Petition No. 1397

Petitioner's Responses to
Connecticut Siting Council Interrogatories
Set One

May 27, 2020

Notice

1. Was the Town of Plainfield Conservation Commission provided notice of the petition? If not, provide proof that such notice was sent to the Town of Plainfield Conservation Commission.

   Company's Response:
   As provided in Exhibit M of the Petition, the Petitioner provided notice of the Project to the Town of Plainfield, on March 23, 2020. In addition, the Petitioner provided notice to the Plainfield Conservation Commission via Certified Mail on May 19, 2020. Proof of Certified Mail and Receipt is provided herewith as Attachment CSC-1.

Project Development

2. If the project is approved, identify all permits necessary for construction and operation and which entity will hold the permit(s)?

   Company's Response:
   The following permits will be required for the Project, including, but not limited to:
   - Connecticut Department of Energy and Environmental Protection (DEEP), Registration in accordance with the Construction General Stormwater Permit
   - Town of Plainfield, Building Permit
   - Town of Plainfield, Electrical Permit

   The permits will be obtained and held by Nutmeg Solar, LLC.

   Additional necessary regulatory approvals include:
   - Connecticut Siting Council (CSC), Decision granting Petition for Declaratory Ruling
   - CSC, Decision approving Development & Management Plan
   - Connecticut Public Utilities Regulatory Authority, Class I Certification

3. Page 3 of the Petition notes that the proposed project was selected in DEEP's Small-Scale Clean Energy RFP whereas p. 13 states the Project was selected as part of the Tri-State RFP. Please clarify.

   Company's Response:
   Constitution Solar was selected in DEEP's Small-Scale RFP.

4. Referring to Petition p. 3, the Project has a power purchase agreement (PPA) with Eversource Energy and The United Illuminating Company. What percentage of the electricity/energy and RECs are being sold to each power supplier?

   Company's Response:
   Pursuant to the PPAs, the Petitioner will sell both electricity/energy and renewable energy credits (RECs) ("Products") to Eversource and The United Illuminating Company ("Buyers"). The percentage of the Products, including electricity, (i.e. the Buyers' Percentage Entitlement), are 80.36% allocation to Eversource Energy and 19.64% allocation to the United Illuminating Company.

5. Are the PPAs based on energy (i.e. MWh) or capacity (i.e. MW) or both? Is there an option within the PPA to allow for changes in the total output of the facility based on unforeseen circumstances or site modifications prior to construction?

   Company's Response:
   The Forward Capacity Auction (FCA) 14 Qualified Megawatt (MW) Capacity for Constitution is 11.6 MW. The PPAs are based on both energy (and RECs) as well as nameplate in terms of meeting the 19.59 MW alternating current (AC) threshold. While the PPA allows for a one-time change in the total output of the facility based on unforeseen circumstances or site modifications prior to construction, the proposed Project has been carefully designed to balance both environmental and economic goals and any modifications could result in the project not moving forward.

6. What is the length of the PPA? Are there provisions for any extension of time in the PPA? Is there an option to renew?

   Company's Response:
   Each PPA has a term of 20 years. The off-taker maintains the right to request a new contract or PPA, but there are no options to renew within the existing PPAs.

7. What is the operational life of the facility? If the PPAs expire and are not renewed, and the solar facility has not reached the end of its lifespan, will the Petitioner decommission the facility or seek other revenue mechanisms for the power produced by the facility?

   Company's Response:
   The Project has an estimated 30-year operational life. In the event no other PPAs are executed, energy from the Project can be sold on a merchant basis for the remaining 10 years.

8. Would the petitioner participate in the ISO-NE Forward Capacity Auction? If yes, which auction(s) and capacity commitment period(s)?

   Company's Response:
   Yes. Constitution Solar participated in Independent System Operator-New England (ISO-NE) Forward Capacity Auction 14, for the 2023-2024 capacity commitment period.

Proposed Site

9. Revise Petition Figure 6 to include designations for 50-foot and 100-foot wetland/watercourse buffers and the location of post-construction stormwater basins.

   Company's Response:
   The revised figure is provided in Attachment CSC-9.

10. Petition p. 23 notes that the project site is currently used for crops. Is it used by the property owner, or is it leased to a third party?

    Company's Response:
    The property is used by the landowner.

11. Petition p. 13 refers to grass cover crops. Is the grass within the solar array considered a farm crop?

    Company's Response:
    Petition p. 11 refers to on-site maintenance and regular mowing of grass between panel rows. The grass within the solar array is not a farm product. It is groundcover to protect from erosion and sedimentation caused by stormwater runoff

12. Petition p. 5 states the project site has a purchase option. Yet, the third column in Table 3-1 is entitled, "Project Lease or Purchase." If the Project is approved, is Constitution Solar required to execute the purchase options? If so, is the "site owner" referenced in the Decommissioning Plan referring to Constitution Solar? Also, if so, why is there a reference to "the end of the property lease term" in the Decommissioning Plan?

    Company's Response:
    The entire Project is under purchase option; the property lease term was included in the table and Decommissioning Plan in error. The decision to execute any of the purchase options remains at the Petitioner's discretion.

13. Is the site parcel, or any portion thereof, part of the Public Act 490 Program? If so, how does the municipal land use code classify the parcel(s)? How would the project affect the use classification?

Company's Response:
All four parcels are currently assessed under the Public Act 490 Program. These parcels would be reclassified if the proposed Project is approved by the CSC.

14. Provide the distance, direction and address of the nearest off-site residence, not owned by the lessor/property owner, from the perimeter fence of the two separate solar field areas.

Company's Response:
The chain link fence surrounding the northern array is approximately 75 feet from the corner of the nearest house, located at 155 Cornell Road. The chain link fence surrounding the southern array is approximately 191 feet from the corner of the nearest house, located at 65 Cornell Road.

15. Petition Attachment L describes outreach to project abutters. What concerns did the abutters have and how were these concerns addressed?

Company's Response:
Throughout the Project's development, both the Petitioner and the Town of Plainfield First Selectman have made themselves available to discuss concerns and incorporate feedback into the Project design.

The Petitioner held an open house for the Project abutters on September 27, 2017 to provide an initial Project overview to neighbors and community members. On November 25, 2019 abutters were contacted directly via phone call and personal visits to homes to provide Project updates and inform them of an upcoming Community Open House. On December 5, 2019, the Petitioner met one-on-one with abutters to provide updates on the Project.

A second Community Open House was held on December 12, 2019 at the Plainfield Town Hall to answer questions and address any further concerns from Town officials. One abutter expressed concerns regarding potential visual impact from the southernmost array. As a result, design changes were made to move panels out of direct view to reduce the potential for visual impacts in this area. Additionally, the Petitioner proposed to plant trees around the array to reduce the visual impacts for the Town, which was well-received. The Petitioner has diligently worked with the Project neighbors since inception of the Project to address concerns.

16. Petition Attachment M contains a list of site owners. Does this refer to Project abutters? Please submit a clearly labeled abutters' map. What other area residents were notified, if any?

Company's Response:
The Exhibit M divider sheet referring to a "list of site owners" is incorrect. The list provided in Exhibit M includes addresses for the site owners, direct abutters and other area residents who were notified about the Project. The list corresponds to the figure, Legal Notice Recipients, provided in Attachment CSC-16, which is color coded to distinguish among site parcels/owner, direct abutters and area residents/Project neighbors who were notified of the Project.

Energy Output

17. Have electrical loss assumptions been factored into the output of the facility? What is the output (MW AC) at the point of interconnection?

Company's Response:
Yes, electrical loss assumptions were factored into the output of the Project upon initial modeling. The Project's output at the point of interconnection (POI) is 19.59 MW AC.

18. What is the efficiency of the photovoltaic module technology of the proposed project?

Company's Response:
The efficiency of the proposed 415-Watt photovoltaic modules is 20.63%. *See* Petition Exhibit E, JinKO EAGLE HC 72M G2 390-415 Watt Solar Module Specifications.

19. What is the estimated capacity factor of the proposed project?

Company's Response:
The estimated capacity factor of the proposed Project is 22.4%.

20. Would the impact of soft or hard shading reduce the energy production of the proposed project? If so, was this included in the proposed projects capacity factor?

Company's Response:
Yes, shading would reduce energy production of the Project, and was modeled into the capacity factor.

21. Is the project being designed to accommodate a potential future battery storage system? If so, please indicate the anticipated size of the system, where it may be located on the site, and the impact it may have on the PPA.

    Company's Response:
    A battery storage system is not contemplated in the Project design.

22. Can the project be designed to serve as a microgrid?

    Company's Response:
    No. The Project's PPAs do not contemplate operations as a microgrid. Moreover, microgrid functionality would require the Project to have an energy storage component, and/or local connected load and dispatch capabilities which are not included in the Project's design.

23. If one section of the solar array experiences electrical problems causing the section to shut down, could other sections of the system still operate and transmit power to the grid? If so, at what electrical point can the Project be sectionalized?

    Company's Response:
    If one section of the array experiences an electrical problem or a fire, the section with the problem will be completely isolated from functioning arrays, thus fuses for defective arrays will blow. The functioning arrays will continue operating normally. If there is a fault that could cause disruption to the grid, the entire solar array will be isolated from the grid; the switches will trip and the inverters also will stop producing power.

24. Explain why a solar panel angle of 13 degrees above the horizontal was selected for this facility as opposed to a more common 20 to 25 degree angle? Is the project designed to maximize annual energy production or peak load shaving?

    Company's Response:
    The 13 degree tilt angle is proposed due to the space constraints on site and goal to maximize annual energy production. The current industry standard to maximize annual production is to design to a 1.4-1.5 direct current (DC)/AC ratio without having shading between 10 AM and 2 PM on the winter solstice. The Petitioner is still analyzing the cost/benefit of increasing the tilt angle while maintaining interrow spacing given the new module technology of Half-cell modules, which reduces the production impact of interrow shading on panels.

25. Do solar facilities present a challenge for the independent system operator for balancing loads and generation (to maintain the system frequency) due to the changing (but not controlled) megawatt output of a solar facility? What technology or operational protocols could be employed to mitigate any challenges?

Company's Response:
The impacts of the Project have been evaluated through a System Impact Study (SIS) performed in coordination with Eversource. This study has indicated that the facility will not have adverse impacts on the bulk power system.

Site Components and Solar Equipment

26. We are string inverters considered for this project? If so, what factors led the current design of several large inverters rather than the use of string inverters? Would the use of string inverters rather than large inverters allow the Petitioner to reduce the footprint of the project?

Company's Response:
Central inverters were approved through the initial SIS. Any change in inverters would likely require a new SIS. The use of string inverters rather than centralized inverters would not significantly change the Project footprint.

27. Referring to Petition p. 7, what site specific factors determine the method of wire installation/routing?

Company's Response:
The locations of the inverters were used to determine the method of wire installation/routing.

28. What is the length of the posts and to what depth would the posts be driven into the ground to support the solar racking system?

Company's Response:
The preliminary engineering has indicated that the posts will average 10-16 feet in length and have an approximately 6–9-foot embedded depth.

Interconnection

29. Provide a detailed drawing of the facility switchyard.

Company's Response:
The final switchyard design is under development in coordination with Eversource. Attachment CSC-29 provides general details for the single line diagram. Final details of

the switchyard facility can be provided as part of the Project's Development & Management Plan if required.

30. Provide detail as to how the different solar array areas are connected to the switchyard.

Company's Response:
The AC collection lines from the inverters will all connect at the switchyard by home run wires via an above ground cable management system along the road and/or underground. Detailed drawings can be provided showing specific locations of cable home runs upon completion of the Electrical Collection system design later this year.

31. Referring to petition Attachment P, Figure 2 depicts an interconnection route - is this the proposed route? If so, provide site plan detail.

Company's Response:
The proposed interconnection route has been changed to a new POI on Cornell Road, adjacent to the Project (Attachment CSC-9). This POI will connect the facility to a dedicated three-phase Eversource feeder.

32. Referring to Petition p. 22 of the Environmental Site Conditions Report in Exhibit C, the proposed collection line that will be under Cornell Road is mentioned. Are new overhead lines proposed for the interconnection? If so, provide a site plan that shows the interconnection route and locations of line support structures. Identify the height and type of support structures necessary for the interconnection.

Company's Response:
The array collection lines will be underground until they enter the switchyard.

33. If no new lines are proposed, is the existing distribution system three-phase or would it have to be upgraded from single-phase to three-phase to connect to the Fry Brook Substation?

Company's Response:
The Project will interconnect with the Eversource Fry Brook Substation through a new dedicated 4.54-mile three-phase feeder.

Public Safety

34. Would the project comply with the National Electrical Code, the National Electrical Safety Code and any applicable National Fire Protection Association codes and standards?

    Company's Response:
    Yes, the Project will comply with all applicable safety codes and standards, including the National Electric Code, National Electric Safety Code and any applicable National Fire Protection Association codes and standards.

35. Referring to petition p. 17, what is the status of the Noise study?

    Company's Response:
    An acoustic analysis is currently being completed for the Project and will be provided to the CSC once complete (to be inserted in Exhibit N).

36. Will the petitioner conduct site safety/operation training for local emergency responders? At what point will outreach occur? How would site access to different facility areas be ensured for emergency responders?

    Company's Response:
    The Petitioner will provide training to local first responders so that site access and emergency response procedures are well understood prior to operation. Site access will be determined with local emergency responders during safety training/orientation.

37. How does the facility shut/de-energized during a fire? Would the solar panels still produce power and present an emergency response hazard if the site is shut down at the inverter level?

    Company's Response:
    See response to Interrogatory #23. Prior to commencing commercial operations, the Petitioner will work do develop a Project specific emergency preparedness plan which standardizes procedures in the unlikely event of a fire.

38. The site is located adjacent to a DEEP designated hunting area. Will the petitioner perform any outreach to DEEP regarding potential safety concerns during construction?

    Company's Response:
    The Petitioner does not anticipate any safety concerns during construction as a result of the Project's proximity to a DEEP-designated hunting area. Any concerns during construction can be directed to the Project site manager.

Environmental

39. What is the acreage of tree clearing and grubbing? What is the acreage of clearing that does not involve grubbing?

    Company's Response:
    The acreage of tree clearing and grubbing is approximately 22 acres. The acreage of clearing that does not involve grubbing is approximately 1 acre.

40. Referring to Site Plans C-005, why does the small area east of Wetland 11 and east of the farm road require clearing and grubbing? What site modifications can be made to avoid clearing in this area?

    Company's Response:
    The area of clearing and grubbing located east of Wetland 11 and west of the farm road is required for a sediment trap that is part of the Stormwater Pollution Control Plan (SWPCP). In order to avoid this clearing, the array located east of the farm road in this area would require significantly more earthwork to construct a basin in a separate location. This would require additional earthwork for swales/berms near the wetland buffer which would result in larger disturbance on the site in general and would require stormwater to travel a longer distance.

41. Referring to Site Plans C-012, can the existing agricultural field edge be maintained instead of clearing to the west, towards the Wetland 1?

    Company's Response:
    Removal of these trees is proposed to prevent shading and to accommodate sediment traps proposed as part of the SWPCP. Reduction of clearing in this area would lead to a system size loss. All clearing in this area is outside of the 100-foot buffer of Wetland 1.

42. Does site clearing account for potential shading effect from adjacent forested areas?

    Company's Response:
    Yes, potential shading impacts have been considered in the limit of clearing and existing tree lines which will remain.

43. Would any tree clearing occur within core forest? If so, estimate the acreage of core forest that would be affected by site clearing.

    Company's Response:
    Yes, approximately 28 acres of tree clearing would occur within mapped core forest. Approximately 40 acres of core forest will be set aside as conservation area for the life of the Project. As the CSC is aware, because it was selected by DEEP in a solicitation before

July 1, 2017, the Project is expressly exempted from the requirements set forth in Public Act 17-218.

44. Has DEEP responded to the Petitioner's September 3, 2019 correspondence regarding the NDDB field studies? If so, please submit.

Company's Response:
The Petitioner received initial comments from NDDB on March 13, 2020. Responses from the Petitioner were provided on April 13, 2020 and May 14, 2020. Initial feedback from NDDB was received on May 14, 2020, the Petitioner responded on May 17, 2020. This correspondence is provided in Attachment CSC-44.

While this dialogue is ongoing, we are confident we can work with the Department to address any remaining concerns and can obtain a Final Determination, which will be provided to the CSC upon receipt.

45. Petition p. 24 states there would be no effect on nearby wells. What effect would rack post driving have on groundwater used for private wells?

Company's Response:
Preliminary engineering indicates that posts will average 10-16 feet in length and approximately 6-9 feet in embedment depth. Due to the composition of the posts, and the limited amount of post material that will be in contact with the ground, no impacts to groundwater quality are anticipated.

46. The site abuts several State-owned parcels. Are there any DEEP/CFPA maintained hiking or recreational trails on these parcels? If so, would the project be visible from these recreational trails?

Company's Response:
The State-owned parcels that abut the western and northern portions of the site are part of the Quinebaug River Wildlife Management Area (WMA). As indicated in Section 6.7 of the Petition, the Quinebaug River WMA totals more than 1,400 acres and is inclusive of the Sugar Brook Field Trail and Wildlife Management Area, the Sugar Brook Snowshoe Loop Trail and the Quinebaug Valley State Trout Hatchery.

The WMA is an area where wildlife habitat is managed to maintain stable, healthy populations of wildlife. Hunting and trapping is generally allowed within this area, and it includes a variety of informal, old paths and logging roads. Based on the interactive trails map provided at the CT Forest and Parks Association (CFPA) website (ctwoodlands.org) and additional internet research, it appears that there are no CFPA- or DEEP-maintained hiking or recreational trails on these parcels. Within the portion of the Quinebaug/Sugar Brook WMA that abuts the north/northeastern portion of the site, the 30-acre Sugar Brook

preserve includes an existing informal 4.7-mile loop trail. A portion of the trail traverses parallel to the northern Project boundary.

While the Project will be partially visible from the trail, site topography and existing vegetation situated between the Project and existing recreational resources within the Quinebaug River WMA help to mitigate some of the viewshed impacts that would result from the proposed Project.

47. Referring to Petition Attachment C, Appendix F, Table A-1. For wetland 7, what is the current setback from the existing agricultural field to the wetland? What seed stock will be used to establish a 50-foot buffer around this wetland? Once established, how will the buffer be managed (e.g. shrub, meadow)?

Company's Response:
Wetland 7 is located in an existing agricultural field, and as a result no setback exists at this time. The Petitioner is proposing to maintain a 50-foot setback from Wetland 7. No seeding is proposed within this buffer, which once established, will be maintained as a meadow.

48. Petition p. 25 states the Project area will be converted to a meadow habitat. What type of seed mix will be used in the project areas to provide a meadow habitat? What are the wildlife benefits from the use of this seed mix?

Company's Response:
The Petitioner proposes use of a low growing solar seed mix. The specific mix will be determined based on availability at the time of construction. The site will be maintained to develop characteristics of a meadow. While there may be secondary pollinator or other wildlife benefits depending on the final seed mix, the primary goal of this meadow habitat is to provide stormwater management.

49. Referring to Petition pp. 23-24, where do these bat species typically hibernate?

Company's Response:
Silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and eastern red bat (*L. borealis*) are long-distance migratory species that travel south in the fall to spend the winter feeding in southern latitudes such as Mexico. Tricolored bat (*Perimyotis subflavus*) hibernate in abandoned mines, caves, and other underground structures. Tricolored bat can regionally migrate to hibernacula within Connecticut or neighboring states, and some populations have even been known to undergo longer migrations to southern latitudes to hibernate. There are at least five known northern long-eared bat (*Myotis septentrionalis*) hibernacula in Connecticut and tricolored bat often share hibernacula with northern long-eared bat. Additionally, potential hibernacula are available just to the north in Massachusetts, near Sheffield and Southbridge, Massachusetts.

50. Can project site fencing be designed to permit small animal movement under the fence?

    Company's Response:
    The fence as proposed would not prevent movement by small animals in and out of the Project area.

51. Petition Appendix C describes construction wildlife exclusion fencing and associated wildlife searches. Will searches be conducted prior to the commencement of each sub-phase?

    Company's Response:
    A perimeter silt fence will be installed prior to implementation of sub phases. Wildlife searches will be conducted as needed throughout construction and following installation of any silt fence that is intended for dual use as wildlife exclusion. Some sub phases may use alternative forms of sediment and erosion control including silt socks or erosion control mix and therefore would not serve as wildlife exclusion fence.

52. Please submit photographic site documentation with notations linked to the site plans or a detailed aerial image that identifies the locations of site-specific and representative site features. The submission should include photographs of the site from public road(s) or publicly accessible area(s) as well as Site-specific locations depicting site features including, but not necessarily limited to, the following locations as applicable:

    For each photo, please indicate the photo viewpoint direction and stake or flag the locations of site-specific and representative site features. Site-specific and representative site features include, but are not limited to, as applicable:
    1. wetlands, watercourses and vernal pools;
    2. forest/forest edge areas;
    3. agricultural soil areas;
    4. sloping terrain;
    5. proposed stormwater control features;
    6. nearest residences;
    7. site access and interior access road(s);
    8. utility pads/electrical interconnection(s);
    9. clearing limits/property lines;
    10. mitigation areas; and
    11. any other noteworthy features relative to the Project.

    A photolog graphic must accompany the submission, using a site plan or a detailed aerial image, depicting each numbered photograph for reference. For each photo, indicate the photo location number and viewpoint direction, and clearly identify the locations of site-

specific and representative site features show (e.g., physical staking/flagging or other means of marking the subject area).

The submission shall be delivered electronically in a legible portable document format (PDF) with a maximum file size of <20MB. If necessary, multiple files may be submitted and clearly marked in terms of sequence.

Company's Response:
The CSC granted the Petitioner's request for an extension of time to submit its response to this interrogatory to June 1, 2020.

Facility Construction

53. For the proposed electrical equipment concrete pad, would the concrete be pre-cast or poured on site? What other concrete components are proposed at the site? Where and by what method would cement trucks be cleaned at the site?

Company's Response:
The switchyard and inverter pad locations will be poured on site.

Cement trucks will be cleaned at a washout station to be located near the site entrance, and will be identified on final construction drawings.

