Memorandum

To: Ms. Dawn M. McKay
CTDEEP
Natural Diversity Database Program
79 Elm Street
Hartford, CT 06106-5127

Date: July 19, 2020

Project #: 42569.00

From: Jeffrey C. Peterson
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Re: NDDB Preliminary Assessment Nos. 201914275 and 202002957
Gravel Pit Solar Project - Proposed Conservation Measures
Windsorville Road, Apothecaries Hall Road, Plantation Road, and
Wapping Road, East Windsor, Connecticut

Introduction

This Memorandum provides the conservation/protection strategies for the four plant and 11 animal species indicated through the Connecticut Department of Energy and Environmental Protection (CTDEEP) Natural Diversity Data Base (NDDB) preliminary assessment as species subject to state protection and having the potential to occur at the Gravel Pit Solar (GPS) Project in the Town of East Windsor. The Project will encompass approximately 485 acres (the Project Area) and will be sited on eight parcels of land totaling approximately 726 acres (the Project Site) with frontage on Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road (see **Figure 1)**. The Project Layout and Critical Habitat Map (without the Solar Array) are provided in **Figure 2** in **Attachment A**). The Project proponent is Gravel Pit Solar.

The objective of this Memorandum is to identify and detail protection strategies for the 15 State-listed animal and plant species that may potentially be affected by GPS activities, detail findings of key habitat types and natural communities present within the Project Site, and to obtain approval for these strategies by CTDEEP. Wherever possible, conservation/protection strategies and techniques have been incorporated from NDDB Program recommendations on similar projects.

The State-protected taxa include:

- Three endangered animal species;
- One threatened animal species and two threatened plant species; and
- Seven animal species of special concern and two plant species of special concern.

A brief description of the pertinent natural history characteristics of each species is provided along with a description of proposed or completed field studies, findings, and/or proposed conservation measures to be implemented by the Project. A table summarizing the proposed conservation/protection strategies for each species is provided as **Attachment B**. Site photos are provided in **Attachment C** and the resumes of preparers are provided in **Attachment D**.

Background

The NDDB responded to two separate requests for State-listed species reviews with NDDB Preliminary Assessment (PA) Nos. 201914275 and 2020022957 dated December 31, 2019 and March 4, 2020, respectively. The species list in the second NDDB PA No. 2020022957 was a smaller subset of the first and did not add any "new" species to the list provided in PA No. 201914275. NDDB PAs are included as **Attachment E**.

This Memorandum also describes the natural history of each species, survey results, potential Project effects and provides a conservation strategy for each listed-taxa.

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Table 1. *Survey Results for Species Provided in NDDB Preliminary Assessments*

Common Name	Scientific Name	Status	Survey Planned/Timing	Observations
Invertebrates				
Big sand tiger beetle	*Cicindela formosa generosa*	SC	Yes/May and June	No
Bog copper	*Lycaena epixanthe*	SC	No suitable habitat	No
Eastern pearlshell	*Margaritifera margaritifera*	SC	No (assume presence)	No
Scribbled sallow moth	*Sympistis perscripta*	SC	Yes/June (host plant)	Yes[1]
Vascular Plants				
Climbing fern	*Lygodium palmatum*	SC	Yes/March-April	No
Dwarf huckleberry	*Gaylussacia bigeloviana*	T	No suitable habitat	No
Short-awned meadow foxtail	*Alopecurus aequalis*	T	Yes/June-July	No
Purple milkweed	*Asclepias purpurascens*	SC	Yes/June-July	No
Vertebrates				
American brook lamprey	*Lethenteron appendix*	E	No	No[2]
American kestrel	*Falco sparverius*	SC	Yes/May and June	Yes[3]
Red-headed woodpecker	*Melanerpes erythrocephalus*	E	Yes/May and June BBS	No
Savannah sparrow	*Passerculus sandwichensis*	SC	Yes/May-Mid June BBS	No
Sharp-shinned hawk	*Accipiter striatus*	E	Yes/ May and June	Yes[4]
Short-eared owl	*Asio flammeus*	T	Yes/May and June	No
Wood turtle	*Glyptemys insculpta*	SC	Yes/May and June	No

Source: CTDEEP NDDB Preliminary Assessment File Nos. 201914275 and 202002957

1: Small (< 30 genets) patches of the host plant, *Nuttallanthus canadensis*, observed on-site.

2: Spawning adult sea lamprey (*Petromyzon marinus*) were observed in southern reaches of Ketch Brook.

