Exhibit L

Environmental Assessment

Environmental Assessment

Proposed Solar Photovoltaic Array
428 Bethmour Road
Bethany, Connecticut

Prepared For
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SOLLI ENGINEERING

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1.0 INTRODUCTION

Solli Engineering (Solli) has prepared this Environmental Assessment (EA) on behalf of TRITEC Americas, LLC. (the Petitioner) for the proposed 0.99 megawatt (MW) solar photovoltaic array located on a portion of the property of 428 Bethmour Road in Bethany, Connecticut. The EA is included as an exhibit to the submission to the Connecticut Siting Council of a petition for declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the construction, maintenance, and operation of the proposed solar photovoltaic array.

2.0 PROJECT DESCRIPTION

2.1 EXISTING SITE CONDITIONS

The project area is located on the property of 428 Bethmour Road in Bethany, Connecticut. The project area is situated at the western portion of the property, adjacent to Bethmour Road, and consists of approximately 6.59 acres of land. The project area is currently improved with a residential building and associated garages, driveway, lawn area, wooded area, and stone farm walls.

Elevations within the project area range from approximately 600 feet at the southeastern corner of the project area to approximately 626 feet at the northwestern corner of the project area along Bethmour Road. Slopes range from 2.5% in the northwest corner of the property, near Bethmour Road, to 40% in the southwest corner of the project area.

2.2 PROPOSED DEVELOPMENT

The proposed solar photovoltaic array will consist of approximately 2,590 TrinaSolar TSM-DEG19C20 540W modules, 8 Sungrow SG125HV 125kW inverters, one 2,000 kVA transformer, and one service interconnection line. The system will consist of a ground-mounted, single-axis tracking system. A gravel access driveway is proposed to access the proposed array, and the development will be surrounded by a 7-ft tall chain link fence to provide adequate security measures. Several utility poles are proposed on-site to provide overhead electrical service which will provide interconnection to the existing Eversource distribution system on Bethmour Road. The project area will cover approximately 6.59 acres of the property.

2.2.1 ACCESS

The project area will be accessed from Bethmour Road via a gravel driveway which covers a total distance of approximately 550 feet. The proposed driveway is located approximately 1,000 feet south of the intersection of Bethmour Road with Pole Hill Road. The driveway will provide access to the proposed array and will generate minimal traffic, for the primary use of operation and maintenance of the photovoltaic array. A 26-ft wide entrance gate is proposed at the entrance to the site on Bethmour Road.

2.2.2 PUBLIC HEALTH AND SAFTEY

The proposed development has been designed to meet all applicable local, state, national and industrial health and safety standards related to electric power generation. The proposed solar photovoltaic array will not consume any raw materials, will not produce any by-products and will be unstaffed under normal operating conditions.

A 7-ft tall chain link fence is proposed to surround the development, and a 26-ft wide gate is proposed at the entrance to the project area and will limit access to authorized personnel only. Town emergency response personnel will have access to the project area via a Knox padlock. The photovoltaic array will have the ability to be de-energized remotely in case of an emergency.

2.2.3 LAND USE PLAN

The solar photovoltaic array has been designed in accordance with state and federal policies and will support the State of Connecticut's energy goals by constructing a renewable energy resource with no substantial adverse environmental impact.

Although the Town of Bethany currently does not have any land use requirements related to solar photovoltaic arrays, the development was designed to meet the Town's land use regulations to the maximum extent practicable.

The project area is located within the Residential Zone (R-65) and the photovoltaic array has been designed to have a minimum setback of 50 feet from all abutting residential properties.

The Petitioner believes that this project will benefit the local community by improving electrical service for existing and future development with the availability of a local, renewable energy source.

2.2.4 STORMWATER MANAGEMENT PLAN

The project will provide approximately 12,600± square feet of impervious/gravel area, an increase in overall impervious surfaces compared to existing conditions. The proposed stormwater conveyance system consists of a proposed drainage swale and a proposed stormwater infiltration basin with adequate storage for the Water Quality Volume that will effectively clean the stormwater runoff prior to discharging into the existing wetlands on-site.

The proposed stormwater management system has been designed to be in compliance with the *2004 Connecticut Stormwater Quality Manual*, Appendix I of the Stormwater General Permit, and the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* while taking prevailing site conditions and practical considerations into account. Please refer to Section 3.3.3 for more information regarding stormwater management on site.

2.2.5 LANDSCAPE PLAN

Vegetation buffers are proposed within the project area to shield the proposed solar photovoltaic array from neighboring properties. Plant materials consists of a mix of evergreen species to provide year-round screening on the north, west and south portions of the property. An existing wetland provides a buffer on the east side of the property.

3.0 ENVIRONMENTAL CONDITIONS

This section provides a summary of the existing environmental conditions in and around the project area, as well as the potential impacts on the environment from the proposed photovoltaic array development. The results discussed in this section demonstrate that the development complies with CT DEEP air and water quality standards and will have no adverse effect on the existing environment and ecology.

3.1 AIR QUALITY

The nature of solar energy generating facilities results in a condition where no air emissions are generated during the operations of the facility. Therefore, this development will have no adverse effect on air quality and will not require a permit.

During construction, temporary mobile source emissions may occur due to the presence of construction vehicles and equipment. Any of these potential air emissions that occur during the construction of the solar photovoltaic array can be considered de minimis. These emissions will be mitigated using measures such

as limited idling times of equipment, regular maintenance of all vehicles and equipment, and watering/spraying of vehicles and equipment to minimize dust and particulate releases. Additionally, all equipment will meet the latest standards for diesel emissions as prescribed by the United Sates Environmental Protection Agency.

3.2 WATER RESOURCES

Wetlands and watercourses onsite were field delineated by BL Companies in October 2021. William Kenny Associates (WKA) conducted additional field investigations including our inventory and assessment of onsite wetland and watercourse conditions on February 27, 2023. Based on our investigations, we concur with BL Companies that there are two wetland and watercourse systems on the property, and we concur with the locations of the wetland boundaries that BL Companies field marked (flagged). These wetland areas are located to the east of the project site, approximately 100 feet away at its closest point. No wetlands or resource areas were found within the project area limits.

3.2.1 WETLANDS AND WATERCOURSES

Central Wetland & Watercourse

The first wetland and watercourse system, located in the central portion of the property, consists of an intermittent watercourse, extending and flowing north to south and bordering woodland wetland habitat. This wetland is located approximately 100 feet away from the northeastern corner of the project area and tapers away approximately 160 feet from the southeastern corner of the project area. The existing watercourse is located within this wetland and the closest point from the project area to the watercourse is approximately 163 feet away. The principal source of hydrology for this wetland and watercourse system is groundwater discharge and surface water flow. The intermittent watercourse originates from a hillside seep in the northern portion of the system and follows the topographic gradient of the hillside flowing offsite to the south. Soils within this system consist of poorly drained sandy loams formed from lodgement glacial till with a shallow hardpan that perches groundwater and causes seeps. At the time of WKA's investigation, the watercourse had one to two inches of water flowing through it and its streambed consisted of moss-covered cobbles and boulders. The woodland wetland bordering the intermittent watercourse consists of primarily the same vegetation found in the adjacent young woodland uplands. The canopy of the wetland is dominated by red maple and includes some pignut hickory and dead or dying green ash trees. The understory is dominated by black birch and includes yellow birch, black tupelo, and American hornbeam. The shrub strata of the woodland wetland is dominated by invasive Japanese barberry and multiflora rose shrubs and native spicebush shrubs and also includes some invasive burning bush shrubs along the fringes of the system. Groundcovers within the wetland include skunk cabbage and Christmas fern. The hydrogeomorphic classification of this wetland and watercourse system is gently sloping and the USFWS classification for this system is Palustrine, Forested, Broad-Leaved Deciduous (PFO1).

Eastern Wetland & Watercourse (Pine Brook)

The second wetland and watercourse system, located in the eastern portion of the property, consists of a perennial watercourse, Pine Brook, extending and flowing north to south, and bordering woodland wetland habitat. This wetland is approximately 770 feet from the project area, and the watercourse associated with this wetlands is approximately 850 feet from the project area. The principal source of hydrology for this wetland and watercourse system is surface water conveyed by Pine Brook. Pine Brook originates from a large swamp approximately 1,800 feet north of the project site and eventually connects to Bladens River approximately 1.75 miles southwest of the project site. Soils within this system consist of poorly drained sandy loams formed from lodgement glacial till with a shallow hardpan that perches groundwater and causes seeps. At the time of WKA's investigation, Pine Brook, which has a stream width of approximately ten feet throughout the site, had a water depth of approximately three to four inches and a streambed consisting of moss-covered cobbles and boulders. The woodland wetland bordering the watercourse consists of primarily the same vegetation found in the adjacent mature woodland uplands. The canopy is

comprised of primarily red maples and the understory is comprised primarily of yellow birch trees. Invasive Japanese barberry and multiflora rose shrubs and native spicebush shrubs are present and groundcovers consist of skunk cabbage and Christmas fern. The hydrogeomorphic classification of this wetland and watercourse system is riverine and the USFWS classification for this system is Riverine, Lower Perennial, Unconsolidated Bottom, Cobble-Gravel (R1UB1).

3.2.2 VERNAL POOL

Based on the field investigation performed by BL Companies, there was no evidence of the existence of any vernal pools within the project area or on the property of 428 Bethmour Road.

3.2.3 WETLAND IMPACTS

Land development has the potential to cause direct and indirect impacts to inland wetlands and watercourses in the short- and long-term from activities such as vegetation clearing, soil filling, soil excavation and/or pollution of stormwater. The proposed site improvements are designed to avoid indirect impacts in the short and long-term through the incorporation of various best management practices (BMPs) such as soil erosion and sediment control measures and stormwater management measures (further discussed in Section 3.3.3). No activities are proposed within wetlands and watercourses, and, as such, no direct impacts will occur.

Table 1: Wetlands Impacts Table

Wetlands Impacts		
Direct Impacts to Wetland 1	0 Acres	
Direct Impacts to Wetland 2	0 Acres	
Direct Impacts to Upland Review Area of Wetland 1	0 Acres	
Direct Impacts to Upland Review Area of Wetland 2	0 Acres	
Limit of Disturbance to Wetland	Western Portion	Eastern Portion
Wetland 1	0 Feet	0 Feet
Wetland 2	0 Feet	0 Feet

3.2.4 FLOODPLAIN AREAS

WKA reviewed the most recent available mapping from the Federal Emergency Management Agency (FEMA) in regard to the presence of floodplain or flood prone areas onsite. According to the FEMA Flood Map Service Center (MSC), flood map number 09009C0267H, effective on 12/17/2010, the subject project area falls within "Zone X" as defined by FEMA. Zone X is defined as "are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood". This indicates that the project area is not within a flood zone and requires no special considerations relative to flooding for its implementation. For more information regarding the FEMA Floodplain Boundaries refer to Figure 3, FEMA Flood Map.

3.3 WATER QUALITY

The proposed solar array facility will have no potable water uses or sanitary discharges due to the unmanned nature of the facility. The proposed development will result in an increase in impervious cover within the project area. As such, the development includes a stormwater management plan to mitigate changes to stormwater runoff resulting from the increase in impervious cover.

3.3.1 GROUNDWATER

WKA reviewed the CT DEEP Water Quality Classifications Map, dated October 2018, in order to assess the quality of ground and surface water within the project area. The map classifies that the project area falls within an area classified by 'GA' groundwater quality. 'GA' is defined as "existing private and potential public or private supplies of water suitable for drinking without treatment and baseflow for hydraulically-connected surface water bodies." For more information regarding the water classifications refer to Figure 4, Water Quality Classification Map.

According to the CT DEEP Public Water Supply Map, the project area does not fall within an aquifer protection area. It is labeled as a private well parcel; however, the nature of the project as a solar farm dictates that no potable water uses are required.

Overall, the project will have no direct adverse environmental impact on groundwater quality. Inadvertent adverse impacts will be mitigated via stormwater management BMPs (further discussed in Section 3.3.3).

3.3.2 SURFACE WATER

The project area is situated within the Pine Brook Local Drainage Basin (6919-01) and the Bladens River Subregional Drainage Basin (6919). These drainage basins are part of the larger Naugatuck Regional Drainage Basin (69) and Housatonic Major Drainage Basin (6). Pine Brook is characterized by the CT DEEP as a first order stream with 'class 1 stream flow' which means that it is a free-flowing stream. The water quality of Pine Brook is listed as 'class A' surface water quality. Class A surface water quality is defined as "Class A designated uses are habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture".

According to the CT DEEP Public Water Supply Map, the project area does not fall within a drinking water watershed. Pine Brook serves as habitat for fish and other aquatic wildlife and flora; however, the onsite portion does not appear to serve as aquatic wildlife or flora habitat. Pine Brook does not sustain a trout population according to the CT DEEP Connecticut Trout Stocking Map nor does it have a cold-water habitat according to the CT DEEP Cold Water Habitat Map. For more information, please refer to Figure 5, Public Supply Watershed Map.

3.3.3 STORMWATER MANAGEMENT

In the short-term, wetlands can be indirectly impacted from sediment laden stormwater from the proposed construction activities. All development is proposed outside of wetlands and watercourses and their 100-foot upland review areas. Nevertheless, the project proposes the installation of soil erosion and sedimentation controls before construction and the maintenance of these controls throughout construction to prevent adverse indirect impacts to inland wetlands and watercourses from soil erosion and sedimentation. These controls are designed to comply with standards set by the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* published by the CT DEP (the predecessor to the CT DEEP) to manage the land disturbance from the development and protect surface water features. Such controls include but are not limited to temporary silt fencing and construction fencing surrounding the perimeter of the work zone, an anti-tracking pad at the construction entrance, silt sack inlet protection in catch basins along the street and temporary sediment traps. The silt fencing proposed around the perimeter of the project area is to retain exposed sediment to the site, preventing its migration downslope to inland wetlands and watercourses. The reinforcement of the silt fencing with construction fencing is to deter access to the site by wildlife and civilians. The anti-tracking pad is proposed to prevent sediment from being tracked into the street. The silt sacks are proposed to prevent sediment that does manage to leave the site from impacting the adjacent storm sewer with sediment laden water. The temporary sediment traps are proposed to act as internal areas to store sediment laden stormwater runoff and allow for particulates to settle and stormwater to recharge into underlying soils. These control measures have been provided by the project engineer to maximize protection to wetlands and watercourses and the monitoring and maintenance of all control measures are required to ensure efficacy throughout all phases of construction.

In the long-term, and if not properly mitigated, wetlands and watercourses can be indirectly adversely impacted by stormwater runoff that flows from buildings, pavement, and vegetated surfaces. The proposed project will not cause post-construction long-term adverse impacts from stormwater runoff due to the proposed stormwater management plan, which will mitigate changes to stormwater runoff resulting a proposed increase in impervious cover. A stormwater basin is proposed in the southeastern portion of the

project area within the area of the young woodland habitat. The stormwater basin has been designed to provide adequate storage of the water quality volume generated from the solar array and other impervious surfaces. Stormwater flowing to the basin will follow grass-lined swales proposed along the western, southern, and eastern sides of the solar array. The basin will allow captured stormwater to settle and gradually infiltrate into the surrounding soils. The basin will also allow for pollutants to be removed when the stormwater flows through the basin vegetation, stems, leaves, and roots. The implementation and maintenance of this BMP will result in decreased peak flows up to the 100-year storm event, and thus, protect groundwater quality.

3.4 HABITAT & WILDLIFE

Three habitat communities are present throughout the project area and surrounding areas. They include shrubland, woodland and wetlands and watercourses. These habitat types are further discussed in Sections 3.4.1 and 3.4.2. Wildlife species at or that can utilize the project area are species common to suburban residential landscapes. These species are further discussed in Section 3.4.3. For more information about the habitat makeup of the project area, please refer to Figure 6, Habitat Cover Map.

3.4.1 HABITAT TYPES

Shrubland

The western portion of the project area consists of shrubland habitat. This habitat previously was a grassland habitat but has significantly succeeded into a shrubland habitat over time. Several recent cut paths extend through the shrubland. The shrubland extends from Bethmour Road to an old stone farm wall in the eastern portion of the project area. Woodland habitat is east of the wall. The existing dwelling, detached garage, storage shed, and asphalt driveway are present in the northwestern portion of this habitat. The shrubland is dominated primarily by invasive autumn olive and multiflora rose shrubs. Some native eastern red cedar and sassafras saplings are interspersed throughout. Some canopy trees are present and include pole-to-saw timber-sized American elm, shagbark hickory and dead or dying white ash. Trees and shrubs are also entwined by invasive oriental bittersweet vines. The groundcover is dominated by various species of grasses and forbs including goldenrod, switchgrass, and mullein. Soils within this portion of the project area are primarily well drained sandy loams formed from lodgment glacial till. To make way for the solar array, the majority of this habitat, except for a small portion in the southwestern portion of the site, is proposed to be eliminated. Please see Table 2 for the total acreage of habitat alteration.

Woodland

The majority of the project area consists of woodland habitat. The woodland stretches over the central and eastern portions of the project area and is comprised of a younger woodland in its central reaches and an older more mature woodland in its eastern reaches. The younger woodland stretches from an old stone farm wall that separates it from the shrubland habitat to the west to the central wetland and watercourse that bisects the center of the property. Other old stone farm walls cross the woodland, sectioning out areas that likely were pasture historically. The younger woodland is dominated by a canopy of pole-to-saw timber-sized red maple trees, some of which along the border with the shrubland habitat, were tapped for their sap. Other common canopy trees include shagbark hickory, red oak, and black oak. Understory trees include black birch, black cherry, black tupelo, American beech, and American hornbeam. Many of the canopy trees appeared topped by storm damage and various tip-ups were present throughout the younger woodland habitat. The younger portion of the woodland is dominated by invasive Japanese barberry and multiflora shrubs and native spicebush shrubs which form thickets. These shrub thickets are entwined with invasive oriental bittersweet vines and native grape vines, greenbrier vines and/or poison ivy vines. Groundcovers consist mainly of goldenrod species along the fringes of the habitat.

The older, eastern woodland differs from its younger, central counterpart with a shift in dominant canopy species and a much barer ground layer due to heavier shading. This portion of the woodland stretches from

the eastern edge of the central wetland and watercourse system to Pine Brook along the eastern property boundary. Large tulip poplars and pin oaks are the dominant canopy trees in the mature eastern woodland with other species such as sugar maple and white oak also present. Shrubs are sparser in this portion of the woodland and only a few invasive Japanese barberry and native high bush blueberry are present. Groundcovers also are sparse and primarily consist of Christmas fern. Soils within these portions of the project site consist of well drained to moderately well drained sandy loams formed from lodgment glacial till. A majority of the younger, central portion of the woodland is proposed to be eliminated by the proposed project. The mature eastern portion of the woodland will remain and not be disturbed. Please see Table 2 for the total acreage of habitat alteration.

Wetlands & Watercourses

Two wetland and watercourse areas were identified and evaluated. Further details in regard to the ecological communities of these wetlands and watercourses are described below in Section 3.2.1. Overall, the wetlands and watercourses are not proposed to be impacted by the proposed development. Please see Table 2 for the total acreage of habitat alteration.

Table 2: Habitat Area Table

Habitat Type	Total Area On Property (±Acres)	Project Area (±Acres)
Shrubland	4.7	3.7
Woodland	12.8	2.9
Wetlands	3.7	0

3.4.2 CORE FOREST DETERMINATION

The Connecticut Department of Energy and the Environment (CT DEEP) defines 'core forests' as "forests surrounded by other forests, and in Connecticut, it has been defined as forest features that are relatively far (more than 300 feet) from the forest-nonforest boundary. Core forests provide habitat for many species of wildlife that cannot tolerate significant disturbance. The loss of core forest cover diminishes water purification and habitat values, and could result in heavier runoff, which might lead to poorer water quality and impaired habitat."

WKA has reviewed available core forest mapping provided by the Housatonic Valley Association, and based on these findings, no core forest will be impacted by this project. The closest core forest habitat to the project area is approximately 2,800 feet to the west of the project area and consists of an approximately 730-acre forest in which only approximately 44-acres are protected. Additionally, according to these findings, no habitat linkages are present between the project area and this core forest. For more information refer to Figure 11, Core Forest Map.

3.4.3 WILDLIFE

The proposed project will eliminate all but a small portion of the shrubland habitat and a portion of the younger central woodland habitat. These habitats support various wildlife including mammalian, amphibian, reptilian and avian species. The shrubland habitat serves small mammalian species, such as woodchuck, fox, skunk, eastern cottontail, opossum, raccoon and voles, moles, and mice, offering them protection from raptor species and larger mammalian predators as well as nesting within the safe confines of the shrub thickets. As mentioned, avian species such as birds of prey will utilize the shrubland as hunting ground for small game, perching in the few canopy trees within this community or along the woodland at its edges. Other avian species such as warblers and sparrows will also use the shrub thickets for nesting and cover.

The young woodland habitat serves the aforementioned small mammalian species that may utilize the shrubland as well as other mammalian species such as grey squirrel, eastern chipmunk, white-tailed deer, bobcats, and coyotes. Evidence of deer and possible coyote scat was identified within this ecosystem at the

time of our investigation. The woodland provides foraging opportunities for these species in the forms on nuts and seeds, plants or in the terms of larger predators, small game. The woodland, being adjacent to wetland and watercourse systems may serve as the terrestrial habitat for wood frogs and spring peepers. It is also likely common reptile species such as eastern garter snakes utilize both the woodland and adjacent shrubland. Avian species such as turkeys are likely to forage in the ground layer of the woodland while songbirds likely perch in the canopy above. Due to the central woodland's young age and its proximity to the shrubland and neighboring properties, it can be assumed that the woodland serves as habitat for more edge tolerant species that are tolerant of habitat fragmentation and human disturbance. The older eastern woodland likely serves the same habitat functions as the younger central woodland due to its proximity to the younger central woodland, small size, and adjacency to edge habitat (i.e., surrounding residential properties). It is unlikely species common to core forests reside within the project area, even in the eastern woodland, due to the forest being isolated from a larger tract.

The adjacent wetlands and watercourses serve as habitat for all aforementioned species and provide them a source of drinking water. The adjacent wetlands and watercourses do not function as vernal pools and no vernal pool areas were identified adjacent to the project area (within 100 feet) via observations made from the project area, public right-of-ways, and information gathered from publicly available sources (i.e., town maps, topographic maps, aerial imagery, etc.). The central watercourse likely does not function as habitat for finfish due to its shallow, intermittent nature, but the eastern watercourse, Pine Brook, potentially serves as finfish habitat. According to the CT DEEP Atlas of the Crayfish of Connecticut, the nearest location where crayfish have been identified is approximately 1.6 miles southwest of the project site in the Bladens River. The species identified in this river is not a State listed species. Additionally, Pine Brook likely does not serve as habitat for freshwater mussels due to its narrow width and low flow. Please see Section 3.2.1 for information regarding Wetland and Watercourse conditions and 3.3.2 for more information regarding Surface Water conditions.

Due to the proposed project, the abundance of wildlife species will decrease slightly but not the diversity of wildlife that utilize the property under current conditions. Additionally, the development is not anticipated to affect endangered, threatened or species of special concern, as, according to State and Federal resources and onsite field investigations, none of these species inhabit the project area (see Sections 3.5, 3.5.1 and 3.5.2). Of the species that inhabit the project area, all are common, and habitat exists for them to use in other areas of Bethany and beyond. As such, the project will not have significant adverse impacts to wildlife.

3.5 RARE SPECIES

WKA reviewed publicly available state and federal information to determine whether listed species and/or critical habitats were present onsite or adjacent to the project area. WKA also investigated for the potential for listed species and/or critical habitat (including the presence of vernal pools) to be present within the project area and surrounding onsite areas and found that no listed species or critical habitat were present within these areas.

3.5.1 NATURAL DIVERSITY DATA BASE

The CT DEEP Natural Diversity Data Base (NDDB) is a collection of maps that show the approximate locations of state endangered, threatened, and special concern species and important natural communities in Connecticut. The locations shown on the maps are based on information collected over the years by DEEP personnel and others. The maps are intended to serve as a pre-screening tool for preventing potential impacts to listed species. Maps are generated for each town. The map for the Town of Bethany is dated December 2022. The map indicates areas where listed species have been identified in a hatched buffer area and areas of critical habitat in green polygons. The hatched buffer areas are intentionally left inaccurate to protect protected species; therefore, if the project area fell within or near a buffer, a request for determination would have to be filed with the CT DEEP NDDB for more accurate information and field

work would need to occur to determine the presence or absence of these species onsite. According to the Town of Bethany NDDB map, this project area does not fall within a hatched buffer area and is approximately 5,850 feet from the nearest area to the southeast of the site at Lake Chamberlain. As such, no request for determination was filed for the property. For more information, please refer to Figure 7, Natural Diversity Database Map.

3.5.2 USFWS CONSULTATION

The US Fish and Wildlife Service (USFWS) provides an online planning tool, its Information for Planning and Consultation (IPaC) system, allowing for project planners the ability to perform a regulatory review for protected species under the Endangered Species Act (ESA) that inhabit or potentially may inhabit their project sites. This resource is designed to provide a list of potential ESA-protected and/or candidate species, migratory bird species protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, critical habitats, as well as the ability to consult whether a proposed project has the potential to result in "take" of listed species. "Take" refers to any means to "harass, harm, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct to threatened and endangered species". In consulting this resource, projects can determine whether they are in compliance with the ESA and other federal acts. Solli Engineering filed on January 30, 2023, an IPaC review of the project site and received a letter report from the USFWS titled "*List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project*". This report is attached in Appendix C. The report specifies that one endangered species, one candidate species and eleven migratory bird species have the potential to be impacted by the proposed project. The endangered species is the Northern Long Eared Bat, the candidate species is the Monarch Butterfly and the migratory birds are listed in the report in the attached Appendix C.

The Northern Long Eared Bat is listed as endangered under the ESA. This species range encompasses the entirety of Connecticut. The CT DEEP has compiled a map of towns with known Northern Long Eared Bat and other bat hibernacula within the state, and no known hibernacula are located within the Town of Bethany. The nearest hibernacula according to the map is within the Town of North Branford, approximately 12 miles southwest of the project area. For more information regarding the locations of NLEB areas of concern, refer to Figure 7, Natural Diversity Database Map. Regardless, to stay in compliance with the ESA, the IPaC Consultation Package Builder (CPB) was utilized to assess whether the project would result in the "take" of Northern Long Eared Bats. The results of the CPB can be found in the attached report "*Consistency letter for the 'Proposed Solar Photovoltaic Array' project indicating that any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR § 17.40(o)*" found in the attached Appendix C. The results of this report indicate that the project is not likely to result in the unauthorized "take" of Northern Long Eared Bats and therefore does not require a permit from the USFWS.

The monarch butterfly is a candidate species for protection under the ESA. Candidate species are "species which the USFWS has sufficient information to propose as endangered or threatened under the ESA, but for which their development of a proposed listing regulation is precluded by other higher priority listing activities". As such, until they are proposed for listing, these species are not officially entitled to legal protection under the ESA, and they are not considered when making a determination as to "take".

3.6 SOILS & GEOLOGY

The project grading is expected to generate a net export of approximately 430 cubic yards of material. Before any fill material is removed or used, the topsoil will be stripped and stockpiled for later seeding of disturbed areas. Any soil exposed due to construction will be treated according to the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

The following soils currently exist on-site and in surrounding areas:

1. Paxton and Montauk fine sandy loams, 3 to 8 percent slopes.
2. Paxton and Montauk fine sandy loams, 8 to 15 percent slopes.
3. Paxton and Montauk fine sandy loams, 15 to 24 percent slopes.
4. Ridgebury, Leicester and Whitman soils, 0 to 8 percent slopes, extremely stony.
5. Woodbridge fine sandy loam, 0 to 3 percent slopes.
6. Woodbridge fine sandy loam, 3 to 15 percent slopes, extremely stony.

For more information, refer to the map Figure 8, Prime Farmland Map.

3.6.1 PRIME FARMLAND SOILS

Solli Engineering has reviewed the listed soils in accordance with the Code of Federal Regulations ("CFR") Title 7, part 657. Prime Farmland Soils are distinguishable based on soil type. These soils are to be identified under CFR Title 7, part 657 in order to know the extent and location of the best land for producing food, feed, fiber forage and oilseed crops. Upon review, the project contains prime farmland. For more information, refer to the map Figure 8, Prime Farmland Map.

Undeveloped forest and associated wetlands cover the majority of the property. Because the expected use of the project area will have a finite lifespan, the Petitioner proposes to use minimally intrusive methods during construction when possible. Grading will be limited by the use of solar panel tracker systems and construction of solar panels in existing areas where grades are similar to proposed conditions. There will be some excavation and regrading that takes place on prime farmland to install stormwater management basins and to properly develop the Site as a whole. In areas where Prime Farmland Soils are disturbed, the developer will remove the topsoil, segregate it from underlying horizons, and stockpile and spread it throughout the Site as necessary to re-establish vegetation growth.

When the solar panel facility reaches the end of its finite lifespan, the facility will be decommissioned. Upon this development, all areas disturbed by the facility will be top dressed with native soils and reseeded with the same (or approved equivalent) pollinator blend that exists within the area of the solar panel facility. These proposed design strategies will not materially affect the prime farmland. According to Public Act No. 17-218, "for a solar photovoltaic facility with a capacity of two or more megawatts, to be located on prime farmland or forestland… the Department of Agriculture represents, in writing, to the council that such project will not materially affect the status of such land as prime farmland or the Department of Energy and Environmental Protection represents, in writing, to the council that such project will not materially affect the status of such land as core forest." The project is a 0.99 MW AC solar photovoltaic facility; therefore, a letter to the Council of the Department of Agriculture is not necessary in this exhibit.

3.7 HISTORIC & ARCHAELOGICAL RESOURCES

Archaeological Consulting Services LLC performed a Phase 1A cultural resources assessment survey on behalf of Solli Engineering and the Petitioner. Their report discloses that a property National Register of Historic Places does not exist within the Site. This conclusion was reached by means of a literature search for previously recorded cultural resources in the area, a review of historical maps and aerial imagery depicting the project area, and a pedestrian survey complete with photo documentation of the project area to determine archaeological sensitivity.

A portion of the project area has been identified as having a moderate-to-high probability of yielding intact archaeological sites and/or deposits due to its gentle slope, hardwood forestation, and soil makeup. Archaeological Consulting Services LLC recommends a Phase 1B survey be performed on the Site within 300 feet of Bethmour Road in advance of construction impacts. This survey would likely contain a number of standard-size shovel tests. For more information refer to the Phase 1A report in Appendix D, Cultural Resources.

3.8 SCENIC AND RECREATIONAL AREAS

All state and local roads and scenic areas are located over one mile away from the project. As such, no state road, local road, or scenic area will be affected physically or impaired visually by the project. No hiking trail exists on or near the project area. The closest open space is located at Amity Junior High School, approximately one-half mile northeast of the property. For more information regarding resources located within one mile of the site refer to Figure 9, Scenic & Recreation Map.

3.9 LIGHTING

Exterior lighting is not planned for the project. There may be on-site equipment that have small lights which will only be activated during maintenance.

3.10 FAA DETERMINATION

Solli Engineering has submitted required project information to the Federal Aviation Administration (FAA) for review. The FAA reviewed multiple sample points to determine whether a potential hazard exists for air navigation. Upon review, the FAA issued a Determination of No Hazard to Air Navigation for all points. A glare analysis is not required at this time. For more information see Appendix E, FAA Determinations.

3.11 VISIBILITY

There will be solar trackers a maximum of 6 ft off finished grade within the solar panel facility. All disturbed areas will be contained within a 7 ft chain link fence. Trees constituting the existing tree line will be preserved and maintained to the best of the developer's ability. Most neighbors in the vicinity of the property will not be able to view the solar panel facility due to tree coverage; however, the facility may be visible to one neighbor year-round from the site driveway. This visibility will be mitigated by the proposed chain-link double-swing gate as well as existing foliage on the neighbor's property. For more information refer to Figure 10, Proposed Conditions Viewshed Map.

The solar panel products are designed in such a way that they are not highly reflective. Because solar panels have tracking features, the panels will not reflect one direction for extended durations.

3.12 NOISE

The project area is currently occupied by a single-family house, with the majority of the property containing undeveloped land.

Noise from the construction of the solar panel facility is exempted under Connecticut regulations for the control of noise. For more information refer to RCSA 22a-69-1.8(h). During construction, the increase in noise will likely lead to a subsequent elevation in ambient sound levels in the immediate vicinity of the project area. Standard construction equipment will be used for the project, and the highest level of noise generated from this equipment – such as backhoes, bulldozers, cranes, and trucks – is expected to be approximately 88 dBA from the origin.

When construction ceases, noise from the solar panel facility will be minimal. The facility would be considered a class C emitter (industrial) to a class A emitter (residential) which regulates noise from exceeding 61 dBA during the day and 51 dBA at night. The maximum amount of noise will be generated during operation hours – the inverters will emit 61 decibels measured one meter from the inverter. Outside the perimeter of the project area, this noise will be negligible. The nearest residential use is 130 feet from proposed electrical equipment; the sound in decibels heard from this distance is 0.067 dbA after applying the inverse square law. Sound would further be reduced by vegetation buffers, rendering the noise negligible. For more information regarding the inverter product information refer to the specification sheets in Appendix F.

4.0 CONCLUSION

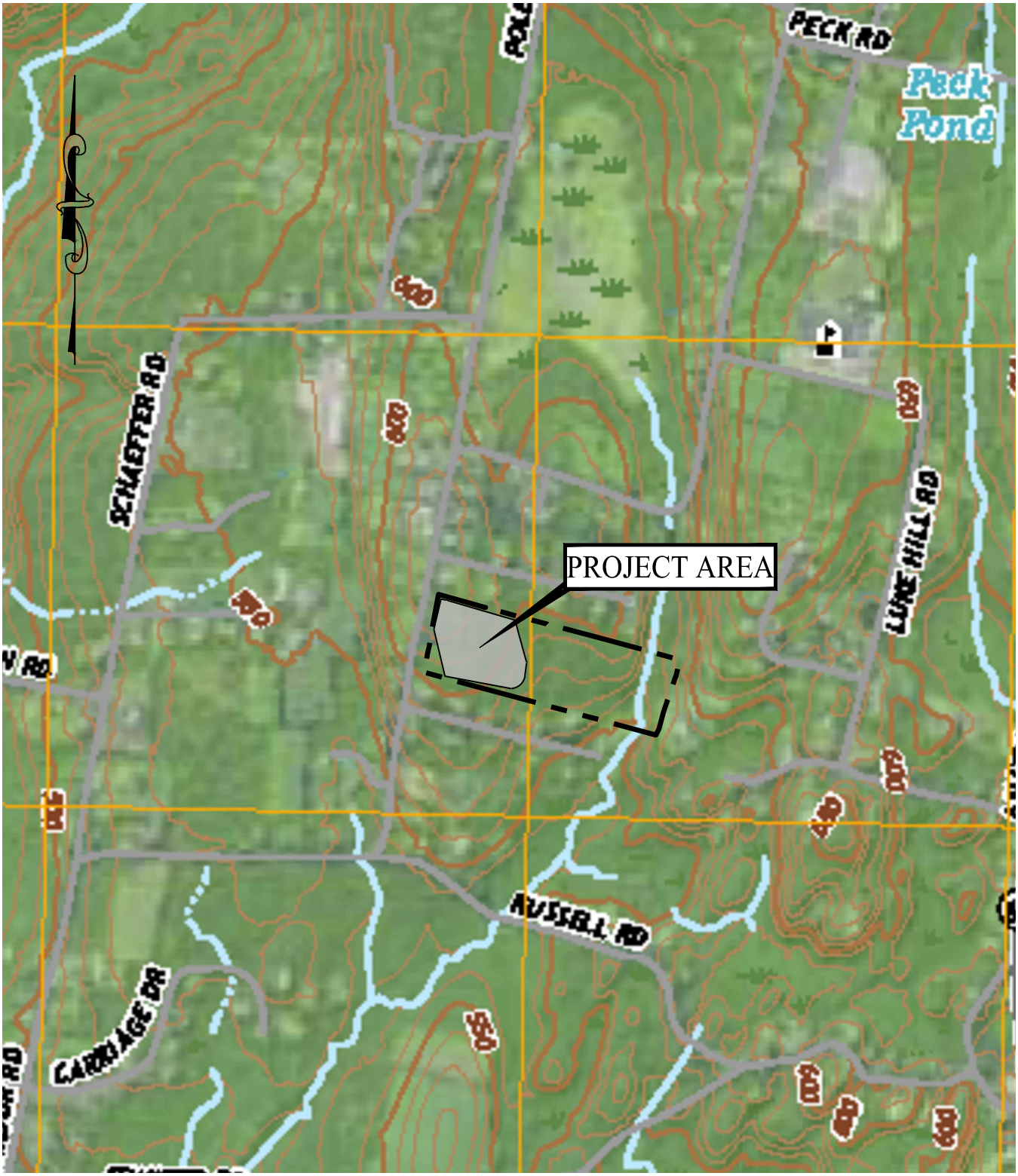
The solar panel facility proposed in this Environmental Assessment will not disproportionally affect the environment and ecology on the project area and surrounding properties, and will not disturb scenic, historic, cultural, or recreational resources within and nearby the project area. The project meets CT DEEP air and water quality standards. There will be minimal traffic to the project area once the facility is active; the only traffic generated will be for maintenance purposes. Wetlands, watercourses, and vernal pools will not be directly impacted by the facility; no vernal pools were found within the project area and property, and the limit of disturbance will be a minimum of 100 feet to all wetland boundaries. Erosion and sediment control will be utilized to protect these resources as mandated by the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

The project is designed to minimize impervious surfaces and regrading. Some excavations will be necessary while developing the project area and constructing stormwater management basins; however, these excavations will be minor and keep the character of the land intact. Stormwater runoff will be managed utilizing the proposed basins. The Petitioner will implement a SWPCP in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Provisions will be written into this SWPCP to account for the monitoring of the project through its construction phase, including the formation of erosion and sediment controls that will need to be observed.

A portion of the project area contains Prime Farmland Soils. These soils will be protected via proactive measures such as limiting earthwork, regrading and other disturbances and arranging that all soils remain on the Site after the project is completed. When the facility reaches the end of its lifespan, all solar panels and associated equipment can be removed, and the site can be top-dressed and reseeded as necessary. The project area would be rehabilitated without issue.

Federal or state threatened, endangered or special concern species is expected to be negatively impacted by this development. State-list species have not been identified within the Site boundaries. The Northern Long-eared Bat was identified as a species that could occur within the Site boundaries, but upon review, the project should not produce negative consequences for the species such as incidental take.

Appendix A: Figures



NOTE: BASE MAP INFORMATION TAKEN FROM USGS
NAUGATUCK CONNECTICUT QUADRANGLE
7.5-MINUTE SERIES. NGA REF. NO. USGSX24K31411

1,000 0 500 1,000

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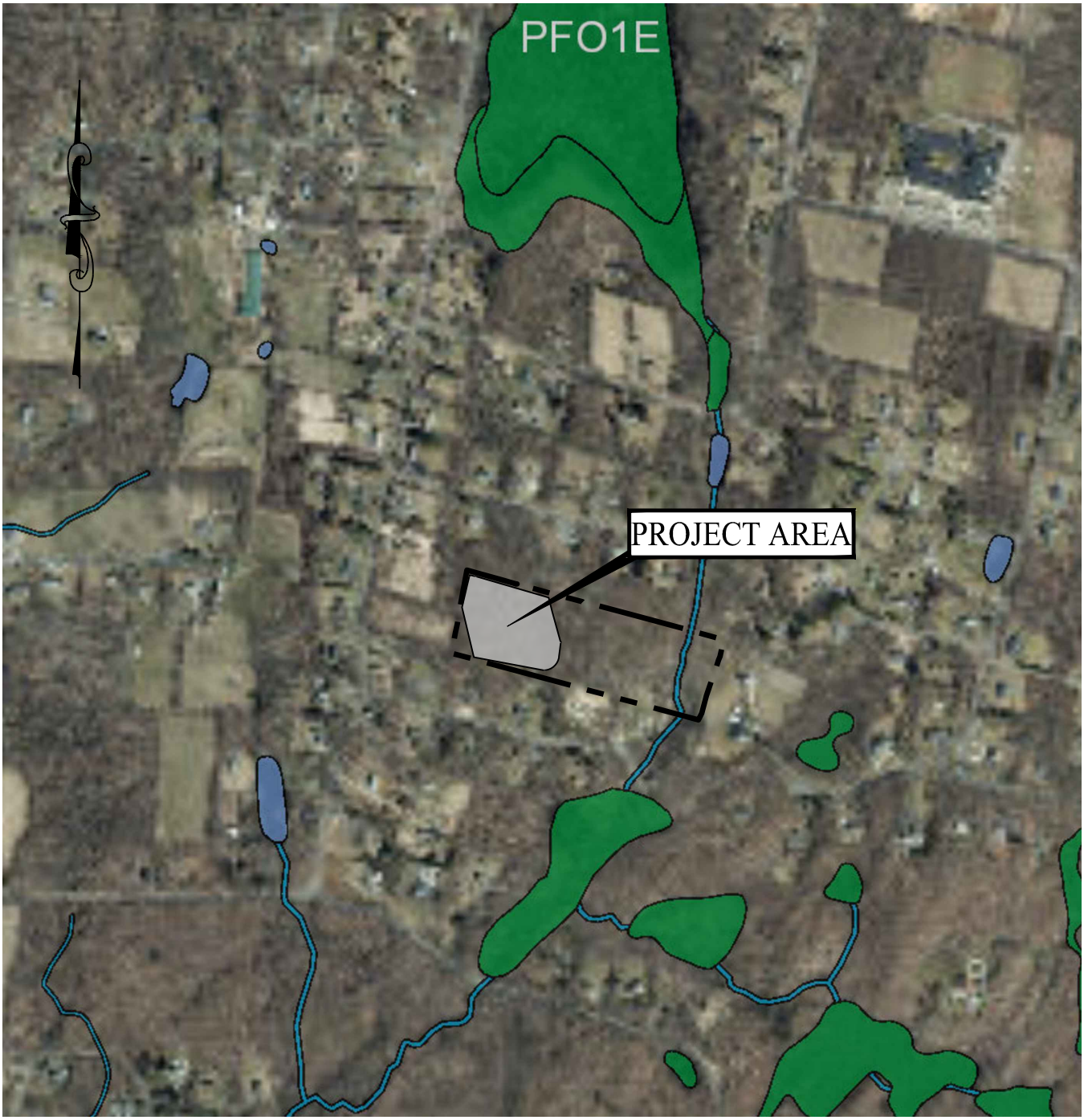
SITE LOCATION MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 1,000'
Figure:	1



Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

NOTE: BASE MAP INFORMATION TAKEN FROM U.S. FISH AND WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY

1,000 0 500 1,000

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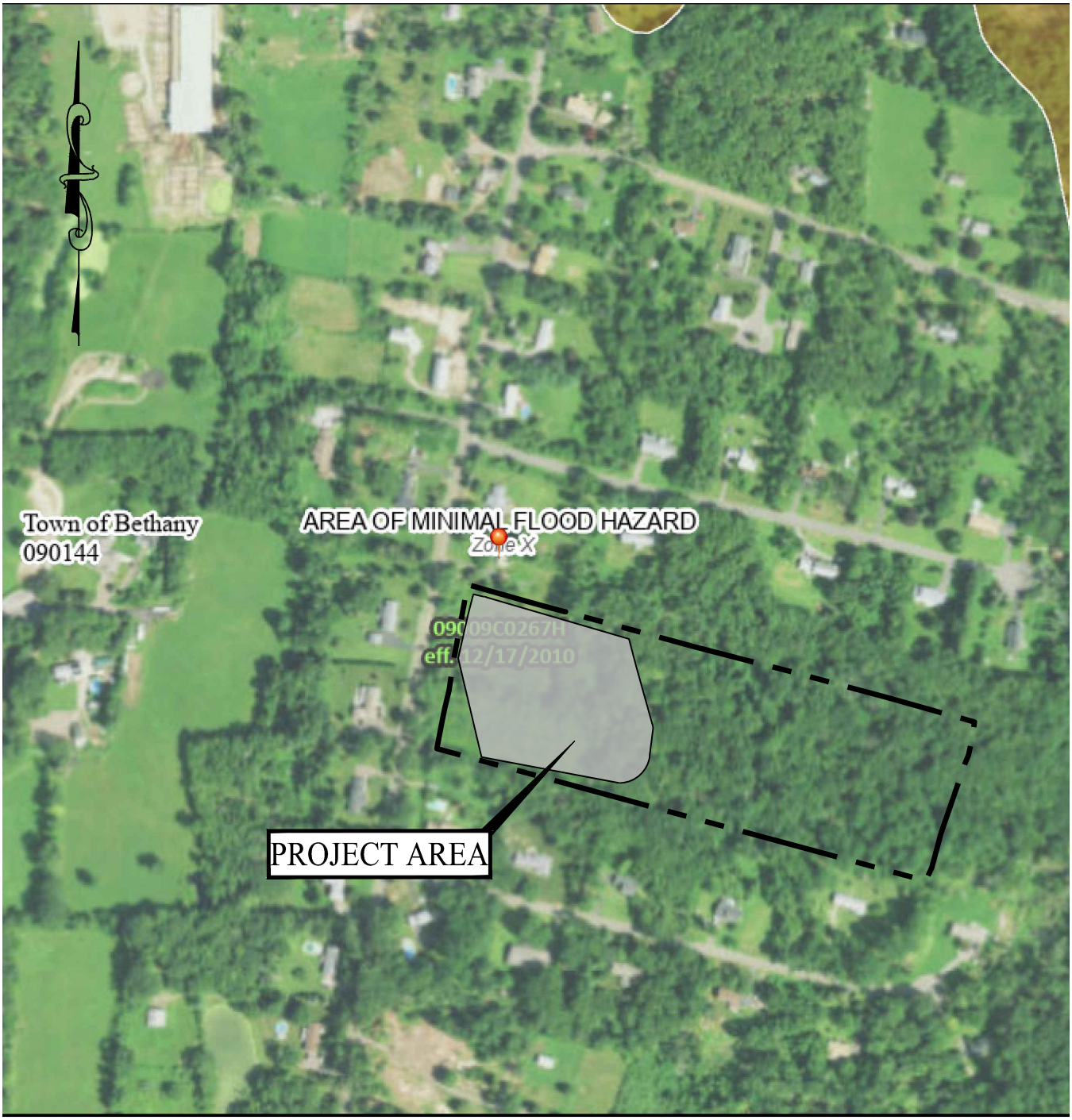
WETLANDS & WATERCOURSES MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 1,000'
Figure:	2



NOTE: BASE MAP INFORMATION TAKEN FROM FEMA FLOOD INSURANCE RATE MAP, MAP NUMBER 09009C0267H, EFFECTIVE 12/17/2010.