54. List the types of construction equipment that would be used at the site.

Company's Response:
The construction equipment to be used at the site includes, but is not limited to:

- Skid steers
- Excavators
- Bull dozers
- Pile drivers
- Cranes
- Fork lifts
- Surveying equipment
- Concrete trucks
- Boom lifts

55. Would there be any attempt to stabilize agricultural areas prior to the commencement of project construction in January 2021? If so, what tasks would be performed and when?

Company's Response:
The Petitioner expects that the agricultural areas will be either fully vegetated hayfields or seeded with a cover crop prior to the commencement of construction on the site. Both of these covers would provide stable ground at the onset of construction.

56. The proposed construction schedule has a portion of the work occurring during winter months. Provide detailed winter work procedures for each major phase that address construction erosion and sediment control as well as stabilization of temporary sediment traps and/or basins, diversion swales and berms. If applied in winter, how will seeding be maintained until the spring growing season?

Company's Response:
Construction of the Project is expected to begin in the 1st quarter of 2021 with mobilization of equipment and land clearing efforts. Trees will be cut in frozen conditions. If reliably frozen conditions do not exist, or if the tree cutting operation results in ground disturbance or rutting, stormwater controls will be installed in accordance with the Soil Erosion and Sediment Control Plans currently under design, and can be provided to the CSC after submission to DEEP. We would not expect that seeding will be a viable temporary stabilization measure when weather conditions would preclude seed germination. During these conditions, erosion control blankets would be utilized for temporary stabilization.

57. Referring to Petition Section 3.5, what is the expected time interval between Phases 2 & 4? What seed mix will be used in Phase 2 to ensure soils are stabilized before commencing Phase 4?

Company's Response:
The time interval between Phases 2 and 4 is dependent on the time it takes for each area to be stabilized after the Phase 2 activities. In general, Phase 4 activities in each subphase can begin once stabilization is achieved in that subphase and in the area to which the subphase will discharge.

58. What are the slopes within the solar array areas?

Company's Response:
The solar array is proposed on a range of slopes, from flat ground to a maximum of 15%.

59. Estimate the amount of cut and fill for the Project. Would the areas with grubbing require fill?

Company's Response:
The estimated cut for the Project is 271,600 cubic yards. The estimated fill for the Project is 41,900 cubic yards. The Petitioner does not anticipate fill being required for areas proposed to be grubbed.

60. Is the soil in non-agricultural areas suitable for planting seed without the importation of nutrient rich topsoil?

Company's Response:
The soils in forested areas not currently used for agricultural purposes mapped as prime farmland soils, or soils of statewide importance suitable for planting seed without the need to import topsoil. *See* Petition Exhibit A, Figure 8, which shows the mapped soils within these areas.

61. Several locations on the Site Plans include stonewall demolition. Where will this material be disposed of?

Company's Response:
The stone from the walls to be demolished will be either repurposed and used on site or removed from the site and disposed of at an appropriate facility. If appropriate, the stones could be donated and reused for nearby restoration projects.

62. Were any debris/waste disposal areas identified within the project limits? How would these areas be managed?

Company's Response:
No waste disposal areas were identified within the Project limits. If waste is encountered during construction, it will be disposed of in accordance with all applicable regulations.

63. Referring to Site Plan G-001;
    a) G. Note 8- what areas of the site contains this material?
    b) G. Note 19 - where are culverts being installed?
    c) E&S Note 2 - what would be the minimum distance from soil stockpiles to wetlands/watercourses?

Company's Response:
    a) General Note 8 is intended to cover materials that could be encountered during construction. These materials are not anticipated to be encountered.
    b) General Note 19 will be removed as no culverts are proposed to convey stormwater post-construction.

c) The distances from stockpiles to resource areas will vary on site, however, no stockpiles will be located within 50 feet of any wetland or watercourse.

64. Referring to Site Plan C-015- the northeast end of the solar field is located at the top of a ravine - are grades conducive to installing fencing and two rows of solar modules arrays in this area? How would stormwater runoff be controlled in this area?

Company's Response:
The two rows on top of the ravine will be removed and relocated elsewhere on site where the slopes are more conducive to development.

65. Referring to Site Plan C-016, two swales are shown. Provide detail as to the type of swale that would be installed. Why are swales only located in these two locations if the topography of the site contains other areas with similar drainage contours along the edge of the solar array?

Company's Response:
The swales shown on Site Plan C-016 are existing swales, which are proposed to be lined with riprap and reinforced with check dams to avoid erosion.

66. Referring to Site Plan C-017, provide the following:
    a) Why is a portion of the perimeter fence and several rows of solar modules installed within the detention basin?
    b) How would rack posts affect basin function? Would the posts act as a drainage pathway?
    c) What is the fence clearance above the design pool height? Could leaf litter accumulate on the fence and cause water to discharge over the berm rather than through the emergency spillway?
    d) Why are the two detention basins arranged in a row? Does the northern basin receive flows form the larger southern basin?
    e) What is the cover material within the detention basins?
    f) Is any cover material being installed on top of the emergency spillway erosion control blankets?
    g) The emergency spillways discharge to a stone wall. Would the stone wall serve to channelize flows rather than allow for a dispersed flow?

Company's Response:
    a) The basins were designed to be constructed with berms and not excavated into grade. This will allow for shallower basins, and maintain the height of the array in and around these areas. To maintain the system size as proposed, some areas of panels and security fence are proposed within the limits of the basins. The panels and electrical components will be located above the berms so these components will not be submerged at any time during or after storm events. Racking posts are

not anticipated to adversely impact basin function and will not affect drainage pathways.

b) The design of the spillways will allow clearance beneath the fence, and as a result no litter or leaves are anticipated to block the outlet.
c) The basins are located based on optimal locations to mitigate peak flows. The northern basin could receive flow from the larger southern basin.
d) The infiltration basins will receive 4 inches of loam and seed.
e) No material is proposed on top of the emergency spillway erosion control blankets. The emergency spillway erosion control blankets are proposed after the spillway level spreader which is comprised of riprap and crushed stone. The erosion control blankets are intended to provide additional protection from erosion after the level spreader.
f) The emergency spillways are designed to be used only during large storm events. Flow is expected to occur as under existing conditions in the areas directly upgradient of the stone wall, and flow from the spillways will act as sheet flow after flowing through the spillway level spreader.

67. Referring to Site Plans C-025 & C-026. Given the orientation of the panels and site topography, what methods of stormwater control would be employed to prevent channelized runoff and sediment from impacting the adjacent wetlands?

Company's Response:
A SWPCP will be prepared prior to construction and implemented during construction of the Project. The SWPCP will include measures intended to address stormwater issues to avoid sediment transfer and erosion. These measures include but are not limited to additional swales and stone spreaders to reduce velocity and armor the surface to address scouring or erosion.

68. Referring to Detail Sheet C-027, three types of swales are shown. Where on the project site would each type be installed?

Company's Response:
The swale details are included to show options that can be utilized based on site conditions, final design and stormwater analysis for the permit level design. Stormwater velocity will be analyzed and the appropriate swales will be utilized to avoid erosion as part of the final design.

69. Has a comprehensive geotechnical study been completed for the site to determine if site conditions support the overall Project design? If so, summarize the results. If not, has the Petitioner anticipated and designed the Project with assumed subsurface conditions? What are these assumed conditions?

Company's Response:
A geotechnical investigation was performed in February and March of 2019. There were a total of 13 geotechnical borings conducted to a depth of 20 feet. Auger refusals were encountered by dense cobbles and boulders at three locations depths varying at 10.0 feet, 17.5 feet, and 14.5 feet. Soil sampling and classification was performed at 2.5 foot intervals to a depth of 15 feet and at 5-foot intervals below 15 foot and extending to the termination depth at each boring.

As a result of the geotechnical investigation, there is moderate to high risk that driven piles (racking posts) will encounter refusals. This will likely result in Petitioner selecting a racking vendor that provides pre-drill and driven ground screws.

70. Petition p. 25 states CS met with DEEP Stormwater Division in 2018. Have there been any subsequent meetings concerning how site construction would conform to DEEP's proposed revisions to the General Permit, including draft Appendix I, *Stormwater Management at Solar Array Construction Projects*? If so, have these changes been incorporated? If not, does CS intend to adhere to Appendix I?

Company's Response:
As of the date of this response, Appendix I and other proposed edits to the current Construction General Permit remain in draft form. The Petitioner understands that a request for hearing has been filed with DEEP. At this time, the final requirements of DEEP's Revised Construction General Permit are unknown. The Petitioner will comply with all applicable rules and regulations, including registration under the DEEP Construction General Permit.

71. Referring to Petition p. 8, provide a site plan that details the construction sub-phases.

Company's Response:
Construction sub-phase design has not yet been completed. A Soil Erosion and Sediment Control Plan will be provided to the CSC after submission to DEEP.

Maintenance Questions

72. What effect would runoff from the drip edge of each row of solar panels have on site drainage patterns? Would channelization below the drip edge be expected? If not, why not? If channelization is discovered during routine site inspections, what methods would be used to eliminate this condition?

Company's Response:
See response to Interrogatory #67.

73. Referring to the Operations and Maintenance (O&M) Plan, what grass height would be maintained to prevent grass fires?

Company's Response:
Grass is expected to be mowed when it reaches an approximate height of 24-30 inches.

74. How will the detention basins be accessed for repairs maintenance? What equipment will be used for access, repairs, and maintenance? Would the presence of the fence and solar arrays within the basins interfere with maintenance?

Company's Response:
Detention basins can be accessed between rows of panels. The maximum slope of the basin walls is 3:1 to allow for maintenance. Small tracked equipment would be used for access, repairs and maintenance.

75. The O&M Plan does not contain information regarding detention basin or swale inspections. Please provide.

Company's Response:
Detailed information on maintenance of stormwater features will be included in the Project's SWPCP. The Petitioner proposes to implement the Best Management Practices for stormwater basins and berms outlined in the Connecticut Stormwater Quality Manual (the Manual), which include regular inspections and maintenance activities. Per the Manual, the following are components of the stormwater basins, including the berms, which would require routine inspection and maintenance:

Embankment (Berm) and Emergency Spillway
- Vegetation and ground cover adequate
- Embankment erosion
- Animal burrows
- Unauthorized planting
- Cracking, bulging, or sliding of embankment/dam
- Seeps/leaks on downstream face

- Slope protection or riprap failure
- Vertical/horizontal alignment of top of dam "As-Built"
- Emergency spillway clear of obstruction and debris

Basin Interior Areas
- Vegetation coverage adequate
- Undesirable vegetative growth
- Undesirable woody vegetation
- Standing water or wet spots
- Sediment and/or trash accumulation

Condition of Outfalls
- Riprap failures
- Slope erosion

Inspections of basins are required every 6 months. If any of the deficiencies listed above are noted during inspections, they will be addressed by the Petitioner.

76. Where would sediment that is removed from the detention basins be disposed of?

Company's Response:
Sediment removed from detention basins will remain on-site and will be located outside of protected natural resource areas.

77. Are there provisions for more frequent inspections of the Project Site in the first few years of operation to monitor and remediate areas of patchy site cover growth, site erosion and detention basin/swale integrity?

Company's Response:
The Construction General Permit and the SWPCP require regular inspections until the site is stabilized.

78. Would the petitioner store any replacement modules on-site in the event solar panels are damaged or are not functioning properly? If so, where? How would damaged panels be detected?

Company's Response:
The Petitioner does not typically store replacement modules on site. Damaged panels can be detected via our remote monitoring software, as indicated by production lower than projected values. This would result in dispatch of a maintenance truck to inspect the site.

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Walter F. Cwynar, Chairman
Plainfield Conservation Comm
8. Community Avenue
Plainfield, CT 06374

9590 9402 3919 8060 6679 95

2. Article Number *(Transfer from service label)*

7018 0360 0002 1205 9244

PS Form 3811, July 2015 PSN 7530-02-000-9053

COMPLETE THIS SECTION ON DELIVERY

A. Signature

[signature] ☑ Agent ☐ Addressee

B. Received by *(Printed Name)* CORONA SIGNIN

C. Date of Delivery 5/22/20

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☑ No

3. Service Type

- ☑ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☑ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
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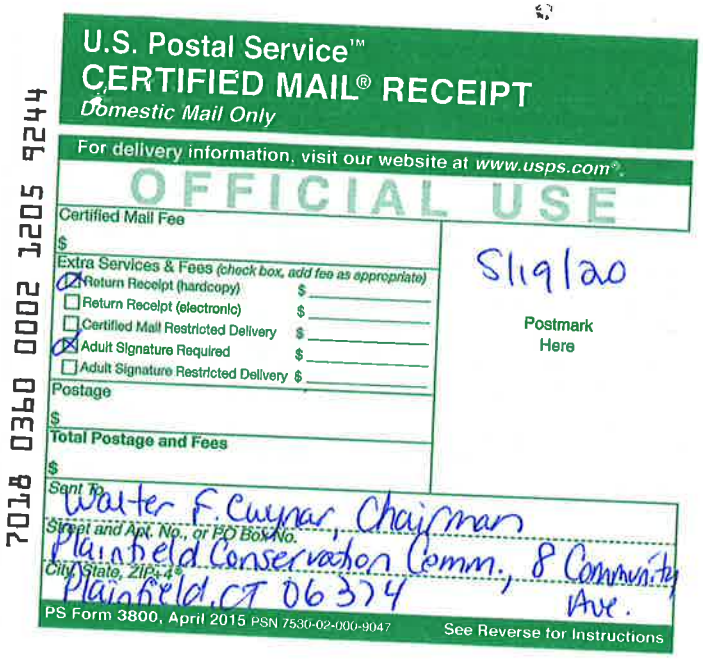
- ☐ Registered Mail Restricted Delivery
- ☑ Return Receipt for Merchandise
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

Domestic Return Receipt



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Plainfield Conservation Comm., 8 Community Ave.

City, State, ZIP+4®
Plainfield, CT 06374

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7018 0360 0002 1205 9244

Constitution Solar, LLC

Via Certified Mail (CMRRR #7018 0360 0002 1205 9244)

May 19, 2020

RE: Constitution Solar, LLC – Petition for Declaratory Ruling for Solar Energy Project in Plainfield, CT

Dear Neighbor:

Constitution Solar, LLC filed a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") in March 2020. The Petition seeks approval of the location, construction, operation and maintenance of the Constitution Solar Project, an approximately 20 megawatt solar photovoltaic ("PV") development, including all associated equipment and related site improvements (the "Project"), to be located in Plainfield. The Project Site consists of four parcels located in the western portion of Plainfield located west of Interstate 395, east of Route 169 (North Canterbury Road), and northwest of Route 14 (Black Hill Road) (the "Property").

The proposed Project will consist of ground-mounted solar PV panels, centralized inverters and transformers, electrical lines, a step-up transformer and fence, a station controller, a perimeter fence and an access road and switchyard. For additional detail about the proposed Project layout, please see the enclosed site plan.

Pursuant to Connecticut General Statutes § 16-50g *et seq*., the location and/or certain features of the Project may change through the Council's regulatory approval process. Electricity generated by the Project will be exported to the electric grid and will supply 100% renewable energy in furtherance of Connecticut's renewable energy goals.

This notice is being sent to you because you are listed as an owner of land that abuts the Property or, in the alternative, as a courtesy.

If you have any questions, please feel free to contact me using the contact information below. You may also contact the Council directly at (860) 827-2935.

Sincerely,

Junior Aguaze

Junior Aguaze
Constitution Solar, LLC
junior.aguaze@nexteraenergy.com
(561) 694-3314

Enclosure

PROPOSED CONSTITUTION SOLAR PROJECT

- Limit of Work/Development Area
- Project Site
- Vegetative Screening
- Switchyard
- Road
- Equipment Pad
- Panels
- CT Municipal Boundary

LOCUS MAP

N

0 250 500

Feet

1 in = 500 ft

NOTES

1. Based on 2019 Statewide Orthophotography, Courtesty of CTECO.

Constitution Solar
Plainfield, Connecticut

March 2020

Tighe&Bond
Engineers | Environmental Specialists

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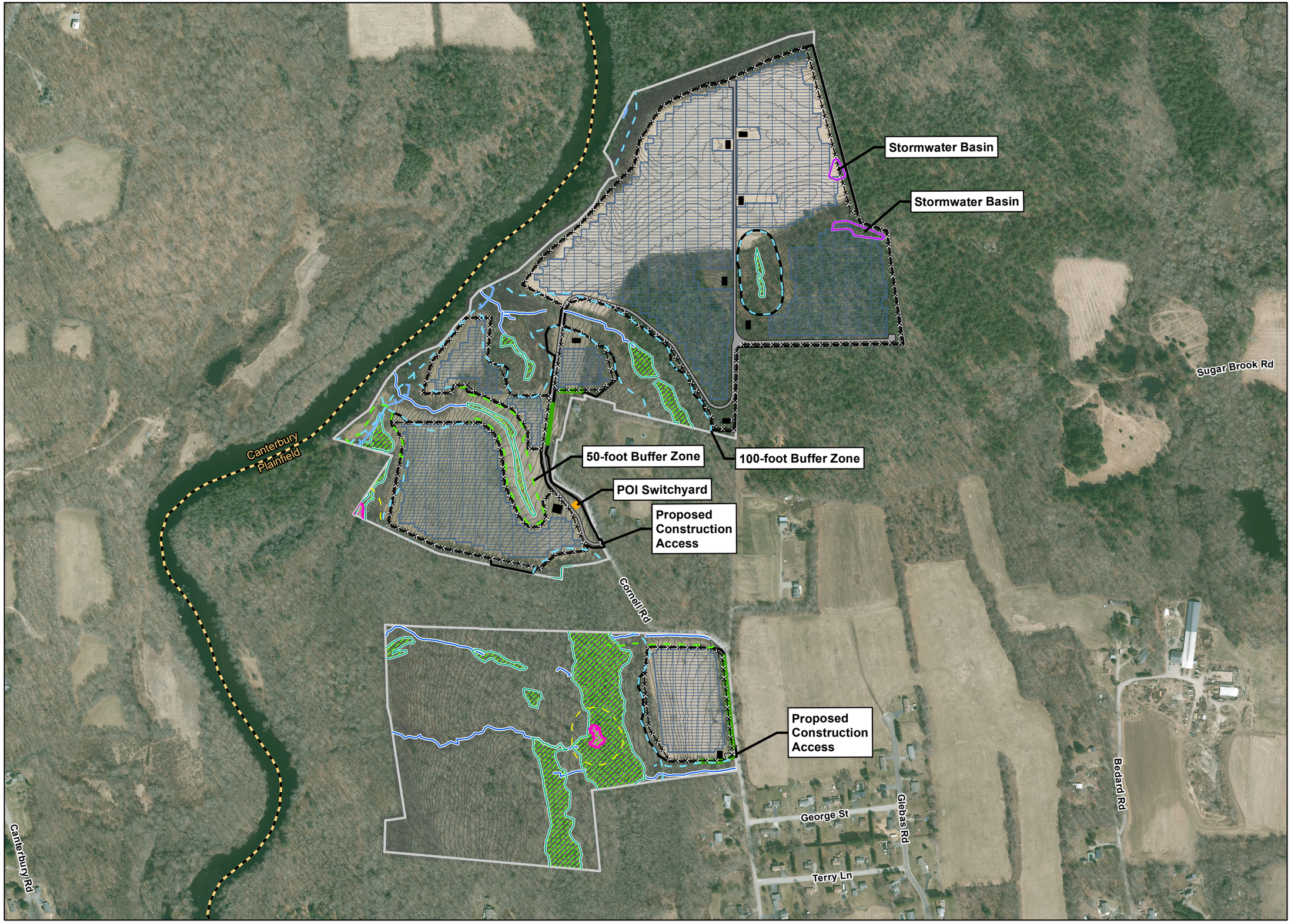
R-0317

FIGURE 6
PROPOSED CONDITIONS



- Limit of Work/Development Area
- Project Site
- Chain Link Fence
- Vegetative Screening
- Stormwater Basin
- 50-foot Buffer Zone
- 100-foot Buffer Zone
- 100' Vernal Pool Envelope
- 2-foot Contour
- Watercourse
- Wetland Boundary
- 100-Year Floodplain
- Panels
- Wetland Area
- Equipment Pad
- Vernal Pool
- Switchyard
- Road
- CT Municipal Boundary

LOCUS MAP

N

0 250 500

Feet

1 in = 500 ft

NOTES

1. Based on 2019 Statewide Orthophotography, Courtesty of CTECO.

Constitution Solar
Plainfield, Connecticut

May 2020

Tighe&Bond
Engineers | Environmental Specialists

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R-0317

LEGAL NOTICE RECIPIENTS

- Parcels Boundary (Approximate)
- Property Owner
- Direct Abutter
- Additional Notified Owners
- CT Municipal Boundary

- XX-XX-XX Project Neighbor Block-Lot IDs*
- XX-XX-XX Direct Abutter Block-Lot IDs*
- XX-XX-XX Property Owner Block-Lot IDs*