3: At least two pairs observed within Project Site, one pair south of Plantation Road, another pair near the gravel pit in parcel 025-49-017C (west of the railroad ROW) and the adjacent offsite capped landfills.

4: Calls believed to be heard from southwestern corner of Project Site north of Plantation Road in March/April (migrant?).

Significant Natural Community Assessment

In addition to State-listed species, the NDDB PAs indicated that three significant natural communities may occur within the Project Site: Alluvial Swamp, Dry Acidic Oak Forest on stratified sand and gravel, and Floodplain Forest. Additionally, one critical habitat was identified as potentially occurring within the Project Site: poor fen. Descriptions of these unique plant communities and field assessment-based determinations of their potential occurrence are provided below. Refer to the **Attachment A** for figures depicting communities identified during field assessments.

Alluvial Swamp: Alluvial swamp and moderately well drained floodplain forest are found along Ketch Brook, especially in reaches west of the railroad bridge outside of the proposed Project footprint. The stream side/backwater Alluvial Swamp community is characterized by the presence of cinnamon fern (*Osmundastrum cinnamomea*), cottonwood (*Populus deltoides*), false helleborine (*Veratrum viride*), jewelweed (*Impatiens capensis*), red maple (*Acer rubrum*), skunk cabbage (*Symplocarpus foetidus*), smooth white violet (*Viola pallens*), and spicebush (*Lindera benzoin*).

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Wetter, more stagnant, backwaters add bittercress (*Cardamine pensylvanica*), fowl manna (*Glyceria striata*), rice cutgrass (*Leerzia oryzoides*), royal fern (*Osmunda regalis*), water forget-me-not (*Myosotis scorpioides*) and winterberry (*Ilex verticillata*). This plant association occupies old meanders and other backwaters. The surface tiers of the very poorly drained soils in Alluvial Swamp are comprised of well decomposed organic materials (sapric) mucks.

The segment of Ketch brook located in the vicinity of the Project is a relatively small watercourse and does not construct the same scale of levee and backwater features that support the floodplain plant associations described by Metzler and Barrett (2006) along the Connecticut and Farmington Rivers. The Ketch Brook will not be impacted as part of the construction or operation of GPS. A horizontal directional drill is currently proposed to avoid disturbance to the bed and bank of the brook or any associated wetland systems.

Floodplain Forest: Floodplain terraces constructed with mineral soil alluvium support taller, more diverse forest stands. Here statuesque sycamore (*Platanus occidentalis*), tower above American elm (*Ulmus americana*), black cherry (*Prunus serotina*), red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), and tuliptree (*Liriodendron tulipifera*), along with the cottonwood and red maple of the Alluvial Swamps. Upland and facultative plants species including Canada mayflower (*Maianthemum canadense*), Christmas fern (*Polystichum acrostichoides*), dwarf ginseng (*Panax trifoliata*), enchanter's-nightshade (*Circaea canadensis*), Canada honewort (*Cryptotaenia canadensis*), white avens (*Geum canadense*), hay-scented fern (*Dennstaedtia punctilobula*), ostrich fern (*Matteuccia struthiopteris*), poison ivy (*Toxicodendron radicans*), round-leaved pyrola (*Pyrola americana*), spring anemone (*Anemone quinquefolia*) and Swan's sedge (*Carex swanii*) are common in the herbaceous stratum along with some of the hydrophytes of Alluvial Swamps.

Although outside of the proposed Project footprint, a notable species found in southern parts of the Project Site floodplain is umbrella tree (*Magnolia tripetala*). Several invasive species are also present on the floodplain terraces, including Asian bittersweet (*Celastrus orbiculatus*), garlic mustard (*Alliaria petiolata*) glossy buckthorn (*Frangula alnus*), multiflora rose (*Rosa multiflora*), and the most pernicious invader, winged-euonymus (*Euonymus alata*).

