEET 8 OF 16
PROJECT #032-2019
SCALE: 1" = 250'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

PHASE I:

1. FIELD STAKING OF CLEARING LIMIT FOR ACCESS DRIVEWAY AND SOLAR ARRAY.
2. CUTTING OF TREES AND BRUSH WITHIN CLEARING LIMITS. BRUSH SHALL BE CHIPPED TO BE USED AS TEMPORARY MULCH DURING THE CONSTRUCTION PERIOD AS NEEDED.
3. INSTALLATION OF EROSION CONTROL BARRIERS ALONG ACCESS PATH AND PERIMETER OF SOLAR ARRAY/SWALES/CONSTRUCTED WETLAND BASIN.



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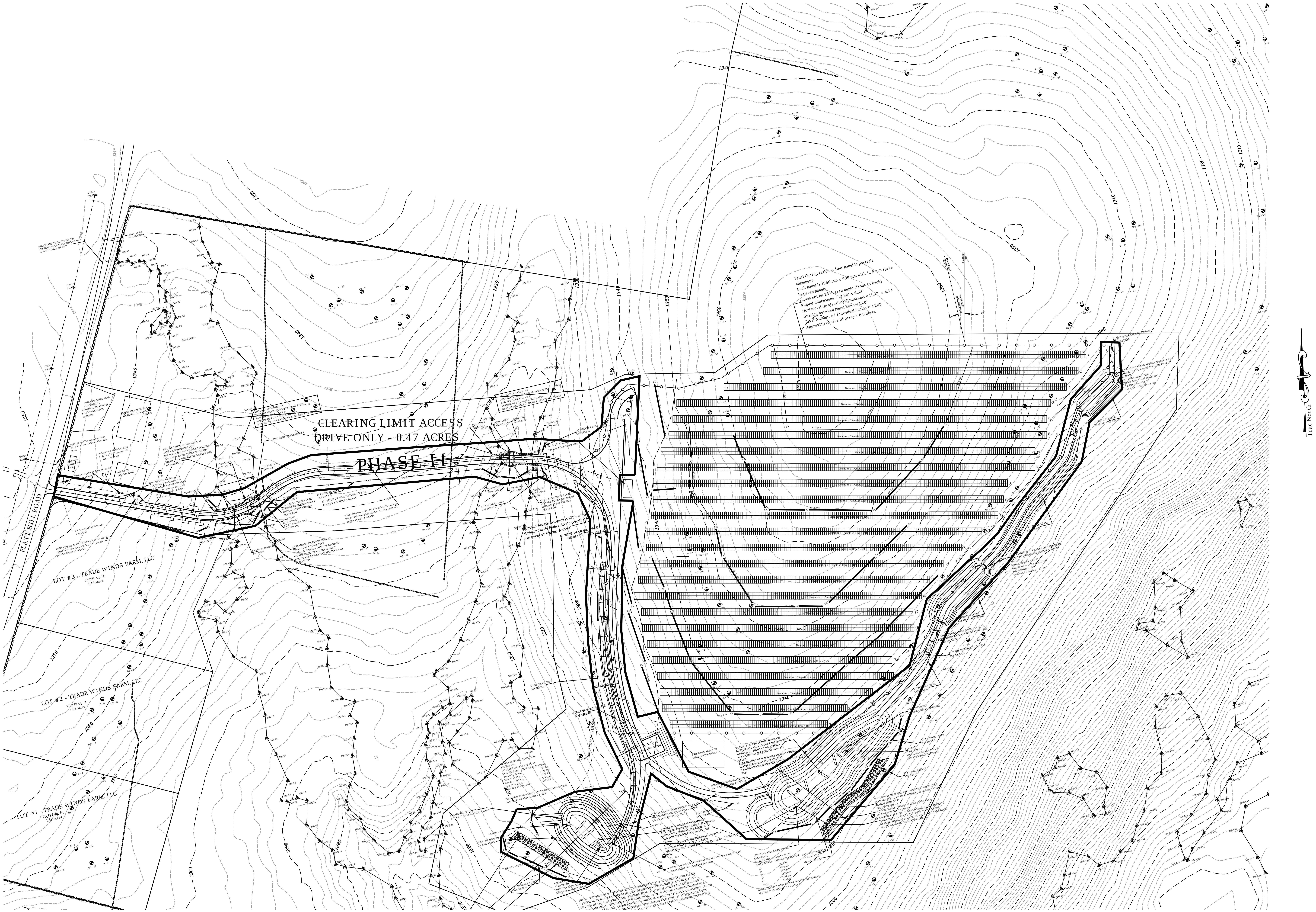
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

PHASING PLAN -PHASE I
SHEET 9 OF 16
PROJECT #032-2019
SCALE: 1" = 80'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

PHASE II:

1. REMOVAL OF STUMPS WITHIN AREA OF ACCESS DRIVEWAY, EAST AND WEST SWALES AND CONSTRUCTED WETLAND SYSTEM.
2. DISPOSAL OF STUMPS OFF-SITE OR GRINDING OF THEM INTO MULCH ON-SITE.
3. CONSTRUCTION OF ACCESS DRIVEWAY FROM PLATT HILL ROAD TO SOUTHERN END INCLUDING TWO INTERMITTENT STREAM CROSSINGS.
4. AFTER ACCESS DRIVEWAY HAS BEEN CONSTRUCTED AND SIDE SLOPES GRADED, INSTALL PARABOLIC SWALES ON EAST & WEST SIDES OF PROPOSED SOLAR ARRAY.
5. CONSTRUCT COMBINED SWALE AND CONSTRUCTED WETLAND SYSTEM PER PLAN AND DETAILS. SEED ALL DISTURBED AREAS WITH SPECIFIED SEED MIXTURE ON APPROVED PLANS.



PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

PHASING PLAN -PHASE II
SHEET 10 OF 16
PROJECT #032-2019
SCALE: 1" = 80'
DATE: 12/22/20, Rev. 3/25/21

LOW IMPACT SUSTAINABLE DEVELOPMENT
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PHASE III A:

1. INSTALLATION OF EROSION CONTROL MEASURES FOR CONSTRUCTION OF SOLAR ARRAY IN PHASE III A. ALL EROSION MEASURES TO BE INSTALLED IN ACCORDANCE WITH APPROVED PLANS AND DETAILS (FILTREXX SOXX AND WOOD CHIP BERMS PER PLAN).
2. USE YORK RAKE OR SIMILAR EQUIPMENT TO REMOVE LOOSE BRUSH AND SCARIFY GROUND SURFACE. INSTALL STEEL RACKING SYSTEM FOR SOLAR PANELS PER MANUFACTURER'S SPECIFICATIONS.
3. INSTALL SOLAR PANELS ON RACKING SYSTEM.
4. SEED AREAS UNDER AND BETWEEN ROWS OF SOLAR PANELS WITH SPECIFIED SEED MIXTURE.
5. EROSION CONTROL MEASURES TO REMAIN IN PLACE UNTIL PERMANENT VEGETATIVE COVER HAS BEEN ESTABLISHED OVER THE DISTURBED AREA.
6. 6" FILTREXX SOXX & WOOD CHIP BERMS REMAIN IN PLACE TO SLOW RUNOFF DOWN UNTIL VEGETATION GROWS UP.

PHASE III B:

1. INSTALLATION OF EROSION CONTROL MEASURES FOR CONSTRUCTION OF SOLAR ARRAY IN PHASE III B. ALL EROSION MEASURES TO BE INSTALLED IN ACCORDANCE WITH APPROVED PLANS AND DETAILS (FILTREXX SOXX AND WOOD CHIP BERMS PER PLAN).
2. USE YORK RAKE OR SIMILAR EQUIPMENT TO REMOVE LOOSE BRUSH AND SCARIFY GROUND SURFACE. INSTALL STEEL RACKING SYSTEM FOR SOLAR PANELS PER MANUFACTURER'S SPECIFICATIONS.
3. INSTALL SOLAR PANELS ON RACKING SYSTEM.
4. SEED AREAS UNDER AND BETWEEN ROWS OF SOLAR PANELS WITH SPECIFIED SEED MIXTURE.
5. EROSION CONTROL MEASURES TO REMAIN IN PLACE UNTIL PERMANENT VEGETATIVE COVER HAS BEEN ESTABLISHED OVER THE DISTURBED AREA.
6. 6" FILTREXX SOXX & WOOD CHIP BERM REMAIN IN PLACE TO SLOW RUNOFF DOWN UNTIL VEGETATION GROWS UP.

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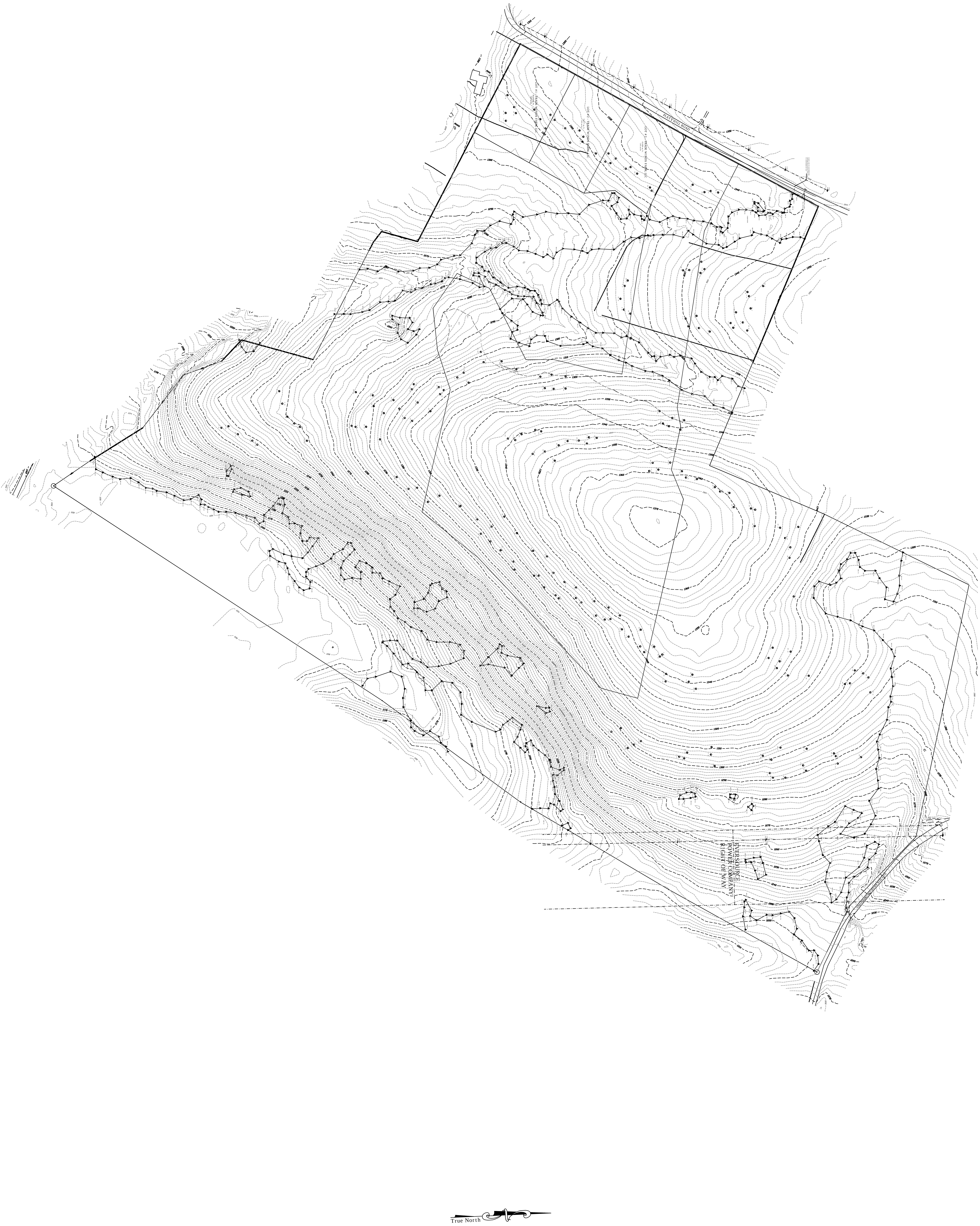
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

PHASING PLAN -PHASE III A & B
SHEET 11 OF 16
PROJECT #032-2019
SCALE: 1" = 80'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

EXISTING CONDITIONS MAP

SHEET 12 OF 16
PROJECT #032-2019
SCALE: 1" = 150'
DATE: 12/22/20, Rev. 3/25/21

LOW IMPACT SUSTAINABLE
LISD
DEVELOPMENT
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PROPERTY LOCATION: PLATT HILL ROAD -WINCHESTER, CONNECTICUT

1.1 PROJECT DESCRIPTION:

The project proposes the creation of a solar array on a portion of the approved Trade Winds Farm subdivision on Platt Hill Road. The solar array and associated access, equipment, stormwater management facilities, and clearing for solar access will be located on 24.8 acres as shown. The solar array will be 8.0 in size. The remaining land containing 75 acres will be conveyed to the Winchester Land Trust to remain in its natural state for perpetuity. A 12' wide driveway from the east side of Platt Hill Road will provide access to the solar array. Two riprap swales, located to the east and west of the solar array will collect and convey runoff to a constructed wetland system proposed to the southeast of the solar array.

1.2 ESTIMATED DISTURBANCE AREA:

Approximately 8.7 acres will be disturbed for access, solar array and stormwater management. 5.36 acres of trees will be cut down outside the solar array, the stumps left in place and the area seeded with a wildflower see mixture for pollinator habitat.

1.3 EROSION CONTROL MEASURES:

12" high Filtrexx Soxx, siltation fence barriers, anti-tracking pad will be used on this site.
A Construction entrance will be installed at the driveway entrance off Platt Hill Road.

1.4 CONSTRUCTION PHASES:

This project will be done in four phase following the sequence specified below.

1.5 CONSTRUCTION START DATES:

Construction on the site will likely commence within 180 days after all requried local land use approvals have been obtained from the Connecticut Siting Council assuming weather conditions permit. It is anticipated that all work will be completed within 6 months from commencement date.

1.6 DESIGN INFORMATION:

Hydrologic computations and analyses are found in the Stormwater Management Report prepared by this office.

1.7 OTHER PERMITS:

The CT DEEP General Permit for Construction Activities must be obtained by the applicant.

1.8 CONSERVATION PRACTICES:

Use of riprap swales, constructed wetland w/forebay, use of native seed mixtures for stabilization and habitat improvement.

1.9 DOCUMENT LIST:

1. Project Plan Set comprised of Sheet 1 thru 13 of 13

2.1 HYDROLOGIC CALCULATIONS:

Stormwater Management Report

2.2 SOIL TEST RESULTS:

Included in Stormwater Management Report

CONSTRUCTION SEQUENCE:

PHASE I

1. Field delineation of clearing limit for access driveway, stormwater conveyance and treatment systems, solar array and sun exposure area by a licensed land surveyor.
2. Temporary crossings of the two intermittent brooks shall be made using 4-6" diameter trees laid down parallel to the flow path of the intermittent streams to allow for the movement of tree skidders for the cutting and removal of trees.
3. Trees shall be cut down within the staked clearing limits. Whole trees shall be moved using timber skidders to a staging area just off Platt Hill Road. Timber quality logs shall be staked in a pile. All other woody material shall be chipped into a pile for used as a temporary stabilization material on disturbed area if vegetation cannot be established due to weather conditions.
4. No soil disturbance will take place during this phase.

PHASE II

1. Install 12" Filtrexx Soxx along the proposed access driveway, and below portions of the riprap swales and constructed wetland system as shown on the approved plans and in accord with the attached construction detail.
2. Remove stumps from area of access driveway, riprap swales and constructed wetland system. The removed stumps shall be placed temporarily at the edge of the anticipated driveway construction limits.
3. The entrance of the access driveway shall be rough graded and the 50' long construction entrance installated at the intersection with Platt Hill Road.
4. Topsoil shall be removed from the portion of the driveway from Platt Hill Road to the first intermittent stream. Topsoil shall be placed in stockpile location as shown.
5. Subsoil shall be mechanically compacted by roller or other similar equipment. The base layer of 1-1/4" processed stone shall be placed and mechanically compacted.
6. Excavation shall be done for each of the two footings for the bottomless culvert in accordance with the detail shown on these plans. The gravel base shall be placed and compacted, the footing, and then the walls shall be formed and poured with 3,000 psi concrete. After the walls have cured, the precast 6' x 3' bottomless concrete culvert shall be per the plan. The boulder retaining wall shall be installed on both sides of the driveway per the plan. Fill shall be placed over the culvert and then the processed stone layer.
7. The same process for the initial section of the driveway shall be repeated for the second intermittent stream crossing.
8. Topsoil shall be removed from the area of the driveway from the second intermittent stream crossing up to the "T" intersection, located just west of the solar array. Topsoil shall be placed in the stockpile location as the driveway constructed in the same manner as discussed above.
9. As the driveway construction reaches the area of the solar array, the previously removed stumps shall be moved to the staging area near Platt Hill Road for chipping into mulch or removal from the site.
10. The vegetated swale along the eastern edge of the solar array shall be installed at this time and in accordance with the details and specifications shown on the plan. Soil removed to ishall be placed on the downhill side of the swale in those areas shown on the plan. The two grassed depressed areas shall be constructed at the same time as the vegetated swale.
11. Topsoil in the area of the southern portion of the driveway shall be removed and placed in a temporary stockpile location as shown.
12. The subsoil shall be mechanically complacted as noted above and then the base layer of 1-1/4" processed stone shall be placed & mechnically compacted.
13. The vegetated swale located to the west of the driveway shall be installed in the same manner as the eastern swale was done. The regraded side slopes along the entire driveway shall be seeded, and covered with hay mulch. If it is not an ideal time to grow grass, then the disturbed areas shall be covered with a minimum of 4" of wood chips/mulch to reduce the impact of raindrops on the un-vegetated surface and prevent erosion of the earth slopes.
14. The two Constructed Wetland systems, outlet structure and emergency spillway shall be installed in compliance with the approved plans and the earth berms in the bottom of the basin shall be installed. The bottom of the basin and side slopes shall be seeded with the specified seed mixture, and covered with hay mulch.
15. The stone trench and concrete level spreader below Basin #2 shall be installed at this time and in accord with the approved plans. Native field stones shall be used in the stone trench as well as downhill of the level spreader per the detail shown on the plan.
16. The area of trees cleared outside the limit of the array shall be seeded with the wildflower seed mixture specified for this area in order to establish pollinator habitat.

PHASE III - A:

1. Remove stumps from upper portion of solar array (Rows #1 to #10). Using Yoke Rake or similar equipment remove brush and other loose organic debris from ground surface.
2. Project land surveyor shall stake centerline of Row #5. 12" Filtrexx Soxx shall be installed just above Row #6 and Row #11 as shown on the plan and in accord with the attached detail.
3. Posts shall be installed for racking system for solar array in accordance with manufacturer's detail and specifications for Row #5.
4. After Row #5 has been installed, the rows uphill and downhill of Row #5 shall be installed providing the edge to edge offset of 15'.
5. After Rows #1 to #10 have been installed along with any electrical equipment, the ground surface shall be lightly scarified by York Rake or mini-excavator, if ground surface has been compacted. All disturbed areas within Phase IIIA of the solar array shall be seeded with New England Semi-Shade Grass and Forbs Mix by New England Wetland Plants.
6. The two rows of Filtrexx Soxx shall remain in place to prevent concentrated flow as the seed mixture becomes established.

PHASE III - B:

1. Remove stumps from lower portion of solar array (Rows #11 to #23). Using Yoke Rake or similar equipment remove brush and other loose organic debris from ground surface.
2. Project land surveyor shall stake centerline of Row #17. 12" Filtrexx Soxx shall be installed just above Row #17 and below Row #23 as shown on the plan and in accord with the attached detail.
3. Posts shall be installed for racking system for solar array in accordance with manufacturer's detail and specifications for Row #17.
4. After Row #17 has been installed, the rows uphill and downhill of Row #17 shall be installed providing the edge to edge offset of 15'.
5. After Rows #11 to #23 have been installed along with any electrical equipment, the ground surface shall be lightly scarified by York Rake or mini-excavator, if ground surface has been compacted. All disturbed areas within Phase IIIA of the solar array shall be seeded with New England Semi-Shade Grass and Forbs Mix by New England Wetland Plants.
6. The two rows of Filtrexx Soxx shall remain in place to prevent concentrated flow as the seed mixture becomes established.
7. The perimeter fence and gate shall be installed at this time and in accord with the submitted details.

PLAN OBJECTIVES AND PRINCIPALS:

The objectives of the Soil Erosion and Sediment Control Plan are to manage both the runoff and the earthwork operations by using Best Management Practices. The objectives are as follows:

a. Control erosion at its source with temporary control measures, minimize the runoff from areas of disturbance, distribute stormwater through natural vegetation before being discharged into wetland systems.
b. Keep land disturbance to a minimum. The site layout has been designed to minimize any potential impacts to wetlands.
c. Construct the project in phases to minimize the area of the site under active construction at one time.
d. Retain existing vegetation wherever feasible. Siltation fence or other barriers will be used to limit the extent of earthwork.
e. Stabilize disturbed areas as soon as practical. Earth disturbance shall not occur on a given area until active construction is to take place in this area.
f. Minimize the length and steepness of slopes.
g. Maintain low runoff velocities.
h. Trap sediment on site. Siltation fence barriers and driveway construction entrance will trap sediment during the construction period.
i. Establish a maintenance and repair program during the construction period. Erosion control measures will be inspected monthly during the active construction period and/or following rainfall events of greater than 0.5 inches and repaired as needed to ensure that they function properly.
j. Assign responsibility for the maintenance program. The responsibility for the maintenance program will be assigned to the contractor who shall designate one of its supervisory personnel to be the liason to the owner's representative. the owner shall retain the services of a licensed professional who shall inspect and monitor the contractor's methods and have the authority to require modifications to the Erosion and Sediment Control Plan. The town will be copied on all inspection reports prepared on behalf of the project.

TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES - MAINTENANCE REQUIREMENTS:

1. Siltation fence barriers: Accumulated sediment shall be removed when it has reached a height of 25% of the exposed sediment barrier and disposed off is an appropriate manner.

2. Filtrexx Soxx shall be inspected on a monthly basis. Accumulated sediment shall be removed from the uphill side of the Soxx when it is 50% of the height of the Soxx above grade.

CONTROL PLAN IMPLEMENTATION:

1. The contractor shall inspect the effectiveness and condition of erosion control devices during storm events, and after each rainfall event of 0.5" or more, prior to weekends and prior to forecasted large storm events.
2. The contractor shall repair or replace damaged erosion control measures immediately, and in case, more than four hours after observing such deficiencies.
3. The contractor shall be prepared to implement interm drainage controls and erosion control measures as may be necessary during the course of construction.
4. The constactor shall make available on-site all equipment, materials and labor necessary to effect emergency erosion control measures within four hours of any impending emergency situation.
5. The contractor shall make a final inspection, and clean up any tracked sediment on the existing road.
6. The contractor shall have on call at all times, a responsible representative who, when authorized, will mobilize the necessary personnel, materials and equipment and otherwise provide the required action when notified of any impending emergency situation.
7. The contractor shall supply a telephone number to the town engineer, planning agent so that the contractor may be contacted during the evenings and on weekends, if necessary.
8. The contractor shall maintain a minimum of 165 lf of Filtrexx 12" Soxx and 200 lf of silt fence on the site for emergencies.