*Plainfield Parcels are located on Map 1

LOCUS MAP

0 375 750
Feet
1 in = 750 ft

NOTES

1. Based on 2019 Statewide Orthophotography, Courtesy of CTECO.
2. Parcels are approximate.

Constitution Solar
Plainfield, Connecticut

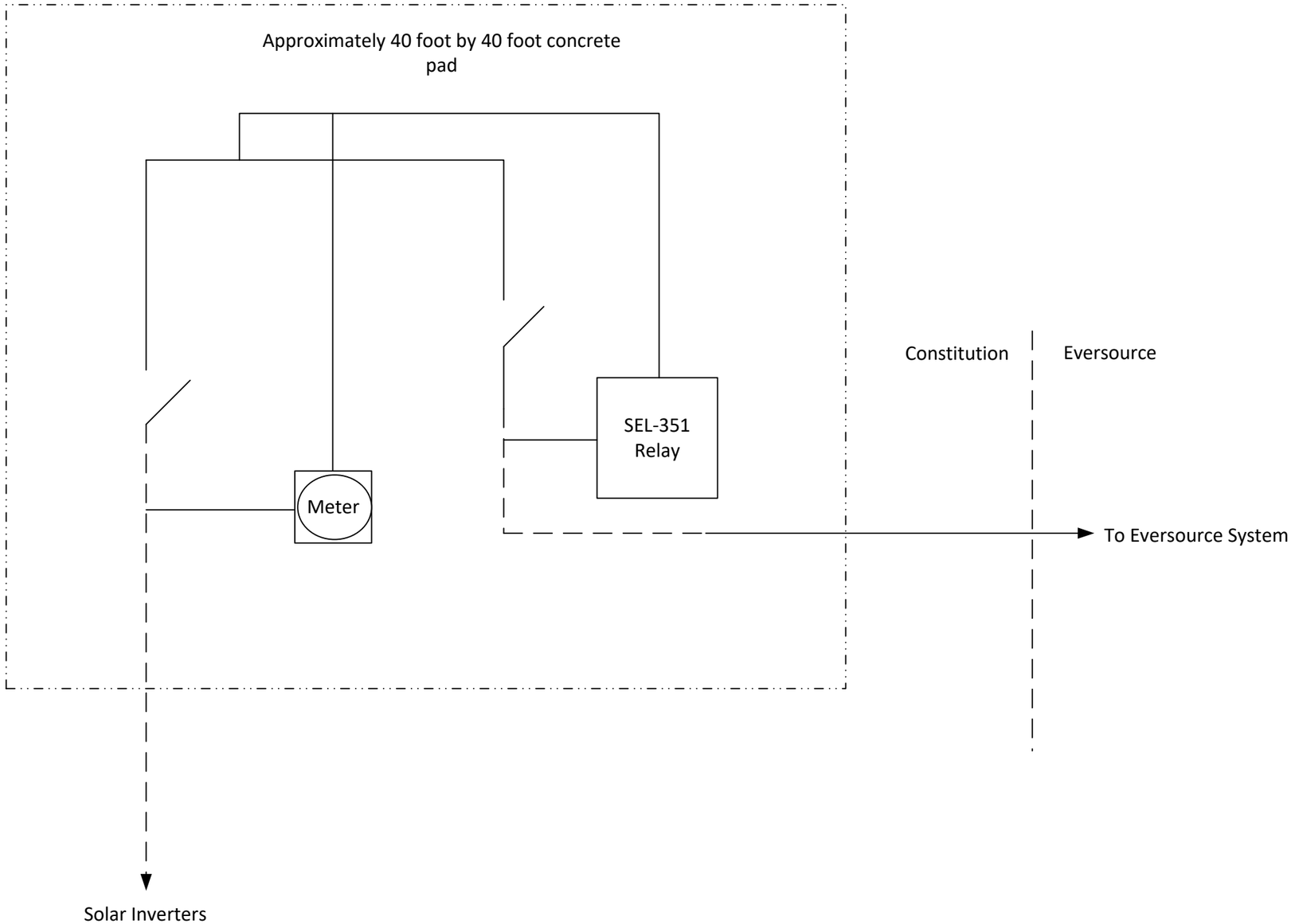
May 2020

Tighe&Bond
Engineers | Environmental Specialists

V:\Projects\R\R0317\ConstitutionCT_Solar\Maps\PermitFigures\LegalNotice_Recipients_ConstitutionCT.mxd

R-0317

Switchyard Typical Design



TETRA TECH

Constitution Solar Correspondence with NDDB Program - Overview

- September 3, 2019 – Constitution Solar Submittal of Environmental Site Conditions Report and request for Final Determination. *See* Petition Exhibit C.
- March 13, 2020 – Comments received from NDDB.
- April 13, 2020 – Response to NDDB from Constitution Solar and request for meeting.
- May 14, 2020 – Follow up response from Constitution Solar Regarding botanical resources and request for meeting.
- May 14, 2020 – Response from NDDB regarding botanical resource survey results.
- May 18, 2020 – Response from Constitution Solar regarding botanical resource survey results and request for meeting.

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

March 13, 2020

Ms. Katelin Nickerson
Tetra Tech, Inc.
451 Presumpscot Street
Portland, ME 04103
dale.knapp@tetratech.com

Project: Further comments Regarding 20 MW Utility-Scale Constitution Solar Project on 147.7 Acres on Cornell Road in Plainfield, Connecticut
NDDB Assessment No.: 201905175 (Previous Preliminary Assessment 201706152)

Dear Katelin Nickerson,

I received the Environmental Site Conditions Report submitted by TetraTech on September 3, 2019. The Report included "*descriptions of existing conditions within the Study Area, reports for the technical field studies conducted and an Avoidance and Mitigation Plan to be used to guide Project construction and operation activities*" regarding the 20 MW utility-scale Constitution Solar project proposed for147.7 acres located on Cornell Road in Plainfield, Connecticut. Please be advised that these are follow-up questions and not a final determination. In order to make a final determination for this project please provide the following missing information.

1. Provide an overview site plan and narrative description that shows and describes the array location/layout in relation to the vernal pools, wetlands and watercourses on the site. The array placement and design has never been provided to the NDDB Program.

2. Provide a map and narrative of conservation easements or "no build zones" on this property in relation to state listed species protection/conservation/mitigation areas.

3. Provide the CV and/or resume for the botanist that did the botanical work at this site. Provide the dates the botanical surveys were conducted, routes taken during the surveys and specific species lists (by habitat) and other information as requested in my NDDB preliminary assessment letter. The list provided in the report seemed brief considering the survey took place on 149 acres. The herbaceous list (including grasses) should have been much longer.

   Please note that our last remaining place for the federal and state listed ***Sandplain agalinis*** is located in Plainfield. The botanical report ruled out its presence on this site because this site "is not near the coast" but that may not be an accurate predictor of presence/absence since our only location of this plant happens to be in Plainfield. I agree that agricultural fields (corn and hay) and forest are not preferred habitats for this plant. However, the report states "*Sandplain agalinis was not observed during multiple site visits completed for field surveys.*" Field notes, observations, dates of surveys, survey routes etc. have not been provided for that plant nor any other botanical survey information other than the combined list of plants seen on this property.

4. Provide additional details documenting nesting birds at this site. Were forest nesting birds considered or surveyed on this site? What forest nesting birds were considered? Specifically will trees remain (in the forested uplands) or be removed as part of the solar development at this site.

5. The eastern spadefoot study was insufficient to determine that no eastern spadefoot would be impacted by this project. Specifically, since these toads are so cryptic, the survey techniques should be varied to ensure the most comprehensive evaluation. The report only suggested visual surveys were used and did not include pitfall trapping or dip net survey techniques according to the report statement:
"*A total of 12.75 hours over five nights in June and July 2018 were spent surveying for the presence of eastern spadefoot toads at the Constitution Solar site*".

   In my opinion, that is not enough effort to rule out presence of this elusive species. I will require a second opinion for the presence of eastern spadefoot from this site. Or you may assume presence of this species within project areas and propose mitigation (long term protection strategies and conservation) for direct and indirect adverse impacts from this project. The herpetological report suggested habitat and soils indicative for the presence of these toads was found and that may be a good place to look for conservation effort.

6. Provide more details on how the study was done to locate state endangered blue-spotted salamanders on this site. From the report it appears that biologists used visual encounter surveys, nocturnal vehicular surveys and cover object searches. No pitfall trapping was used according to the report. (I believe the surveys for the state endangered salamander was included in the more general amphibian and reptile surveys but I would like a specific narrative on how the biologist came to the conclusion that this species was not present on this project site). The nocturnal vehicular surveys were not done until June which would have been too late to capture their early spring migration to the breeding pools. Since they spend so much time underground how was this taken into consideration during survey protocol development for this species?

   While the report includes some information on this species, it states that the herpetological inventory was not focused on pool-breeding amphibians. It appears that no pitfall trapping or dip netting techniques were utilized. The protection measures offered in the report state that vernal pools will include a no disturbance buffer, but do not detail protection of the associated Critical Terrestrial Habitat they also require. Please provide more details as to the conclusion that was made that this species is not present. Include details on the nocturnal vehicular surveys since they were done in June, which may have been too late to capture early spring migration. Were weather conditions appropriate to late-season migrations?

7. Please provide information on stormwater discharge. Will the stormwater eventually be discharged to the Quinebaug River? Provide a mussel management plan designed to protect freshwater mussels and state listed aquatic resources (dragonflies) from direct and indirect adverse impacts of stormwater and/or other discharges from this project. The freshwater mussel protection plan must be developed by a biologist with experience with freshwater mussels and dragonflies. In my opinion none of the biologist resumes submitted (with the report) had the expertise to evaluate these species and impacts from this solar project on their populations.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov . Thank you for consulting the Natural Diversity Data Base.

Sincerely,

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

From:	Rivard, Linda
To:	deep.nddbrequest@ct.gov; Dawn.McKay@ct.gov; Robin.Blum@ct.gov; Jenny.Dickson@ct.gov; Rick.Jacobson@ct.gov
Cc:	Lee, Hagen; Jonathan.gravel@nexteraenergy.com; Nickerson, Katelin
Subject:	Constitution Solar Project, Additional Wildlife Resource Information – NDDB
Date:	Monday, April 13, 2020 6:58:32 PM
Attachments:	Constitution Solar_Response to NDDB Comments_041320.pdf

Good evening,

On behalf of Katelin Nickerson (Tetra Tech, Inc.) and Constitution Solar, LLC, please see the attached response to the Department of Energy and Environmental Protection's Natural Diversity Database Program letter dated March 13, 2020 provided for the Constitution Solar Project.

As noted in the attached cover letter, Constitution Solar is requesting receipt of a final determination as soon as possible, to facilitate moving forward with other permitting processes (i.e., Stormwater Permit). We would like to set up a conference call with staff to discuss any concerns you may have regarding the materials provided. Please let us know if you have any questions about this submittal and when we could schedule a meeting with you to discuss the Constitution Solar Project.

Sincerely,

Linda

Linda Rivard | Environmental Scientist and Planner
Direct (Cell): 207.205.7168

linda.rivard@tetratech.com

Tetra Tech | **Complex World, Clear Solutions**
451 Presumpscot St. | Portland, ME 04103 | www.tetratech.com

TETRA TECH

April 13, 2020

Via electronic mail deep.nddbrequest@ct.gov
Ms. Dawn McKay
Wildlife Division, Bureau of Natural Resources
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, Connecticut 06106-5127

Subject: Constitution Solar Project, Additional Wildlife Resource Information – NDDB Assessment #201905175

Dear Ms. McKay,

On behalf of Constitution Solar, LLC (Constitution Solar or Project), Tetra Tech, Inc. (Tetra Tech) submitted an Environmental Site Conditions Report (Report) and request for final determination on September 3, 2019 to the Department of Energy and Environmental Protection's (DEEP's) Natural Diversity Data Base Program (NDDB) for the Project. The information in the enclosed documents provides responses to your March 13, 2020 letter regarding the Project.

These responses serve as a supplement to the information provided in the original Report. Attachment A provides narrative responses from Constitution Solar. Attachment B includes the supporting and requested Project Figures. Field staff resumes are in Attachment C, and Attachment D includes full copies of the referenced peer-reviewed papers.

Constitution Solar requests a final determination as soon as possible in order to move forward with other permitting processes (i.e., Stormwater Permit). While we would like to request an in-person meeting to review these materials and to address questions about the Project directly, that may not be feasible due to COVID-19. We would prefer to discuss your concerns on a conference call or other remote type of meeting, if possible. Please let us know if you have any questions about this submittal and when would be a good time to meet.

Respectfully submitted,

Katelin Nickerson

Katelin Nickerson
Tetra Tech
katelin.nickerson@tetratech.com

cc: Rick Jacobsen (DEEP); Jenny Dickson (DEEP); Robin Blum (DEEP); Hagen Lee (NextEra); Jon Gravel (NextEra)

Attachment A – Constitution Solar Responses
Attachment B – Figures
Attachment C – Resumes
Attachment D – Referenced Peer-reviewed Papers

TETRA TECH

Attachment A: Constitution Solar's response to comments from NDDB

NDDB Comment #1:

Provide an overview site plan and narrative description that shows and describes the array location/layout in relation to the vernal pools, wetlands and watercourses on the site. The array placement and design has never been provided to the NDDB Program.

Constitution Solar Response:

The Project is designed to avoid direct impacts to vernal pools, wetlands and watercourses. Through maximizing the use of existing roads and cleared areas, a minimal amount of clearing (25 acres) will be required to build the Project. The Project is proposing a standard 100-foot wetland and watercourse buffer, with limited exceptions, as this is a widely accepted rule across Connecticut. Limited exceptions to this rule occur where resources are located within or directly adjacent to already cleared areas or existing roads. Attachment B, Figure 1 depicts the conceptual site layout as developed by the Project's engineering team. Attachment B, Figure 2 displays the natural resources mapped at the site, the buffers applied, and the areas where there are exceptions to the standard 100-foot buffer.

Regarding vernal pool protection, no clearing or Project activities are proposed within the 100-foot envelope of either of the two vernal pools mapped within the Study Area (the approximately 149-acre area where natural resource survey work was performed; see Figure 2 in Attachment B). Approximately 0.7 acres of clearing is proposed within the 750-foot Critical Terrestrial Habitat (CTH) for vernal pool VP01 (approximately 225 feet to the east of VP01) to prevent shading to the proposed solar arrays. This leaves the pool envelope intact, as well as the expansive upland forest area that occurs on the west side of the vernal pool. Attachment B, Figure 3 shows the post-construction habitat analysis for both vernal pools. Note the forested area around vernal pool VP01 following the proposed clearing would be 84%.

There is no proposed clearing within the 750-foot CTH of vernal pool VP02. As described in the Environmental Site Conditions Report (Report), VP02 is a much higher functioning pool than VP01 and the Project completely avoids clearing to preserve the integrity of the pool and adjacent terrestrial habitat. Solar arrays will be installed within the CTH of both pools (320 feet from VP01 and 210 feet from VP02). However, in both cases, the Project components are sited within existing agricultural fields (Attachment B, Figure 3).

NDDB Comment #2:

Provide a map and narrative of conservation easements or "no build zones" on this property in relation to state listed species protection/conservation/mitigation areas.

Constitution Solar Response:

The no build zones generally align with natural resources and the proposed buffers around these resources. The approximately 42-acre area of forested wetlands, upland, and intermittent watercourses located within the southern parcel will be left intact and preserved for the life of the Project. Upon initiation of Project construction, Constitution Solar will own the parcels outright thus making preservation of this area feasible with no other landowner agreements necessary.

The Project is proposing to preserve approximately 70-acres of forested wetlands, 4 acres of emergent wetlands, approximately 5,000 linear feet of intermittent and ephemeral watercourses, and

approximately 30 acres of forested upland areas. These no build areas will protect the functions of these natural resources within the larger landscape and protect habitat for listed species that may occur within and around the site. These no build areas will remain through the life of the Project, which is expected to be a minimum of 30 years.

The Quinebaug Wildlife Management Area abuts the Project in several locations including the area where vernal pool VP02 extends off the site. Linking this habitat preservation area to existing conservation land will maintain available habitat for local wildlife. Attachment B, Figure 4 depicts these preserved areas in relation to the Project's development footprint and the Quinebaug River Wildlife Management Area. More information regarding the protection of specific listed species is provided in the following responses.

NDDB Comment #3:

Provide the CV and/or resume for the botanist that did the botanical work at this site. Provide the dates the botanical surveys were conducted, routes taken during the surveys and specific species lists (by habitat) and other information as requested in my NDDB preliminary assessment letter. The list provided in the report seemed brief considering the survey took place on 149 acres. The herbaceous list (including grasses) should have been much longer.

Please note that our last remaining place for the federal and state listed Sandplain agalinis is located in Plainfield. The botanical report ruled out its presence on this site because this site "is not near the coast" but that may not be an accurate predictor of presence/absence since our only location of this plant happens to be in Plainfield. I agree that agricultural fields (corn and hay) and forest are not preferred habitats for this plant. However, the report states "Sandplain agalinis was not observed during multiple site visits completed for field surveys." Field notes, observations, dates of surveys, survey routes etc. have not been provided for that plant nor any other botanical survey information other than the combined list of plants seen on this property.

Constitution Solar Response:

Site-specific botanical data were collected during wetland and watercourse delineations and other natural resource investigations. These surveys were conducted to evaluate habitats and associated botanical communities present at the site. Meander surveys were conducted throughout the entire Study Area. Survey dates were between June 13-15, 2017, and June 8, 2018. Additional botanical notes were taken during a site visit on June 20, 2018. Supplemental botanical information was collected during the summer of 2018 during herpetofauna surveys led by Dr. Kevin Ryan, in June, July, and September.

The majority of the plant species list was compiled primarily by Katelin Nickerson, a Professional Wetland Scientist with 12 years of experience conducting natural resources surveys throughout New England and other parts of the U.S. (see resume in Attachment C). While the species list may not be exhaustive, it is representative of the habitats that occur within the Study Area. To provide the supplemental information requested, the Project Team has reviewed all field notes, photos and reports to identify the habitats in which each species was observed (Table 1).

Table 1. Botanical Resources and Habitat Type within the Constitution Solar Project Study Area

Common Name	Scientific Name	Habitat[1]
Trees		
Red maple	*Acer rubrum*	FOU, FSW
Sugar maple	*Acer saccharum*	FOU
White ash	*Fraxinus americana*	FOU
Green ash	*Fraxinus pennsylvanica*	FSW, FOU
Black ash	*Fraxinus nigra*	FSW
Eastern hemlock	*Tsuga canadensis*	FOU, FSW
Swamp white oak	*Quercus bicolor*	FSW
Northern red oak	*Quercus rubra*	FOU
Yellow birch	*Betula alleghaniensis*	FOU, FSW
Black birch	*Betula lenta*	FOU, FSW
Paper birch	*Betula papyrifera*	FOU
Gray birch	*Betula populifolia*	FOU
American hornbeam	*Carpinus caroliniana*	FOU, FSW
Balsam fir	*Abies balsamea*	FOU, FSW
Black walnut	*Juglans nigra*	FOU
Shagbark hickory	*Carya ovata*	FOU
Pignut hickory	*Carya glabra*	FOU, FSW
Bitternut hickory	*Carya cordiformis*	FOU
American elm	*Ulmus americana*	FOU, FSW
American beech	*Fagus grandifolia*	FOU
Eastern white pine	*Pinus strobus*	FOU
Shrubs		
Northern spicebush	*Lindera benzoin*	FSW, FOU
Japanese barberry	*Berberis thunbergii*	FOU
Multiflora rose	*Rosa multiflora*	FSW, FOU
Burning bush	*Euonymus alatus*	FOU
Swamp holly	*Ilex mucronata*	FSW
Virginia creeper	*Parthenocissus quinquefolia*	FOU, FSW
Coastal sweet pepperbush	*Clethra alnifolia*	FSW
Mountain laurel	*Kalmia latifolia*	FOU
Maple-leaf arrowwood	*Viburnum acerifolium*	FOU
Highbush blueberry	*Vaccinium corymbosum*	FSW
Bristly dewberry	*Rubus hispidus*	FSW
Autumn olive	*Elaeagnus umbellata*	FOU
Asian bittersweet	*Celastrus orbiculatus*	FOU, FSW
Herbaceous		
Skunk cabbage	*Symplocarpus foetidus*	FSW

Common Name	Scientific Name	Habitat[1]
Cinnamon fern	*Osmundastrum cinnamomeum*	FSW
Jewelweed	*Impatiens capensis*	FSW, EMW
Canada mayflower	*Maianthemum canadense*	FOU
Marginal wood fern	*Dryopteris marginalis*	FOU
Interrupted fern	*Osmunda claytoniana*	FOU, FSW
Northern water horehound	*Lycopus uniflorus*	EMW
Jack-in-the-pulpit	*Arisaema triphyllum*	FOU, FSW
Poison ivy	*Toxicodendron radicans*	FOU, FSW
Christmas fern	*Polystichum acrostichoides*	FOU
Smallspike false nettle	*Boehmeria cylindrica*	FSW, EMW
Sensitive fern	*Onoclea sensibilis*	FSW, EMW
New York fern	*Parathelypteris noveboracensis*	FOU
Sand violet	*Viola affinis*	FSW
Wrinkleleaf goldenrod	*Solidago rugosa*	FSW, EMW
Stalk-grain sedge	*Carex stipata*	FSW
Upright sedge	*Carex stricta*	EMW
Sweet joe-pye weed	*Eutrochium purpureum*	EMW
Rattlesnake manna grass	*Glyceria canadensis*	EMW
Bluejoint	*Calamagrostis canadensis*	EMW
Purplestem aster	*Symphyotrichum puniceum*	EMW
Harlequin blue flag	*Iris versicolor*	EMW
Purple loosestrife	*Lythrum salicaria*	EMW
King-of-the-meadow	*Thalictrum pubescens*	FSW, EMW
Mountain wood fern	*Dryopteris campyloptera*	FOU
Common wild oat	*Avena fatua*	FOU
Heartleaf foamflower	*Tiarella cordifolia*	FOU
Fowl manna grass	*Glyceria striata*	FSW
Partridgeberry	*Mitchella repens*	FOU
Evergreen wood fern	*Dryopteris intermedia*	FOU
Bigleaf aster	*Eurybia macrophylla*	FOU
Northern lady fern	*Athyrium angustum*	FOU
Hayscented fern	*Dennstaedtia punctilobula*	FOU
Meadow grass	*Poa* spp.	AGF
Bedstraw	*Galium* spp.	AGF
Fescue	*Festuca* spp.	AGF
Reed canary grass	*Phalaris arundinacea*	AGF, EMW
Clover	*Trifolium* spp.	AGF

[1] FOU=forested upland; FSW=forest and shrub wetland; AGF=agricultural field; EMW=emergent wetland

Sandplain Agalinis

For the reasons described in the Report, it is believed that suitable habitat for sandplain agalinis (*Agalinis acuta*) does not occur within the Study Area. This determination was not made solely on the fact that the Project is located inland. Rather the conclusion is based primarily on known habitat preferences of the species and observations of habitats that are present in the Study Area, as documented by experienced biologists familiar with the site. As stated in the Report, favored growing conditions for sandplain agalinis include native grasslands on sandy loam, loam, and loamy sand soils. It requires exposed mineral soil in proximity to little bluestem (*Schizachyrium scoparium*) and other native grasses. Although there are areas of sandy soils that occur within the Study Area (Windsor and Hinckley loamy sand soil types), sandplain agalinis is not expected to occur as the native grassland habitat it requires is not present on the site. The non-forested areas within the Study Area are currently maintained in row crops (corn) or as hayfields with dense cover of grasses and forbs such as fescue (*Festuca* spp.), reed grass (*Calamagrostis* spp.), sweet vernal grass (*Anthoxanthum odoratum*), and other common hayfield species. These areas are not subject to any type of disturbance regime that could create the areas of exposed soils in which this species typically occurs.