Dry Acidic Oak Forest: In the Connecticut River Valley this plant community is common on outwash described as ice-contact stratified drift. The significant relief and irregular to steeply sloping kettle and kame topography has deterred clearing for agricultural use. The best representation of this plant community within the Project Site is north of Plantation Road between Ketch Brook and the tobacco fields south of the gravel mine where two approximate polygons are depicted on **Figures 1** and **2** in **Attachment A**. Here the convex upper slopes and summits of kames support black oak (*Quercus velutina*) and red oak are dominant canopy species with scarlet oak (*Q. coccinea*), white oak (*Q. alba*), and white pine (*Pinus strobus*) also present. The understory in this community occurs in patches, with most of the forest floor consisting of leaf litter. Blue Ridge blueberry (*Vaccinium pallida*), hay-scented fern, lowbush blueberry (*V. angustifolium*) and Pennsylvania sedge (*Carex pensylvanica*) are common. The floristic composition of this community is similar to the Northern Red Oak / Black Oak / Blue Ridge Blueberry Community described by Metzler and Barrett (2006). Analysis of soil samples from this area had low base saturation, a pH of 4.5 and high aluminum activity. Some soils in this area have one- to two-foot thick paraglacial wind deposited mantles of silt loam above the stratified sands and gravel.

Within the larger polygon, recently harvested multi-acre blocks in this forest are quickly colonized by blackberry (*Rubus allegheniensis*), black birch (*Betula lenta*), and dewberry (*Rubus ideaus*). The western limit of this forest traces the top of the steep 60 to 70-foot tall escarpment above the Ketch Brook floodplain. Along this dry ridgeline chestnut oak (*Quercus prinus*) and pitch pine (*Pinus rigida*) are added to the canopy. The ravine side slopes below this summit

supports an evergreen forest dominated by eastern hemlock (*Tsuga canadensis*) and white pine with red oak and large black birch, sugar maple, and white oak common codominants.

The Project will remove some of the trees shown in the larger of the two Dry Acid Oak Forest polygons. These removals will involve trees along the end of the agricultural fields and the steep slopes above depressions in the ice contact stratified drift.

Dry acidic oak forest is not present south of Plantation Road. The forests within the two glacial meltwater valleys that project into the farmland are similar to the Sugar Maple - White Ash / New York Fern Community described by Metzler and Barrett (2006) with white ash (*Fraxinus americana*) conspicuous by its absence. These valleys have mineral soil sediment layers commonly one to three feet thick representing accumulated soil loss from several decades of farming in the watershed.

The Project Site north and east of the railroad only supports a few remnant blocks and strips oak forest. Here cover types are characterized by open gravel mine, post-mining early successional cover types, reclaimed forest areas dominated by black locust (*Robinea pseudoacacia*), a transmission line ROW, farm fields and the ravine along Ketch Brook which is forested with American beech (*Fagus grandifolia*), sugar maple, red maple, occasional oaks, or hemlock/white pine.

Poor Fen: The Morris Road Poor Fen is a critical habitat separated from the Project Site by a railroad track constructed on a fill section. The fen developed in a deep kettle hole created close to a stationary ice front during the final glacial retreat. The fen is surround by a moat ringed with buttonbush (*Cephalanthus occidentalis*) and water willow (*Decodon verticillatus*). The substrate in the central portion of the fen is a floating mat of sphagnum moss. This feature is off-site on private property and could not be visited to identify more of the taxa present, but stunted black spruce (*Picea mariana*), red maple and white pine were observed from the shoulder of Wapping Road.

No similar poor fen habitat is present within the Project Site. Wetland 12, 13 and 16 within the Project Site occur west of the Morris Road Fen in the same surficial geological setting.

Wetland 12 is a wetland depression without an inlet or outlet. The northern part of the wetland includes a vernal pool. Soils in this wetland are mostly very poorly drained and include soils with mineral histic epipedons consisting of well decomposed muck generally less than six-inches thick. The wetland is forested with red maple. Spicebush rings the wetland perimeter and central portions support scattered patches of buttonbush in standing water. Royal fern is present along with emerging sedges and grasses that could not be identified before flowering.

Wetland 13 is underlain by poorly drained and very poorly drained mineral soils. The tree canopy consists of American elm and red maple with a shrub stratum consisting of buttonbush, elderberry (*Sambucus nigra*), silky dogwood (*Swida amomum*), and spicebush. The herbaceous stratum is dominated by jewelweed and skunk cabbage, with wood reed grass (*Cinna latifolia*).

Wetland 16 is approximately 1,200 feet north of the Morris Road Fen on the west side of the railroad grade. This wetland also formed in a kettle hole and has no inlet or outlet. Wetland substrate consists of poorly and very poorly drained mineral soils without sphagnum. This forested wetland has a closed canopy consisting of eastern hemlock, red maple, white pine, and yellow birch (*Betula alleghaniensis*) with an understory of cinnamon fern, evergreen wood fern (*Dryopteris intermedia*), jewelweed, sensitive fern (*Onoclea sensibilis)* and winterberry. There is a small vernal pool

at the southern end of this wetland where water pools into early summer and is underlain by poorly drained and very poorly drained mineral soils.