GENERAL EROSION AND SEDIMENTATION CONTROL PLAN NOTES:

1. Regrading on this site shall done in such a manner as to prevent stagnant water from collecting in depresssions.
2. All erosion and sedimentation control measures will be installed prior to the start of any construction activity.
3. All erosion and sedimentation control measures shall be constructed in accordance with the submitted construction details and in compliance with the specifications and standards found in the "Guidelines for Soil Erosion and Sediment Control" as prepared by the State of Connecticut, revised to 2002.
4. Siltation fence barriers will be installed at the limit of all disturbed areas. Staked straw bales, will be utilized as necessary during the construction period. All work done shall be in accordance with the details shown on the plans.
5. Land disturbance will be kept to a minimum. Restabilization of all disturbed areas will occur as soon as final grading in complete.
6. All erosion and sedimentation control measures will be maintained in an effective conditions throughout the construction period.
7. Accumulated sediment will be removed from the control structures and disposed of in a lawful and safe manner.
8. Additional control measures will be installed during the construction period if the Zoning or Wetland Enforcement Officer requires them. The design engineer shall inspect the site periodically to ensure the proper installation of erosion control measures.
9. Regular inspections of the construction site shall be made by a representative of the Town of Winchester and a professional retained by the owner to assure compliance with the approved plans.
10. The responsibility for implementing the erosion and sedimentation control plan, informing all parties engaged on the construction site of the requirements and objectives of the plan, notifying the appropriate town agencies of any transfer of this responsibility and for conveying a copy of the erosion and sedimentation control plan if title to the land is transferred is placed upon the owner of record.

SEED MIXTURES

NEW ENGLAND SEMI-SHADE GRASS AND FORBS MIX:
Virginia Wildrye, Canada Wild Rye, Partridge Pea, Red Fescue, Spiked Grayfeather/Marsh Blazing Star, Sensitive Fern, Zigzag Aster, Hollow-Stem Joe Pye Weed, White Avens, Eastern Columbine, and Pat Rush.
Application Rate: 30 pounds per acre or 1 pound per 1,450 square feet

NEW ENGLAND WILDFLOWER MIX:
Little Bluestem, Red Fescue, Indian Grass, Partridge Pea, Canada Wild Rye, Blue Vervain, Butterfly Milkweed, Narrowleafed Blue Eyed Grass, Black Eyed Susan, New England Aster, Spiked Greyfeather/Marsh Blazing Star, Starved/Calico Aster, Early Goldenrod, and Hollow-Stem Joe Pye Weed.
Application Rate: 23 pounds per acre or 1 pound per 1,900 square feet.

NEW ENGLAND WETMIX:
Fox Sedge, Lurid Sedge, Blunt Broom Sedge, Blue Vervain, Fowl Bluegrass, Hop Sedge, Green Bulrush, Creeping Spike Rush, Fringed Sedge, Soft Rush, Spotted Joe Pye Weed, Rattlesnake Grass, Swamp Aster, Blueflag, Swamp Milkweed, and Square Stemmed Monkey Flower.
Application Rate: 18 pounds per acre or 1 pound per 2,500 square feet

NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DETENTION BASINS AND MOIST SITES:
Riverbank Wild Rye, Creeping Red Fescue, Little Bluestem, Big Bluestem, Switch Grass, Upland Bentgrass, Nodding Bur Marigold, Hollow-Stemed Joe Pye Weed, New England Aster, Boneset, Blue Vervain, Soft Rush, and Wool Grass.
Application Rate: 35 pounds per acre or 1 pound per 1,250 square feet

SEEDING MIXTURES FOR AREAS TO BE MAINTAINED AS GRASS:

MIXTURE #1	
KENTUCKY BLUEGRASS	20 LBS/ACRE
CREEPING RED FESCUT	20 LBS/ACRE
PERENNIAL RYEGRASS	5 LBS/ACRE
MIXTURE #2	
CREEPING RED FESCUE	20 LBS/ACRE
REDTOP	2 LBS/ACRE
TALL FESCUE	20 LBS/ACRE

MAINTENANCE REQUIREMENTS FOR GRASS SWALES/CONSTRUCTED WETLAND BASIN:

GRASS SWALES AND CONSTRUCTED WETLAND BASIN SHALL BE INSPECTED ANNUALLY.

GRASS SWALES:
1. Perform visual inspection by walking the length of the grass swales,
2. Remove any woody debris which may have fallen or been blown in the swales by hand,
3. Visually inspect field stone check dams for their integrity, if stones have become loose, reset by hand
4. No mowing of the swales are necessary.

CONSTRUCTED WETLAND BASIN:
FOREBAY:
1. Perform visual inspection of forebay, use a large stick or piece of wood to measure the depth of any sediment in the forebay. If the depth of sediment is greater than 1/3 the depth, then the sediment shall be removed by mini-excavator,
2. Remove any woody debris which may have fallen or been blown in the forebay by hand,

CONSTRUCTED WETLAND BASIN:
1. Perform visual inspection of the bottom of the constructed wetland,
2. Remove any woody debris which may have fallen or been blown into the bottom of the basin,
3. Inspect the berm for the presence of any woody vegetation. If any woody vegetation is growing on the berm, it shall be cut at ground level and removed. If the woody vegetation is small enough, it shall be pulled out by hand and thrown into the upland area adjacent to the constructed wetland.
4. The outlet structure shall be inspected and any woody debris trapped on the trash rack shall be removed and disposed of in an upland area adjacent to the constructed wetland.

INSPECTION AND MAINTENANCE OF CONSTRUCTED WETLAND VEGETATION:
1. The vegetative community in the Constructed Wetland shall be inspected annually for the presence of any invasive wetland or upland plants for the first three years after planting.
2. Any invasive plants found shall be removed by hand pulling and disposed of in an appropriate manner away from the Construction Wetland Basin.

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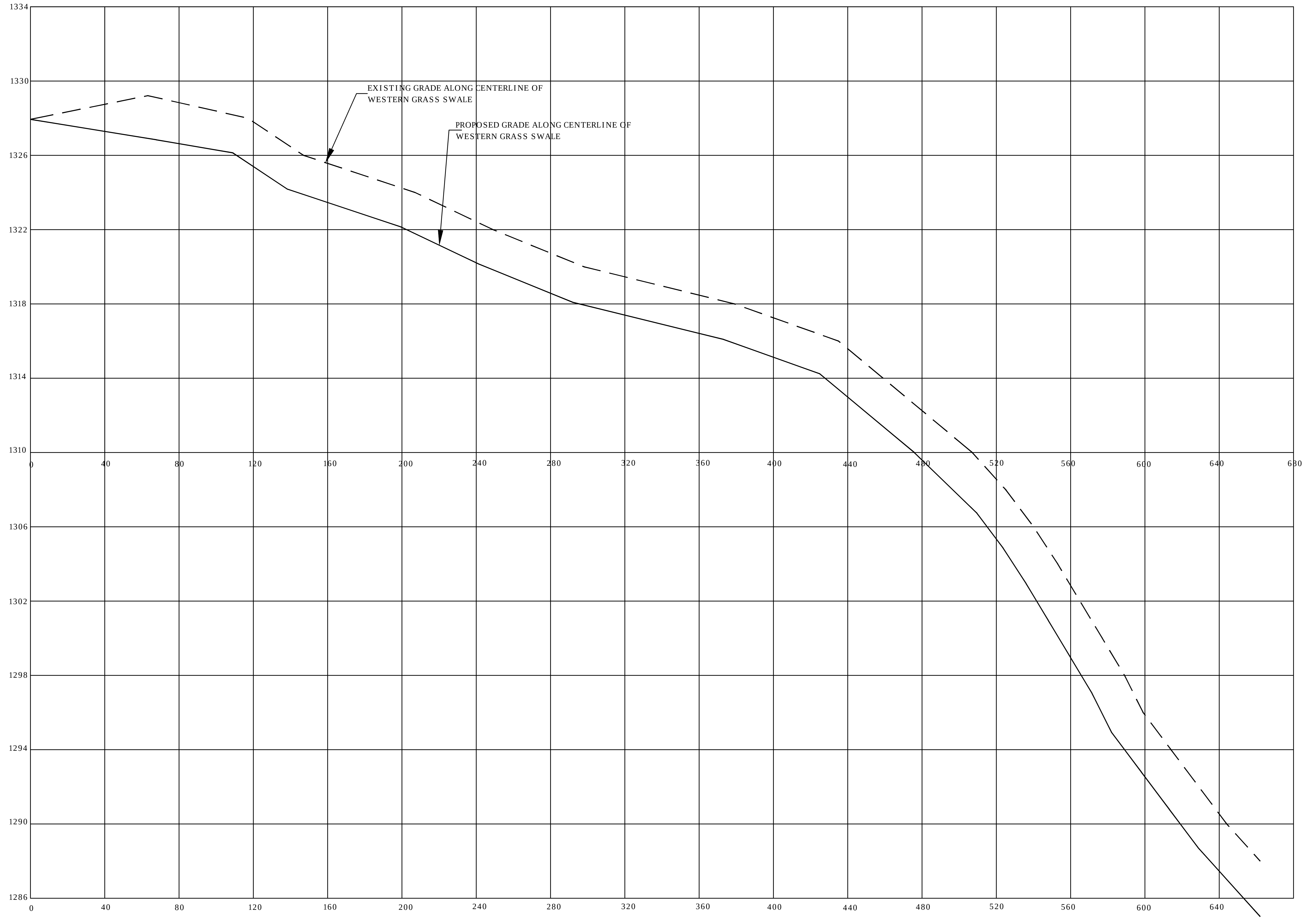
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

CONSTRUCTION NARRATIVE
SHEET 13 OF 16
PROJECT #032-2019
SCALE: 1" = 150'
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

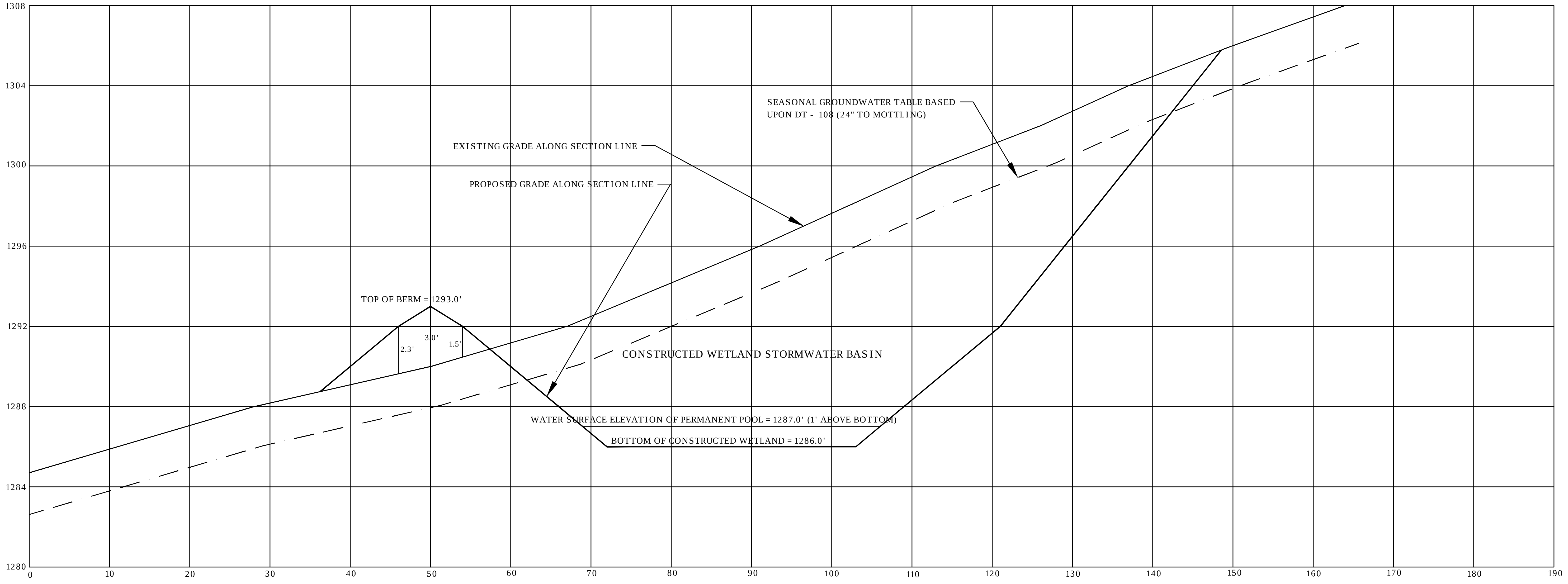
PROFILE OF WESTERN GRASS SWALE

HORIZONTAL: 1" = 40'
VERTICAL: 1" = 4'



CROSS SECTION "A" - "A" SCALES:

HORIZONTAL: 1" = 10'
VERTICAL: 1" = 4'



RESULTS OF HAND HOLES, HH-1 AND HH-2 PERFORMED IN BASIN #1
DATE: DECEMBER 16, 2020
HH-1:
0 - 4" TOPSOIL
4 - 26" YELLOW BROWN FINE SANDY LOAM
26 - 32" GREY BROWN MEDIUM COMPACT MEDIUM SAND, SOME GRAVEL
(COMPACT AT 32"), MOTTLING AT 26"
HH-2
0 - 4" TOPSOIL
4 - 27" YELLOW BROWN FINE SANDY LOAM
27 - 33" GREY BROWN MEDIUM COMPACT MEDIUM SAND, SOME GRAVEL
(COMPACT AT 33"), MOTTLING AT 27"

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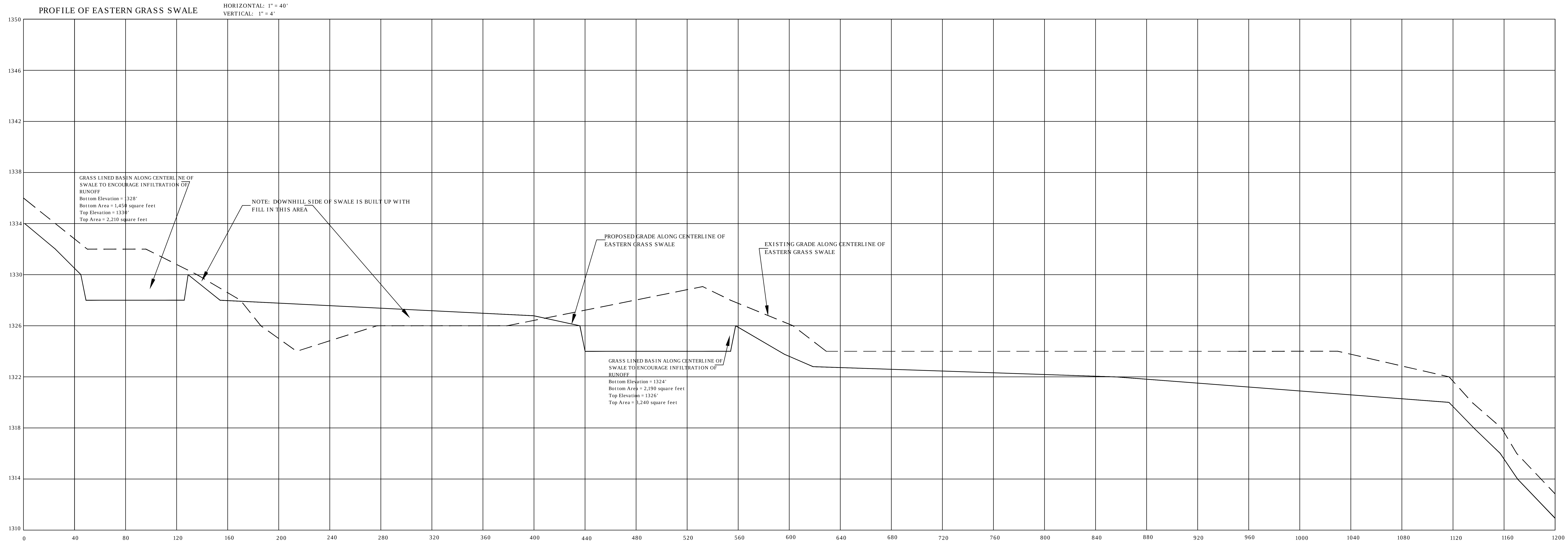
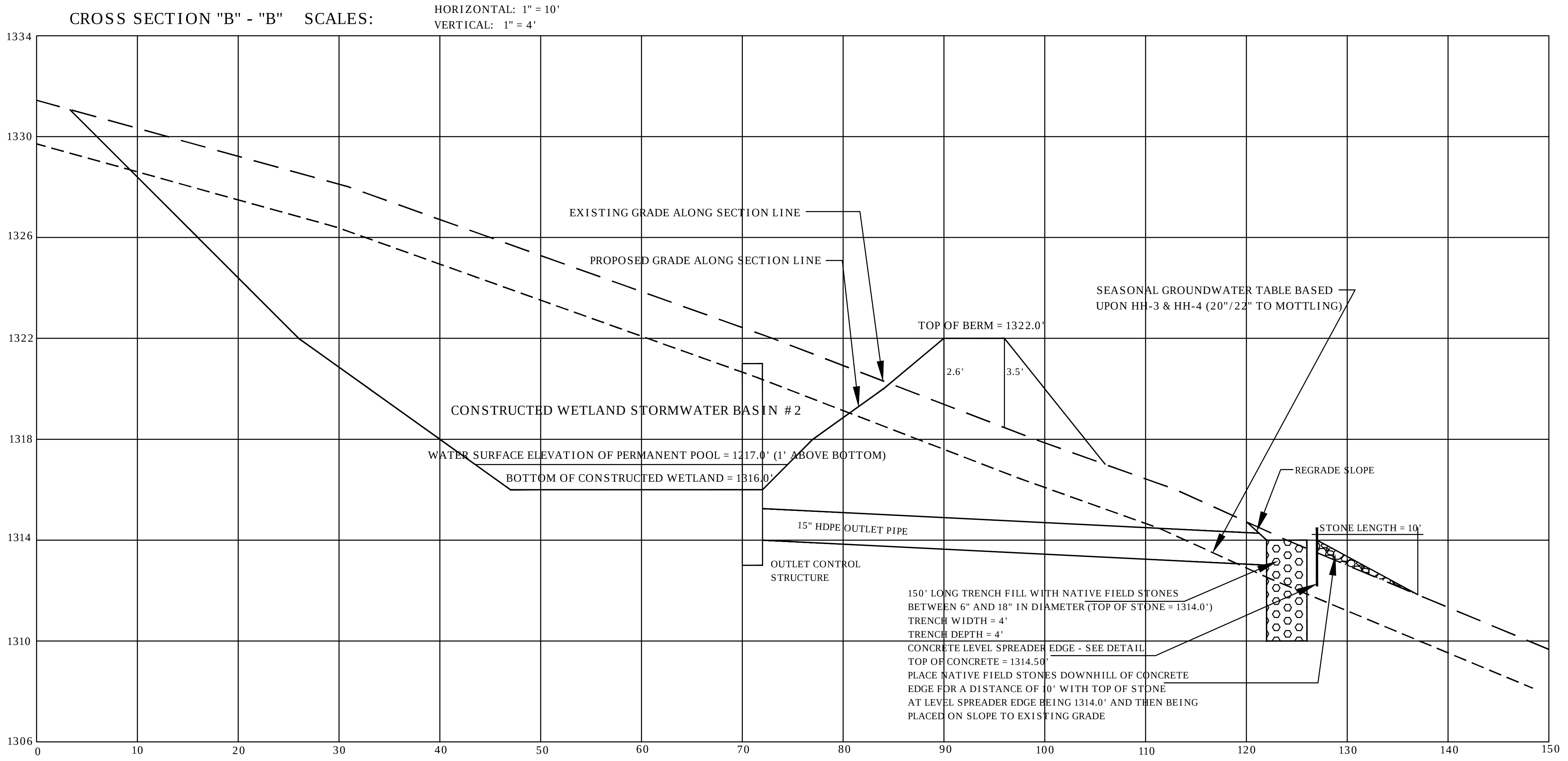
LOW IMPACT SUSTAINABLE DEVELOPMENT
TRINKAUS ENGINEERING

CROSS SECTIONS
SHEET 14 OF 16
PROJECT #032-2019
SCALES AS NOTED
DATE: 12/22/20, 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT


PROFILE OF EASTERN GRASS SWALE

HORIZONTAL: 1" = 40'
VERTICAL: 1" = 4'


CROSS SECTION "B" - "B" SCALES:

HORIZONTAL: 1" = 10'
VERTICAL: 1" = 4'

RESULTS OF HAND HOLES, HH-3 AND HH-4 PERFORMED IN BASIN #2
DATE: DECEMBER 16, 2020

HH-3:
0 - 3" TOPSOIL
3 - 20" YELLOW BROWN VERY FINE SAND AND SILT LOAM
20 - 33" GREY BROWN LIGHT TO MEDIUM COMPACT SILTY SAND
(COMPACT AT 33"), MOTTLING AND WATER BLEEDING IN AT 20"

HH-4
0 - 4" TOPSOIL
4 - 22" YELLOW BROWN VERY FINE SAND AND SILT LOAM
22 - 35" GREY BROWN LIGHT TO MEDIUM COMPACT SILTY SAND
(COMPACT AT 35"), MOTTLING AND WATER BLEEDING IN AT 22"

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LOW IMPACT SUSTAINABLE DEVELOPMENT
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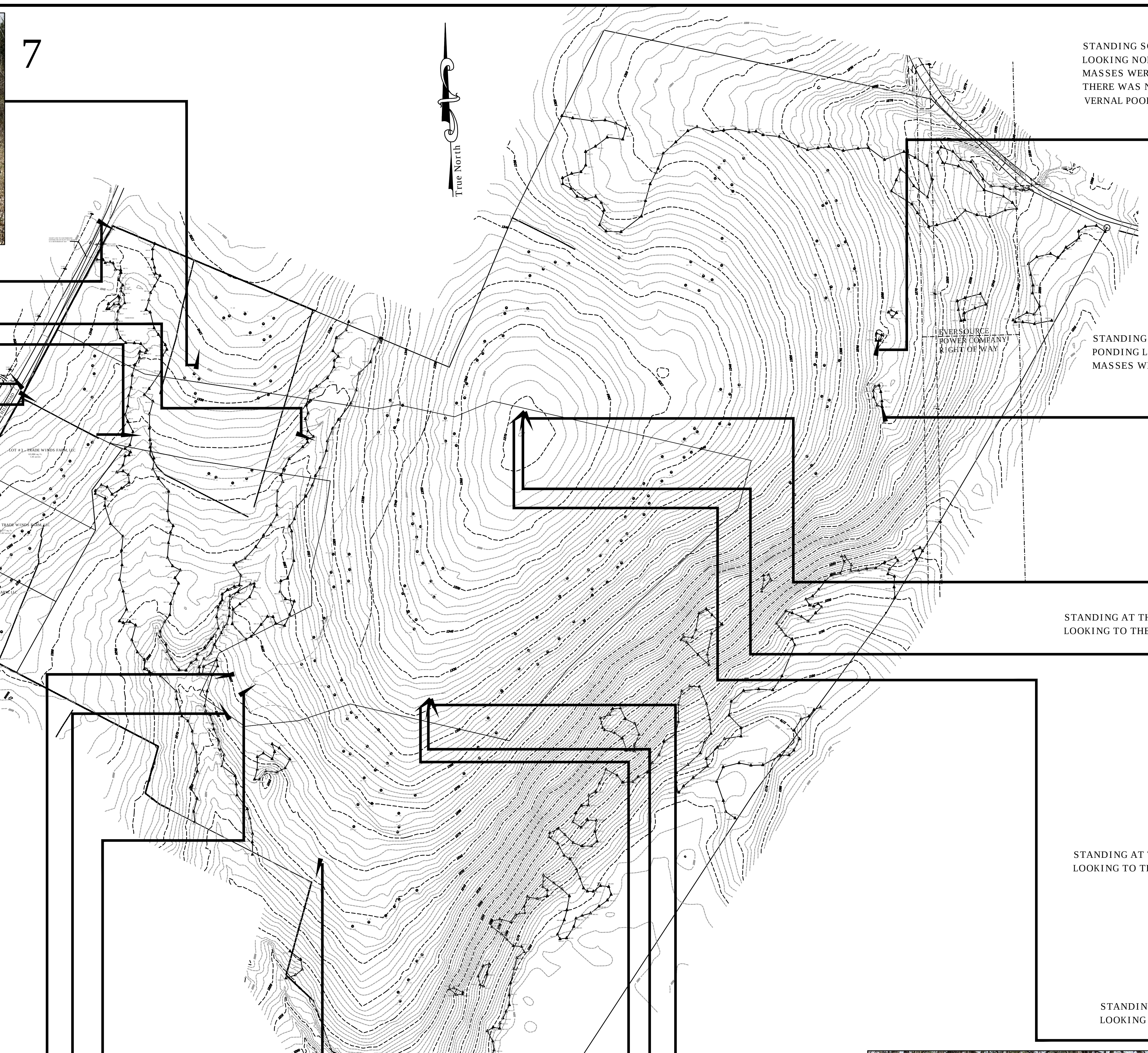
CROSS SECTIONS
SHEET 15 OF 16
PROJECT #032-2019
SCALES AS NOTED
DATE: 12/22/20, Rev. 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT



1

STANDING ON EAST SIDE OF ROAD AT NORTHERN PROPERTY LINE LOOKING EAST

7

STANDING AT APPROXIMATE SOUTHERN LIMIT FARMLAND SOILS LOOKING NORTH

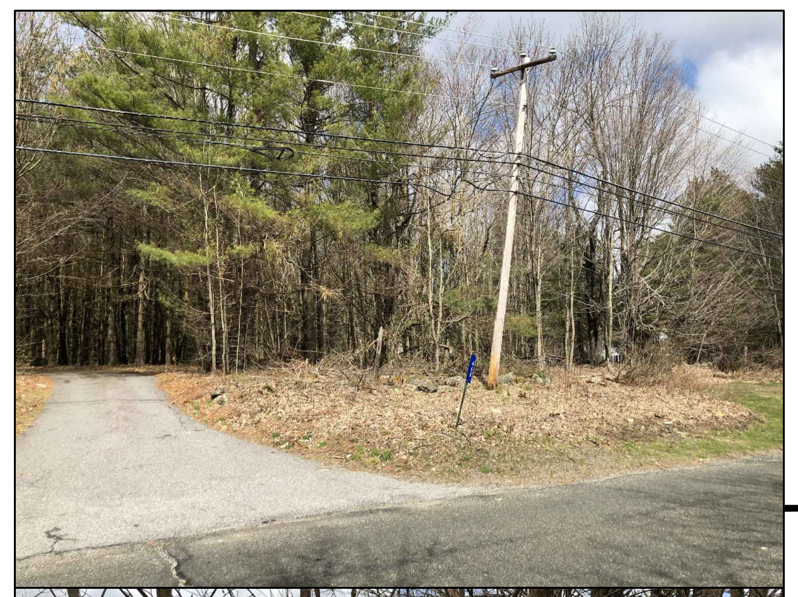
6

STANDING ON WEST SIDE OF WETLAND CROSSING #2 LOOKING EAST (ORIGINAL CORDUROY CROSSING STILL IN PLACE)

5

STANDING ON WEST SIDE OF WETLAND CROSSING #1 LOOKING EAST (ORIGINAL CORDUROY CROSSING STILL IN PLACE)

4



STANDING ON EAST SIDE OF ROAD LOOKING WEST AT UTILITY POLE FOR POWER CONNECTION

3

STANDING ON EAST SIDE OF ROAD LOOKING EAST AT PATH OF DRIVEWAY ACCESS TO SOLAR ARRAY

2

STANDING ON EAST SIDE OF ROAD LOOKING EAST AT PROPERTY AND ADJACENT RESIDENCE

8

STANDING SOUTH OF SOUTHERN VERNAL POOL LOOKING NORTH AT VERNAL POOL - NO EGG MASSES WERE VISIBLE IN POOL THERE WAS NO WATER IN NORTHERN VERNAL POOL

9

STANDING SOUTH OF WETLAND AREA WITH PONDING LOOKING NORTH - NO EGG MASSES WERE VISIBLE IN THIS WETLAND

10

STANDING AT THE NORTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTHEAST

11

STANDING AT THE NORTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTH

12

STANDING AT NORTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTHWEST

13

STANDING AT THE SOUTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTHEAST

14

STANDING AT THE SOUTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTH

15

STANDING AT SOUTH SIDE OF SOLAR ARRAY LOOKING TO THE SOUTHWEST

16

STANDING ON SOUTHERN PORTION OF BASIN LOOKING TO THE NORTHEAST

17

STANDING JUST NORTH OF PROPERTY CORNER LOOKING TO SOUTH ALONG STONE WALL

18

STANDING ON DOWNWARD SIDE OF BERM OF BASIN LOOKING TO THE SOUTHWEST TO THE STREAM WHERE THE OUTLET PIPE WILL DISCHARGE ONTO RIPRAP PAD AND THEN THE STREAM

19

STANDING ON SLOPE ABOVE STREAM JUST BELOW CONFLUENCE OF TWO INTERMITTENT WATERCOURSES LOOKING TO THE NORTHWEST

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PHOTO PLAN OF SITE
SHEET 16 OF 16
PROJECT #032-2019
SCALE: 1" = 200'
DATE: 12/22/20, 3/25/21

PREPARED FOR
LSE PICTOR LLC
PLATT HILL ROAD
WINCHESTER - CONNECTICUT

EXHIBIT 3

www.vhb.com

April 5, 2021

Carrie Larson Ortolano. Esq., Associate General Counsel
LSE Pictor LLC
40 Tower Lane, Suite 201
Avon, CT 06001

Re: 2021 Vernal Pool Breeding Habitat Evaluation
1.99+/-MW Solar Development Project
Platt Hill Road, Winchester, CT

Dear Attorney Ortolano,

As requested by LSE Pictor LLC (“Lodestar”), Vanasse Hangen Brustlin, Inc. (VHB) investigated wetlands on Lodestar’s Platt Hill Road project site in Winchester, Connecticut (the “Site”) for vernal pool breeding habitat. As you know, the March 23, 2021 interrogatory letter from the Connecticut Siting Council (“CSC”) Petition No. 1398A requested investigation of vernal pools specifically within the red maple swamp located along the eastern boundary of the Site. VHB reviewed wetlands on the Site, which were previously flagged by other parties, and prepared a Wetland Verification Letter (dated October 23, 2020). However, that field work was conducted during the fall, outside of the typical season for identification of biological vernal pool indicators. This letter summarizes the findings of VHB’s spring 2021 vernal pool breeding habitat evaluation on the Site.

Vernal Pool Identification and Assessment

The Connecticut Department of Energy and Environmental Protection (CT DEEP) generally describes vernal pools as “seasonal depressional wetlands, which in the northeast occur in glaciated areas that are covered by shallow water for variable periods from winter to spring but may be completely dry during the summer and fall” (CT DEEP 2021). And although Connecticut's municipal inland wetlands agencies regulate vernal pools, the CT DEEP does not provide a regulatory definition of vernal pool. Acknowledging the lack of an official definition for vernal pools in Connecticut, in a technical paper addressing vernal pool considerations for site development, Calhoun and Klemens (2002) note that vernal pools generally occupy less than 2 acres and recommend following guidance provided by Donahue (1996), which is includes the following factors:

a) presence of one or more obligate species,
b) water for approximately 2 months during the growing season,
c) a confined depression that lacks a permanent outlet stream,
d) no fish, and
e) dries out in most years.

In addition, the Connecticut Association of Wetland Scientist (CAWS) Vernal Pool Monitoring webpage (CAWS 2020) cites the following vernal pool definition:

> *Vernal pool means a seasonal watercourse in a defined depression or basin, that lacks a fish population and supports or is capable of supporting breeding and development of amphibian or invertebrate species recognized as obligate to such watercourses. These species include spotted salamander, Jefferson salamander complex, marbled salamander, wood frog, and fairy shrimp*.

These criteria are similar, although the CAWS do not require the pool to dry in most years. The common and specific names for Connecticut species considered by Calhoun and Klemens (2002) to be obligate biological indicators of vernal pool habitat are listed within Table 1.

Table 1 Obligate Vernal Pool Species

Common Name	Scientific name
Jefferson Salamander	*Ambystoma jeffersonianum*
Blue-spotted Salamander complex	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Marbled Salamander	*Ambystoma opacum*
Wood Frog	*Lithobates sylvaticus*
Eastern Spadefoot Toad	*Scaphiopus holbrookii*
Fairy Shrimp	*Eubranchipus* spp.

Furthermore, because vernal pool-breeding amphibians depend on terrestrial habitats as well as aquatic breeding habitats for survival, Calhoun and Klemens (2002) emphasize the importance of considering the surrounding upland areas, up to 750 feet from breeding pools. One hundred feet from the edge of the pool is considered the "vernal pool envelope" and the zone between 100 feet to 750 feet has been termed "critical upland habitat." The authors go on to provide a ranking methodology to assess the quality of each breeding area based on biological indicators and surrounding land use. This tool- a one-page form titled "Vernal Pool Assessment Sheet"- is specifically intended to be used for development planning purposes. Therefore, the purview of Connecticut's municipal inland wetlands agencies encompasses wetland vernal pool habitat and surrounding upland areas.

Survey Methodology

On April 1, 2021, VHB senior ecologist, Brett Trowbridge investigated wetlands on the Site and portions of the proposed development area for biological vernal pool indicators. This investigation occurred during overcast weather conditions with occasional snow flurries and a high temperature of approximately 38°F. The ArcGIS Collector application was used to navigate to each of the wetlands that were previously identified during delineation of wetlands on the Site. Wading surveys were conducted within inundated depressions on the Site while wearing polarized glasses to increase subsurface visibility. Meandering, visual surveys were conducted within the larger wetland systems. A dip net was used to sample for biological indicators within inundated areas as well. Discretion was used during dipnet sweeps, such that small, shallow areas containing obligate vernal pool indicators were not substantially disrupted (i.e., increasing turbidity in areas containing egg masses or spermatophores). Field notes and supporting photographs were taken for areas that were found to meet the vernal pool criteria presented above. Geographic information system (GIS) tools and aerial imagery were used to determine land use surrounding breeding areas and calculate percentages for terrestrial habitat impacts associated with Site development.

Survey Findings

Four areas on the Site were found to support breeding by obligate vernal species. However, only three areas exhibited physical and biological vernal pool indicators. Table 2 provides a summary of obligate vernal pool biological observations.

Vernal Pool 1 is an isolated depression approximately 40 feet long by 20 feet wide, with a firm leafy bottom located in the northeastern portion of the Site. At the time of the investigation, the estimated average and maximum water depths for Vernal Pool 1 were 12 inches and 18 inches, respectively (see Photo 1). Based on its hillside landscape position, the pool appears to have a perched hydrology. However, based on the firm bottom, it is likely that Vernal Pool 1 dries down completely during most years. Observed obligate vernal pool indicators included wood frog (*Lithobates sylvaticus*) egg masses (see Photo 2) and Ambystomatid salamander spermatophores (see Photo 3).

Vernal Pools 2 and 3 are shallow, cryptic pools formed by the void from the roots of fallen trees (i.e., tree tip-ups) located within the red maple shrub swamp in the southeastern portion of the Site (see Photos 4 and 5). Vernal Pool 2 is approximately 40 feet long by 10 feet wide and Vernal Pool 3 is approximately 30 feet long by 20 feet wide. Both pools have soft, mucky bottoms and during the investigation, the maximum and estimated average water depths in each pool were 9 inches and 6 inches, respectively. Based on their lower landscape position and rich organic surface materials Vernal Pools 2 and 3 likely exhibit seasonal inundation and long-term soil saturation. Observed obligate vernal pool indicators included wood frog egg masses in Vernal Pool 2 (see Photo 6) and Ambystomatid salamander spermatophores within Vernal Pool 3 (see Photo 7).

Ambystomatid salamander spermatophores and three wood frog egg masses were observed within the channel of an unnamed stream located along the eastern Site boundary within the red maple shrub swamp (see Photo 8). The stream has a silty bottom and exhibited approximately 12 inches of flow during the investigation (see Photo 9). Additional Ambystomatid salamander spermatophores were observed in approximately 1 inch of standing water within the red maple shrub swamp beyond the stream channel (see Photo 10). These observations, all occurred within 100 feet of Vernal Pools 2 and 3. Although these areas exhibited biological vernal pool indicators during 2021, they do not conform to the physical and/or hydrological requirements for vernal pools. Specifically, the stream area exhibits a permanent inlet and outlet, which allows potential fish passage. The area with shallow spermatophores, some of which were above the water line, does not have appropriate hydrology for larval development of obligate vernal pool breeding amphibians. Therefore, these two areas are not recognized as viable vernal pools.

Table 2 Obligate Vernal Pool Biological Observations

Location	Wood Frog Egg Masses	Ambystomatid Salamander Spermatophores
Vernal Pool 1	10	Present
Vernal Pool 2	17	Absent
Vernal Pool 3	0	Present
Eastern Unnamed Stream	3	Present

Two small areas that were previously identified as vernal pools indicated by wetland flags MB 352 through MB 355 and MB 356 through MB 359 on the Site Development Plans from Trinkaus Engineering, LLC (dated March 6, 2020) did not contain vernal pool indicators during VHB's 2021 investigation. The former area does not have suitable hydrology to support larval development of obligate vernal pool breeding amphibians. This small area is a hillside seep and no surface water was present at the time of the inspection. Furthermore, the topography is not suitable for flooding and this area did not contain surface water indicators such as water stained leaves or waterlines on rocks or woody vegetation (see Photo 11). The latter previously identified vernal pool area does appear to have suitable physical conditions and hydrology to support larval development of obligate vernal pool breeding amphibians. This approximately 10-feet wide by 40-feet long, well-defined depression contained a maximum water depth of 20 inches and average depth was estimated to be 16 inches and had a firm leafy bottom (see Photo 12). However, no evidence of vernal pool breeding of was observed despite a thorough visual survey and multiple dip-nettings.

Several isolated hillside seeps exist on the Site (see Figure 1). These areas are generally cobbly or bouldery side slope features where groundwater is near the soil surface or groundwater breakout areas with shallow sheet flow (see Photos 9 and 10). The isolated hillside seeps do not contain appropriate topography for surface flooding and therefore do not provide suitable breeding habitat for obligate vernal pool species.

Terrestrial Vernal Pool Habitat

Figure 1 shows 100-foot "vernal pool envelopes" and 750-feet "critical upland habitats" surrounding vernal pool breeding areas. GIS aerial imagery were used to determine the land uses surrounding the breeding areas and GIS analysis were used to quantify potential habitat areas within 750 feet of the pools. Table 3 presents approximate land use percentages for each habitat zone. Overall, the existing suitable terrestrial habitat is extensive around each vernal pool, with only sparse residential development near Vernal Pools 2 and 3.

Table 3 Upland Vernal Pool Habitat Percentages

Habitat Zone	Development Category	Vernal Pool 1	Vernal Pool 2	Vernal Pool 3
Vernal Pool Envelope (0-100 ft)	Undeveloped	0%	0%	0%
	Proposed Solar Development	0%	0%	0%
Critical Terrestrial Habitat (100-750 ft)	Undeveloped	95%	100%	100%
	Proposed Solar Development	5%	0%	0%

Table 4 Summary of Onsite Vernal Pools

Pool ID	Approximate Breeding Area (Ft^2)	Permanent Outlet	Hydrology	Obligate Species	Fish Present	Vernal Pool Classification	Tier Rating*
Vernal Pool 1	800	no	temporary	Ambystomatid salamander and wood frog	no	classic	I
Vernal Pool 2	480	no	temporary	wood frog	no	cryptic	III
Vernal Pool 3	600	no	temporary	Ambystomatid salamander	no	cryptic	III

Notes: *Tier ratings determined via completing Vernal Pool Assessment Sheets (Calhoun and Klemens 2002) for each vernal pool.

The proposed solar development will not alter any vernal pool envelopes. However, 4.7 percent of the critical upland area associated with Vernal Pool 1 will be altered. No critical upland areas associated with Vernal Pools 2 and 3 will be altered.

The attached Vernal Pool Assessment Sheets (Calhoun and Klemens 2002) present biological values, habitat conditions, and tier rankings for Vernal Pools 1-3. Table 4 lists square footages for each breeding area , summarizes vernal pool criteria, and lists tier rankings according to the Calhoun and Klemens (2002) Vernal Pool Assessment Sheets. Based on those sheets, Vernal Pool 1 is considered a Tier I breeding area, while cryptic Vernal Pools 2, and 3 are classified as Tier III breeding areas.

Conclusions

During an April 2, 2021 evaluation, VHB identified one classic, isolated vernal pool and two cryptic vernal pools on or near the Project Site. These areas appear to have suitable hydrology for full larval development and metamorphosis of vernal pool breeding amphibians. Table 2 summarizes biological observations for each pool. Another pool that exhibits suitable physical and hydrological conditions did not exhibit biological indicators during 2021 (wetland flags MB 356 through MB 359).

Portions of red maple shrub swamp located in the southern portion of the Site provide diffuse cryptic vernal pool breeding habitat where vernal pool amphibian opportunistically breed within the deeper pockets of the forested wetland system. However, vernal pool breeding conditions within the red maple shrub swamp are sub-optimal and portions of this wetland appear to serve as sinks for vernal pool breeding amphibians. As noted above, breeding attempts within areas that may contain fish or within areas with insufficient water depths are unlikely to be successful.

Please feel free to contact me at (860) 807-4388 or jshamas@vhb.com with any questions or comments.

Sincerely,

Jeffrey Shamas, CE, CSS, PWS
Director of Environmental Services

References:

Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Connecticut Association of Wetland Scientists (CAWS). 2020. Vernal Pool Monitoring webpage: http://ctwetlands.org/vernal-pool-monitoring.html; last accessed 23 April 2020.

Connecticut Department of Energy and Environmental Protection (CT DEEP). 2020. Vernal Pools webpage: https://portal.ct.gov/DEEP/Water/Wetlands/Vernal-Pools; last accessed 23 April 2021.

Donahue, D. F. 1996. A guide to the identification and protection of vernal pool wetlands in Connecticut. University of Connecticut Cooperative Extension Program.

Klemens, M. W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin No. 112, Connecticut Department of Environmental Protection, Hartford, CT.

Figure

Figure 1	**2021 Wetland and Vernal Pool Resources**

Attachments

Attachment 1	Vernal Pool Evaluation Photographs
Attachment 2	Vernal Pool Assessment Sheets (Calhoun and Klemens 2002; 3 sheets: VPs 1-3)

Figure 1 Wetland and Vernal Pool Resources

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LSE Winchester Solar
Platt Hill Road

Winchester, CT

Wetland and Vernal Pool Resources

Legend

- Proposed Limit of Work
- Property Boundary
- Eversource Easement
- 50' Wetland Setback
- Delineated Wetland Edge
- Wetland Resource Area
- Delineated Vernal Pool Area
- Vernal Pool Envelope (VPE) (0-100')
- Critical Terrestrial Habitat (CTH) (100-750 Feet)
- ▨ Isolated Hillside Seep
- Red Maple Shrub Swamp

Attachment 1 Vernal Pool Evaluation Photographs

Photo 1.	Description:
	Southerly view of Vernal Pool 1, perched on a side slope in the northeastern portion of the Site.
Photo 2.	Description:
	Fresh wood frog egg masses observed within Vernal Pool 1.

Photo 3.	Description:
	Ambystomatid salamander spermatophores observed within the southern end of Vernal Pool 1.
Photo 4.	Description:
	Westerly view of Vernal Pool 2 located within the red maple shrub swamp in the southeastern portion of the Site. Seventeen wood frog egg masses were observed within this tree tip-up pool.

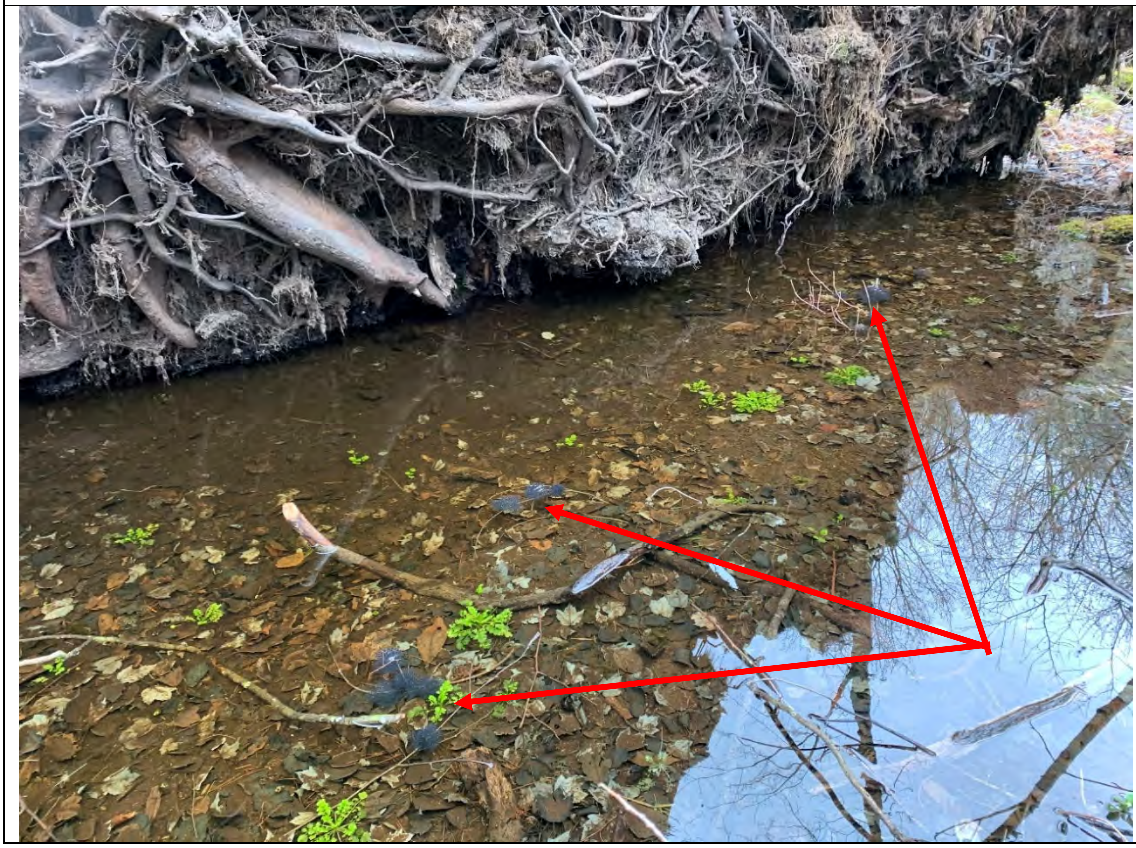
Photo 5.	Description:
	Easterly view of Vernal Pool 3 located within the red maple shrub swamp in the southeastern portion of the Site. Ambystomatid salamander spermatophores were observed within this tree tip-up pool.
Photo 6.	Description:
	Northeasterly view of fresh wood frog egg masses within Vernal Pool 2.

Photo 7.	Description:
	Ambystomatid salamander spermatophores observed within Vernal Pool 3.
Photo 8.	Description:
	Wood frog egg masses observed within the channel of an unnamed stream located along the eastern Site boundary within the red maple shrub swamp.