While no species-specific surveys for sandplain agalinis have been conducted to-date, Constitution Solar will acquire a second opinion from Art Gilman, of Gilman & Briggs Environmental. Mr. Gilman is a professional botanist with more than 30 years of field experience related to rare plants in New England (see resume in Attachment C). He has completed rare species surveys for numerous large and small projects for the United States Department of Defense and for renewable and conventional energy infrastructure projects in Connecticut and throughout the northeast. Mr. Gilman will conduct a detailed habitat assessment for sandplain agalinis within the Survey Area in spring 2020. If potentially suitable habitat is observed during the habitat assessment, and it is feasible to do so, Constitution Solar will assume presence and adjust the Project design to avoid the potential habitat. Otherwise, species-specific surveys will be completed within the potentially suitable habitat during the ideal survey window in late summer, and if a population is observed, it will be avoided or mitigated by the Project. Constitution Solar will keep NDDB apprised of the implementation of these surveys and results.

NDDB Comment #4:

Provide additional details documenting nesting birds at this site. Were forest nesting birds considered or surveyed on this site? What forest nesting birds were considered? Specifically, will trees remain (in the forested uplands) or be removed as part of the solar development at this site.

Constitution Solar Response:

Forest nesting birds were considered for the Project, including species of concern identified as having the potential to occur within the Survey Area during agency consultation. Avian species that were observed during various natural resource investigations were recorded, including a US Fish and Wildlife listed bird of conservation concern. Wood thrush (*Hylocichla mustelina),* a bird of conservation concern, was heard vocalizing in the southern parcel, within the forested area located on the west side of the parcel. This portion of the Study Area will remain intact and is designated as a habitat preservation area for the life of the Project (Attachment B, Figure 4).

Approximately 25 acres of forest area located within the 80-acre limit of disturbance will be cleared during construction (Attachment B, Figure 1). Nearly all of the forested area (upland and wetland) in the southern parcel (approximately 42 acres) where the wood thrush was observed, will be avoided entirely. A minimal amount of tree clearing (0.7 acres) will occur along the western edge of the agricultural field in the southern parcel to prevent shading impacts. Furthermore, avoidance measures will be employed during construction in the northern parcel, including seasonal clearing restrictions (winter tree clearing) to prevent impacts to migratory bird species, as well as tree roosting bat species. Proposed mitigation strategies, described in the Project's Avoidance and Mitigation Plan, include construction-phase environmental monitoring, on-site environmental training for contractors, and minimizing soil disturbance and establishing meadow habitat following construction. It is likely that forest-dwelling birds will avoid the Project's construction area during construction, and return to the site to nest, hunt and/or forage following the completion of construction activities.

NDDB Comment #5:

The eastern spadefoot study was insufficient to determine that no eastern spadefoot would be impacted by this project. Specifically, since these toads are so cryptic, the survey techniques should be varied to ensure the most comprehensive evaluation. The report only suggested visual surveys were used and did not include pitfall trapping or dip net survey techniques according to the report statement: "A total of 12.75 hours over five nights in June and July 2018 were spent surveying for the presence of eastern spadefoot toads at the Constitution Solar site".

In my opinion, that is not enough effort to rule out presence of this elusive species. I will require a second opinion for the presence of eastern spadefoot from this site. Or you may assume presence of this species within project areas and propose mitigation (long term protection strategies and conservation) for direct and indirect adverse impacts from this project. The herpetological report suggested habitat and soils indicative for the presence of these toads was found and that may be a good place to look for conservation effort.

Constitution Solar Response:

Pitfall trapping and dip net surveying were not used because of a variety of technical and effectiveness concerns. Instead, visual encounter surveys were used as an evidence-based, time-tested, and effective method to detect the presence of eastern spadefoot toad (*Scaphiopus holbrookii*). This method has been used throughout the publication record on the species. The results of Ryan et al. (2015; Attachment D) informed our understanding of eastern spadefoot toad burrow emergence patterns in Connecticut. The findings of the study enhanced the prospect of employing nocturnal visual encounter surveys as a method for monitoring known, and detecting previously undocumented, populations of this species. Field observations to date indicate that a person with experience surveying for the species can reliably detect them in areas where they are known to occur, provided the area is searched during suitable meteorological conditions (see Ryan et al. 2015 in Attachment D). A program in Massachusetts has been successfully using visual encounter surveys to detect the presence of and monitor eastern spadefoot toads for the past several years.

Pitfall trapping can be used to detect the presence of the eastern spadefoot toad, but in our opinion, it is not warranted if trained individuals are conducting visual encounter surveys at a given site. First, pitfall trapping results in a significant amount of bycatch and mortality of trapped animals. For example, shrews

(e.g., *Blarina brevicauda* and *Sorex cinereus*) are regularly captured in pitfall traps. These trapped animals tend to kill any anurans trapped with them prior to expiring themselves, presumably due to stress and exhaustion. Second, eastern spadefoot toads are not very mobile when emerged, compared to American toads (*Anaxyrus americanus*) or Fowler's toads (*Anaxyrus fowleri*). American and Fowler's toads appear to be active foragers, while eastern spadefoot toads are "sit-and-wait" predators (see Timm and McGarigal 2010 in Attachment D). Therefore, it is our opinion that eastern spadefoot toads are significantly less likely to be captured in a fixed pitfall trap than they are to be seen during visual encounter surveys by trained individuals.

Dip-netting was not employed to detect the presence of eastern spadefoot toads as no potential breeding pools were identified within the Study Area. Had potential breeding pools been observed, best practices would require surveying for the presence of eggs and/or tadpoles.

The 12.75 person hours represents five nights of on-site surveys. Our experience with detecting eastern spadefoot toads lead us to the opinion that five nights of survey effort by highly trained individuals is sufficient to detect the presence of the species given the amount of potentially suitable habitat documented at the site (see discussion on suitable habitat below). On the same nights that the five surveys at Constitution Solar were conducted, one of the Project surveyors (Jeff Cavallaro) searched the vicinity of one or the other of two known eastern spadefoot breeding pools in proximity to the Project, one in Plainfield, Connecticut and the other in Lisbon, Connecticut. Immediately before or after each survey at the Constitution Solar site, an eastern spadefoot toad was observed to be active (i.e., emerged from its burrow) near one of the pools located in proximity to the Project. Each of the eastern spadefoot toads observed at the nearby sites were detected in less than 1 hour of searching.

Eastern spadefoot toad occurrence does tend to coincide with Hinkley soil types, and United States Department of Agriculture, Natural Resources Conservation Service soil maps indicate that 14.5 acres of the Study Area (10% of the total area) is mapped as Hinckley soils. However, while this preferred soil type is present in the Study Area, preferred cover type is lacking, thus providing less than suitable habitat for eastern spadefoot toads. The cover type in which eastern spadefoot toads are most often found is early successional habitat – typically in areas with bare soil and clumps of vegetation. This type of cover is lacking in the Study Area. Some bare soil is present when agricultural fields are plowed and the nearest dense vegetation to these areas are the edges of the fields themselves. It has been our experience that while eastern spadefoot toads will occasionally burrow in active agricultural fields; they tend not to remain in these fields for extended periods of time.

Finally, while eastern spadefoot toads were previously characterized as "cryptic" or "elusive," the scientific consensus regarding this species has changed. In the last 15 years, greater access to data have informed a deepened understanding of eastern spadefoot toad natural history, which has been reflected in publications, several of which were authored or coauthored by members of the Project Team. It is our opinion that if eastern spadefoot toads are present, trained individuals would have found the species during the investigations that were conducted during suitable conditions. To be clear, we affirm the need to proceed with caution when it comes to siting new development, but the science has evolved to the point where we can state our conclusions about this particular species with a much greater degree of confidence in comparison to the knowledge base available for the species 20 years ago.

NDDB Comment #6:

Provide more details on how the study was done to locate state endangered blue-spotted salamanders on this site. From the report it appears that biologists used visual encounter surveys, nocturnal vehicular surveys and cover object searches. No pitfall trapping was used according to the report. (I believe the surveys for the state endangered salamander was included in the more general amphibian and reptile surveys, but I would like a specific narrative on how the biologist came to the conclusion that this species was not present on this project site). The nocturnal vehicular surveys were not done until June which would have been too late to capture their early spring migration to the breeding pools. Since they spend so much time underground how was this taken into consideration during survey protocol development for this species?

While the report includes some information on this species, it states that the herpetological inventory was not focused on pool-breeding amphibians. It appears that no pitfall trapping or dip netting techniques were utilized. The protection measures offered in the report state that vernal pools will include a no disturbance buffer, but do not detail protection of the associated Critical Terrestrial Habitat they also require. Please provide more details as to the conclusion that was made that this species is not present. Include details on the nocturnal vehicular surveys since they were done in June, which may have been too late to capture early spring migration. Were weather conditions appropriate to late-season migrations?

Constitution Solar Response:

Based on the results of the vernal pool surveys completed within the Study Area, the Report states that the presence of blue spotted salamander (*Ambystoma laterale*) is unlikely. Regardless of the likelihood of their occurrence, the Project's Avoidance and Mitigation Plan describes the design considerations, construction practices, and monitoring that will take place to protect all pool-breeding amphibians that were observed within the Study Area, and other amphibian species that have the potential to occur, but were not observed during field surveys.

If it were later determined that blue-spotted salamander is present at the Project site, this finding would not necessitate any change to the Project's design or the Avoidance and Mitigation Plan, which already conserves the habitats that blue-spotted salamanders would use for diurnal refuge. Solar panels and equipment are proposed to be installed in existing cleared fields - areas that currently do not serve as diurnal refuges. Although minimal tree clearing is proposed in the vicinity of VP01, this vernal pool will remain connected to a large block of forested uplands and wetlands. Attachment B, Figure 4 shows the post-construction condition proposed for both VP01 and VP02. Notably the proposed Project design capitalizes on existing clearings in these areas and the CTH for each pool will remain largely the same as they are today.

The General Herpetological Inventory of the Constitution Solar Project completed in August 2019 (Inventory Report) describes in detail, the survey methods implemented for all reptile and amphibian species, with an emphasis on detection of spotted turtle (*Clemmys guttata*), wood turtle (*Glyptemys insculpta*), eastern hognose snake (*Heterodon platirhinos*), and eastern ribbon snake (*Thamnophis sauritus*). The Inventory Report correctly states that pool-breeding amphibians, including blue-spotted salamander, were not the focus of the general herpetological survey efforts, but that cover object searches did detect other pool-breeding amphibians, namely spotted salamanders. It is correct to note

that pitfall trapping was not utilized for pure-diploid blue-spotted salamanders, or any other species. Nocturnal vehicular surveys in June would indeed be inappropriate if they had been intended to detect blue-spotted salamanders. However, these surveys were targeted on determining presence of eastern spadefoot toads.

It should be noted that general herpetological survey efforts completed were in addition to vernal pool surveys conducted during the appropriate springtime survey periods in 2017, 2018, and 2019. As described in the Report, no blue-spotted salamander eggs were found during these investigations. In 2019, methods included dip-netting and examining pool debris for the presence of single eggs, also which did not yield any results that would indicate presence of blue-spotted salamander at the Project site.

However, out of an abundance of caution, the Inventory Report does not come to any conclusions regarding the presence or absence of blue-spotted salamanders at the site. Rather, it presents the results of 55.75 person-hours completed within the Study Area by trained individuals using appropriate methods to detect a wide variety of reptile and amphibian species. Results identified in the Inventory Report was used to inform the Project's layout and in development of the Project's Avoidance and Mitigation Plan.

As described above, the Avoidance and Mitigation Plan provided with the Report, outlines the measures that will be taken during Project construction. This plan will protect all pool breeding amphibians that are known to occur, as well as other species not observed, but that have the potential to occur in the Study Area. Avoidance and mitigation strategies included in this plan include limit of work restrictions, construction timing, personnel training, exclusion fencing, monitoring, and operational avoidance practices.

NDDB Comment #7:

Please provide information on stormwater discharge. Will the stormwater eventually be discharged to the Quinebaug River? Provide a mussel management plan designed to protect freshwater mussels and state listed aquatic resources (dragonflies) from direct and indirect adverse impacts of stormwater and/or other discharges from this project. The freshwater mussel protection plan must be developed by a biologist with experience with freshwater mussels and dragonflies. In my opinion none of the biologist resumes submitted (with the report) had the expertise to evaluate these species and impacts from this solar project on their populations.

Constitution Solar Response:

The 2017 preliminary assessment species list provided by NDDB indicates that eastern pearlshell mussel (*Margaritifera margaritifera*) and sparkling jewelwing (*Calopteryx dimidiata*) have the potential to occur in the Study Area. Upon further review, Tetra Tech has determined that both species have the potential to occur in proximity to the Study Area, adjacent to the Quinebaug River. Accordingly, Constitution Solar will employ several avoidance and mitigation measures to protect these aquatic species. While an aquatic biologist did not conduct surveys for these species, a general avoidance plan will sufficiently protect all aquatic species that may occur in the adjacent Quinebaug River.

The habitat of the eastern pearlshell mussel generally includes streams that also contain trout and salmon populations, and they are most commonly associated with high-quality, cold-water fishery habitats. All of the streams present within the Study Area are intermittent or ephemeral drainages that do not support year-round water flow. The Study Area does not contain suitable habitat to support this species, as no

trout streams or riverine habitat occurs within the Study Area. However, suitable habitat is present within the Quinebaug River, which is located outside of, but adjacent to the Project. Attachment B, Figure 2 depicts the Project's development footprint in proximity to the Quinebaug River.

The habitat of sparkling jewelwing includes streams and rivers with abundant stream-side emergent vegetation for perching. As mentioned above, all the streams present within the Study Area are intermittent or ephemeral drainages that do not support year-round water flows or abundant stream-side emergent vegetation. Like eastern pearlshell, the only suitable habitat in proximity to the Project occurs within the Quinebaug River.

Because there are no proposed impacts to any watercourses, and there is a lack of suitable habitat for these two species within the Study Area, we do not believe a mussel protection plan is appropriate for this Project. Avoiding direct impacts, paired with a robust stormwater management plan, is adequate protection for all aquatic species that could occur within and downslope from the Project site.

Habitat for eastern pearlshell (and other freshwater mussels) and sparkling jewelwing could be impacted by erosion and sedimentation to adjacent watercourses that feed into the Quinebaug River, during Project construction. Heavy rainfall events could produce turbid surface water runoff from recently exposed soils, which could negatively impact the water quality of adjacent water resources. As discussed below, preventing this scenario is a key tenet of Constitution Solar's stormwater management approach. The Project will establish a no-disturbance buffer around all wetlands and watercourses, which will be fortified by using the best erosion control devices available to maintain high water quality of the stormwater runoff during heavy rainfall events. This strategy also will protect freshwater mussels, and other state listed aquatic resources that could be present downstream from the Project.

Avoidance and Buffers

Generally, Constitution Solar will maintain a minimum 100-foot buffer around all watercourses, with the exception of watercourses located in the vicinity of existing gravel roads that will be used for site access during construction where the buffer will be less than 100 feet (Attachment B, Figure 2). Redundant erosion control devices will be installed along the gravel access roads to ensure a failsafe system to protect streams S06 and S01, where these existing access roads occur closer than 100 feet to the resources. Regular road maintenance will be employed during construction and will be maintained during the operational life of the Project. Similarly, much of the development proposed on the western side of the Project site (adjacent to the Quinebaug River) will occur in areas that have already been cleared to accommodate current agricultural uses.

The Project will establish an approximately 42-acre habitat preservation area around the forested uplands, forested wetlands (including VP01), and streams located in the southern parcel (Attachment B, Figure 4). Avoiding clearing and development in this portion of the Study Area will not only protect valuable upland and wetland habitat, but also will leave a forested buffer intact between several tributaries to the Quinebaug River and the Project site.

Attachment B, Figure 2 depicts the watercourse buffers and the nearest distances from proposed construction activities to the Quinebaug River and tributaries within the Study Area. The ground distance measurements account for the actual physical distance (horizontal and vertical changes) on the ground.

This demonstrates that in many cases the buffer zone for each watercourse is farther than 100 feet when elevation is considered.

As discussed above, eastern pearlshell and sparkling jewelwing habitat that could occur within the Quinebaug River will be protected by ensuring appropriate stormwater controls and site stabilization plans are employed during construction activities.

Stormwater Control and Site Stabilization

A comprehensive erosion and sediment control plan is currently under development for the Project. This plan will be included as part of the Stormwater Management Report to be submitted to DEEP as part of an Application for a Construction Stormwater General Permit (General Permit). Best management practices will be followed to ensure proper erosion and sediment controls are implemented, and that the water quality of adjacent watercourses is maintained.

Following installation of the solar array in the agricultural fields, the grasses established below the panels will help stabilize soils that are currently exposed and subject to erosion. No-disturbance buffers and the establishment of meadow habitat are two methods that will be employed to ensure water quality will be protected throughout the life of the Project. Compared to current site uses, the final site stabilization measures will result in reduced soil loss from the Project site, resulting in an overall net improvement to water quality in comparison to current conditions.