500 0 250 500

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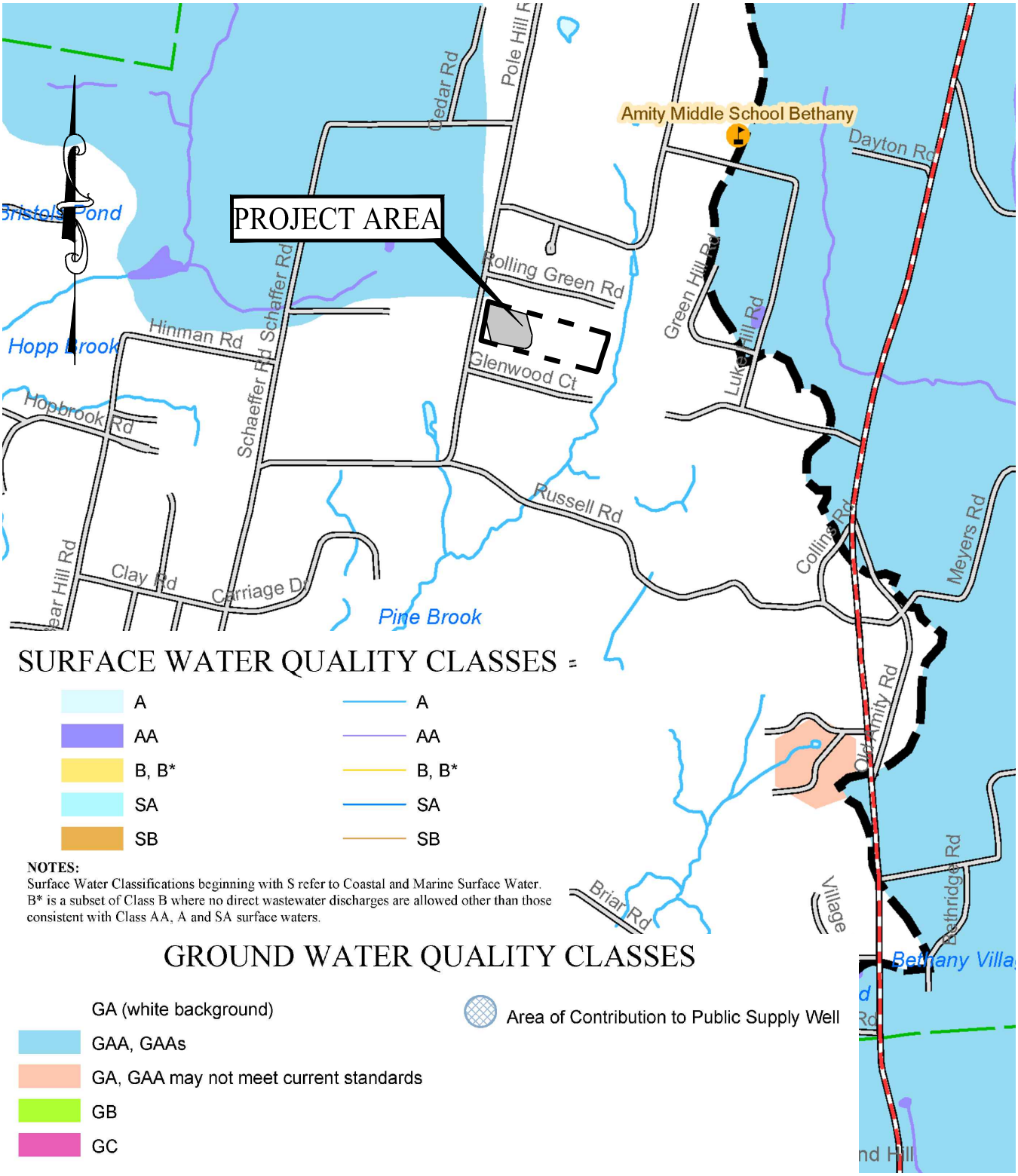
FEMA FLOOD MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 500'
Figure:	3



NOTE: BASE MAP INFORMATION TAKEN FROM CT DEEP, DATED: OCTOBER, 2018.

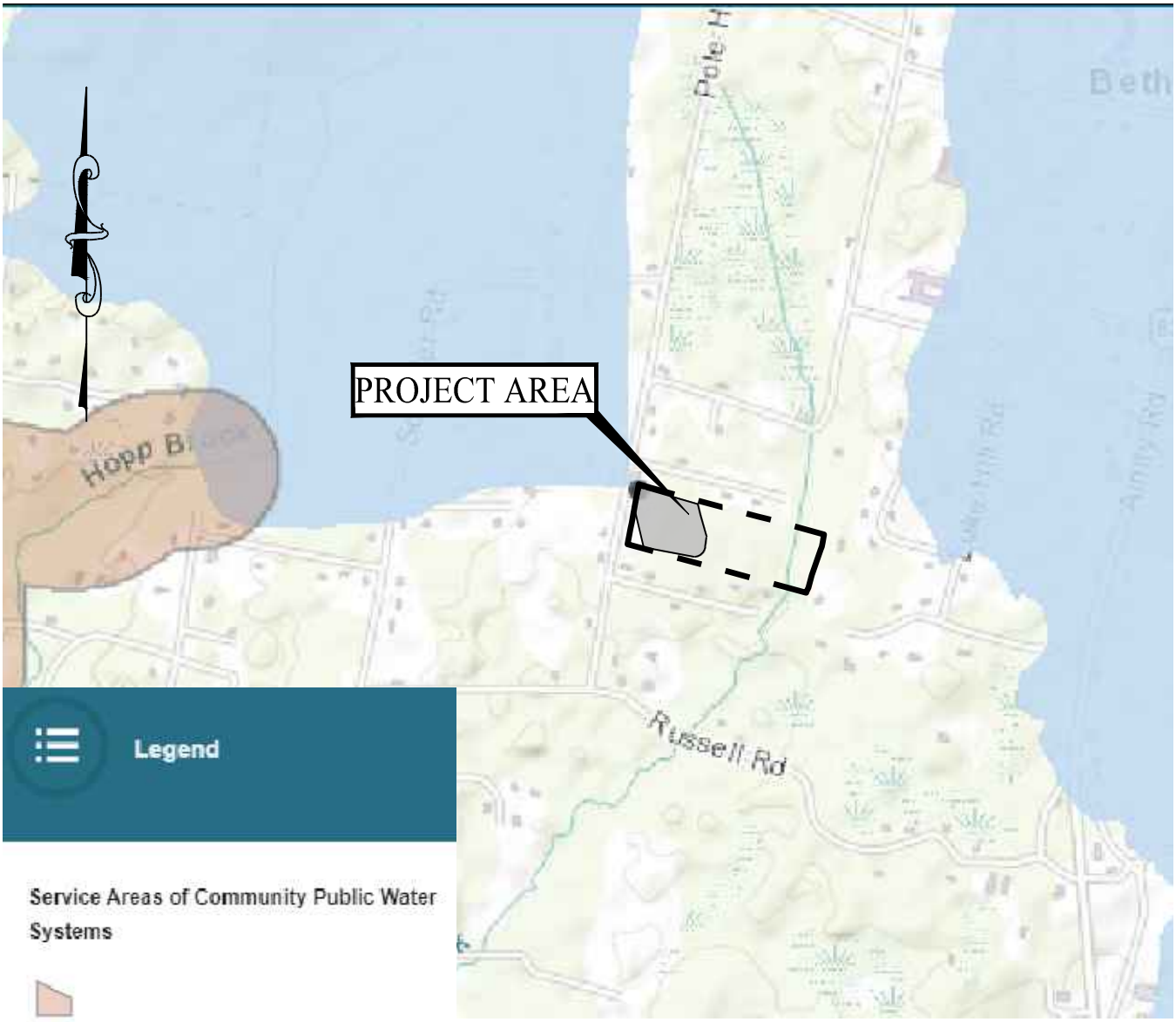
2,000 0 1,000 2,000

SOLLI ENGINEERING
501 Main Street, Monroe, CT 06468
T: (203) 880-5455 F: (203) 880-9695

WATER QUALITY CLASSIFICATION MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 2,000'
Figure:	4



NOTE: BASE MAP INFORMATION TAKEN FROM CONNECTICUT STATE DEPARTMENT OF PUBLIC HEALTH GIS MAP.

1,500 0 750 1,500

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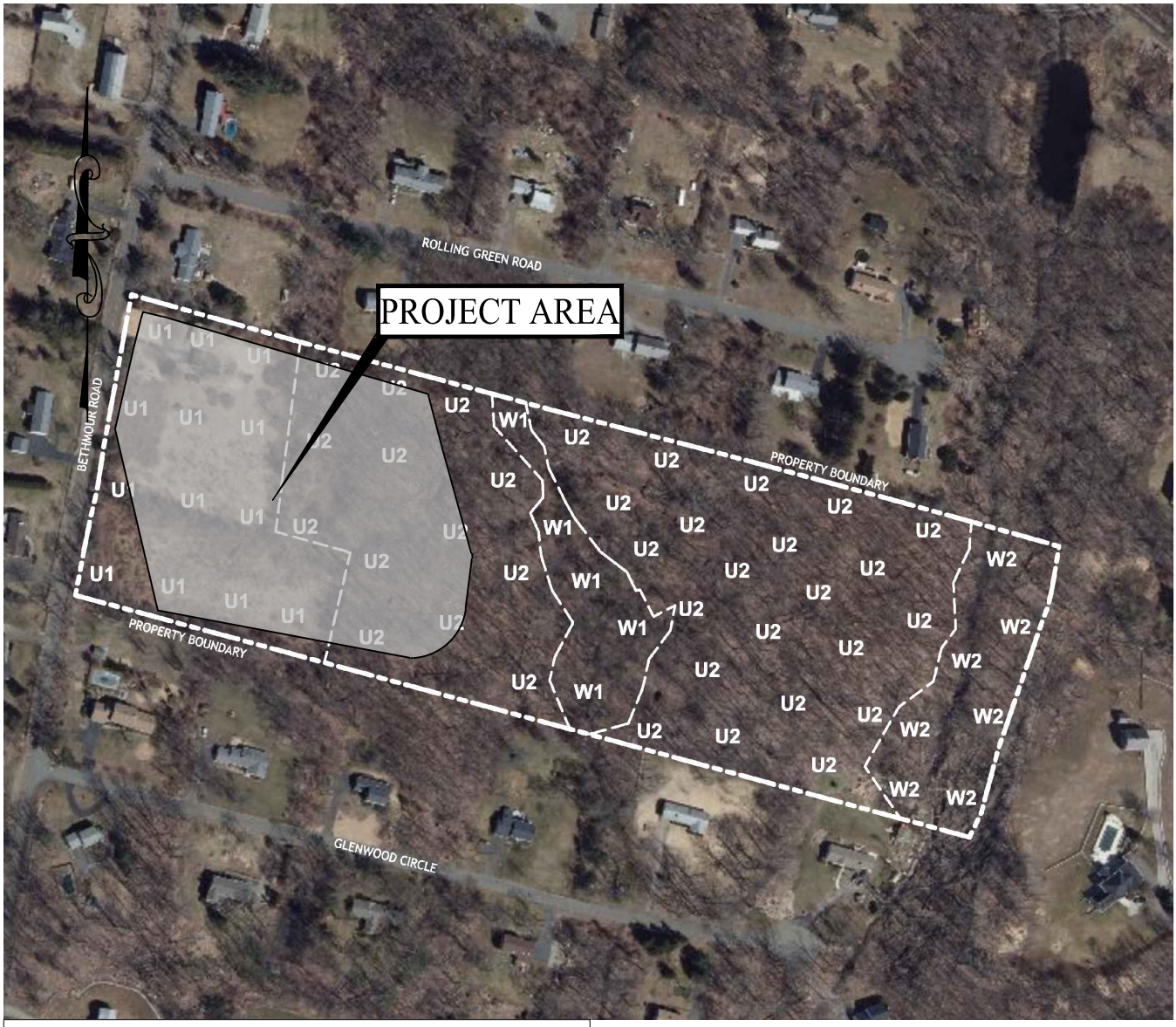
PUBLIC SUPPLY WATERSHED MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 1,500'
Figure:	5



ECOLOGICAL COMMUNITY	
SYM.	NAME
UPLAND	
U1	SHRUBLAND
U2	WOODLAND
WETLAND	
W1	WOODLAND WETLAND WITH INTERMITTENT WATERCOURSE
W2	WOODLAND WETLAND WITH STREAM (PINE BROOK)

NOTE: BASE MAP INFORMATION TAKEN FROM ECOLOGICAL COMMUNITIES MAP PREPARED BY WILLIAM KENNY ASSOCIATES

300 0 150 300

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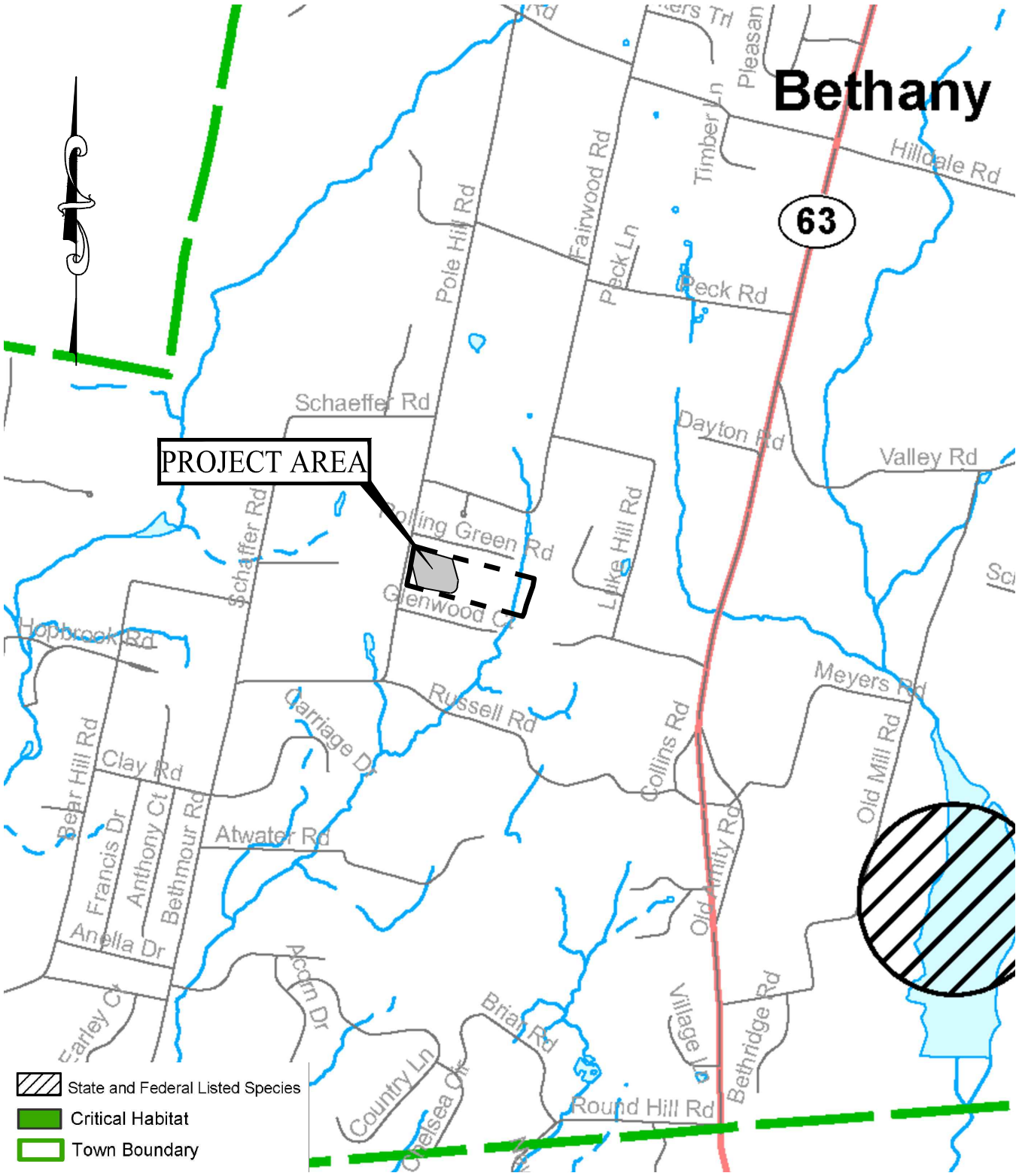
HABITAT COVER MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 300'
Figure:	6



NOTE: BASE MAP INFORMATION TAKEN FROM CT DEEP BUREAU OF NATURAL RESOURCES WILDLIFE DIVISION, DATED: DECEMBER, 2022.

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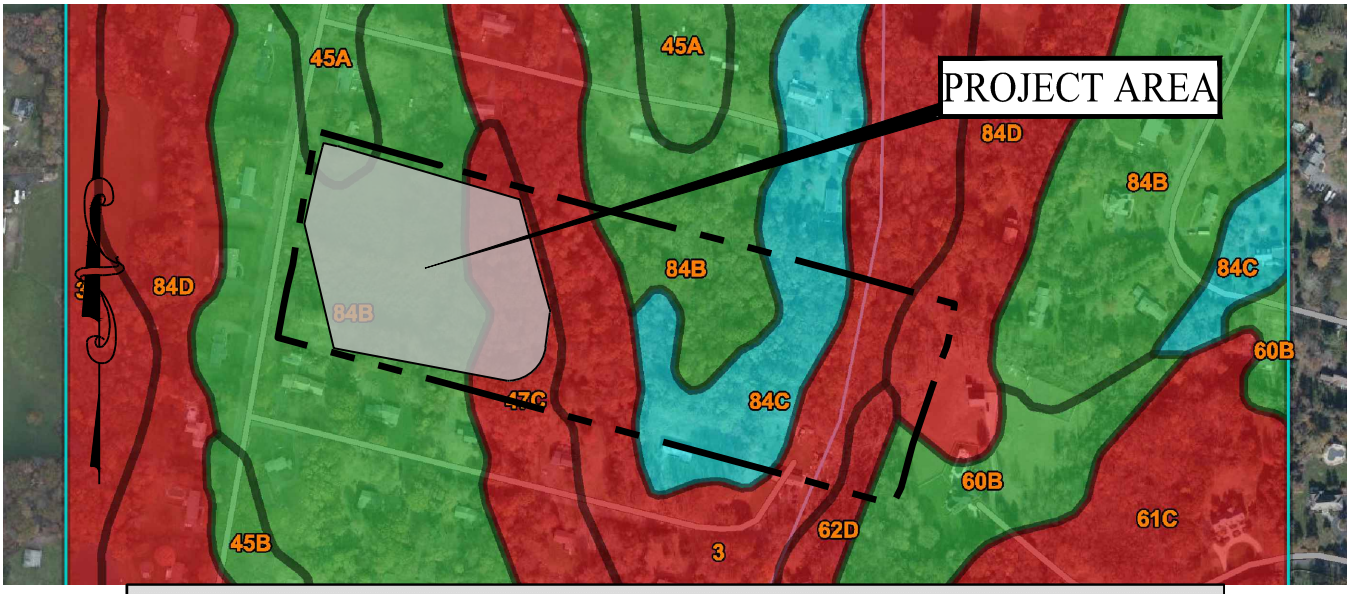
NATURAL DIVERSITY DATA BASE MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 2,000'
Figure:	7



Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	Not prime farmland	24.2	18.7%
45A	Woodbridge fine sandy loam, 0 to 3 percent slopes	All areas are prime farmland	5.7	4.4%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	All areas are prime farmland	1.7	1.3%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	All areas are prime farmland	6.5	5.0%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	Not prime farmland	9.4	7.3%
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	Not prime farmland	1.9	1.5%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	All areas are prime farmland	44.6	34.5%
84C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes	Farmland of statewide importance	10.0	7.7%
84D	Paxton and Montauk fine sandy loams, 15 to 25 percent slopes	Not prime farmland	18.8	14.5%
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	Not prime farmland	0.1	0.1%

NOTE: BASE MAP RESOURCES TAKEN FROM THE NATURAL RESOURCES CONSERVATION SERVICE, URL: https://websoilsurvey.sc.egov.usda.gov

500 0 250 500

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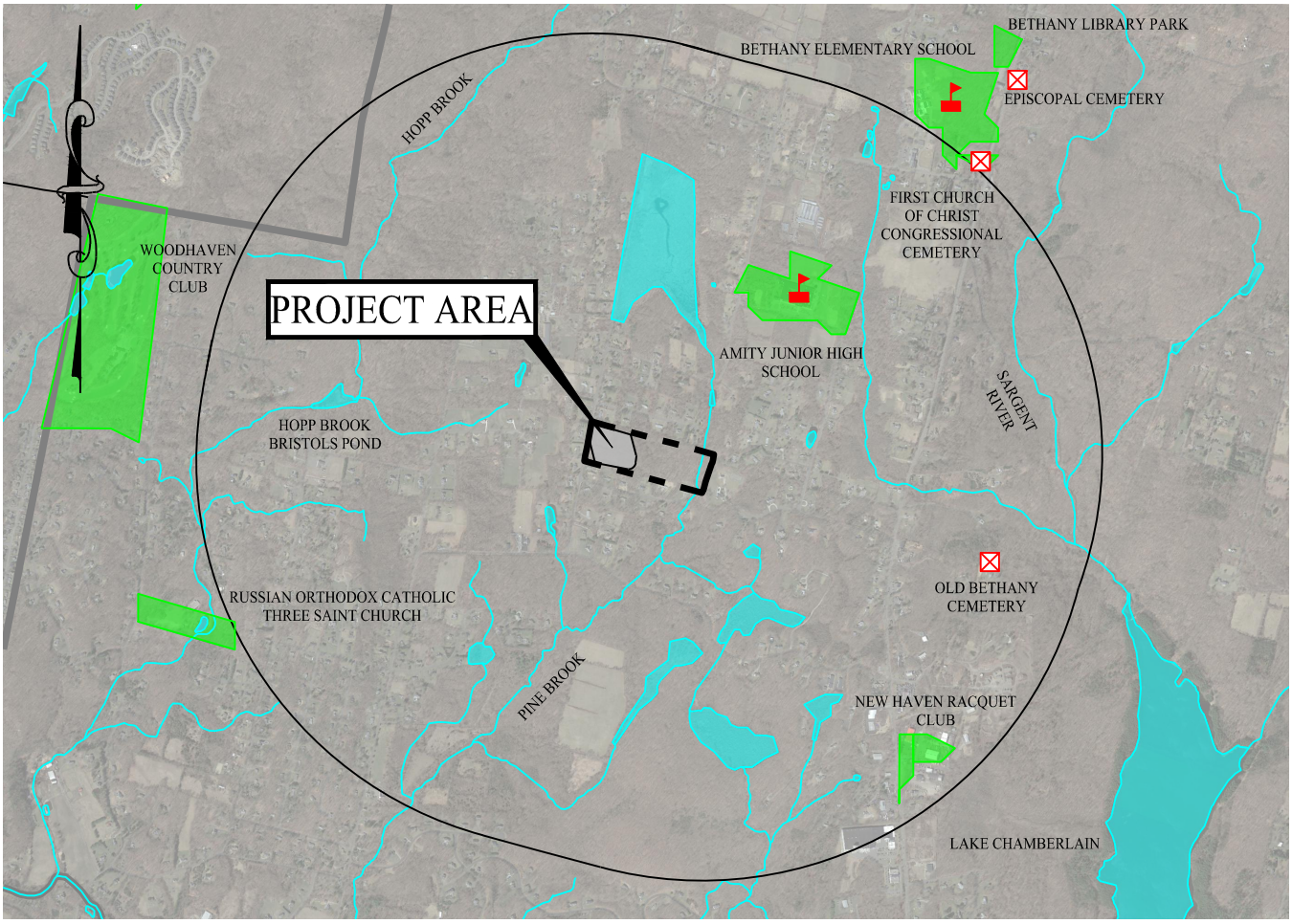
PRIME FARMLAND MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 500'
Figure:	8



LEGEND

- PROPERTY LINE
- 1 MILE RADIUS
- TOWN BOUNDARY
- NTL. SCENIC ROADWAY
- STATE SCENIC ROADWAY
- HIKING TRAIL
- WATERCOURSES (CT DEEP)
- OPEN WATER (CT DEEP)
- OPEN SPACE (CT ECO)
- SCHOOL
- CEMETERY
- PARK

NOTE: BASE MAP RESOURCES TAKEN FROM CT ECO OPEN SPACE MAPPING AND CT DEEP HYDROGRAPHY

2,500 0 1,250 2,500

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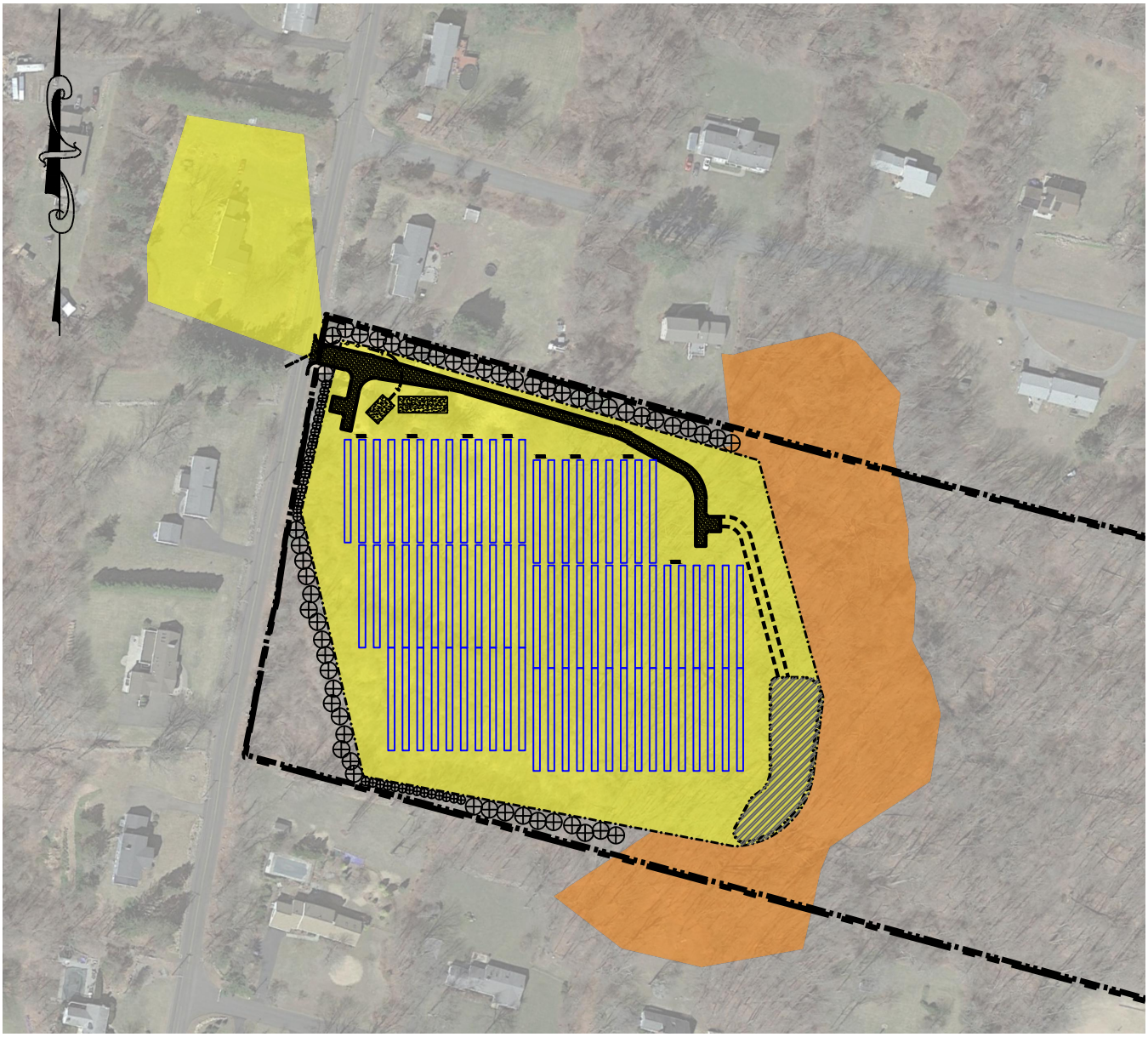
SCENIC & RECREATION MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 2,500'
Figure:	9



LEGEND

PROPERTY LINE

PREDICTED YEAR-ROUND VISIBILITY

PREDICTED SEASONAL VISIBILITY

200 0 100 200

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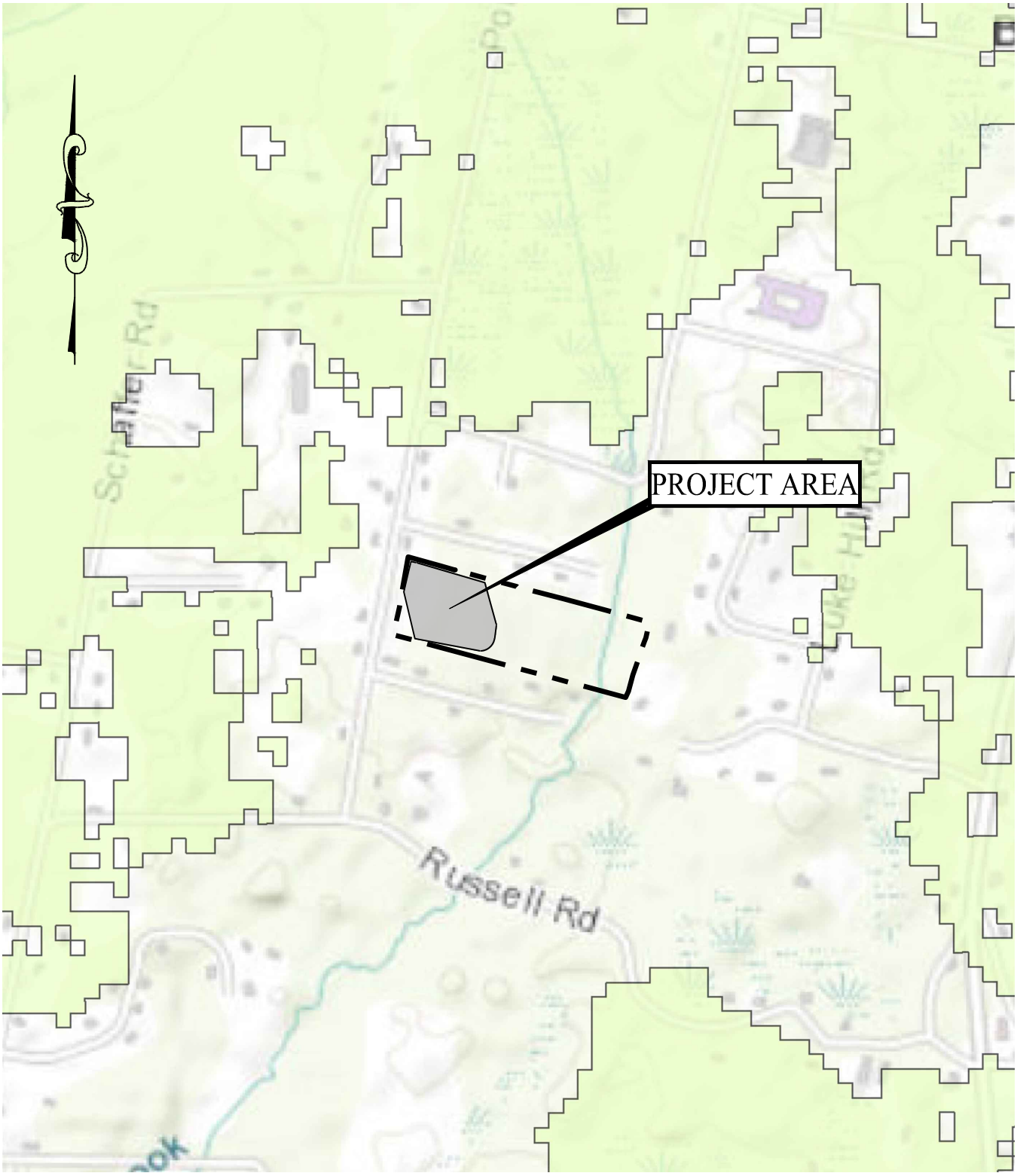
PROPOSED CONDITIONS VIEWSHED MAP
428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 200'
Figure:	10



NOTE: BASE MAP RESOURCES TAKEN FROM ARCGIS
FORESTLAND HABITAT IMPACT MAP

1,000 0 500 1,000

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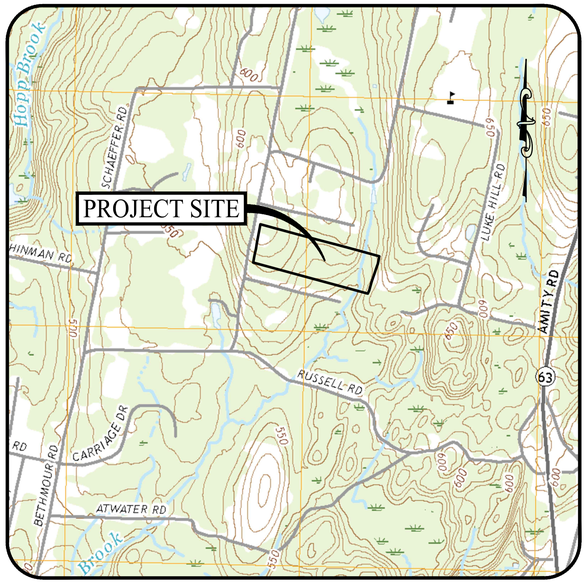
CORE FOREST MAP

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 1,000'
Figure:	11

Appendix B: Site Plans

SOLLI ENGINEERING

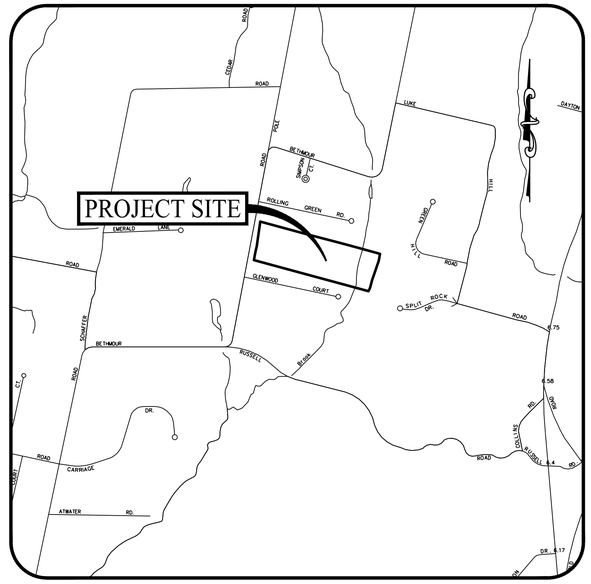


USGS MAP

SCALE: 1" = 1,000'

PROPOSED SOLAR PHOTOVOLTAIC ARRAY

428 BETHMOUR ROAD
BETHANY, CONNECTICUT



LOCATION MAP

SCALE: 1" = 1,000'

PREPARED FOR:

TRITEC AMERICAS

888 PROSPECT STREET, SUITE 200
LA JOLLA, CALIFORNIA

PREPARED BY:

SOLLI ENGINEERING

501 MAIN STREET, MONROE, CONNECTICUT 06468
11 VANDERBILT AVENUE, NORWOOD, MASSACHUSETTS 02062

OWNER

THE NEVAR COMPANY
PO BOX 743
CHESHIRE, CONNECTICUT 06410

APPLICANT

TRITEC AMERICAS, LLC
888 PROSPECT STREET, SUITE 200
LA JOLLA, CALIFORNIA 92307

PROPERTY INFORMATION

ADDRESS: 428 BETHMOUR ROAD
MAP-BLOCK-LOT: 113-1 & 113-1-A
ZONE: R-65
AREA: ±21.22 AC
BOOK/PAGE: 0215/0543

SOIL SCIENTIST

WILLIAM KENNY
WILLIAM KENNY ASSOCIATES
195 TUNXIS HILL CUTOFF SOUTH
FAIRFIELD, CT 06825
(203) 366-0588

ELECTRICAL ENGINEER

PURE POWER ENGINEERING, INC.
111 RIVER STREET, SUITE 1110
HOBOKEN, NJ 07030
(201) 687-9975

SITE / CIVIL ENGINEER

KEVIN SOLLI, P.E., CPESC, LEED AP BD+C
LICENSE NO. 25759
SOLLI ENGINEERING, LLC
501 MAIN STREET
MONROE, CONNECTICUT 06468
(203) 880-5455

LANDSCAPE ARCHITECT

MARY BLACKBURN, P.L.A.,
LICENSE CT NO. 1499
SOLLI ENGINEERING, LLC
501 MAIN STREET
MONROE, CONNECTICUT 06468
(203) 880-5455

SURVEYOR OF RECORD

PATRICK J CORLESS, JR. LICENSE NO. 70015
BL COMPANIES
355 RESEARCH PARKWAY
MERIDEN, CONNECTICUT 06450
(203) 630-1406

DRAWING LIST

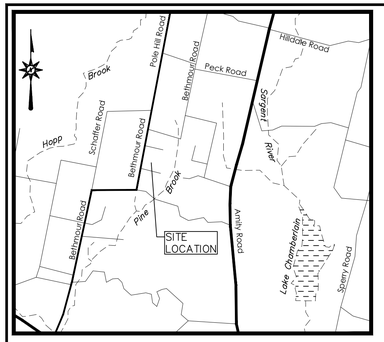
SHEET #	SHEET NAME	PLAN DATE	LATEST REVISION
0.00	COVER SHEET	04/18/23	N/A
EX-1	EXISTING CONDITIONS MAP	01/05/22	N/A
2.11	SITE LAYOUT PLAN	04/18/23	N/A
2.21	GRADING AND DRAINAGE PLAN	04/18/23	N/A
2.31	SOIL EROSION & SEDIMENT CONTROL PLAN	04/18/23	N/A
2.41	SOIL EROSION & SEDIMENT CONTROL NOTES & DETAILS	04/18/23	N/A
3.01	CONSTRUCTION DETAILS	04/18/23	N/A

Rev. #: Date Description

Project:
PROPOSED SOLAR PHOTOVOLTAIC ARRAY
428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title: COVER SHEET

Sheet #: 0.00



LOCATION MAP

NOT TO SCALE

MAP REFERENCES

A. "MAP OF LAND IN BETHANY CONN., BELONGING TO THE DRAZEN LUMBER CO., OF NEW HAVEN CONN." SCALE 1"=100', DATE 11/16/1935. CERTIFIED SUBSTANTIALLY CORRECT BY A.M. WELLINGTON AND FILED AS MAP A101 IN THE TOWN OF BETHANY CLERKS OFFICE.

B. "'GLENWOOD' MAP OF LOTS OWNED & DEVELOPED BY THE BERNER LOHNE CO., INC., BETHANY, CONN." SCALE 1"=50', DATE 4/2/1964. CERTIFIED SUBSTANTIALLY CORRECT BY RICHARD J. NOWAKOWSKI AND FILED AS MAP A200 IN THE TOWN OF BETHANY CLERKS OFFICE.

C. "ROLLING GREEN ACRES–EAST, SECTION ONE, OWNED AND DEVELOPED BY ROLLING GREEN ACRES INC., BETHANY, CONN." SCALE 1"=50', DATE 5/1965. CERTIFIED SUBSTANTIALLY CORRECT BY WILLIAM O. DOLL AND FILED AS MAP A201 IN THE TOWN OF BETHANY CLERKS OFFICE.

D. "LOTS 4 THRU 13, FINAL, ROLLING GREEN ACRES, SECTION 2 EAST, BETHANY CONN." SCALE 1"=50', DATE 10/1965, REVISED 11/15/1965, ADDITIONS 04/18/1966. SURVEYED BY CAHN ENGINEERS, NEW HAVEN, CT AND FILED AS MAP A209 IN THE TOWN OF BETHANY CLERKS OFFICE.

E. "MAP OF GREEN HULL ACRES, BETHANY, CONNECTICUT" SCALE 1"=100', DATE 9/5/1972. SURVEYED BY ROBERT G. SWELL AND FILED AS MAP A284 IN THE TOWN OF BETHANY CLERKS OFFICE.

F. "MAP OF LAND OF LENA KRUPIEN, BETHANY, CONNECTICUT" SCALE 1"=40', DATE 7/18/1980. SURVEYED BY WILLIAM E. GILBERT ASSOCIATES, CONSULTING ENGINEERS, BETHANY, CT AND FILED AS MAP A403 IN THE TOWN OF BETHANY CLERKS OFFICE.

G. "SUBDIVISION PLAN, SPLIT ROCK, 55 LUKE HILL ROAD, BETHANY, CT." SCALE 1"=100', DATE 11/16/1994. PREPARED BY JOHN PAUL GARCIA & ASSOC. P.C. ENGINEERS AND SURVEYORS, BETHANY, CT AND FILED AS MAP A709 IN THE TOWN OF BETHANY CLERKS OFFICE.

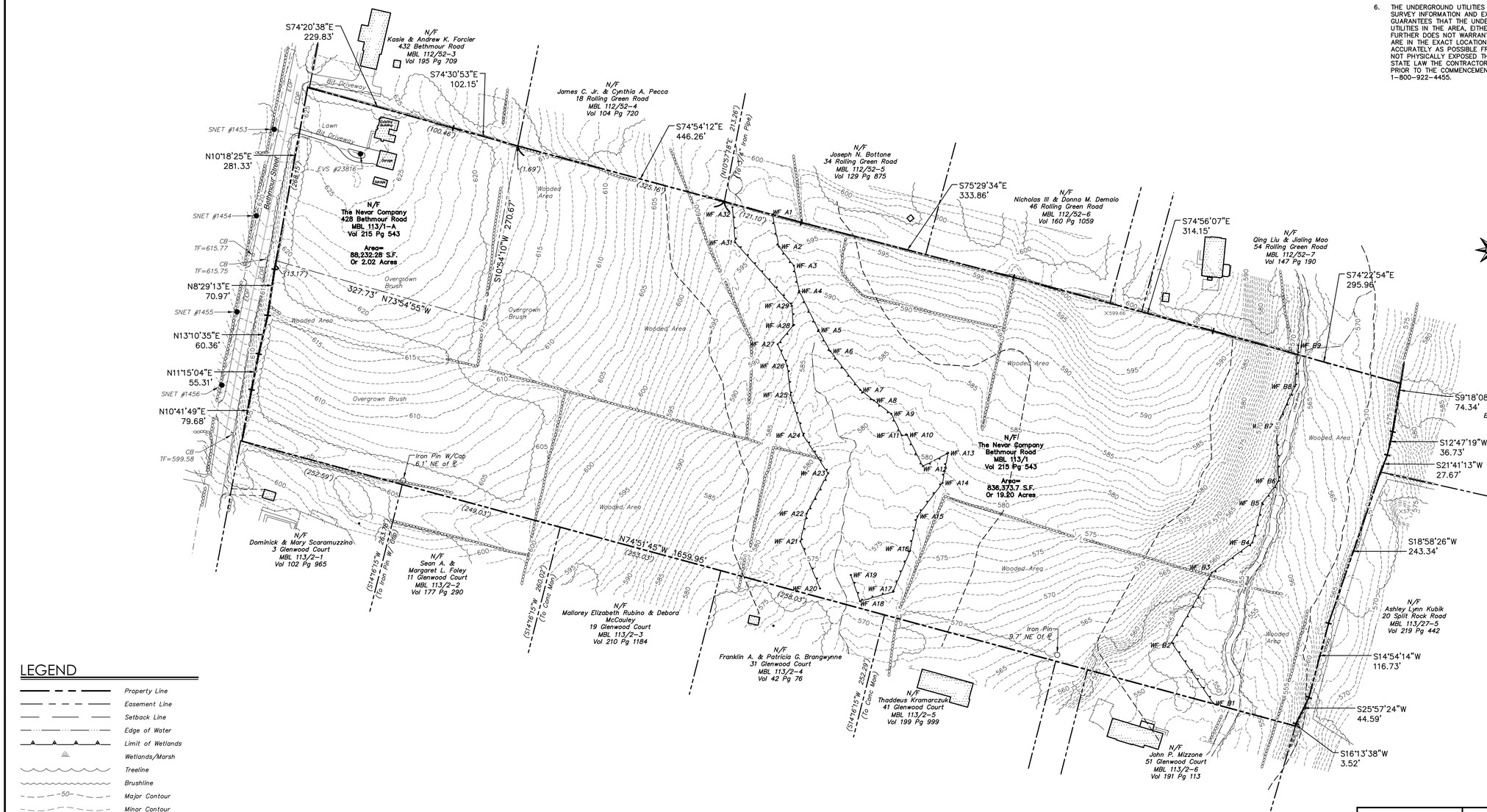
GENERAL NOTES

1. A) THIS MAP HAS BEEN PREPARED IN ACCORDANCE WITH THE REGULATIONS OF CONNECTICUT STATE AGENCIES, SECTIONS 20–300b–1 THROUGH 20–300b–20 AND THE "STANDARDS AND SUGGESTED METHODS AND PROCEDURES FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" PREPARED AND ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. AUGUST 29, 2019.

   B) THIS PLAN CONFORMS TO HORIZONTAL ACCURACY CLASS A–2 AND TOPOGRAPHIC ACCURACY CLASS T–2.

   C) BOUNDARY DETERMINATION IS BASED UPON A RESURVEY.

   D) THE TYPE OF SURVEY PERFORMED IS A EXISTING CONDITIONS SURVEY AND IS INTENDED TO DEPICT THE BOUNDARY, EASEMENTS, AND EXISTING CONDITIONS WITH RESPECT TO MONUMENTATION FOUND, STRUCTURES, EASEMENTS, ENCROACHMENTS, VISIBLE UTILITIES, ROADWAYS AND CONTOURS.
2. NORTH ARROW AND BEARINGS REFER TO THE CONNECTICUT STATE PLANE COORDINATE SYSTEM (CT NAD 83 – EPOCH 2011) AND ARE BASED ON GPS OBSERVATIONS PERFORMED BY BL COMPANIES DURING NOVEMBER, 2021 UTILIZING THE SMARTNET VRS NETWORK.
3. ELEVATIONS REFER TO THE NORTH AMERICAN DATUM OF 1988 (NAVD 88). THE DATUM WAS DETERMINED BY USING (GEOID 18) AND IS BASED ON GPS OBSERVATIONS PERFORMED BY BL COMPANIES IN NOVEMBER, 2021 UTILIZING THE SMARTNET VRS NETWORK.
4. PARCEL IS LOCATED IN A OTHER AREA "X", (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) AS DEPICTED ON F.I.R.M. MAP NUMBER 09009C0267H, PANEL 267 OF 635. WITH EFFECTIVE DATE DECEMBER 17, 2010.
5. WETLAND BOUNDARY DETERMINED BY BL COMPANIES ON JANUARY 5, 2022 AND LOCATED BY FIELD SURVEY BY BL COMPANIES ON JANUARY 5, 2022.
6. THE UNDERGROUND UTILITIES DEPICTED HAVE BEEN PLOTTED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES DEPICTED COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES DEPICTED ARE IN THE EXACT LOCATION INDICATED THOUGH THEY ARE PLOTTED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY EXPOSED THE UNDERGROUND UTILITIES. PER CONNECTICUT STATE LAW THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF EXCAVATION. CALL BEFORE YOU DIG 1–800–922–4455.



LEGEND

- Property Line
- Easement Line
- Setback Line
- Edge of Water
- Limit of Wetlands
- Wetlands/Marsh
- Treeline
- Brushline
- Major Contour
- Minor Contour
- Stone Wall
- Retaining Wall
- Fence
- Overhead Wires
- Utility Pole
- Utility Pole w/ Light
- CB Catch Basin

GRAPHIC SCALE
80 40 0 80
SCALE IN FEET

STATE OF CONNECTICUT PATRICK J. CORLESS JR. No. 70015 LICENSED LAND SURVEYOR

TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

1/5/2022

PATRICK J. CORLESS, JR., L.S. #70015

NO CERTIFICATION IS EXPRESSED OR IMPLIED UNLESS THIS MAP BEARS THE ORIGINAL SIGNATURE AND EMBOSSED SEAL OF THE ABOVE NAMED LAND SURVEYOR.

Apr 28, 2023 938am pcorless G:\2021\10\2101190\DWG\EX2101190(1).dwg Layout: EX1_24x36_ARCH

Architecture
Engineering
Environmental
Land Surveying
BL Companies
355 Research Parkway
Meriden, CT 06450
(203) 630-1406
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LAND OF
THE NEVAR COMPANY
428 BETHMOUR ROAD
BETHANY, CONNECTICUT

REVISIONS

No.	Date	Desc.