<table>
<tr><td>Photo 9.</td><td>Description:</td></tr>
<tr><td></td><td>Southerly view of the unnamed stream located along the eastern Site boundary within the red maple shrub swamp.</td></tr>
<tr><td>Photo 10.</td><td>Description:</td></tr>
<tr><td></td><td>Ambystomatid salamander spermatophores observed within the red maple shrub swamp. Given their unusually shallow or emergent positions, these male reproductive structures are non-likely to be functional and will become desiccated. The spermatophores were most likely deposited during a brief period when the water was deeper.</td></tr>
</table>

Photo 11.	Description:
	Southwesterly view of a small hillside seep that was previously delineated by wetland flags MB 352 through MB 355. This area was previously identified as a potential vernal pool by others. However, this wetland does not have suitable hydrology to support vernal pool breeding, because the topography does not allow flooding. No surface water indicators such as water stained leaves or waterlines were observed either.
Photo 12.	Description:
	Southwesterly view of the isolated wetland that was delineated with wetland flags MB 356 through MB 359. This wetland appears to have suitable physical and hydrological conditions to support larval development of obligate vernal pool breeding amphibians. However, no biological vernal pool indicators were observed.

Photo 13.	Description:
	Westerly view of the isolated hillside seep delineated by wetland flags MB 660- MB 665. This is one of several hillside seeps on the Site. These areas do not contain appropriate topography for surface flooding and therefore do not provide suitable breeding habitat for obligate vernal pool species.
Photo 14.	Description:
	Northwesterly view of the isolated hillside seep delineated by wetland flags MB 600- MB 613. This area does not contain appropriate topography for surface flooding and does not provide suitable vernal pool breeding habitat.

Attachment 2 Vernal Pool Assessment Sheets

(Winchester, CT) VP1

VERNAL POOL ASSESSMENT SHEET

A. Biological Value of the Vernal Pool

(1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?
Yes______ No_____X_____

(2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?
Yes___X___ No__________

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes______ No_____X_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes___X___ No__________

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes___X___ No________

NOTE: For these purposes, "undeveloped" means open land largely free of roads, structures, and other infrastructure. It can be forested, partially forested, or open agricultural land.

Cumulative Assessment

Number of questions answered YES in category A	Number of questions answered YES in category B	Tier Rating
[✓ 1-3]	[✓ 2]	[✓ Tier I]
1-3	1	Tier II
0	1-2	Tier III
1-3	0	Tier III

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

(Winchester, CT) VP2

VERNAL POOL ASSESSMENT SHEET

A. Biological Value of the Vernal Pool

(1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?

Yes______ No_____X_____

(2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?

Yes______ No_____X_____

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?

Yes______ No_____X_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?

Yes___X___ No__________

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?

Yes___X___ No________

NOTE: For these purposes, "undeveloped" means open land largely free of roads, structures, and other infrastructure. It can be forested, partially forested, or open agricultural land.

Cumulative Assessment

Number of questions answered YES in category A	Number of questions answered YES in category B	Tier Rating
1-3	2	Tier I
1-3	1	Tier II
[✓ 0]	[✓ 1-2]	[✓ Tier III]
1-3	0	Tier III

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

VERNAL POOL ASSESSMENT SHEET

A. Biological Value of the Vernal Pool

(1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?
Yes______ No_____X_____

(2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?
Yes______ No_____X_____

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes______ No_____X_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes___X___ No__________

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes___X___ No________

NOTE: For these purposes, "undeveloped" means open land largely free of roads, structures, and other infrastructure. It can be forested, partially forested, or open agricultural land.

Cumulative Assessment

Number of questions answered YES in category A	Number of questions answered YES in category B	Tier Rating
1-3	2	Tier I
1-3	1	Tier II
[✓ 0]	[✓ 1-2]	[✓ Tier III]
1-3	0	Tier III

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

EXHIBIT 4

STORMWATER MANAGEMENT REPORT
1.99 MW SOLAR ARRAY
PLATT HILL ROAD
WINCHESTER – CONNECTICUT
PREPARED FOR LSE PICTOR LLC
DECEMBER 22, 2020
Revised: 3/25/21

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Stormwater Management Report – Lodestar Energy – Platt Hill Road – Winchester, Connecticut

Date: December 22, 2020, Revised: 3/25/21

Existing Conditions

The site of the proposed solar array is located on the former Trade Winds Farm Subdivision, which contained 24 lots developed under the Open Space regulations of the Town of Winchester. Trade Winds Farm, LLC is maintaining ownership of the three approved lots which front on Platt Hill Road. The remaining portion of the site is being sold to Maitland Energy, LLC which will then lease a portion of the site to Lodestar Energy for the solar array.

The site consists of overgrown meadow, brush area mostly located in the western portion of the site. The balance of the site is wooded with a mixture of northern hardwood species and a small concentration of white pines in the southeastern portion of the site.

Proposed Conditions

A parcel containing 20.8 acres for the solar array is being created with the required minimum lot width onto Platt Hill Road. An open space parcel of 75.0 acres will surround the solar array and will be given to the Winchester Land Trust for preservation in perpetuity.

The solar array will be in the south-central portion of the site. A gravel driveway, 12' in width will provide access to the array from Platt Hill Road. The driveway will cross two small intermittent streams, found in the western portion of the site in the same locations as the road for the subdivision was approved. The initial 900'+ of the driveway will have a 2.5% cross slope to allow runoff from the gravel driveway to sheet off as overland flow into the adjacent upland areas where it will infiltrate into the undisturbed soils.

A "T" intersection is proposed just to the west of the solar array to allow for the turning movements of trailer trucks which will deliver the photovoltaic panels and support systems for installation. The driveway will then go south to a smaller parking area of approximately 900 square feet (gravel surface).

There are 1.25 acres if 15% slopes on the site in the area of the array. The proposed solar array, consisting of 24 rows of panels, containing 7,288 panels is located on the west and east sides of the central ridgeline/slope on slopes less than 15.0%. There is a 15' spacing between the panel rows. The area of the solar array is 8.0 acres. The cleared areas to the west, east and south of the actual array is 5.6 acres.

Stumps will be removed from the area of the actual array. The areas under and between the solar panels will be seeded with "New England Semi-Shade Grass and Forbs Mix" from New England Wetland Plants (www.newp.com/catalog/seed-mixes/#erosionDry) . This seed mix is a low mow and maintenance species. The stumps will remain in the cleared areas. The ground within the cleared areas outside the area of the array will be seeded with "New England Wildflower Mix" by New England Wetland Plants ((www.newp.com/catalog/seed-mixes/#erosionDry) to provide a food source for pollinator species. Both seed mixtures are provided on the project plan set.

The soil types as determined by Mr. Beroz in the area of the solar array are Paxton, which are Hydrologic Soil Class C in TR-55. As part of the subdivision, 150 deep test holes were done to determine the suitability for on-site sewage disposal systems. Many of these test holes are in the area of the solar array and are approximately 7' in depth. The results of the test holes in and near the proposed solar array are shown in Appendix "A" of this report

Stormwater Management

The design of the stormwater management collection, treatment and detention system fully complies with the requirements found in Appendix "I" of the Connecticut General Permit by the CT DEEP. First, the solar panels are considered impervious (RCN of 98), the gravel driveway is also considered impervious with a slightly lower RCN as the top 4" layer of gravel will be washed (RCN of 96) and thus porous, while the 8" base of the driveway will be compacted processed stone.

The ground cover under and between the rows of panels were considered as Lawn, Fair Condition on Class D soils (required by Appendix "I" by CT DEEP) as there will be some disturbance of the soil surface (removal of stumps, debris) even though no other grading of these soils being proposed for this solar array. The Fair condition was used to be conservative as it takes a minimum of two full years for the vegetation to become fully established and thus initially after the installation of the array, the rate and volume of runoff will be higher.

Runoff from the area of the solar array will drain as overland flow in two directions. Runoff from the center of the array will follow the ridgeline to the south and then will taper to the southwest toward the western grass swale or to the southeast toward the eastern grass swale. Both swale systems will direct runoff to one or two constructed wetland stormwater management practices as shown on the site plan.

The parabolic grass swales will have stone check dams at variable intervals (dependent upon the slope) which will reduce flow velocities while safely conveying the peak rate of runoff generated by the 10-year rainfall event as required by the CT DEP 2004 Storm Water Quality Manual "2004 Manual". Manning's Equation was used to compute the depth of flow and velocity in the swales. Computations are provided later in this report.

Intermittent Stream Crossings

6' x 3' bottomless box culverts will be used to cross the two intermittent stream crossing to provide access from Platt Hill Road to the solar array.

Stormwater Treatment/Detention

To maintain the natural hydrologic conditions on the site, two stormwater basins are being provided. Basin #1 is located downhill and south of the southwest corner of the solar array and will accept runoff from the western grass swale. The discharge from Basin #1, the spillway, and outlet level spreader are located more than 50’ from the delineated inland wetland boundary. The level spreader consists of a 4’ x 4’ trench filled with native field stones. A concrete lip (level spreader) is proposed on the downhill side of the trench and will ensure that any runoff which does not infiltrate into the underlying soils will occur as uniform flow over the entire length of the concrete spreader (100’).

Basin #2 is located downhill of the southeast corner of the solar array and will accept runoff from the eastern grass swale. The discharge from this basin will be directed to a stone filled trench with a level, uniform concrete lip to ensure that the concentrated flow to the stone filled trench will be discharged as overland flow onto the undisturbed forested slope below the stone filled trench. Basin #2 will maintain hydrologic drainage area which is tributary to the wetland system located at the bottom of the slope along the eastern perimeter boundary of the site. Both Basins will be Constructed Wetland systems which have been designed in compliance with CT DEP 2004 Storm Water Quality Manual.

Basin #1 has a 6’ deep forebay providing 2,057 cubic feet of storage which is 39% of the calculated Water Quality Volume (WQV) per the 2004 Manual. The forebay, located in the northeast corner of the system will trap any sediment which is not trapped within the west grassed swale. Basin #1 will have a permanent pool which is 12” in depth and will provide 4,352 cubic feet of storage below the lowest outlet orifice. When combined with the forebay volume, 121% of the calculated WQV will be provided, thus exceeding the requirements of the 2004 Manual. The outlet structure is in the southwest corner of the system. In order to provide a higher level of treatment of the runoff, a series of 3’ wide by 8” high earth berms will be installed in the bottom of the system to increase the flow path from inlet to outlet, thus increasing the contact time between the runoff and vegetation within the bottom of the basin.

Basin #2 also has a forebay in addition to the two grassed depressed areas along the eastern swale which will also function as traps for any fine sediments. Similar to Basin #1, low earth berms will be constructed across the bottom of Basin #2 to enhance the pollutant removal. Also, like Basin #1, there will be a permanent pool which is 12” in depth and will provide a volume of 4,922 cubic feet which exceeds the WQV of 4,693 cubic feet.

Appendix “I” requires that a zero increase in the peak rate of runoff is achieved for all design storms. The criteria has been achieved and the results are provided in Tables 3 and 4 below.

Literature and other solar arrays in Connecticut have shown that runoff volumes are significantly increased over pre-development conditions. These increased runoff volumes when discharged to receiving streams have caused erosion of the native channel and downstream sedimentation of the eroded material. To address the increased runoff volumes, the outlet structure of both Basin #1 and Basin #2 been designed to provide the Channel Protection Volume (CPV) found in the 2004 Manual. The CPV requires the reduction of the post-development peak rate for the 2-year storm to be reduced to 50% of the pre-development peak rate for the 2-year storm.

The bottom of the basin and berms will be seeded with New England Wetmix by New England Wetland Plants (www.newp.com/catalog/seed-mixes/#erosionDry). The side slopes of the basin shall be seeded with New England Erosion Control/Restoration Mix for Detention Basins and Moist sites by New England Wetland Plants(www.newp.com/catalog/seed-mixes/#erosionDry) .

The design of the constructed wetland will provide the following aspects:

a. Reduction of non-point source pollutants loads by having a permanent pool, vegetated bottom and long flow paths,
b. The peak rate for the 2-year event will be reduced from 9.13 cfs to 2.16 cfs in Basin #1 and from 8.10 cfs to 1.36 cfs in Basin #2, thus exceeding the requirements of the Channel Protection Volume found in the 2004 Manual.
c. Zero increase in the peak rate of runoff is provided for the WQ Storm, 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year rainfall events. It is important to understand that 90% of the annual rainfall events are less than 1" of rainfall in 24 hours and that 98% of the annual rainfall events are less than 3.48" of rainfall in 24 hours (2-year storm) when long term rainfall events are evaluated. It is most important from a peak rate and runoff volume perspective to focus on those storms equal to or less than the 2-year event to prevent adverse environmental impacts to receiving streams.

Table 1 shows the increase in peak rates of runoff from the solar array

Storm Event	Pre-development	Post-development	Net Change
WQ storm	0.03 cfs	0.73 cfs	+0.70 cfs
1-year	5.30 cfs	12.89 cfs	+7.59 cfs
2-year	9.38 cfs	19.59 cfs	+10.21 cfs
5-year	17.00 cfs	31.16 cfs	+14.16 cfs
10-year	23.92 cfs	41.10 cfs	+17.18 cfs
25-year	33.90 cfs	54.91 cfs	+21.01 cfs
50-year	41.28 cfs	64.87 cfs	+23.59 cfs
100-year	49.72 cfs	76.11 cfs	+26.39 cfs

Table 2 shows the increase in runoff volumes from the solar array

Storm Event	Pre-development	Post-development	Net Change
WQ storm	0.019 acre-feet	0.129 acre-feet	+0.11 acre-feet
1-year	0.790 acre-feet	1.333 acre-feet	+0.543 acre-feet
2-year	1.313 acre-feet	1.959 acre-feet	+0.646 acre-feet
5-year	2.300 acre-feet	3.175 acre-feet	+0.875 acre-feet
10-year	3.205 acre-feet	4.205 acre-feet	+1.000 acre-feet
25-year	4.528 acre-feet	5.665 acre-feet	+1.137 acre-feet
50-year	5.519 acre-feet	6.736 acre-feet	+1.217 acre-feet
100-year	6.666 acre-feet	7.959 acre-feet	+1.293 acre-feet

Table 3 shows the reductions of peak rates of runoff from Constructed Wetlands – Basin #1

Storm Event	Post to CW	CW Discharge	Net Change
WQ storm	0.79 cfs	0.05 cfs	-0.74 cfs
1-year	6.40 cfs	2.83 cfs	-3.57 cfs
2-year	**9.13 cfs**	**4.78 cfs**	**-4.35 cfs**
5-year	13.68 cfs	8.02 cfs	-5.66 cfs
10-year	17.49 cfs	10.49 cfs	-7.00 cfs
25-year	22.72 cfs	17.07 cfs	-5.65 cfs
50-year	26.46 cfs	21.80 cfs	-4.66 cfs
100-year	30.67 cfs	27.20 cfs	-3.47 cfs

Table 4 shows the reductions of peak rates of runoff from Constructed Wetlands – Basin #2

Storm Event	Post to CW	CW Discharge	Net Change
WQ storm	0.61 cfs	0.00 cfs	-0.61 cfs
1-year	5.61 cfs	0.71 cfs	-4.90 cfs
2-year	**8.10 cfs**	**1.36 cfs**	**-6.74 cfs**
5-year	12.28 cfs	2.68 cfs	-9.60 cfs
10-year	15.79 cfs	3.89 cfs	-11.90 cfs
25-year	20.62 cfs	9.06 cfs	-11.56 cfs
50-year	24.08 cfs	14.62 cfs	-9.46 cfs
100-year	27.97 cfs	17.35 cfs	-10.62 cfs

Table 5 Post-development Peak Rates of runoff at Taylor Brook

Storm Event	Pre-development	Post-development	Net Change
WQ storm	0.03 cfs	0.05 cfs	+0.02 cfs
1-year	5.30 cfs	3.33 cfs	-1.97 cfs
2-year	**9.38 cfs**	**5.99 cfs**	**-3.39 cfs**
5-year	17.00 cfs	10.42 cfs	-6.58 cfs
10-year	23.92 cfs	13.94 cfs	-9.98 cfs
25-year	33.90 cfs	22.93 cfs	-10.97 cfs
50-year	41.28 cfs	34.54 cfs	-6.74 cfs
100-year	49.72 cfs	43.55 cfs	-6.17 cfs

WATER QUALITY VOLUME CALCULATION:
BASIN #1:
WQV = (1”)(Rv)(A)/12, WHERE Rv = 0.05 + 0.009 (I)
A = 4.68 acres
I = 1.37 acres (29.2%)
Rv = 0.05 + 0.009 (29.2) = 0.31
WQV = (1)(0.31)(4.68)/12 = 0.1209 acre-feet = 5,266 cubic feet

WATER QUALITY VOLUME CALCULATION:
BASIN #2:
WQV = (1”)(Rv)(A)/12, WHERE Rv = 0.05 + 0.009 (I)
A = 4.31 acres
I = 1.22 acres (28.3%)
Rv = 0.05 + 0.009 (28.3) = 0.30
WQV = (1)(0.30)(4.31)/12 = 0.1077 acre-feet = 4,693 cubic feet

GROUNDWATER RECHARGE VOLUME CALCULATION (WEST SWALE):
GRV = (D)(A)(I)/12
A = 4.68 acres
I = 1.37 acres (0.292)
D = 0.10 (Class C soils)
GRV = (0.10)(4.68)(0.292)/12 = 0.0113 acre-feet = 496 cubic feet

GROUNDWATER RECHARGE VOLUME CALCULATION (EAST SWALE):
GRV = (D)(A)(I)/12
A = 4.31 acres
I = 1.22 acres (0.283)
D = 0.10 (Class C soils)
GRV = (0.10)(4.31)(0.283)/12 = 0.0101 acre-feet = 443 cubic feet

CAPACITY CALCULATION OF PARABOLIC GRASS AND RIPRAP SWALES:

BOTH SWALES HAVE A TOP WIDTH = 8.0’ AND A CENTERLINE DEPTH OF 2.0’

AVERAGE SLOPE - WEST SWALE = 3.06%, Q = 17.49 CFS (10-year storm)
Depth of flow = 0.92’, Flow velocity = 3.63 fps, Full flow capacity = 115.35 cfs
Flow rate for Water Quality Storm = 0.79 cfs
Depth of flow = 0.28’, Flow velocity = 0.53 fps

AVERAGE SLOPE – EAST SWALE = 2.50%, Q = 15.79 CFS (10-year storm)
Depth of flow = 0.91’, Flow velocity = 3.22 fps, Full flow capacity = 104.27 cfs
Flow rate for Water Quality Storm = 0.61 cfs
Depth of flow = 0.27’, Flow velocity = 0.45 fps

Discussion of Water Quality Systems:

There are many types of stormwater treatment systems found in the CT DEP 2004 Storm Water Manual to reduce non-point source pollutant loads. The practices can be divided into two general categories; those systems which are dry and will fully infiltrate the required Water Quality Volume (WQV) and those which have a wetland or open water component.

Infiltration practices include infiltration basins, underground gallery systems, infiltration trenches, Sand Filters, Bioretention systems, Bioswales, and dry detention ponds. With the exception of a dry detention pond, the key commonality for all other dry systems is that they must be located in deep, very well drained soils where a minimum of 30” can be provided between the bottom of the practice and seasonal high ground water to allow for the WQV to fully infiltrate. Infiltration practices are only suitable for the treatment and infiltration of the WQV and are not designed to handle runoff from rainfall events which are larger than the water quality storm (1”/24 hours). Other practices must be used after an infiltration practice to provide peak rate and runoff attenuations per the 2004 Manual.

Dry detention ponds are not effective at reducing non-point source pollutant loads but can be used for the reduction in the peak rate and volume of runoff. All other infiltration practices are used primarily to reduce non-point source pollutant loads by treating the WQV only and meeting the Groundwater Recharge Volume (GRV) for the water quality storm event.

Wet practices consist of various types of ponds, such as micro-pool extended detention ponds, wet pond, wet extended detention pond, pocket pond, and multiple pond systems and wetland systems, such as shallow wetlands, extended detention wetlands, pond/wetland system. The key commonality of these wet practices is that the bottom of these practices must be located below the seasonal high groundwater table in order to maintain the saturated conditions in the practice.

All types of wet practices are very effective at reducing non-point source pollutant loads as well as meeting peak rate and volume reduction requirements. The most commonly used wet practices are the wetland systems as require very little maintenance and do not have large, deep open water components. Wet ponds and other pond systems have a permanent pool of open water with variable depths as their primary treatment component. However, the water found in the permanent pool will become heated by the sun and when discharged has a higher temperature than the receiving wetland or watercourse and this will increase the temperature of the water in the wetland or watercourse which will adversely affect aquatic species which live in these systems.

On this site there are not deep well drained soils found in the area of the proposed array so infiltration practices are not appropriate to treat the runoff from the proposed solar array. If they were to be proposed on this site, they would not function properly as there would not be an unsaturated zone under the practice into which runoff could infiltrate.

The soils in the area of the array have a hardpan layer approximately 24” below the ground surface. The presence of the hardpan layer creates a perched seasonal high groundwater table on top of the hardpan layer. The material in the hardpan layer consist of silts, clay and sometimes, fine gravel which is highly compacted and is simply impermeable to the vertical or horizontal movement of water within this soil layer which causes the perched groundwater table.

Because of the high seasonal groundwater table, only wet practices are suitable on this site to reduce non-point source pollutant loads.

The two constructed wetland systems proposed here have a forebay to trap sediments, a shallow permanent pool (< 12” in depth), low earth berms to lengthen the flow path within the bottom of the basin and increase the contact time between the runoff and the vegetation and soils on the bottom of the basin and is densely planted with native wetland plants which provides an environmental which not only greatly reducing non-point source pollutant loads but does not allow the water in the constructed wetland to heat up and the water surface is covered with the native plants.

This project proposes to use both wet swales (on both sides of the array) and a constructed wetland system at the end of both swales to treat the runoff from the area of the array. There will be minimal sediment loads under post-development conditions as no sand will be applied to any impervious surface. The primary pollutants are nutrients (nitrogen and phosphorous) from both atmospheric deposition on the solar panels and the decomposition of vegetation under and around the array as well as small amounts of metals which may leach from the metal components of the racking system if any rainfall is slightly acidic. The CT DEP goal of reducing the TSS concentration in post-development runoff by 80% will easily be achieved as the TSS removal efficiency for a wet swale is 73% and 75% for the constructed wetland as standalone treatment system.