Attachment B – Figures

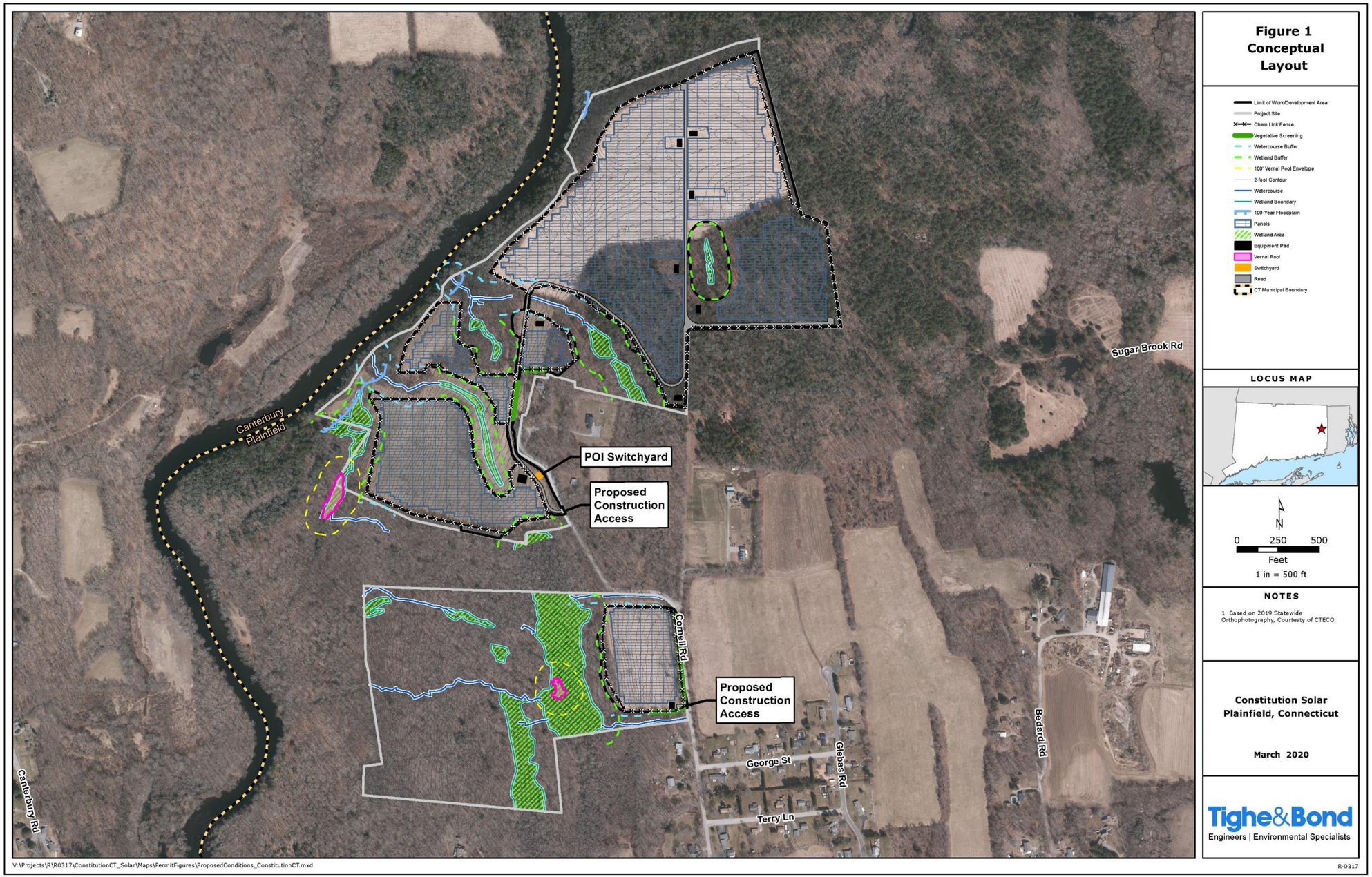


Figure 1 – Conceptual Site Layout

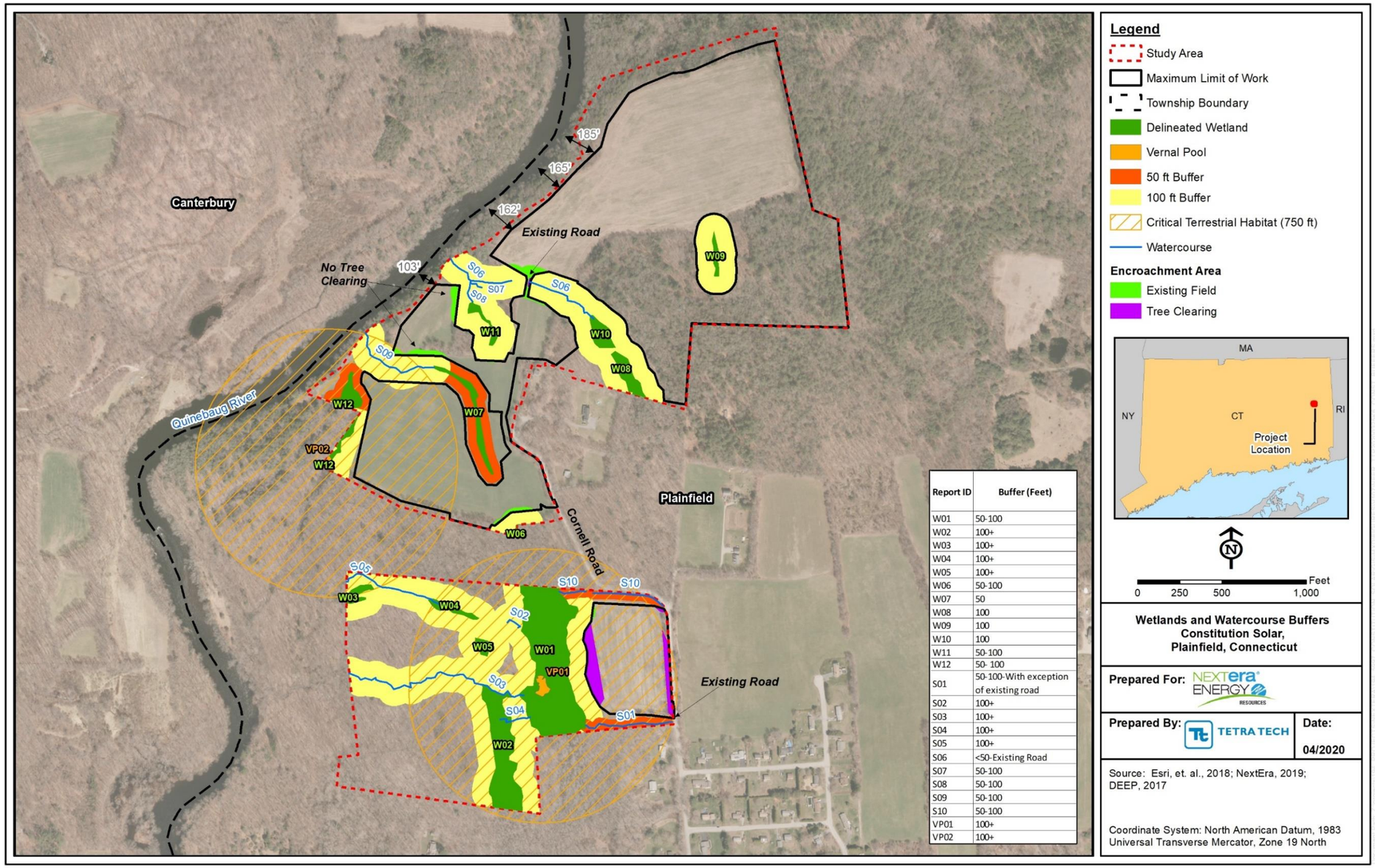
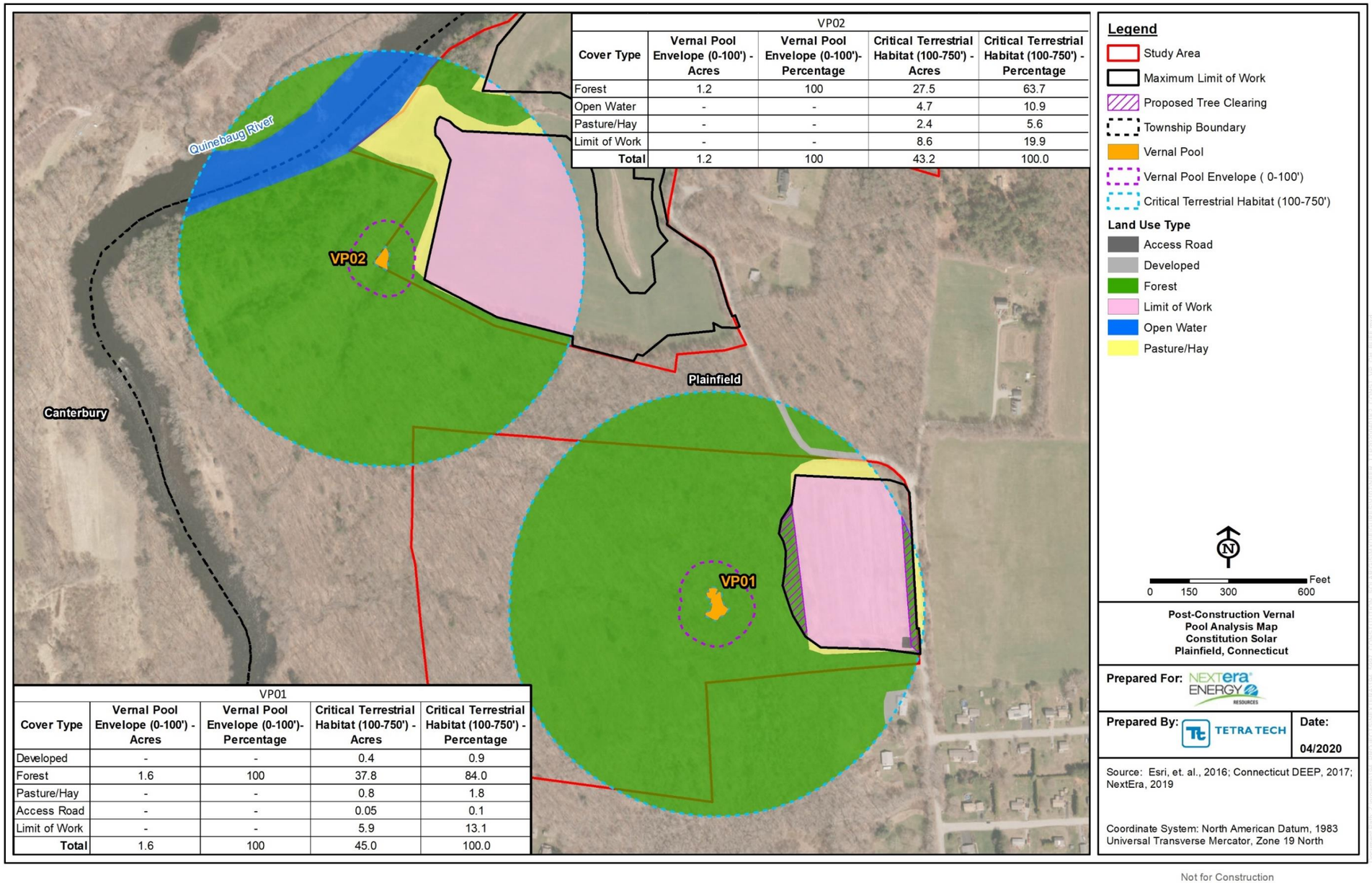


Figure 2 – Constitution Solar Natural Resource Buffers



VP02

Cover Type	Vernal Pool Envelope (0-100') - Acres	Vernal Pool Envelope (0-100')- Percentage	Critical Terrestrial Habitat (100-750') - Acres	Critical Terrestrial Habitat (100-750') - Percentage
Forest	1.2	100	27.5	63.7
Open Water	-	-	4.7	10.9
Pasture/Hay	-	-	2.4	5.6
Limit of Work	-	-	8.6	19.9
Total	1.2	100	43.2	100.0

VP01

Cover Type	Vernal Pool Envelope (0-100') - Acres	Vernal Pool Envelope (0-100')- Percentage	Critical Terrestrial Habitat (100-750') - Acres	Critical Terrestrial Habitat (100-750') - Percentage
Developed	-	-	0.4	0.9
Forest	1.6	100	37.8	84.0
Pasture/Hay	-	-	0.8	1.8
Access Road	-	-	0.05	0.1
Limit of Work	-	-	5.9	13.1
Total	1.6	100	45.0	100.0

Figure 3 – Constitution Solar Vernal Pool Critical Terrestrial Habitat Analysis

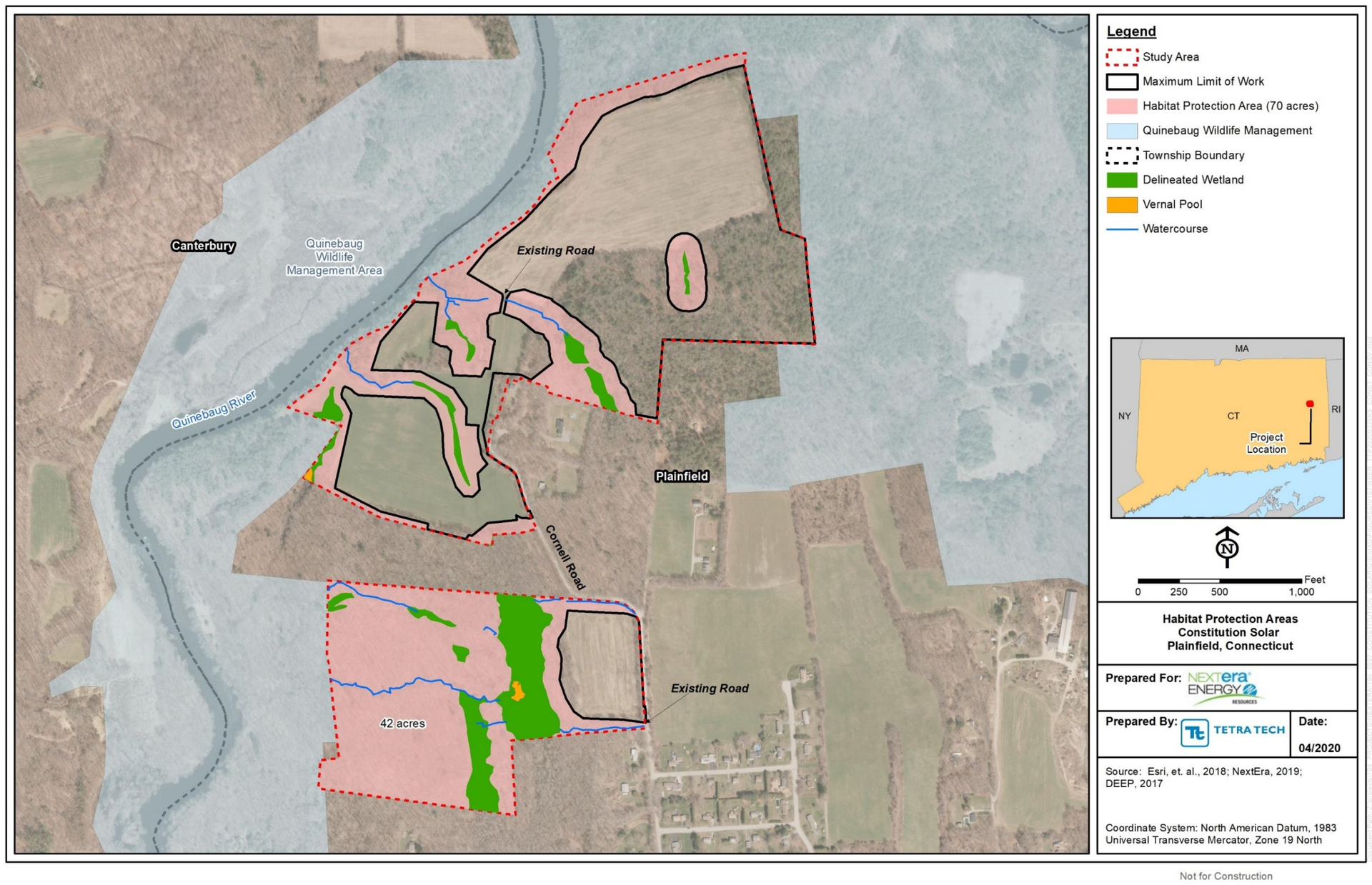


Figure 4 – Constitution Solar Conservation Areas

TETRA TECH

Attachment C – Resumes

Katelin Nickerson, PWS, CWS
Arthur Gillman – Botanist

Professional Summary

Katelin has twelve years of experience in environmental consulting in Maine, the Northeast, and North America. She is an experienced field biologist, conducting field wetland delineations, vernal pool, and other natural resource surveys for permitting, feasibility studies and project due diligence. She has worked alongside botanists, soil scientists, wildlife biologist and herpetologists. Her broad experience in environmental surveys and permitting provides her robust background as a field ecologist. Ms. Nickerson is a Professional Wetland Scientist, and is responsible for creating and implementing study plans, and collecting field data for permitting and natural resources assessments. Katelin is currently working as a project manager and wetlands subject matter expert contributing to the permitting process and working to balance client needs with regulatory requirements for small- and large-scale projects.

Education

- BA, Environmental Studies (Minor in Biology), William Smith College, 2007

Registrations/Certifications

- Certified Wetland Scientist (CWS), New Hampshire, number 292
- Professional Wetland Scientist (PWS), Society of Wetland Scientists, number 2708

Selected Tetra Tech Project Experience

Multiple Utility Scale Solar Projects, Connecticut 2017 - 2020

Project manager and field lead responsible for leading the project through field survey, technical reporting, and permitting processes. Working with the development team and subcontractors to navigate the regulatory process. Was responsible for leading vernal pool surveys, and field wetland and waterbody delineations and report development.

Multiple Utility Scale Solar Projects, Maine 2017 - 2020

Worked as field lead to conduct field surveys for vernal pools, and wetland and waterbody delineation, and development of technical reports. Worked with the developer and the project team to attend public meetings and site visits with regulators. Katelin helped lead the effort to submit a Maine Site Location of Development Act (SLODA) permit applications and permit review with the United States Army Corps of Engineers (USACE).

Wetland and Natural Resource Services, 2017, National Grid, Granite State Power Link, multiple locations Vermont and New Hampshire

Conducted field reconnaissance for proposed substation locations in western New Hampshire and Vermont. Lead the field effort for wetland and waterbody delineation at a proposed substation location in Northeast Kingdom, Vermont. Developed a brief report summarizing the survey results.

Wetland and Natural Resource Services, 2017, Confidential Project, Washington County, Maine

Lead field reconnaissance for a proposed solar development in Downeast, Maine. Worked to develop an in-depth review of the proposed project area and the potential permitting needs and environmental restrictions. A critical issues analysis was part of a package submittal by NextEra as part of the New England Clean Energy Request for Proposals.

Wetland and Natural Resource Services, 2017, U.S. Department of the Navy, Great Pond Outdoor Adventure Center, Great Pond, Maine

Lead the field effort for wetland delineations for a preliminary jurisdictional determination (JD) at the Great Pond Outdoor Adventure Center in Hancock County, Maine. Katelin developed a report submitted to the USACE for the JD. This report will be used by the Navy for future developments and as an inventory for jurisdictional resources within their property.

Selected Previous Project Experience

Project Scientist, 2008–2017, Stantec Consulting, Topsham, Maine

Katelin worked for Stantec as a natural resource scientist leading field wetland delineations and natural resource surveys for a variety of projects. She contributed to natural community mapping, listed species surveys, soil surveys, and analysis for energy and transportation projects, and utility corridors throughout New England and various locations in the U.S. and Canada. Contributed to a number of fisheries and wildlife surveys including habitat identification, species identification and stream surveys.

Proposed Oil Pipeline Wetland and Stream Delineation, 2012, Northern Minnesota
Conducted wetland delineations and Global Positioning System surveys over 83 miles of proposed pipeline in Northern Minnesota. Determined wetland boundaries characterized wetland and waterbody resources and contributed to the data organization and Quality Assurance/Quality Control.

Gas Pipeline Wetland Delineation and Vegetation Monitoring, 2011–2016, West Virginia, Pennsylvania, and Ohio

Conducted wetland delineation and monitoring work along existing and proposed natural gas pipelines in West Virginia, Ohio, and Pennsylvania. Wetland monitoring work included invasive species surveys.

Stream Characterization and Baseline Survey, 2012, Placerville, Idaho

Worked to collect baseline stream data near Placerville, Idaho to support an Environmental Assessment for the development of a mine in the area. Collected benthic macroinvertebrates and evaluated fish habitat and water quality, and channel and riparian conditions of four stream reaches.

Bingham Wind Project, 2010-2016, Central Maine

Conducted wetland delineations, vernal pool surveys over an area totaling approximately 6,800 acres for a 56-turbine wind project in central Maine. Identified streams and Wetlands of Special Significance Conducted surveys to determine the presence of deer wintering areas, a regulated natural resource. Contributed to a Class D soil survey of a 17-mile transmission line associated with the project.

Hancock Wind Project, 2014, Hancock County, Maine

Project Scientist and field leader responsible for organization, progress, and safety of field staff through the field work phase of the 17-turbine wind project. Conducted wetland delineations, vernal pool surveys, and Global Positioning System surveys. Assisted with field surveys for a Class L soil survey and contributed to the report and mapping of soils identified within the project boundaries. Responsible for data management and associated reporting of findings to accompany permit applications.

Northern Maine Interconnect Transmission Line Project, 2015, Aroostook County, Maine

Project scientist and field lead responsible for organization, progress, and safety of a 4-person field crew for vernal pool surveys and wetland delineations along 30 miles of proposed interconnect transmission line project. Coordinated with the project manager to complete field tasks and meet client needs. Contributed the reporting and permit application.

Bingham Wind Project, 2016, Central Maine

Working as an Environmental monitor on clearing, and earthwork of a 56-turbine wind power project, Duties include construction environmental monitoring, permit compliance, communication with contractors, third party inspectors and the client, and developing daily reports on the conditions of the site.

Common Loon Researcher, Biodiversity Research Institute 2008

Worked as a field biologist to survey, capture, process and band the Common Loon (*Gavia immer*) in western Maine. Contributed to a long-term study of the species.

Resumé

Arthur V. Gilman

Contact: Gilman & Briggs Environmental, Inc.
1 Conti Circle, Suite 5, Barre VT 05641
avgilman@together.net or team@gbevt.com
802-522-5610 802-479-7480

Education: B.A., Brown University 1976, cum laude

Employment:

- Principal, Gilman & Briggs Environmental, 2005–present. Currently involved in a range of projects including siting, planning, and permitting of electrical transmission lines, communications towers, solar arrays, natural gas pipelines, municipal infrastructure, housing developments, commercial projects, and landscape projects for private landowners. Familiar with federal and state laws concerning endangered species, the federal wetland permitting process, and state permitting processes. Average 80 projects/year.

- Biologist, Wm. D. Countryman Environmental Assessment and Planning, Northfield, Vermont, 1988-2005. Responsibilities included marketing of services; searches for rare, threatened and endangered species, especially plants but also wildlife; wetland delineations and evaluations; wildlife habitat assessment and mapping; co-ordination with project engineers and providing advice; consultation with permitting agencies; preparation of reports, permit applications and testimony.

- Propagator and plant scientist, White Flower Farm, Litchfield, CT, 1977-1988. Responsibilities included propagation to meet average annual demand of ca. 600,000 units, greenhouse production, pest control, maintenance of stock, etc.

Recent representative projects include:

- VELCO's Ascutney project, endangered species survey on approximately 15 miles of transmission line corridor in south-central Vermont; also pre-construction mapping of invasive (quarantined) non-native plants (2013-2017) and post-construction inspection for invasive plants (2018).
- Central Maine Power's New England Clean Energy Connect project (NECEC). Subcontractor to Tetra Tech, Inc., responsible for searches for rare, threatened, or endangered species on ca. 60 miles of new ("green") electric transmission corridor in western Maine (2018).
- Belter Farm. Reclassification of jurisdictional Class Two wetlands in South Burlington in connection with a manure-management project (2018).
- National Grid's Granite State Power Link Project. Subcontractor to TRC, responsible for searches, mapping, and reporting of rare, threatened or endangered species and significant natural communities on ca. 58 miles of existing and new (proposed) electric transmission line corridor in the Northeast Kingdom of Vermont and adjacent New Hampshire (2017).

- NatureServe's (2017) Northeast Regional Floristic Quality Assessment Tool. Representing the Northeast Highlands Region of the US EPA, USGS and NRCS Ecological Regions of North America, assigned Co-efficients of Conservatism for all native plant species within the Region.
- Expert witness for Environmental Protection Agency, Region 1, Civil Action No. 2:160cv-00319-cr (*U.S. v. Nelson Farms, Inc. and Douglas Nelson, Sr*.), regarding unauthorized actions in a wetland (2017–2018).
- Bearfort Mountain Natural Area natural community and botanical assessments on 1300 acre preserved lands in northern New Jersey; botanist responsible for plant identification and quadrat (releve) sampling. Subcontractor with Tetra Tech, Inc. for client Algonquin Gas (2014-2015).
- Vermont Gas "Addison County Natural Gas Project" Phase 1. (2012-2016). Inspection, reports, and permit support for a new 40-mile natural transmission line in western Vermont in regard to rare species and natural areas. Subcontractor to VHB.
- Spectra's AIM project, search for rare plants including federally endangered small whorled pogonia at multiple sites in New York and Connecticut (2015, 2016).
- Barton Solar, LLC, photovoltaic system in Barton, Vermont, including procurement on a State Endangered Species Permit (2013- current).
- Rare species and wetlands surveys at approximately 30 other solar projects in Vermont.
- Vermont Technical College, Office of Continuing Education, teaching Wetlands Delineation short course, botanical and permitting components (2014-2018).
- Valuations of large (> 10,000 sheets) herbarium collections gifted to The Pringle Herbarium, University of Vermont (2006, 2017).

Other recent projects have involved natural resource assessment, planning, evaluation of impacts, and permitting for 115 kV and 345 kV electrical transmission lines in Vermont and Maine. More than 500 miles of corridor in Maine and Vermont have been assessed. Recent clients have included VELCO (several projects); Central Maine Power (several projects, including the 200 mi. MPRP project), and Bangor Hydro-Electric (Downeast Reliability Project).

Wetland delineations, assessment, and permit applications on numerous private, state and public municipal projects throughout Vermont and Maine. Recent clients have included Vermont Gas Systems, Inc., City of Newport, VT, Town of Bennington, VT, Town of Grand Isle, VT, Town of Swanton, VT, Town of Cabot, VT, and several Vermont engineering companies.