Surveyed	KJ
Drawn	JW
Reviewed	PJC
Scale	1"=80'
Project No.	2101190
Date	01/05/2022
Field Book	564
CAD File:	EX2101190(1)

Title

EXISTING CONDITIONS MAP

Sheet No.

EX-1

Xref (s) : XY2101190(1)

LEGEND

- PROPERTY LINE
- BUILDING SETBACK
- EXISTING WETLAND LIMITS
- UPLAND REVIEW AREA - 100 FT BUFFER
- EDGE OF FARM ROAD/ACCESS DRIVE
- STORMWATER BASIN AREA
- EXISTING STREAM LIMITS
- 100' RESIDENTIAL SETBACK
- CHAIN LINK FENCE
  TRINA 540W MODULES
- EVERGREEN TREE
- INVERTER
- UTILITY POLE
- OVERHEAD ELECTRIC LINE
- ELECTRIC CONDUIT
- NEW ENGLAND EROSION CONTROL / RESTORATION NO MOW MIX

GENERAL NOTES

1. THESE PLANS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT FOR CONSTRUCTION. NO CONSTRUCTION OR DEMOLITION SHALL BEGIN UNTIL FINAL APPROVAL OF THIS PLAN IS GRANTED.
2. ALL PROPOSED SITE WORK TO BE COMPLETED IN ACCORDANCE WITH ALL PERMITS, APPROVALS AND CONDITIONS OF APPROVALS ISSUED BY LOCAL, STATE AND/OR FEDERAL REVIEWING AGENCIES.
3. EXISTING BOUNDARY, TOPOGRAPHY AND SITE CONDITIONS INFORMATION TAKEN FROM A PLAN ENTITLED "EXISTING CONDITIONS MAP, 428 BETHMOUR ROAD, BETHANY, CONNECTICUT, EX-1," DATED JANUARY 05, 2022, SCALE: 1"=80', BY BL COMPANIES.
4. REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
5. THE SUBJECT PARCEL CONSISTS OF A TOTAL AREA OF APPROXIMATELY 21.23± ACRES, LOCATED IN THE RESIDENTIAL-65 (R-65) DISTRICT IN THE TOWN OF BETHANY, CONNECTICUT.
6. WETLAND BOUNDARY DETERMINED AND LOCATED BY FIELD SURVEY BY BL COMPANIES ON 01/05/2022.
7. PORTIONS OF THE SITE ARE LOCATED WITHIN FEMA DESIGNATED FLOOD HAZARD AREA "X" AS DEPICTED ON F.I.R.M. MAP NUMBER 09009C0267H, PANEL 267 OF 635, WITH EFFECTIVE DATE DECEMBER 17, 2010.
8. ALL CONSTRUCTION SHALL COMPLY WITH THE TOWN OF BETHANY STANDARDS AND CONNECTICUT DEPARTMENT OF TRANSPORTATION STANDARDS AND SPECIFICATIONS IN THE ABOVE REFERENCED INCREASING HIERARCHY. IF SPECIFICATIONS ARE IN CONFLICT, THE MORE STRINGENT SPECIFICATION SHALL APPLY. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE OSHA, FEDERAL, STATE AND LOCAL REGULATIONS.
9. PRIOR TO DEMOLITION OR CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" 72 HOURS BEFORE THE COMMENCEMENT OF WORK AT "(800) 922-4455" AND VERIFY ALL UTILITY AND STORM DRAINAGE SYSTEM LOCATIONS. INFORMATION ON EXISTING UTILITIES AND STORM DRAINAGE SYSTEMS HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING UTILITY PROVIDER AND MUNICIPAL RECORD MAPS AND/OR FIELD SURVEY AND IS NOT GUARANTEED CORRECT OR COMPLETE. UTILITIES AND STORM DRAINAGE SYSTEMS ARE SHOWN TO ALERT THE CONTRACTOR TO THEIR PRESENCE AND THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS AND ELEVATIONS OF ALL UTILITIES AND STORM DRAINAGE SYSTEMS INCLUDING SERVICES.
10. SHOULD ANY UNCHARTED OR INCORRECTLY CHARTED, EXISTING PIPING OR OTHER UTILITY BE UNCOVERED DURING EXCAVATION, CONSULT THE CIVIL ENGINEER IMMEDIATELY FOR DIRECTIONS BEFORE PROCEEDING FURTHER WITH WORK IN THIS AREA.
11. THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY ZONING PERMITS REQUIRED BY GOVERNMENT AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL LOCAL AND STATE PERMITS. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROLS NECESSARY FOR THIS PROJECT.
12. TRAFFIC CONTROL SIGNAGE SHALL CONFORM TO THE STATE DOT STANDARD DETAIL SHEETS AND THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. SIGNS SHALL BE INSTALLED PLUMB WITH THE EDGE OF THE SIGN 2' OFF THE FACE OF THE CURB, AND WITH 7' VERTICAL CLEARANCE UNLESS OTHERWISE DETAILED OR NOTED.
13. THE CONTRACTOR SHALL RESTORE ANY DRAINAGE STRUCTURE, PIPE, UTILITY, PAVEMENT, CURBS, SIDEWALKS, LANDSCAPED AREAS OR SIGNAGE DISTURBED DURING CONSTRUCTION TO THEIR ORIGINAL CONDITION OR BETTER, AS APPROVED BY THE CIVIL ENGINEER OF RECORD. DURING CONSTRUCTION CONTRACTOR IS TO HAVE THE SITE MAINTAINED FREE OF ALL TRASH, LITTER, DEBRIS AND OVERGROWN VEGETATION.
14. THE OWNER SHALL BE RESPONSIBLE FOR MAINTAINING THE SITE FREE OF ALL TRASH, LITTER, DEBRIS AND OVERGROWN VEGETATION THROUGHOUT CONSTRUCTION.
15. ALTERNATIVE METHODS AND PRODUCTS OTHER THAN THOSE SPECIFIED MAY BE USED IF REVIEWED AND APPROVED BY THE OWNER, CIVIL ENGINEER, AND REGULATORY AGENCY PRIOR TO INSTALLATION DURING THE BIDDING PROCESS.

SOLAR ARRAY SYSTEM INFORMATION

	TOTAL
SIZE DC	1.399 MW
SIZE AC	0.999 MW
INVERTER LOAD RATIO	1.40
MODULE TYPE	TRACKING TRINASOLAR TSM-540-DEG19C.20 (540W)
MODULE QUANTITY	2,590
INVERTER	SUNGROW SG125HV 125KW
INVERTER QUANTITY	8
UTILITY	EVERSOURCE

PLANTING SCHEDULE

KEY	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	COMMENTS
TREES						
AC	10	ABIES CONCOLOR	CONCOLOR / WHITE FIR	B&B	7'-8' HT	15' O.C.
PG	23	PICEA GLAUCA	WHITE SPRUCE	B&B	7'-8' HT	15' O.C.
PP	22	PICEA PUNGENS	COLORADO BLUE SPRUCE	B&B	7'-8' HT	15' O.C.
TO	34	THUJA OCCIDENTALIS 'ELEGANTISSIMA'	AMERICAN ARBORVITAE	B&B	7'-8' HT	8' O.C.
SEED MIXES						
NEW ENGLAND EROSION CONTROL/RESTORATION NO MOW MIX (NEW ENGLAND WETLAND PLANTS, INC.)						
APPLICATION RATE: 1 LBS/2,500 S.F.						

Rev. #: Date Description

Graphic Scale: 80 0 80 160

SOLLI ENGINEERING
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11 Vanderbilt Ave, Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	22113201
Plan Date:	04/18/23
Scale:	1" = 80'

STATE OF CONNECTICUT · KEVIN M. SOLLI · 25759 · LICENSED PROFESSIONAL ENGINEER

Kevin Solli, P.E.
CT 25759

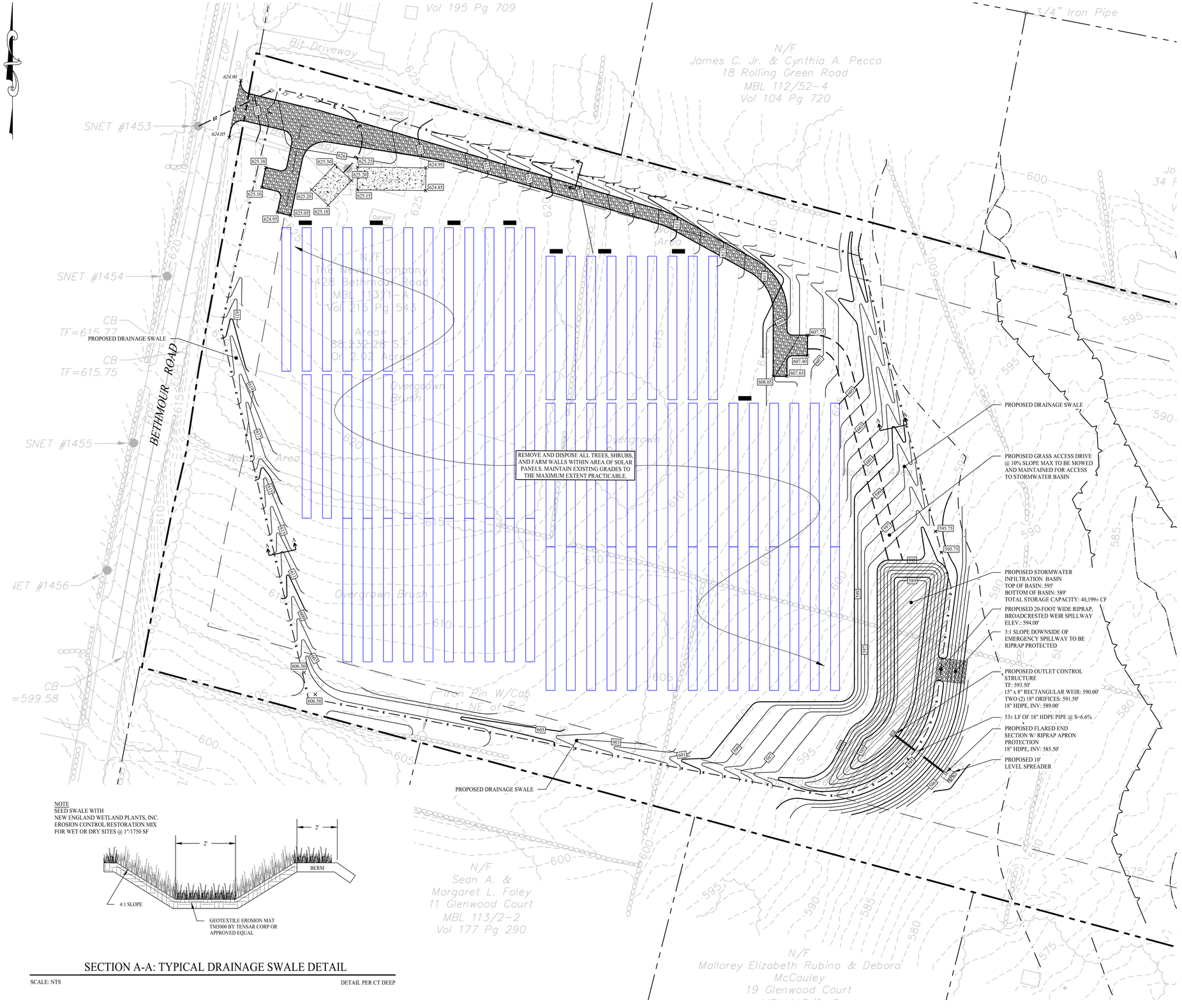
Project:

PROPOSED SOLAR PHOTOVOLTAIC ARRAY

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title: SITE LAYOUT PLAN

Sheet #: 2.11



NOTE
SEED SWALE WITH
NEW ENGLAND WETLAND PLANTS, INC.
EROSION CONTROL/RESTORATION MIX
FOR WET OR DRY SITES @ 1"/1750 SF

SECTION A-A: TYPICAL DRAINAGE SWALE DETAIL

SCALE: NTS DETAIL PER CT DEEP

GENERAL NOTES

1. THESE PLANS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT FOR CONSTRUCTION. NO CONSTRUCTION OR DEMOLITION SHALL BEGIN UNTIL FINAL APPROVAL OF THIS PLAN IS GRANTED.
2. ALL PROPOSED SITE WORK TO BE COMPLETED IN ACCORDANCE WITH ALL PERMITS, APPROVALS AND CONDITIONS OF APPROVALS ISSUED BY LOCAL, STATE AND/OR FEDERAL REVIEWING AGENCIES.
3. EXISTING BOUNDARY, TOPOGRAPHY AND SITE CONDITIONS INFORMATION TAKEN FROM A PLAN ENTITLED "EXISTING CONDITIONS MAP, 428 BETHMOUR ROAD, BETHANY, CONNECTICUT, EX-1," DATED JANUARY 05, 2022, SCALE: 1"=80', BY BL COMPANIES.
4. REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
5. THIS DRAWING IS INTENDED TO DESCRIBE GRADING AND DRAINAGE ONLY. REFER TO SITE PLAN FOR GENERAL INFORMATION, AND DETAIL SHEETS FOR DETAILS.
6. THE CONTRACTOR SHALL PRESERVE EXISTING VEGETATION WHERE POSSIBLE AND/OR AS NOTED ON DRAWINGS. REFER TO EROSION CONTROL PLAN FOR LIMIT OF DISTURBANCE AND EROSION CONTROL NOTES.
7. TOPSOIL SHALL BE STRIPPED AND STOCKPILED ON SITE FOR USE IN FINAL LANDSCAPING.
8. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS REQUIRED BY GOVERNMENT AND LOCAL AGENCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS FROM THE TOWN OF BETHANY REQUIRED TO PERFORM ALL WORK, INCLUDING FOR STREET CUTS AND CONNECTIONS TO EXISTING UTILITIES. THE CONTRACTOR SHALL POST ALL BONDS, PAY ALL FEES, PROVIDE PROOF OF INSURANCE AND PROVIDE TRAFFIC CONTROL NECESSARY FOR THIS WORK.
9. ALL DISTURBANCE INCURRED TO TOWN OR STATE PROPERTY DUE TO CONSTRUCTION SHALL BE RESTORED TO ITS PREVIOUS CONDITION OR BETTER, TO THE SATISFACTION OF THE TOWN OF BETHANY AUTHORITY.
10. IF IMPACTED OR CONTAMINATED SOIL IS ENCOUNTERED BY THE CONTRACTOR, THE CONTRACTOR SHALL SUSPEND EXCAVATION WORK OF IMPACTED SOIL AND NOTIFY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT PRIOR TO PROCEEDING WITH FURTHER WORK IN THE IMPACTED SOIL LOCATION UNTIL FURTHER INSTRUCTED BY THE OWNER AND/OR OWNER'S ENVIRONMENTAL CONSULTANT.
11. ALL PIPE LENGTHS ARE HORIZONTAL DISTANCES AND ARE APPROXIMATE.

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- ADJOINING LOT LINE
- MAJOR CONTOURS (420)
- MINOR CONTOURS (421)
- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- CONTOUR LABEL (420)
- PROPOSED SPOT ELEVATION (568.85)
- EXISTING SPOT ELEVATION (568.85)
- SWALE
- STORM DRAIN PIPE
- RIP RAP SPILLWAY
- OUTLET CONTROL STRUCTURE
- FLARE END SECTION
- LEVEL SPREADER
- GRASS PATHWAY

Rev. #:	Date	Description

Graphic Scale: 40 0 40 80

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Drawn By:	AWC
Checked By:	CJB
Approved By:	KMS
Project #:	22113201
Plan Date:	04/18/23
Scale:	1" = 40'

STATE OF CONNECTICUT · KEVIN M. SOLLI · 25759 · LICENSED PROFESSIONAL ENGINEER

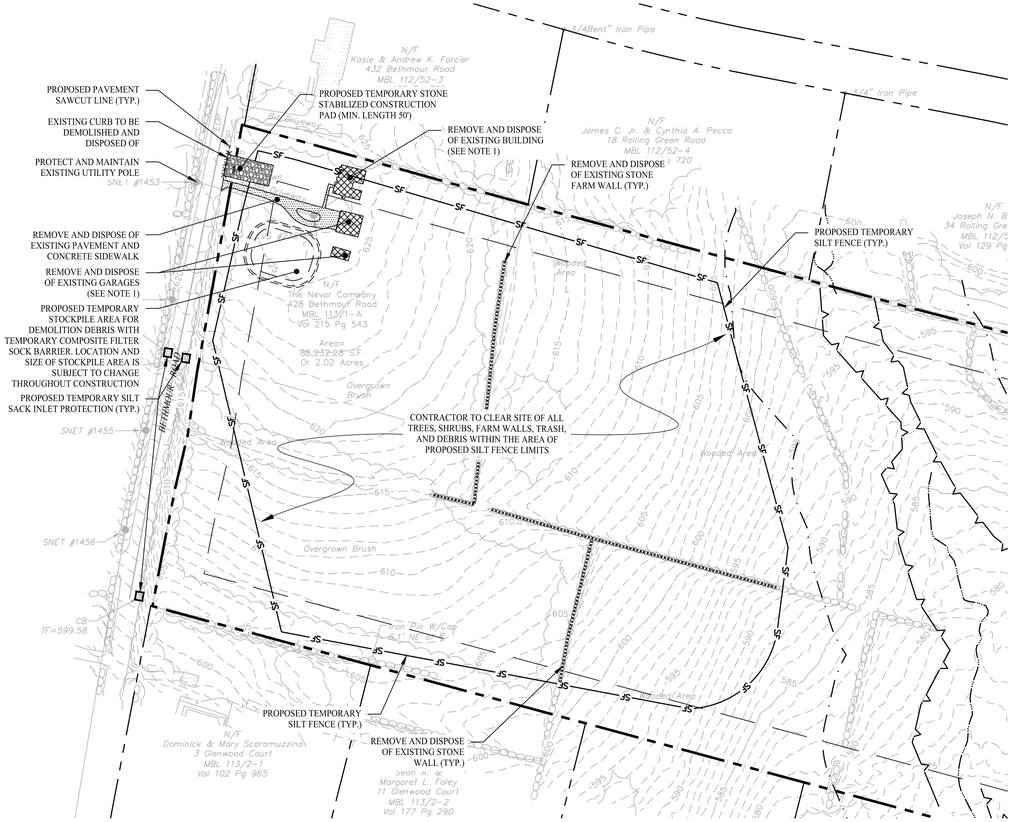
Kevin Solli, P.E.
CT 25759

Project:

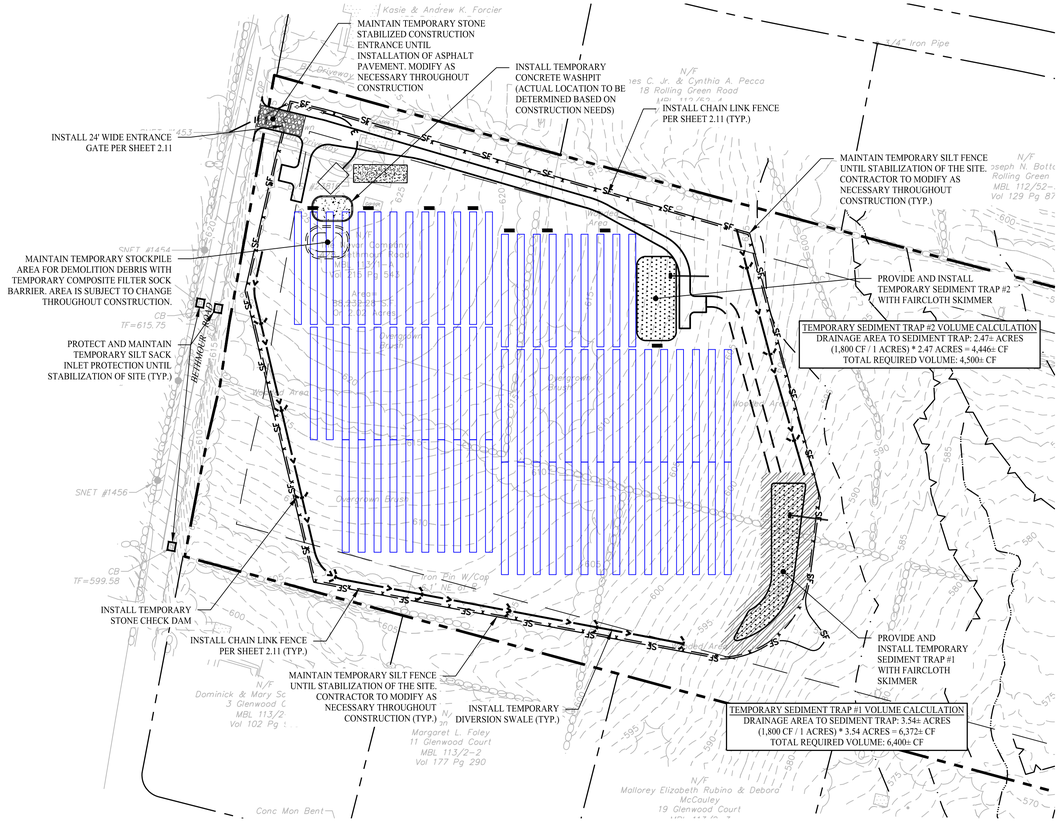
PROPOSED SOLAR PHOTOVOLTAIC ARRAY

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title:	Sheet #:
GRADING & DRAINAGE PLAN	2.21



DEMOLITION & SOIL EROSION & SEDIMENT CONTROL PHASE I



SOIL EROSION & SEDIMENT CONTROL PHASE II

DEMOLITION NOTES

1. CONTRACTOR SHALL SECURE ANY PERMITS, PAY ALL FEES AND PERFORM CLEARING AND GRUBBING AND DEBRIS REMOVAL PRIOR TO COMMENCEMENT OF GRADING OPERATIONS.
2. ALL BUILDINGS, INCLUDING FOUNDATIONS WALLS, FOOTINGS AND BASEMENT SLABS INDICATED ON PLAN ARE TO BE REMOVED FROM THE SITE.
3. ALL SEDIMENT AND EROSION CONTROLS AS SHOWN ON THE PLAN HEREON SHALL BE INSTALLED BY THE DEMOLITION CONTRACTOR PRIOR TO START OF DEMOLITION OPERATIONS.
4. REMOVE AND DISPOSE OF ANY CONCRETE, FENCES, STAIRS, WALLS, DEBRIS AND RUBBISH REQUIRING REMOVAL FROM THE WORK AREA IN AN APPROVED OFF SITE LANDFILL, BY AN APPROVED HAULER. THE HAULER SHALL COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATORY REQUIREMENTS.
5. THE CONTRACTOR SHALL PROTECT ALL IRON PINS, MONUMENTS AND PROPERTY CORNERS DURING DEMOLITION ACTIVITIES. ANY CONTRACTOR DISTURBED PINS, MONUMENTS, AND OR PROPERTY CORNERS, ETC. SHALL BE RESET BY A LICENSED LAND SURVEYOR AT THE EXPENSE OF THE CONTRACTOR.
6. THE DEMOLITION CONTRACTOR SHALL STABILIZE THE SITE AND KEEP EROSION CONTROL MEASURES IN PLACE UNTIL THE COMPLETION OF HIS WORK OR UNTIL THE COMMENCEMENT OF WORK BY THE SITE CONTRACTOR, WHICHEVER OCCURS FIRST, AS REQUIRED OR DEEMED NECESSARY BY THE ENGINEER OF RECORD. THE SITE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE MAINTENANCE OF EXISTING EROSION AND SEDIMENTATION CONTROLS AND FOR INSTALLATION OF ANY NEW EROSION AND SEDIMENT CONTROLS AS SHOWN HEREON.
7. THE CONTRACTOR SHALL ADHERE TO ALL OSHA, FEDERAL, STATE AND LOCAL REGULATIONS WHEN OPERATING CRANES, BOOMS, HOISTS, ETC. IN PROXIMITY OF OVERHEAD ELECTRIC LINES. IF CONTRACTOR MUST OPERATE EQUIPMENT CLOSE TO ELECTRIC LINES CONTACT THE POWER COMPANY TO MAKE ARRANGEMENTS FOR PROPER SAFEGUARDS. ANY UTILITY PROVIDER FEES SHALL BE PAID BY THE CONTRACTOR.
8. PRIOR TO DEMOLITION OR CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" 72 HOURS BEFORE THE COMMENCEMENT OF WORK AT "811" AND VERIFY ALL UTILITY AND STORM DRAINAGE SYSTEM LOCATIONS. INFORMATION ON EXISTING UTILITIES AND STORM DRAINAGE SYSTEMS HAS BEEN COMPILED FROM AVAILABLE INFORMATION INCLUDING UTILITY PROVIDER AND MUNICIPAL RECORD MAPS AND/OR FIELD SURVEY AND IS NOT GUARANTEED CORRECT OR COMPLETE. UTILITIES AND STORM DRAINAGE SYSTEMS ARE SHOWN TO ALERT THE CONTRACTOR TO THEIR PRESENCE AND THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL LOCATIONS AND ELEVATIONS OF ALL UTILITIES AND STORM DRAINAGE SYSTEMS INCLUDING SERVICES.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SAFETY AND SECURITY OF THE SITE DURING ALL PHASES OF CONSTRUCTION. THE ENGINEER OF RECORD IS NOT RESPONSIBLE FOR SITE SAFETY MEASURES TO BE EMPLOYED DURING CONSTRUCTION. THE ENGINEER OF RECORD HAS NO CONTRACTUAL DUTY TO CONTROL THE SAFEST METHODS OR MEANS OF THE WORK, JOB SITE RESPONSIBILITIES, SUPERVISION OR TO SUPERVISE SAFETY AND DOES NOT VOLUNTARILY ASSUME ANY SUCH DUTY OR RESPONSIBILITY.
10. SHOULD ANY UNCHARTED OR INCORRECTLY CHARTED, EXISTING PIPING OR OTHER UTILITY BE UNCOVERED DURING EXCAVATION, CONSULT THE ENGINEER OF RECORD IMMEDIATELY FOR DIRECTIONS BEFORE PROCEEDING FURTHER WITH WORK IN THIS AREA.
11. NO WORK ON THIS SITE SHALL BE INITIATED BY THE CONTRACTOR UNTIL A PRE-CONSTRUCTION MEETING WITH OWNER AND THE ENGINEER OF RECORD IS PERFORMED. THE CONTRACTOR SHALL HAVE MARK OUTS OF EXISTING UTILITIES COMPLETED PRIOR TO MEETING.
12. CONTRACTOR SHALL BACKFILL ALL AREAS WHERE BUILDING SLABS AND FOUNDATIONS HAVE BEEN REMOVED.

SEDIMENT & EROSION CONTROL NOTES

1. THESE PLANS ARE FOR PERMITTING PURPOSES ONLY AND ARE NOT FOR CONSTRUCTION. NO CONSTRUCTION OR DEMOLITION SHALL BEGIN UNTIL APPROVAL OF THE FINAL PLANS IS GRANTED BY ALL GOVERNING AND REGULATORY AGENCIES.
2. ALL SITE WORK TO BE COMPLETED IN ACCORDANCE WITH ALL PERMITS, APPROVALS AND CONDITIONS OF APPROVALS ISSUED BY THE TOWN OF BETHANY FOR THIS PROJECT.
3. EXISTING SITE CONDITIONS AND BOUNDARY INFORMATION TAKEN FROM A PLAN TITLED "EXISTING CONDITIONS MAP, 428 BETHMOUR ROAD, BETHANY, CONNECTICUT, EX-1," DATED JANUARY 05, 2022, SCALE: 1"=80', BY BL COMPANIES.
4. REFER TO THE EXISTING CONDITIONS MAP FOR THE ENTIRE PROPERTY BOUNDARY AND EXISTING CONDITIONS INFORMATION. THE PLAN HEREON DEPICTS A PORTION OF THE PROPERTY IN WHICH THE SITE WORK IS BEING PROPOSED.
5. PRIOR TO STARTING ANY OTHER WORK ON SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT. EROSION CONTROLS TO BE INSTALLED AT THE EDGE OF PROPOSED WORK.
6. EROSION CONTROLS TO ACT AS A LIMIT OF WORK LINE TO ENSURE THAT NO EQUIPMENT ENCROACHES ON THE ADJACENT PROPERTIES AND AREAS INTENDED TO REMAIN UNDISTURBED.
7. EROSION CONTROLS SHALL REMAIN IN PLACE AND BE MAINTAINED FOR THE DURATION OF THE PROJECT TO LIMIT THE MOVEMENT OF SILTATION AND SEDIMENTS FROM ENTERING EXISTING DRAINAGE SYSTEMS OR FROM LEAVING THE SITE. ANY ACCUMULATED SEDIMENTS ARE TO BE REMOVED FROM THE EROSION CONTROLS AND DISPOSED TO PROPERLY. ADDITIONALLY, ALL EROSION CONTROLS ARE TO BE INSPECTED AFTER A STORM EVENT AND THE CONTROLS REPLACED OR ARMORED AS NECESSARY AND ACCUMULATED SEDIMENTS REMOVED.
8. ADDITIONAL EROSION CONTROLS ARE TO BE UTILIZED AS NECESSARY AND AS DIRECTED BY THE ENGINEER OF RECORD TO LIMIT SEDIMENTS FROM DISCHARGING TO ADJACENT PROPERTIES, RESOURCE AREAS, OR INTO EXISTING STORM DRAIN SYSTEMS.
9. CONTRACTOR SHALL BE RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT EROSION SHALL NOT AFFECT OFF-SITE AREAS, WHETHER SUCH EROSION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
10. A RESERVE AMOUNT OF EROSION CONTROL MATERIALS ARE TO BE KEPT WITHIN EASY ACCESS ON SITE AT ALL TIMES.
11. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF THE TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
12. TEMPORARY STOCKPILING OF MATERIALS RELATED TO THE CONSTRUCTION ACTIVITIES ARE TO BE PROPERLY STABILIZED, PROTECTED AND DEMARCATED TO LIMIT MOVEMENT OF MATERIAL INTO STORM DRAIN SYSTEM, RESOURCE AREAS, OR ONTO ADJACENT PARCELS
13. REFUELING AND ANY WORK ASSOCIATED WITH THE MAINTENANCE OF CONSTRUCTION EQUIPMENT TO BE PERFORMED IN COMPLIANCE WITH APPLICABLE REGULATIONS.
14. THE AREAS OF CONSTRUCTION SHALL REMAIN IN A STABLE CONDITION AT THE CLOSE OF EACH CONSTRUCTION DAY. EROSION CONTROLS SHALL BE CHECKED AT THIS TIME AND MAINTAINED OR REINFORCED IF NECESSARY.
15. EROSION CONTROLS SHALL REMAIN IN PLACE UNTIL ALL DISTURBED AREAS HAVE BEEN STABILIZED WITH PAVEMENT, PLANTINGS, OR WITH AN ESTABLISHED STAND OF GRASS. EROSION CONTROLS SHALL NOT BE REMOVED UNTIL SITE STABILIZATION IS COMPLETE. CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS AS DIRECTED BY THE ENGINEER OF RECORD.
16. UTILIZE APPROPRIATE DEWATERING SYSTEMS AND TECHNIQUES TO MAINTAIN THE EXCAVATED AREA SUFFICIENTLY DRY FROM GROUNDWATER AND/OR SURFACE RUNOFF SO AS TO NOT ADVERSELY AFFECT CONSTRUCTION PROCEDURES OR CAUSE EXCESSIVE DISTURBANCE OF UNDERLYING NATURAL GROUND.
17. WATER FROM TRENCHES AND EXCAVATIONS SHALL NOT BE DISCHARGED DIRECTLY TO STORM DRAIN SYSTEMS. PROPER TREATMENT TO A SEDIMENTATION AREA IS TO TAKE PLACE PRIOR TO DISCHARGE TO ANY DRAINAGE SYSTEMS.
18. THE CONTRACTOR SHALL REPAIR ANY DAMAGE RESULTING FROM THE FAILURE OF THE DEWATERING OPERATIONS OR FROM FAILURE TO MAINTAIN ALL THE AREAS OF WORK IN SUITABLE DRY CONDITION.
19. PRECAUTIONS SHALL BE TAKEN TO PROTECT NEW WORK FROM FLOODING DURING STORMS OR FROM OTHER CAUSES. GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS SHALL BE PROPERLY SLOPED TO PREVENT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. WHERE REQUIRED, TEMPORARY DITCHES SHALL BE PROVIDED FOR DRAINAGE. UPON COMPLETION OF THE WORK AND WHEN DIRECTED, ALL AREAS SHALL BE RESTORED IN A SATISFACTORY MANNER AND AS DIRECTED.
20. REFER TO SHEET 2.41 FOR DETAILS OF THE PROPOSED SOIL EROSION AND SEDIMENT CONTROL (SEC) MEASURES AND ADDITIONAL INFORMATION REGARDING CONSTRUCTION SEQUENCE, SEC MEASURE INSTALLATION, AND MAINTENANCE.

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- ADJOINING LOT LINE
- SILT FENCE PROTECTION
- CONSTRUCTION FENCE
- CURB REMOVAL
- FENCE / ROCK WALL REMOVAL
- BUILDING / STRUCTURE DEMOLITION
- BITUMINOUS CONCRETE PAVEMENT DEMOLITION
- TEMPORARY SEDIMENT TRAP / BASIN
- SILT SACK INLET PROTECTION
- STONE CHECK DAM
- MATERIAL STOCKPILE AREA
- CONSTRUCTION ENTRANCE
- CONCRETE WASHPIT

CONSTRUCTION SEQUENCE (PHASE I)

1. PHASE I:
- 1.1. INSTALL STABILIZED CONSTRUCTION ENTRANCE / EXIT.
- 1.2. INSTALL SILT FENCE / SEC MEASURES AS PROPOSED (CLEAR ONLY THOSE AREAS NECESSARY TO INSTALL SEC MEASURES).
- 1.3. PREPARE TEMPORARY PARKING AND STORAGE AREAS.
- 1.4. HALT ALL ACTIVITIES AND CONTACT THE ENGINEER OF RECORD / TOWN OF BETHANY LAND USE AGENT TO PERFORM INSPECTION AND CERTIFICATION OF BEST MANAGEMENT PRACTICES (BMP'S). GENERAL CONTRACTOR SHALL SCHEDULE AND CONDUCT THE STORM WATER PRE-CONSTRUCTION MEETING WITH THE ENGINEER, CITY AGENCIES AND GROUND-DISTURBING CONTRACTOR BEFORE PROCEED WITH CONSTRUCTION.
- 1.5. PERFORM PAVEMENT SAWCUTS.
- 1.6. DEMOLISH AND REMOVE EXISTING STRUCTURES / FOUNDATIONS.
- 1.7. REMOVE ALL EXISTING CURBING, BITUMINOUS CONCRETE PAVEMENT, CONCRETE PADS AND FENCING.
- 1.8. BEGIN CLEARING AND GRUBBING THE SITE.
- 1.9. ESTABLISH MATERIAL STOCKPILE AREA AND INSTALL SEC BARRIER SURROUNDING PILE.
- 1.10. BEGIN ROUGH GRADING OF THE SITE.

CONSTRUCTION SEQUENCE (PHASE II)

2. PHASE II:
- 1.1. TEMPORARILY SEED, THROUGHOUT CONSTRUCTION, DENUDED AREAS THAT WILL BE INACTIVE FOR 14 DAYS OR MORE..
- 1.2. INSTALL PROPOSED STORM DRAINAGE SYSTEM AND STRUCTURES (SEE SHEET 2.21).
- 1.3. START CONSTRUCTION OF BUILDING PAD, PARKING AREAS, AND STRUCTURES.
- 1.4. PERMANENTLY STABILIZE AREAS TO BE VEGETATED AS THEY ARE BROUGHT TO FINAL GRADE.
- 1.5. PREPARE SITE FOR FINAL GRADING.
- 1.6. CONSTRUCT CONCRETE PADS.
- 1.7. INSTALL APPROPRIATE INLET PROTECTIONS PRIOR TO PAVING.
- 1.8. CONTRACTOR / CONSTRUCTION MANAGER TO COORDINATE WITH ENGINEER OF RECORD TO OBTAIN STABILIZED SITE STATUS.
- 1.9. CONTINUE DAILY INSPECTION REPORTS UNTIL THE FINAL DAILY INSPECTION REPORT IS SIGNED BY THE CONSTRUCTION MANAGER AND SUBMITTED.

Rev. #:	Date	Description

Graphic Scale: 80 0 80 160

SOLLI ENGINEERING
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Drawn By:	CMH
Checked By:	CJB
Approved By:	KMS
Project #:	22113201
Plan Date:	04/18/23
Scale:	1" = 80'

STATE OF CONNECTICUT KEVIN M. SOLLI 25759 LICENSED PROFESSIONAL ENGINEER

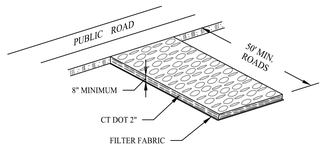
Kevin Solli, P.E.
CT 25759

Project:

PROPOSED SOLAR PHOTOVOLTAIC ARRAY

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title:	Sheet #:
SOIL EROSION & SEDIMENT CONTROL PLAN	2.31



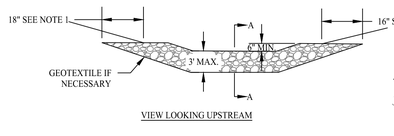
GRADATION TABLE

SQUARE MESH SIEVES	CONN. DOT 2" CRUSHED GRAVEL % FINER	ASTM C-33 NO. 2 % FINER	ASTM C-33 NO. 3 % FINER
2 1/2 INCHES	100	90-100	100
2 INCHES	95-100	35-70	90-100
1 1/2 INCHES	35-70	0-15	35-70
1 1/4 INCHES	0-25	---	---
1 INCHES	0-10	---	0-15
3/4 INCHES	---	0-5	---
1/2 INCHES	---	---	0-5
3/8 INCHES	---	---	---

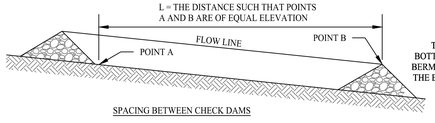
SOURCE:
U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, STORRS, CONNECTICUT

CONSTRUCTION ENTRANCE

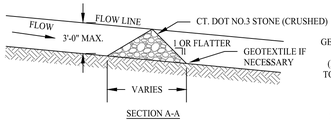
SCALE: NTS



VIEW LOOKING UPSTREAM

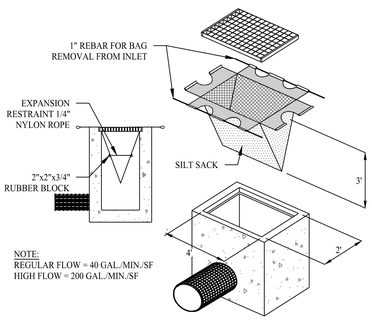


SPACING BETWEEN CHECK DAMS



SECTION A-A

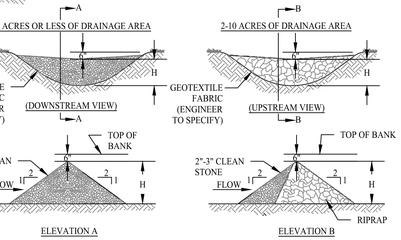
NOTES:
1. KEY STONE INTO THE DITCH BANKS AND EXTEND INTO THE ABUTMENTS A MINIMUM OF 18" TO PREVENT FLOW FROM FLANKING THE DAM.
2. THE MINIMUM DESIGN CAPACITY SHALL CONVEY A 2 YEAR-24 HOUR PEAK FLOW.



NOTE:
REGULAR FLOW = 40 GAL./MIN./SF
HIGH FLOW = 200 GAL./MIN./SF

SILT SACK DETAIL

SCALE: NTS



GENERAL RULE FOR SPACING:
THE ELEVATION OF THE BOTTOM OF THE UPSTREAM BERM SHOULD BE EQUAL TO THE ELEVATION OF THE TOP OF THE SUCCEEDING DOWNSTREAM BERM.

CHECK DAMS IN SWALE

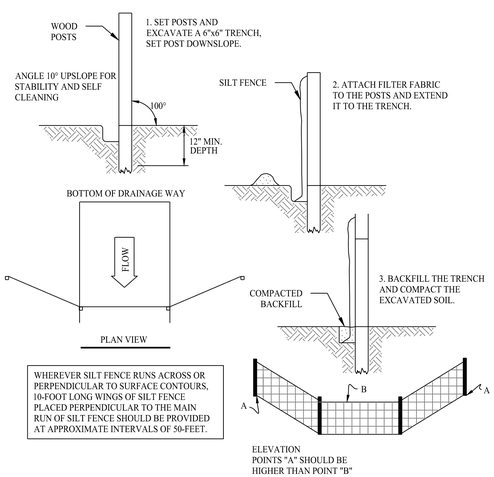
ELEVATION A

ELEVATION B

NOTE: SEE SITE MAP FOR LOCATION OF CHECK DAM(S).

STONE CHECK DAM DETAIL

SCALE: NTS

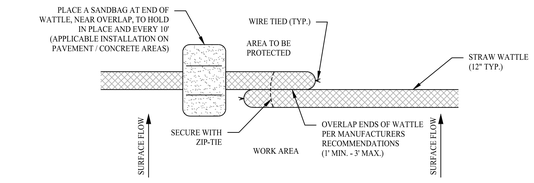


WHEREVER SILT FENCE RUNS ACROSS OR PERPENDICULAR TO SURFACE CONTOURS, 10-FOOT LONG WINGS OF SILT FENCE PLACED PERPENDICULAR TO THE MAIN RUN OF SILT FENCE SHOULD BE PROVIDED AT APPROXIMATE INTERVALS OF 50-FEET.

ELEVATION POINTS "A" SHOULD BE HIGHER THAN POINT "B"

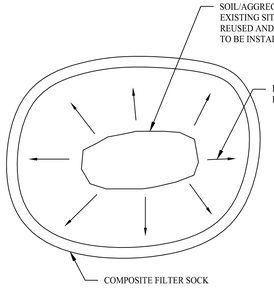
SILT FENCE PROTECTION DETAIL

SCALE: NTS



COMPOSITE FILTER SOCK

SCALE: NTS



NOTES
1. ALL EXISTING EXCAVATED MATERIAL THAT IS NOT TO BE REUSED IN THE WORK IS TO BE IMMEDIATELY REMOVED FROM THE SITE AND PROPERLY DISPOSED OF.

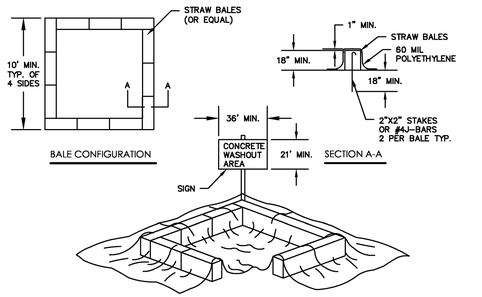
2. SOIL/AGGREGATE STOCKPILE SITES TO BE WHERE SHOWN ON THE DRAWINGS OR WHERE APPROVED BY CIVIL ENGINEER.

3. RESTORE STOCKPILE SITES TO PRE-EXISTING PROJECT CONDITION AND RESEED AS REQUIRED.

4. STOCKPILE HEIGHTS MUST NOT EXCEED 35'. STOCKPILE SLOPES MUST BE 2:1 OR FLATTER.

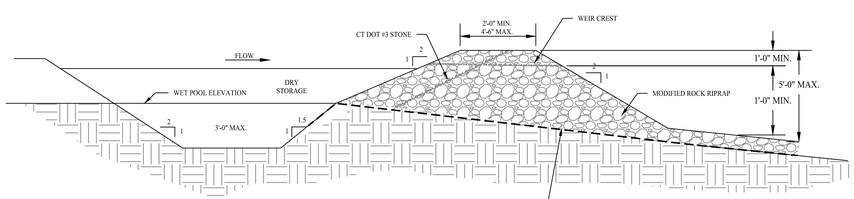
MATERIALS STOCKPILE DETAIL

SCALE: NTS

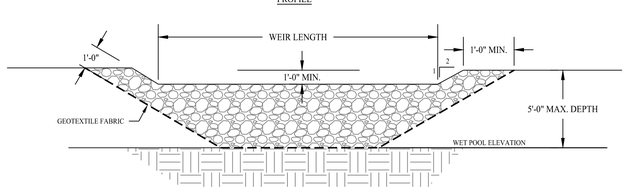


CONCRETE WASHOUT PIT

SCALE: NTS



PROFILE



WEIR CREST SECTION

EMERGENCY SPILLWAY DETAIL

SCALE: NTS

SOIL EROSION & SEDIMENT CONTROL NOTES

SEDIMENT & EROSION CONTROL NARRATIVE
THE SEDIMENT AND EROSION CONTROL PLAN WAS DEVELOPED TO PROTECT THE EXISTING ROADWAY AND STORM DRAINAGE SYSTEMS, ADJACENT PROPERTIES, AND ANY ADJACENT WETLAND AREA AND WATER COURSE FROM SEDIMENT LADEN SURFACE RUNOFF AND EROSION.

CONSTRUCTION SCHEDULE
THE ANTICIPATED STARTING DATE FOR CONSTRUCTION IS SUMMER 2023 WITH COMPLETION ANTICIPATED BY SPRING 2024. APPROPRIATE EROSION CONTROL MEASURES AS DESCRIBED HEREIN, SHALL BE INSTALLED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ALL SITE CLEARING OR CONSTRUCTION ACTIVITY. SCHEDULE WORK TO MINIMIZE THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED.

CONTINGENCY EROSION PLAN
THE CONTRACTOR SHALL INSTALL ALL SPECIFIED EROSION CONTROL MEASURES AND WILL BE REQUIRED TO MAINTAIN THEM IN THEIR INTENDED FUNCTIONING CONDITION. THE LAND USE AGENTS OF THE TOWN OF BETHANY AND ENGINEER OF RECORD SHALL HAVE THE AUTHORITY TO REQUIRE SUPPLEMENTAL MAINTENANCE OR ADDITIONAL MEASURES IF FIELD CONDITIONS ARE ENCOUNTERED BEYOND WHAT WOULD NORMALLY BE ANTICIPATED.

OPERATION REQUIREMENTS
CLEARING, GRUBBING & DEMOLITION OPERATIONS:
1. ALL SEDIMENTATION AND EROSION CONTROL MEASURES WILL BE INSTALLED PRIOR TO THE START OF CLEARING, GRUBBING AND DEMOLITION OPERATIONS.
2. FOLLOWING INSTALLATION OF ALL SEDIMENTATION AND EROSION CONTROL MEASURES, THE CONTRACTOR SHALL NOT PROCEED WITH GRADING, FILLING OR OTHER CONSTRUCTION OPERATIONS UNTIL THE ENGINEER OF RECORD HAS INSPECTED AND APPROVED ALL INSTALLATIONS.
3. THE CONTRACTOR SHALL TAKE EXTREME CARE DURING CLEARING, GRUBBING AND DEMOLITION OPERATIONS SO AS NOT TO DISTURB SEDIMENTATION AND EROSION CONTROL DEVICES AS WELL AS EXISTING LANDSCAPED AREAS.
4. FOLLOWING THE COMPLETION OF CLEARING, GRUBBING AND DEMOLITION OPERATIONS, ALL AREAS SHALL BE STABILIZED WITH TOPSOIL AND SEEDING, PROCESSED AGGREGATE STONE OR DISPERSED HAY AS SOON AS PRACTICAL.