SOLAR ARRAY – PRE-DEVELOPMENT

WQ STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 0.03 cfs @ 15.55 hrs, Volume= 0.019 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.00"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

1-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 5.30 cfs @ 12.55 hrs, Volume= 0.790 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-year Rainfall=2.74"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

2-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 9.38 cfs @ 12.52 hrs, Volume= 1.313 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.48"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

5-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 17.00 cfs @ 12.50 hrs, Volume= 2.300 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-year Rainfall=4.69"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

10-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 23.92 cfs @ 12.49 hrs, Volume= 3.205 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.70"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

25-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 33.90 cfs @ 12.48 hrs, Volume= 4.528 af, Depth> 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=7.09"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

50-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 41.28 cfs @ 12.48 hrs, Volume= 5.519 af, Depth> 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=8.09"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

100-YEAR STORM

Summary for Subcatchment 3S: Solar Array Area - PRE

Runoff = 49.72 cfs @ 12.48 hrs, Volume= 6.666 af, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=9.22"

Area (sf)	CN	Description
593,934	73	Woods, Fair, HSG C
593,934		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	100	0.0200	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.48"
6.5	483	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.5	631	0.0790	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
34.6	1,214	Total			

SOLAR ARRAY – POST-DEVELOPMENT
WQ STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 0.73 cfs @ 12.43 hrs, Volume= 0.129 af, Depth> 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.00"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,**
					Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,**
					Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,**
					Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

1-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 12.89 cfs @ 12.26 hrs, Volume= 1.333 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-year Rainfall=2.74"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,**
					Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,**
					Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,**
					Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

2-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

```
Runoff    =     19.59 cfs @   12.26 hrs,  Volume=         1.999 af,  Depth>  1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  2-year Rainfall=3.48"

      Area (sf)   CN   Adj  Description
-----------------------------------------------------------------------------
         10,000   96        Gravel surface, HSG D
        142,952   98        Unconnected pavement, HSG D
        270,008   84        50-75% Grass cover, Fair, HSG D
        170,974   71        Meadow, non-grazed, HSG C
-----------------------------------------------------------------------------
        593,934   84    82  Weighted Average, UI Adjusted
        450,982             75.93% Pervious Area
        142,952             24.07% Impervious Area
        142,952             100.00% Unconnected

    Tc  Length     Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
-----------------------------------------------------------------------------
  13.7     100  0.0200      0.12              Sheet Flow,
                                              Grass: Dense   n= 0.240   P2= 3.48"
   2.2     483  0.0620      3.73              Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
   2.5     631  0.0790      4.22              Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
-----------------------------------------------------------------------------
  18.4   1,214  Total
```

5-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

```
Runoff    =     31.16 cfs @   12.25 hrs,  Volume=         3.175 af,  Depth>  2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  5-year Rainfall=4.69"

      Area (sf)   CN   Adj  Description
-----------------------------------------------------------------------------
         10,000   96        Gravel surface, HSG D
        142,952   98        Unconnected pavement, HSG D
        270,008   84        50-75% Grass cover, Fair, HSG D
        170,974   71        Meadow, non-grazed, HSG C
-----------------------------------------------------------------------------
        593,934   84    82  Weighted Average, UI Adjusted
        450,982             75.93% Pervious Area
        142,952             24.07% Impervious Area
        142,952             100.00% Unconnected

    Tc  Length     Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
-----------------------------------------------------------------------------
  13.7     100  0.0200      0.12              Sheet Flow,
                                              Grass: Dense   n= 0.240   P2= 3.48"
   2.2     483  0.0620      3.73              Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
   2.5     631  0.0790      4.22              Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
-----------------------------------------------------------------------------
  18.4   1,214  Total
```

10-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 41.10 cfs @ 12.25 hrs, Volume= 4.205 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.70"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

25-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 54.91 cfs @ 12.25 hrs, Volume= 5.665 af, Depth> 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=7.09"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

50-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 64.87 cfs @ 12.25 hrs, Volume= 6.736 af, Depth> 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=8.09"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

100-YEAR STORM

Summary for Subcatchment 4S: Solar Array Area - POST

Runoff = 76.11 cfs @ 12.25 hrs, Volume= 7.959 af, Depth> 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=9.22"

Area (sf)	CN	Adj	Description
10,000	96		Gravel surface, HSG D
142,952	98		Unconnected pavement, HSG D
270,008	84		50-75% Grass cover, Fair, HSG D
170,974	71		Meadow, non-grazed, HSG C
593,934	84	82	Weighted Average, UI Adjusted
450,982			75.93% Pervious Area
142,952			24.07% Impervious Area
142,952			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
18.4	1,214	Total			

SOLAR ARRAY WEST SWALE
WQ STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 0.79 cfs @ 12.23 hrs, Volume= 0.087 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.00"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

1-YEAR STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 6.40 cfs @ 12.20 hrs, Volume= 0.589 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-year Rainfall=2.74"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

2-YEAR STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 9.13 cfs @ 12.20 hrs, Volume= 0.843 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.48"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

5-YEAR STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 13.68 cfs @ 12.19 hrs, Volume= 1.276 af, Depth> 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-year Rainfall=4.69"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

10-YEAR STORM

```
                    Summary for Subcatchment 7S: Solar Array - West Swale

Runoff     =      17.49 cfs @   12.19 hrs,  Volume=          1.647 af,  Depth>  4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  10-year Rainfall=5.70"

         Area (sf)    CN    Adj   Description
---------------------------------------------------------------------------------
             9,000    96          Gravel surface, HSG D
            59,557    98          Unconnected pavement, HSG D
*          135,419    84          Meadow in array area, Fair, HSG D
---------------------------------------------------------------------------------
           203,976    89     87   Weighted Average, UI Adjusted
           144,419                70.80% Pervious Area
            59,557                29.20% Impervious Area
            59,557                100.00% Unconnected

    Tc   Length    Slope  Velocity  Capacity  Description
 (min)   (feet)   (ft/ft)  (ft/sec)     (cfs)
---------------------------------------------------------------------------------
   9.4      100   0.0200      0.18            Sheet Flow,
                                              Grass: Short   n= 0.150   P2= 3.48"
   2.2      483   0.0620      3.73            Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
   2.5      631   0.0790      4.22            Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
---------------------------------------------------------------------------------
  14.1    1,214   Total
```

25-YEAR STORM

```
                    Summary for Subcatchment 7S: Solar Array - West Swale

Runoff     =      22.72 cfs @   12.19 hrs,  Volume=          2.168 af,  Depth>  5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  25-year Rainfall=7.09"

         Area (sf)    CN    Adj   Description
---------------------------------------------------------------------------------
             9,000    96          Gravel surface, HSG D
            59,557    98          Unconnected pavement, HSG D
*          135,419    84          Meadow in array area, Fair, HSG D
---------------------------------------------------------------------------------
           203,976    89     87   Weighted Average, UI Adjusted
           144,419                70.80% Pervious Area
            59,557                29.20% Impervious Area
            59,557                100.00% Unconnected

    Tc   Length    Slope  Velocity  Capacity  Description
 (min)   (feet)   (ft/ft)  (ft/sec)     (cfs)
---------------------------------------------------------------------------------
   9.4      100   0.0200      0.18            Sheet Flow,
                                              Grass: Short   n= 0.150   P2= 3.48"
   2.2      483   0.0620      3.73            Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
   2.5      631   0.0790      4.22            Shallow Concentrated Flow,
                                              Grassed Waterway   Kv= 15.0 fps
---------------------------------------------------------------------------------
  14.1    1,214   Total
```

50-YEAR STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 26.46 cfs @ 12.19 hrs, Volume= 2.546 af, Depth> 6.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=8.09"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

100-YEAR STORM

Summary for Subcatchment 7S: Solar Array - West Swale

Runoff = 30.67 cfs @ 12.19 hrs, Volume= 2.976 af, Depth> 7.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=9.22"

	Area (sf)	CN	Adj	Description
	9,000	96		Gravel surface, HSG D
	59,557	98		Unconnected pavement, HSG D
*	135,419	84		Meadow in array area, Fair, HSG D
	203,976	89	87	Weighted Average, UI Adjusted
	144,419			70.80% Pervious Area
	59,557			29.20% Impervious Area
	59,557			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

SOLAR ARRAY EAST SWALE

WQ STORM

Summary for Subcatchment 8S: Solar Array - East Swale

Runoff = 0.61 cfs @ 12.24 hrs, Volume= 0.071 af, Depth> 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.00"

Area (sf)	CN	Adj	Description
53,395	98		Unconnected pavement, HSG D
134,589	84		50-75% Grass cover, Fair, HSG D
187,984	88	86	Weighted Average, UI Adjusted
134,589			71.60% Pervious Area
53,395			28.40% Impervious Area
53,395			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

1-YEAR STORM

Summary for Subcatchment 8S: Solar Array - East Swale

Runoff = 5.61 cfs @ 12.20 hrs, Volume= 0.517 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-year Rainfall=2.74"

Area (sf)	CN	Adj	Description
53,395	98		Unconnected pavement, HSG D
134,589	84		50-75% Grass cover, Fair, HSG D
187,984	88	86	Weighted Average, UI Adjusted
134,589			71.60% Pervious Area
53,395			28.40% Impervious Area
53,395			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

2-YEAR STORM

Summary for Subcatchment 8S: Solar Array - East Swale

Runoff = 8.10 cfs @ 12.20 hrs, Volume= 0.746 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.48"

Area (sf)	CN	Adj	Description
53,395	98		Unconnected pavement, HSG D
134,589	84		50-75% Grass cover, Fair, HSG D
187,984	88	86	Weighted Average, UI Adjusted
134,589			71.60% Pervious Area
53,395			28.40% Impervious Area
53,395			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

5-YEAR STORM

Summary for Subcatchment 8S: Solar Array - East Swale

Runoff = 12.28 cfs @ 12.19 hrs, Volume= 1.141 af, Depth> 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-year Rainfall=4.69"

Area (sf)	CN	Adj	Description
53,395	98		Unconnected pavement, HSG D
134,589	84		50-75% Grass cover, Fair, HSG D
187,984	88	86	Weighted Average, UI Adjusted
134,589			71.60% Pervious Area
53,395			28.40% Impervious Area
53,395			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0200	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.48"
2.2	483	0.0620	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	631	0.0790	4.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.1	1,214	Total			

10-YEAR STORM

```
                       Summary for Subcatchment 8S: Solar Array - East Swale

Runoff      =       15.79 cfs @   12.19 hrs,  Volume=           1.480 af,  Depth>  4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  10-year Rainfall=5.70"

      Area (sf)   CN   Adj   Description
---------------------------------------------------------------------------------
         53,395   98         Unconnected pavement, HSG D
        134,589   84         50-75% Grass cover, Fair, HSG D
---------------------------------------------------------------------------------
        187,984   88    86   Weighted Average, UI Adjusted
        134,589              71.60% Pervious Area
         53,395              28.40% Impervious Area
         53,395              100.00% Unconnected

    Tc  Length    Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
---------------------------------------------------------------------------------
   9.4     100   0.0200      0.18            Sheet Flow,
                                             Grass: Short   n= 0.150   P2= 3.48"
   2.2     483   0.0620      3.73            Shallow Concentrated Flow,
                                             Grassed Waterway   Kv= 15.0 fps
   2.5     631   0.0790      4.22            Shallow Concentrated Flow,
                                             Grassed Waterway   Kv= 15.0 fps
---------------------------------------------------------------------------------
  14.1   1,214   Total
```

25-YEAR STORM

```
                       Summary for Subcatchment 8S: Solar Array - East Swale

Runoff      =       20.62 cfs @   12.19 hrs,  Volume=           1.957 af,  Depth>  5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  25-year Rainfall=7.09"

      Area (sf)   CN   Adj   Description
---------------------------------------------------------------------------------
         53,395   98         Unconnected pavement, HSG D
        134,589   84         50-75% Grass cover, Fair, HSG D
---------------------------------------------------------------------------------
        187,984   88    86   Weighted Average, UI Adjusted
        134,589              71.60% Pervious Area
         53,395              28.40% Impervious Area
         53,395              100.00% Unconnected

    Tc  Length    Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
---------------------------------------------------------------------------------
   9.4     100   0.0200      0.18            Sheet Flow,
                                             Grass: Short   n= 0.150   P2= 3.48"
   2.2     483   0.0620      3.73            Shallow Concentrated Flow,
                                             Grassed Waterway   Kv= 15.0 fps
   2.5     631   0.0790      4.22            Shallow Concentrated Flow,
                                             Grassed Waterway   Kv= 15.0 fps
---------------------------------------------------------------------------------
  14.1   1,214   Total
```

50-YEAR STORM

Summary for Subcatchment 8S: Solar Array - East Swale

```
Runoff      =       24.08 cfs @   12.19 hrs,  Volume=          2.304 af,  Depth>  6.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  50-year Rainfall=8.09"

      Area (sf)   CN    Adj   Description
-----------------------------------------------------------------------------
         53,395   98          Unconnected pavement, HSG D
        134,589   84          50-75% Grass cover, Fair, HSG D
-----------------------------------------------------------------------------
        187,984   88     86   Weighted Average, UI Adjusted
        134,589               71.60% Pervious Area
         53,395               28.40% Impervious Area
         53,395               100.00% Unconnected

    Tc  Length    Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
-----------------------------------------------------------------------------
   9.4     100   0.0200      0.18            Sheet Flow,
                                             Grass: Short   n= 0.150   P2= 3.48"
   2.2     483   0.0620      3.73            Shallow Concentrated Flow,
                                             Grassed Waterway  Kv= 15.0 fps
   2.5     631   0.0790      4.22            Shallow Concentrated Flow,
                                             Grassed Waterway  Kv= 15.0 fps
-----------------------------------------------------------------------------
  14.1   1,214   Total
```

100-YEAR STORM

Summary for Subcatchment 8S: Solar Array - East Swale

```
Runoff      =       27.97 cfs @   12.19 hrs,  Volume=          2.698 af,  Depth>  7.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr  100-year Rainfall=9.22"

      Area (sf)   CN    Adj   Description
-----------------------------------------------------------------------------
         53,395   98          Unconnected pavement, HSG D
        134,589   84          50-75% Grass cover, Fair, HSG D
-----------------------------------------------------------------------------
        187,984   88     86   Weighted Average, UI Adjusted
        134,589               71.60% Pervious Area
         53,395               28.40% Impervious Area
         53,395               100.00% Unconnected

    Tc  Length    Slope  Velocity  Capacity  Description
 (min)  (feet)   (ft/ft)  (ft/sec)     (cfs)
-----------------------------------------------------------------------------
   9.4     100   0.0200      0.18            Sheet Flow,
                                             Grass: Short   n= 0.150   P2= 3.48"
   2.2     483   0.0620      3.73            Shallow Concentrated Flow,
                                             Grassed Waterway  Kv= 15.0 fps
   2.5     631   0.0790      4.22            Shallow Concentrated Flow,
                                             Grassed Waterway  Kv= 15.0 fps
-----------------------------------------------------------------------------
  14.1   1,214   Total
```

BASIN #1 - CONSTRUCTED WETLAND ROUTING RESULTS: WQ STORM

```
                    Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area =       4.683 ac,  29.20% Impervious,  Inflow Depth >   0.22"    for  WQ Storm event
Inflow       =      0.79 cfs @   12.23 hrs,  Volume=           0.087 af
Outflow      =      0.05 cfs @   17.18 hrs,  Volume=           0.027 af,  Atten= 94%,  Lag= 297.0 min
Primary      =      0.05 cfs @   17.18 hrs,  Volume=           0.027 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,287.13' @ 17.18 hrs   Surf.Area= 2,760 sf   Storage= 2,708 cf

Plug-Flow detention time= 417.3 min calculated for 0.027 af (31% of inflow)
Center-of-Mass det. time= 263.8 min ( 1,153.5 - 889.8 )

Volume        Invert      Avail.Storage   Storage Description
   #1       1,286.00'          24,829 cf  Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
    (feet)             (sq-ft)       (cubic-feet)       (cubic-feet)
  1,286.00               2,042                  0                  0
  1,288.00               3,315              5,357              5,357
  1,290.00               4,811              8,126             13,483
  1,292.00               6,535             11,346             24,829

Device   Routing          Invert   Outlet Devices
   #1    Primary        1,286.00'  15.0"  Round Culvert
                                   L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 1,286.00' / 1,285.50'   S= 0.0100 '/'   Cc= 0.900
                                   n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2    Device 1       1,287.00'  6.0" Vert. Orifice/Grate   X 2 rows with 8.0" cc spacing C= 0.600
                                   Limited to weir flow at low heads
   #3    Device 1       1,288.00'  4.0" Vert. Orifice/Grate   X 3 rows with 6.0" cc spacing C= 0.600
                                   Limited to weir flow at low heads
   #4    Device 1       1,289.00'  8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                   Limited to weir flow at low heads
   #5    Device 1       1,290.00'  8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                   Limited to weir flow at low heads
   #6    Device 1       1,291.00'  16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32
   #7    Primary        1,291.10'  8.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32

Primary OutFlow  Max=0.05 cfs @ 17.18 hrs  HW=1,287.13'   (Free Discharge)
 ↑
 ├─1=Culvert  (Passes 0.05 cfs of 4.21 cfs potential flow)
 │  ↑
 │  ├─2=Orifice/Grate  (Orifice Controls 0.05 cfs @ 1.22 fps)
 │  ├─3=Orifice/Grate  ( Controls 0.00 cfs)
 │  ├─4=Orifice/Grate  ( Controls 0.00 cfs)
 │  ├─5=Orifice/Grate  ( Controls 0.00 cfs)
 │  └─6=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
 └─7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

1-YEAR STORM

Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area = 4.683 ac, 29.20% Impervious, Inflow Depth > 1.51" for 1-year event
Inflow = 6.40 cfs @ 12.20 hrs, Volume= 0.589 af
Outflow = 2.83 cfs @ 12.53 hrs, Volume= 0.523 af, Atten= 56%, Lag= 19.9 min
Primary = 2.83 cfs @ 12.53 hrs, Volume= 0.523 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,288.98' @ 12.53 hrs Surf.Area= 4,048 sf Storage= 8,965 cf

Plug-Flow detention time= 104.7 min calculated for 0.522 af (89% of inflow)
Center-of-Mass det. time= 53.0 min (884.5 - 831.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,286.00'	24,829 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,286.00	2,042	0	0
1,288.00	3,315	5,357	5,357
1,290.00	4,811	8,126	13,483
1,292.00	6,535	11,346	24,829

Device	Routing	Invert	Outlet Devices
#1	Primary	1,286.00'	**15.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,286.00' / 1,285.50' S= 0.0100 '/' Cc= 0.900 n= 0.009 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	1,287.00'	**6.0" Vert. Orifice/Grate** X 2 rows with 8.0" cc spacing C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,288.00'	**4.0" Vert. Orifice/Grate** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 1	1,289.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#5	Device 1	1,290.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Device 1	1,291.00'	**16.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#7	Primary	1,291.10'	**8.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=2.83 cfs @ 12.53 hrs HW=1,288.98' (Free Discharge)
- **1=Culvert** (Passes 2.83 cfs of 9.06 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 2.22 cfs @ 5.64 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.61 cfs @ 3.51 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
  - **5=Orifice/Grate** (Controls 0.00 cfs)
  - **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

2-YEAR STORM

Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area = 4.683 ac, 29.20% Impervious, Inflow Depth > 2.16" for 2-year event
Inflow = 9.13 cfs @ 12.20 hrs, Volume= 0.843 af
Outflow = 4.78 cfs @ 12.46 hrs, Volume= 0.774 af, Atten= 48%, Lag= 16.1 min
Primary = 4.78 cfs @ 12.46 hrs, Volume= 0.774 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,289.62' @ 12.46 hrs Surf.Area= 4,525 sf Storage= 11,697 cf

Plug-Flow detention time= 88.5 min calculated for 0.773 af (92% of inflow)
Center-of-Mass det. time= 48.5 min (869.8 - 821.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,286.00'	24,829 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,286.00	2,042	0	0
1,288.00	3,315	5,357	5,357
1,290.00	4,811	8,126	13,483
1,292.00	6,535	11,346	24,829

Device	Routing	Invert	Outlet Devices
#1	Primary	1,286.00'	**15.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,286.00' / 1,285.50' S= 0.0100 '/' Cc= 0.900 n= 0.009 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	1,287.00'	**6.0" Vert. Orifice/Grate** X 2 rows with 8.0" cc spacing C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,288.00'	**4.0" Vert. Orifice/Grate** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 1	1,289.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#5	Device 1	1,290.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Device 1	1,291.00'	**16.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#7	Primary	1,291.10'	**8.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=4.78 cfs @ 12.46 hrs HW=1,289.61' (Free Discharge)
- **1=Culvert** (Passes 4.78 cfs of 10.22 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 2.69 cfs @ 6.84 fps)
  - **3=Orifice/Grate** (Orifice Controls 1.20 cfs @ 4.57 fps)
  - **4=Orifice/Grate** (Orifice Controls 0.90 cfs @ 2.67 fps)
  - **5=Orifice/Grate** (Controls 0.00 cfs)
  - **6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

5-YEAR STORM

```
                         Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area =        4.683 ac,  29.20% Impervious,  Inflow Depth >   3.27"    for  5-year event
Inflow      =       13.68 cfs @   12.19 hrs,  Volume=           1.276 af
Outflow     =        8.02 cfs @   12.41 hrs,  Volume=           1.204 af,  Atten= 41%,  Lag= 13.3 min
Primary     =        8.02 cfs @   12.41 hrs,  Volume=           1.204 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,290.43' @ 12.41 hrs   Surf.Area= 5,184 sf   Storage= 15,643 cf

Plug-Flow detention time= 73.8 min calculated for 1.204 af (94% of inflow)
Center-of-Mass det. time= 43.8 min ( 853.5 - 809.7 )

Volume        Invert     Avail.Storage   Storage Description
   #1      1,286.00'         24,829 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation        Surf.Area       Inc.Store       Cum.Store
    (feet)          (sq-ft)     (cubic-feet)    (cubic-feet)
  1,286.00            2,042               0               0
  1,288.00            3,315           5,357           5,357
  1,290.00            4,811           8,126          13,483
  1,292.00            6,535          11,346          24,829

Device   Routing            Invert   Outlet Devices
    #1   Primary          1,286.00'  15.0"  Round Culvert
                                     L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                     Inlet / Outlet Invert= 1,286.00' / 1,285.50'   S= 0.0100 '/'   Cc= 0.900
                                     n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
    #2   Device 1         1,287.00'  6.0" Vert. Orifice/Grate   X 2 rows with 8.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #3   Device 1         1,288.00'  4.0" Vert. Orifice/Grate   X 3 rows with 6.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #4   Device 1         1,289.00'  8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #5   Device 1         1,290.00'  8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #6   Device 1         1,291.00'  16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32
    #7   Primary          1,291.10'  8.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32

Primary OutFlow  Max=7.99 cfs @ 12.41 hrs  HW=1,290.43'   (Free Discharge)
 ↑
 ├1=Culvert  (Passes 7.99 cfs of 11.52 cfs potential flow)
 │ ↑
 │ ├2=Orifice/Grate  (Orifice Controls 3.18 cfs @ 8.11 fps)
 │ ├3=Orifice/Grate  (Orifice Controls 1.66 cfs @ 6.35 fps)
 │ ├4=Orifice/Grate  (Orifice Controls 2.62 cfs @ 3.87 fps)
 │ ├5=Orifice/Grate  (Orifice Controls 0.53 cfs @ 2.23 fps)
 │ └6=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
 └7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

10-YEAR STORM

Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area = 4.683 ac, 29.20% Impervious, Inflow Depth > 4.22" for 10-year event
Inflow = 17.49 cfs @ 12.19 hrs, Volume= 1.647 af
Outflow = 10.49 cfs @ 12.40 hrs, Volume= 1.574 af, Atten= 40%, Lag= 12.7 min
Primary = 10.49 cfs @ 12.40 hrs, Volume= 1.574 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,290.98' @ 12.40 hrs Surf.Area= 5,655 sf Storage= 18,610 cf

Plug-Flow detention time= 65.9 min calculated for 1.574 af (96% of inflow)
Center-of-Mass det. time= 41.1 min (843.7 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,286.00'	24,829 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,286.00	2,042	0	0
1,288.00	3,315	5,357	5,357
1,290.00	4,811	8,126	13,483
1,292.00	6,535	11,346	24,829

Device	Routing	Invert	Outlet Devices
#1	Primary	1,286.00'	**15.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,286.00' / 1,285.50' S= 0.0100 '/' Cc= 0.900 n= 0.009 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	1,287.00'	**6.0" Vert. Orifice/Grate** X 2 rows with 8.0" cc spacing C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,288.00'	**4.0" Vert. Orifice/Grate** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 1	1,289.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#5	Device 1	1,290.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Device 1	1,291.00'	**16.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#7	Primary	1,291.10'	**8.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=10.48 cfs @ 12.40 hrs HW=1,290.98' (Free Discharge)
↑1=**Culvert** (Passes 10.48 cfs of 12.33 cfs potential flow)
  ↑2=**Orifice/Grate** (Orifice Controls 3.48 cfs @ 8.86 fps)
  —3=**Orifice/Grate** (Orifice Controls 1.91 cfs @ 7.29 fps)
  —4=**Orifice/Grate** (Orifice Controls 3.67 cfs @ 5.26 fps)
  —5=**Orifice/Grate** (Orifice Controls 1.42 cfs @ 3.51 fps)
  └6=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└7=**Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