Rare, threatened and endangered species searches and evaluation of significant natural communities on other projects in Vermont, Maine, New York, and Connecticut. Clients have included the Mt. Mansfield Colocation Corporation, Vermont Telephone Company (VTel), TransCanada (Kibby Mtn. Expansion), US Department of Defense (Cutler Naval Station, Maine), Spectra Energy (New York and Connecticut), and the Vermont Association of Snow Travelers (Lamoille Valley Rail Trail). Recent projects have included alpine and sub-alpine communities, forested summits, sandplains, slate quarries, fens, vernal pools, river shores, salt marshes, and freshwater-estuarine habitats.

TETRA TECH

Attachment D – Referenced Peer-reviewed Papers

Journal of Herpetology, Vol. 49, No. 2, 257–263, 2015

Monitoring Eastern Spadefoot (*Scaphiopus holbrookii*) Response to Weather with the Use of a Passive Integrated Transponder (PIT) System

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ABSTRACT.—**Eastern Spadefoots (*Scaphiopus holbrookii*) are probably one of the least-understood amphibian species in the United States. In New England, populations are localized and it is likely that some populations go undocumented because of the species' cryptic habits. We used passive integrated transponders (PIT tags) to monitor burrow emergence with the aid of continuously running, stationary (but portable) PIT tag readers. We monitored the activity of individual Eastern Spadefoots by placing circular antennae directly over burrows of PIT tag-implanted individuals. We monitored 18 Eastern Spadefoots from 1 to 84 nights in the spring, summer, and fall of 2009–2011. Our results indicate that, on average, Eastern Spadefoots emerged on 43% of the nights that they were monitored. Nights when Eastern Spadefoots emerged were warmer and more humid than nonemergence nights. Eastern Spadefoots were also much more likely to emerge on a given night if they had emerged the night before. Our results have improved the understanding of Eastern Spadefoot burrow-emergence patterns in the northeast region. Our findings may considerably enhance the prospect of employing nocturnal visual encounter surveys as a method for monitoring known, and detecting previously undocumented, populations of this species.**

The Eastern Spadefoot (*Scaphiopus holbrookii*) is a pool-breeding amphibian found from southern New England and southeastern New York south along the Atlantic Coastal Plain to Florida. It is found throughout the South from Tennessee west to the Mississippi Valley (Klemens, 1993). It is among the rarest amphibians in the northeastern United States, listed as "Imperiled" in New York and Massachusetts and "Critically Imperiled" in Connecticut, Rhode Island, and Pennsylvania (Natureserve, 2012). New England populations are scattered, and found typically in river valleys with sandy, well drained soils (Klemens, 1993). It is likely that some populations go undocumented because of the species' cryptic habits. Most notably, Eastern Spadefoots do not breed on a rhythmic, annual cycle typical of the large majority of North American pool-breeding amphibian species, and can forgo breeding for numerous, consecutive years (Ball, 1936; Klemens, 1993). Even in years when breeding occurs, the activity is explosive, typically lasting only 1 or 2 days or nights, and can occur anytime from late March through August in southern New England (Klemens, 1993; Timm, pers. obs.). Because of this irregular and contracted breeding pattern, calling anuran surveys are severely limited as a primary tool to document and monitor local Eastern Spadefoot populations (Cook et al., 2011).

Eastern Spadefoots spend the vast majority of their lives in the uplands surrounding breeding pools in self-dug underground burrows from which they emerge sporadically at night to feed. When aboveground for feeding purposes, they tend to remain close (<1 to ca. 35 m) to their burrows (Pearson, 1955; Johnson, 2003). Limited information exists on the burrow-emergence patterns of this species throughout its range, and much of what is known is based on a single study conducted in the south (Pearson, 1955), where the animals are encountered more commonly than in more northern latitudes and may be active year-round. Pearson (1955) conducted intensive nocturnal visual surveys and found that individuals emerge from their burrows on warm, rainy, or humid nights, largely during the hours immediately following sunset and immediately preceding sunrise. Individual Eastern Spadefoots exhibited high fidelity to burrow locations and may remain at them for extended periods. One individual used the same burrow over 51 consecutive months (Pearson, 1957). Other studies on related spadefoot species have similarly found an increased probability of surface activity during wet nights (Savage, 1942; Dimmitt and Ruibal, 1980). Gaining an improved understanding of burrow emergence patterns of Eastern Spadefoots in the northeastern United States could considerably enhance the prospect of employing nocturnal visual-encounter surveys as a method for monitoring known populations and detecting previously undocumented populations of Eastern Spadefoots.

We conducted a study over 3 yr (2009–2011) investigating Eastern Spadefoot burrow emergence with the use of passive integrated transponders. The objectives of this study were 1) to quantify when and how often individual Eastern Spadefoots emerge from their burrows, and 2) to assess the effects of selected meteorological conditions and previous emergence activity on burrow emergence.

MATERIALS AND METHODS

Research Sites.—We conducted our research at three sites located approximately 2.5 km apart from one another within the Quinebaug River drainage in Windham County, Connecticut, USA. The sites are underlain by stratified glacial drift; the deposits are generally coarse, consisting of layers of sand and gravel.

In Connecticut mean annual precipitation is 114 cm, with precipitation distributed evenly throughout the year, although summer months may receive slightly higher amounts than winter months in some years. Monthly precipitation averages 7.6–10.2 cm, with occasional large storms occurring in any month (Miller et al., 2002). The state has a temperate climate, with mild winters and warm summers. The January and July mean temperatures are −3°C and 21°C, respectively (City-Data.com, 2012). Summer temperatures are relatively uniform over the state; the greatest contrast occurs during winter, with northern portions of the state reaching lower temperatures than southern (coastal) ones (Coolweather.net, 2012).

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DOI: 10.1670/12-230

FIG. 1. Using a toad tote to monitor burrow emergence of a PIT tagged eastern spadefoot. Note the iButton placed within the antenna. Photograph by Nicole Cudzilo.

The first site is privately owned and was farmed in the past. The second site contains an 8-ha quick-infiltration detention basin designed to handle storm water from an adjacent parking lot, and also to serve as Eastern Spadefoot upland habitat. The third site is adjacent to the second site and is a suburban residential neighborhood with ca. ¼-ha lots dominated by cultivated lawns and gardens. All three sites are surrounded by a mosaic of forest, gravel mines, agriculture, and light development.

Capture and Tagging.—We captured 15 Eastern Spadefoots in pitfall traps placed at the first and second sites. These individuals were captured during foraging events or when en route to new burrows rather than during breeding migrations. The remaining three animals were captured by hand at the third site during a breeding event.

Upon capture of each individual, we measured the snout-to-vent length (SVL, to the nearest 0.1 cm) and mass (to the nearest 0.1 g), and implanted each individual with a 12-mm PIT tag (Model HPT12, 134.2kHz ISO FDXB tag; Biomark, Boise, Idaho) and a radio transmitter (Model R1655 or A2455; Advanced Telemetry Systems, Isanti, Minnesota) following the methods in Madison et al. (2010). Eastern Spadefoots were anesthetized with 3.1-mM tricaine methane sulfonate (MS-222) neutralized to pH 7.0 with NaOH. When the righting response and response to touch were completely suppressed (following Faccio, 2003 and McDonough and Paton, 2007) we made a ca. 7-mm incision in the ventral posteriolateral abdominal wall and inserted radio transmitters and PIT tags (bathed in chlorhexidine and rinsed with well water) into the peritoneal cavity. We closed the incision with dissolvable sutures (Model PDS II, RB-1 taper, Size 5-0, Ethicon Inc., Somerville, New Jersey) and rinsed the animals with well water. We then kept the individuals overnight in separate plastic containers lined with wet paper towels and we released them within 5 m of their initial capture location the following evening.

Radio and PIT Telemetry.—Two portable PIT tag devices were constructed for use in this study; each consisted of a battery-powered Destron-Fearing transceiver (Model FS 2001A-ISO; Digital Angel Co., St. Paul, Minnesota) housed inside a waterproof Pelican® case alongside a large, sealed 12-volt lead-acid battery. A custom-built ca. 15-cm-diameter circular antenna constructed of 1.27-cm PVC pipe (similar to Blomquist et al., 2008) was connected to the readers though watertight openings in the side of the Pelican® cases via a 2-m cable.

Following initial release we located burrowed radio-transmittered individuals with the use of local triangulation via radio telemetry. We then placed PIT antennae over individual burrows so that the reader could detect and record the PIT tag number and the date and time the individual was underground in its burrow (Fig. 1). We programmed readers

to record this information every 15 min so as to record continuously for several weeks without overrunning the memory of the reader. When an Eastern Spadefoot emerged from its burrow and moved greater than ca. 35 cm (the approximate read range of the reader with a 12-mm tag), its PIT tag was no longer detected by the reader, which was reflected by tag-reading gaps in the stored data. If and when the individual returned to the same burrow, the reader resumed recording the PIT tag number at 15-min intervals. Individuals were monitored on an opportunistic basis. We checked the readers daily to replace batteries and determine if they were still detecting the PIT tags of the individuals they were monitoring. If necessary, we shifted antenna positions slightly to obtain a signal. If a signal still could not be detected, we confirmed via radio telemetry that an individual was either in the same burrow (but at a depth beyond the read range or the tag reader) or at a new location.

Data Analysis.—Throughout the study we periodically downloaded data from the PIT tag readers. The data commonly showed small gaps in tag-read frequency greater than 15 min, but less than 1 h, during both day and night. This might be attributed to an individual Eastern Spadefoot shifting its position underground, as subtle changes in antenna orientation can affect detection success by the reader (Blomquist et al., 2008; Ryan, pers. obs.). Tag-read gaps greater than 1 h were defined as emergence events if they occurred between ½ h before sunset and ½ h after sunrise. The time interval of 1 h was chosen to err on the conservative side of our estimation of number of emergences detected.

To relate burrow-emergence patterns to selected meteorological variables, we downloaded average daily temperature data (2009–2011) from the National Climatic Data Center station (NCDC) located at the Windham County Airport in Willimantic, Windham County, Connecticut, approximately 20–22 km from our research sites. In addition, during 2010 and 2011 we placed temperature- and humidity-logging iButtons (Model DS1923-F5 Hygrochron, Embedded Data Systems, Lawrenceburg, Kentucky) on the ground next to monitored burrows (the NCDC does not provide relative humidity data). We obtained daily precipitation amounts (to the nearest millimeter) from a rain gauge installed at the first research site.

We used generalized linear mixed effects models (GLMM) to assess how average daily temperature (°C), daily amount of precipitation (mm), average daily relative humidity, and whether or not an individual emerged the previous night affected Eastern Spadefoot burrow emergence. These variables were chosen based on previous work on the ecology and physiology of spadefoots and other anurans. We analyzed all animals together in the models but used individuals as the random effect. Generally, we hypothesized that emergence would take place primarily on warm, rainy nights. Specifically, we hypothesized that temperature, precipitation, and humidity would be positively correlated with Eastern Spadefoot burrow emergence. We also hypothesized that individuals would be more likely to emerge on a given night if they had emerged the night before. Because of differences in predictor information collected between years, we conducted two sets of analyses using the same emergence data. The first set used emergence data from 2009 to 2011 with the NCDC average daily temperature data and precipitation data from the on-site rain gauge. The second set used the 2010–2011 emergence data with the iButton temperature and humidity data and the on-site rain gauge data. We did not observe emergences beyond October 31 in any year and did not include data past this date.

We used an information-theoretic approach to evaluate competing hypotheses about the factors influencing Eastern Spadefoot emergence for both data sets (Burnham and Anderson, 2002). For the 2009–2011 and 2010–2011 data sets, we developed 5 and 10 candidate models, respectively, based on plausible combinations of the variables in each data set (Table 1), and we ranked these models using Akaike's Information Criterion corrected for small sample size (AIC_c) and Akaike's model weights (ω). We used model averaging to derive parameter estimates from all models in each set (Anderson, 2008). Variables were considered to be correlated positively with emergence if 95% confidence intervals around odds ratios did not overlap one.

We conducted a χ^2 test for homogeneity of proportions using a Monte Carlo simulation to compute the P value to test if proportions of emergences (Table 2) were uniform across all Eastern Spadefoots. We conducted all statistical analyses using the statistical software R version 2.14.2 (R Development Core Team, 2012) and we defined statistical significance as $P \leq 0.05$.

Results

Frequency of Emergence.—Eastern Spadefoots did not appear to respond negatively to the presence of the PIT antenna located over their burrows as they returned to the same burrow routinely during monitoring. We monitored 18 Eastern Spadefoots each for a median of 13 nights (range 1–84 nights). The earliest date monitored was 27 April and the latest date was 5 December (Table 2). We monitored Eastern Spadefoots for 312 individual nights, which resulted in 405 "spadefoot nights" as two PIT tag readers were deployed simultaneously during 97 nights. Only 371 spadefoot nights were used in analyses, as we did not use data past 31 October. We detected 158 emergences as defined by >1 h tag-read gaps occurring at night (Fig. 2). Eastern spadefoots emerged on 43% of spadefoot nights monitored (158/371 spadefoot nights)—(Table 2). The majority of emergences (76%) were initiated in the first 1.5 h after sunset (Fig. 3).

Emergence events detected by the PIT tag readers were confirmed on 14 occasions. We observed six shifts to a new burrow confirmed via telemetry, visually observed five spadefoots outside their burrows, and caught three spadefoots in a pitfall trap the morning following emergence. Spadefoots were never observed emerged from their burrows during the day.

Individual spadefoots did not differ in how often they emerged. Model output for the mixed-effects logistic regression indicated zero variance in proportion of emergences. This was also supported by the χ^2 test for homogeneity ($\chi^2 = 12.63$; $P = 0.77$).

Weather Conditions, Previous Activity, and Emergence.—For both data sets, the top-ranked logistic regression models (those within 2 AIC_c) combined contained all variables (Table 3). Model averaging results showed that the probability of spadefoot emergence was correlated with temperature and previous night's activity status for the 2009–2011 data set and temperature, previous night's activity status, and humidity for the 2010–2011 data set. The 95% confidence intervals of odds ratios for these variables did not overlap one (Table 4).

Discussion

For both data sets, the strongest predictor of emergence was whether or not an individual Eastern Spadefoot emerged the

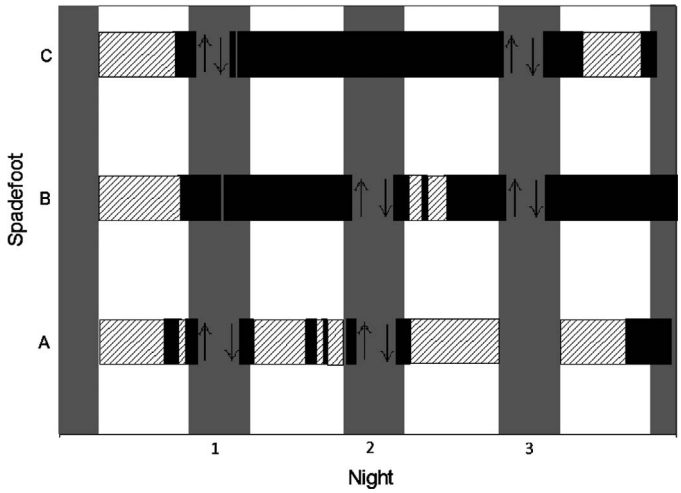

FIG. 2. Raw PIT tag reader (black bars) and telemetry data (cross hatching) for three monitored Eastern Spadefoots over the course of 3 nights. Vertical gray bars demarcate nighttime hours, horizontal black bars indicate detection of PIT a tag, up and down arrows indicate spadefoot position (above or below ground, respectively), and cross hatching indicates location confirmation of a burrowed spadefoot via radio telemetry (once during the day). Tag-read gaps >1 h occurring at night are classified as emergences. Note that the actual monitoring dates of spadefoots A, B, and C differ, hence the sequential numbering from 1 to 3. Note also that for spadefoot A, night 3, we considered the toad not to have emerged, as telemetry readings confirmed presence in the same burrow during both the preceding and following days.

previous night. This may be related to high temporal autocorrelation in weather, i.e., if conditions are suitable for Eastern Spadefoot emergence on a particular night, they will have a high likelihood of being suitable the next night. The probability of emergence was correlated positively with air temperature in both model sets with average temperatures for emergence nights of 21°C and 26°C for the NCDC and iButton data sets, respectively. The former is very close to Pearson's (1955) estimate of 20.56°C for Eastern Spadefoot activity nights. As Eastern Spadefoots do not regulate their own body temperature physiologically, there is likely a threshold relationship between temperature and emergence, which could explain the similarities in these results (Table 4). The observed higher average temperature for the iButton data set was expected as the majority of monitored burrows were in areas with little canopy cover, subjecting the iButtons to direct sunlight, which likely caused temperature readings to be biased upwards (Table 4).

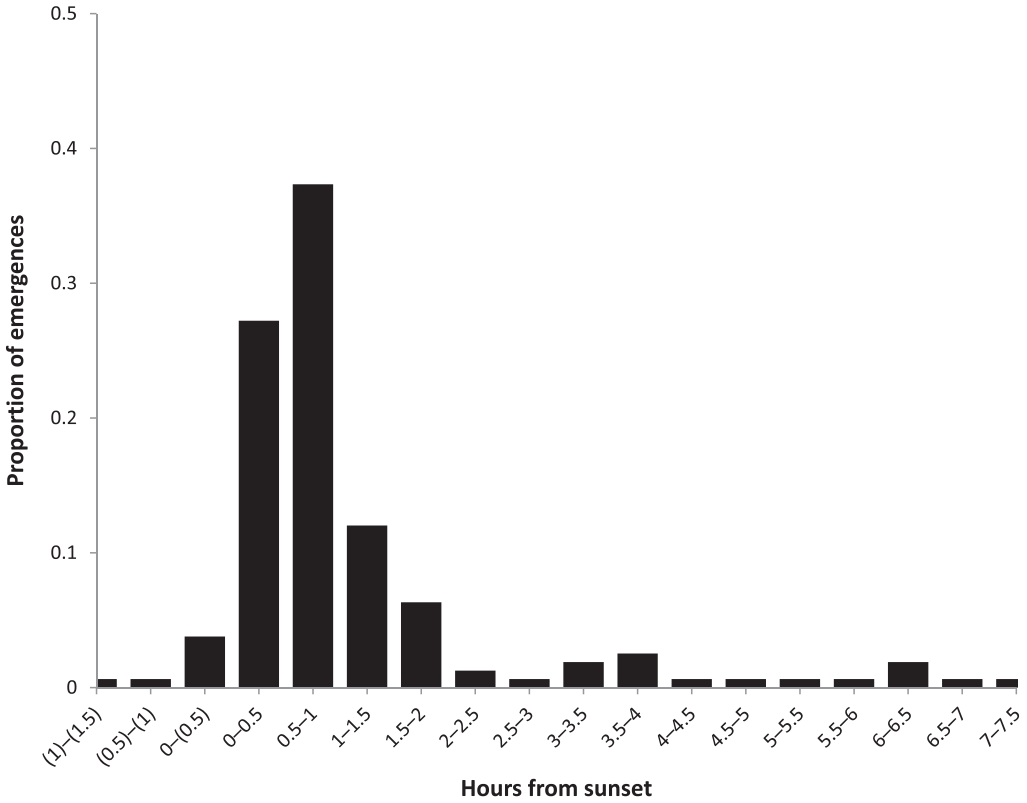

FIG. 3. Proportion of Eastern Spadefoot burrow emergence relative to hours from sunset.

TABLE 1. Variables used to describe Eastern Spadefoot nonbreeding burrow emergences.

Variable	Description
TEMP	Average daily temperature (°C) obtained from the National Climatic Data Center
PREVIOUS	Toad emergence the preceding day
RAIN	Amount of precipitation (mm)
iTEMP	Average daily temperature (°C) measured with iButtons
iHUMID	Average daily relative humidity measured with iButtons

The majority of emergences took place shortly after sunset (Fig. 3). We do not present time of re-entry into burrows (and hence duration of emergences) because it was often difficult to identify exactly when an individual re-entered its burrow. For example, it was not uncommon for an individual's tag to be read several times sporadically in the morning hours, which may be caused by an individual moving on the surface in the vicinity of its burrow prior to re-entry. Also, though an individual may have returned to the same burrow location, the individual's exact depth/position underground may have differed slightly from the previous day, thus affecting tag detection.

Pearson (1955) noted Eastern Spadefoots are most active during hours immediately following sunset and immediately preceding sunrise. If he was suggesting that Eastern Spadefoots emerge, burrow, and re-emerge during the course of one night, our data do not reflect this, as it appears that Eastern Spadefoot emerge only once for the entire night. Timm et al. (2014) have observed the same pattern during nocturnal telemetry surveys. Pearson's study involved only visual detection, and his observed peak in activity may be a peak in detection rates in that Eastern Spadefoots may be more easily observed when moving out of, or back to, their burrow locations. Eastern Spadefoots may be difficult to detect for the majority of a given emergence night, as they most likely are a sit-and-wait predator unlike many *Anaxyrus* (*Bufo*) species (Timm and McGarigal, 2010).

Our estimate of proportion of nights emerged (43%) has some sampling error. It is possible that on occasion an individual spadefoot may have emerged but then stayed within the read-range of the antenna (ca. 35 cm). Alternatively, an individual may shift its position underground, causing its tag not to be read by the PIT tag reader; if the resulting data gap is longer than 1 h, we may have recorded a false emergence. In his study on Eastern Spadefoots in Florida (where they may remain active all year), Pearson (1955) estimated that the animals emerged from their burrows on the scale of ~8% of nights annually, which is markedly lower than in our study. Our results are closer to those of Timm et al. (2014), who found that Eastern Spadefoots emerged during ~60% of spadefoot nights monitored (via radio telemetry) in Cape Cod, Massachusetts.

Savage (1942) stated that European Common Spadefoots *Pelobates fuscus* exhibit individual variation in emergence proportions. Our results conflict with his statement in that we found zero variance in emergence proportions among individuals. If individual variation in proportion to emergences does exist, our sample size may have been too small to detect an effect.