ROUGH GRADING OPERATIONS:
1. DURING THE REMOVAL AND/OR PLACEMENT OF EARTH AS INDICATED ON THE GRADING PLAN, TOPSOIL SHALL BE STRIPPED AND APPROPRIATELY STOCKPILED FOR REUSE.
2. ALL STOCKPILED TOPSOIL SHALL BE SEEDED, MULCHED WITH HAY, AND ENCLOSED BY A SILTATION FENCE OR COMPOSITE FILTER SOCK.

FILLING OPERATIONS:
1. PRIOR TO FILLING, ALL SEDIMENTATION AND EROSION CONTROL DEVICES SHALL BE PROPERLY IMPLEMENTED, MAINTAINED AND FULLY INSTALLED, AS DIRECTED BY THE ENGINEER AND AS SHOWN ON THIS PLAN.
2. ALL FILL MATERIAL ADJACENT TO ANY WETLAND AREAS, IF APPLICABLE TO THIS PROJECT, SHALL BE GOOD QUALITY, WITH LESS THAN 5% FINES PASSING THROUGH A #200 SIEVE (BANK RUN), SHALL BE PLACED IN LIFT THICKNESS NOT GREATER THAN THAT SPECIFIED IN PROJECT SPECIFICATIONS. LIFTS SHALL BE COMPACTED TO 95% MAX. DRY DENSITY MODIFIED PROCTOR OR AS SPECIFIED IN THE CONTRACT SPECIFICATIONS OR IN THE GEOTECHNICAL REPORT.
3. AS GENERAL GRADING OPERATIONS PROGRESS, ANY TEMPORARY DIVERSION DITCHES SHALL BE RAISED OR LOWERED, AS NECESSARY, TO DIVERT SURFACE RUNOFF TO THE SEDIMENT TRAPS AND BASIN (IF APPLICABLE).

PLACEMENT OF DRAINAGE STRUCTURES, UTILITIES, AND ROADWAY CONSTRUCTION OPERATIONS:
1. SILT FENCES SHALL BE INSTALLED AT THE DOWNHILL SIDES OF TEMPORARY TRAPS, MUD PUMP DISCHARGES, AND UTILITY TRENCH MATERIAL STOCKPILES. HAY BALES MAY BE USED IF SHOWN ON THE EROSION CONTROL PLANS OR IF DIRECTED BY THE ENGINEER OF RECORD.

FINAL GRADING AND PAVING OPERATIONS:
1. ALL INLET AND OUTLET PROTECTION SHALL BE PLACED AND MAINTAINED AS SHOWN ON EROSION CONTROL PLANS AND DETAILS, AND AS DESCRIBED IN SPECIFICATIONS AND AS DESCRIBED HEREIN.
2. NO CUT OR FILL SLOPES SHALL EXCEED 2:1 EXCEPT WHERE STABILIZED BY ROCK FACED EMBANKMENTS OR EROSION CONTROL BLANKETS, JUTE MESH AND VEGETATION. ALL SLOPES SHALL BE SEEDED, AND ANY ROAD OR DRIVEWAY SHOULDER AND BANKS SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF FINAL GRADING UNTIL TURF IS ESTABLISHED.
3. PAVEMENT SUB-BASE AND BASE COURSES SHALL BE INSTALLED OVER AREAS TO BE PAVED AS SOON AS FINAL SUB-GRADES ARE ESTABLISHED AND UNDERGROUND UTILITIES AND STORM DRAINAGE SYSTEMS HAVE BEEN INSTALLED.
4. AFTER CONSTRUCTION OF PAVEMENT, TOPSOIL, FINAL SEEDING, MULCH AND LANDSCAPING, REMOVE ALL TEMPORARY EROSION CONTROL DEVICES ONLY AFTER ALL AREAS HAVE BEEN PAVED AND/OR GRASS HAS BEEN WELL ESTABLISHED AND THE SITE HAS BEEN INSPECTED AND APPROVED BY THE TOWN OF BETHANY LAND USE AGENT AND/OR ENGINEER OF RECORD.

INSTALLATION OF SEDIMENTATION AND EROSION CONTROL MEASURES

I. SILTATION FENCE:
- A. DIG A SIX INCH TRENCH ON THE UPHILL SIDE OF THE DESIGNATED FENCE LINE LOCATION.
- B. POSITION THE POST AT THE BACK OF THE TRENCH (DOWNHILL SIDE), AND HAMMER THE POST AT LEAST 1.5 FEET INTO THE GROUND.
- C. LAY THE BOTTOM SIX INCHES OF THE FABRIC INTO THE TRENCH TO PREVENT UNDERMINING BY STORM WATER RUN-OFF.
- D. BACKFILL THE TRENCH AND COMPACT.

II. SILT SACK INLET PROTECTION:
- A. REMOVE CATCH BASIN GRATE AND PROPERLY PLACE THE SILT SACK INTO THE FRAME OF THE CATCH BASIN.
- B. PLACE GRATE BACK ONTO FRAME AND ENSURE NO PORTIONS OF THE SILT SACK HAVE SAGGED INTO THE CATCH BASIN.
- C. ONCE GRATE IS PLACED BACK ONTO FRAME OBSERVE TO SEE IF SILT SACK IS INSTALLED IN A MANNER THAT WILL ALLOW FOR SEDIMENT TO BE FILTERED OUT DURING STORM EVENTS.

III. COMPOSITE FILTER SOCK:
- A. COMPOSITE FILTER SOCK TO BE PLACE IN ACCORDANCE WITH SHEET 2.31. ALL DAMAGED SOCKS AND POSTS SHALL BE REPLACED AND PROPERLY REPOSITIONED AS NECESSARY.
- B. COMPOSITE FILTER SOCK TO BE SECURED BY EITHER SAND BAG (IMPERVIOUS AREAS) OR BY WOOD STAKE HAMMERED INTO GROUND (PERVIOUS AREAS).
- C. SEDIMENT DEPOSITS SHALL BE REMOVED FROM BEHIND THE FENCE WHEN THEY EXCEED 3-4 INCHES IN HEIGHT.

IV. CONSTRUCTION ENTRANCE:
- A. REMOVE ALL VEGETATION AND OTHER MATERIALS FROM THE FOUNDATION AREA. GRADE AND CROWN FOUNDATION FOR POSITIVE DRAINAGE.
- B. PLACE 1-3" STONE A MINIMUM OF 100FT ALONG THE FULL WIDTH OF THE CONSTRUCTION ACCESS ROAD. AGGREGATE SHOULD BE PLACED AT LEAST 6" THICK.
- C. GEOTEXTILE FILTER FABRIC SHALL BE PLACED BETWEEN STONE FILL AND EARTH SURFACE TO TO REDUCE THE MIGRATION OF SOIL PARTICLES FROM THE UNDERLYING SOIL INTO THE STONE AND VICE VERSA.
- D. ALL SURFACE WATER THAT IS FLOWING TO OR DIVERTED TOWARD THE CONSTRUCTION ENTRANCE SHALL BE PIPED BENEATH THE ENTRANCE.
- E. FILTER FABRIC FENCE SHALL BE INSTALLED DOWN GRADIENT FROM THE CONSTRUCTION ENTRANCE IN ORDER TO CONTAIN ANY SEDIMENT-LADEN RUNOFF FROM THE ENTRANCE.

V. CHECK DAM
- A. CHECK DAMS MAY BE CONSTRUCTED OF ROCK, SAND BAGS
- B. ENSURE DAMS ARE SPACED SO THAT THE ELEVATION OF THE TOE OF THE UPSTREAM SAM IS EQUAL TO THE ELEVATION OF THE TOP OF THE DOWNSTREAM DAM.
- C. LOG DAMS SHALL BE CONSTRUCTED OF UP TO 6-INCH DIAMETER LOGS EMBEDDED AT LEAST 18 INCHES DEEP INTO THE SOIL.
- D. PLACE ROCK BY HAND OR MECHANICALLY TO ENSURE COMPLETE COVERAGE OF SWALE.

OPERATION AND MAINTENANCE OF SEDIMENTATION AND EROSION CONTROL MEASURES

I. SILTATION FENCE:
- A. ALL SILTATION FENCES SHALL BE INSPECTED AS A MINIMUM WEEKLY OR AFTER EACH RAINFALL. ALL DETERIORATED FABRIC AND DAMAGED POSTS SHALL BE REPLACED AND PROPERLY REPOSITIONED IN ACCORDANCE WITH THIS PLAN.
- B. SEDIMENT DEPOSITS SHALL BE REMOVED FROM BEHIND THE FENCE WHEN THEY EXCEED A HEIGHT OF ONE FOOT.

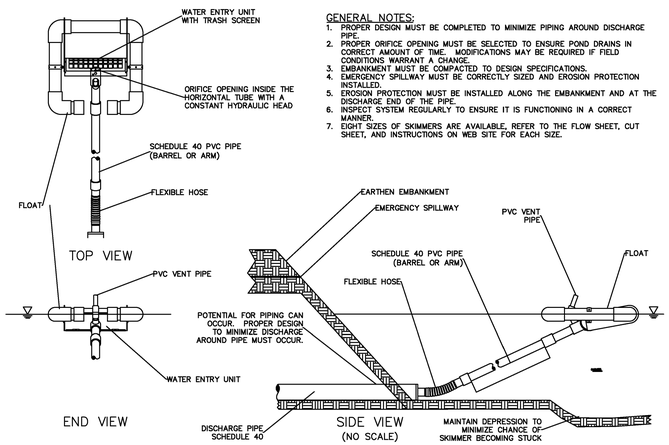
II. SILT SACK INLET PROTECTION:
- A. ALL SILT SACK INLET PROTECTION DEVICES SHALL BE INSPECTED AS A MINIMUM WEEKLY OR AFTER EACH RAINFALL. ALL DETERIORATE SILT SACKS AND SACKS THAT APPEAR TO HAVE AN EXCESS OF SEDIMENT SHALL BE REPLACED AND PROPERLY REPOSITIONED IN ACCORDANCE WITH THIS PLAN.
- B. SEDIMENT DEPOSITS SHALL BE REMOVED FROM THE SILT SACKS WHEN THEY EXCEED A COUPLE INCHES OF SEDIMENT WITHIN THE CATCH BASIN.

III. COMPOSITE FILTER SOCK:
- A. ALL COMPOSITE FILTER SOCKS SHALL BE INSPECTED AS A MINIMUM WEEKLY OR AFTER EACH RAINFALL. ALL DETERIORATED FABRIC AND DAMAGED POSTS SHALL BE REPLACED AND PROPERLY REPOSITIONED IN ACCORDANCE WITH THIS PLAN.
- B. SEDIMENT DEPOSITS SHALL BE REMOVED FROM BEHIND THE SOCK WHEN THEY EXCEED A HEIGHT OF 4 INCHES.

IV. CONSTRUCTION ENTRANCE:
- A. THE CONSTRUCTION ENTRANCE AND FENCE SHALL BE INSPECTED AT A MINIMUM WEEKLY AND AFTER HEAVY RAINS OR HEAVY USE.
- B. REMOVE MUD AND HEAVY SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROAD IMMEDIATELY.
- C. THE GRAVEL PAD SHALL BE TOPDRESSED WITH NEW STONE WHEN MUD AND SOIL PARTICLES CLOG THE VOIDS IN THE GRAVEL.
- D. RESHAPE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.
- E. REPAIR ANY BROKEN ROAD PAVEMENT IMMEDIATELY.

V. CHECK DAMS:
- A. INSPECT CHECK DAMS AFTER EACH RAINFALL EVENT.
- B. REMOVE SEDIMENT ACCUMULATIONS IN THE CHECK DAM.
- C. CHECK THE STRUCTURE AND ABUTMENTS FOR EROSION, PIPING, OR ROCK DISPLACEMENT AND REPAIR IMMEDIATELY.
- D. REMOVE CHECK DAMS AFTER DRAINAGE AREA HAS BEEN STABILIZED PERMANENTLY.

EROSION AND SEDIMENT CONTROL PLAN
1. SILTATION FENCE WILL BE INSTALLED AT ALL CULVERT OUTLETS IF CULVERT OUTLETS ARE APPLICABLE TO THIS PROJECT AND ALONG THE TOE OF ALL CRITICAL CUT AND FILL SLOPES.
2. CULVERT DISCHARGE AREAS WILL BE PROTECTED WITH RIP RAP CHANNELS; ENERGY DISSIPATERS WILL BE INSTALLED AS SHOWN ON THESE PLANS AND AS NECESSARY.
3. CATCH BASINS WILL BE PROTECTED WITH HAY BALE FILTERS, SILT SACKS, SILTATION FENCE, OR OTHER INLET PROTECTION DEVICES PER DETAILS, THROUGHOUT THE CONSTRUCTION PERIOD AND UNTIL ALL DISTURBED AREAS ARE THOROGHLY STABILIZED.
4. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL MANUAL, LATEST EDITION.
5. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED PRIOR TO CONSTRUCTION WHENEVER POSSIBLE
6. ALL CONTROL MEASURES WILL BE MAINTAINED IN EFFECTIVE CONDITION THROUGHOUT THE CONSTRUCTION PERIOD.
7. ADDITIONAL CONTROL MEASURES WILL BE INSTALLED DURING THE CONSTRUCTION PERIOD, IF NECESSARY OR REQUIRED OR AS DIRECTED BY THE ENGINEER OF RECORD.
8. SEDIMENT REMOVED FROM EROSION CONTROL STRUCTURES WILL BE DISPOSED IN A MANNER WHICH IS CONSISTENT WITH THE INTENT AND REQUIREMENTS OF THE EROSION CONTROL PLANS, NOTES, AND DETAILS.
9. THE OWNER IS ASSIGNED THE RESPONSIBILITY FOR IMPLEMENTING THIS EROSION AND SEDIMENT CONTROL PLAN. THIS RESPONSIBILITY INCLUDES THE INSTALLATION AND MAINTENANCE OF CONTROL MEASURES, INFORMING ALL PARTIES ENGAGED ON THE CONSTRUCTION SITE OF THE REQUIREMENTS AND OBJECTIVES OF THE PLAN.



GENERAL NOTES:
1. PROPER DESIGN MUST BE COMPLETED TO MINIMIZE PIPING AROUND DISCHARGE PIPE.
2. PROPER ORIFICE OPENING MUST BE SELECTED TO ENSURE POND DRAINS IN CORRECT AMOUNT OF TIME. MODIFICATIONS MAY BE REQUIRED IF FIELD CONDITIONS WARRANT A CHANGE.
3. EMBANKMENT MUST BE COMPACTED TO DESIGN SPECIFICATIONS.
4. EMERGENCY SPILLWAY MUST BE CORRECTLY SIZED AND EROSION PROTECTION INSTALLED.
5. EROSION PROTECTION MUST BE INSTALLED ALONG THE EMBANKMENT AND AT THE DISCHARGE END OF THE PIPE.
6. INSPECT SYSTEM REGULARLY TO ENSURE IT IS FUNCTIONING IN A CORRECT MANNER.
7. EIGHT SIZES OF SKIMMERS ARE AVAILABLE, REFER TO THE FLOW SHEET, CUT SHEET, AND INSTRUCTIONS ON WEB SITE FOR EACH SIZE.

FAIRCLOTH SKIMMER DISCHARGE SYSTEM

SCALE: NTS

PROVIDED BY: J. W. FAIRCLOTH & SON INC.

Rev. #:	Date	Description

SOLLI ENGINEERING
501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
11 Vanderbilt Ave, Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By:	CMH
Checked By:	CJB
Approved By:	KMS
Project #:	22113201
Plan Date:	04/18/23
Scale:	NTS

STATE OF CONNECTICUT KEVIN M. SOLLI 25759 LICENSED PROFESSIONAL ENGINEER

Kevin Solli, P.E.
CT 25759

Project:

PROPOSED SOLAR PHOTOVOLTAIC ARRAY

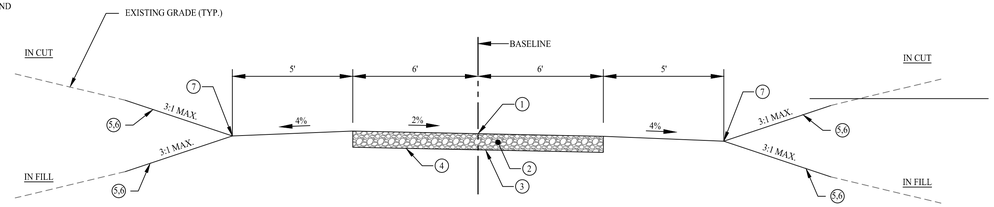
428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title:	Sheet #:
SOIL EROSION & SEDIMENT CONTROL NOTES & DETAILS	2.41

May 22, 2023 - 9:26am Anthony
X:\SE Files\Project Data\2022\22113201 - 428 Bethmour Road - Bethany\Cadd Data\22113201-2.41.dwg

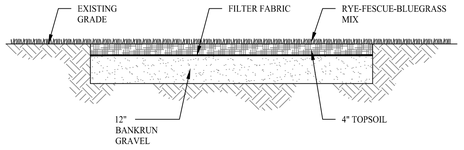
1. POINT OF APPLICATION OF GRADE OR MATCH EXISTING GROUND
2. 8" LAYER CRUSHER RUN GRAVEL
3. NONWOVEN GEOTEXTILE (MIRAFI 140N OR EQUAL)
4. LIMIT OF EXCAVATION OR LIMIT OF COMPACTION
5. EROSION CONTROL BLANKET ON SLOPES 3:1 OR GREATER
6. 6" TOPSOIL AND SEED
7. VEGETATED CHANNEL

NOTES:
1. THE CONTRACTOR SHALL CONTACT CT CALL BEFORE YOU DIG (CBYD) A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION.
2. TRANSITIONS BETWEEN TYPICAL ACCESS ROAD SECTIONS SHALL OCCUR OVER 50 FEET. (TYPICAL)



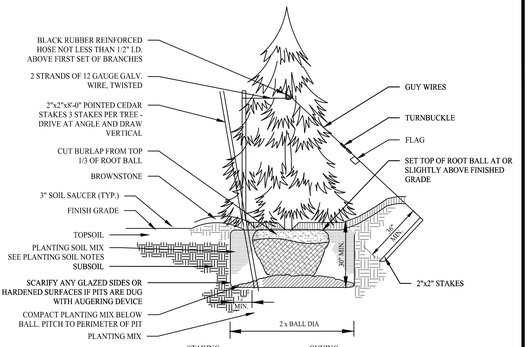
TYPICAL GRAVEL ROADWAY SECTION

SCALE: NTS



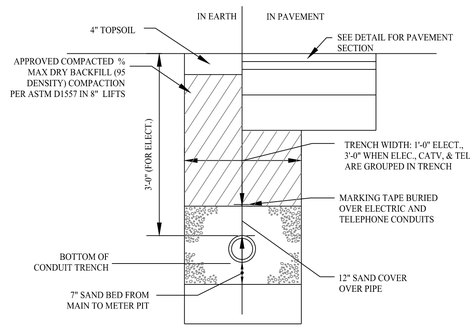
GRASS ACCESS DRIVE

SCALE: NTS



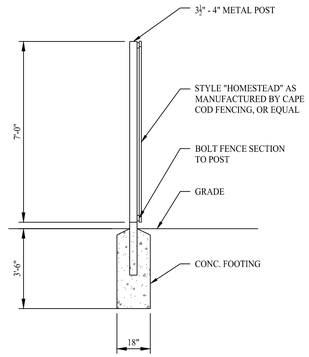
EVERGREEN TREE PLANTING

SCALE: NTS



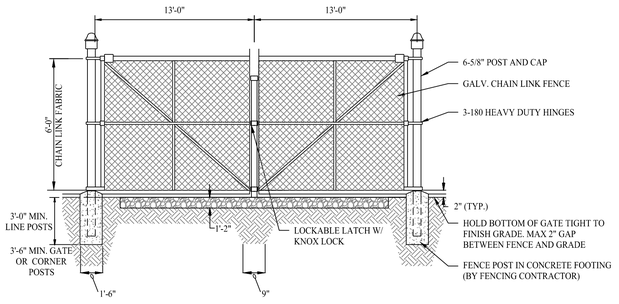
TYPICAL ELECTRICAL/TELEPHONE/CABLE AND GAS TRENCH

SCALE: NTS



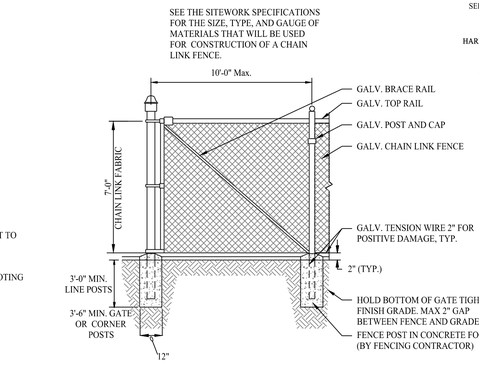
FENCE POST INSTALLATION

SCALE: NTS



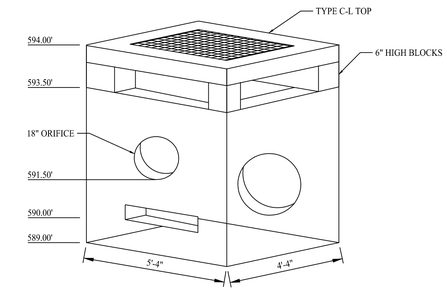
DOUBLE SWING GATE DETAIL

SCALE: NTS



7' HIGH CHAIN LINK FENCE DETAIL

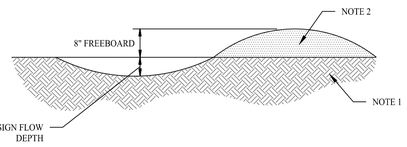
SCALE: NTS



OUTLET CONTROL STRUCTURE

SCALE: NTS

NOTES:
1. REMOVE ANY EXISTING VEGETATION AND SCARIFY OR BENCH ADJACENT SOILS PRIOR TO PLACING BERM.
2. BERM MATERIALS MUST BE ADEQUATELY COMPACTED AND STABILIZED.
3. REFER TO E&S PHASE I & II FOR TEMPORARY AND/OR FINAL STABILIZATION MEASURES.
4. BERM SHALL NOT BE CONSTRUCTED OF TOPSOIL.

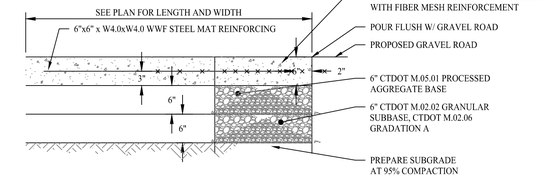


DIVERSION SWALE DETAIL

SCALE: NTS

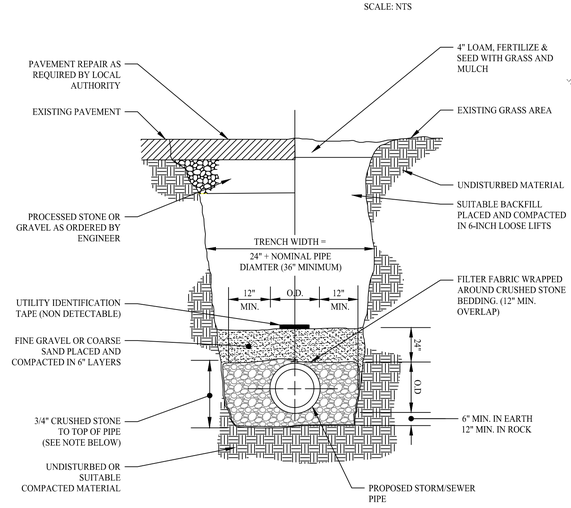
BROADCRESTED WEIR SPILLWAY

SCALE: NTS



CONCRETE UTILITY PAD

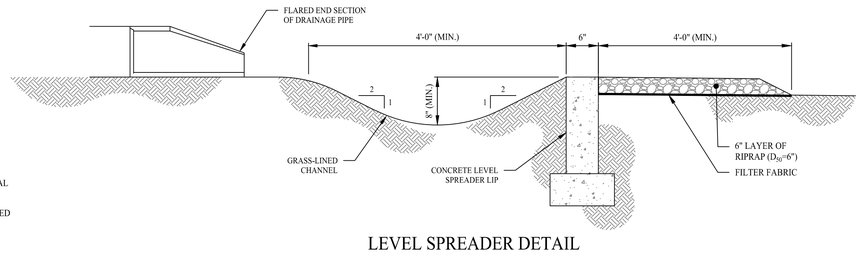
SCALE: NTS



NOTES:
- SUITABLE BACKFILL TO BE COMPACTED TO 95% MAX. DRY DENSITY IN LIFTS (6" TYPICAL) PER ASTM A1557/AASHTO T-99.
- SPECIAL FOUNDATION MAY BE REQUIRED AS DIRECTED BY CIVIL ENGINEER IN AREAS OF PEAT OR UNSUITABLES.
- TRENCH SUPPORT SYSTEMS TO BE USED PER OSHA STANDARDS.

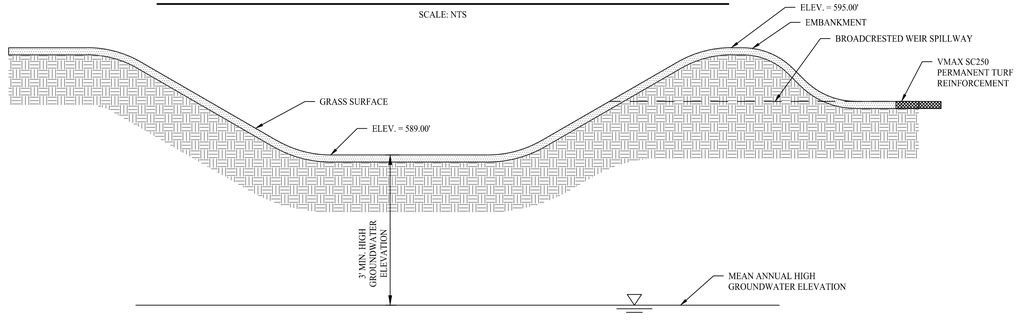
STORM TRENCH SECTION DETAIL

SCALE: NTS



LEVEL SPREADER DETAIL

SCALE: NTS



INFILTRATION BASIN CROSS-SECTION

SCALE: NTS

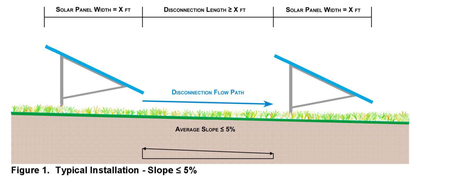


Figure 1. Typical Installation - Slope ≤ 5%

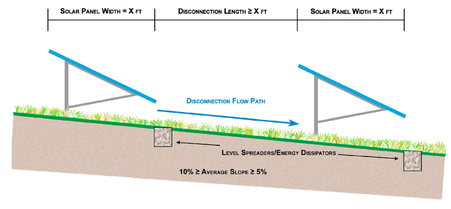


Figure 2. Typical Installation – Slope ≥ 5% but ≤ 10%

SOLAR ARRAY SPACING

SCALE: NTS

DETAIL PER MARYLAND DEPARTMENT OF THE ENVIRONMENT STORMWATER DESIGN GUIDE

Rev. #:	Date	Description

SOLLI ENGINEERING
501 Main Street, Monroe, CT 06468 T: (203) 880-5455 F: (203) 880-9695
11 Vanderbilt Ave, Norwood, MA 02062 T: (781) 352-8491 F: (203) 880-9695

Drawn By:	CMH
Checked By:	CJB
Approved By:	KMS
Project #:	22113201
Plan Date:	04/18/23
Scale:	NTS

STATE OF CONNECTICUT KEVIN M. SOLLI 25759 LICENSED PROFESSIONAL ENGINEER

Kevin Solli, P.E.
CT 25759

Project:

PROPOSED SOLAR PHOTOVOLTAIC ARRAY

428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Sheet Title:	Sheet #:
CONSTRUCTION DETAILS	3.01

Appendix C: USFWS

SOLLI ENGINEERING

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To:
Project Code: 2023-0039468
Project Name: Proposed Solar Photovoltaic Array

January 30, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Updated 12/27/2022 - Please review this letter each time you request an Official Species List, we will continue to update it with additional information and links to websites may change.

About Official Species Lists

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Federal and non-Federal project proponents have responsibilities under the Act to consider effects on listed species.

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested by returning to an existing project's page in IPaC.

Endangered Species Act Project Review

Please visit the "**New England Field Office Endangered Species Project Review and Consultation**" website for step-by-step instructions on how to consider effects on listed

species and prepare and submit a project review package if necessary:

https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review

NOTE Please do not use the **Consultation Package Builder** tool in IPaC except in specific situations following coordination with our office. Please follow the project review guidance on our website instead and reference your **Project Code** in all correspondence.

Northern Long-eared Bat - (Updated 12/27/2022) Please visit our New England Field Office Project Review webpage at the link above for updated northern long-eared bat consultation guidance. The Service published a final rule to reclassify the northern long-eared bat (NLEB) as endangered on November 30, 2022. The final rule will go into effect on **January 30, 2023**. After that date, the current 4(d) rule for NLEB will no longer be in effect, and the 4(d) determination key will no longer be available. New compliance tools will be available by mid- to late-January, and information will be posted on our New England Field Office Project Review webpage in January, so please check this site often for updates.
Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective. If your project may result in incidental take of NLEB after the new listing goes into effect, this will need to be addressed in an updated consultation that includes an Incidental Take Statement. Many of these situations will be addressed through the new compliance tools. If your project may require re-initiation of consultation, please wait for information on the new tools to appear on our website or contact our office at **newengland@fws.gov** for additional guidance.

Additional Info About Section 7 of the Act
Under section 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether projects may affect threatened and endangered species and/or designated critical habitat. If a Federal agency, or its non-Federal representative, determines that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Federal agency also may need to consider proposed species and proposed critical habitat in the consultation. 50 CFR 402.14(c)(1) specifies the information required for consultation under the Act regardless of the format of the evaluation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/service/section-7-consultations

In addition to consultation requirements under Section 7(a)(2) of the ESA, please note that under sections 7(a)(1) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Please contact NEFO if you would like more information.

Candidate species that appear on the enclosed species list have no current protections under the

ESA. The species' occurrence on an official species list does not convey a requirement to consider impacts to this species as you would a proposed, threatened, or endangered species. The ESA does not provide for interagency consultations on candidate species under section 7, however, the Service recommends that all project proponents incorporate measures into projects to benefit candidate species and their habitats wherever possible.

Migratory Birds

In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

https://www.fws.gov/program/migratory-bird-permit

https://www.fws.gov/library/collections/bald-and-golden-eagle-management

Please feel free to contact us at **newengland@fws.gov** with your **Project Code** in the subject line if you need more information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat.

Attachment(s): Official Species List

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Project Code: 2023-0039468
Project Name: Proposed Solar Photovoltaic Array
Project Type: Power Gen - Solar
Project Description: Development of a 0.99 MW AC solar photovoltaic array with associated improvements
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.41145755,-73.01363032324062,14z

Counties: New Haven County, Connecticut

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency: Solli Engineering
Name: Anthony Capuano
Address: 11 Vanderbilt Avenue, Suite 240
City: Norwood
State: MA
Zip: 02062
Email anthony@sollillc.com
Phone: 7813528491

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To:
Project code: 2023-0045225
Project Name: Bethany Solar Farm

February 14, 2023

Subject: Consistency letter for the 'Bethany Solar Farm' project indicating that any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o).

Dear Samuel Ulfsson:

The U.S. Fish and Wildlife Service (Service) received on February 14, 2023 your effects determination for the 'Bethany Solar Farm' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. You indicated that no Federal agencies are involved in funding or authorizing this Action. This IPaC key assists users in determining whether a non-Federal action may cause "take"[1] of the northern long-eared bat that is prohibited under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will

first need to be addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

Please report to our office any changes to the information about the Action that you entered into IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation.

If your Action proceeds as described and no additional information about the Action's effects on species protected under the ESA becomes available, no further coordination with the Service is required with respect to the northern long-eared bat.

The IPaC-assisted determination for the northern long-eared bat **does not** apply to the following ESA-protected species that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Candidate

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species listed above.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Bethany Solar Farm

2. Description

The following description was provided for the project 'Bethany Solar Farm':

> The proposed development is for a solar photovoltaic array that will produce .99 MW AC. The property is located at 428 Bethmour Road, Bethany CT. The property is 21.22 acres. 5.66 acres will be impacted by the development. No wetlands will be impacted by the development. No work is expected to be done within the 100' Upland Wetland Review Area (100' Wetland Buffer).

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@41.411761299999995,-73.01510739515678,14z

Determination Key Result

This non-Federal Action may affect the northern long-eared bat; however, any take of this species that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o).

Determination Key Description: Northern Long-eared Bat 4(d) Rule
This key was last updated in IPaC on **May 15, 2017**. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for non-Federal actions is to assist determinations as to whether proposed actions are excepted from take prohibitions under the northern long-eared bat 4(d) rule.

If a non-Federal action may cause prohibited take of northern long-eared bats or other ESA-listed animal species, we recommend that you coordinate with the Service.

Determination Key Result

Based upon your IPaC submission, any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o).

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   No

2. Will your activity purposefully **Take** northern long-eared bats?

   No

3. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/media/nleb-roost-tree-and-hibernacula-state-specific-data-links-0.

   Yes

4. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

5. Will the action involve Tree Removal?

   Yes

6. Will the action only remove hazardous trees for the protection of human life or property?

   Yes

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

1

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

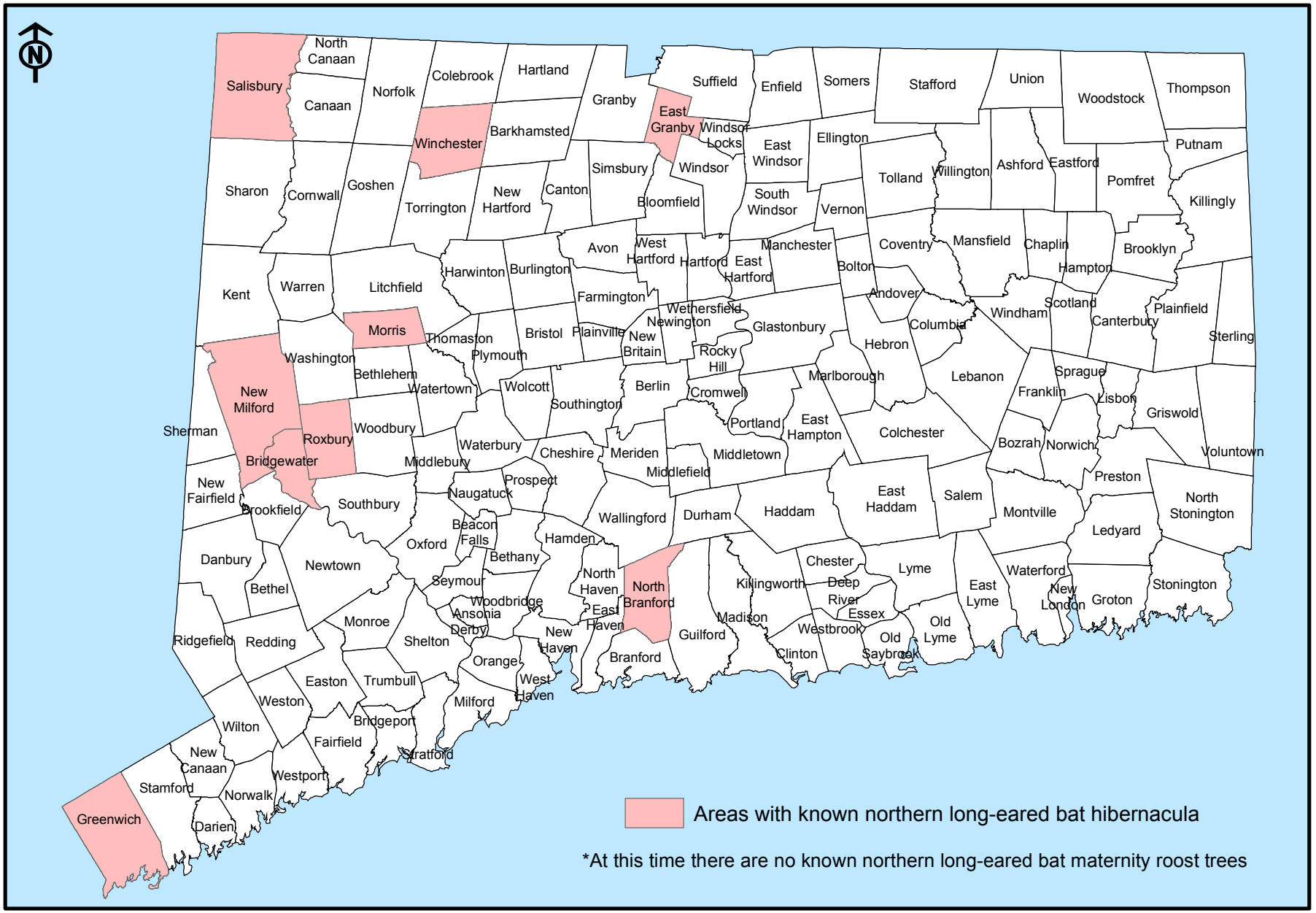
10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Solli Engineering LLC
Name: Samuel Ulfsson
Address: 501 Main Street #2A
City: Monroe
State: CT
Zip: 06468
Email sulfsson@sollillc.com
Phone: 2033216572

Northern long-eared bat areas of concern in Connecticut to assist with Federal Endangered Species Act Compliance



March 6, 2019

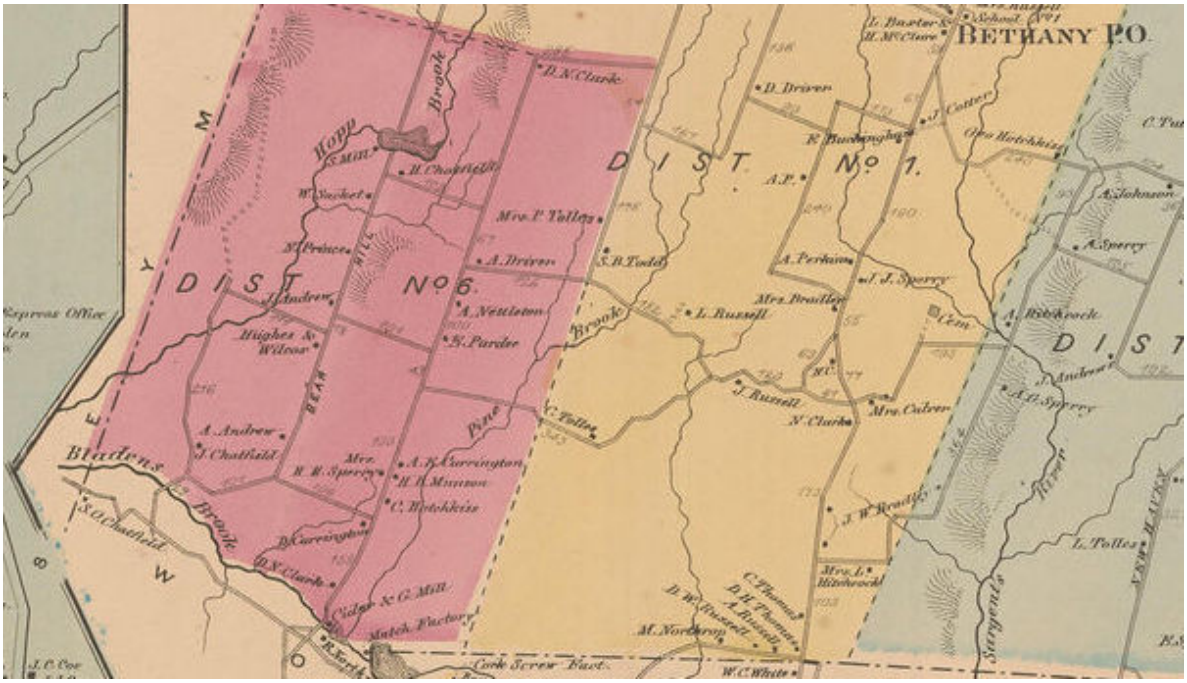
For information on federal requirements visit http://www.fws.gov/midwest/endangered/mammals/nleb/

Appendix D: Cultural Resources

SOLLI ENGINEERING

Phase Ia Archaeological Assessment Survey
Proposed Solar Photovoltaic Array
Town of Bethany, Connecticut

March, 2023



ACS

◆ *Archaeological Consulting Services* ◆

Phase Ia Archaeological Assessment Survey
Proposed Solar Photovoltaic Array
Town of Bethany, Connecticut

by

Gregory F. Walwer, Ph.D.
and
Dorothy N. Walwer, M.A.

of

ACS

for

Solli Engineering
501 Main Street, Suite 2A
Monroe, CT 06468
(203) 880-5455

March, 2023

ACS
◆ ***Archaeological Consulting Services*** ◆
118 Whitfield Street
Guilford, Connecticut 06437
(203) 458-0550
www.acsarchaeology.com
acsinfo@yahoo.com

Abstract

This report contains the results of a Phase Ia archaeological assessment survey conducted by ACS (Archaeological Consulting Services) during the month of March, 2023. The project calls for an evaluation of potential cultural resources to be affected by the construction of a solar farm on a property that measures about 22 acres in Bethany, Connecticut. The project property consists of two lots, including a two-acre house lot at 428 Bethmour Road in Bethany on the east side of the road, and an additional undeveloped 20-acre lot to the east. The project is being coordinated by Solli Engineering, a civil engineering firm based in Monroe, Connecticut. Solli supplied site plans which show the proposed development and existing conditions. The project is subject to review by the Connecticut Siting Council and the Connecticut State Historic Preservation Office (SHPO).

The project area lies in southwest Bethany, on the east side of Bethmour Road. Background research indicates a low sensitivity for potential prehistoric cultural resources, with a statistical prehistoric landscape sensitivity model developed and utilized by ACS indicating a high score of only 6.5 out of a potential 100.0, and therefore within the low sensitivity range (0-20). The low score can be attributed to rocky soil contexts and considerable distance to the nearest major water source, which is Pine Brook that flows through the eastern end of the project property but relatively far from the project area that is concentrated in the far western end of the property. The property bears a higher sensitivity for historic cultural resources, given its location on Bethmour Road that was occupied since at least the early 19th century.

Land records and historic maps indicate the presence of the Tolles house and farmstead to the north of the project area by the 1850s, which may be the same as the Greek Revival Street B. Todd house appearing on maps at a slightly different location by the 1860s. Neither house exists today, although there is an existing house on the property built in 1949. That house and its associated outbuildings are not architecturally distinctive, and therefore not eligible for the National Register of Historic Places (NRHP), nor are the various stone wall alignments on the property which have been sufficiently documented on historic and recent survey maps. Because of the possibility that previous historic occupations could have been located elsewhere on Bethmour Road, including within the project property, ACS recommends a Phase Ib archaeological reconnaissance survey, limited to an area within 300 feet of Bethmour Road and within the project impact area, prior to any construction activities and subject to review by the Connecticut State Historic Preservation Office (SHPO).

Project Summary

Project Name: Proposed Solar Photovoltaic Array, Bethany, Connecticut.

Project Purpose: To investigate possible cultural resources which may be impacted by the construction of a solar farm in Bethany, Connecticut, in compliance with requirements of the Connecticut Siting Council and the Connecticut State Historic Preservation Office.

Project Funding: The Nevar Company, Cheshire, Connecticut.

Project Location: 428 Bethmour Road, Bethany, Connecticut.

Project Size: ~22 acres.

Investigation Type: Phase Ia archaeological assessment survey.

Investigation Methods: Background research, pedestrian surface survey.

Dates of Investigation: March, 2023.

Performed by: ACS (Archaeological Consulting Services), 118 Whitfield Street, Guilford, Connecticut 06437, (203) 458-0550 (telephone), (203) 672-2442 (fax), acsinfo@yahoo.com.

Principal Investigators: Gregory F. Walwer, Ph.D. and Dorothy N. Walwer, M.A.

Submitted to:

Solli Engineering (Robert Pryor, Director of Site / Civil Engineering), 501 Main Street, Suite 2A, Monroe, CT 06468, (203) 880-5455.

Connecticut Office of State Archaeology (Dr. Sarah Sportman, State Archaeologist), University of Connecticut, 354 Mansfield Road, Storrs, Connecticut 06269-1176, (860) 486-5248.

Reviewing Agency:

Connecticut State Historic Preservation Office (Catherine Labadia, Staff Archaeologist), 450 Columbus Boulevard, Hartford, Connecticut 06103, (860) 500-2329.

Recommendations: Phase Ib archaeological reconnaissance survey of areas to be impacted within 300 feet of Bethmour Road. The existing 1949 house is not eligible for the National Register of Historic Places, nor are stone wall alignments which have been sufficiently recorded on survey maps.

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CHAPTER 1: INTRODUCTION

Project Description

This report provides the results of a Phase Ia archaeological assessment survey conducted by ACS for the planned development of a solar voltaic array, or solar farm, in Bethany, New Haven County, Connecticut. The owner of the property is The Nevar Company of Cheshire, Connecticut. The project consists of two lots, including a house lot at 428 Bethmour Road (Tax Map 113, Lot 1A) measuring 2.05 acres, and the adjacent lot to the rear of the house (Tax Map 113, Lot 1) that measures 19.65 acres. The project area is in southwest Bethany, on the east side of the road, and consists of a long parcel running west to east. The house lot contains a small, 620 square-foot home built in 1949.

ACS was contacted by Solli Engineering, a civil engineering firm based in Monroe, Connecticut to conduct the archaeological assessment survey for the project. Solli supplied ACS with a survey map, indicating that the survey was likely required for review by the Connecticut State Historic Preservation Office (SHPO) and Connecticut Siting Council. The survey map shows existing conditions, including topography and wetlands, as well as the location of the existing house and detached garage. The bulk of the proposed development would be in the western third of the overall property, with the demolition of the existing structures where an access drive is proposed.

ACS conducted the assessment survey in conformance with the *Environmental Review Primer for Connecticut Archaeological Resources* issued by SHPO. The assessment survey evaluated the potential need, if any, for a Phase Ib archaeological reconnaissance survey. The archaeological assessment survey consisted of a thorough background research effort and pedestrian surface survey to evaluate the potential sensitivity of the project area for any prehistoric and/or historic cultural resources, with SHPO to serve as review agency for the final report.

CHAPTER 2: BACKGROUND

Environmental Setting

The project area is located in the Town of Bethany, New Haven County, Connecticut. The project setting is in the Southwest Hills (IV-A) ecoregion of Connecticut. The project area lies in the southwest part of Bethany, a couple of miles to the east of Route 8. The area contains a mix of residential neighborhoods and small agricultural plots. The house at 428 Bethmour Road and associated outbuildings occupy the northwest corner of the project area on the east side of the road (Figure 1).

Underlying bedrock is a unit of Ordovician Granitic Gneiss (Og), an Ordovician formation on the order of 440 to 500 million years old (Rodgers 1985). Jurassic basalt intrusives appear within the formation that is steeply inclined, on the order of 65 to 80 degrees to the northwest. The property is set on a large glacial moraine, with one test bore to the north revealing 130 feet of till above bedrock (Stone et al. 1992). The project area is within the Bladens River drainage basin (#6919) that empties west into the Naugatuck River (McElroy 1991). A tributary of Bladens River named Pine Brook flows south through the very eastern end of the parcel and into Bladens River about one mile to the south of the project area (Figure 2). There is also a lesser wetlands body lying towards the center of the property, entirely to the east of the proposed development. The house at the western end of the property is set on a low hill peak at about 630 feet above mean sea level, with a generally southeast dipping surface to 600 feet above mean sea level at the eastern end of the development, and about 550 feet above mean sea level at the far eastern end of the property. The area surrounding the structures at the western end is mostly clear of vegetation other than a grass lawn and some thick scrub growth, while the rest of the property is wooded.