25-YEAR STORM

```
                     Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area =       4.683 ac,  29.20% Impervious,  Inflow Depth >   5.55"    for  25-year event
Inflow      =      22.72 cfs @   12.19 hrs,  Volume=           2.168 af
Outflow     =      17.07 cfs @   12.32 hrs,  Volume=           2.091 af,  Atten= 25%,  Lag= 8.0 min
Primary     =      17.07 cfs @   12.32 hrs,  Volume=           2.091 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,291.43' @ 12.32 hrs   Surf.Area= 6,045 sf   Storage= 21,251 cf

Plug-Flow detention time= 57.8 min calculated for 2.086 af (96% of inflow)
Center-of-Mass det. time= 37.7 min ( 832.8 - 795.1 )

Volume       Invert     Avail.Storage   Storage Description
   #1      1,286.00'        24,829 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store       Cum.Store
    (feet)          (sq-ft)     (cubic-feet)    (cubic-feet)
  1,286.00            2,042                0               0
  1,288.00            3,315            5,357           5,357
  1,290.00            4,811            8,126          13,483
  1,292.00            6,535           11,346          24,829

Device    Routing          Invert    Outlet Devices
   #1     Primary       1,286.00'    15.0"  Round Culvert
                                     L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                     Inlet / Outlet Invert= 1,286.00' / 1,285.50'   S= 0.0100 '/'   Cc= 0.900
                                     n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2     Device 1      1,287.00'    6.0" Vert. Orifice/Grate   X 2 rows with 8.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
   #3     Device 1      1,288.00'    4.0" Vert. Orifice/Grate   X 3 rows with 6.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
   #4     Device 1      1,289.00'    8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
   #5     Device 1      1,290.00'    8.0" Vert. Orifice/Grate   X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
   #6     Device 1      1,291.00'    16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32
   #7     Primary       1,291.10'    8.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32

Primary OutFlow  Max=16.81 cfs @ 12.32 hrs  HW=1,291.42'   (Free Discharge)
├─1=Culvert  (Inlet Controls 12.94 cfs @ 10.54 fps)
│  ├─2=Orifice/Grate  (Passes < 3.70 cfs potential flow)
│  ├─3=Orifice/Grate  (Passes < 2.08 cfs potential flow)
│  ├─4=Orifice/Grate  (Passes < 4.31 cfs potential flow)
│  ├─5=Orifice/Grate  (Passes < 2.59 cfs potential flow)
│  └─6=Broad-Crested Rectangular Weir  (Passes < 11.76 cfs potential flow)
└─7=Broad-Crested Rectangular Weir  (Weir Controls 3.88 cfs @ 1.53 fps)
```

50-YEAR STORM

Summary for Pond 9P: Constructed Wetland (Basin #1)

Inflow Area = 4.683 ac, 29.20% Impervious, Inflow Depth > 6.52" for 50-year event
Inflow = 26.46 cfs @ 12.19 hrs, Volume= 2.546 af
Outflow = 21.80 cfs @ 12.30 hrs, Volume= 2.466 af, Atten= 18%, Lag= 6.4 min
Primary = 21.80 cfs @ 12.30 hrs, Volume= 2.466 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,291.63' @ 12.30 hrs Surf.Area= 6,220 sf Storage= 22,499 cf

Plug-Flow detention time= 53.6 min calculated for 2.461 af (97% of inflow)
Center-of-Mass det. time= 35.7 min (826.5 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,286.00'	24,829 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,286.00	2,042	0	0
1,288.00	3,315	5,357	5,357
1,290.00	4,811	8,126	13,483
1,292.00	6,535	11,346	24,829

Device	Routing	Invert	Outlet Devices
#1	Primary	1,286.00'	**15.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,286.00' / 1,285.50' S= 0.0100 '/' Cc= 0.900 n= 0.009 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	1,287.00'	**6.0" Vert. Orifice/Grate** X 2 rows with 8.0" cc spacing C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,288.00'	**4.0" Vert. Orifice/Grate** X 3 rows with 6.0" cc spacing C= 0.600 Limited to weir flow at low heads
#4	Device 1	1,289.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#5	Device 1	1,290.00'	**8.0" Vert. Orifice/Grate** X 2 rows with 10.0" cc spacing C= 0.600 Limited to weir flow at low heads
#6	Device 1	1,291.00'	**16.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#7	Primary	1,291.10'	**8.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

```
Primary OutFlow  Max=21.71 cfs @ 12.30 hrs  HW=1,291.63'  (Free Discharge)
├─1=Culvert  (Inlet Controls 13.22 cfs @ 10.77 fps)
│ ├─2=Orifice/Grate  (Passes < 3.80 cfs potential flow)
│ ├─3=Orifice/Grate  (Passes < 2.17 cfs potential flow)
│ ├─4=Orifice/Grate  (Passes < 4.58 cfs potential flow)
│ ├─5=Orifice/Grate  (Passes < 3.06 cfs potential flow)
│ └─6=Broad-Crested Rectangular Weir  (Passes < 22.20 cfs potential flow)
└─7=Broad-Crested Rectangular Weir  (Weir Controls 8.49 cfs @ 2.00 fps)
```

100-YEAR STORM

Summary for Pond 9P: Constructed Wetland (Basin #1)

```
Inflow Area =         4.683 ac,  29.20% Impervious,  Inflow Depth >   7.63"    for  100-year event
Inflow       =       30.67 cfs @   12.19 hrs,  Volume=             2.976 af
Outflow      =       27.20 cfs @   12.27 hrs,  Volume=             2.893 af,  Atten= 11%,  Lag= 4.8 min
Primary      =       27.20 cfs @   12.27 hrs,  Volume=             2.893 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,291.82' @ 12.27 hrs   Surf.Area= 6,380 sf   Storage= 23,670 cf

Plug-Flow detention time= 50.1 min calculated for 2.893 af (97% of inflow)
Center-of-Mass det. time= 33.7 min ( 820.4 - 786.7 )

Volume          Invert     Avail.Storage   Storage Description
-------------------------------------------------------------------------------------------
   #1       1,286.00'          24,829 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area           Inc.Store         Cum.Store
    (feet)            (sq-ft)        (cubic-feet)      (cubic-feet)
--------------------------------------------------------------------
  1,286.00              2,042                   0                 0
  1,288.00              3,315               5,357             5,357
  1,290.00              4,811               8,126            13,483
  1,292.00              6,535              11,346            24,829

Device    Routing          Invert    Outlet Devices
-------------------------------------------------------------------------------------------
    #1    Primary       1,286.00'    15.0"  Round Culvert
                                     L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                     Inlet / Outlet Invert= 1,286.00' / 1,285.50'   S= 0.0100 '/'   Cc= 0.900
                                     n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
    #2    Device 1      1,287.00'    6.0" Vert. Orifice/Grate    X 2 rows with 8.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #3    Device 1      1,288.00'    4.0" Vert. Orifice/Grate    X 3 rows with 6.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #4    Device 1      1,289.00'    8.0" Vert. Orifice/Grate    X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #5    Device 1      1,290.00'    8.0" Vert. Orifice/Grate    X 2 rows with 10.0" cc spacing C= 0.600
                                     Limited to weir flow at low heads
    #6    Device 1      1,291.00'    16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32
    #7    Primary       1,291.10'    8.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00
                                     Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                     3.30  3.31  3.32

Primary OutFlow  Max=26.70 cfs @ 12.27 hrs  HW=1,291.80'   (Free Discharge)
  1=Culvert  (Inlet Controls 13.45 cfs @ 10.96 fps)
    2=Orifice/Grate  (Passes < 3.88 cfs potential flow)
    3=Orifice/Grate  (Passes < 2.23 cfs potential flow)
    4=Orifice/Grate  (Passes < 4.79 cfs potential flow)
    5=Orifice/Grate  (Passes < 3.38 cfs potential flow)
    6=Broad-Crested Rectangular Weir  (Passes < 32.93 cfs potential flow)
  7=Broad-Crested Rectangular Weir  (Weir Controls 13.25 cfs @ 2.35 fps)
```

BASIN #2 – CONSTRUCTED WETLANDS ROUTING RESULTS: WQ STORM

```
                         Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =      4.316 ac,  28.40% Impervious,  Inflow Depth >   0.20"    for  WQ Storm event
Inflow      =      0.61 cfs @   12.24 hrs,  Volume=          0.071 af
Outflow     =      0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =      0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,316.75' @ 24.00 hrs   Surf.Area= 4,593 sf   Storage= 3,079 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume        Invert      Avail.Storage   Storage Description
   #1      1,316.00'          46,822 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
    (feet)            (sq-ft)       (cubic-feet)       (cubic-feet)
  1,316.00              3,592                  0                  0
  1,318.00              6,252              9,844              9,844
  1,320.00              9,184             15,436             25,280
  1,322.00             12,358             21,542             46,822

Device   Routing          Invert   Outlet Devices
   #1    Primary       1,314.00'   15.0"  Round Culvert
                                   L= 55.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 1,314.00' / 1,313.00'   S= 0.0182 '/'   Cc= 0.900
                                   n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2    Device 1      1,317.00'   4.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #3    Device 1      1,318.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #4    Device 1      1,319.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #5    Device 1      1,320.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #6    Primary       1,320.50'   8.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #7    Device 1      1,321.00'   16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32
   #8    Primary       1,321.50'   8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                   Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                   2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=1,316.00'   (Free Discharge)
↑
├─1=Culvert  (Passes 0.00 cfs of 6.93 cfs potential flow)
│ ↑
│ ├─2=Orifice/Grate  ( Controls 0.00 cfs)
│ ├─3=Orifice/Grate  ( Controls 0.00 cfs)
│ ├─4=Orifice/Grate  ( Controls 0.00 cfs)
│ ├─5=Orifice/Grate  ( Controls 0.00 cfs)
│ └─7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
├─6=Orifice/Grate  ( Controls 0.00 cfs)
└─8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

1-YEAR STORM

```
                    Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =      4.316 ac, 28.40% Impervious, Inflow Depth >  1.44"   for 1-year event
Inflow      =      5.61 cfs @  12.20 hrs, Volume=         0.517 af
Outflow     =      0.71 cfs @  13.19 hrs, Volume=         0.379 af, Atten= 87%, Lag= 59.4 min
Primary     =      0.71 cfs @  13.19 hrs, Volume=         0.379 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,318.32' @ 13.19 hrs  Surf.Area= 6,720 sf  Storage= 11,916 cf

Plug-Flow detention time= 268.7 min calculated for 0.379 af (73% of inflow)
Center-of-Mass det. time= 178.3 min ( 1,013.7 - 835.4 )

Volume      Invert    Avail.Storage  Storage Description
  #1     1,316.00'       46,822 cf  Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation     Surf.Area    Inc.Store    Cum.Store
   (feet)       (sq-ft)  (cubic-feet)  (cubic-feet)
 1,316.00         3,592            0            0
 1,318.00         6,252        9,844        9,844
 1,320.00         9,184       15,436       25,280
 1,322.00        12,358       21,542       46,822

Device  Routing       Invert  Outlet Devices
  #1    Primary     1,314.00' 15.0"  Round Culvert
                              L= 55.0'  CPP, square edge headwall,  Ke= 0.500
                              Inlet / Outlet Invert= 1,314.00' / 1,313.00'  S= 0.0182 '/'  Cc= 0.900
                              n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
  #2    Device 1    1,317.00' 4.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #3    Device 1    1,318.00' 6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #4    Device 1    1,319.00' 6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #5    Device 1    1,320.00' 6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #6    Primary     1,320.50' 8.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #7    Device 1    1,321.00' 16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                              Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                              2.50  3.00
                              Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                              3.30  3.31  3.32
  #8    Primary     1,321.50' 8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                              Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                              2.50  3.00  3.50  4.00  4.50  5.00  5.50
                              Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                              2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=0.71 cfs @ 13.19 hrs  HW=1,318.32'  (Free Discharge)
 ↑
 ├1=Culvert  (Passes 0.71 cfs of 11.36 cfs potential flow)
 │ ↑
 │ ├2=Orifice/Grate  (Orifice Controls 0.45 cfs @ 5.17 fps)
 │ ├3=Orifice/Grate  (Orifice Controls 0.25 cfs @ 1.92 fps)
 │ ├4=Orifice/Grate  ( Controls 0.00 cfs)
 │ ├5=Orifice/Grate  ( Controls 0.00 cfs)
 │ └7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
 ├6=Orifice/Grate  ( Controls 0.00 cfs)
 └8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

2-YEAR STORM

```
                         Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =      4.316 ac,  28.40% Impervious,  Inflow Depth >   2.08"    for  2-year event
Inflow      =      8.10 cfs @   12.20 hrs,  Volume=           0.746 af
Outflow     =      1.36 cfs @   12.88 hrs,  Volume=           0.590 af,  Atten= 83%,  Lag= 41.0 min
Primary     =      1.36 cfs @   12.88 hrs,  Volume=           0.590 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,318.96' @ 12.88 hrs   Surf.Area= 7,656 sf   Storage= 16,506 cf

Plug-Flow detention time= 224.2 min calculated for 0.589 af (79% of inflow)
Center-of-Mass det. time= 147.1 min ( 972.0 - 824.9 )

Volume        Invert      Avail.Storage   Storage Description
-----------------------------------------------------------------------------
  #1       1,316.00'         46,822 cf    Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
    (feet)            (sq-ft)       (cubic-feet)       (cubic-feet)
---------------------------------------------------------------------
  1,316.00              3,592                  0                  0
  1,318.00              6,252              9,844              9,844
  1,320.00              9,184             15,436             25,280
  1,322.00             12,358             21,542             46,822

Device   Routing          Invert   Outlet Devices
-----------------------------------------------------------------------------
   #1    Primary       1,314.00'   15.0"  Round Culvert
                                   L= 55.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 1,314.00' / 1,313.00'   S= 0.0182 '/'   Cc= 0.900
                                   n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2    Device 1      1,317.00'   4.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #3    Device 1      1,318.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #4    Device 1      1,319.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #5    Device 1      1,320.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #6    Primary       1,320.50'   8.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #7    Device 1      1,321.00'   16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32
   #8    Primary       1,321.50'   8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                   Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                   2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=1.36 cfs @ 12.88 hrs  HW=1,318.96'   (Free Discharge)
↑
├─1=Culvert  (Passes 1.36 cfs of 12.30 cfs potential flow)
│  ↑
│  ├─2=Orifice/Grate  (Orifice Controls 0.56 cfs @ 6.44 fps)
│  ├─3=Orifice/Grate  (Orifice Controls 0.80 cfs @ 4.05 fps)
│  ├─4=Orifice/Grate  ( Controls 0.00 cfs)
│  ├─5=Orifice/Grate  ( Controls 0.00 cfs)
│  └─7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
├─6=Orifice/Grate  ( Controls 0.00 cfs)
└─8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

5-YEAR STORM

```
                    Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =      4.316 ac, 28.40% Impervious, Inflow Depth >  3.17"   for 5-year event
Inflow      =     12.28 cfs @  12.19 hrs, Volume=          1.141 af
Outflow     =      2.68 cfs @  12.72 hrs, Volume=          0.958 af, Atten= 78%, Lag= 31.8 min
Primary     =      2.68 cfs @  12.72 hrs, Volume=          0.958 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,319.91' @ 12.72 hrs  Surf.Area= 9,045 sf  Storage= 24,416 cf

Plug-Flow detention time= 190.5 min calculated for 0.956 af (84% of inflow)
Center-of-Mass det. time= 125.4 min ( 938.4 - 812.9 )

Volume      Invert    Avail.Storage   Storage Description
---------------------------------------------------------------------------------
  #1      1,316.00'       46,822 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store        Cum.Store
    (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
-------------------------------------------------------------
  1,316.00            3,592                0                0
  1,318.00            6,252            9,844            9,844
  1,320.00            9,184           15,436           25,280
  1,322.00           12,358           21,542           46,822

Device   Routing       Invert   Outlet Devices
---------------------------------------------------------------------------------
  #1     Primary     1,314.00'  15.0"  Round Culvert
                                L= 55.0'  CPP, square edge headwall,  Ke= 0.500
                                Inlet / Outlet Invert= 1,314.00' / 1,313.00'  S= 0.0182 '/'  Cc= 0.900
                                n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
  #2     Device 1    1,317.00'  4.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #3     Device 1    1,318.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #4     Device 1    1,319.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #5     Device 1    1,320.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #6     Primary     1,320.50'  8.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #7     Device 1    1,321.00'  16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                2.50  3.00
                                Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                3.30  3.31  3.32
  #8     Primary     1,321.50'  8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=2.68 cfs @ 12.72 hrs  HW=1,319.90'   (Free Discharge)
 ↑
 ├1=Culvert  (Passes 2.68 cfs of 13.58 cfs potential flow)
 │ ↑
 │ ├2=Orifice/Grate  (Orifice Controls 0.70 cfs @ 7.97 fps)
 │ ├3=Orifice/Grate  (Orifice Controls 1.22 cfs @ 6.19 fps)
 │ ├4=Orifice/Grate  (Orifice Controls 0.76 cfs @ 3.89 fps)
 │ ├5=Orifice/Grate  ( Controls 0.00 cfs)
 │ └7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
 ├6=Orifice/Grate  ( Controls 0.00 cfs)
 └8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

10-YEAR STORM

```
                     Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =        4.316 ac,  28.40% Impervious,  Inflow Depth >   4.12"    for  10-year event
Inflow       =      15.79 cfs @   12.19 hrs,  Volume=           1.480 af
Outflow      =       3.89 cfs @   12.68 hrs,  Volume=           1.279 af,  Atten= 75%,  Lag= 29.1 min
Primary      =       3.89 cfs @   12.68 hrs,  Volume=           1.279 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,320.59' @ 12.68 hrs   Surf.Area= 10,114 sf   Storage= 30,936 cf

Plug-Flow detention time= 175.3 min calculated for 1.279 af (86% of inflow)
Center-of-Mass det. time= 116.3 min ( 922.0 - 805.7 )

Volume        Invert      Avail.Storage   Storage Description
---------------------------------------------------------------------------------------
   #1      1,316.00'          46,822 cf   Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
    (feet)             (sq-ft)        (cubic-feet)       (cubic-feet)
--------------------------------------------------------------------
  1,316.00              3,592                  0                  0
  1,318.00              6,252              9,844              9,844
  1,320.00              9,184             15,436             25,280
  1,322.00             12,358             21,542             46,822

Device   Routing          Invert   Outlet Devices
---------------------------------------------------------------------------------------
   #1    Primary       1,314.00'   15.0"  Round Culvert
                                   L= 55.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 1,314.00' / 1,313.00'   S= 0.0182 '/'   Cc= 0.900
                                   n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
   #2    Device 1      1,317.00'   4.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #3    Device 1      1,318.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #4    Device 1      1,319.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #5    Device 1      1,320.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #6    Primary       1,320.50'   8.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
   #7    Device 1      1,321.00'   16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32
   #8    Primary       1,321.50'   8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                   Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                   2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=3.89 cfs @ 12.68 hrs  HW=1,320.58'   (Free Discharge)
↑
├─1=Culvert  (Passes 3.86 cfs of 14.43 cfs potential flow)
│  ↑
│  ├─2=Orifice/Grate  (Orifice Controls 0.78 cfs @ 8.90 fps)
│  ├─3=Orifice/Grate  (Orifice Controls 1.44 cfs @ 7.36 fps)
│  ├─4=Orifice/Grate  (Orifice Controls 1.09 cfs @ 5.56 fps)
│  ├─5=Orifice/Grate  (Orifice Controls 0.55 cfs @ 2.79 fps)
│  └─7=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
├─6=Orifice/Grate  (Orifice Controls 0.03 cfs @ 0.99 fps)
└─8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

25-YEAR STORM

```
                    Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =      4.316 ac, 28.40% Impervious, Inflow Depth >  5.44"   for 25-year event
Inflow      =     20.62 cfs @  12.19 hrs, Volume=         1.957 af
Outflow     =      9.06 cfs @  12.51 hrs, Volume=         1.736 af, Atten= 56%, Lag= 19.3 min
Primary     =      9.06 cfs @  12.51 hrs, Volume=         1.736 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,321.18' @ 12.51 hrs  Surf.Area= 11,060 sf  Storage= 37,246 cf

Plug-Flow detention time= 154.7 min calculated for 1.732 af (89% of inflow)
Center-of-Mass det. time= 103.3 min ( 901.3 - 798.0 )

Volume      Invert    Avail.Storage  Storage Description
  #1      1,316.00'        46,822 cf  Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation       Surf.Area       Inc.Store       Cum.Store
    (feet)         (sq-ft)     (cubic-feet)    (cubic-feet)
  1,316.00           3,592               0               0
  1,318.00           6,252           9,844           9,844
  1,320.00           9,184          15,436          25,280
  1,322.00          12,358          21,542          46,822

Device  Routing          Invert  Outlet Devices
  #1    Primary       1,314.00'  15.0"  Round Culvert
                                 L= 55.0'  CPP, square edge headwall, Ke= 0.500
                                 Inlet / Outlet Invert= 1,314.00' / 1,313.00'  S= 0.0182 '/'  Cc= 0.900
                                 n= 0.009  Corrugated PE, smooth interior, Flow Area= 1.23 sf
  #2    Device 1      1,317.00'  4.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #3    Device 1      1,318.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #4    Device 1      1,319.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #5    Device 1      1,320.00'  6.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #6    Primary       1,320.50'  8.0" Vert. Orifice/Grate   C= 0.600  Limited to weir flow at low heads
  #7    Device 1      1,321.00'  16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                 Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                 2.50  3.00
                                 Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                 3.30  3.31  3.32
  #8    Primary       1,321.50'  8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                 Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                 2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                 Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                 2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=8.96 cfs @ 12.51 hrs  HW=1,321.18'  (Free Discharge)
├─1=Culvert  (Passes 7.97 cfs of 15.13 cfs potential flow)
│ ├─2=Orifice/Grate  (Orifice Controls 0.84 cfs @ 9.65 fps)
│ ├─3=Orifice/Grate  (Orifice Controls 1.62 cfs @ 8.24 fps)
│ ├─4=Orifice/Grate  (Orifice Controls 1.31 cfs @ 6.69 fps)
│ ├─5=Orifice/Grate  (Orifice Controls 0.91 cfs @ 4.64 fps)
│ └─7=Broad-Crested Rectangular Weir  (Weir Controls 3.28 cfs @ 1.14 fps)
├─6=Orifice/Grate  (Orifice Controls 0.99 cfs @ 2.83 fps)
└─8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