Our models show that the daily amount of rainfall may not be a strong predictor of nonbreeding emergence of Eastern Spadefoots. Of the 158 emergences we detected, 114 (72%) took place in the absence of a precipitation event. This may be because days with rain were less common than days without rain over the course of our study. Precipitation events occurred on only 35% of nights monitored. We have also observed, however, that Eastern Spadefoots most often shifted burrow locations during nights when a precipitation event occurred. Therefore, Eastern Spadefoots are perhaps most often encountered on rainy nights for two reasons: 1) efforts to detect Eastern Spadefoots and other amphibians are concentrated on rainy nights, and 2) the detectability of Eastern Spadefoots is likely higher on rainy nights because they move longer distances during these occasions, presumably to shift burrow locations to new areas (pers. obs.; Timm et al., 2014). Emergences during nights

TABLE 2. Inventory of Eastern Spadefoots monitored from 2009 to 2011.

Spadefoot identification number	Age class (A = adult; J = juvenile)	Sex	Snout-to-vent length (mm)	Weight (g)	Nights monitored	Number of nights monitored	Number of emergences
1	A	M	60	22.1	2 July–2 July 2009	1	1
2	J	–	50	13.4	4 July–16 July 2009	13	6
3	A	F	56	21.5	9 July–15 July 2009	6	2
4	A	F	58	20.7	19 July–27 July 2009	9	2
5	A	M	66	27.0	29 July–30 July 2009	2	2
6	J	–	43	9.6	5 August–22 September 2009	46	17
7	A	M	54	20.8	26 September–27 September 2009	2	1
8	J	–	49	13.2	28 September–21 October 2009	16	7
9	J	–	51	11.7	11 July–18 July 2010	8	6
10	A	M	56	14.0	20 July 2010–4 August 2010	13	7
11	A	F	60	21.8	20 July–5 August 2010	17	6
12	A	M	65	27.8	27 April–17 July 2011	66	27
11	A	F	60	22.1	18 May–22 June 2011	30	13
13	A	M	59	16.6	5 July–22 July 2011	17	8
14	A	F	68	41.8	19 July–29 September 2011	54	29
15	A	M	59	19.5	25 July–5 August 2011	6	6
12	A	M	65	27.8	8 September–25 September 2011	18	8
16	A	F	58	18.0	28 September–18 October 2011	21	5
17	A	M	60	22.7	2 October–19 October 2011	18	5
18	A	F	54	15.3	24 October–4 December 2011	42	0
Total	–	–	–	–	–	405	158

TABLE 3. Rankings of logistic regression models of Eastern Spadefoot burrow emergence. *K* is the number of variables included in the model, and log (L) is the log-likelihood of the model. Models were ranked with the use of change in Akaike's Information Criterion corrected for small sample size (ΔAIC_c) and Akaike's model weights (ω). Variable descriptions are given in Table 1.

Rank	Model	*K*	AIC_c	ΔAIC_c	ω	Cumulative ω	Log (L)
2009–2011 models							
1	TEMP + PREVIOUS	2	424.68	0	0.66	0.66	−209.30
2	TEMP + RAIN + PREVIOUS	2	426.29	1.62	0.29	0.96	−209.09
3	TEMP	1	430.79	6.11	0.03	0.99	−213.38
4	TEMP + RAIN	2	432.55	7.88	0.01	1	−213.24
5	RAIN	1	453.34	28.67	0	1	−224.65
2010–2011 models							
1	iTEMP + iHUMID + PREVIOUS + RAIN	4	308.35	0	0.47	0.47	−149.05
2	iTEMP + iHUMID + PREVIOUS	3	308.41	0.06	0.45	0.92	−150.12
3	iTEMP + PREVIOUS + RAIN	3	313.77	5.43	0.03	0.96	−152.81
4	iTEMP + iHUMID	2	314.92	6.57	0.02	0.97	−154.41
5	iTEMP + iHUMID + RAIN	3	315.49	7.14	0.01	0.99	−153.66
6	iTEMP + PREVIOUS	2	315.54	7.19	0.01	1	−154.72
7	iTEMP	1	324.61	16.26	0	1	−160.28
8	iHUMID + PREVIOUS	2	326.48	18.14	0	1	−160.19
9	RAIN	1	339.1	30.76	0	1	−167.53
10	iHUMID	1	340.1	31.75	0	1	−168.02

without rainfall tend to be largely for foraging and individuals tend not to travel far from their burrows during these foraging bouts (Pearson, 1955; Timm et al., 2014).

As Eastern Spadefoots breed only sporadically, calling anuran surveys are severely limited as a tool to detect their presence (Cook et al., 2011). Concentrating effort on attempting to detect individuals visually during nonbreeding emergence is therefore a more useful approach to detecting the species. The results of this study show that PIT tag readers are an effective, relatively noninvasive method for monitoring PIT-tagged Eastern Spadefoots *in situ*. Our results help to understand the relationship between meteorological conditions and Eastern Spadefoot emergence better, and provide guidance to refine protocols for conducting nocturnal visual encounter surveys for Eastern Spadefoots under conditions of maximal detectability. Specifically, our results indicate that the most productive searches for Eastern Spadefoots in New England would be conducted on rainy nights from mid-June through mid-September when the average air temperature is ≥20°C. Additionally, searches conducted during nights following observed emergences, even in the absence of precipitation, may be helpful, as our results indicate that Eastern Spadefoots are more likely to emerge during sequential nights. The only caveat to this is that responsiveness to rain may be reduced by consecutive days of rain (Dimmitt and Ruibal, 1980). However, consecutive days of rain and/or heavy rain events are known to elicit breeding (Gosner and Black, 1955; Pearson, 1955; Greenberg and Tanner, 2004), thereby making both visual encounter and calling surveys more effective.

Acknowledgments.—We thank T. Mahard and T. Mammone for their help in the field and lab. Fieldwork was sanctioned by the Connecticut Department of Energy and Environmental Protection of which we thank J. Dickson, K. Moran, and J. Victoria for their guidance and support. Handling of animals was conducted under University of Maine Institutional Animal Care and Use Committee Permits A2008-02-06 and A2011-02-01. We thank W. Halteman and C. Bohlen for statistical guidance, and M. Hunter, D. Harrison, and two anonymous reviewers for helpful comments on previous drafts of this manuscript. Special recognition goes to the Shinkiewicz family for very generously providing study sites and housing, to the Hicks/O'Neill family for providing housing and project advice and support, to M. Klemens for initiating the overall project, lending his invaluable experience with Eastern Spadefoots, and for contributing essential data to assist with this research, and to D. Quinn of CTHerpConsultant, LLC for partnering with the project and providing much useful research advice. Funding was provided by Lowe's Home Centers, Inc., Connecticut State Wildlife Grants, the Connecticut Endangered Species/Wildlife Income Tax Check-off Fund, the University of Maine's Sustainability Solutions Initiative, and the University

TABLE 4. Model-averaged parameter estimates (β), standard error, odds ratios, 95% confidence intervals, and descriptive statistics from all logistic regression models in the candidate model set (Table 3) explaining Eastern Spadefoot emergence. Variables are defined in Table 1, SE = unconditional standard error, SD = standard deviation, Min. = minimum, Max. = maximum.

				95% confidence interval		Emergence nights				Nonemergence nights			
Variable	β	SE	Odds ratio	Lower	Upper	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
2009–2011 data set													
TEMP	0.100	0.030	1.105	1.051	1.174	21	3.81	9	29	18	5.29	2	28
RAIN	0.010	0.010	1.010	0.990	1.030	5	16.23	0	111	3	8.86	0	68
PREVIOUS	0.680	0.240	1.974	1.246	3.158	–	–	–	–	–	–	–	–
2010–2011 data set													
iTEMP	0.130	0.030	1.138	1.062	1.220	26	5.08	10	37	23	6.89	4	35
RAIN	0.020	0.010	1.020	0.990	1.041	4	15	0	111	3	8	0	64
PREVIOUS	0.840	0.280	2.316	1.336	4.055	–	–	–	–	–	–	–	–
iHUMID	0.030	0.010	1.030	1.010	1.062	78	14.45	35	100	77	15.82	29	100

of Maine Department of Wildlife Ecology. We thank I. Broadwater for serving as a liaison between a private funding source and the University of Maine. The use of trade names does not constitute endorsement by the U.S. Government. This is Maine Agriculture and Forest Experiment Station Paper 3390.

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Accepted: 16 June 2014.

(maximum 128, minimum 74). The observations reported here were based on three-year old frogs, but toe-twitching in captive *P. corroboree* has been observed in all ages from metamorphs to adults, beginning as early as six days after the completion of metamorphosis (McFadden, pers. obs.).

Interestingly, for the vast majority of individuals, the twitching digit was raised off the substrate. This would minimize the potential impact of its use as a vibrational stimulus as proposed for a number of anuran species predating on smaller invertebrates (Sloggett and Zeilstra 2008). Rather, the rapid movement of a raised digit would suggest that toe-twitching in this genus might primarily be a visual stimulus, either to attract or displace prey (Radcliffe et al. 1986). Alternately, it is possible that the twitching could be simply an excited response to the presence of prey. In this study, there is no indication that the crickets responded to the twitching digit. However, it is possible that a response could be elicited from their natural prey of ants, though this was not tested in this study.

The genus *Pseudophryne* consists of about 13 endemic Australian species, all of which are small, cryptic ground-dwelling species similar to *P. corroboree*. Toe-twitching has been observed in at least one other species (*P. bibroni*; P. Byrne, pers. comm.) and might prove to be widespread within the genus. The purpose of feeding-induced pedal movements in *P. corroboree* is unknown, but this predominantly ant-feeding genus may use toe-twitching behavior to attract prey or simply to inducing prey movement, which in turn may enhance detection of prey by frogs.

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The Diets of Subadult Fowler's Toads (*Bufo fowleri*) and Eastern Spadefoot Toads (*Scaphiopus h. holbrookii*) at Cape Cod National Seashore, USA

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Fowler's Toad (*Bufo fowleri*) and the Eastern Spadefoot (*Scaphiopus h. holbrookii*) are two ecologically similar, sympatric anuran species that inhabit early successional habitats at Cape Cod National Seashore (CACO), USA. Densities of these two species at CACO rival those from any other known locality in the northeastern U.S., likely in large part due to the abundance of optimal upland and wetland habitats present in combination with limited human development at CACO. Though locally abundant at CACO, these two species are regionally rare (*S. h. holbrookii*; Klemens 1993) and/or are in decline in areas of the northeastern U.S. (*B. fowleri* and *S. h. holbrookii*; Klemens 1993), largely as a result of habitat loss and development occurring in the region. As such, an improved knowledge of specific life-history traits (e.g., dietary composition, upland habitat preferences, movement patterns) of these two species will prove valuable to their long-term conservation in the northeastern U.S.

While several previous studies have reported on the stomach contents of *B. fowleri* (Barbour 1953; Brown 1974; Bush 1959; Bush and Menhinick 1962; Clarke 1974; Klimstra and Myers 1965) and *S. h. holbrookii* (Pearson 1955; Punzo 1992), with the exception of one study reporting stomach contents of *B. fowleri* in Connecticut (Clarke 1974), none of these studies were conducted in the northeastern U.S. Furthermore, none of these studies for either species reported results for subadult age class individuals. Thus the ability to extrapolate results from these studies to subadult *B. fowleri* and *S. h. holbrookii* in the northeastern U.S. is limited.

We report on the stomach contents of subadult *B. fowleri* and *S. h. holbrookii* captured in pitfall traps during terrestrial arthropod sampling in a coastal dune ecosystem (i.e., the "Province Lands") at CACO from early June through late September 2007. We report results only for the subadult age class (~1–2 year-old individuals, determination based on measured snout–vent lengths [SVL] as that was the only age class captured in pitfall traps. To characterize the diet of each anuran species, we calculated the *proportional occurrence* of each invertebrate taxon in the stomach contents (calculated as the proportion of stomachs containing at least one individual of that taxon) and the *proportional abundance* of each invertebrate taxon in the stomach contents (calculated as the proportion, by count, of total stomach contents comprised of each taxon).

To compare dietary overlap of the two anuran species, we calculated Schoener's diet similarity index (*Cxy*; Schoener 1968):

$$Cxy = 1 - 0.5 \Sigma \left| P_{ix} - P_{iy} \right|$$

TABLE 1. Cumulative stomach contents of captured subadult *Bufo fowleri* and *Scaphiopus h. holbrookii*.

Invertebrate Taxon	*B. fowleri*	*S. h. holbrookii*
Araneae	67	16
Opiliones	0	1
Isopoda	10	18
Collembola	19	7
Orthoptera	1	1
Blattodea	14	6
Homoptera	2	0
Coleoptera	43	14
Coleoptera larvae	4	0
Lepidoptera	13	0
Lepidoptera larvae	14	0
Diptera	107	5
Formicidae	2710	60
Hymenoptera (excluding Formicidae)	4	0
Total	3008	128

where P_{ix} and P_{iy} are the proportion of species' *x* and *y* diet comprised of the i^{th} prey taxon. *Cxy* ranges from 0–1 with values approaching 1 indicating greater dietary overlap between species.

To examine dietary niche breadth of the two anuran species, we calculated Hurlbert's niche breadth (*B'*; Hurlbert 1978):

$$B' = 1/\Sigma\ (p_j^2/a_j)$$

where, for each species, p_j is the proportion of individuals containing the j^{th} prey taxon in their stomach, and a_j is the proportion of total stomach contents over all individuals comprised of the j^{th} prey taxon. For purposes of comparison we used Hurlbert's standardized niche breadth (B'_A; Hurlbert 1978):

$$B'_A = (B' - a_{min})/(1 - a_{min})$$

where a_{min} is the smallest observed proportion of all the prey taxa for a given species. B'_A ranges from 0-1 and represents the ratio of observed niche breadth to the maximum possible niche breadth.

A total of 76 subadult *B. fowleri* (SVL mean: 36.1mm, range: 25–45 mm) and 18 subadult *S. h. holbrookii* (SVL mean: 36.6 mm, range: 26–45 mm) were captured and had their stomach contents analyzed. Of the total individuals captured, ~6% (5/76) of *B. fowleri* and ~11% (2/18) of *S. h. holbrookii* had empty stomachs. Excluding individuals with empty stomachs, the number of prey items per stomach was greater for *B. fowleri* (mean = 42.37, range = 1–141; total = 3008) than for *S. h. holbrookii* (mean = 8.00, range = 1–25, total = 128).

Fourteen different invertebrate prey taxa and life stages were identified in the anuran stomachs; 13 of these were present at least once in *B. fowleri* stomachs and nine were present at least once in *S. h. holbrookii* stomachs (Table 1). Formicidae was the dominant prey taxon in the stomachs of both anurans, comprising 88% and 90% of the *B. fowleri* diet and 56% and 47% of the *S. h. holbrookii* diet based on proportional occurrence and abundance, respectively (Table 2). The Schoener diet similarity index was 0.556, indicating modest dietary overlap between the two study species. Lastly, the standardized Hurlbert's niche breadth was greater for the stomach contents of *S. h. holbrookii* ($B'_A = 0.152$) compared to *B. fowleri* ($B'_A = 0.028$).

Both species contained a diversity of invertebrate taxa in their stomachs, and although the total number of taxa consumed by *B. fowleri* (13) was greater than by *S. h. holbrookii* (9), the proportion of the diet represented by the various taxa was more highly skewed in *B. fowleri* than in *S. h. holbrookii*, which accounted for the smaller dietary niche breadth of *B. fowleri*. *Bufo fowleri* appeared to be an ant (Formicidae) specialist; ants accounted for 88–90% of the diet (by proportional abundance). *Scaphiopus h. holbrookii* appeared to be more of a dietary generalist; five invertebrate taxa were required to account for >90% of the diet (by proportional abundance). The larger dietary niche breadth of *S. h. holbrookii* compared to *B. fowleri* suggests that the former species may be more of a dietary generalist than the latter. This is generally consistent with results obtained from other studies in other geographic locations comparing individual species of these two families (Anderson et al. 1999; Smith et al. 2004), although one previous study found a similar niche breadth for one *Bufo* and one *Scaphiopus* species (Punzo 1992). The broader dietary niche breadth of *S. h. holbrookii* may be an evolutionary adaptation that enables this species to coexist with ecologically similar, dietary specialists such as *B. fowleri* and/or cope with the highly dynamic conditions of the coastal dune ecosystem in this study area (Anderson et al. 1999).

The importance of ants in the diet of subadult *B. fowleri* and *S. h. holbrookii* in our study is consistent with results reported in several previous studies of *B. fowleri* (Brown 1974; Bush and Menhinick 1962; Clarke 1974; Klimstra and Myers 1965) and *S. h. holbrookii* (Pearson 1955; Punzo 1992). In fact, the percentage of *B. fowleri* diet comprised of ants that we observed (88-90%) is the largest reported value that we are aware of for any *Bufo* species

TABLE 2. Proportion of stomachs containing a particular invertebrate taxon ("P_1"), and proportion of stomach contents based on counts of individual food items ("P_2") in all subadult *Bufo fowleri* and *Scaphiopus h. holbrookii*.

Invertebrate Taxon	*B. fowleri* (N = 76)		*S. h. holbrookii* (N = 18)	
	P1	P2	P1	P2
Araneae	0.26	0.02	0.50	0.13
Opiliones	—	—	0.06	0.01
Isopoda	0.09	0.00	0.22	0.14
Collembola	0.12	0.01	0.22	0.05
Orthoptera	0.01	0.00	0.06	0.01
Blattodea	0.09	0.00	0.17	0.05
Homoptera	0.03	0.00	—	—
Coleoptera	0.41	0.01	0.28	0.11
Coleoptera larvae	0.03	0.00	—	—
Lepidoptera	0.11	0.00	—	—
Lepidoptera larvae	0.09	0.00	—	—
Diptera	0.43	0.04	0.11	0.04
Formicidae	0.88	0.90	0.56	0.47
Hymenoptera (excluding Formicidae)	0.03	0.00	—	—

"—" indicates that there were no individuals of that invertebrate taxon present

worldwide. The ability to eat ants and other noxious and armored invertebrates (e.g., beetles; Coleoptera) may be an adaptation that insures an adequate food supply for these anuran species, as there is little competition for these invertebrate groups from other predators (Clarke 1974). Moreover, consuming large numbers of ants to meet the species' dietary needs may be highly adaptive for these anurans because the ant populations may be capable of sustaining very high predation rates since most of the ants eaten by anurans are workers and not reproductive units. As stated by Toft (1980), "ant specialists are more like grazers or browsers that eat the leaves of a tree rather than like predators that take whole individuals". Consequently, anuran predation may have relatively limited impact on the availability of ants. Additionally, the toxic skin secretions of some anurans (including members of Bufonidae and Pelobatidae) are at least partially sequestered from dietary sources (primarily ants and beetles; Isacch and Barg 2002; Saporito et al. 2004). Therefore, a diet comprised of a relatively large number of ants and/or beetles (as is the case for *B. fowleri* and *S. h. holbrookii* in this study) may be necessary to produce the toxic secretions used as a chemical defense against potential predators. The use of toxic skin secretions as a defense against potential predators is well documented in Bufonidae and Pelobatidae (Duellman and Trueb 1986). In fact, toxic skin secretions of *S. h. holbrookii* can cause symptoms similar to an allergic reaction in humans, including watery irritated eyes, runny nose, sneezing, and strong burning sensation in the nose and eyes during and subsequent to handling of individuals (B.C. Timm, pers. obs.).

Differences we observed between species in the proportion of the diet comprised of ants (*B. fowleri*, 88–90%; *S. h. holbrookii*, 47-56%) may be an indication of differing feeding strategies. Specifically, other investigators have noted that anuran species with a higher proportion of ants (and/or termites) in their diet are more active foragers than those with a comparatively lower proportion of ants (and/or termites) in their diet (Gerritsen and Strickler 1977; Krebs 1978; Toft 1980). These authors suggest that prey species that are patchily distributed in space and time (such as ants and termites) are more likely to be discovered and eaten by actively foraging predators than by sit-and-wait predators. Thus, *B. fowleri* may be more of an active forager while *S. h. holbrookii* may be more of a sit-and-wait predator. While we are not aware of any published studies on the foraging strategy of subadults of either species, our preliminary results from nocturnal radio-telemetry work on adult *S. h. holbrookii* suggest that they are in fact best characterized as sit-and-wait predators (B. C. Timm, unpubl. data).

Results from this study provide the first published account of the diets of subadult *B. fowleri* and *S. h. holbrookii*. In addition to a general understanding of dietary composition, these results also provide insight into potential feeding strategies exhibited by these species as well as potential interspecific competition between these species via dietary overlap. Though we only captured subadult individuals of the two study species, we suggest that future studies examining diets of individual and sympatric amphibian species include an assessment of these attributes for different age classes (e.g., newly metamorphosed juveniles, subadults, and adults) of the focal species of interest. Results from such studies will provide much needed information regarding ontogenetic dietary consistency/shifts, an aspect of amphibian ecology for which there is currently a dearth of scientific information.

Acknowledgments.—We thank C. Raimond, I. Anderson, N. Freidenfelds, and S. Buchanan for help with data collection, P. Paton and T. Tupper for reviews of previous drafts of this manuscript, and B. Cook and C. Phillips at Cape Cod National Seashore for logistical support throughout the course of this research. This study was partially funded by a PMIS grant and a CESU extension from the U.S. National Park Service and a Robert & Patricia Switzer Environmental Fellowship to B. Timm. Handling of animals was conducted under a University of Massachusetts Amherst Institutional Animal Care and Use Protocol and collection permits granted by the Massachusetts Division of Fisheries and Wildlife. This material is based upon work supported by the Cooperative State Research Extension, Education Service, US Department of Agriculture, the Massachusetts Agricultural Experiment Station, and the Department of Natural Resources Conservation, under project number 3456.

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Subject: Constitution Solar Botanical Habitat Survey - NDDB Assessment #201905175

Dear Dawn –

See the attached results of the botanical habitat survey conducted at the site of the proposed Constitution Solar Project. This should complete our response to your March 13, 2020 comments on the Environmental Site Conditions report and request for final determination.

Please let us know when would be a good time to set up a conference call to discuss these responses and the project site generally.