The project area contains three principal soil types (Figure 3) within an area designated as the Paxton-Woodbridge-Ridgebury soil association (Reynolds 1979; USDA NRCS websoil survey 2023). A unit of Woodbridge fine sandy loam (WxA / 45A) surrounds the house and outbuildings at the low hill peak. The moderately well drained soil typically has a profile with a topsoil of dark brown fine sandy loam to seven inches deep, followed by a fine sandy loam subsoil of dark yellowish brown over olive brown to 25 inches below the surface, and a substratum of olive, very firm gravelly fine sandy loam to five feet deep or more. Well drained Paxton fine sandy loam (PbB / 84B) is on the surrounding gentle hill slope, having a typical topsoil of dark brown fine sandy loam to eight inches deep, followed by a subsoil of dark yellowish brown and olive brown fine sandy loam to 25 inches deep, and a substratum of olive, very firm gravelly fine sandy loam to five feet deep or more. The Woodbridge and Paxton soils are very similar, with possibly better drainage characteristics for the Paxton soil. The rockier version of Woodbridge fine sandy loam (WzC / 47C) occurs downslope in steeper contexts, and with a similar profile to that of the less rocky version, but with a much thinner two-inch topsoil, and thicker subsoil to the same 25-inch depth. The less rocky soils would have been suitable for historic agricultural pursuits. Wetlands on the property are associated with poorly drained Ridgebury, Leicester, and Whitman fine sandy loam (RN).

Figure 1: Map of the Project Area

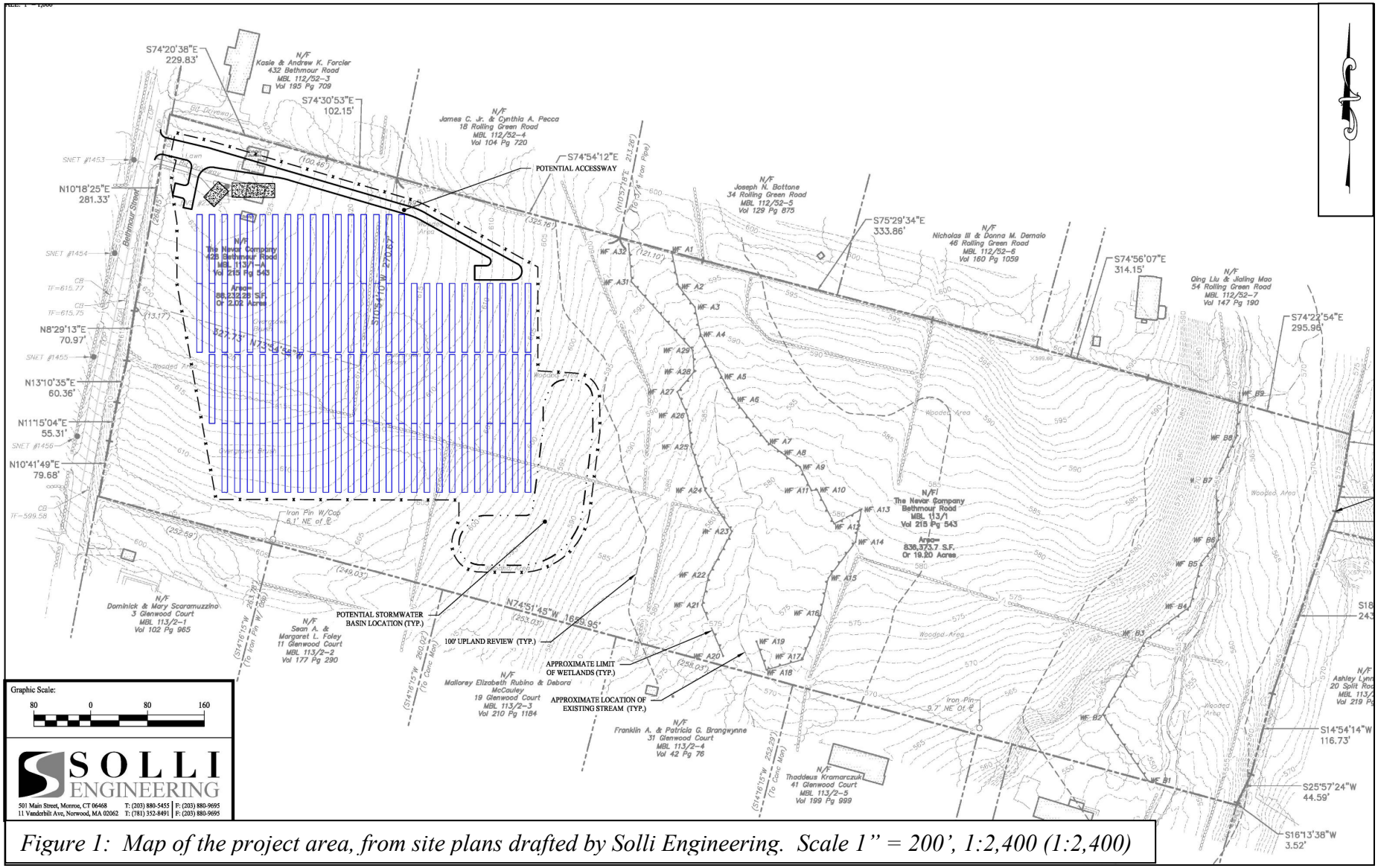

Figure 1: Map of the project area, from site plans drafted by Solli Engineering. Scale 1" = 200', 1:2,400 (1:2,400)

Figure 2: USGS 7.5' Topographic Map, Naugatuck Quadrangle

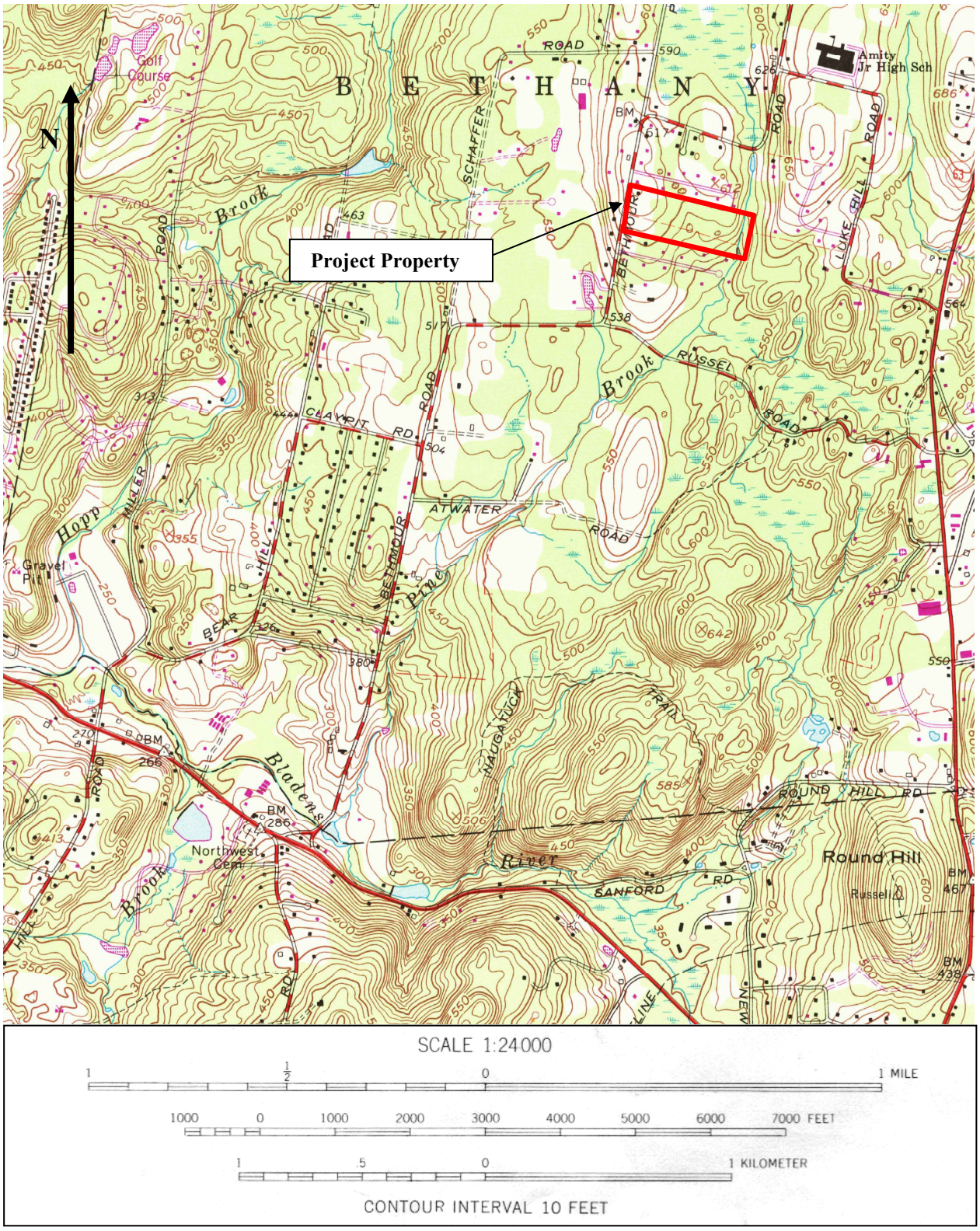

Figure 2: From USGS 1984.

Figure 3: USDA Websoil Survey Map

Figure 3: From USDA NRCS websoil survey.

Cultural Setting

Regional Prehistory

The prehistory of the project region and New England in general can be broadly divided into periods reflecting changes in environment, Native American subsistence and settlement patterns, and the material culture which is preserved in the archaeological record. Although it remains controversial today, the conservative estimates for the first occupations of North America are about 18,000 to 15,000 years ago, just after the maximum extent of the last glaciation and the broadest extent of the Bering land bridge (Kehoe 1981:7; Parker 1987:4; Jennings 1989:52). Southern Connecticut itself remained glaciated until about 15,200 B.P. (Snow 1980:103; Gordon 1983:71; Parker 1987:5; McWeeney 1994:181, 1999:6).

Paleo-Indian

The Paleo-Indian period is documented in Connecticut after 12,000 years ago and extends to roughly 9,500 B.P. (Swigart 1974; Snow 1980:101; Lavin 1984:7; Moeller 1984, 1999). This was a period of climatic amelioration from full glacial conditions, and a rise in sea levels which fell short of inundating the continental shelf. It was during this time that tundra vegetation was replaced by patches of boreal forests dominated by spruce trees (Snow 1980:114; Parker 1987:5-6), and eventually white pine and several pioneering deciduous genera (McWeeney 1994:182, 1999:7). Early in the period, the environment was conducive to the existence of large herbivores and a low population density of humans who procured these animals as a major subsistence resource, although warming temperatures and denser forests contributed to the extinction of certain species. The projected human social and settlement patterns are those of small bands of semi-nomadic or restricted wandering people who hunted mammoth, mastodon, bison, elk, caribou, musk ox, and several smaller mammals (Ritchie 1969:10-11; Snow 1980:117-120). Episodes of sparse vegetation during this period encouraged the use of high lookout points over hollows and larger valleys by people in pursuit of large game. The southern part of New England had an earlier recovery from glacial conditions when compared to areas to the north, however, with a higher density of vegetation that might have precluded Paleo-Indians of Connecticut from focussing heavily on the larger mammals (McWeeney 1994:182).

The cultural material associated with this period includes large to medium-sized, fluted projectile points (cf. Clovis), in addition to knives, drills, pieces esquillees and gravers, scrapers, perforators, awls, abraders, spokeshaves, retouched pieces, utilized flakes, and hammerstones (Wilbur 1978:5; Snow 1980:122-127; Moeller 1980). Although numerous finds from this period have been found in Connecticut, only a few, small *in situ* sites exist throughout the state. Finds tend to be located near very large streams in the lower Connecticut River Valley, and in rockshelters of other regions (McBride 1981). A survey performed by the Connecticut Office of State Archaeology and the Archaeological Society of Connecticut resulted in the documentation of 53 Paleo-Indian "find spots" in Connecticut (Bellantoni and Jordan 1995).

Early Archaic

The Early Archaic period lasted from approximately 9,500 B.P. to 7,500 B.P. (Snow 1980:159; Lavin 1984:9; Moeller 1984). Sea levels and temperatures continued to rise during this period as denser stands of forests dominated by pine and various deciduous species replaced the vegetation of the former period (Davis 1969:418-419; Snow 1980:114; Parker 1987:9; McWeeney 1994:184-185, 1999:8-9). This environmental change was rapid and caused a major shift in the animals it supported, including deer, moose, other small to medium-sized mammals, migratory birds, fish, and shellfish. The material culture changed along with the environmental conditions to include the atlatl and smaller stemmed and bifurcated projectile points (Stanly, cf. Kanawha and Lecroy) for procuring smaller, faster game in more closed settings (Wilbur 1978:6-7). The expanded tool set included choppers and anvil stones. Settlement patterns were probably becoming more territorialized towards a central-based wandering character (Snow 1980:171; see also Forrest 1999). The Early Archaic period is poorly represented in Connecticut and the lower coastal river valleys, probably resulting from a combined effect of low population densities in response to rapidly changing environmental conditions, as well as site location and preservation factors (Snow 1980:168; McBride 1981; McBride and Dewar 1981:45; Lavin 1984:9; McWeeney 1986; see also Forrest 1999).

Middle Archaic

The Middle Archaic period extended from approximately 7,500 B.P. to 6,000 B.P. (Snow 1980:173; Lavin 1984:9; McBride 1984; Jones 1999). It was by the end of this period of increased warming that sea levels and coastal configurations had stabilized and approached their present conditions (Kehoe 1981:211; Gordon 1983:82; Parker 1987:9). The period is marked by the establishment of forests with increasing proportions of deciduous hardwoods in relation to the pine predecessors in Connecticut (Davis 1969; Snow 1980:114; McWeeney 1999:10). The material culture included square or contracting-stemmed points (Neville, Stark, and Merrimac), semi-lunar groundstone knives, ground and winged banner stones for atlatls, plummets for nets, gouges, denticulates, perforators, percussed celts and adzes and grooved axes for woodworking (Snow 1980:183-184), as well as tools used in previous periods. This more extensive range of material culture indicates a broader subsistence base than in previous periods, including greater fish and shellfish procurement (Wilbur 1978:8; Snow 1980:178-182) which was associated with the stabilization of sea levels towards the end of the period. The increased breadth of subsistence resources had the effect of increasing scheduling efforts and may have caused settlement patterns to take on more of a central-based or seasonally circulating pattern with bands joining and dispersing on a seasonal basis (Snow 1980:183). Sites found in the lower Connecticut River Valley region suggest that a wider range of environments and associated site types were exploited, including both large and special task sites in upland areas (McBride 1981, 1984:56). This regional pattern may confirm the suggested settlement pattern of central-based, seasonally circulating or restricted circulating groups of people supported by logistical procurement sites throughout the state. Middle Archaic sites are fairly rare in Connecticut, again a combined product of rising sea levels and poor site preservation (see Forrest 1999).

Late Archaic

The Late Archaic period ranged from approximately 6,000 B.P. to 3,700 B.P. (Snow 1980:187; Lavin 1984:11; McBride 1984; Pfeiffer 1984; Cassedy 1999). This period is marked by a warm-dry maximum evident from pollen cores in the region (Davis 1969:414; Ogden 1977). Hardwood, oak-dominated forests very similar in character to ones established today covered most of Connecticut by the Late Archaic (Parker 1987:10). The Late Archaic in Connecticut has been divided into two traditions: the Laurentian and the Narrow Point (Lavin 1984:11), with the former perhaps being distributed more in the interior. The Laurentian tradition is defined by wider-bladed, notched and eared triangular points, and ground slate points and ulus, while the Narrow Point tradition includes smaller, thicker, and narrower points. The tool kit and general material culture became even more expanded during this period, with the advent of ground stone manos, nut mortars, pestles, and bowls, as well as stone pipes, bone tools, corner-notched (Vosburg, Brewerton, and Vestal), side-notched (Otter Creek, Brewerton, Normanskill), smaller narrow-stemmed (Dustin, Lamoka, Squibnocket, and Wading River), and triangular points (Squibnocket, Brewerton, and Beekman), grooved and perforated weights, fish weirs and harpoons, and decorative gorgets (Wilbur 1978:15-24; Snow 1980:228-231). The groundstone material has been inferred as being associated with an increased vegetable diet that consisted of berries, nuts, and seeds (Snow 1980:231; Lavin 1984:13), including acorn, butternut, chestnut, walnut, hickory, bayberry, blackberry, goose foot, cranberry, partridge berry, service berry, strawberry, and swamp current (Cruson 1991:29). Deer continued to be the predominant meat source, although animal remains recovered from archaeological sites in the region include black bear, raccoon, woodchuck, rabbit, otter, gray squirrel, red fox, gray fox, wolf, wild turkey, grouse, pigeon, migratory fowl, and anadromous and freshwater fish and shellfish (Cruson 1991:28-29). Various sea mammals and fish were procured along the coast.

The increasing breadth of the subsistence base and material culture was in turn associated with a central-based settlement pattern in which a restricted range of seasonally scheduled and used areas were exploited in a more semi-sedentary fashion than previously (Lavin 1984:13; Dincauze 1990:25). Sites in the lower Connecticut River Valley suggest that the larger rivers served more as long-term bases within a central-based circulating system than in the Middle Archaic (McBride 1981; McBride and Dewar 1981:48). The interior uplands of Connecticut may have supported a relatively independent set of seasonally circulating groups which used larger wetlands as long-term bases (Wadleigh 1981). Mortuary practices of the time suggest some sedentism for certain groups of people who were buried in specialized secondary cremation cemeteries and who may have had some control over restricted resources (e.g. riparian transportation routes) (Walwer 1996). Although the cremation sites largely include utilitarian funerary objects, some contain non-local materials which suggest trade association with cultures to the west of Connecticut (Walwer 1996).

Terminal Archaic

The Terminal Archaic period extended from approximately 3,700 B.P. to 2,700 B.P., as defined by the Susquehanna and Small-Stemmed traditions (Swigart 1974; Snow 1980:235; Lavin 1984:14; Pfeiffer 1984; Pagoulatos 1988; Cruson 1991; Cassedy 1999). Steatite, or soapstone, was a frequently used material by this time, and could be fashioned into bowls and other objects. The mass, permanency, and labor intensiveness of creating these heavy items have

led to the inference of more sedentary base camps, especially on large rivers where the development of a canoe technology had become fully established and increased the effective catchment area within which groups of people were gathering resources on a continuous basis. The material culture of the period was very similar to the Late Archaic, with a proliferation of stemmed projectile point types including Snook Kill, Bare Island and Poplar Island stemmed points, Orient Fishtail points, Sylvan and Vestal side-notched points, and Susquehanna corner-notched points. The resource base continued to consist of deer and small mammals, nuts, shellfish, turtles, and birds (Snow 1980:249). The first signs of ceramics (Vinette I pottery) tempered with steatite fragments appeared during this period (Lavin 1984:15; Lavin and Kra 1994:37; see also Cassedy 1999:131), and archaeological evidence of trade with other regions becomes more substantial for this time (Pfeiffer 1984:84).

The distribution of sites and site types in the lower Connecticut River Valley during this period suggests that there was a change in settlement to one with fewer, yet larger sites in riverine settings, and associated satellite task-specific sites in the uplands (McBride 1981; McBride and Dewar 1981:49). The implications are less foraging-strategy residential movement and more task-oriented collection activities within a radiating settlement pattern, but probably one in which some degree of seasonal circulation of settlement took place. Pagoulatos (1988) has shown that while sites associated with the Small-Stemmed tradition tend to suggest a more mobile settlement pattern in the interior uplands, sites of the Susquehanna tradition indicate a semi-sedentary collector strategy in major riverine and estuarine environments. At least certain groups exhibited semi-sedentism and some control over restricted resources, as indicated by the elaborate burials of the Terminal Archaic (Walwer 1996). Mortuary practices from the period include secondary cremation interments in formalized cemetery areas, with individual pits containing fragmented utilitarian material from communal cremation areas, as well as highly stylized funerary objects from non-local material (Walwer 1996). The lack of other, less formalized burial types evident in the archaeological record may be a matter of poor preservation, in which case it has been proposed that the cremation cemeteries are representative of a hierarchical society in which a portion of the people (of the Susquehanna "tradition") were able to generate a surplus economy that supported a semi-sedentary settlement pattern. This surplus may have been generated by the procurement and control over the transportation of steatite from various areas in Connecticut and surrounding territory.

Early Woodland

The Early Woodland period in Connecticut extended from about 2,700 B.P. to 2,000 B.P. (Lavin 1984:17; Juli and McBride 1984; Cruson 1991; Juli 1999). A cooling trend during the Early Woodland (Davis 1969:414; Parker 1987:10; McWeeney 1999:11) is thought to have reduced population sizes and regional ethnic distinction as the hickory nut portion of the resource base was significantly decreased, although the apparent decline in populations may possibly be related to other factors such as the inability to confidently distinguish Early Woodland sites from those of other periods (Filios 1989; Concannon 1993). Climatic deterioration and depopulation are in turn thought to have inhibited the progression towards, and association with, more complex social structures and networks that were developing further to the west and south (Kehoe 1981:215). A proliferation of tobacco pipes may indicate the beginnings of agricultural

efforts in the northeast. The Early Woodland of this region, however, exhibits no direct traces of subsistence crop remains, indicating continuity with previous periods in terms of subsistence practices (Lavin 1984:18).

Materially, the period is marked by a substantial development of a ceramic technology, with the Early Windsor tradition of pottery being dominant in the Early Woodland of Connecticut (Rouse 1980:68; Lavin 1984:17, 1987). Both Early Windsor cord-marked and Linear Dentate ceramic forms were being produced at this time. Diagnostic projectile points can be developmentally traced to indigenous points of previous periods, consisting of many stemmed forms in addition to Meadowood and Fulton side-notched points, Steubenville points, and Adena-Rossville types, but now may have been used in conjunction with the bow and arrow (Lavin 1984:18). Adena-like boatstones are also found in this period. Although rare contact with the Adena culture is evident throughout assemblages of the period, the Early Woodland in southern New England remained a very gradual transitional period (Snow 1980:279,287; Lavin 1984:19).

A heightened use of ceramics has been erroneously promoted as an automatic indication of increased sedentism in many areas. Instead, central-based camps with restricted seasonal encampments appear to be the dominant settlement pattern (Snow 1980:287). Minimal archaeological evidence from the lower Connecticut River Valley appears to suggest a similar settlement pattern to the Terminal Archaic in which large riverine sites served as central bases with upland seasonal dispersal or specific task sites (McBride 1981; McBride and Dewar 1981:49), but with a lesser degree of sedentism. Interior uplands populations also decreased during the Woodland era, perhaps related to the intensification of agricultural resources along major riverine and coastal areas (Wadleigh 1981:83). The trend towards greater mobility may in part be attributed to the decline in the use of steatite that no longer gave certain groups control over critical and restricted resources, as indicated by the declining ceremonialism of burial sites at the time which were more often located in habitation sites and exhibited combinations of secondary cremation features and primary inhumations (Walwer 1996). This transition in the socio-economics of the region was brought about by the decrease in importance of steatite as ceramics obscured its value for producing durable containers. Partially preserved primary inhumations appear for the first time in the region based on preservation considerations.

Middle Woodland

The Middle Woodland period lasted from about 2,000 B.P. to 1,000 B.P. (Lavin 1984:19; Juli and McBride 1984; Cruson 1991; Juli 1999). The climate was returning to the conditions basically witnessed today (Davis 1969:420; McWeeney 1999:11). It is a period which exhibited considerable continuity with previous periods in terms of both subsistence and material culture. Cylindrical pestles and groundstone hoes are tools diagnostic of the period and reflect developing agricultural efforts, including the cultivation of squash, corn, and beans on a seasonally tended basis (Snow 1980:279). Direct evidence for agriculture in the form of preserved vegetal remains, however, does not generally appear until the early Late Woodland (Lavin 1984:21) when corn is thought to have been introduced into the Connecticut River Valley from the upper Susquehanna and Delaware River Valleys (Bendremer and Dewar 1993:386). Projectile point forms from the period include Snyders corner-notched, LongBay and Port Maitland side-notched, Rossville

stemmed, and Greene lanceolate types. A proliferation of ceramic styles was witnessed during the Middle Woodland (Rouse 1980; Lavin 1984:19-20, 1987; Lavin and Kra 1984:37), including Rocker Dentate, Windsor Brushed, Sebonac Stamped, Hollister Stamped, Selden Island, and Windsor Plain types that were all also produced in the Late Woodland, with the exception of the Rocker Dentate. Ceramic forms from the Early Woodland were still being produced as well. Minor traces of the Hopewell cultures to the west are also present in the archaeological record of this period. Site types and distributions in the lower Connecticut River Valley imply that a moderate increase of sedentism with aspects of a radiating settlement pattern took place on large rivers, supported by differentiated upland task sites (McBride 1981; McBride and Dewar 1981:49). This trend may have been supported by the expansion of tidal marshes up larger rivers (McBride 1992:14).

Late Woodland

The Late Woodland period extended from approximately 1,000 B.P. to 1600 A.D., the time of widespread European contact in the broader region (Snow 1980:307; Kehoe 1981:231; Lavin 1984:21; Feder 1984, 1999). A warmer climate and increased employment of large scale agriculture for subsistence in New England were associated with increased population densities, more sedentary settlements, and more permanent living structures and facilities in larger villages. Settlements in Connecticut, however, tended to remain smaller with only small scale agricultural efforts, and as part of a seasonal round in which smaller post-harvest hunting and task-specific settlements were established in fall, and protected settlements occupied in winter (Guillette 1979:CI5-6; McBride and Bellantoni 1982; Lavin 1984:23; Starna 1990:36-37). Instead of maintaining permanent villages near agricultural plots, aboriginal populations engaged in the slashing and burning new plots and let old plots lie fallow periodically (Salwen 1983:89). In this area, domestic resources included corn, beans, squash, Jerusalem artichoke, and tobacco (Guillette 1979:CI5; Starna 1990:35). Agriculture was largely maintained by women, with the exception of tobacco (Salwen 1983:89; Starna 1990:36). Deer, small mammals, fish and shellfish, migratory birds, nuts and berries, and other wild foods continued to contribute significantly to the diet (Waters 1965:10-11; Russell 1980). Many of the foods produced were dried and/or smoked and stored in baskets and subterranean holes or trenches.

The increasing diversity of wild estuary resources may have served to increase sedentism in the coastal ecoregions of Connecticut (Lavin 1988:110; Bragdon 1996:67), while agriculture and sedentism may have been even more prominent along the larger river bottoms (Bragdon 1996:71). Late Woodland settlement patterns of groups in the uplands interior ecozones of Connecticut may have included the highest degree of mobility, while many sites from the central lowlands represent task-specific sites associated with larger settlements along the Connecticut River (McBride 1992:16). House structures consisted of wigwams or dome-shaped wooden pole frameworks lashed and covered with hides or woven mats, and clothing was made from animal hides (Guillette 1979:CI7-8; Starna 1990:37-38). Pottery for the period is defined as the Late Windsor tradition in Connecticut (Rouse 1980:68; Lavin 1984:22, 1987). Most of the ceramic forms of the Middle Woodland were still being produced, in addition to the newer Niantic Stamped and Hackney Pond forms. Ceramics of the East River tradition also appear in the area during the Late Woodland, having originated and been concentrated in the New York area (Rouse 1980; Wiegand 1987; Lavin 1987). The period exhibits some continuity in terms of

projectile point forms, although the Jack's Reef, Madison triangular, and Levanna points are considered diagnostic for the period. As likely with earlier periods, the material culture included various textile products such as baskets and mats, and wooden utensils such as bowls, cups, and spoons (Willoughby 1935; Russell 1980:56).

Unlike groups of the Mississippi valley, the overall cultural pattern for the entire Connecticut Woodland era exhibits considerable continuity. Interregional contact increased during this period, however, with non-local lithic materials increasing from as low as 10% to as high as 90% from the early Middle Woodland to the Late Woodland (McBride and Bellantoni 1982:54; Feder 1984:105), although most trade appears to have been done between neighboring groups rather than initiated through long-distance forays (Salwen 1983:94). The lack of enormous agricultural surpluses for the time is indicated by the low density of small storage features in habitation sites, as well as the ubiquitous primary inhumation of people without a select portion of graves exhibiting special treatment that would require high energy expenditure (Walwer 1996). As confirmed by early ethnohistoric accounts, this suggests a largely egalitarian and relatively mobile society for the Late Woodland despite the fact that this period marks the highest development of food production (i.e. agriculture) during the course of prehistory in the region. Corn was undoubtedly important, however, as a disproportionate amount of the simple, flexed burials were oriented towards the southwest which was the aboriginally acknowledged direction for the origins of corn and the Spirit Land.

Local Sites and Surveys

According to site files of the Connecticut Office of State Archaeology (CT OSA 2023) and Connecticut State Historic Preservation Office (CT SHPO 2023), there are ten previously recorded prehistoric archaeological sites within one mile of the project area (Figure 4). At about one mile to the southeast, the Uniroyal Nursery site (8-001) was surface collected by an amateur archaeologist, and produced a lanceolate quartz projectile point and debitage. More quartz tools and debitage were recorded at Bernard Berge's Site (8-025) nearby. The Claypit Field site (8-004) is about one-half mile to the southeast of the project area, where another surface collection procured a dentate stamped pipe stem, thus Woodland era to Contact period, and a similar find occurred about one mile to the southwest at the Carrington Site (8-019). The Krupien Site (8-027) is located about one mile to the west of the project area, where a narrow stemmed quartz projectile point was recovered. The Hinman Firehouse site (8-031) reportedly yielded hundreds of projectile points from a site just over one-half mile to the west. A Late Archaic Brewerton side-notched projectile point was recovered from the Paprosky's Vegetable Garden site (8-028) at about one mile east of the project area. Other sites (8-018; 020; 023) of the area do not have substantive information other than site location.

Summary

A low to moderate density of archaeological sites has been recorded in the region immediately surrounding the project area. Together with information from other surveys and previously recorded sites of the area, regional subsistence-settlement models described above are represented, with a variety of sites including smaller upland camp sites given the small stream environments in the area. The distribution of previously recorded sites is dispersed among the various tributaries of Bladens River, with most sites found by amateur archaeological surface collections, and possibly imprecise recording and mapping in some cases.

Figure 4: Prehistoric Sites of the Region

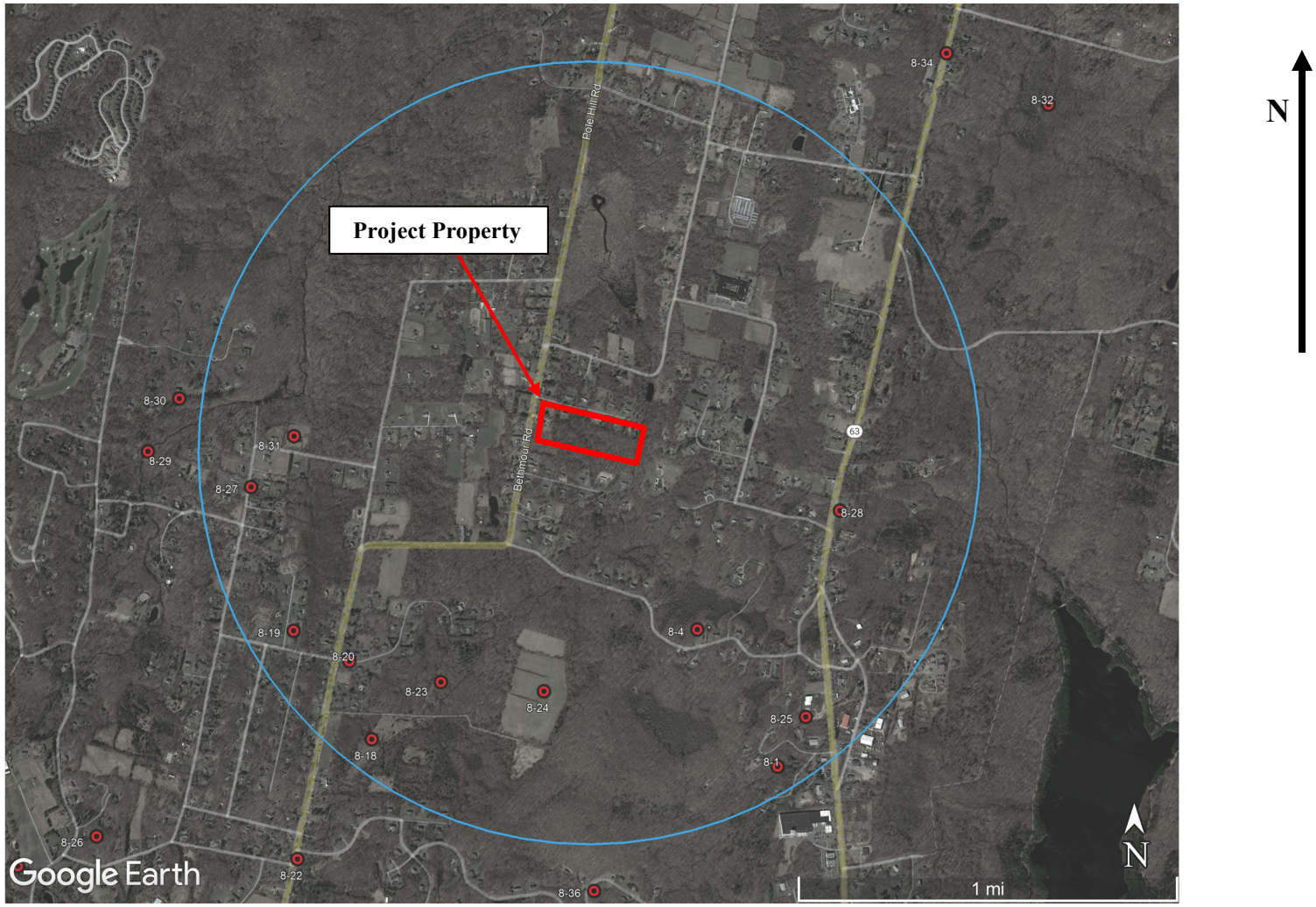

Figure 4: From CT SHPO 2023. Red dots are previously identified archaeological site locations, all prehistoric within the one-mile radius of 428 Bethmour Road.

Local History

Contact Period

The Contact period is designated here as the time ranging from the first substantial contact between Europeans and Native American inhabitants of the area, to the time the area was thoroughly occupied by Euroamerican settlers, from roughly 1600 to 1700. The first contact between aboriginal populations of the broader region and European explorers occurred in 1524 when Verrazano reached the coast of New England (Terry 1917:16). Others followed in the first decade of the 1600s (Salwen 1983). In 1614, Dutch explorers reached the Connecticut River (DeForest 1852:70; DeLaet 1909 [1625-1640]:43), and in 1625 they were met by the Quinnipiac in New Haven Harbor (Brusic 1986:9) when they established fur trading relationships with the native inhabitants in the region until the early 1630s (Guillette 1979:WP2-4). Substantial English settlements in the area started in 1635-1636. DeForest (1852:48) estimated about 6,000 to 7,000 Native Americans in Connecticut at this time, while Winthrop had estimated somewhere between 12,000 and 15,000 and most others (Trumbull 1818:40; Gookin 1970[1674]; Cook 1976; Snow 1980:35; Bragdon 1996:25) estimate between 16,000 and 20,000.

The composition of the tribes at the time of contact is fairly well known, although boundaries fluctuated significantly, as did the political alliances by which the tribes could be defined (Thomas 1985:138). Three major divisions of Algonkian speaking groups can be delineated, and their territories conform well to ecozone distributions (see Dowhan and Craig 1976:26 and Speck 1928:Plate 20), including the Mohegan-Pequot range in the Southeast Hills and Eastern Coastal ecoregions, the Nipmucks in the Northeast Hills and Northern Uplands ecoregions, and tribes of the Wappinger-Mattabesec Confederacy in the North Central Uplands and most of western Connecticut. The validity of the Wappinger-Mattabesec Confederacy as a cultural entity has been challenged (Salwen 1983:108-109), with many smaller and somewhat independent tribes occupying much of the western half of the state.

The Paugussetts and Naugatucks occupied the territory surrounding the project area at the time of initial contact, with the Paugussetts on the western side of the Housatonic and lower Naugatuck Rivers, and the Naugatucks to the north near the town of the same name, although records of various early land transactions suggest that the Paugussetts and Naugatucks were very integrated and closely affiliated, along with the nearby Pequannocks, Pootatucks, and Wepawaugs who have all been loosely termed Paugussetts (DeForest 1852:49-50; Guillette 1979:GH-1-2). The Paugussett confederacy of these five tribes occupied an area loosely defined by the West River of West Haven to the east, Sasco Brook in Fairfield to the west, the confluence of the Shepaug and Housatonic Rivers to the north, and further north along the Naugatuck River drainage (Spiess 1933:31; Guillette 1979:GH-2). According to Speck (1928), the Paugussetts were linguistically part of the larger Wappinger-Mattabesec Confederacy of tribes that extended west of the Connecticut River and onto Long Island.

Ethnohistoric sources yield clues to aboriginal Final Woodland and early Contact settlement patterns (McBride and Bellantoni 1982; Starna 1990:36-37). Spring settlements were located to take advantage of anadromous fish runs in larger drainages and along the coast. Late spring attention focussed on tending corn fields. Semi-sedentary settlements near these fields were supported by special task hunting and gathering sites. Dispersal in the late fall and winter brought smaller groups into protected, upland or interior valleys where hunting and gathering continued, for a longer duration in the Contact period than earlier and by a smaller subsistence

unit (family). Fortified villages were likely a response to very early Contact period intertribal political strife resulting from increased economic pressures of sedentism and territoriality (Salwen 1983:94; McBride 1990:101; but see Thomas 1985:136). One such fortified village of the Paugussetts is said to have been located on the Housatonic less than a mile north of its confluence with the Naugatuck River (DeForest 1852:51). Large villages were found to be associated with a central-based circulating settlement pattern with family units dispersing from and returning to the major settlement on a seasonal basis in the lower Connecticut River Valley and surrounding region in the early Contact period (McBride 1981). Eventually, however, many Native American populations had been dispersed and afflicted by disease, warfare, and intertribal conflict to the point that small, scattered reservations served as the last community sites for various aboriginal populations in the area. Small Native American settlements of the late 17th century may have been located at Hospital Bluff on the west side of the Naugatuck, and near East Mountain on Mad River to the east (Anderson 1896(1)).

The early Contact period economic base for Native Americans in Connecticut continued to consist of hunting deer and small mammals, gathering berries, nuts and roots, and procuring shellfish and fish on larger drainages and along the coast (Waters 1965:7; Salwen 1970:5). This basic subsistence strategy was supported by varying intensities of horticulture, including the production of corn as the staple, as well as squash, beans, Jerusalem artichoke, and tobacco (Guillette 1979:CI5; Starna 1990:35). The importance of corn is evident in the description of ritual activities, including the Green Corn Festival and similar ceremonies that extended with various groups into the present day (Speck 1909:194-195; Speck 1928:255; Tantaquidgeon 1972:81; Fawcett 1995:54-57). Elderly women held extensive knowledge of wild plants which provided a host of medicines and treatments (Tantaquidgeon 1972; Russell 1980:35-37). Wigwams continued to serve as the principal form of housing, in some cases well into the 18th century (Sturtevant 1975).

The material culture included a mix of aboriginal forms as well as some European goods such as metal kettles and other metal implements (knives, projectile points), cloth, glass beads, and kaolin pipes (Salwen 1966, 1983:94-96). Wampum served as an important trade item for the Native Americans with European traders, but more significantly had served as symbolic signs of allegiance or reciprocity and sacred markers or tokens of honor in the form of belts (Guillette 1979:CI8; Ceci 1990:58-59; Salisbury 1990:87; Fawcett 1995:59). With European metal drill bits, tribes along the coast were now mass producing wampum for trade with the Dutch and English who in turn used the shell beads to trade with other tribes further inland (Salwen 1983:96; Ceci 1990:58). Late Contact period Euroamerican goods included various metal tools, glass bottles, ceramic vessels, kaolin clay tobacco pipes, and nails (McBride and Grumet 1992). Unlike the Late Woodland, Contact aboriginal lithic products were once again mostly manufactured from local sources (McBride and Bellantoni 1982:54). Dugout canoes may have continued to provide a major form of transportation in larger drainages (Salwen 1983:91). While colonization brought new material goods to Native Americans in the area in exchange for land and services, the indigenous inhabitants became increasingly subject to legislative and economic restrictions by the colonists (Salisbury 1990:83).

Sachems and councils of leading males formed the basic political unit for groups of villages (Gookin 1970; Simmons 1986:12-13), along with clan mothers whose authoritative roles became diminished as a result of a strong European male-leadership bias (Fawcett 1995).

Tributes paid to sachems were generally used as reserves for the tribe at large. Although sachems were generally assigned by hereditary lineage, this was not always the case (Bragdon 1996:140-141). Authority was usually enforced by persuasion of a council. Shamans were "magico-religious" specialists of the tribes who also had a considerable role in leadership and decision-making (Speck 1909:195-196; Simmons 1986:43; Starna 1990:42-43). Rules of obligation and reciprocity operated on all levels of tribal-wide decision-making (Bragdon 1996:131-134), serving to diffuse centralized authority. Other special status roles included warriors and persons who had visions, thus social status was largely based on achievement and recognition. While the assignment of lineality (i.e. matrilineal vs. patrilineal) for the area tribes is still largely debated (Bragdon 1996:157), the well established practice of bride-pricing supports the contention of patrilineal social organization (Speck 1909:193; Salwen 1983:97). Post-marital residence appears to have been ambilocal.

On a larger scale, more powerful tribes demanded tributes from smaller ones, often resulting in loose alliances between the latter. This process resulted in a dynamic political situation that prompted intertribal conflict, especially after contact with Euroamericans (Guillette 1979; Bragdon 1996). The European settlers would eventually use this embedded rivalry system to their advantage. In the period between 1616 and 1619, and more severely around 1633, disease epidemics would initiate a trend of drastic reductions in the native population that aided in Euroamerican settlements of the area (Snow and Lanphear 1988; Snow and Starna 1989; Starna 1990:45-46). Diseases introduced into the Americas included chicken pox, cholera, diphtheria, malaria, measles, oncercerosis, poliomyelitis, scarlet fever, smallpox, tapeworms, trachoma, trichinosis, typhoid fever, whooping cough, and yellow fever (Newman 1976:671).

In 1637, the Paugussetts provided refuge for Pequots who were fleeing after their defeat in the Pequot "War", although this resulted in the defeat of the hosts by the colonists (Guillette 1979:GH-2). The Paugussetts may have been centered along the Naugatuck in western Ansonia at this time (Larson 1976:1). First land transactions between the Paugussetts and English settlers occurred in Milford about 1639 (Guillette 1979:GH-3-4).

Trade between the English colonists and the Paugussetts was apparently peaceful in the early part of the Contact period, but after the war between Hudson River tribes and the Dutch in the early 1640s, colonists in Connecticut became concerned about the possibility of "uprisings" and proceeded to enact laws which would restrict Native American activity (Guillette 1979:GH-4). Friction increased as the Paugussetts began to become familiar with the consequences of their previous land transactions as well as agreements to pay tribute to Connecticut for protection against the Mohawks. English settlers let livestock feed freely in Native American corn fields, and an effort by Wepawaugs to burn underbrush for ecological purposes in Milford resulted in a larger fire that was interpreted by colonists to be a Native American attack (DeForest 1852:222). Other tensions of the 1640s included personal skirmishes and issues over European weapon and liquor procurement by Native Americans in the area. As colonist populations grew and the perceived Native American threat diminished, land purchases proliferated in the 1650s. Early settlers of the Naugatuck Valley region were granted rights to mine graphite in the area by 1657. By 1665, almost all property in the southern portions of Paugussett territory had been sold by Ansantawae and the other sachems without full realization of the consequences (DeForest 1852:270; Orcutt 1972 [1882]:14-15).

The aboriginal populations of the area found it increasingly difficult to continue their original adaptations, and were allotted areas on Golden Hill (Pequannocks) in Bridgeport in 1659, and Turkey Hill (Wepawaugs) in Derby on the Housatonic in 1671 to serve as reservations (DeForest 1852:264; Orcutt 1972 [1882]:13; Guillette 1979:GH1) where many subsequently tried to subsist by manufacturing baskets and engaging in other small industries. Land disputes continued after this time, and in 1680 these conflicts led to the establishment of the Corum Hill Reservation in Huntington, the agreement for which included the rights of the Paugussetts to procure fish and game in the Derby area (DeForest 1852:270; Guillette 1979:GH-8). Native American populations declined throughout the Contact period, and many in southwestern Connecticut emigrated to the north and west after King Philip's War of 1675.

As early as 1639, Euroamerican settlers from New Haven started to occupy the greater Milford area, the town then including the western part of Bethany. Bethany territory itself was not occupied by Euroamerican settlers until Alexander Bryan of Milford purchased land from Nehantond, a Naugatuck tribal member, in 1664. As with their southern counterparts, these late sales resulted in the effective removal of northern Paugussetts to areas not yet occupied by English settlers to the north and west. By 1710, approximately 500 Paugussetts remained in the greater Housatonic valley region (Cook 1976:68).

18th Century

In 1731, the Paugussett Nation was dismantled (DeForest 1852:354; Guillette 1979) as removals continued. Waterbury had a short-lived Quinnipiac reservation on the southeast part of East Mountain at this time (Anderson 1896(1):357). The Turkey Hill reservation population was supposedly reduced to four persons by 1774, and the Golden Hill reservation population reduced to seven by 1765 (DeForest 1852:354-355). The end of the 18th century witnessed the continued decline of reservation populations due to land sales, Euroamerican encroachments on the land, as well as migrations to other parts of the state and New York during the "Brothertown" movement (Guillette 1979:GH-8,9). These combined factors essentially led to the end of aboriginal adaptations by the end of the 18th century when most Native Americans of the region were forced to become somewhat integrated into Euroamerican communities. By 1850, very few Paugussetts were in the area, most having moved to join the Scaghticokes or Iroquois further to the north (Spiess 1933:31).

A substantial land purchase in 1700 by Milford settlers was known as the “Two-Bit Purchase,” signifying the small amount of compensation for what was not likely fully comprehended as exclusive, indefinite land-use rights. Other land sales followed in the early 18th century. Amity Road (Route 63) was a well established route through Bethany by the first quarter of the 18th century, connecting Waterbury and New Haven. Amity Parish was incorporated by the General Assembly in 1738, consisting of most of Bethany and Woodbridge territory (Whitlock 1982:10; Sharpe 1989:41), and the Congregational Church was built at the Woodbridge town green a few years later. The first schoolhouse of Amity was constructed at the intersection of Old Amity Road and Meyers Road about one-half mile east of the project area in 1750 (Sharpe 1989:104). In 1762, Bethany and Woodbridge were divided, with Bethany Parish receiving its name from a biblical reference (Lines 1905:2; Whitlock 1982:143-144; Sharpe 1989:2,9). The first Congregational Church in Bethany was built at intersection of Amity Road and Dayton Road, also about one-half mile east / northeast of the project area, and completed by

1773. Bethany supplied men and provisions to the militia effort of New Haven following an attack by the British in the summer of 1779, although Tories of the area were still active. The town of Woodbridge was formally incorporated in 1784, and at that time included Bethany territory (Whitlock 1982:148). Litchfield Turnpike (Route 69) was built and improved by the Straits Turnpike Company in 1797 (Sharpe 1989:111). Bethany Union Library was founded in 1798, and the Episcopal Church was organized in 1799.