Three additional wetlands have formed in kettle holes west of the tobacco fields where a second stationary ice front stalled. Similar to the three previously described wetlands, Wetlands 6, 7, and 8 do not have any fen- or bog-like characteristics.

State-listed Species, Proposed Surveys, and Conservation Measures

State Listed Plants

According to the CTDEEP NDDB correspondence there are four State-listed species of that could potentially occur in the Project Site. Descriptions of each species are provided below.

Short-awned meadow foxtail *(Alopecurus aequalis)*

Short-awned meadow foxtail is listed as State Threatened. Barkworth, M.E. et al. (2007) describes this grass as native to the temperate zone of the northern hemisphere, noting that it is the most widespread and variable species of *Alopecurus* in North America. This species is not listed in the 2012 edition of Flora Conservanda. Haines (2011) describes its habitats as wet meadows, ditches, shorelines, wet sand of borrow pits, and other disturbed places. Fernald (1970) provides the flowering period as May through September.

Survey Plans/Results: With two active gravel pits, road and railroad ditches, and other disturbed places throughout the Project Site ample suitable habitat is present for this species. Reconnaissance of potentially suitable areas began in late May and was concluded July 14, 2020 without identifying any occurrences of this species or any of its cogeners in the ditches along the railroad, gravel haul roads, along Ketch Brook, or in the sand and gravel pit in the northeastern reaches of the Project Site. The open floodplain of Ketch Brook at the Eversource utility crossing is colonized by reed canary grass (*Phalaris arundinacea*). If the NDDB possesses Element Occurrences (EO) records for this species within the Project Site, we would respectfully request locational data.

Conservation Strategy: No conservation measures are proposed for this taxa at this time.

Purple milkweed (*Asclepias purpurascens*)

Purple milkweed is a state species of special concern. Flora Conservanda lists this plant as Division 2, a regionally rare taxa with 20 or fewer occurrences in New England over the 20-25 year period before 2012. This species is found in habitats that range from semi-open margins of Pinus-Quercus woodlands, roadsides, utility corridors, and old-fields on soil substrates ranging from dry to quite moist with a noted preference for soils with calcareous parent materials. (Farnsworth and DiGregorio, 2002). The red Triassic sedimentary rock parent rock of the Connecticut River Valley weathers to a soil with a marginally higher base saturation in comparison to the acid crystalline rock outside of the valley. However, we found forest soils to be strongly acid based on soil tests results from the UConn Soil Lab. Farmland soils have been periodically amended for years with limestone and were found to have circum-neutral pHs. The railroad grade used crushed basalt as ballast which can provide basic cations. Fernald provides a flowering period of late May to July, Farnsworth and DiGregorio note that the flowering period overlaps with other milkweed species but do not provide specific flowering dates.

Survey Plans/Results: Surveys for this plant were undertaken at woodland edges around fields, the Eversource electric transmission line right-of-way (ROW), and along the railroad grade in May and the first week of June and the first and

second weeks of July 2020. The only plants in the *Apocynaceae* family identified within the Project Site were spreading dogbane (*Apocynum androsaemifolium*) and common milkweed (*Asclepias syriaca*).

Conservation Strategy: None proposed at this time. If this species is encountered a conservation strategy will be developed.

Dwarf huckleberry (*Gaylussacia bigeloviana*)

Dwarf huckleberry is a state Threatened species. This species is not listed in Flora Conservanda and is near its southern range in southern New England (continuing south along the Appalachians). Fernald describes its habitat as sphagnous bogs and wet peats and Haines (2011) indicates habitat types of bogs, acidic fens and heathlands. All these habitats share a common substrate of sphagnum moss. If present in the area, this species is most likely to occur in the Morris Road Poor Fen or perhaps another wetland with a fen-like aerial signature more than 500 ft west of the northern extent of the Project Site. The delineation and description of all the wetland areas within the Project Site did not encounter any suitable habitat for this species. Wetland substrates within the Project Site consist of mineral soils or well decomposed organic mucks (sapric materials).

Survey Plans/Results: No surveys are proposed for this species.

Conservation Strategy: None proposed.