Hope you are well,
Katelin

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Subject: Constitution Solar Project, Additional Botanical Resource Information – NDDB Assessment #201905175

Dear Ms. McKay,

On behalf of Constitution Solar, LLC (Constitution Solar or Project), Tetra Tech, Inc. (Tetra Tech) submitted an Environmental Site Conditions Report (Report) and request for final determination on September 3, 2019 to the Department of Energy and Environmental Protection's (DEEP's) Natural Diversity Data Base Program (NDDB) for the Project; additionally, our team submitted a response to your comments on April 13, 2020.

As described in our April 13 response, we have obtained Art Gilman of Gilman & Briggs Environmental to provide supplemental botanical support for the Project. Mr. Gilman conducted a site visit and survey on April 29, 2020 to evaluate the botanical resources at the site with a focus on identification of suitable habitat for Sandplain Agalinis (*Agalinis acuta*). The information in the enclosed documents presents the results of the botanical habitat survey and serves as a supplement to the information provided in the original Report and the recent response to questions from NDDB.

Mr. Gilman's findings indicate a lack of suitable habitat and low potential for Sandplain Agalinis to occur within the Project site. The soils in portions of the Project site are simply too moist and/or too finely textured. In other areas where suitable soils and drainage occur, there other factors that make it unlikely for Sandplain Agalinis to occur, such as the presence of cultivated crops, overhead shading (particularly along field edges), and dense herbaceous or invasive vegetation and/or leaf litter.

As noted in our recent submittal, Constitution Solar requests a final determination as soon as possible in order to move forward with other permitting processes. We would be happy to discuss any questions you may have on a conference call if possible. Please let us know if you have any questions about this submittal and when would be a good time to meet.

Respectfully submitted,

Katelin Nickerson

Katelin Nickerson
Tetra Tech
katelin.nickerson@tetratech.com

cc: Rick Jacobson (DEEP); Jenny Dickson (DEEP); Robin Blum (DEEP); Hagen Lee (NextEra); Jon Gravel (NextEra)

Gilman & Briggs Environmental
1 Conti Circle, #5, Barre, VT 05641
Ph: 802-479-7480; team@gbevt.com

MEMORANDUM

To: Katelin Nickerson
From: Art Gilman
Date: 5 May 2020
Re: Constitution Solar, Plainfield, CT

Introduction

This memorandum recaps my inspection of the lands involved in the proposed Constitution Solar Project located on Cornell Road, Plainfield, CT, on 29 April of this year. The purpose of my inspection was to determine whether Sandplain Agalinis (*Agalinis acuta*), a species of plant that is both federally protected and protected by the State of Connecticut might occur on the property. As such, and given the earliness of the season, and that Sandplain Agalinis does not bloom until August and September, this is a habitat-based analysis. It is noted, however, that although many plants could be identified on-site by remnants of 2019 growth (i.e., dried stalks and seed-capsules), no remnants were observed that could be identified as the genus *Agalinis*.

Sandplain Agalinis is an annual species in the plant family Orobanchaceae, which is generally characterized by plants that are partially parasitic, typically with seedling growth dependent on attachment to the roots of other plant—often grasses—but later with green stems and leaves capable of supporting the mature plant by photosynthesis. Being annual, each plant lives only through one season, and populations are dependent on proper conditions being present for germination and development each year.

This species is restricted to the northeastern United States with most populations near the Atlantic coast from southern New England to Long Island, NY, and Maryland, with only approximately 20 locations known. Habitats are strongly associated with "sandplain grasslands," i.e., non-forested, sunny, open habitats with sandy soil, often dry. Natural threats to its persistence include habitat succession to forest, buildup of excess organic matter (i.e., thatch or thick turf), and competition with other species. Some populations are known in cemeteries where mowing maintains optimum conditions, and it has been noted that grazing (pasturing) may have once provided low-level disturbance. Further, grassland systems are often fire-dependent and Sandplain Agalinis may be fire-tolerant as well. While it is tolerant of these sorts of habitat disturbances, it is never weedy, and populations are limited to relatively natural areas. Review of literature indicates no situations of its being associated with growing of food or crops, in gardens or in cultivated fields.

Site Visit and Observations

I visited the site on 29 April of this year, at the beginning of the growing season. Weather was warm (ca. 60°) and dry; some early spring weeds were in bloom (e.g., weeds *Lamium purpureum*, *Draba verna*, *Arabidopsis thaliana, Poa annua*); and fields and field edges were green with new growth of grass. Trees were barely at the bud-burst stage.

Using the aerial photographs and maps of the site, I investigated all the open areas, fields, and field margins, but did not inspect forest interiors as these would not provide suitable habitat for Sandplain Agalinis in any case. My observations were as follows:

South field, west side of Cornell Road:

This field was cultivated in corn (Zea) in 2019. Much of the site is quite damp, especially where level; some of the sloping terrain was more well drained. Soil is mapped as Woodbridge fine sandy loam and overall appears too fine-textured and its hydrology too mesic to support the dry-adapted Sandplain Agalinis. There were significant populations of low, "winter-annual" weeds (i.e., weeds that start growth in fall, survive over winter, and bloom in early spring) in this field. Margins included robust growth of nettles, raspberries, burdocks, etc., indicative of rich soils and thick vegetation in the summer; such conditions would not be conducive to Sandplain Agalinis.

South field, SW corner. Note winter-annual weeds on mesic soil and stubble of previous year's corn crop.

West field, and west field north extension, west of the terminus of Cornell Road.

This field slopes from Cornell Road westerly to the Quinebaug River. Most is mapped as having Woodbridge fine sandy loam soils, with some Sudbury sandy loam and one area of Hinkley loamy sand. Its north extension, which is a high terrace abutting the Quinebaug River, is mapped as having Windsor loamy sand. The entire area is in hay and overall the growth was observed to be quite thick—there were no areas where the vegetation was noted as being thin.

The main West Field is quite mesic (some areas even with saturated soils at the beginning of the growing season) and, given the heavy growth of hay grasses, this field would not be suitable for Sandplain Agalinis.

The north extension was observed to have been rather recently rehabilitated with robust growth of red clover (*Trifolium pratense*), white clover (*T. repens*) and orchard grass (*Dactylis glomerata*), which is a typical mix planted to achieve a good hay crop. Other herbs included bedstraw (*Galium mollugo*) and sweet vernal grass (*Anthoxanthum odoratum*). No areas of exposed soil were observed. The west margin of this field has a narrow strip of forest at the crest of the steep riverbank. Native herbs observed here included round-leaved pyrola (*Pyrola americana*) and spotted wintergreen (*Chimaphila maculata*), along with organic litter and duff. Although sufficiently dry and sunny to support Sandplain Agalinis, there was no evidence of exposed soils that would allow germination of annual plants or other conditions that might indicate a population of this species here.

West field, main field

West field, north extension.

Middle Field

The area termed here the Middle Field, lies between the terminus of Cornell Road and the North Field. It also is underlain by Woodbridge fine sandy loam and also is in hay. Like the West Field it appears to have mesic conditions and would be extremely unlikely to support Sandplain Agalinis

North Field

This is the largest field on the site and has the largest areas of sandy soils, including both Hinckley loamy sand and Windsor loamy sand. The entire area was cultivated to corn in 2019; a small area along the western side, however, was not harvested. In addition to the fact, noted above, that the species has not been found in cultivated areas, corn crops are often grown with a significant application of herbicides, and also produce heavy shade in late summer and early fall, making the presence of Sandplain Agalinis in the cropped area itself is extremely remote.

Furthermore, it was observed that the rows of corn were planted very close to the field margin (in some areas even under overhanging tree limbs), leaving only a very narrow strip of land for habitat for any native species, particularly for annuals. Only a few annual species noted, from 2019 remnants: blunt-leaved rabbit tobacco (*Pseudognaphalium obtusifolium*), Indian tobacco (*Lobelia inflata*), smartweed (*Persicaria lapathifolia*), spring cress (*Draba verna*), and the weedy grasses yellow foxtail (*Setaria pumila*) and fall panic-grass (*Panicum dichotomiflorum*). Again here, as for the other fields, the margins between the cultivation and the forest dominated by a mix of relatively robust perennials such a pokeweed (*Phytolacca americana*) and mugwort (*Artemsia vulgaris*), and dense thickets of multiflora rose (*Rosa multiflora*) and staghorn sumac (*Rhus typhina*). The only typically sandplain-associated species were a few plants of pinweed (*Lechea intemedia*).

Finally, it was noted that the adjacent forests are dominated by white pine (*Pinus strobus*) and red oak (*Quercus rubra*) with admixtures of red maple (*Acer rubrum*) and hemlock (*Tsuga canadensis*), and do

not have commonly occurring sandplain elements such as pitch pine (*Pinus rigida*) or scrub oak (*Quercus ilicifolia*)—additional evidence that the area does not, in general, provide suitable habitat for the species.

North field, south edge – note how close corn plantings are to forest edge.

North field, north margin

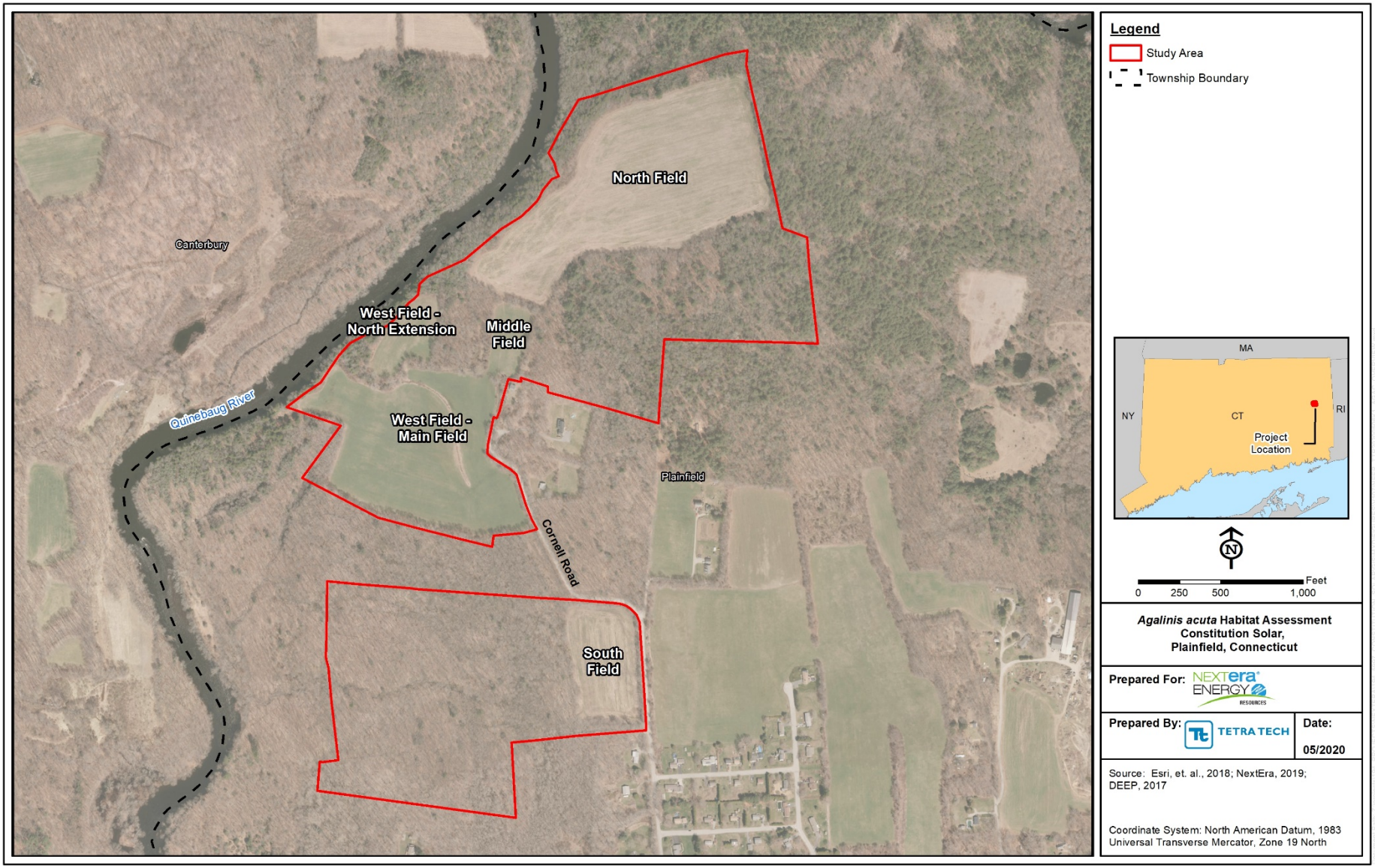
Conclusion

Given these observations, I believe the entire project area, despite having suitable sand soil in some locations, has a very low potential for Sandplain Agalinis to occur.

TETRA TECH

ATTACHMENT A – Figure 1

TETRA TECH



***Agalinis acuta* Habitat Assessment**
Constitution Solar,
Plainfield, Connecticut

Prepared For: NEXTera ENERGY RESOURCES

Prepared By: TETRA TECH

Date: 05/2020

Source: Esri, et. al., 2018; NextEra, 2019; DEEP, 2017

Coordinate System: North American Datum, 1983 Universal Transverse Mercator, Zone 19 North

Not for Construction

TETRA TECH

ATTACHMENT B – Plant Species List

Plants Observed at Constitution Solar, 29 April 2020
Art Gilman
Note: Effort concentrated on fields and field margins in connection with inspection of the parcels for potential habitat for Sandplain Agalinis. For this reason, trees and other forest plants are only noted incidentally.

Common Name	Scientific Name	Location Notes
Trees, Shrubs, and Woody Vines		
Japanese barberry	Berberis thunbergii	Forest
Sweet birch	Betula lenta	Forest
Gray birch	Betula populifolia	Forest
Ironwood	Carpinus caroliniana	Forest
Asian bittersweet	Celastrus orbiculatus	Field margin
Autumn olive	Elaeagnus umbellatus	Field margin
Beech	Fagus grandifolia	Forest
Red cedar	Juniperus virginiana	Forest
Spicebush	Lindera benzoin	Forest
Morrow's Asian honeysuckle	Lonicera morrowii	Field margin
White pine	Pinus strobus	Forest
Sycamore	Platanus occidentalis	Forest
Red oak	Quercus rubra	Forest
Multiflora rose	Rosa multiflora	Field margin
Staghorn sumac	Rhus typhina	Field margin
Tall blackberry	Rubus alleghaniensis	Field margin
Red raspberry	Rubus idaeus	Field margin
Blackcap raspberry	Rubus occidentalis	Field margin
Gray willow	Salix cf. cinerea (?)	Field margin
Black elderberry	Sambucus nigra	Field margin
Hemlock	Tsuga canadensis	Forest
American elm	Ulmus americana	Forest
Ferns and Fern Allies		
Running-pine	Diphasiastrum digitatum	Forest
Field horsetail	Equisetum arvense	Field margin
Christmas fern	Polystichum acrostichoides	Forest
Grasses/Graminoids		
Brown bent grass	Agrostis capillaris	Field margin
Sweet vernal grass	Anthoxanthum odoratum	Hayfield
Orchard grass	Dactylis glomerata	Hayfield
Rosette grass	Dichanthelium sp.	Weed in cultivated field
Crabgrass	Digitaria ischaemum	Weed in cultivated field
Greene's rush	Juncus greenei	Field margin
Path rush	Juncus tenuifolia	Field margin
Mexican muhly grass	Muhlenbergia mexicana	Field margin
Fall panic grass	Panicum dichotomiflorum	Weed in cultivated field
Reed canary grass	Phalaris arundinacea	Hayfield

Annual bluegrass	Poa annua	Weed in cultivated field
Little bluestem	Schizachyrium scoparium	Field margin (few)
Bulrush	Scirpus sp. cf. hattorianus	Hayfield
Yellow foxtail grass	Setaria pumila	Weed in cultivated field
Herbs		
Yarrow	Achillea millefolium	Field margin
Garlic mustard	Alliaria petiolata	Weed in cultivated field
Wild garlic	Allium vineale	Weed in cultivated field
Thale cress	Arabidopsis thaliana	Weed in cultivated field
Burdock	Arctium minus	Field margin
Milkweed	Asclepias syriaca	Field margin
Pennsylvanica bittercress	Cardamine pensylvanica	Weed in cultivated field
Mouse-ear chickweed	Cerastium fontanum	Weed in cultivated field
Spotted wintergreen	Chimaphila maculata	Edge forest
Queen Anne's lace	Daucus carota	Field margin
Spring cress	Draba verna	Weed in cultivated field
Willow-herb	Epilobium coloratum	Field margin
Erigeron cf. philadelphiucm	Daisy fleabane	Field margin
Bedstraw	Galium mollugo	Hayfield
White avens	Geum canadense	Edge forest
Gill-over-the-grouns	Glechoma hederacea	Hayfield
Hawkweed sp.	Pilosella sp.	Field margin
Bluets	Houstonia caerulea	Field margin
Canada St. John's-wort	Hypericum canadense	Field margin
Orange grass	Hypericum gentianoides	Field margin
St. John's-wort	Hypericum perforatum	Field margin
Dotted St. John's-wort	Hypericum punctatum	Field marging
Jewelweed	Impatiens capensis (seedlings)	Field margin
Purple dead-nettle	Lamium purpureum	Weed in cultivated field
Pinweed	Lechea intermedia	Field margin, few
Narrow-leaved pinweed	Lechea tenuifolia	Field margin, few
Motherwort	Leonurus cardiaca	Field margin
Indian tobacco	Lobelia inflata	Field margin
Square-pod water-primrose	Ludwigia alternifolia	Field margin
False lily-of-the-valley	Maianthemum canadense	Forest
Dock-leaved smartweed	Persicaria lapathifolia	Field margin
Pokeweed	Phytolacca americana	Field margin
English plantain	Plantago lanceolata	Hayfield
Old-field cinquefoil	Potentilla simplex	Field margin
Round-leaved pyrola	Pyrola american	Edge forest
Buttercup sp.	Ranunculus sp	Weed in cultivated field
Sheep sorrel	Rumex acetosella	Field margin
Bitter dock	Rumex obtusifolius	Field margin
Ashy goldenrod	Solidago nemoralis	Field margin
Calico aster	Symphyotrichum laterilforum	Field margin
Skunk cabbage	Symplocarpus foetidus	Forest

Dandelion	Taraxacum officinale	Hayfield
Nettle	Urtica gracilis	Field margin
Mullein	Verbascum thapsus	Weed in cultivated field
Purslane speedwell	Veronica peregrina	Weed in cultivated field
Wild pansy	Viola arvensis	Weed in cultivated field

From: McKay, Dawn on behalf of DEEP Nddbrequest
To: Nickerson, Katelin
Cc: DEEP Nddbrequest
Subject: RE: Constitution Solar Botanical Habitat Survey - NDDB Assessment #201905175
Date: Thursday, May 14, 2020 1:17:21 PM
Attachments: image001.jpg
image003.png

Katelin,
I have received the habitat assessment report from your consulting botanist Art Gilman of Gilman & Briggs Environmental for Federal and State listed *Agalinis acuta*. However, I do not believe that this site was assessed fully with respect to plants. Although his findings were that there was low potential and lack of suitable habitat for this particular plant, my comments also included that there was a lack of field studies done by qualified individuals and due diligence on upland portions of this site with respect to plants. I am not describing the agricultural fields on the site but the forested areas and native grassland areas. I believe Robin Blum addressed this with you outside of my additional comments. Is Art Gilman going to look more closely at this site for upland plants during the appropriate growing season? I hope you and your family are well.
Take care,
Dawn

Dawn M McKay
Environmental Analyst 3
Natural Diversity Data Base Program
Wildlife Division
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www.ct.gov/deep

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From:	Nickerson, Katelin
To:	DEEP Nddbrequest
Cc:	Blum, Robin; Dickson, Jenny; Jacobson, Rick; Aguaze, Junior; jonathan.gravel@nexteraenergy.com; Flinn, Natalie
Subject:	RE: Constitution Solar Botanical Habitat Survey - NDDB Assessment #201905175
Date:	Monday, May 18, 2020 3:04:00 PM
Attachments:	image005.png image006.jpg image003.jpg

Dawn,

Thank you for the quick response. The botanical survey methodology and information presented in the Environmental Site Conditions Report and the more recent botanical habitat survey are similar to the recently approved Nutmeg and Quinebaug Solar projects. We believe the methods used to evaluate the botanical resources for this Project are ecologically sound, scientifically sufficient and conform with previous Department recommendations.

The recent survey was specifically intended to identify suitable habitat for sandplain agalinis (*Agalinis acuta*). As you are aware, this annual species does not occur in forested areas. Additionally, native grassland areas do not occur at this site. The survey results confirm the original Environmental Site Conditions report that there is limited to no habitat availability for this species and it is unlikely to occur.

The species-specific information in this updated botanical habitat survey was provided in response to your question from April 13, 2020:

> *Provide the CV and/or resume for the botanist that did the botanical work at this site. Provide the dates the botanical surveys were conducted, routes taken during the surveys and specific species lists (by habitat) and other information as requested in my NDDB preliminary assessment letter. The list provided in the report seemed brief considering the survey took place on 149 acres. The herbaceous list (including grasses) should have been much longer.*
>
> *Please note that our last remaining place for the federal and state listed Sandplain agalinis is located in Plainfield. The botanical report ruled out its presence on this site because this site "is not near the coast" but that may not be an accurate predictor of presence/absence since our only location of this plant happens to be in Plainfield. I agree that agricultural fields (corn and hay) and forest are not preferred habitats for this plant. However, the report states "Sandplain agalinis was not observed during multiple site visits completed for field surveys." Field notes, observations, dates of surveys, survey routes etc. have not been provided for that plant nor any other botanical survey information other than the combined list of plants seen on this property.*

We would be happy to get on a conference call to discuss the Project with you further. Mr. Gillman can be available as well as other subject matter experts that may be able to answer any specific questions you may have.

The Constitution Solar Team respectfully requests a Final Determination on its request submitted on September 3, 2019 as soon as practicable.

Thank you for your well wishes, we are lucky to all be healthy during these times.

Respectfully,

Katelin

Katelin Nickerson, PWS, CWS | Project Manager/Senior Wetland Scientist
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