19th Century

The project property was probably part of the Daniel Tolles family land holdings of the early 19th century, and it was likely farmed at that time. A mid-19th century map (Whiteford 1852) shows N. (Nehemiah) Tolles as the owner of a homestead to the north of the project property on Bethmour Road, with no other homes on the east side of the road at that time (Figure 5a). Early 19th century industry in Bethany was focused on wool production (Sharpe 1989:45). The town of Bethany was not separated from Woodbridge and incorporated as its own town until 1832 (Lines 1905:6; Whitlock 1982:142,149; Sharpe 1989:2). In an unfortunate event to follow, the first selectmen removed a last indigenous Native American family to Derby, who were then mostly wiped out by smallpox. New schools and churches were built (Sharpe 1989), and the town reached a population of 1,170 by 1840, followed by an overall decline in population until the early 20th century due to the migration of farmers and others westward (Whitlock 1982:149). A railroad line from Cheshire to Plainville was built in 1848 to within two miles of Bethany to the east.

By the mid to late 19th century, the Johnson family owned the project property and other lands on the east side of Bethmour Road. Nearby the project property, the Street B. Todd family owned a 22-acre parcel with a dwelling acquired from his father in-law Spencer Hotchkiss according to land records (Land Records Volume 5, page 208 - 1857), with the Johnsons owning land on all sides except for the highway to the west. The house was a Greek Revival structure (Bunton 1972), likely built in the 1830s to 1850s, thus possibly the same as Tolles house but mapped to the south of the project property, likely in error (Figure 5b). Unlike the Todd parcel, there was no mention of any particular structures on parcels owned by the Johnson family that surrounded the 22-acre parcel.

The late 19th century of Bethany was marked by the development of utilities. In 1888, the West River was dammed to form Lake Watrous that was managed by the New Haven Water Company, followed by the creation of other lakes over the next decade (Sharpe 1989:44). The telephone was introduced to Bethany by 1898.

20th Century+

At the start of the 20th century, the town population was reduced to 517, about one-half its peak from the prior century (Lines 1905:7). A chestnut blight in 1910 depleted an important lumber supply in town. A town hall was built in 1914, and the Bethany Grange was organized the following year. Amity Road was paved in 1918. 1920 witnessed the low point in Bethany population at just 411 people, followed by steady population increases. In 1934, the school system began to consolidate, with the Bethany Community School on Peck Road replacing four one-room schoolhouses. In 1936, Clark Memorial Library was established.

Figure 5a: Historic Sites of the Area (1852 Map)

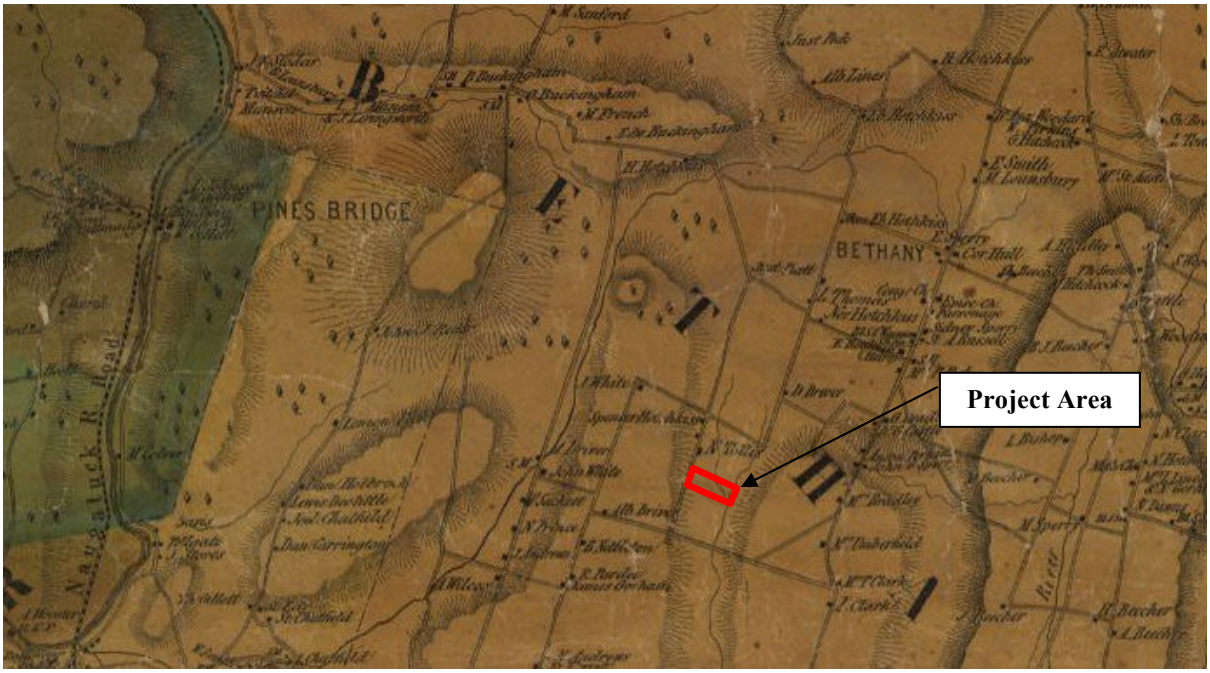

Figure 5a: From Whiteford 1852.

Figure 5b: Historic Sites of the Area (1868 Map)

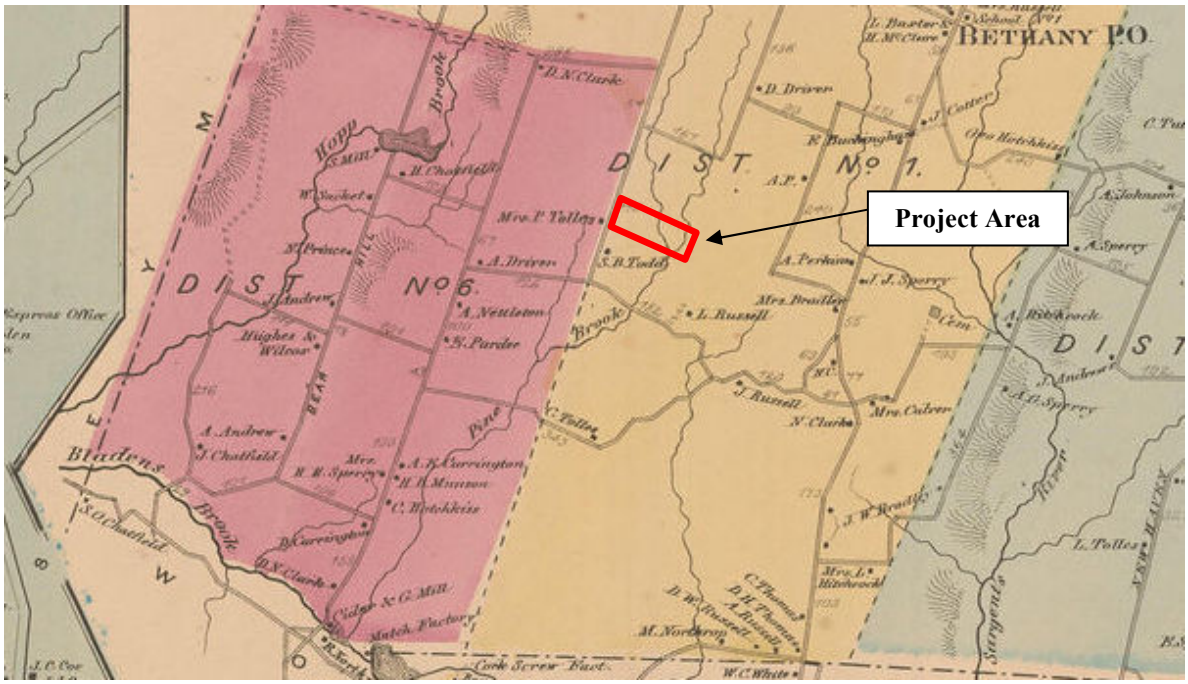

Figure 5b: From Beers 1868.

In 1915, Dwight L. Johnson sold 37 acres of land inclusive of the project property to Morris Liebman and others (LR Volume 12, page 248). Fifteen years later, rights were conveyed to the Drazen Lumber Company, and by 1936 Lena Krupien had ownership of the property. A survey map from 1935 shows the Drazen Lumber Company land before acquisition by Krupien, with an existing house directly to the north of the project property that is listed as Parcel "V," and the same map showing the delineation of stone wall alignments that still exist today. The house to the north likely relates to the Street B. Todd house (Town Historian William Brinton, pers. comm. 2023), and it is likely that the depiction of that house on the Beers 1868 map to the south of the project property was in error (see Figures 5c and 5d).

The housing boom that followed World War II reached Bethany. The small house that occupies the project property was built in 1949 according to the town assessor's office. By 1950, the population of the town was 1,318, triple that of the low point three decades earlier. By 1960, the population nearly doubled again, to 2,384, and by 1970 it nearly tripled to 3,857. The Rolling Green Acres subdivision of the 1960s directly to the north of the project property and on other land nearby included the Street B. Todd homestead site, with the project property listed in land records and on survey maps as Parcel "V," including the 2.51 house lot of the project property and the 19+ acres to the rear. A survey map from 1980 shows the existing house and detached garage on 2.05 acres, surrounded by other land owned by Krupien and some Rolling Green Acres subdivision land directly to the north, where the Street B. Todd house was razed in 1964 (Bunton 1972).

Local Sites and Surveys

The only property in Bethany recorded with the National Register of Historic Places (NRHP) consists of the Wheeler - Beecher House on Amity Road over one mile northeast of the project area (Clouette 1976). The house was built in 1807 by David Hoadley (builder of the United Church in New Haven) for first owner Darius Beecher, who subsequently moved west and reportedly lost his family fortune (Sharpe 1989:101). The Street B. Todd house, a Greek Revival House owned by father in-law Spencer Hotchkiss, was located to the south of the project property on Bethmour Road, and was razed in 1964 as the only historic house in the area at that time (Bunton 1972). There have only been two professional archaeological surveys in Bethany, one related to an electric transmission line through Bethany (Raber 2013), the other related to the Bethany Farms subdivision located in the southern part of town (CAS 1994). There are no historic archaeological sites previously recorded within one mile of the project area.

Summary

Originally a part of the larger town of Woodbridge, Bethany was not incorporated until 1832, and remained very agricultural until the middle of the 20th century. The project property was owned by the Johnson family by the middle of the 19th century, although it appears to have remained as open land until the 1930s when the Drazen Lumber Company had control of the property for a brief time. The 1949 existing house was set on a two-acre lot carved off a larger parcel, with the land owned by the Krupien family for much of the 20th century.

Figure 5c: Historic Sites of the Area (1934 Map)

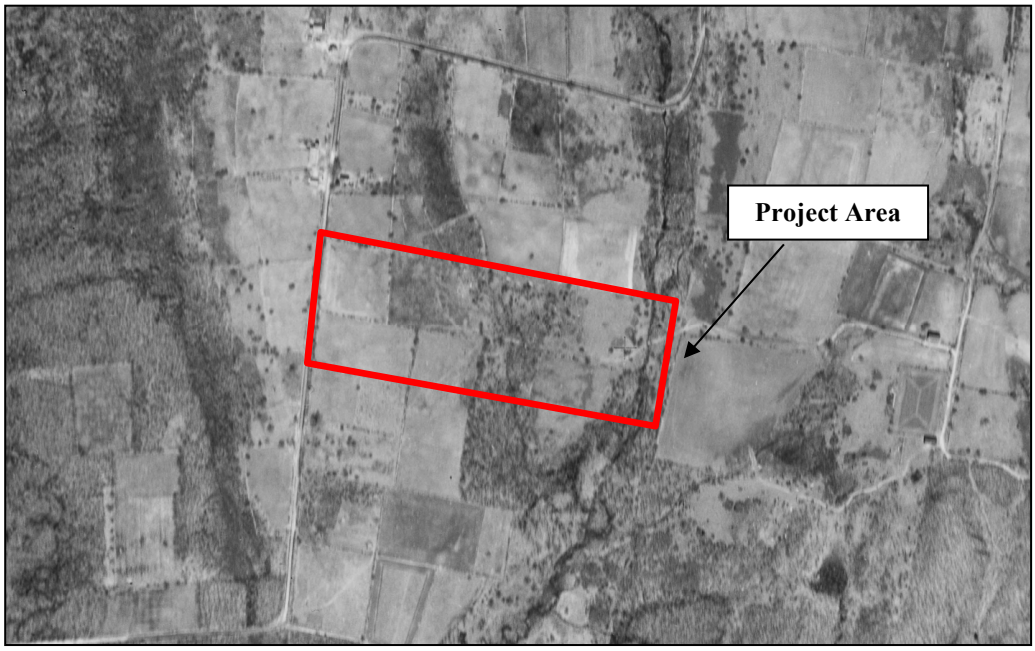

Figure 5c: From Fairchild 1934.

Figure 5d: Historic Sites of the Area (1947 Map)

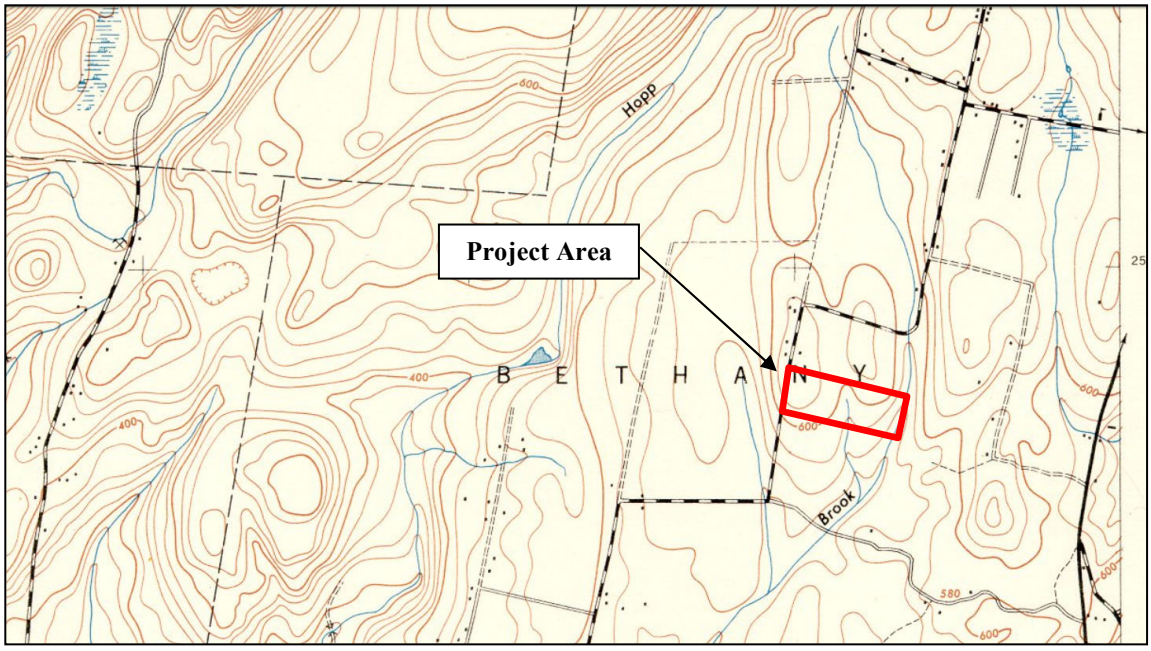

Figure 5d: From USGS 1947.

CHAPTER 3: CONCLUSION

Prehistoric Sensitivity

Background research and the pedestrian surface survey indicate a low sensitivity for potential prehistoric cultural resources in the project area. A statistical prehistoric landscape sensitivity model developed and employed by ACS utilizes eight environmental variables to rank sections of project properties relative to a scale of 100.0 (www.acsarcheaology.com/sensitivity-model.html). In this case, the project area scores no higher than 6.5 out of a possible 100.0, and therefore solidly within the low (0-20) sensitivity range. Factors contributing to this low sensitivity score include great distance to the nearest major water source for the project area, rocky hill slope context, and fine particle fraction for dominant soils. Pine Brook does flow through the very eastern end of the project property, although this section of the property is on the order of 1,000 feet to the east of the project area of development, and only a minor body of wetlands lies in close proximity to the eastern end of the project area where there are moderate slopes and very rocky soil contexts. A review of previously recorded prehistoric sites in the region reveals none in close proximity to the project area, with sites concentrated close to substantial water sources, particularly on glacial meltwater landforms and alluvial terraces. No further archaeological conservation efforts are required for the proposed project development with respect to potential prehistoric cultural resources.

Historic Sensitivity

Historically, the project area has a moderate sensitivity for historic cultural resources. The project setting was probably on the outskirts of Naugatuck settlement range during the Contact period, a tumultuous time when indigenous populations were experiencing significant impact from non-indigenous disease, land occupation by Euroamerican settlement, and removal to other regions. Euroamerican settlement was minimal during the latter part of the 17th century, and was relatively sparse by agriculturalists until the early 20th century. Amity Road (Route 63) and then Litchfield Turnpike (Route 69) were early traveled routes through Bethany, which was not incorporated as a town until 1832. By the 1850s, the project property and surrounding lands were owned by the Tolles family, with the Nehemiah Tolles homestead located to the north on Bethmour Road. By the 1860s, the Greek Revival house owned by Spencer Hotchkiss had been conveyed to his son-in-law, Street B. Todd, mapped in error by then to the south of the project property, with that homestead sold many times during the 20th century and finally razed in 1964. The surrounding land, including the project property, was owned by the Johnson family for much of the 19th century, likely acquired from the Tolles family. Land records and historic maps reveal that the existing house on the project property was built in 1949 on land owned by Lena Krupien and acquired from the Drazen Lumber Company and otherwise apparently vacant from the mid-19th century through the present, although it is possible that the Tolles family or predecessors could have constructed earlier homesteads along Bethmour Road in the vicinity of the project property.

The existing house on the project property that was constructed in 1949 is one story and measures only 620 square feet (Figure 6). It bears a concrete foundation, asphalt shingle pitched roof, and vinyl siding. A small detached garage just south of the house dates to 1952 (see Figure 6), and an associated shed dates to approximately 1980. The house and barn are in excess of 50 years old, but they do not bear distinctive architectural qualities that could render them eligible for the National Register of Historic Places (NRHP). Both are within an open field with tall grass and thick scrub growth reflecting lack of recent occupation (Figure 7). The ground surface surrounding the house and throughout the surrounding fields appear to be relatively undisturbed, and are separated from the wooded section of the project property to the east by a historic stone wall alignment (Figure 8). Constructed of locally available granitic gneiss, the various stone wall alignments of the property are depicted on current and historic survey maps (Figure 9), and are likely on the order of 200 years old, although they are not well formed. Their principal historic value is in their mapping, which could be useful information regarding historic agricultural lot sizes, particularly where there were different uses of the land within historic farms.

ACS recommends that any part of the development project within 300 feet of Bethmour Road be subject to a Phase Ib archaeological reconnaissance survey in advance of any construction impacts (Figure 10). The historic route of Bethmour Road is known to have contained homes dating back to the early 19th century and possibly earlier, and there could be traces of homesteads preceding those that appear on available historic maps or in land records confidently associated with prior land owners. Any such remains could reveal important information regarding Euroamerican population expansion into the frontier parts of early colonial settlements. Any further archaeological study of the project property should be subject to review by the Connecticut State Historic Preservation Office (SHPO).

Figure 6: House and Garage

Figure 6: East view of the house and garage at 428 Bethmour Road.

Figure 7: Field

Figure 7: Southeast view of the open field containing the house, with scrub growth.

Figure 8: Stone Wall – Field Edge

Figure 8: Southwest view of weakly developed stone wall alignment separating the open field in background from the wooded section of the property. A piece of oxidized farm equipment rests on the wall, scale bar five feet.

Figure 9: Stone Wall – Wooded Section

Figure 9: Southwest view of stone wall alignment in the wooded section of the project area.

Figure 10: Cultural Resource Sensitivity Map

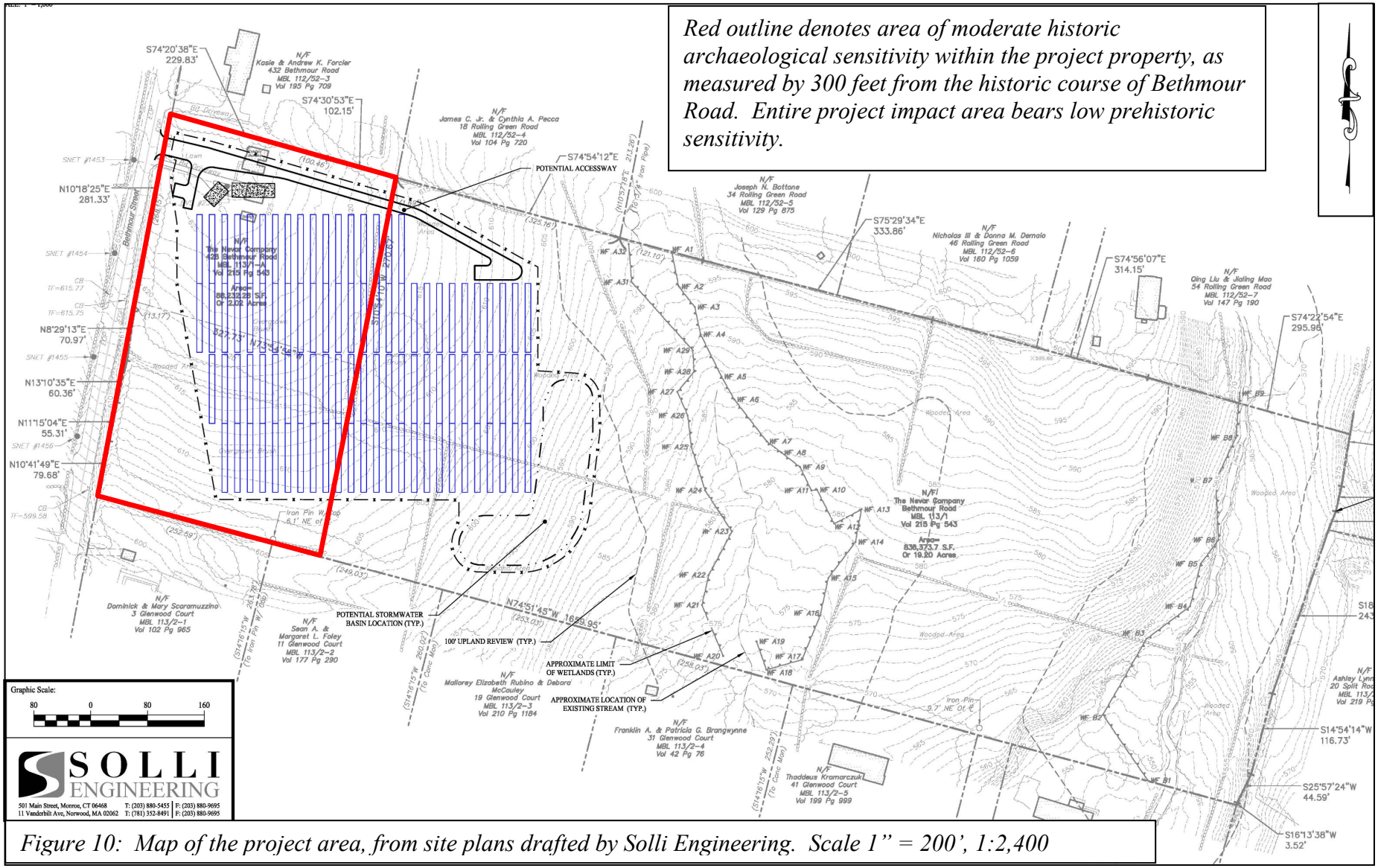

Figure 10: Map of the project area, from site plans drafted by Solli Engineering. Scale 1" = 200', 1:2,400

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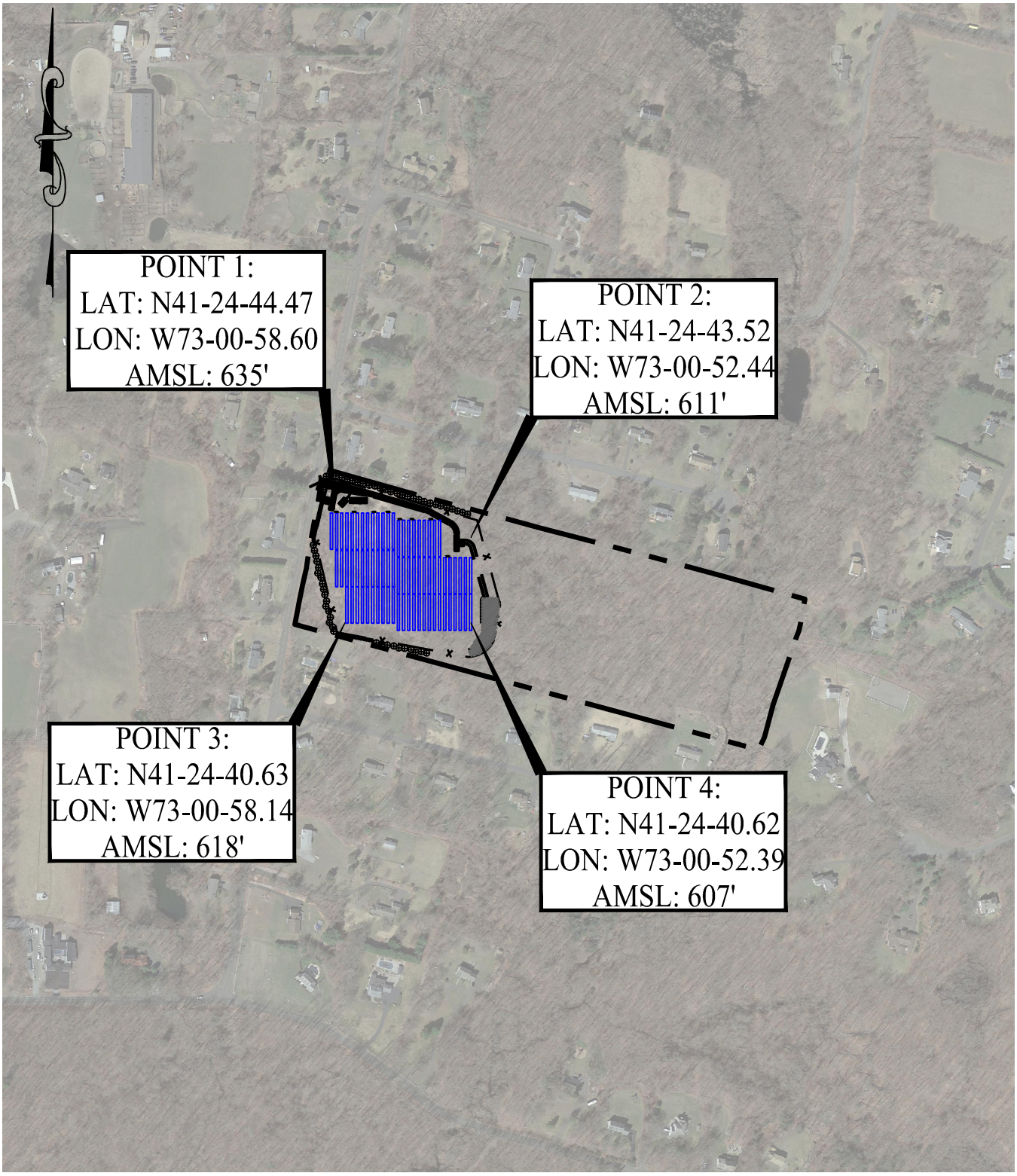
Appendix E: FAA



500 0 250 500

SOLLI ENGINEERING
501 Main Street, Monroe, CT 06468
T: (203) 880-5455 F: (203) 880-9695

FAA STUDY POINT LOCATIONS
428 BETHMOUR ROAD
BETHANY, CONNECTICUT

Project #:	22113201
Plan Date:	
Scale:	1" = 500'
Figure:	12

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2023-ANE-1235-OE

Issued Date: 02/23/2023

David H Trepeck
TRITEC Americas, LLC
888 Prospect Street, Suite 200
La Jolla, CA 92037

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Solar Panel Point 1
Location:	Bethany, CT
Latitude:	41-24-44.47N NAD 83
Longitude:	73-00-58.60W
Heights:	625 feet site elevation (SE) 10 feet above ground level (AGL) 635 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 08/23/2024 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO

SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

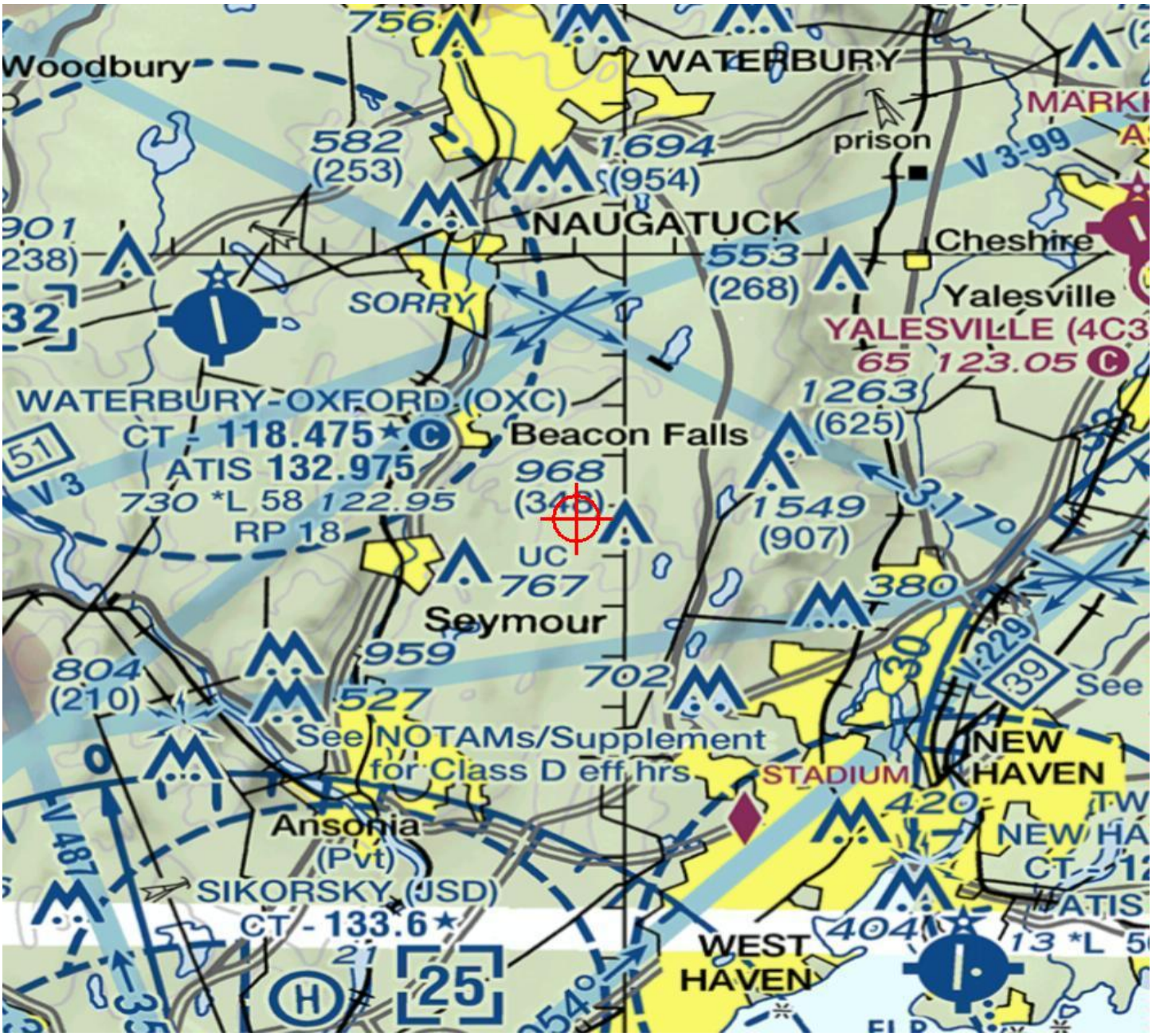
This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (404) 305-6430, or kelly.r.nelson@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2023-ANE-1235-OE.

Signature Control No: 572764419-573963113 (DNE)
Kelly Nelson
Specialist

Attachment(s)
Map(s)

Sectional Map for ASN 2023-ANE-1235-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2023-ANE-1236-OE

Issued Date: 02/23/2023

David H Trepeck
TRITEC Americas, LLC
888 Prospect Street, Suite 200
La Jolla, CA 92037

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Solar Panel Point 2
Location:	Bethany, CT
Latitude:	41-24-43.52N NAD 83
Longitude:	73-00-52.44W
Heights:	601 feet site elevation (SE) 10 feet above ground level (AGL) 611 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 08/23/2024 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
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SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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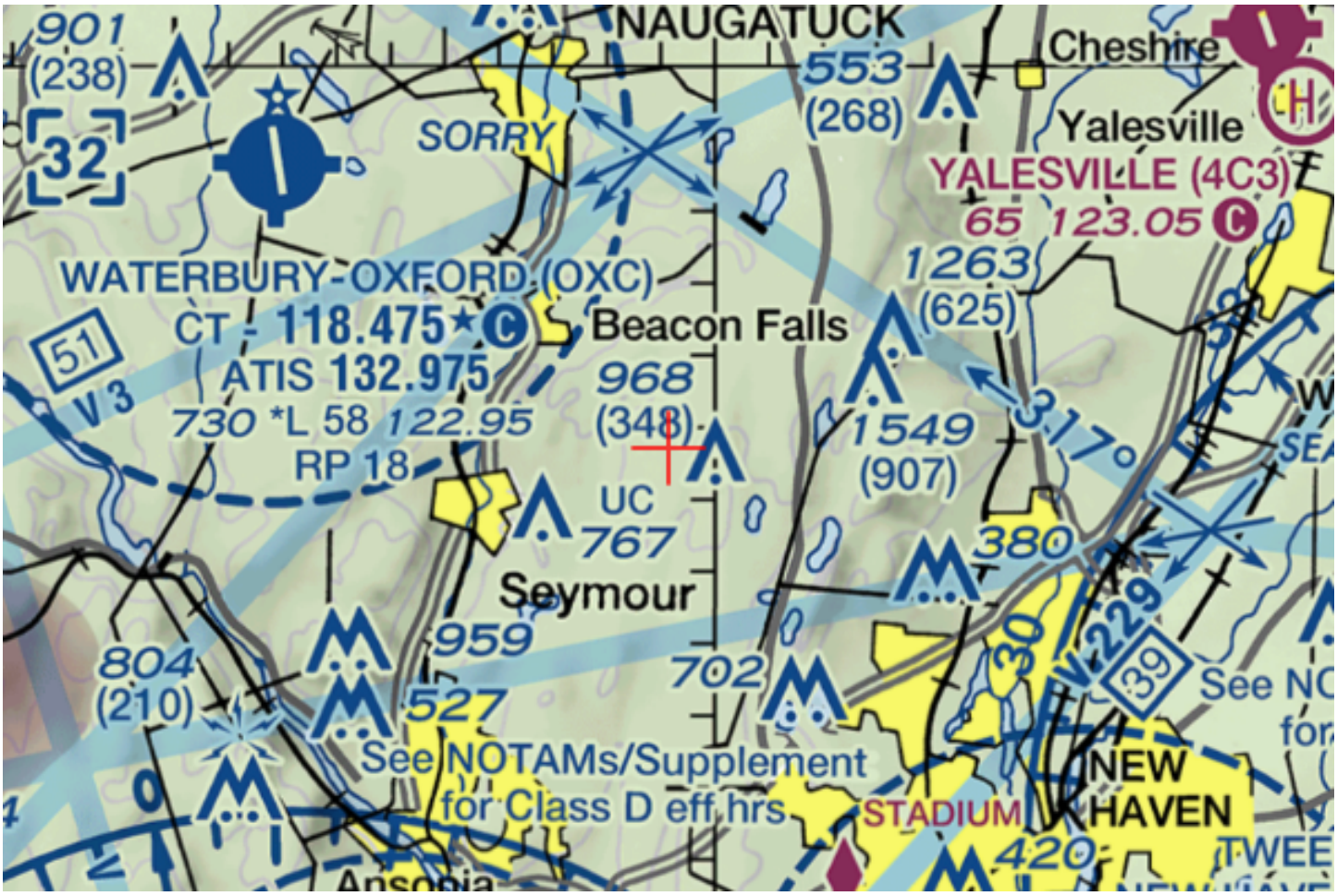
If we can be of further assistance, please contact our office at (404) 305-6430, or kelly.r.nelson@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2023-ANE-1236-OE.

Signature Control No: 572764420-573963115 (DNE)
Kelly Nelson
Specialist

Attachment(s)
Map(s)

Sectional Map for ASN 2023-ANE-1236-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
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10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2023-ANE-1237-OE

Issued Date: 02/23/2023

David H Trepeck
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888 Prospect Street, Suite 200
La Jolla, CA 92037

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Solar Panel Point 3
Location:	Bethany, CT
Latitude:	41-24-40.63N NAD 83
Longitude:	73-00-58.14W
Heights:	608 feet site elevation (SE) 10 feet above ground level (AGL) 618 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 08/23/2024 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

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SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

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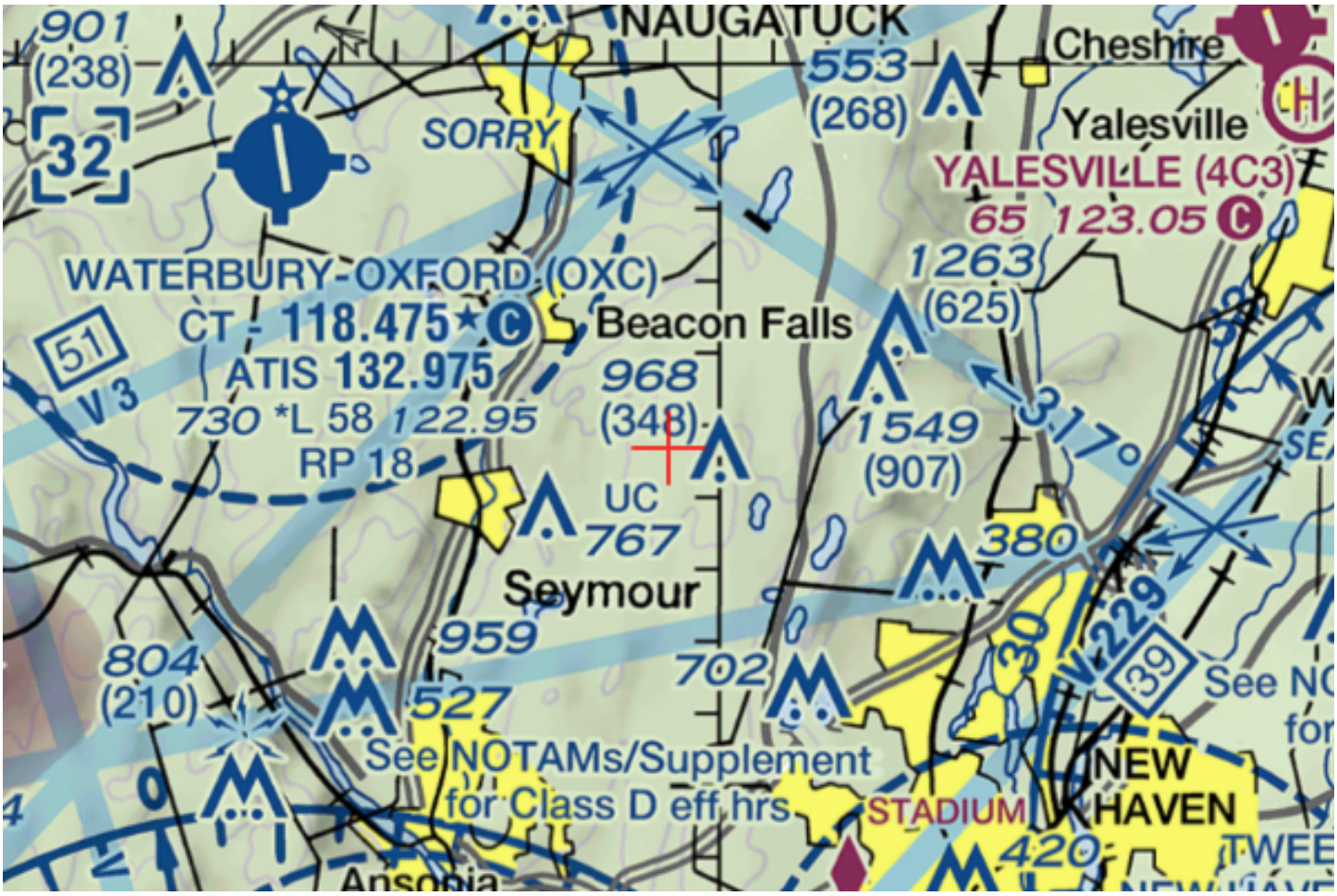
This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (404) 305-6430, or kelly.r.nelson@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2023-ANE-1237-OE.

Signature Control No: 572764421-573963114 (DNE)
Kelly Nelson
Specialist

Attachment(s)
Map(s)

Sectional Map for ASN 2023-ANE-1237-OE



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Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
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Aeronautical Study No.
2023-ANE-1238-OE

Issued Date: 02/23/2023

David H Trepeck
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**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Solar Panel Point 4
Location:	Bethany, CT
Latitude:	41-24-40.62N NAD 83
Longitude:	73-00-52.39W
Heights:	597 feet site elevation (SE) 10 feet above ground level (AGL) 607 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 08/23/2024 unless:

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SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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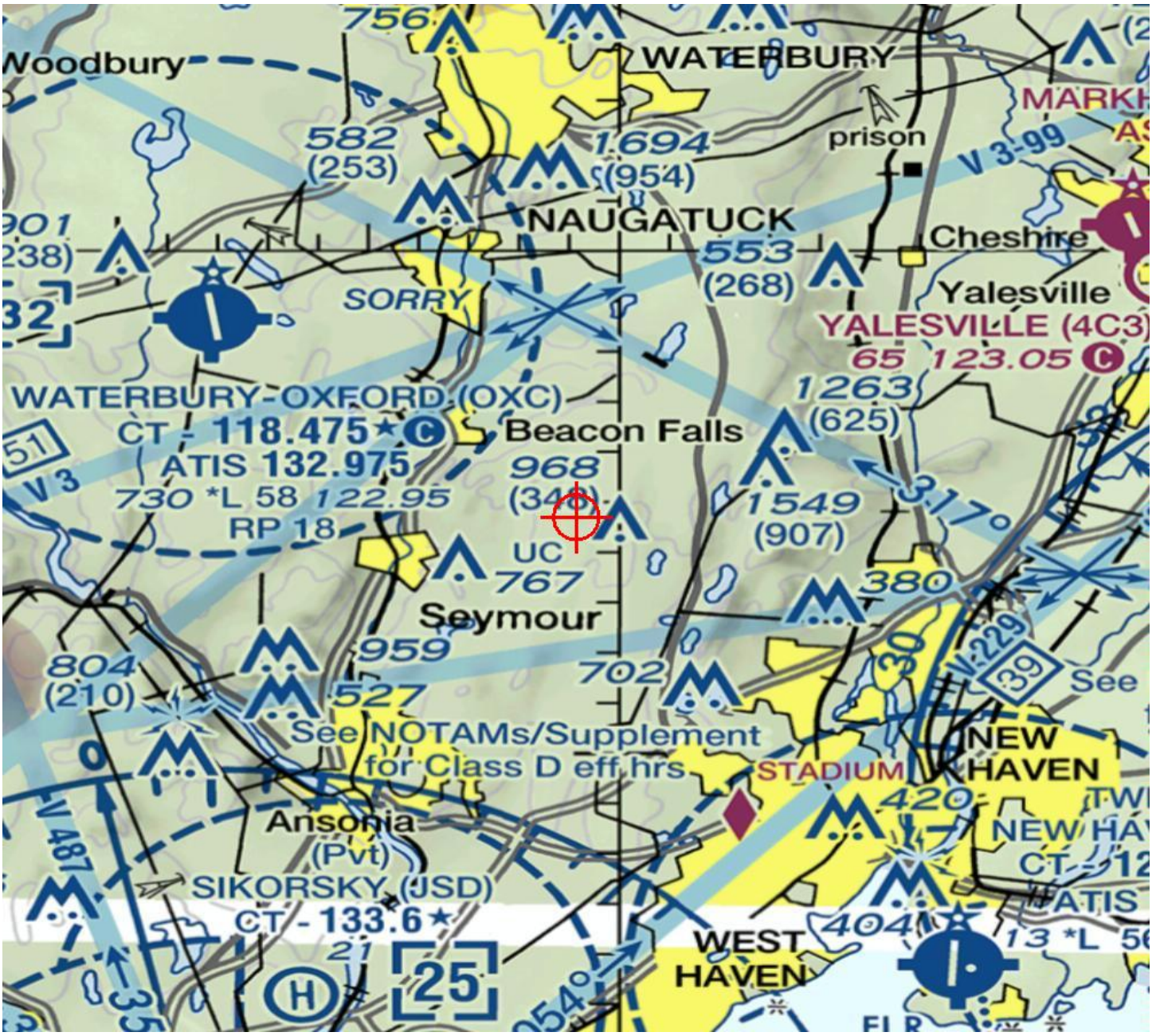
If we can be of further assistance, please contact our office at (404) 305-6430, or kelly.r.nelson@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2023-ANE-1238-OE.