50-YEAR STORM

```
                         Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area =       4.316 ac,  28.40% Impervious,  Inflow Depth >   6.41"   for  50-year event
Inflow      =      24.08 cfs @   12.19 hrs,  Volume=           2.304 af
Outflow     =      14.62 cfs @   12.40 hrs,  Volume=           2.073 af,  Atten= 39%,  Lag= 12.6 min
Primary     =      14.62 cfs @   12.40 hrs,  Volume=           2.073 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,321.34' @ 12.40 hrs   Surf.Area= 11,308 sf   Storage= 38,995 cf

Plug-Flow detention time= 141.8 min calculated for 2.073 af (90% of inflow)
Center-of-Mass det. time= 94.1 min ( 887.6 - 793.6 )

Volume      Invert     Avail.Storage   Storage Description
  #1      1,316.00'       46,822 cf    Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store        Cum.Store
     (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
  1,316.00            3,592                0                0
  1,318.00            6,252            9,844            9,844
  1,320.00            9,184           15,436           25,280
  1,322.00           12,358           21,542           46,822

Device   Routing          Invert   Outlet Devices
  #1     Primary       1,314.00'   15.0"  Round Culvert
                                   L= 55.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 1,314.00' / 1,313.00'   S= 0.0182 '/'   Cc= 0.900
                                   n= 0.009  Corrugated PE, smooth interior,  Flow Area= 1.23 sf
  #2     Device 1      1,317.00'   4.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
  #3     Device 1      1,318.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
  #4     Device 1      1,319.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
  #5     Device 1      1,320.00'   6.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
  #6     Primary       1,320.50'   8.0" Vert. Orifice/Grate    C= 0.600   Limited to weir flow at low heads
  #7     Device 1      1,321.00'   16.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00
                                   Coef. (English)  2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                   3.30  3.31  3.32
  #8     Primary       1,321.50'   8.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00  3.50  4.00  4.50  5.00  5.50
                                   Coef. (English)  2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                                   2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32

Primary OutFlow  Max=14.61 cfs @ 12.40 hrs  HW=1,321.34'   (Free Discharge)
 ├─1=Culvert  (Passes 13.42 cfs of 15.31 cfs potential flow)
 │  ├─2=Orifice/Grate  (Orifice Controls 0.86 cfs @ 9.83 fps)
 │  ├─3=Orifice/Grate  (Orifice Controls 1.66 cfs @ 8.46 fps)
 │  ├─4=Orifice/Grate  (Orifice Controls 1.37 cfs @ 6.96 fps)
 │  ├─5=Orifice/Grate  (Orifice Controls 0.99 cfs @ 5.02 fps)
 │  └─7=Broad-Crested Rectangular Weir  (Weir Controls 8.55 cfs @ 1.58 fps)
 ├─6=Orifice/Grate  (Orifice Controls 1.19 cfs @ 3.42 fps)
 └─8=Broad-Crested Rectangular Weir  ( Controls 0.00 cfs)
```

100-YEAR STORM

Summary for Pond 11P: Constructed Wetland (Basin #2)

Inflow Area = 4.316 ac, 28.40% Impervious, Inflow Depth > 7.50" for 100-year event
Inflow = 27.97 cfs @ 12.19 hrs, Volume= 2.698 af
Outflow = 17.35 cfs @ 12.38 hrs, Volume= 2.459 af, Atten= 38%, Lag= 11.7 min
Primary = 17.35 cfs @ 12.38 hrs, Volume= 2.459 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,321.57' @ 12.38 hrs Surf.Area= 11,670 sf Storage= 41,615 cf

Plug-Flow detention time= 130.7 min calculated for 2.459 af (91% of inflow)
Center-of-Mass det. time= 86.9 min (876.3 - 789.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,316.00'	46,822 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,316.00	3,592	0	0
1,318.00	6,252	9,844	9,844
1,320.00	9,184	15,436	25,280
1,322.00	12,358	21,542	46,822

Device	Routing	Invert	Outlet Devices
#1	Primary	1,314.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,314.00' / 1,313.00' S= 0.0182 '/' Cc= 0.900 n= 0.009 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	1,317.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,318.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	1,319.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	1,320.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Primary	1,320.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	1,321.00'	**16.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#8	Primary	1,321.50'	**8.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=17.30 cfs @ 12.38 hrs HW=1,321.56' (Free Discharge)
- **1=Culvert** (Inlet Controls 15.56 cfs @ 12.68 fps)
  - **2=Orifice/Grate** (Passes < 0.88 cfs potential flow)
  - **3=Orifice/Grate** (Passes < 1.72 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 1.44 cfs potential flow)
  - **5=Orifice/Grate** (Passes < 1.08 cfs potential flow)
  - **7=Broad-Crested Rectangular Weir** (Passes < 18.54 cfs potential flow)
- **6=Orifice/Grate** (Orifice Controls 1.44 cfs @ 4.11 fps)
- **8=Broad-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 0.60 fps)

TAYLOR BROOK DESIGN POINT

WQ STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   0.04"   for  WQ Storm event
Inflow      =     0.05 cfs @   17.18 hrs,  Volume=          0.027 af
Primary     =     0.05 cfs @   17.18 hrs,  Volume=          0.027 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

1-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   1.20"   for  1-year event
Inflow      =     3.33 cfs @   12.62 hrs,  Volume=          0.902 af
Primary     =     3.33 cfs @   12.62 hrs,  Volume=          0.902 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

2-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   1.82"   for  2-year event
Inflow      =     5.99 cfs @   12.50 hrs,  Volume=          1.364 af
Primary     =     5.99 cfs @   12.50 hrs,  Volume=          1.364 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

5-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   2.88"   for  5-year event
Inflow      =    10.42 cfs @   12.44 hrs,  Volume=          2.162 af
Primary     =    10.42 cfs @   12.44 hrs,  Volume=          2.162 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

10-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   3.80"   for  10-year event
Inflow      =    13.94 cfs @   12.45 hrs,  Volume=          2.852 af
Primary     =    13.94 cfs @   12.45 hrs,  Volume=          2.852 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

25-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   5.10"   for  25-year event
Inflow      =    22.93 cfs @   12.44 hrs,  Volume=          3.826 af
Primary     =    22.93 cfs @   12.44 hrs,  Volume=          3.826 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

50-YEAR STORM

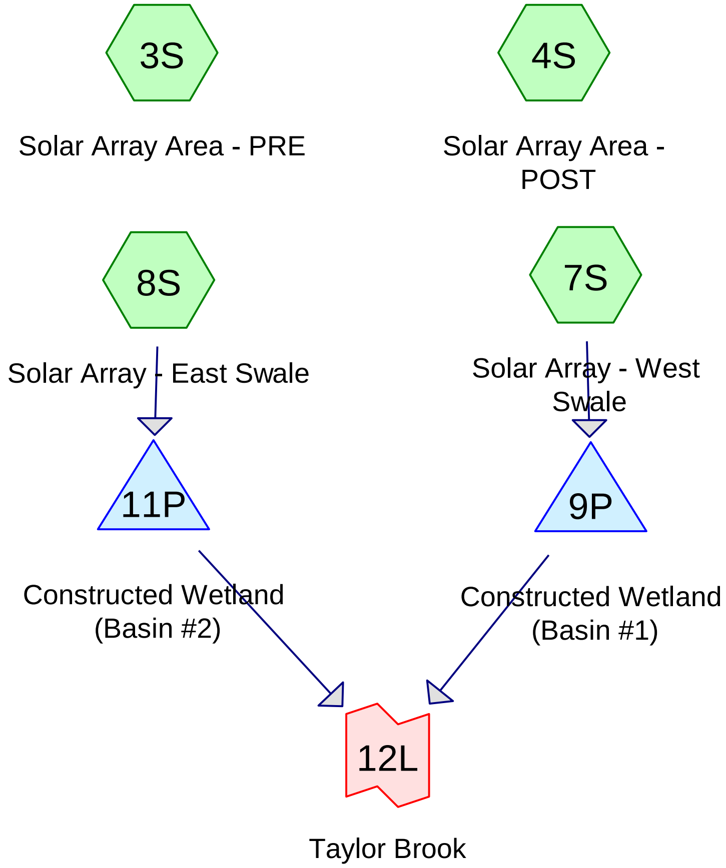
Summary for Link 12L: Taylor Brook

```
Inflow Area =    8.998 ac,  28.82% Impervious,  Inflow Depth >   6.05"   for  50-year event
Inflow      =    34.54 cfs @   12.35 hrs,  Volume=          4.539 af
Primary     =    34.54 cfs @   12.35 hrs,  Volume=          4.539 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```

100-YEAR STORM

Summary for Link 12L: Taylor Brook

```
Inflow Area =       8.998 ac,  28.82% Impervious,  Inflow Depth >   7.14"    for  100-year event
Inflow       =       43.55 cfs @    12.28 hrs,  Volume=              5.352 af
Primary      =       43.55 cfs @    12.28 hrs,  Volume=              5.352 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
```



HydroCAD Diagram

CONCLUSION

The analysis and design of the stormwater conveyance system exceeds the requirements found in Appendix “I” from the CT DEP.   The design of the Constructed Wetland conforms to the standards found in the CT DEEP 2004 Storm Water Quality Manual in order to reduce non-point source pollutants from the site.   The design provides the Channel Protection Volume per the 2004 Manual which will prevent adverse impacts to the receiving streams on this site.   Peak rate attenuation is provided for the 1-year, 2-year, 5-year and 10-year, 25-year, 50-year, and 100-year rainfall events.

Flows directed to the existing wetland system from the Constructed Wetlands will have velocities less than 3 fps, which are non-erosive for this type of soil, so there will be no erosion of the receiving inland wetlands.

While there will be some filling of wetlands for the access driveway, it is unavoidable and has been minimized to the maximum extent possible through using a narrow driveway and boulder retaining wall to limit the extent of fill within the wetland area.

There will be no impact on any of the other wetlands on this site as a result of the construction of the access driveway, stormwater management system and solar array.

STATE OF CONNECTICUT
STEVEN D. TRINKAUS
#15546
PROFESSIONAL ENGINEER

Steven Trinkaus, PE
Trinkaus Engineering, LLC

APPENDIX “A”
SOIL TEST RESULTS WITHIN AREA OF PROPOSED SOLAR ARRAY

DT – 28	
0 – 9”	TOPSOIL
9 – 22”	YELLOW BROWN FINE SANDY LOAM
22 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 22”, MOTTLING AT 22”
DT – 29	
0 – 6”	TOPSOIL
6 – 26”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
26 – 77”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 77”, ROOTS TO 26”, MOTTLING AT 26”
DT – 32	
0 – 6”	TOPSOIL
6 – 20”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
20 – 75”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 75”, ROOTS TO 22”, MOTTLING AT 22”
DT – 33	
0 – 6”	TOPSOIL
6 – 15”	YELLOW BROWN FINE SANDY LOAM
15 – 22”	LIGHT YELLOW BROWN SANDY LOAM
22 – 77”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 77”, ROOTS TO 22”, MOTTLING AT 22”
DT – 35	
0 – 6”	TOPSOIL
6 – 20”	ORANGE BROWN FINE SANDY LOAM
20 – 30”	YELLOW BROWN FINE SANDY LOAM
30 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 30”, MOTTLING AT 30”
DT – 71	
0 – 6”	TOPSOIL
6 – 23”	ORANGE BROWN FINE SAND & SILT LOAM
23 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 23”, MOTTLING AT 23”, WATER BLEEDING AT 27”
DT – 72	
0 – 6”	TOPSOIL
6 – 26”	O0RANGE BROWN FINE SANDY LOAM, SOME SILT
26 – 84”	GREY BROWN MEDIUM COMPACT SAND AND SILT
	LEDGE > 84”, ROOTS TO 26”, MOTTLING AT 26”, WATER BLEEDING AT 24”
DT – 73	
0 – 6”	TOPSOIL
6 – 24”	ORANGE BROWN FINE SANDY LOAM, SOME SILT
24 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 24”, MOTTLING AT 24”, WATER BLEEDING AT 28”

DT – 74

0 – 6”	TOPSOIL
6 – 24”	ORANGE BROWN FINE SAND & SILT LOAM
24 – 75”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 75”, ROOTS TO 24”, MOTTLING AT 24”, WATER BLEEDING AT 28”

DT – 75

0 – 6”	TOPSOIL
6 – 23”	PALE YELLOW BROWN FINE SAND & SILT LOAM
23 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 23”, MOTTLING AT 23”, WATER BLEEDING AT 28”

DT – 76

0 – 6”	TOPSOIL
6 – 24”	ORANGE BROWN FINE SAND & SILT LOAM
24 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 24”, MOTTLING AT 24”, WATER BLEEDING AT 27”

DT – 77

0 – 5”	TOPSOIL
5 – 23”	ORANGE BROWN FINE SAND AND SILT LOAM
23 – 77”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 77”, ROOTS TO 23”, MOTTLING AT 23”, WATER BLEEDING AT 28”

DT – 78

0 – 3”	TOPSOIL
3 – 19”	ORANGE BROWN FINE SAND & SILT LOAM
19 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 19”, MOTTLING AT 19”, WATER BLEEDING AT 23”

DT – 79

0 – 5”	TOPSOIL
5 – 20”	YELLOW BROWN SILT LOAM
20 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 20”, MOTTLING AT 20”, WATER BLEEDING AT 24”

DT – 80

0 – 6”	TOPSOIL
6 – 20”	YELLOW BROWN FINE SAND & SILT LOAM
20 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 20”, MOTTLING AT 20”, WATER BLEEDING AT 23”

DT – 81	
0 – 5”	TOPSOIL
5 – 20”	PALE YELLOW BROWN FINE SAND & SILT LOAM
20 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 20”, MOTTLING AT 20”, WATER BLEEDING AT 23”
DT – 82	
0 – 5”	TOPSOIL
5 – 22”	PALE YELLOW BROWN FINE SAND & SILT LOAM
22 – 77”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 77”, ROOTS TO 19”, MOTTLING AT 19”, WATER BLEEDING AT 22”
DT – 83	
0 – 6”	TOPSOIL
6 – 23”	PALE YELLOW BROWN FINE SAND & SILT LOAM
23 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 23”, MOTTLING AT 23”, WATER BLEEDING AT 28”
DT – 84	
0 – 6”	TOPSOIL
6 – 21”	PALE YELLOW BROWN FINE SAND & SILT LOAM
21 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 21”, MOTTLING AT 21”, WATER BLEEDING AT 22”
DT – 85	
0 – 6”	TOPSOIL
6 – 24”	PALE YELLOW BROWN FINE SAND & SILT LOAM
24 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 24”, MOTTLING AT 24”, WATER BLEEDING AT 27”
DT – 86	
0 – 5”	TOPSOIL
5 – 23”	YELLOW BROWN FINE SAND & SILT LOAM
23 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 23”, MOTTLING AT 23”, WATER BLEEDING AT 27”
DT – 87	
0 – 3”	TOPSOIL
3 – 21”	YELLOW BROWN FINE SAND & SILT LOAM
21 – 80”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 80”, ROOTS TO 21”, MOTTLING AT 21”, WATER BLEEDING AT 24”

DT – 88	
0 – 4”	TOPSOIL
4 – 21”	YELLOW BROWN FINE SAND & SILT LOAM
21 – 83”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 83”, ROOTS TO 21”, MOTTLING AT 21”, WATER BLEEDING AT 24”
DT – 89	
0 – 6”	TOPSOIL
6 – 21”	YELLOW BROWN FINE SAND & SILT LOAM
21 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 21”, MOTTLING AT 21”, WATER BLEEDING AT 24”
DT – 102	
0 – 3”	TOPSOIL
3 – 24”	YELLOW BROWN FINE SANDY LOAM
24 – 36”	GREY BROWN MEDIUM COARSE SAND
36 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 36”, LIGHT MOTTLING AT 36”,
DT – 103	
0 – 3”	TOPSOIL
3 – 22”	YELLOW BROWN FINE SANDY LOAM
22 – 361”	GREY BROWN MEDIUM COARSE SAND
31 – 81”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 81”, ROOTS TO 31”, LIGHT MOTTLING AT 31”,
DT – 104	
0 – 3”	TOPSOIL
3 – 24”	YELLOW BROWN FINE SANDY LOAM
24 – 36”	GREY BROWN MEDIUM COARSE SAND
36 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 36”, LIGHT MOTTLING AT 36”,
DT – 105	
0 – 3”	TOPSOIL
3 – 19”	YELLOW BROWN FINE SANDY LOAM
19 – 31”	GREY BROWN MEDIUM COARSE SAND
31 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 31”, LIGHT MOTTLING AT 31”,
DT – 106	
0 – 3”	TOPSOIL
3 – 19”	YELLOW BROWN FINE SANDY LOAM
19 – 30”	GREY BROWN MEDIUM COARSE SAND
30 – 83”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 30”, LIGHT MOTTLING AT 30”,
DT – 107	
0 – 3”	TOPSOIL

3 – 21”	YELLOW BROWN FINE SANDY LOAM
21 – 33”	GREY BROWN MEDIUM COARSE SAND
33 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 33”, LIGHT MOTTLING AT 33”,
DT – 108	
0 – 4”	TOPSOIL
3 – 24”	YELLOW BROWN FINE SANDY LOAM
26 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 26”, LIGHT MOTTLING AT 26”,
DT – 109	
0 – 8”	TOPSOIL
8 – 26”	YELLOW BROWN FINE SANDY LOAM
26 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL
	LEDGE > 84”, ROOTS TO 26”, LIGHT MOTTLING AT 26”,
DT – 111	
0 – 6”	TOPSOIL
6 – 28”	ORANGE BROWN FINE SAND & SILT LOAM
28 – 77”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 77”, ROOTS TO 28”, LIGHT MOTTLING AT 28”
DT – 112	
0 – 3”	TOPSOIL
3 – 22”	ORANGE BROWN FINE SANDY LOAM
22 – 32”	YELLOW BROWN FINE SANDY LOAM
32 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 32”, LIGHT MOTTLING AT 32”,
	NO WATER
DT – 113	
0 – 4”	TOPSOIL
4 – 18”	ORANGE BROWN FINE SANDY LOAM
18 – 27”	YELLOW BROWN FINE SANDY LOAM
27 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 27”, LIGHT MOTTLING AT 27”,
	NO WATER
DT – 114	
0 – 3”	TOPSOIL
3 – 18”	ORANGE BROWN FINE SANDY LOAM
18 – 25”	YELLOW BROWN FINE SANDY LOAM
25 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 25”, LIGHT MOTTLING AT 25”,
	NO WATER

DT – 115	
0 – 6”	TOPSOIL
6 – 21”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
21 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 21”, MOTTLING AT 21”, NO WATER
DT – 116	
0 – 6”	TOPSOIL
6 – 25”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
25 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 25”, MOTTLING AT 25”, NO WATER
DT – 117	
0 – 4”	TOPSOIL
4 – 14”	ORANGE BROWN FINE SANDY LOAM
14 – 23”	YELLOW BROWN FINE SANDY LOAM
23 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 23”, MOTTLING AT 23’, NO WATER
DT – 118	
0 – 5”	TOPSOIL
5 – 21”	YELLOW BROWN FINE SANDY LOAM
21 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 21”, MOTTLING AT 21”, NO WATER
DT – 119	
0 – 7”	TOPSOIL
7 – 21”	YELLOW BROWN FINE SANDY LOAM
21 – 84”	GREY BROWN MEDIUM COMPACT SAND AND SILT
	LEDGE > 84”, ROOTS TO 21”, MOTTINGH AT 21”
DT – 120	
0 – 5”	TOPSOIL
5 – 20”	YELLOW BROWN FINE SANDY LOAM
20 – 81”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 81”, ROOTS TO 20”, MOTTLING AT 20”, NO WATER
DT – 121	
0 – 6”	TOPSOIL
6 – 21”	YELLOW BROWN FINE SANDY LOAM
21 – 84”	GREY BROWN MEDIUM COMPACT SILTY SAND
	LEDGE > 84”, ROOTS TO 21”, MOTTLING AT 21”

DT – 122	
0 – 7”	TOPSOIL
7 – 27”	YELLOW BROWN FINE SANDY LOAM
27 – 33”	GREY BROWN LIGHTLY COMPACT SAND AND GRAVEL
33 – 84”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL, SOME SILT
	LEDGE > 84”, ROOTS TO 33”, MOTTLING AT 33”
DT – 123	
0 – 6”	TOPSOIL
6 – 26”	YELLOW BROWN FINE SANDY LOAM
26 – 31”	GREY BROWN LIGHTLY COMPACT SAND & GRAVEL
31 – 72”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL, SOME SILT
	LEDGE > 72”, ROOTS TO 31”, MOTTLING AT 31”
DT – 124	
0 – 7”	TOPSOIL
7 – 23”	ORANGE BROWN FINE SANDY LOAM
23 – 31”	GREY BROWN LIGHTLY COMPACT SAND & GRAVEL
31 – 80”	GREY BROWN MEDIUM COMPACT SAND & GRAVEL, SOME SILT
	LEDGE > 80”, ROOTS TO 31”, MOTTLING AT 31”
DT – 133	
0 – 6”	TOPSOIL
6 – 24”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
24 – 78”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 78”, ROOTS TO 24”, MOTTLING AT 24”
DT – 134	
0 – 6”	TOPSOIL
6 – 23”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
23 – 73”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 73”, ROOTS TO 23”, MOTTLING AT 23”
DT – 135	
0 – 9”	TOPSOIL
9 – 23”	YELLOW BROWN FINE SAND & SILT LOAM
23 – 78”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 78”, ROOTS TO 23”, MOTTLING AT 23”
DT – 136	
0 – 8”	TOPSOIL
8 – 25”	YELLOW BROWN FINE SAND & SILT LOAM
25 – 81”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 81”, ROOTS TO 25”, MOTTLING AT 25”

DT – 137	
0 – 5”	TOPSOIL
5 – 24”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
24 – 77”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 77”, ROOTS TO 24”, MOTTLING AT 24”
DT – 138	
0 – 6”	TOPSOIL
6 – 23”	YELLOW BROWN FINE SANDY LOAM, SOME SILT
23 – 73”	GREY BROWN COMPACT SILTY SAND, SOME GRAVEL
	LEDGE > 73”, ROOTS TO 23”, MOTTLING AT 23”

APPENDIX "B"
ASSESSMENT OF PRIME FARMLAND SOILS
NATURAL RESOURCE CONSERVATION SERVICE

EXHIBIT 5

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ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-122464-1
Client Project/Site: Solar Module TCLP

For:
SUMEC Energy Holdings Co. Ltd.
No.1 Xinghuo Road
Nanjing Hi-tesh Zone
Nanjing, China 210061

Attn: Mr. Chester Chen

Authorized for release by:
12/3/2019 7:25:49 PM

Michael DelMonico, Project Manager I
(330)497-9396
michael.delmonico@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 240-122464-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

CASE NARRATIVE

Client: SUMEC Energy Holdings Co. Ltd.

Project: Solar Module TCLP

Report Number: 240-122464-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, Canton attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The sample was received on 11/18/2019 11:10 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 13.8º C.

TCLP METALS (ICP)

Sample SOLAR PANEL (240-122464-1) was analyzed for TCLP metals (ICP) in accordance with EPA SW-846 Methods 1311/6010B. The sample was leached on 11/25/2019, prepared on 11/26/2019 and analyzed on 11/27/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP MERCURY

Sample SOLAR PANEL (240-122464-1) was analyzed for TCLP mercury in accordance with EPA SW-846 Methods 1311/7470A. The sample was leached on 11/25/2019, prepared on 11/26/2019 and analyzed on 11/27/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
1311	TCLP Extraction	SW846	TAL CAN
3010A	Preparation, Total Metals	SW846	TAL CAN
7470A	Preparation, Mercury	SW846	TAL CAN
Part Size Red	Particle Size Reduction Preparation	None	TAL CAN

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

Sample Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-122464-1	SOLAR PANEL	Solid	11/14/19 00:00	11/18/19 11:10	

Detection Summary

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Client Sample ID: SOLAR PANEL

Lab Sample ID: 240-122464-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	4.3		0.050		mg/L	1		6010B	TCLP

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: SUMEC Energy Holdings Co. Ltd.
Project/Site: Solar Module TCLP

Job ID: 240-122464-1

Client Sample ID: SOLAR PANEL

Lab Sample ID: 240-122464-1

Date Collected: 11/14/19 00:00
Date Received: 11/18/19 11:10

Matrix: Solid

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 10:08	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Lead	**4.3**		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 10:08	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:19	1

QC Sample Results

Client: SUMEC Energy Holdings Co. Ltd.
Job ID: 240-122464-1
Project/Site: Solar Module TCLP

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Method: 6010B - Metals (ICP)

Lab Sample ID: MB 240-412722/2-A
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412722

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 09:59	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Lead	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:59	1

Lab Sample ID: LCS 240-412722/3-A
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412722

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	2.15		mg/L		108	50 - 150
Barium	2.00	2.00		mg/L		100	50 - 150
Cadmium	1.00	1.05		mg/L		105	50 - 150
Chromium	1.00	1.01		mg/L		101	50 - 150
Lead	1.00	0.900		mg/L		90	50 - 150
Selenium	2.00	2.13		mg/L		106	50 - 150
Silver	0.100	0.107		mg/L		107	50 - 150

Lab Sample ID: LB 240-412574/1-B
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 412722

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Barium	ND		0.50		mg/L		11/26/19 14:00	11/27/19 09:54	1
Cadmium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Chromium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Lead	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Selenium	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1
Silver	ND		0.050		mg/L		11/26/19 14:00	11/27/19 09:54	1

Lab Sample ID: 240-122464-1 MS
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	ND		5.00	5.46		mg/L		109	75 - 125
Barium	ND		50.0	51.9		mg/L		103	75 - 125
Cadmium	ND		1.00	1.12		mg/L		112	75 - 125
Chromium	ND		5.00	5.38		mg/L		108	75 - 125
Lead	4.3		5.00	9.84		mg/L		110	75 - 125
Selenium	ND		1.00	1.14		mg/L		114	75 - 125
Silver	ND		1.00	1.07		mg/L		107	75 - 125

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 240-122464-1 MSD
Matrix: Solid
Analysis Batch: 412928

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412722

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	**Result**	**Qualifier**	**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**	**RPD**	**Limit**
Arsenic	ND		5.00	5.59		mg/L		112	75 - 125	2	20
Barium	ND		50.0	54.0		mg/L		108	75 - 125	4	20
Cadmium	ND		1.00	1.14		mg/L		114	75 - 125	2	20
Chromium	ND		5.00	5.43		mg/L		109	75 - 125	1	20
Lead	4.3		5.00	9.95		mg/L		112	75 - 125	1	20
Selenium	ND		1.00	1.16		mg/L		116	75 - 125	2	20
Silver	ND		1.00	1.09		mg/L		109	75 - 125	2	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-412725/2-A
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412725

	MB	MB							
Analyte	**Result**	**Qualifier**	**RL**	**MDL**	**Unit**	**D**	**Prepared**	**Analyzed**	**Dil Fac**
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:15	1

Lab Sample ID: LCS 240-412725/3-A
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412725

	Spike	LCS	LCS				%Rec.
Analyte	**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**
Mercury	0.00500	0.00549		mg/L		110	80 - 120

Lab Sample ID: LB 240-412574/1-D
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 412725

	LB	LB							
Analyte	**Result**	**Qualifier**	**RL**	**MDL**	**Unit**	**D**	**Prepared**	**Analyzed**	**Dil Fac**
Mercury	ND		0.0020		mg/L		11/26/19 14:00	11/27/19 18:13	1

Lab Sample ID: 240-122464-1 MS
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412725

	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	**Result**	**Qualifier**	**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**
Mercury	ND		0.00500	0.00564		mg/L		113	80 - 120

Lab Sample ID: 240-122464-1 MSD
Matrix: Solid
Analysis Batch: 413058

Client Sample ID: SOLAR PANEL
Prep Type: TCLP
Prep Batch: 412725

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	**Result**	**Qualifier**	**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**	**RPD**	**Limit**
Mercury	ND		0.00500	0.00563		mg/L		113	80 - 120	0	20

QC Association Summary

Metals

Processed Batch: 412195

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	Part Size Red	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	Part Size Red	
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	Part Size Red	

Leach Batch: 412574

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	1311	412195
LB 240-412574/1-B	Method Blank	TCLP	Solid	1311	
LB 240-412574/1-D	Method Blank	TCLP	Solid	1311	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	1311	412195
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	1311	412195

Prep Batch: 412722

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	3010A	412574
LB 240-412574/1-B	Method Blank	TCLP	Solid	3010A	412574
MB 240-412722/2-A	Method Blank	Total/NA	Solid	3010A	
LCS 240-412722/3-A	Lab Control Sample	Total/NA	Solid	3010A	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	3010A	412574
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	3010A	412574

Prep Batch: 412725

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	7470A	412574
LB 240-412574/1-D	Method Blank	TCLP	Solid	7470A	412574
MB 240-412725/2-A	Method Blank	Total/NA	Solid	7470A	
LCS 240-412725/3-A	Lab Control Sample	Total/NA	Solid	7470A	
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	7470A	412574
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	7470A	412574

Analysis Batch: 412928

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	6010B	412722
LB 240-412574/1-B	Method Blank	TCLP	Solid	6010B	412722
MB 240-412722/2-A	Method Blank	Total/NA	Solid	6010B	412722
LCS 240-412722/3-A	Lab Control Sample	Total/NA	Solid	6010B	412722
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	6010B	412722
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	6010B	412722

Analysis Batch: 413058

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-122464-1	SOLAR PANEL	TCLP	Solid	7470A	412725
LB 240-412574/1-D	Method Blank	TCLP	Solid	7470A	412725
MB 240-412725/2-A	Method Blank	Total/NA	Solid	7470A	412725
LCS 240-412725/3-A	Lab Control Sample	Total/NA	Solid	7470A	412725
240-122464-1 MS	SOLAR PANEL	TCLP	Solid	7470A	412725
240-122464-1 MSD	SOLAR PANEL	TCLP	Solid	7470A	412725

Lab Chronicle

Client Sample ID: SOLAR PANEL
Date Collected: 11/14/19 00:00
Date Received: 11/18/19 11:10

Lab Sample ID: 240-122464-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Processed	Part Size Red			412195	11/22/19 08:42	POP	TAL CAN
TCLP	Leach	1311			412574	11/25/19 16:55	DRJ	TAL CAN
TCLP	Prep	3010A			412722	11/26/19 14:00	MRL	TAL CAN
TCLP	Analysis	6010B		1	412928	11/27/19 10:08	WKD	TAL CAN
TCLP	Processed	Part Size Red			412195	11/22/19 08:42	POP	TAL CAN
TCLP	Leach	1311			412574	11/25/19 16:55	DRJ	TAL CAN
TCLP	Prep	7470A			412725	11/26/19 14:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	413058	11/27/19 18:19	SLD	TAL CAN

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

Accreditation/Certification Summary

Client: SUMEC Energy Holdings Co. Ltd.
Job ID: 240-122464-1
Project/Site: Solar Module TCLP

Laboratory: Eurofins TestAmerica, Canton

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	**Program**	**Identification Number**	**Expiration Date**
California	State Program	2927	02-23-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
7470A	7470A	Solid	Mercury

13.1/13.8

SUMEC

SUMEC ENERGY HOLDINGS CO.,LTD.
江苏苏美达能源控股有限公司

致TO Eurofins TestAmerica
4101 Shuffel Street NW, North Canton, OH 44720, USA

发票编号 INV.NO. SUMEC-EUROFINS-20191114
日期 DATE 2019/11/14

发 票
COMMERCIAL INVOICE

L/C NO.

唛头及编号 Mark && Numbers	品名 Descriptions	数量 Quantities	单价 Unit Price	总价 Amount
N/M			USD	USD
	raw material sample of solar module	2 SET	5.00	10
		2 SET		10.00

TOTAL:PACKED IN: 1 CARTON
G/W: 1 KGS
N/W: 0.9 KGS

SUMEC ENERGY HOLDINGS CO.,LTD.
NO.1 XINGHUO ROAD, NATIONAL LEVEL NANJING
HI-TECH ZONE, NANJING, 210061 P.R. CHINA

江苏苏美达能源控股有限公司
SUMEC ENERGY HOLDINGS CO.,LTD

王健

Accepted by Lab 11/18/19
ETA 1110

240-122464 Chain of Custody

Eurofins TestAmerica Canton Sample Receipt Form/Narrative **Login # :** 122464
Canton Facility

Client Sunmec Energy Holdings Inc Site Name ____

Cooler unpacked by: Ryan Cribler

Cooler Received on 11-18-19 Opened on 11-18-19 1110

FedEx: 1st Grd Exp UPS FAS Clipper TD [✓ Client Drop Off] TestAmerica Courier Other DHL

Receipt After-hours: Drop-off Date/Time ____ Storage Location ____

TestAmerica Cooler # ____ Foam Box Client Cooler [✓ Box] Other ____

Packing material used: Bubble Wrap Foam [✓ Plastic Bag] None Other ____

COOLANT: Wet Ice Blue Ice Dry Ice Water [✓ None]

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-10 (CF **+0.7** °C) Observed Cooler Temp. 13.1 °C Corrected Cooler Temp. 13.8 °C
   IR GUN #IR-11 (CF **+0.9**°C) Observed Cooler Temp. ____ °C Corrected Cooler Temp. ____ °C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 [✓ Yes] No
   -Were the seals on the outside of the cooler(s) signed & dated? Yes [✓ No] NA
   -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes [✓ No]
   -Were tamper/custody seals intact and uncompromised? [✓ Yes] No NA
3. Shippers' packing slip attached to the cooler(s)? [✓ Yes] No
4. Did custody papers accompany the sample(s)? [✓ Yes] No
5. Were the custody papers relinquished & signed in the appropriate place? Yes [✓ No]
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes [✓ No]
7. Did all bottles arrive in good condition (Unbroken)? [✓ Yes] No
8. Could all bottle labels be reconciled with the COC? [✓ Yes] No
9. Were correct bottle(s) used for the test(s) indicated? [✓ Yes] No
10. Sufficient quantity received to perform indicated analyses? [✓ Yes] No
11. Are these work share samples? Yes [✓ No]
    If yes, Questions 12-16 have been checked at the originating laboratory.
12. Were all preserved sample(s) at the correct pH upon receipt? Yes No [✓ NA] pH Strip Lot# **HC995364**
13. Were VOAs on the COC? Yes [✓ No]
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No [✓ NA]
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # ____ Yes [✓ No]
16. Was a LL Hg or Me Hg trip blank present? ____ Yes [✓ No]

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM ____ Date ____ by ____ via Verbal Voice Mail Other

Concerning ____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES

Samples processed by:

Will log ID as "Solar Panel" sample date as 11/14/19 (date at top of COC/letter), no sample time. Will log TCLP Metals w/ PSR per PM.

18. SAMPLE CONDITION

Sample(s) ____ were received after the recommended holding time had expired.
Sample(s) ____ were received in a broken container.
Sample(s) ____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) ____ were further preserved in the laboratory.
Time preserved: ____ Preservative(s) added/Lot number(s): ____

VOA Sample Preservation - Date/Time VOAs Frozen: ____

WI-NC-099

EXHIBIT 6

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO
ATTENTION OF

19 January 2021

Regulatory Division
File Number: NAE-2021-00176

Carrie Larson Ortolano Esq.
LSE Pictor, LLC
40 Tower Lane, Suite 201
Avon, CT 06001

Dear Ms. Larson Ortolano:

PROPOSED WORK/LOCATION: Construct a Gravel Access Road, Winchester, CT.

We have reviewed your proposal to perform work within Corps of Engineers jurisdiction. We have assigned this file number **NAE-2021-00176.** Please reference this number in any future correspondence with us.

Since your project may have only minimal individual and cumulative impacts on waters and wetlands of the United States, it is authorized by the Corps of Engineers under the Connecticut General Permits (GPs). This authorization does not obviate the need to obtain other federal, state, or local approvals. You are responsible for ensuring that the work meets the terms and conditions of the CT GPs. We have recorded this project as permittee self-verification of the CT GPs in our database.

Please contact me at (978) 318-8703 if you have any questions.

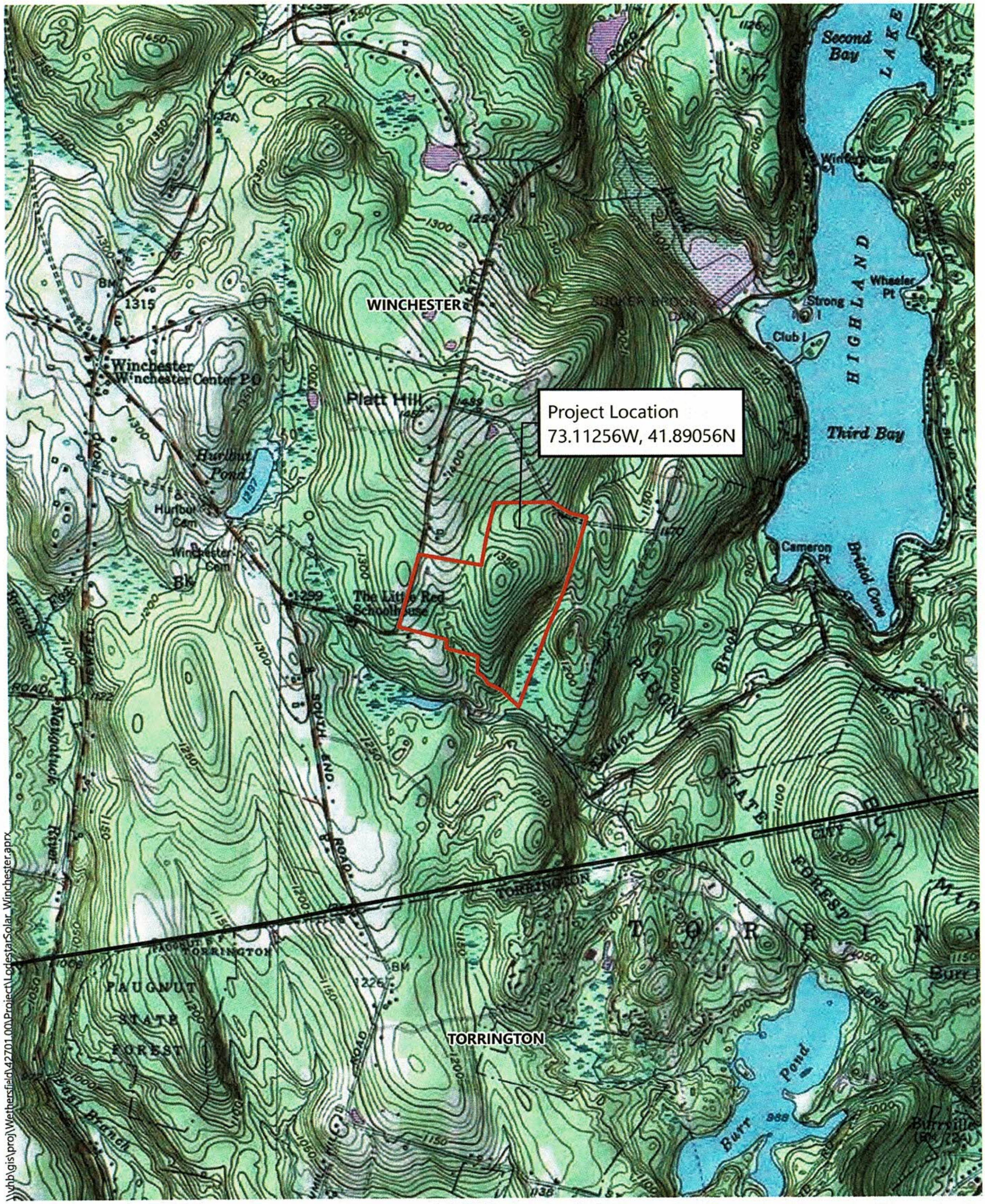
Sincerely,

Kevin R Kotelly

Kevin R. Kotelly, P.E.
Chief, Permits & Enforcement Branch
Regulatory Division

Enclosure (plans)

vhb January 12, 2021 | **FIGURE 1**



\\vhb\gis\proj\Wethersfield\42701.00\ProjectLodestarSolar_Winchester.aprx

0 1000 2000 4000 Feet

🟥 Project Location

⬜ Town Boundary

LSE Winchester Solar
Platt Hill Road

| Winchester, CT

USGS Site Location Map

Source: VHB, ArcGIS Online, CTDEEP

EXHIBIT 7

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April 5, 2021

Ref: 42701.00

Ms. Carrie Larson Ortolano
Associate General Counsel
LSE Pictor LLC
40 Tower Lane, Suite 201
Avon, CT 06001

Re: CTDEEP Dam Safety Determination
Petition #1389A – LSE Pictor, LLC
Platt Hill Road, Winchester, CT

Dear Ms. Ortolano:

This letter is written in support of the above-referenced Petition. Correspondence from the Project team to CTDEEP Dam Safety Division began with an email from LSE Pictor LLC on January 13, 2021 and concluded with an email from Mr. Kartik Parekh at CTDEEP Dam Safety Division on January 27, 2021. In this email from Mr. Parekh, it is stated that the department intends to follow Connecticut General Statute Section 22a-409(c) regarding solar development projects, which indicates that dams impounding less than three (3) acre-feet of water would not require a CTDEEP Dam Safety Permit.

We have enclosed a copy of the email correspondence with CTDEEP Dam Safety Division with this letter for reference, and also have provided herewith a table of the proposed stormwater basins' criteria for the LSE Pictor, LLC site plans and Stormwater Management Report prepared by Trinkaus Engineering, LLC, revised through March 25, 2021. No proposed stormwater basin exceeds three (3) acre-feet of impounded water as indicated. We trust that this satisfactorily concludes the necessary correspondence with this department unless proposed conditions are altered to necessitate a new determination.

Basin #	**Lowest Existing Grade @ Berm**	**Proposed Grade of Spillway Crest**	**Maximum Height of Impoundment**	**Volume of Impounded Water**
Constructed Wetland Basin 1	±1290.0	1291.1	±1.1 feet	±0.1 acre-feet
Constructed Wetland Basin 2	±1318.0	1321.5	±3.5 feet	±0.8 acre-feet
East Settling Basin	±1323.5	1326.0	±2.5 feet	±0.2 acre-feet
Northeast Settling Basin	±1329.0	1330.0	±1.0 feet	±0.1 acre-feet

Sincerely,

Steven J. Kochis

Steven J. Kochis, PE
Senior Project Engineer

Kochis, Steve

From: Parekh, Kartik <Kartik.Parekh@ct.gov>
Sent: Wednesday, January 27, 2021 7:37 AM
To: cortolano@lodestarenergy.com
Cc: alifland@lodestarenergy.com; strinkaus@earthlink.net; Kochis, Steve; Hall, Ivonne
Subject: [External] RE: dam safety request for classification -- Platt Hill Road, Winchester

Carrie
We have received new guidance on when new solar power development proposals should be submitted to the DEEP Dam Safety program for permit need determination review. Solar sites' stormwater basins that are designed to impound less than 3 acre-feet of water at maximum storage elevation (assume water level at the crest of the dam) would not need a DEEP Dam Safety Permit to construct. Please check with the local inland wetlands agency for permit requirements.

Stormwater basins that are designed to store more than 3 acre-feet of water would require a request for a permit need determination that provides supplemental information.

This determination applies to the stormwater basins associated with development of new solar power sites. Once the dams are constructed you must contact the DEEP Dam Safety Program to receive dam registration forms and have the dams registered with the State.

Please feel free to contact me or my supervisor, Ivonne Hall at Ivonne.Hall@ct.gov if you have any questions.
Thank you.

Kartik Parekh
Dam Safety Section
Water Planning & Management Division
Bureau of Water Protection & Land Reuse
Connecticut Department of Energy and Environmental Protection
79 Elm Street, Hartford, CT 06106-5127
P: 860.424.3615 | F: 860.424.4075 | E: kartik.parekh@ct.gov

Connecticut Department of
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www.ct.gov/deep/dams

Conserving, improving and protecting our natural resources and environment;
Ensuring a clean, affordable, reliable, and sustainable energy supply.

From: Hall, Ivonne <Ivonne.Hall@ct.gov>
Sent: Wednesday, January 13, 2021 4:31 PM
To: Parekh, Kartik <Kartik.Parekh@ct.gov>
Subject: FW: dam safety request for classification -- Platt Hill Road, Winchester

Ivonne

Ivonne Grajko Hall, P.E.
Supervising Civil Engineer
Dam Safety Program
Water Planning & Management Division
Bureau of Water Protection & Land Reuse
Connecticut Department of Energy and Environmental Protection
79 Elm Street, Hartford, CT 06106-5127
P: 860.424.3754 | E: Ivonne.hall@ct.gov
https://portal.ct.gov/DEEP/Water/Dams/Dams-Safety
https://portal.ct.gov/DEEP/Water/Dams/State-Dams-and-Dam-Safety

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

www.ct.gov/deep

From: Carrie Ortolano <cortolano@lodestarenergy.com>
Sent: Wednesday, January 13, 2021 11:49 AM
To: Laskin, Anna <Anna.Laskin@ct.gov>; Hall, Ivonne <Ivonne.Hall@ct.gov>
Cc: Anna Lifland <alifland@lodestarenergy.com>; Steve Trinkaus <strinkaus@earthlink.net>; Kochis, Steve <skochis@vhb.com>
Subject: dam safety request for classification -- Platt Hill Road, Winchester

Good morning-

LSE Pictor LLC ("Lodestar") is the developer of a proposed solar photovoltaic generating facility located at Platt Hill Road in Winchester, On behalf of Lodestar, I am submitting the attached for a determination from dam safety. I enclose the proposed site plans and stormwater report, prepared in connection with a Siting Council petition for declaratory ruling, which will be filed in January, 2021. Steve Trinkaus, the project engineer at Trinkaus Engineering and Steve Kochis, Lodestar's consulting engineer from VHB, are copied on this correspondence. As you will see, the project includes two proposed detention basins, the berms of which are shown as 2.5 feet above ground level.

Lodestar respectfully requests a classification of the proposed berms/detention basins.

Please let us know if you need any more information or if you have any questions.

Respectfully submitted on behalf of Lodestar.

Carrie Larson Ortolano
Associate General Counsel
860.539.5137
cortolano@lodestarenergy.com
www.lodestarenergy.com

<u>EXHIBIT 8</u>

LODESTAR

Carrie Ortolano <cortolano@lodestarenergy.com>

Platt Hill - Updated Site Plans and Stormwater Report

Stone, Chris <Chris.Stone@ct.gov> Tue, Feb 2, 2021 at 12:54 PM
To: Anna Lifland <alifland@lodestarenergy.com>, "Williams, Neal" <Neal.Williams@ct.gov>, Carrie Ortolano <cortolano@lodestarenergy.com>

Anna,

I have reviewed the revisions and they look fine. They reduced the developed footprint and pulled the stormwater basins and outfalls back 50+ feet from the wetlands in accordance with the new general permit Appendix I. The final step for approving the registration is the submission of the Letter of Credit in accordance with Appendix I. The amount of the letter of credit for sites disturbing less than 20 acres is $7,500 per acre of disturbance. You can find the template for the LOC in Appendix J of the new permit.

Since the new permit was reissued on December 31, be aware that you will be required to follow all of the elements of the new permit including the inspection requirements that involve the designing qualified professional and the local Conservation District. Let me know if you have any questions.

Thanks,

Chris

Christopher Stone, P.E.

Stormwater Section

Water Permitting & Enforcement Division

Bureau of Materials Management & Compliance Assurance

Connecticut Department of Energy and Environmental Protection
79 Elm Street, Hartford, CT 06106-5127
Phone: (860) 424-3850 | Fax: (860) 424-4074. | Email: Chris.Stone@ct.gov

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Conserving, improving and protecting our natural resources and environment;

Ensuring a clean, affordable, reliable, and sustainable energy supply.

From: Anna Lifland <alifland@lodestarenergy.com>
Sent: Monday, February 1, 2021 4:11 PM
To: Williams, Neal <Neal.Williams@ct.gov>; Stone, Chris <Chris.Stone@ct.gov>; Carrie Ortolano <cortolano@lodestarenergy.com>
Subject: Re: Platt Hill - Updated Site Plans and Stormwater Report

[Quoted text hidden]