Signature Control No: 572764424-573963116 (DNE)
Kelly Nelson
Specialist

Attachment(s)
Map(s)

Sectional Map for ASN 2023-ANE-1238-OE



Appendix F: Product Information

SOLLI ENGINEERING

TALESUN

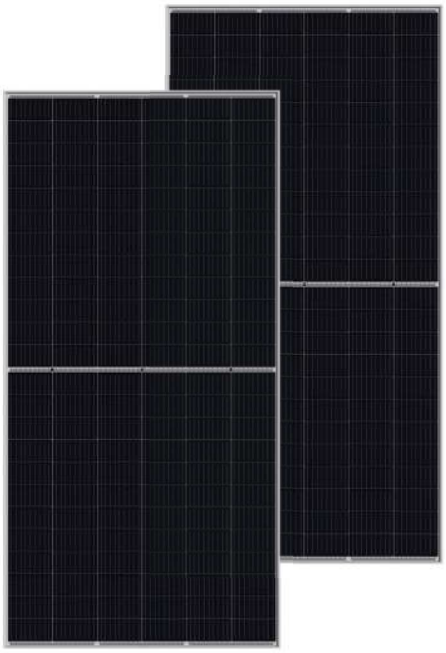
BIPRO

TP6G72M
TP6G72M(H)

144 half-cell

390 - 415W

bifacial transparent single glass
9BB half-cut mono perc



KEY FEATURES

9BB half-cut cell technology
New circuit design, lower internal current, lower Rs loss

Industry leading high yield
Bifacial PERC cell technology,
5%-25% more yield depends on different conditions

Excellent Anti-PID performance
2 times of industry standard Anti-PID test by TUV SUD

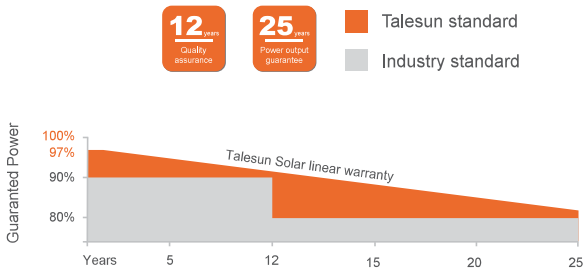
Wider application
No water-permeability and high wear-resistance,
can be widely used in high-humid, windy and dusty area

IP68 junction box
High waterproof level

SYSTEM & PRODUCT CERTIFICATES

- IEC 61215 / IEC 61730 / UL 1703
- ISO 9001: 2015 Quality Management System
- ISO 14001: 2015 Environment Management System
- ISO 45001: 2018 Occupational Health and Safety Management Systems

PERFORMANCE WARRANTY



marketing.hq@talesun.com

Annual Module Capacity Globally: 12GW
China: 10GW
Thailand: 2GW

TALESUN

ELECTRICAL PARAMETERS

Performance at STC (Power Tolerance 0 ~ +3%)

Maximum Power (Pmax/W)	390	395	400	405	410	415
Operating Voltage (Vmpp/V)	40.8	41.1	41.4	41.7	42.0	42.3
Operating Current (Impp/A)	9.56	9.61	9.67	9.72	9.77	9.82
Open-Circuit Voltage (Voc/V)	48.7	48.9	49.1	49.3	49.5	49.7
Short-Circuit Current (Isc/A)	10.08	10.14	10.20	10.26	10.32	10.38
Module Efficiency ηm(%)	19.06	19.3	19.55	19.79	20.04	20.28

Performance at NMOT

Maximum Power (Pmax/W)	291.5	295.1	298.8	302.4	306.1	309.8
Operating Voltage (Vmpp/V)	38.1	38.3	38.5	38.8	39.0	39.2
Operating Current (Impp/A)	7.65	7.70	7.75	7.80	7.86	7.91
Open-Circuit Voltage (Voc/V)	45.6	45.7	45.9	46.1	46.3	46.4
Short-Circuit Current (Isc/A)	8.13	8.18	8.23	8.27	8.32	8.37

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5 NMOT: Irradiance at 800W/m², Ambient Temperatue 20°C, Air Mass AM1.5, Wind Speed 1m/s

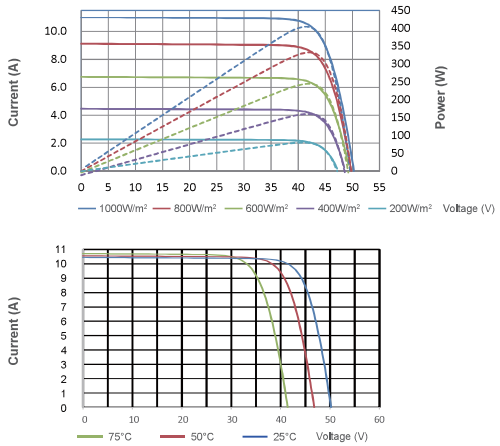
Electrical characteristics with different rear side power gain (refer to 400W front)

Pmax gain	Pmax/W	Vmpp/V	Impp/A	Voc/V	Isc/A
5%	420	41.4	10.14	49.1	10.71
10%	440	41.4	10.63	49.1	11.22
15%	460	41.4	11.11	49.1	11.73
20%	480	41.4	11.59	49.1	12.24
25%	500	41.4	12.08	49.1	12.75

MECHANICAL SPECIFICATION

Cell Type	Half-cell 9 busbar
Cell Dimensions	158.75*158.75mm (6inches)
Cell Arrangement	144 (6*24)
Weight	23.5kg (51.8lbs)
Module Dimensions	2030*1008*35mm (79.72*39.68*1.38inches)
Cable Length (Portrait)	(+)300mm (11.81inches) / (-)300mm (11.81inches)
Cable Length (Landscape)	(+)1200mm (47.24inches) / (-)1200mm (47.24inches)
Cable Cross Section Size	4mm² (0.006inches²)
Front Glass	3.2mm High Transmission, Tempered Glass
No. of Bypass Diodes	3/6
Packing Configuration(1)	31pcs/carton, 682pcs/40hq
Packing Configuration(2)	31+3pcs/carton, 715pcs/40hq
Frame	Anodized Aluminium Alloy
Junction Box	IP68

I-V CURVE



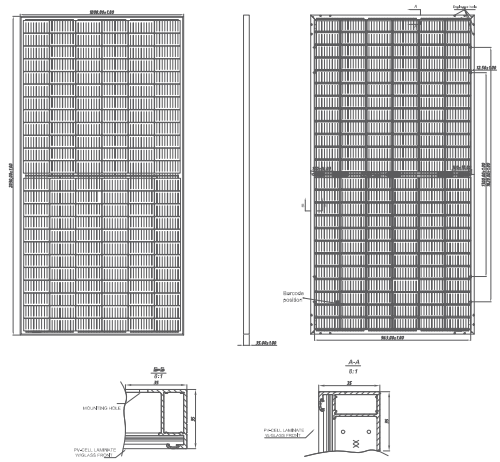
OPERATING CONDITIONS

Maximun System Voltage	1000V/1500V/DC(IEC)
Operating Temperature	-40°C ~ +85°C
Maximun Series Fuse	20A
Static Loading	5400pa
Conductivity at Ground	≤0.1Ω
Safety Class	II
Resistance	≥100MΩ
Connector	MC4 Compatible
Backside Output Ratio* *Under STC: Backside Output Ratio = $P_{max(rear)}$ /$P_{max(front)}$	60% - 80%

TEMPERATURE COEFFICIENT

Temperature Coefficient Pmax	-0.36%/°C
Temperature Coefficient Voc	-0.26%/°C
Temperature Coefficient Isc	+0.043%/°C
NMOT	42±2°C

TECHNICAL DRAWINGS



TALESUN

TDP™ 2.0 TURNKEY SOLAR TRACKER
With *BalanceTrac*

™ *TDP* is a trademark of Solar FlexRack

SOLAR FLEXRACK
A Division of Northern States Metals

Tough, Reliable Tracker & Team of Experts at Your Service

Solar FlexRack's new TDP 2.0 Turnkey Solar Tracker with complete project support services for commercial and utility-scale solar installations introduces an advanced design featuring new *BalanceTrac*. This next-generation technology enables solar power plants to increase energy yield while significantly reducing project risks. That translates to smart installation cost-savings across your project budget.

The Only Tracker Solution with:

- Full Design
- Installation
- Commissioning Services

Increased Energy Yield

TDP 2.0 with new *BalanceTrac* is efficiently designed to support more modules per row, a rotational range of up to 110°, and is compatible with 1,000 and 1500V modules. These key features enable significant energy production gains in solar power plants.

Greater Adjustability To Maximize Performance

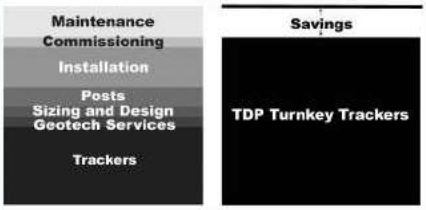
TDP 2.0 Tracker has up to a 10% slope tolerance that can eliminate the need to level land. Independently driven rows provide easy access for mowing, cleaning and maintenance. Autonomous tables increase design flexibility to maximize ground coverage on irregular and non-adjacent lots. Programmable granular backtracking, snow shedding and new wind damper technology mitigate inclement climatic events and reduce risk of tracker damage. All of these features compound to increase system performance.

Installations Fly with Solar FlexRack

No special equipment or additional steps are required to square your racking. The proprietary design allows modules to easily slide into place, accelerating the process, and reducing installation time.

Complete Support Services Reduce Project Risks And Costs

A tracker solution that comes with all the critical associated support services and an unmatched team of experts that will significantly reduce your risks and project costs. Project management is simplified, redundancies are eliminated, and you have one highly-experienced supplier-instead of many.



Increased Yield & Reduced Costs

- More modules per row (up to 90)
- Rotational range of up to 110° (±55°)
- Optimized for 1,000 & 1,500V modules
- Lower per-unit fixed costs for balance of system savings
- Allows shorter piles
- Programmable technology to mitigate inclement climatic conditions
- installations fly with no prying, adjusting or special tools
- Built to last, the robust design reduces amount of tracker components and wear
- Autonomous tables increase design flexibility to maximize land use
- Smart backtracking reduces row shading to optimize energy production
- Independently driven rows provide easy access for mowing, cleaning and other maintenance

Solar FlexRack, 3207 Innovation Place, Youngstown, OH 44509 | 1.888.380.8138 | info@solarflexrack.com | solarflexrack.com

TDP™ 2.0 Turnkey Solar Tracker with *BalanceTrac*

TESTING

Rain, wind, sleet, snow, heat – every day and everywhere, our products are battling the elements.

We perform ongoing extensive testing in these key areas: wind tunnel, structural load, electrical bonding, and life cycle.

Solar FlexRack trackers also undergo wind tunnel testing performed by RWDI, per American Society Of Civil Engineers Standard ASCE 7.

UL COMPLIANCE

All Solar FlexRack systems have gone through UL testing.

Each component-connection point within the system conforms to NEC codes for electrically bonded and conductive systems.

Testing is performed by TUV Rheinland in accordance with UL 2703.

Certification covers both United States and Canada.

Find out more about Solar FlexRack product reliability and testing at http://solarflexrack.com/products/testing

Learn more about our Preferred Installer Program: http://solarflexrack.com/resources/preferred-installer-program/

TRACKING	
Tracking method	Single-axis horizontal, distributed drive
Backtracking	Smart backtracking - customized to terrain for maximum production
Tracking range	Up to 110° (± 55°)
Ground coverage ratio (GCR)	Configurable (0.33 to 0.50)
Tracking accuracy	2°
Stow Angle	Configurable

ARRAY CONFIGURATION	
Panels per tracker	Up to 90
Trackers per controller	1
String voltage	Up to 1,500 Volts
Panel configurations	1 in portrait (crystalline)
	2 in landscape (crystalline)
	4 in landscape (thin film)
Drive type	Slew
	24 Volts dc

OPERATIONS & MAINTENANCE	
Scheduled maintenance	None
Warranty	10 Years: Structural and Controllers
	5 Years: Drives and Electrical
Certifications	UL 2703
Dynamic load management	Limited progressive damping technology
Snow management	Programmable snow shedding

INSTALLATION & TOLERANCES	
North-south slope tolerance	Up to 10%
North-south post spacing	± 1.5 inches
East-west post alignment	± 0.625 inches
Post height	± 1 inch
Post plumb	± 1°
Post twist	± 2°
Tube twist	± 2°

CONSTRUCTION	
Structural materials	Hot dip galvanized steel
Bearings	UV-rated engineering plastic, no lubrication needed
Mechanical connections	Bolted - no welding, drilling or cutting required

CONTROL SYSTEM	
Data feed	Ethernet, Zigbee, SCADA
Power consumption	31 kWh per tracker per year

ENVIRONMENTAL	
Operating temperature	-30 °C to +60 °C
Wind	105 mph (Up to 130 mph)
Stow	35 mph
Snow load	10 psf (standard)
	Higher snow load available upon request

TDP 2.0 TURNKEY SOLAR TRACKER
With *BalanceTrac*

Support Services

- ✓ Geotechnical Services
- ✓ Structural Analysis
- ✓ Layout & Design
- ✓ Foundation Design Services
- ✓ Post Driving
- ✓ Pull Testing
- ✓ Tracking System Installation
- ✓ Visual Inspection of Trackers
- ✓ Preferred Installer Network
- ✓ Post, Rack & Module Installation
- ✓ Configuration of Tracker Controls
- ✓ Configuration of Network Controls
- ✓ Project Management
- ✓ PE Stamp
- ✓ Onsite Training
- ✓ Commissioning
- ✓ Remote Data Monitoring & Reporting

Over 2.0 Gigawatts of Solar FlexRack Installed

Solar FlexRack, a division of Northern States Metals, is an integrated solar company that offers custom-designed, fixed tilt ground mount and single-axis solar tracking systems in the commercial, community solar and utility-scale solar mounting industries. Solar FlexRack offers full turnkey packages including engineering, geotechnical, pullout testing, field, layout, and installation services to address the actual site conditions of an installation and provide a full scope of services from design to delivery and installation. Solar FlexRack has completed over 2 GW of solar racking installations in 40 states across America and five countries globally.

For more information on Solar FlexRack visit: www.solarflexrack.com

Vertex

BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG19C.20

PRODUCT RANGE: 525-550W

550W+	0~+5W	21.0%
MAXIMUM POWER OUTPUT	POSITIVE POWER TOLERANCE	MAXIMUM EFFICIENCY

High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation
- Designed for compatibility with existing mainstream system components
- High return on Investment

High power up to 550W

- Up to 21.0% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection

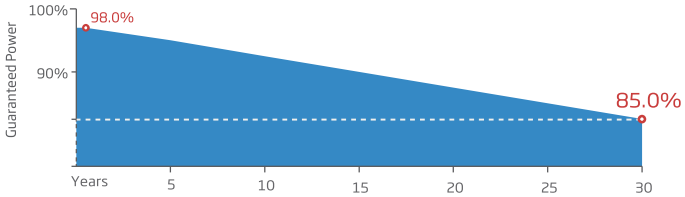
High reliability

- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load

High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

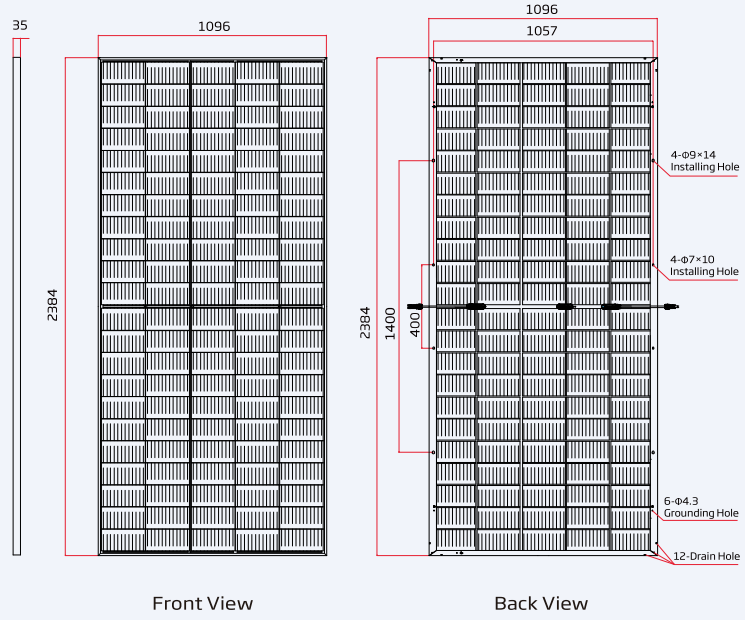
Trinasolar

Vertex BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG19C.20

PRODUCT RANGE: 525-550W

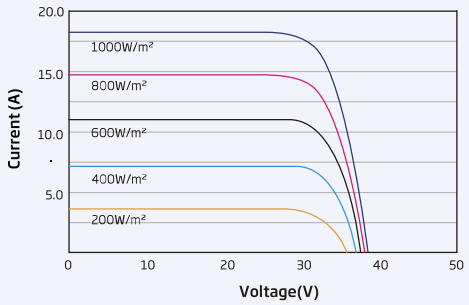
DIMENSIONS OF PV MODULE(mm)



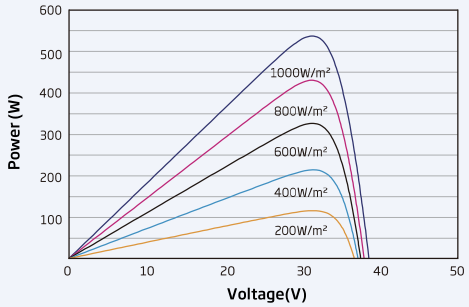
Front View

Back View

I-V CURVES OF PV MODULE (540 W)



P-V CURVES OF PV MODULE(540 W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	525	530	535	540	545	550
Power Tolerance-PMAX (W)	0 ~ +5					
Maximum Power Voltage-VMPP (V)	30.8	31.0	31.2	31.4	31.6	31.8
Maximum Power Current-IMPP (A)	17.04	17.11	17.16	17.21	17.24	17.29
Open Circuit Voltage-VOC (V)	37.1	37.3	37.5	37.7	37.9	38.1
Short Circuit Current-ISC (A)	18.14	18.19	18.24	18.30	18.35	18.39
Module Efficiency ηm (%)	20.1	20.3	20.5	20.7	20.9	21.0

STC: Irrdiance 1000W/m2, Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)**

Total Equivalent power -PMAX (Wp)	562	567	573	578	583	589
Maximum Power Voltage-VMPP (V)	30.8	31.0	31.2	31.4	31.6	31.8
Maximum Power Current-IMPP (A)	18.23	18.31	18.36	18.41	18.45	18.50
Open Circuit Voltage-VOC (V)	37.1	37.3	37.5	37.7	37.9	38.1
Short Circuit Current-ISC (A)	19.41	19.46	19.52	19.58	19.63	19.68
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	398	401	405	409	413	416
Maximum Power Voltage-VMPP (V)	28.6	28.8	29.0	29.2	29.4	29.5
Maximum Power Current-IMPP (A)	13.88	13.93	13.97	14.02	14.08	14.10
Open Circuit Voltage-VOC (V)	35.0	35.1	35.3	35.5	35.7	35.9
Short Circuit Current-ISC (A)	14.62	14.66	14.70	14.75	14.79	14.82

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline 210mm PERC
No. of cells	110 cells
Module Dimensions	2384×1096×35 mm (93.86×43.15×1.38 inches)
Weight	32.6 kg (71.9 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	35mm (1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 280/280 mm (11.02/11.02 inches) Landscape: 1400/1400 mm (55.12/55.12 inches)
Connector	Trina TS4*/MC4 EVO2

*Please specifiy connector on your order

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of VOC	- 0.25%/°C
Temperature Coefficient of ISC	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

12 year Product Workmanship Warranty

30 year Power Warranty

2% first year degradation

0.45% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 31 pieces

Modules per 40' container: 527 pieces

** Back-side power gain varies depending upon the specific project albedo

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_DE19C_2021_A

www.trinasolar.com

SOLECTRIA™ XGI 1500

PREMIUM 3-PHASE TRANSFORMERLESS UTILITY-SCALE INVERTERS

FEATURES

- Made in the USA with global components
- Buy American Act (BAA) compliant
- Four models:
  - 125kW/125kVA,
  - 125kW/150kVA,
  - 150kW/166kVA,
  - 166kW/166kVA
- 99.0% peak efficiency
- Flexible solution for distributed and centralized system architecture
- Advanced grid-support functionality Rule 21/UL1741SA
- Robust, dependable and built to last
- Lowest O&M and installation costs
- Access all inverters on site via WiFi from one location
- Remote diagnostics and firmware upgrades
- SunSpec Modbus Certified
- Tested compatible with the TESLA PowerPack Microgrid System
- app for system visibility

OPTIONS

- String combiners for distributed and centralized systems
- Web-based monitoring
- Extended warranty

MADE IN THE USA

With U.S. and Global Components

Yaskawa Solectria Solar's XGI 1500 utility-scale string inverters are designed for high reliability and built of the highest quality components that were selected, tested and proven to last beyond their warranty.

XGI 1500 inverters provide advanced grid-support functionality and meet the latest IEEE 1547 and UL 1741 standards for safety. They are the most powerful 1500 VDC string inverters in the PV market and have been engineered for both distributed and centralized system architecture.

Designed and engineered in Lawrence, MA, XGI inverters are assembled and tested at Yaskawa America's facilities in Buffalo Grove, IL. They are Made in the USA with global components and are compliant with the Buy American Act.

YASKAWA SOLECTRIA SOLAR

Yaskawa Solectria Solar 1-978-683-9700 | Email: inverters@solectria.com | solectria.com
Document No. FL.XGI1500.01 | 05/03/2021 |

SOLECTRIA™ XGI 1500 TECHNICAL DATA

SPECIFICATIONS

SOLECTRIA XGI 1500 Model		XGI 1500-125/125	XGI 1500-125/150	XGI 1500-150/166	XGI 1500-166/166
DC Input	Absolute Maximum Input Voltage	1500 VDC	1500 VDC	1500 VDC	1500 VDC
	Maximum Power Input Voltage Range (MPPT)	860-1250 VDC	860-1250 VDC	860-1250 VDC	860-1250 VDC
	Operating Voltage Range (MPPT)	860-1450 VDC	860-1450 VDC	860-1450 VDC	860-1450 VDC
	Number of MPP Trackers	1 MPPT	1 MPPT	1 MPPT	1 MPPT
	Maximum Operating Input Current	148.3 A	148.3 A	178.0 A	197.7 A
	Maximum Operating PV Power	128 kW	128 kW	153 kW	170 kW
	Maximum DC/AC Ratio | Max Rated PV Power	2.6 | 332 kW	2.6 | 332 kW	2.2 | 332 kW	2.0 | 332 kW
	Max Rated PV Short-Circuit Current (∑Isc x 1.25)	500 A	500 A	500 A	500 A
AC Output	Nominal Output Voltage	600 VAC, 3-Ph	600 VAC, 3-Ph	600 VAC, 3-Ph	600 VAC, 3-Ph
	AC Voltage Range	-12% to +10%	-12% to +10%	-12% to +10%	-12% to +10%
	Continuous Real Output Power	125 kW	125 kW	150 kW	166 kW
	Continuous Apparent Output Power	125 kVA	150 kVA	166 kVA	166 kVA
	Maximum Output Current	120 A	144 A	160 A	160 A
	Nominal Output Frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Power Factor (Unity default)	+/- 0.80 Adjustable	+/- 0.80 Adjustable	+/- 0.80 Adjustable	+/- 0.80 Adjustable
	Total Harmonic Distortion (THD) @ Rated Load	<3%	<3%	<3%	<3%
	Grid Connection Type	3-Ph + N/GND	3-Ph + N/GND	3-Ph + N/GND	3-Ph + N/GND
	Fault Current Contribution (1 cycle RMS)	144 A	173 A	192 A	192 A
Efficiency	Peak Efficiency	98.9%	98.9%	99.0%	99.0%
	CEC Average Efficiency	98.5%	98.5%	98.5%	98.5%
	Tare Loss	<1 W	<1 W	<1 W	<1 W
Temperature	Ambient Temperature Range	-40°F to 140°F (-40C to 60C)		-40°F to 140°F (-40C to 60C)	
	De-Rating Temperature	122°F (50C)		113°F (45C)	
	Storage Temperature Range	-40°F to 167°F (-40C to 75C)		-40°F to 167°F (-40C to 75C)	
	Relative Humidity (non-condensing)	0 - 95%		0 - 95%	
	Operating Altitude	Full Power up to 9,840 ft (3.0 km); De-Rate to 70% of Full Power at 13,123 ft (4.0 km)			
Communications	Advanced Graphical User Interface	WiFi			
	Communication Interface	Ethernet			
	Third-Party Monitoring Protocol	SunSpec Modbus TCP/IP			
	Web-Based Monitoring	Optional			
	Firmware Updates	Remote and Local			
Testing & Certifications	Safety Listings & Certifications	UL 1741, IEEE 1547, UL 1998			
	Advanced Grid Support Function-ality	Rule 21, UL 1741SA			
	Testing Agency	ETL			
	FCC Compliance	FCC Part 15 (Subpart B, Class A)			
Warranty	Standard and Options	5 Years Standard; Option for 10 Years			
Enclosure	Acoustic Noise Rating	73 dBA @ 1 m ; 67dBA @ 3 m			
	DC Disconnect	Integrated 2-Pole 250 A DC Disconnect			
	Mounting Angle	Vertical only			
	Dimensions	Height: 29.5 in. (750 mm) | Width: 39.4 in. (1000 mm) | Depth: 15.1 in. (380 mm)			
	Weight	270 lbs (122 kg)			
	Enclosure Rating and Finish	Type 4X, Polyester Powder-Coated Aluminum			

IT'S PERSONAL

YASKAWA SOLECTRIA SOLAR

Yaskawa Solectria Solar 1-978-683-9700 | Email: inverters@solectria.com | solectria.com
Document No. FL.XGI1500.01 | 05/03/2021 |

Appendix G: Geotechnical Report

SOLLI ENGINEERING

GEI Consultants

Consulting
Engineers and
Scientists

Geotechnical Report

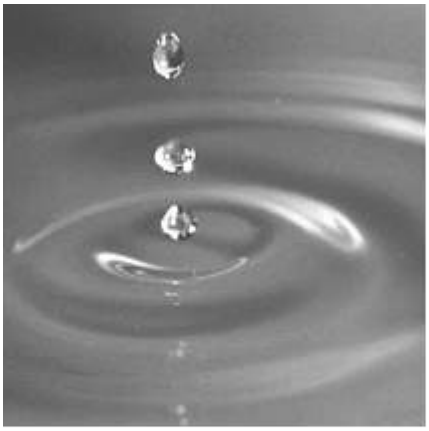
Bethany Solar

428 Bethmour Road
Bethany, Connecticut

Submitted to:
BL Companies
355 Research Parkway
Meriden, CT 06450

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive, Suite 201
Glastonbury, CT 06033
860-368-5300

July 5, 2022
Project No. 2201295



Matthew Glunt, P.E.
Senior Geotechnical Engineer

Anna M. Hernberg, P.E.
Geotechnical Engineer

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1. Introduction

1.1 Project Summary

GEI Consultants, Inc. (GEI) prepared this report to present the results of a subsurface exploration program and foundation recommendations for the proposed ground-mounted photovoltaic (PV) array in Bethany, Connecticut. On behalf of Tritec, BL Companies has engaged GEI to provide geotechnical engineering services for this project.

1.2 Scope of Services

GEI completed the following scope of services for this report. These services were performed to investigate the subsurface conditions at the Site:

- Marked out test pit locations in preparation for the public utility service mark out (Call Before You Dig).
- Conducted a subsurface exploration program consisting of six (6) test pits.
- Assigned three (3) sieve analyses with hydrometer and moisture content laboratory tests.
- Graphed the grain size distribution test results on the USDA Soil Texture Triangle, obtained the NRCS Hydrologic Soil Group, and estimated a soil infiltration rate.
- Assigned soil resistivity, pH, sulfates, and chlorides testing to one (1) composite soil sample.
- Provided soil corrosivity analysis.
- Developed recommendations for a ballast-supported PV array, should this be evaluated as an option by the design team.
- Developed soil parameters that can be used in the design of a pile-supported PV array.
- Developed frost parameters that can be used in the design of a pile-supported PV array and the solar developer's risk evaluation.
- Developed recommendations for the access roadway cross section.
- Prepared this *Geotechnical Report* presenting the results of the subsurface explorations and our recommendations.

We performed these services in general accordance with the Connecticut Building Code (Building Code), which is comprised of the 2015 International Building Code (IBC) and a separate package of state-specific amendments.

1.3 Authorization

Our work was performed in general accordance with our proposal dated February 11, 2022, and the resulting Subconsultant Agreement executed March 22, 2022.

1.4 GEI Team

The following GEI personnel performed the services for this report:

- Matthew Glunt, P.E. Project Manager / Technical Review
- Anna Hernberg, P.E. Geotechnical Engineer
- Thomas Rezzani, E.I.T. Geotechnical Professional

1.5 Vertical and Horizontal Reference

Elevations provided in this report are in feet and are referenced to the contours on the plan titled “Sketch Plan”, Sheet No. SK-7, prepared by BL Companies dated January 2022.

Test pit locations were geo-referenced at the site using a handheld GPS unit with accuracy on the order of 5 to 10 feet. These locations were overlaid onto the provided site plan and sketched on Figure 1. Test pit locations shown should be considered approximate.

2. Site and Project Description

2.1 Site Description

The site is a 21.23-acre property located at 428 Bethmour Road. The site is bound by residential properties to the north, east, and south, and Bethmour Road to the west.

The proposed development area is generally brush-covered, with thinner vegetation along previously disturbed areas near Bethmour Road, and woods at the eastern end of the property. A vacant house and associated outbuildings are located at the northeast corner of the site. Several dry-stacked stone walls cross the property.

The grade slopes from El. 625 at the northwest property corner down to El. 590 at the eastern extent of the proposed limit of disturbance. Existing wetlands are located along the east side of the property, beyond the proposed limit of disturbance.

2.2 Proposed Construction

We were provided with a copy of the preliminary Site Plan drawing (SK-7) by BL Companies. We understand an approximate 1.25 MW DC/1.0 MW AC ground-mounted solar array will be sited on the property. Based on the provided preliminary Site Plan, in addition to the PV array, the development will consist of the following:

- One concrete electrical equipment pad and one substation, both located at the northwest corner of the site.
- One stormwater management basin located to the southeast of the PV array.
- A 12-ft wide gravel road ringing the solar array.
- A small gravel parking area for maintenance personnel.
- A new permanent entrance from Bethmour Road.

We understand the preference of the solar developer is to support the array on pile foundations. Recommendations for design and construction of racking pile foundations, as well as a ballast foundation alternative, are provided in Sections 5.3 and 5.4.

We expect that most of the proposed solar array will generally follow the existing contours.

3. Exploration Procedures

3.1 Field Testing Procedures

The test pit locations were laid out within areas of interest on the site based on the provided sketch plan using a handheld GPS unit. Approximate test pit locations relative to the site plan are shown in Figure 1. The appropriate one-call utility location service (Call Before You Dig) was contacted prior to our arrival.

Six (6) test pits were excavated within or near the proposed development footprint on April 7, 2022, using an excavator to depths of 4.5 to 8.7 feet each. Several (5 of 6) test pits were terminated based on excavator refusal. The test pits were logged and photographed by GEI. Test pit logs are attached in Appendix A.

Representative samples were placed in appropriately identified sealed bags and transported to our office for laboratory assignment. Upon completion, each test pit was backfilled with excavated spoils in lifts tamped with the excavator bucket.

3.2 Laboratory Testing

Laboratory testing was conducted on representative soil samples to confirm field identification of the soils and establish engineering characteristics for design. Tests performed by GeoTesting Express, under subcontract to GEI, included the following:

- Three (3) grain-size analyses with standard sieve set and hydrometer (ASTM D6913/D7928)
- Three (3) moisture content tests (ASTM D2216)
- The following corrosion tests on one sample from test pit TP-1, composited from depths ranging from 0.7 to 4.5 feet deep:
    - pH (ASTM D4972)
    - Sulfates (ASTM D516)
    - Chlorides (ASTM D512)
    - Electrical resistivity (ASTM G57).

Results of the laboratory testing program are attached in Appendix B.

4. Subsurface Conditions

4.1 Geologic Setting

Local geologic maps identify that the referenced area is underlain by thick deposits of glacial till (DEP 2009). Glacial till deposits typically overlay the bedrock surface.

Bedrock underlying the site is mapped (Rodgers 1985) as the Beardsley Member of Harrison Gneiss, which is described as gray to dark gray, medium-grained, well-layered and lineated gneiss.

4.2 Subsurface Conditions

The generalized subsurface conditions at the site are described below, in order of increasing depth. The subsurface conditions between exploration locations may differ. The nature and extent of variations between the sampling points will not become evident until construction.

Topsoil – Topsoil in the test pits was measured at 8 to 14 inches thick. These soils were generally characterized as silty sand (SM) or sandy silt (ML) and contained roots and organic fibers. The topsoil in TP-1 contained approximately 10% gravel and small cobbles.

Silty Sand – A 1-foot-thick layer of silty sand (SM) was encountered below the topsoil layer in TP-2. The sand contained approximately 30 percent fines.

Glacial Till – Glacial till was encountered beneath the topsoil and silty sand layers to test pit termination. These soils were characterized as variable proportions of sand, silt, and gravel, and were most often classified as silty sand with gravel (SM), silty gravel with sand (GM), and widely graded sand with silt and gravel (SW-SM). The proportion of silty fines generally ranged from 15 to 35 percent. Interspersed cobbles and boulders were noted below 1.5 feet deep.

Excavator Refusal – Other than TP-5, the test pits were terminated based on excavator refusal at depths ranging from 4.5 to 8.2 feet (El. 620.5 at the northwest corner to El. 594.5 at the southwest corner). Refusal was generally most shallow at the northwest and southeast corners of the proposed development area.

Excavator refusal may have resulted from encountering very dense glacial till, weathered rock, cobbles or boulders, or the upper surface of sound bedrock. Diamond core sampling would be required to determine the character and continuity of material below the refusal of excavator.

4.3 Groundwater Conditions

Groundwater intrusion was observed in five test pits at depths of 2.3 to 3.8 feet. Groundwater intrusion was not observed in TP-4. We note that dense glacial till deposits may exhibit very slow infiltration and recharge rates. Therefore, groundwater may be present within these soils but not observed as free water within test excavations until several hours after the hole is opened. Samples in dense glacial till below groundwater may have been described as "damp" or "moist" due to the compact matrix of the stratum.

Groundwater levels are subject to seasonal and weather-related variations. Groundwater measurements made at different times and different locations may be significantly different than the measurements taken as part of this investigation.

5. Design Recommendations

5.1 Design Load Recommendations

The foundation of the ground mounted PV array should be designed to resist the forces caused by the load combinations in the Building Code for a Risk Category I structure.

We recommend that wind and snow loading from the Building Code be considered when developing foundation designs as follows:

- Wind load should be calculated in accordance with Chapter 6 of ASCE 7 with the exception of basic wind speed, which is specified in Chapter 16 of the Building Code Table 1604.11. The ultimate wind speed, V_{ult}, for Risk Category I for Bethany is 115 mph.
- Snow load should be calculated in accordance with Chapter 7 of ASCE 7 with the exception of ground snow load, which is specified in Chapter 16 of the Building Code, Table 1604.11. The ground snow load for Bethany is 30 lb/ft^2.

5.2 Allowable Soil Bearing Capacity

The maximum allowable bearing pressures that should be used for the design of equipment pads or PV ballast pads, should they be used, are listed below. Based on the results of this investigation, the equipment pad will likely be founded on glacial till.

Bearing Stratum	Net Allowable Bearing Pressure
Native Glacial Till or Structural Fill	2.0 tons/ft^2

The natural soils may be susceptible to frost heave. We recommend that the proposed equipment pads or other slabs or footings bear on Structural Fill that extends below the frost depth. If some seasonal movement of the equipment pads is acceptable, we recommend all organics, and the top foot of existing frost susceptible material below the slab should be removed and replaced with compacted Structural Fill. At least 18 inches of Structural Fill should be placed below the slab in all areas.

5.3 Pile-supported PV Array Recommendations

We understand that piles will likely be favored by the solar developer to support the PV array in the in-situ soils. Recommended geotechnical parameters for pile design are provided in Table 1.

Dense glacial till containing cobbles and boulders should be expected across the site. Difficulties such as shallow pile refusal on rock and misalignments due to cobble and boulder obstructions should be expected. These conditions may result in misalignments or difficulty reaching depth requirements. Capabilities of foundation products for installation in these difficult conditions will vary by manufacturer, some of which may have proprietary solutions for working in this type of environment. We recommend forwarding the results of this investigation to pile suppliers/designers, who will have a better understanding of the capabilities and limitations of their specific foundation products, as well as potential mitigation options.

Potential pile-support systems include but are not limited to ground screw piles and driven piles. Ground screws have been advertised as a cost-effective solution to rocky soil environments. We understand that pilot holes for the ground screws can be drilled through boulders or into bedrock.

For lateral pile capacity calculations in soil, we recommend using the passive earth pressure coefficients, K_p, for each soil type provided in Table 1. The pile designer must also consider potential lateral pile movements. Movements of several inches may be needed to develop the lateral capacity.

For axial loading, we recommend that piles be designed using an allowable skin friction and allowable end bearing based on the NAVFAC DM 7.02 analysis procedure provided in Appendix C. Alternatively, the pile designer can opt to perform on-site load tests to estimate the allowable loads.

The soil chemical and resistivity test results in Section 5.8 are provided so that the pile designer can perform a corrosivity analysis based on the materials of the pile.

The pile designer should consider the forces caused by frost on the piles, compared to the pile tension capacity. Recommended adfreeze and frost depth consideration are discussed below.

5.4 Ballast-supported PV Array Recommendations

An alternative to the proposed pile foundation is a ballast system. Potential Ballast-Support systems include but are not limited to:

- Precast Concrete Ballast
- Cast-in-Place Concrete Ballast

If the PV array or a portion of the PV array is supported by ballast ground-mount systems, the subgrade should be proof-rolled with a 5-ton vibratory roller before placing the ballast system. Where fill is added, we recommend that Structural Fill, Ordinary Fill, or on-site soils be placed and compacted to at least 92 percent of its maximum dry density determined in accordance with ASTM D1557 (Modified Proctor).

We recommend a maximum allowable soil bearing pressure as shown in the Allowable Soil Bearing Capacity table in Section 5.2.

The details of the surface preparation for the ballast system depend on the system selected. Generally, the bearing surface for each ballast system element should be level.

The natural soils and Ordinary Fill may be susceptible to frost heave. Therefore, some movement of the ballast foundation should be expected.

5.5 Adfreeze/Freezing Conditions

Soil in contact with foundations near the ground surface can freeze to the foundation and develop a substantial adfreeze bond. If the soil in contact with the foundation is frost susceptible, heave can transmit uplift forces to the foundation. Based on the test pit and laboratory results, soils expected to be in contact with racking piles contain up to about 35 percent fines and are therefore potentially frost susceptible.

We recommend using the average value of adfreeze bond stress of 100 kPa (approximately 2,100 lb/ft^2) and 65 kPa (approximately 1,300 lb/ft^2) for fine-grained soils frozen to steel and concrete, respectively, as reported in the Canadian Foundation Engineering Manual 4th Edition.

5.6 Frost Depth

The Connecticut State Building Code specifies a minimum embedment of 42 inches for frost protection of foundations for buildings and structures.

5.7 Seismic Design

The 2018 edition of the Connecticut Building Code document mirrors the 2015 International Building Code, with exception of the revisions and supplemental information provided by state building officials.

Based on the criteria of Building Code Section 1613.3.2 and the conditions observed in the test pits, we recommend the use of Site Class D for seismic design. The Site Class was used

in conjunction with the seismic hazard (S_S, S_1) for this location to determine spectral design values, as follows:

Corresponding spectral response design parameters are as follows:

2018 Connecticut Building Code	
Site Class	D
Risk Category	I
Use/Occupancy Group	U
S_S	0.189 g
S_1	0.063 g
S_{DS}	0.202 g
S_{D1}	0.101 g
PGA_M	0.147 g
Seismic Design Category	B

We calculated the spectral response parameters for the Site using general procedures outlined in Building Code Section 1613.3. Peak ground acceleration (PGA_M) is adjusted for Site Class effects, per ASCE 7-10 Section 11.8.3.

Soils present below the site are not judged to be susceptible to liquefaction and this does not need to be accounted for in the design.

5.8 Soil Corrosivity

Electrical resistivity is a broad indicator of soil corrosivity because corrosion reactions are electrochemical in nature and proceed most rapidly when resistivity (i.e., resistance to the flow of ions and electrical current) is low. Specifically, resistivity is a measure of how strongly a given material opposes the flow of electrical current. The composite sample collected from test pit TP-1 at depths 0.7 to 4.5 feet had an electrical resistivity reading of 113,634 Ω-cm, indicating a non-corrosive environment.

Sulfates in soil and groundwater in concentrations greater than 1,000 mg/kg are generally considered to be corrosive to structural elements. The American Concrete Institute recommends that Type II cement be used if sulfate concentrations exceed 1,000 mg/kg. Sample test results indicate sulfates concentrations of less than 10 mg/kg, which is less than 1,000 mg/kg.

Chloride concentrations above 500 mg/kg are generally considered to be corrosive to structural elements. Sample test results indicate chloride concentrations of 12 mg/kg, which is less than 1,000 mg/kg.

We summarized our evaluation of the soil corrosivity to structural elements shown in the table below by comparing the laboratory test results to some available corrosivity references.

Test	Laboratory Results	Reference	Corrosivity to Structural Elements
pH	6.7	Caltrans - Corrosion Guidelines January 2015	Not corrosive
Electrical Resistivity	113,634 Ω-cm	EPRI - Environmental Factors Governing Corrosion Rates, Report 1021854 December 2011	Not corrosive
Chlorides	12 mg/kg	Caltrans - Corrosion Guidelines January 2015	Not corrosive
Sulfates	<10 mg/kg	Caltrans - Corrosion Guidelines January 2015	Not corrosive

5.9 Estimated Infiltration Rate

As currently shown, we expect the bottom of the proposed stormwater basin will be in poorly draining dense glacial tills. We evaluated the USDA soil texture of the sample collected in this region by plotting the grain size analysis results on the USDA Soil Texture Triangle. The soil texture class for this sample is “Sandy Loam.”

We then evaluated the NRCS hydrologic soil group and infiltration rate based on the USDA soil textures. The NRCS hydrologic soil group and estimated infiltration rate for “Sandy Loam” are “B” and 1.0 inches/hour, respectively. NRCS data is summarized in Table 2.

6. Construction Considerations

6.1 Subgrade Preparation

6.1.1 General

To prepare the site for grading operations, topsoil, organic matter, existing pavements, demolished structure remnants, and other deleterious material should be stripped from the site improvement areas. Soft, wet, loose, or otherwise un-suitable soils should be removed and replaced, or potentially re-compacted in-place.

6.1.2 Demolition of Existing Structures and Utilities

All existing structures should be removed in their entirety from within the equipment pad, substation, and solar array footprints. Where existing structures fall at least 10 feet from site improvements, below grade portions of these structures may remain in place.

Existing utilities to remain in use should be rerouted around the proposed structure footprints. Remove or grout existing utilities to be abandoned prior to construction. If not removed, any pipes over 3 inches in diameter should be filled with flowable fill or grout. Otherwise, these pipes may serve as conduits for subsurface erosion resulting in formation of voids below structures. Where existing utilities are left in place and plugged within foundations, it may be necessary to undercut poorly compacted backfill to provide adequate support for foundations.

6.1.3 Equipment Pad

Excavations to final subgrade for the equipment pad should be performed in such a way that limits disturbing or loosening subgrade soils. After stripping and cutting and prior to placing pad base materials, the resulting subgrade should be firm, stable, and unyielding. Stabilization, where required, may consist of removing unsuitable material and replacement with compacted Structural Fill, or where unsuitable soils are relatively thin, drying and compacting in place.

Equipment pad soil subgrades should be proof-rolled with at least four (4) passes of a minimum 5-ton vibratory roller.

We recommend that a GEI representative observe the final preparation of all subgrades prior to equipment pad construction.

6.1.4 Access Roads

We understand that the access roads at the site will be gravel surface roads. The following roadway sections are suitable for the access roads:

- 12 inches of CTDOT M.02.03 Gravel Surface over a geotextile. Geotextile fabric for roadway underlayment should be a heavy-duty woven product, consisting of GEOTEX 200ST or an approved equivalent.

We recommend that the gravel road section be compacted with at least four (4) passes of a vibratory roller imparting an impact load of at least 10 tons. The resulting subgrade should be firm, stable, and unyielding. Water should be added to materials as needed during compaction. We note that areas of exposed soils will be highly susceptible to disturbance by moisture and equipment movements.

We recommend that the road surface be graded with a minimum cross slope of ½ inch per foot of road width to allow water to drain. Drainage ditches should be provided along the edges of the road to direct surface water and runoff away from the road and subbase.

We recommend that a GEI representative observe the final preparation of all subgrades prior to access road construction.

6.2 Excavation

Excavations will be primarily through dense glacial tills. Cobbles, small boulders, and moderately difficult excavation should be expected within native soils, especially below 4 feet deep. We expect that excavation through soils can be accomplished with conventional earthmoving equipment.

All excavations should be sloped or shored in accordance with the local, state, and federal regulations, including Occupational Safety and Health Agency (OSHA 29 CFR Part 1926) excavation trench safety standards.

Excavation below approximately 2 to 4 feet will require dewatering in most locations. We expect that this can be accomplished using filtered sumps and pumps.

The site soils will be susceptible to moisture intrusion and softening. Therefore, surface water should be controlled during construction.

6.3 Freezing Conditions

The soils at the site are frost susceptible. Therefore, if construction is performed during freezing weather, special precautions will be required to prevent the subgrade soils from freezing. Freezing of the soil beneath the foundation during construction may result in subsequent settlement of the structure.

All subgrades should be free of frost before placement of concrete. Frost-susceptible soils that have frozen should be removed and replaced with compacted Structural Fill. The footing and the soil adjacent to the footing should be insulated until they are backfilled. Soil placed as fill should be free of frost, as should the ground on which it is placed.

If slabs-on-grade or footings are built and left exposed during the winter, precautions should be taken to prevent freezing of the underlying soil.

6.4 Backfilling and Compaction

We recommend that all final cut and fill slopes be constructed at no steeper than 2H:1V grade to allow for the planting and maintenance of grass cover. These slopes should be protected and seeded as soon as practicable after they are completed to reduce the potential for surface erosion.

Recommended specifications for gradation and compaction of backfill soils are provided in the attached recommended Material Specifications (Appendix D).

Existing native glacial till soils can likely be re-used on site as Structural Fill or Ordinary Fill, provided they do not contain oversize, organic, or otherwise deleterious material and can meet the appropriate compaction and moisture requirements. Cobbles and small boulders should be expected within these soils. We caution some of these materials will be difficult to work if allowed to become wet, and placement may be very difficult during certain times of the year.

Fill imported from off site should meet the attached gradation requirements. Fill placed within structural limits, under the access roadway, equipment pad, and substation, and behind any retaining walls should meet the compaction requirements for Structural Fill. Backfill placed in non-structural areas should meet the compaction requirements for Ordinary Fill. Proposed borrow materials that fall slightly outside of these specifications may also be suitable for use, subject to review and approval by GEI.

7. Closure

7.1 Follow-on Services

We recommend that GEI be kept on the project through the final design and construction phases for the following services:

- Review geotechnical-related contractor submittals and assist in developing responses to questions from the contractor (i.e. RFI's).
- Provide periodic site visits during construction to view subgrades and consult on geotechnical-related issues that occur.

7.2 Limitations

This report was prepared for the use of the project team, exclusively. Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the proposed PV array. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations, and whether our recommendations have been properly implemented in the design.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No warranty, express or implied, is made.

Tables

Table 1. Recommended Geotechnical Design Parameters
Bethany Solar
Bethany, Connecticut

Soil Material	Total Unit Weight Above Water Table	Drained Friction Angle	Undrained Strength	Earth Pressure Coefficients[2]		
	γ_t (pcf)	ϕ' (degrees)	C' (ksf)	K_o	K_a	K_p
Ordinary Fill (92% Compaction)[3]	120	32	0	0.47	0.31	3.25
Structural Fill (95% Compaction)[4]	125	35	0	0.43	0.27	3.69
Native Glacial Till	125	36	0	0.41	0.26	3.85

Notes:
1. The values of soil properties in this table are based on empirical correlations using the soil classifications, laboratory index tests, and engineering judgment.
2. K_o = Coefficient of Earth Pressure at Rest K_a = Active Earth Pressure Coefficient (Rankine) K_p = Passive Earth Pressure Coefficient (Rankine).
3. For material compacted to ~92% of Modified Proctor maximum dry density in accordance with ASTM D1557.
4. For material compacted to ~95% of Modified Proctor maximum dry density in accordance with ASTM D1557.

Table 2. USDA Soil Texture, NRCS Soil Group, and Infiltration Rate
Bethany Solar
Bethany, Connecticut

Test Pit ID	Sample Depth (feet)	Percent Sand[1]	Percent Silt[1]	Percent Clay[1]	USDA Soil Texture[2]	NRCS Hydrologic Soil Group[3]	Infiltration Rate (inches/hour)[3]
TP-3 (G4)	4.7-8.7	74.6	20.9	4.5	Loamy Sand / Sandy Loam	B	1.5
TP-4 (G3)	2-5	65.9	27.1	7.1	Sandy Loam	B	1.0
TP-6 (G2)	1-4	67.1	27.0	5.9	Sandy Loam	B	1.0

Notes:
1. USDA classification of soil particle sizes (mm): Sand: 0.05 to 2, Silt: 0.002 to 0.05, Clay: <0.002. Percentage of gravel removed from results to include only sand, silt, and clay proportions.
2. USDA soil texture is based on the soil texture triangle.
3. National Resources Conservation Service (NRCS) Hydrologic Soil Group and Infiltration Rate (referred to as Rawls rate) are based on Soil Texture Class and Table 7-1 of the NRCS Part 630 Hydrology National Engineering Handbook (2009) and Rawls et al 1982 “Estimation of Soil Water Properties.”

Figures

SOURCE:

Base map prepared by BL Companies, "Sketch Plan", Sheet No. SK-7, dated 1/2022

LEGEND:

Approximate Test Pit Location

GEI Consultants

EXPLORATION LOCATION PLAN
428 BETHMOUR ROAD
BETHANY, CT

GEI PROJECT NO: **2201295**

FIGURE NO.
1

Appendix A

Test Pit Logs

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	**CLIENT: BL Companies**	**TEST PIT LOG**	
	PROJECT: Tritec Bethany Solar	**PAGE**	**TP-1**
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	625.0	**LOCATION:**	See Plan.
NORTHING: NM	**EASTING:** NM	**TOTAL DEPTH:**	4.5 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	10 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	3.5 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0	G-1	0 - 0.7	SILTY SAND (SM); ~70% F-C sand, ~20% NP fines, ~10% F-C gravel and cobbles up to 4", brown, moist, contains organic fibers and roots. **TOPSOIL**
1			
2	G-2	0.7 - 2.7	SANDY SILT (ML); ~50% NP fines, ~30% F-C sand, ~20% F-C gravel and cobbles, olive, damp, few organic fibers. **GLACIAL TILL**
3	G-3	2.7 - 4.5	Red seam of silt at 3'. East corner of Test Pit contains cobbles up to 6" at 3' deep. WIDELY GRADED SAND WITH GRAVEL (SW); ~80% F-C sand (mostly M-C), ~20% F-C gravel and cobbles, grayish brown, wet. **GLACIAL TILL** *Excavator refusal at 4.5' deep. Possible bedrock*
4			

Bottom of test pit at 4.5 feet. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: Groundwater intrusion at 3.8 FT.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-1
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):		625.0	**LOCATION:**	See Plan	
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**	4.5 FT	
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**	10 FT	
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**	3.5 FT	
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**	Per SK-7 / NM	
WEATHER:	40-50° F Cloudy		**DATE START / END**	4/7/2022	

PHOTOGRAPHIC LOG

Bottom of test pit at 4.5 feet.
Pictures showing soil strata at Test Pit 1

NOTES:
IN. = INCHES NM= NOT MEASURED
FT. = FEET

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-2
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	614.0	**LOCATION:**	See Plan.
NORTHING:	NM **EASTING:** NM	**TOTAL DEPTH:**	8.2 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	10.5 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	5.5 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0	G-1	0 - 1.0	SILTY SAND (SM); ~70% F-M sand, ~30% NP fines, brown, some roots and organic fibers, moist. **TOPSOIL**
1	G-2	1.0 - 2.0	Similar to G-1, reddish brown, absent organic fibers. **SILTY SAND**
2	G-3	2.0 - 6.0	SILTY GRAVEL WITH SAND (GM); ~35% F-C gravel and cobbles, ~35% NP fines, ~30% F-C sand, gray, damp to wet. **GLACIAL TILL**
4		6.0 - 8.2	SILTY SAND WITH GRAVEL (SM); ~65% F-C sand, ~20% NP fines, ~15% F-C gravel and cobbles, olive to brown, soil mottling, wet. Cobbles and boulders at 6.2' deep. **GLACIAL TILL**
5			
6			
7			
8			
#			*Excavator refusal at 8.2' deep. Possible bedrock*

Bottom of test pit at 8.2 feet. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: Groundwater intrusion at 2.3 FT.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-2
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	614.0		**LOCATION:**	See Plan.	
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**	8.2 FT	
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**	10.5 FT	
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**	5.5 FT	
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**	Per SK-7 / NM	
WEATHER:	40-50° F Cloudy		**DATE START / END**	4/7/2022	

PHOTOGRAPHIC LOG

Bottom of test pit at 8.2 feet.
Pictures showing soil strata at Test Pit 2

NOTES:

IN. = INCHES NM= NOT MEASURED

FT. = FEET

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-3
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	612.0	**LOCATION:**	See Plan.
NORTHING: NM **EASTING:** NM		**TOTAL DEPTH:**	8.7 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	7 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	4 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0	G-1	0 - 0.8	SILTY SAND (SM); ~70% F-M sand, ~30% NP fines, dark brown, organic fibers, moist. **TOPSOIL**
1 2	G-2	0.8 - 2.5	WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% F-C sand, ~25% F-C gravel and cobbles, ~10% NP fines, little organic fibers, moist. Increase in cobbles at 2' deep. **GLACIAL TILL**
3 4	G-3	2.5- 4.7	SILTY GRAVEL WITH SAND (GM); ~55% F-C gravel and cobbles up to 6", ~30% F-C sand, ~15% NP fines, gray to grayish brown, moist to damp. **GLACIAL TILL**
5 6 7 8	**G-4**	4.7 - 8.7	WIDELY GRADED SAND WITH GRAVEL (SW); 49.8% F-C sand, 29.7% F-C gravel and cobbles, 20.5% NP fines. Moisture content = 9.7%. **GLACIAL TILL** Increase in boulders and cobbles at 7' deep. *Excavator refusal at 8.7' deep. Possible bedrock*

Bottom of test pit at 8.7 feet. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: Groundwater intrusion at 3.7 FT.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-3
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	612.0		**LOCATION:**	See Plan.	
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**	8.7 FT	
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**	7 FT	
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**	4 FT	
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**	Per SK-7 / NM	
WEATHER:	40-50° F Cloudy		**DATE START / END**	4/7/2022	

PHOTOGRAPHIC LOG

Bottom of test pit at 8.7 feet.
Pictures showing soil strata at Test Pit 3

NOTES:

IN. = INCHES NM= NOT MEASURED

FT. = FEET

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-4
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	600.0		**LOCATION:**	See Plan.	
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**	5.5 FT	
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**	10 FT	
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**	4.5 FT	
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**	Per SK-7 / NM	
WEATHER:	40-50° F Cloudy		**DATE START / END**	4/7/2022	

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0	G-1	0 - 0.7	SILTY SAND (SM); ~80% F-C sand, ~20% NP fines, dark brown, moist, organic fibers. **TOPSOIL**
1	G-2	0.7 - 1.8	SILTY SAND WITH GRAVEL (SM); ~70% F-C sand, ~15% NP fines, ~15% F-C gravel, orange-brown, moist, little organic fibers. **GLACIAL TILL**
2 3 4 5	G-3	1.8 - 5.5	SILTY SAND (SM); 56.3% F-C sand, 32.9% NP fines, 10.8% gravel and cobbles, gray-brown, moist. Moisture content = 11.6%. **GLACIAL TILL** Increase in boulders and cobbles at 4.5' *Excavator refusal at 5.5' deep. Possible bedrock*

Bottom of test pit at 5.5 feet. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: No groundwater intrusion observed.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	**CLIENT: BL Companies**	**TEST PIT LOG**	
	PROJECT: Tritec Bethany Solar	**PAGE**	**TP-4**
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	600.0	**LOCATION:**	See Plan.
NORTHING: NM	**EASTING:** NM	**TOTAL DEPTH:**	5.5 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	10 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	4.5 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

PHOTOGRAPHIC LOG

Bottom of test pit at 5.5 feet.
Pictures showing soil strata at Test pit 4

NOTES:

IN. = INCHES NM= NOT MEASURED

FT. = FEET

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-5
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	620.5	**LOCATION:**	See Plan.
NORTHING:	NM **EASTING:** NM	**TOTAL DEPTH:**	8.3 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	10 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	5.5 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0 – 1	G-1	0 - 1.2	SILTY SAND (SM); ~65% F-M sand, ~35% NP fines, brown, moist, organic fibers. **TOPSOIL**
2 – 3	G-2	1.2 - 3.2	SILTY GRAVEL WITH SAND (GM); ~65% F-C gravel and cobbles up to 12", ~20% F-C sand, ~15% NP fines, olive, damp to wet. Increase in cobbles at 2.5' deep. **GLACIAL TILL**
4 – 8	G-3	3.2 - 8.3	SILTY SAND WITH GRAVEL (GM); ~50% F-C sand, ~35% NP fines, ~15% F-C gravel and cobbles, brown, wet. **GLACIAL TILL**

Bottom of test pit at 8.3 feet. Planned extent. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: Groundwater intrusion at 2.7 FT.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-5
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):		620.5	**LOCATION:**	See Plan	
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**	8.3 FT	
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**	10 FT	
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**	5.5 FT	
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**	Per SK-7 / NM	
WEATHER:	40-50° F Cloudy		**DATE START / END**	4/7/2022	

PHOTOGRAPHIC LOG

Bottom of test pit at 8.3 feet.
Pictures showing soil strata at Test Pit 5.

NOTES:

IN. = INCHES NM= NOT MEASURED
FT. = FEET

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-6
	CITY/STATE: Bethany, CT	1	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):	616.0	**LOCATION:**	See Plan.
NORTHING:	NM **EASTING:** NM	**TOTAL DEPTH:**	7.8 FT
OBSERVED BY:	Tom Rezzani	**TOTAL LENGTH:**	10 FT
CHECKED BY:	Anna Hernberg	**TOTAL WIDTH:**	4.5 FT
EQUIPMENT:	HITACHI 135 G	**DATUM VERT. / HORZ.:**	Per SK-7 / NM
WEATHER:	40-50° F Cloudy	**DATE START / END**	4/7/2022

DEPTH FT.	SAMPLE TYPE & ID	SAMPLE DEPTH (FT)	SOIL DESCRIPTION
0	G-1	0 - 1.0	SANDY SILT (ML); ~65% NP fines, ~35% F-C sand (mostly F), black, moist, interspersed roots and fibers. **TOPSOIL**
1			
2	G-2	1.0 - 4.3	SILTY SAND WITH GRAVEL (SM); 48.6% F-C sand, 30.3% NP fines, 21.1% F-C gravel and cobbles, light brown to orange-brown , damp to wet. Cobbles at 1.5' deep. Increase in cobbles at 2.7' deep. Moisture content = 12.6%. **GLACIAL TILL**
3			
4			
5	G-3	4.3 - 7.8	WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~45% F-C sand, ~45% F-C gravel and cobbles, ~10% NP fines, gray-brown , wet. Large Boulder observed in northeast corner at 6.5' deep. **GLACIAL TILL**
6			
7			
8			*Excavator refusal at 7.8' deep. Possible bedrock*

Bottom of test pit at 7.8 feet. Backfilled with excavated soil placed in lifts and tamped with excavator bucket.

Note: Groundwater intrusion observed at 3.0 FT.

F=FINE M=MEDIUM NP= NONPLASTIC NM= NOT MEASURED
C=COARSE LP=LOW PLASTICITY MP=MEDIUM PLASTICITY

GEI Consultants, Inc. 455 Winding Brook Drive Glastonbury, CT 06033 (860) 368-5300	CLIENT: BL Companies	TEST PIT LOG	
	PROJECT: Tritec Bethany Solar	PAGE	TP-6
	CITY/STATE: Bethany, CT	2	
	GEI PROJECT NUMBER: 2201295		

GROUND SURFACE ELEVATION (FT):		616.0	**LOCATION:**		See Plan
NORTHING:	NM	**EASTING:** NM	**TOTAL DEPTH:**		7.8 FT
OBSERVED BY:	Tom Rezzani		**TOTAL LENGTH:**		10 FT
CHECKED BY:	Anna Hernberg		**TOTAL WIDTH:**		4.5 FT
EQUIPMENT:	HITACHI 135 G		**DATUM VERT. / HORZ.:**		Per SK-7 / NM
WEATHER:	40-50° F Cloudy		**DATE START / END**		4/7/2022

PHOTOGRAPHIC LOG

Bottom of test pit at 7.8 feet.
Pictures showing soil strata at Test Pit 6

NOTES:

IN. = INCHES NM= NOT MEASURED

FT. = FEET

Appendix B

Laboratory Test Results

Client:	GEI Consultants, Inc.				
Project:	Bethany Solar				
Location:	Bethany, CT			Project No:	GTX-315402
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	05/11/22	Checked By:	jdt
Depth :	---	Test Id:	665909		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
TP-3	G4	4.67-8.67'	Moist, dark brown gray silty sand with gravel	9.7
TP-4	G3	2-5'	Moist, dark brownish gray silty sand	11.6
TP-6	G2	1-4'	Moist, brown silty sand with gravel	12.6

Notes: Temperature of Drying : 110º Celsius

Client:	GEI Consultants, Inc.				
Project:	Bethany Solar				
Location:	Bethany, CT			Project No:	GTX-315402
Boring ID:	TP-1	Sample Type:	bag	Tested By:	amp
Sample ID:	Composite-1	Test Date:	05/05/22	Checked By:	jdt
Depth :	0.7-4.5'	Test Id:	665903		
Test Comment:	---				
Visual Description:	Moist, brown silty sand with gravel				
Sample Comment:	---				

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
TP-1	Composite-1	0.7-4.5'	Moist, brown silty sand with gravel	6.7	5.7

Notes: Sample Preparation: screened through #10 sieve

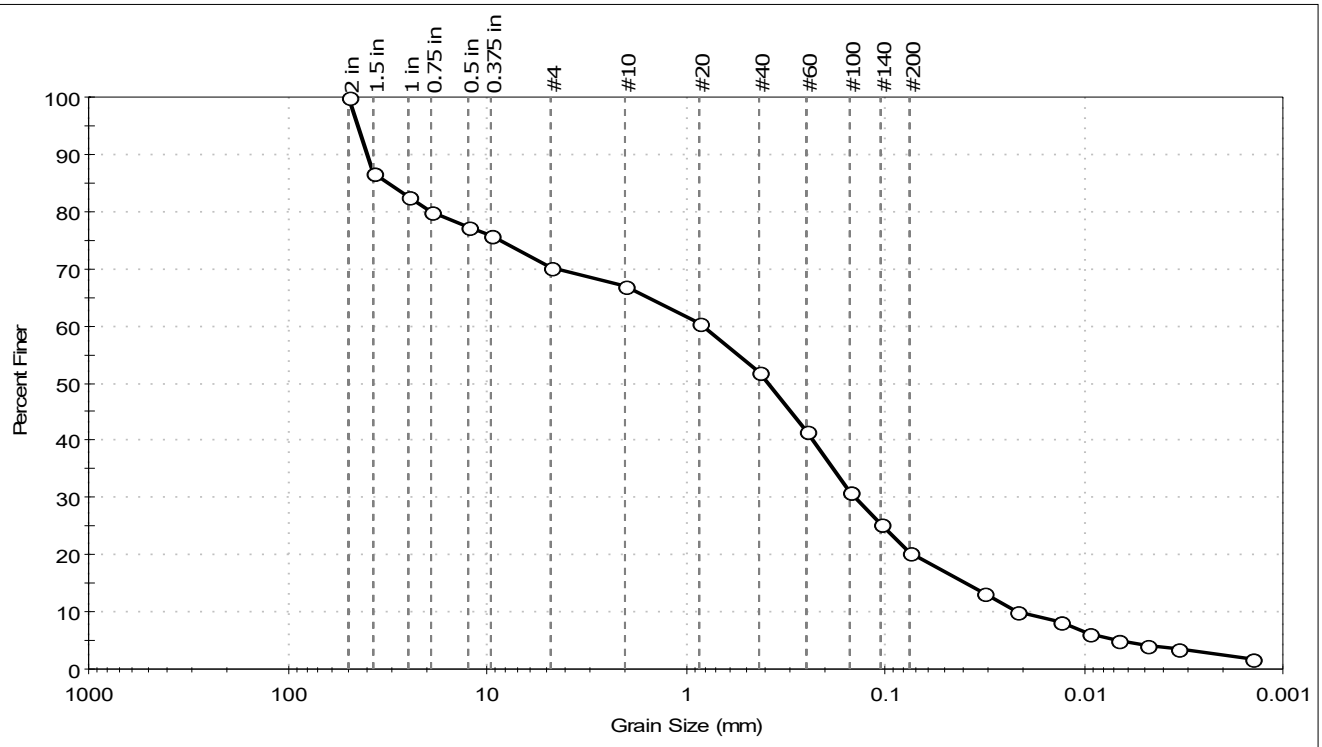
Method A, pH meter used

GeoTesting EXPRESS

Client:	GEI Consultants, Inc.				
Project:	Bethany Solar				
Location:	Bethany, CT			Project No:	GTX-315402
Boring ID:	TP-3	Sample Type:	bag	Tested By:	ckg
Sample ID:	G4	Test Date:	05/11/22	Checked By:	jdt
Depth :	4.67-8.67'	Test Id:	665905		

Test Comment: ---
Visual Description: Moist, dark brown gray silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	29.7	49.8	20.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	87		
1 in	25.00	83		
0.75 in	19.00	80		
0.5 in	12.50	77		
0.375 in	9.50	76		
#4	4.75	70		
#10	2.00	67		
#20	0.85	61		
#40	0.42	52		
#60	0.25	42		
#100	0.15	31		
#140	0.11	25		
#200	0.075	20		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0320	13		
---	0.0217	10		
---	0.0131	8		
---	0.0094	6		
---	0.0067	5		
---	0.0048	4		
---	0.0034	4		
---	0.0014	2		

Coefficients

D_{85} = 31.3644 mm D_{30} = 0.1419 mm
D_{60} = 0.8143 mm D_{15} = 0.0388 mm
D_{50} = 0.3855 mm D_{10} = 0.0216 mm
C_u = 37.699 C_c = 1.145

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

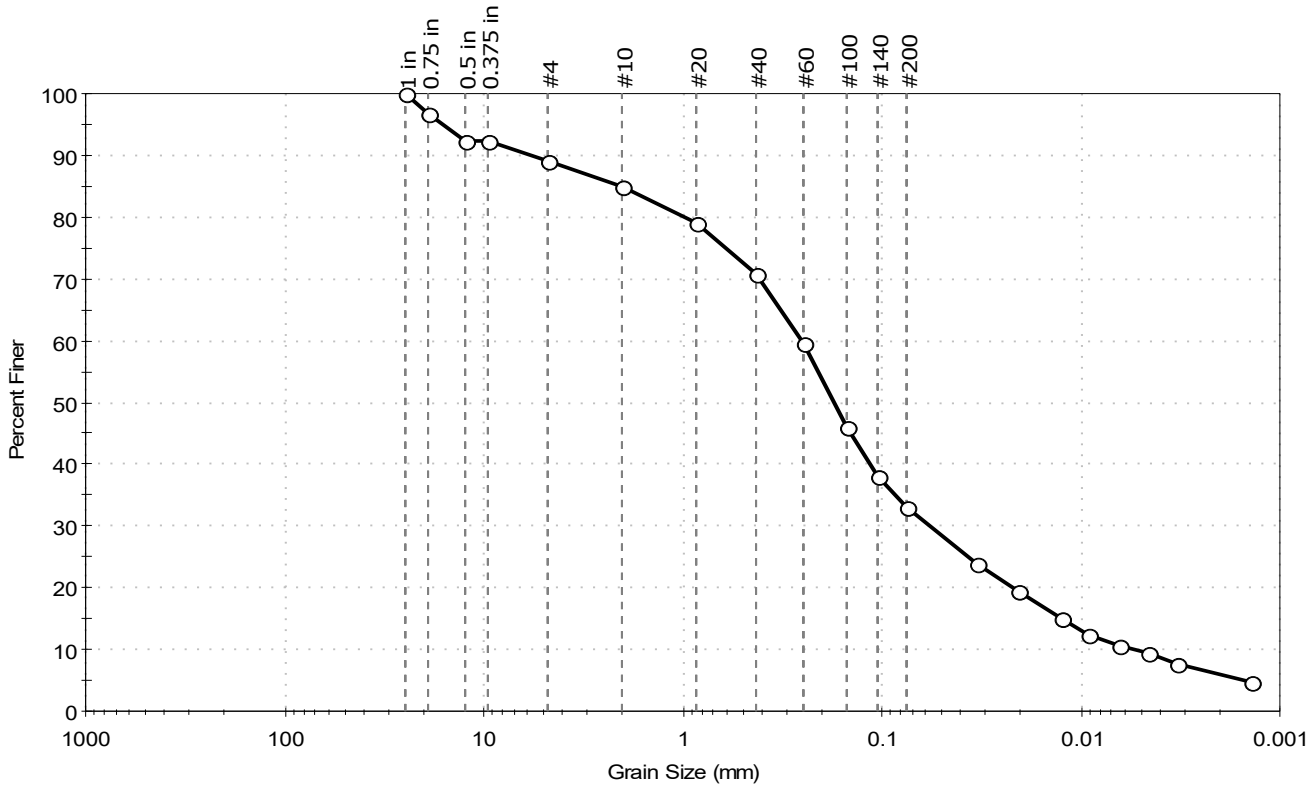
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

GeoTesting EXPRESS

Client:	GEI Consultants, Inc.				
Project:	Bethany Solar				
Location:	Bethany, CT			Project No:	GTX-315402
Boring ID:	TP-4	Sample Type:	bag	Tested By:	ckg
Sample ID:	G3	Test Date:	05/11/22	Checked By:	jdt
Depth :	2-5'	Test Id:	665904		
Test Comment:	---				
Visual Description:	Moist, dark brownish gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	10.8	56.3	32.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	97		
0.5 in	12.50	92		
0.375 in	9.50	92		
#4	4.75	89		
#10	2.00	85		
#20	0.85	79		
#40	0.42	71		
#60	0.25	60		
#100	0.15	46		
#140	0.11	38		
#200	0.075	33		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0333	24		
---	0.0209	20		
---	0.0126	15		
---	0.0091	12		
---	0.0065	11		
---	0.0046	9		
---	0.0033	8		
---	0.0014	5		

Coefficients

D_{85} = 2.0146 mm D_{30} = 0.0575 mm
D_{60} = 0.2549 mm D_{15} = 0.0125 mm
D_{50} = 0.1749 mm D_{10} = 0.0055 mm
C_u = 46.345 C_c = 2.358

Classification

ASTM N/A

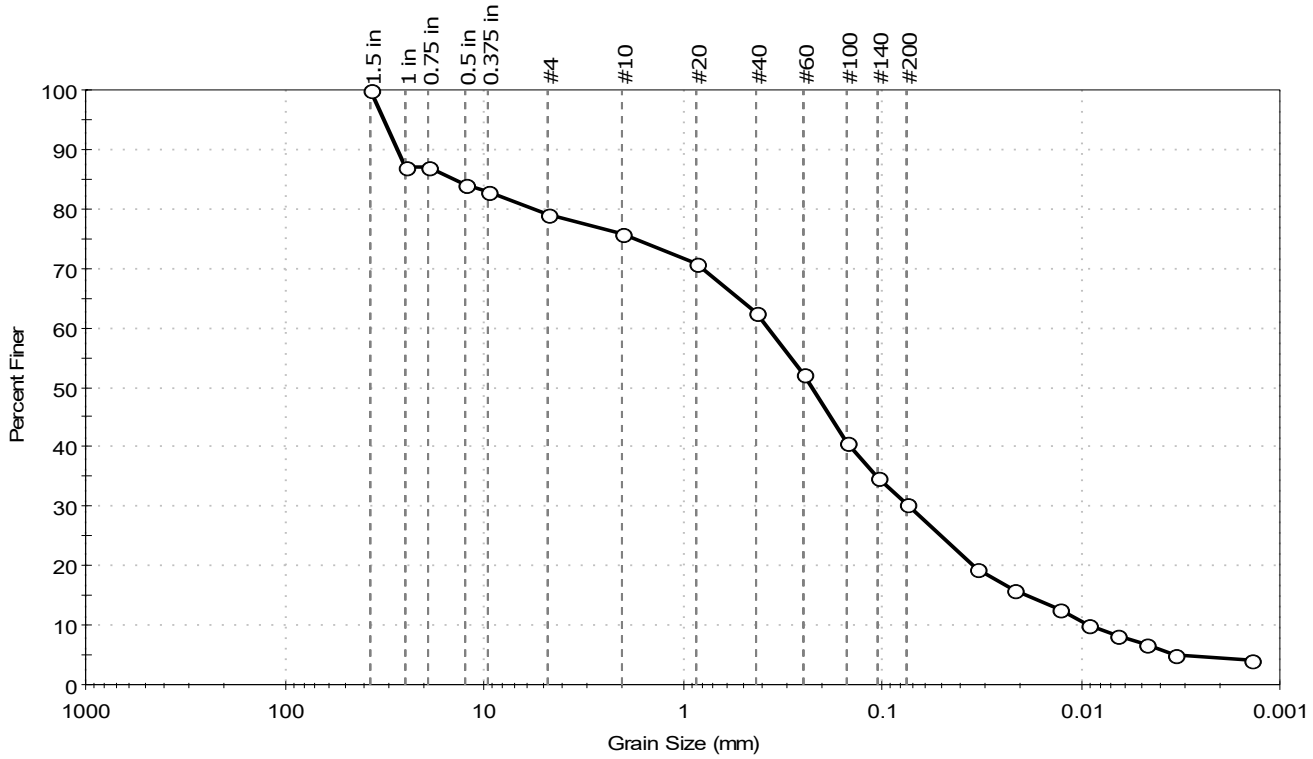
AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: Sieve

Client:	GEI Consultants, Inc.				
Project:	Bethany Solar				
Location:	Bethany, CT			Project No:	GTX-315402
Boring ID:	TP-6	Sample Type:	bag	Tested By:	ckg
Sample ID:	G2	Test Date:	05/11/22	Checked By:	jdt
Depth :	1-4'	Test Id:	665906		
Test Comment:	---				
Visual Description:	Moist, brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	21.1	48.6	30.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	87		
0.75 in	19.00	87		
0.5 in	12.50	84		
0.375 in	9.50	83		
#4	4.75	79		
#10	2.00	76		
#20	0.85	71		
#40	0.42	63		
#60	0.25	52		
#100	0.15	41		
#140	0.11	35		
#200	0.075	30		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0334	19		
---	0.0216	16		
---	0.0128	13		
---	0.0093	10		
---	0.0066	8		
---	0.0047	7		
---	0.0034	5		
---	0.0014	4		

Coefficients

D_{85} = 14.2744 mm D_{30} = 0.0733 mm

D_{60} = 0.3721 mm D_{15} = 0.0184 mm

D_{50} = 0.2255 mm D_{10} = 0.0092 mm

C_u = 40.446 C_c = 1.569

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	GEI Consultants, Inc.
Project:	Bethany Solar
Location:	Bethany, CT
GTX#:	315402
Test Date:	05/05/22
Tested By:	amp
Checked By:	jdt

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
TP-1	Composite-1	0.7-4.5	Moist, brown silty sand with gravel	113,634	8.80E-06

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

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GEOTESTING EPXRESS INCORPORATED
125 NAGOG PARK
ACTON MA 01720-3451
USA

Analysis No.	TS-A2210280
Report Date	09 May 2022
Date Sampled	29 April 2022
Date Received	06 May 2022
Where Sampled	Acton, MA USA
Sampled By	Client

This is to attest that we have examined: Soil: Project: Bethany Solar; Site Location: Bethany, CT; Job Number: GTX-315402

When examined to the applicable requirements of:

ASTM D 512-12* "Standard Test Methods for Chloride Ion in Water" Method B

ASTM D 516-16 "Standard Test Method for Sulfate Ion in Water"

Results:

ASTM D512 - Chloride Method B

Sample		Results		Detection Limit
		ppm (mg/kg)	%[1]	
TP-1		12.	0.0012	10.
Composite-1	0.7 – 4.5'			

NOTE: [1]Percent by weight after drying and prepared as per the Standard. *Withdrawn 2021 without Replacement

ASTM D 516 – Sulfates (Soluble)

Sample		Results		Detection Limit
		ppm (mg/kg)	%[1]	
TP-1		< 10.	< 0.0010	10.
Composite-1	0.7 – 4.5'			

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

END OF ANALYSIS

USEPA Laboratory ID UT00930

Merrill Gee P.E. – Engineer in Charge

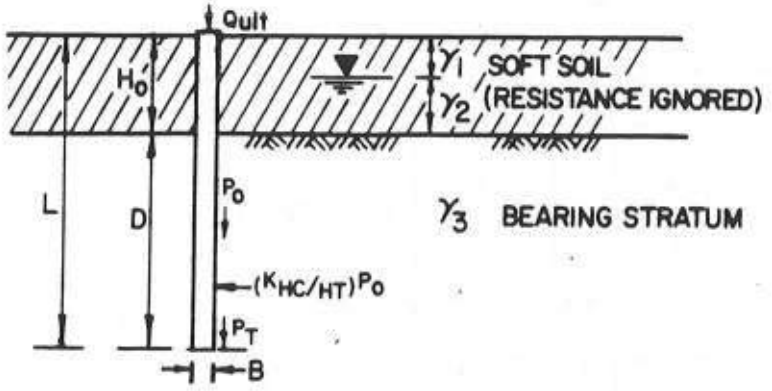
Appendix C

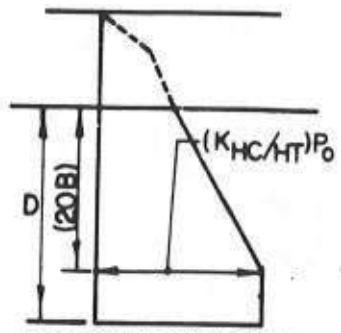
NAVFAC DM 7.02

Naval Facilities Engineering Command
200 Stovall Street
Alexandria, Virginia 22332-2300 APPROVED FOR PUBLIC RELEASE

Foundations &
Earth Structures

DESIGN MANUAL 7.02
REVALIDATED BY CHANGE 1 SEPTEMBER 1986





PRESSURE DIAGRAM
$K_{HC}P_o$ AND $K_{HT}P_o$

(A) ULTIMATE LOAD CAPACITY IN COMPRESSION

$$Q_{ult} = P_T N_q A_T + \sum_{H=H_o}^{H=H_o+D} (K_{HC})(P_o)(\tan\delta)(S)$$

WHERE Q_{ult} = ULTIMATE LOAD CAPACITY IN COMPRESSION

P_T = EFFECTIVE VERTICAL STRESS AT PILE TIP (SEE NOTE 1)

N_q = BEARING CAPACITY FACTOR (SEE TABLE, FIGURE 1 CONTINUED)

A_T = AREA OF PILE TIP

K_{HC} = RATIO OF HORIZONTAL TO VERTICAL EFFECTIVE STRESS ON SIDE OF ELEMENT WHEN ELEMENT IS IN COMPRESSION.

P_o = EFFECTIVE VERTICAL STRESS OVER LENGTH OF EMBEDMENT, D (SEE NOTE 1)

δ = FRICTION ANGLE BETWEEN PILE AND SOIL (SEE TABLE, FIGURE 1 CONTINUED)

S = SURFACE AREA OF PILE PER UNIT LENGTH

FOR CALCULATING Q_{all}, USE F_S OF 2 FOR TEMPORARY LOADS, 3 FOR PERMANENT LOADS. (SEE NOTE 2)

(B) ULTIMATE LOAD CAPACITY IN TENSION

$$T_{ult} = \sum_{H=H_o}^{H=H_o+D} (K_{HT})(P_o)(\tan\delta)(S)(H)$$

WHERE: T_{ult} = ULTIMATE LOAD CAPACITY IN TENSION, PULLOUT

K_{HT} = RATIO OF HORIZONTAL TO VERTICAL EFFECTIVE STRESS ON SIDE OF ELEMENT WHEN ELEMENT IS IN TENSION

FOR CALCULATING T_{all}, USE $F_S = 3$ ON T_{ult} PLUS THE WEIGHT OF THE PILE (W_P), THUS $T_{all} = \frac{T_{ult}}{3} + W_P$ (SEE NOTE 2)

NOTE-1: EXPERIMENTAL AND FIELD EVIDENCE INDICATE THAT BEARING PRESSURE AND SKIN FRICTION INCREASE WITH VERTICAL EFFECTIVE STRESS P_o UP TO A LIMITING DEPTH OF EMBEDMENT, DEPENDING ON THE RELATIVE DENSITY OF THE GRANULAR SOIL AND POSITION OF THE WATER TABLE. BEYOND THIS LIMITING DEPTH (10B ± TO 40B ±) THERE IS VERY LITTLE INCREASE IN END BEARING, AND INCREASE IN SIDE FRICTION IS DIRECTLY PROPORTIONAL TO THE SURFACE AREA OF THE PILE. THEREFORE, IF D IS GREATER THAN 20 B, LIMIT P_o AT THE PILE TIP TO THAT VALUE CORRESPONDING TO D = 20B.

NOTE-2: IF BUILDING LOADS AND SUBSURFACE CONDITION ARE WELL DOCUMENTED IN THE OPINION OF THE ENGINEER, A LESSER FACTOR OF SAFETY CAN BE USED BUT NOT LESS THAN 2.0 PROVIDED PILE CAPACITY IS VERIFIED BY LOAD TEST AND SETTLEMENTS ARE ACCEPTABLE.

FIGURE 1
Load Carrying Capacity of Single Pile in Granular Soils

BEARING CAPACITY FACTORS - N_q

ϕ* (DEGREES)	26	28	30	31	32	33	34	35	36	37	38	39	40
N_q (DRIVEN PILE DISPLACE-MENT)	10	15	21	24	29	35	42	50	62	77	86	120	145
N_q** (DRILLED PIERS)	5	8	10	12	14	17	21	25	30	38	43	60	72

EARTH PRESSURE COEFFICIENTS K_{HC} AND K_{HT}

PILE TYPE	K_{HC}	K_{HT}
DRIVEN SINGLE H-PILE	0.5 – 1.0	0.3 – 0.5
DRIVEN SINGLE DISPLACEMENT PILE	1.0 – 1.5	0.6 – 1.0
DRIVEN SINGLE DISPLACEMENT TAPERED PILE	1.5 – 2.0	1.0 – 1.3
DRIVEN JETTED PILE	0.4 – 0.9	0.3 – 0.6
DRILLED PILE (LESS THAN 24" DIAMETER)	0.7	0.4

FRICTION ANGLE - δ

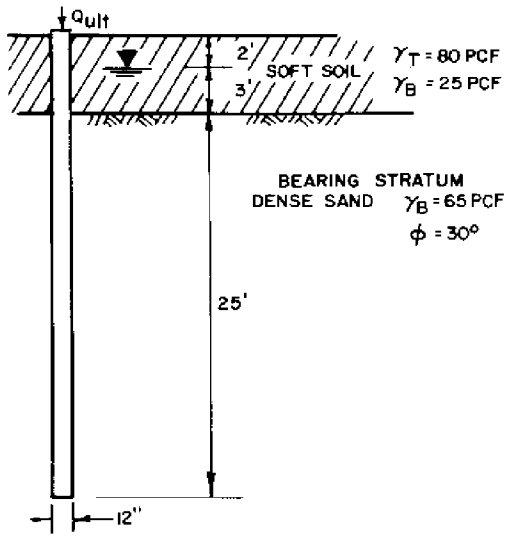
PILE TYPE	δ
STEEL	20°
CONCRETE	3/4 ϕ
TIMBER	3/4 ϕ

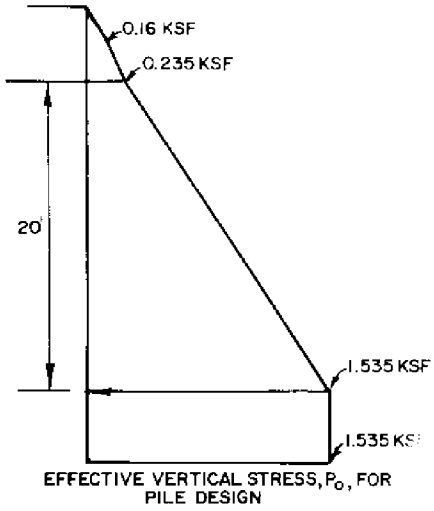
* LIMIT ϕ TO 28° IF JETTING IS USED

** (A) IN CASE A BAILER OR GRAB BUCKET IS USED BELOW GROUNDWATER TABLE, CALCULATE END BEARING BASED ON ϕ NOT EXCEEDING 28°.

(B) FOR PIERS GREATER THAN 24-INCH DIAMETER, SETTLEMENT RATHER THAN BEARING CAPACITY USUALLY CONTROLS THE DESIGN. FOR ESTIMATING SETTLEMENT, TAKE 50% OF THE SETTLEMENT FOR AN EQUIVALENT FOOTING RESTING ON THE SURFACE OF COMPARABLE GRANULAR SOILS. (CHAPTER 5, DM-7.1).

FIGURE 1 (continued)
Load Carrying Capacity of Single Pile in Granular Soils





EFFECTIVE VERTICAL STRESS, P_o, FOR PILE DESIGN

FOR A 12" DIAMETER CLOSED END, DRIVEN PIPE PILE, CONCRETE FILLED, FIND Q_{all} AND T_{all} FOR A 30 FOOT LONG PILE.

P_o MAX OCCURS AT 20B, OR 20' INTO BEARING STRATUM.

$\phi = 30°$, $N_q = 21$

$K_{HC} = 1.5$, $\delta = 20°$

$K_{HT} = 1.0$

$A_T = \pi \times 0.5^2 = 0.78$ SF

CIRCUM. AREA / lf $= 1 \times \pi = 3.14$ SF / lf

$$Q_{ult} = 1.535 \times 21 \times 0.78 + \left[\left(1.5 \times \left(\frac{0.235 + 1.535}{2} \right) \times \text{TAN } 20 \times 20 \times 3.14 \right) + (1.5 \times 1.535 \times \text{TAN } 20 \times 5 \times 3.14) \right]$$

$$= 25.14 + [30.34 + 13.16]$$

$$= 68.64 \text{ K}$$

FOR $F_S = 3$, $Q_{all} = \frac{68.64}{3} = 22.9$ K

$$T_{ult} = 1.0 \times \left(\frac{0.235 + 1.535}{2} \right) \times \text{TAN } 20 \times 20 \times 3.14 + 1.0 \times 1.535 \times \text{TAN } 20 \times 5 \times 3.14$$

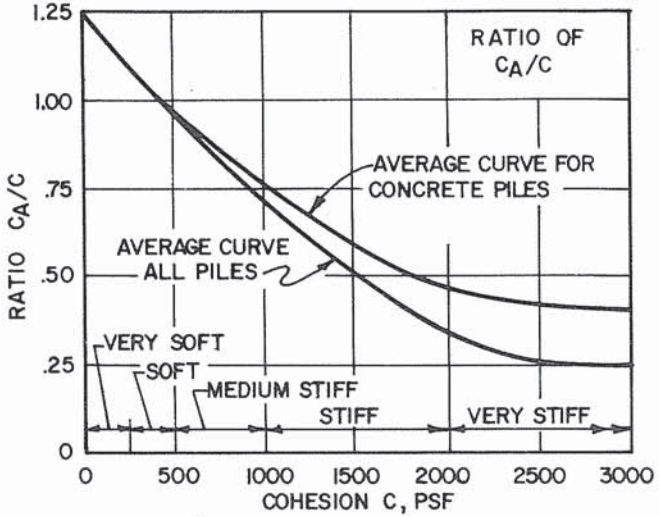
$$= 20.23 + 8.77$$

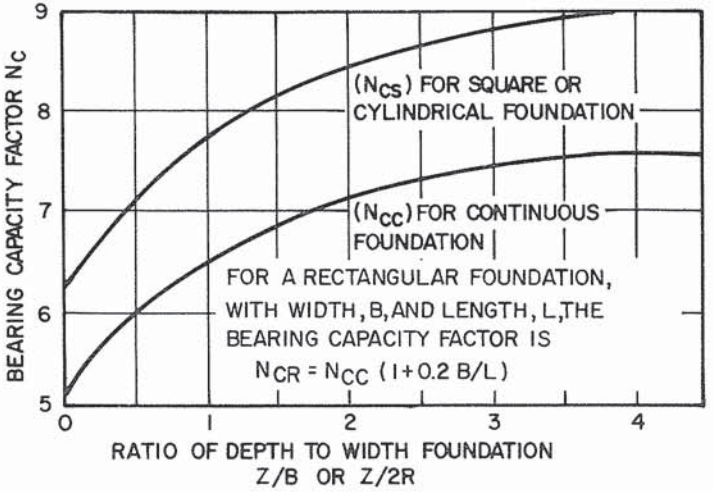
$$= 29.0 \text{ K}$$

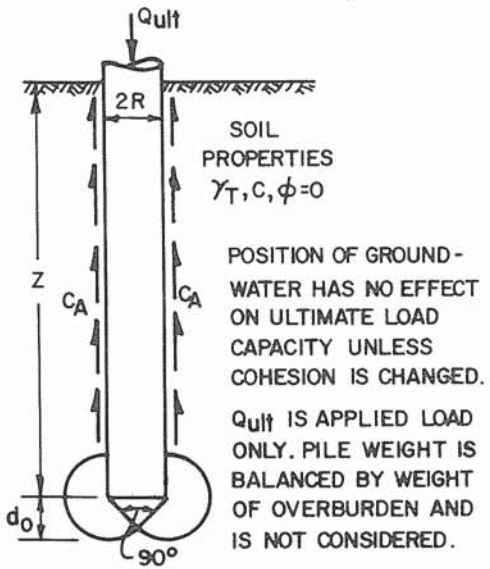
$W_P \approx .117 \text{ K/lf} \times 30' = 3.5$ K

$T_{all} = \frac{29.0}{3} + 3.5 = 13.2$ K

FIGURE 1 (continued)
Load Carrying Capacity of Single Pile in Granular Soils







ULTIMATE LOAD CAPACITY IN COMPRESSION

$$Q_{ult} = C\,(N_{CS})\,\pi R^2 + C_A\,2\pi RZ$$
$$(N_{CC})$$

RECOMMENDED VALUES OF ADHESION

PILE TYPE	CONSISTENCY OF SOIL	COHESION, C PSF	ADHESION, C_A PSF
TIMBER AND CONCRETE	VERY SOFT	0 - 250	0 - 250
	SOFT	250 - 500	250 - 480
	MED. STIFF	500 - 1000	480 - 750
	STIFF	1000 - 2000	750 - 950
	VERY STIFF	2000 - 4000	950 - 1300
STEEL	VERY SOFT	0 - 250	0 - 250
	SOFT	250 - 500	250 - 460
	MED. STIFF	500 - 1000	460 - 700
	STIFF	1000 - 2000	700 - 720
	VERY STIFF	2000 - 4000	720 - 750

ULTIMATE LOAD CAPACITY IN TENSION

$T_{ult} = C_A\,2\pi RZ$

T_{ult} UNDER SUSTAINED LOAD MAY BE LIMITED BY OTHER FACTORS, SEE TEXT.

FIGURE 2
Ultimate Load Capacity of Single Pile or Pier in Cohesive Soils

(3) Drilled Piers. For drilled piers greater than 24 inches in diameter settlement rather than bearing capacity may control. A reduced end bearing resistance may result from entrapment of bentonite slurry if used to maintain an open excavation to the pier's tip. Bells, or enlarged bases, are usually not stable in granular soils.

(4) Piles and Drilled Piers in Cohesive Soils. See Figure 2 and Table 3. Experience demonstrates that pile driving permanently alters surface adhesion of clays having a shear strength greater than 500 psf (see Figure 2). In softer clays the remolded material consolidates with time, regaining adhesion approximately equal to original strength. Shear strength for point-bearing resistance is essentially unchanged by pile driving. For drilled piers, use Table 3 from Reference 4, Soils and Geology, Procedures for Foundation Design of Buildings and Other Structures, by the Departments of Army and Air Force, for determining side friction. Ultimate resistance to pullout cannot exceed the total resistance of reduced adhesion acting over the pile surface or the effective weight of the soil mass which is available to react against pullout. The allowable sustained pullout load usually is limited by the tendency for the pile to move upward gradually while mobilizing an adhesion less than the failure value.

Adhesion factors in Figure 2 may be very conservative for evaluating piles driven into stiff but normally consolidated clays. Available data suggests that for piles driven into normally to slightly overconsolidated clays, the side friction is about 0.25 to 0.4 times the effective overburden.

(5) Piles Penetrating Multi-layered Soil Profile. Where piles penetrate several different strata, a simple approach is to add supporting capacity of the individual layers, except where a soft layer may consolidate and relieve load or cause drag on the pile. For further guidance on bearing capacity when a pile penetrates layered soil and terminates in granular strata see Reference 5, Ultimate Bearing Capacity of Foundations on Layered Soils Under Inclined Loads, by Meyerhoff and Hanna, which considers the ultimate bearing capacity of a deep member in sand underlying a clay layer and for the case of a sand bearing stratum overlying a weak clay layer.

(6) Pile Buckling. For fully embedded piles, buckling usually is not a problem. For a fully embedded, free headed pile with length equal to or greater than 4T, the critical load for buckling is as follows (after Reference 6, Design of Pile Foundations, by Vesic):

$$P_{crit} = 0.78\ T^3 f \quad \text{for } L \geq 4T$$

where: P_{crit} = critical load for buckling

f = coefficient of variation of lateral subgrade reaction (see Figure 10)

T = relative stiffness factor (see Figure 10)

L = length of pile.

TABLE 3
Design Parameters for Side Friction for Drilled Piers in Cohesive Soils

Design Category	Side Resistance		Remarks
	C_A/C	Limit on side shear - tsf	
A. Straight-sided shafts in either homogeneous or layered soil with no soil of exceptional stiffness below the base			
1. Shafts installed dry or by the slurry displacement method	0.6	2.0	
2. Shafts installed with drilling mud along some portion of the hole with possible mud entrapment	0.3(a)	0.5(a)	(a) C_A/C may be increased to 0.6 and side shear increased to 2.0 tsf for segments drilled dry
B. Belled shafts in either homogeneous or layered clays with no soil of exceptional stiffness below the base			
1. Shafts installed dry or by the slurry displacement methods	0.3	0.5	
2. Shafts installed with drilling mud along some portion of the hole with possible mud entrapment	0.15(b)	0.3(b)	(b) C_A/C may be increased to 0.3 and side shear increased to 0.5 tsf for segments drilled dry

Appendix D

Recommended Material Specifications

Recommended Material Specifications
Bethany Solar
428 Bethmour Road
Bethany, CT

Structural Fill and Ordinary Fill shall consist of hard, durable sand and gravel, free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be nonplastic. On-site materials can be re-used as Structural Fill or Ordinary Fill, provided they can meet the appropriate compaction and moisture requirements indicated below and do not contain deleterious materials. Soils to be used as fill imported from off site should also meet the gradation requirements given below.

Structural Fill

Structural Fill should consist of hard, durable sand and gravel. It should be free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be nonplastic. Structural Fill shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
3 inches	100
1 - ½ inch	55 – 100
No. 4	35 – 85
No. 16	20 – 65
No. 50	5 – 40
No. 200 (fines)	0 – 10

Structural Fill should be compacted in maximum 12-inch-thick, loose lifts to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction). The moisture content should be held to within +/- 3 percent of optimum moisture content (as determined by ASTM D1557).

Ordinary Fill

Ordinary fill should consist of hard, durable sand and gravel, free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be nonplastic. Ordinary Fill shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
6 inches	100
3 inches	80 – 100
No. 4	20 – 100
No. 200 (fines)	0 – 20

Ordinary fill should be compacted in maximum 12-inch-thick, loose lifts to at least 92 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction). The moisture content should be held to within +/- 3 percent of optimum moisture content (as determined by ASTM D1557).

Geotextile Fabric

Geotextile fabric for roadway underlayment (if used, refer to Section 6.1.4) should be a heavy-duty woven fabric, consisting of GEOTEX 200ST or an approved equivalent product.