Climbing fern (*Lygodium palmatum*)

Climbing fern is a state Species of Special Concern. This species is not listed in Flora Conservanda and it is distributed widely in the eastern United States (U.S.). This plant species is a wintergreen low climber entwinning itself over other plants. This species is often found in the transition between wetland and uplands. Haines (2011) describes its habitat preferences as low forests, forest edges, swamp margins, mainly on peaty, acid soils overlying sand. Fernald provides moist, acid soils of thickets, marshes, and open woods. The Flora of New Jersey Project describes suitable habitat as wet acid swales and stream floodplains (Flora of New Jersey, 2011). Requires constant moisture, high light levels and intensely acid soils to thrive. This final description most closely fits the anecdotal experience of this author.

Survey Plans/Results: Wetland delineations were conducted in the winter and early spring during leaf-off when this evergreen species is most conspicuous. Additional surveys were conducted within the floodplain of Ketch Brook, the Eversource electric transmission ROW, edges of the railroad clearing, and within woodlands focusing on edges from early March to April. No observation of this species was made. No further surveys are proposed unless the NDDB has locational data from an EO within the Project Site that it can to share.

Conservation Strategy: No conservation strategy is proposed for climbing fern as it has not been found within the Project Site.

Invertebrates

According to the CTDEEP NDDB correspondence there are three State-listed species of insect that could potentially occur in the Project Site. Descriptions of each species are provided below.

Bog Copper (*Lycaena epixanthe*)

The Bog Copper, a State-Species of Special Concern, is a small butterfly that ranges in color from orange-red to brown (U.S. Forest Service, accessed 5-11-20). This species is restricted to acid fens and bogs where it nectars on its almost exclusive host cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*). The bog substrate, usually Sphagnum moss, must be saturated or nearly so most or all of the year and the area must be sunny. Neither fen nor bog habitats are present within the Project Site. While cranberry can establish on wet infertile sands, neither species of cranberry have been observed within the Project Site.

Survey Plans/Results: Further surveys are not proposed for this species since it is very unlikely to occur within the Project Site.

Conservation Strategy: None proposed.

Big sand tiger beetle (*Cicindela formosa generosa*)

The big sand tiger beetle is a State Species of Special Concern that inhabits exposed sandy substrates where its larvae are subterranean and trap insects in shallow pits they construct. Larvae may take more than one year before emerging as adults in the fall before over-wintering. Adults emerge May through June to breed and become less common by July (Brust et al. 2005). Wagner (2015) notes this species has a strong affinity to areas mapped as Windsor sands. The parent material for these soils were originally deposited as paraglacial dunes. While the Windsor series in not mapped on the site, gravel mining can unintentionally create similar habitats.

Survey Plans/Results: The inactive areas of two gravel pits were surveyed on May 21st, 2020. At the time of survey, material was being hauled out of one of the gravel mines and grading was ongoing within the northern portion of the second gravel pit. These active areas were avoided. The floor of the southern part of the second gravel pit was observed to vary in textures from silty clays and silts at the fine end to sand and sand and gravel at the coarse extreme. The bronzed tiger beetle (*Cicindela repanda*) was observed in the eastern end of the pit near the process water ponds. Here the substrate was silty to clayey in texture. An estimated six adult bronzed tiger beetles were very active at this location. Two individuals of the six-spotted tiger beetle (*C. sexguttata*) were observed in the first gravel pit on a haul road leading to Plantation Road.

Additional surveys were completed in June and concluded on July 14th, 2020 and no observations of the big sand tiger beetle were observed.

Conservation Strategy: None at this time. If this species is found in the Project Site, the proponent will coordinate with the CTDEEP NDDB section to develop conservation measures.

Scribbled sallow moth (*Sympistis perscripta*)

The scribbled sallow moth is a state Species of Special Concern. It is an uncommon moth associated with infertile, droughty, open habitats such as those found within Eversource powerline ROW and open roadsides where its larval host plant, Canada toadflax (*Nuttallanthus canadensis*), is found (New York Natural Heritage Program, 2020). Scribbled sallow moth completes one generation per year in Connecticut. Flight season for adults occurs from late May into early June. Wagner et al. (2008) reports that the infrequently observed caterpillars have been seen mostly in late June while feeding on the host plant.

Survey Plans/Results: VHB biologists conducted a survey for Canada toadflax while searching for purple milkweed in June and July. Some small stations have been encountered at field edges and on gravel pit spoil piles, but none of these populations numbered more than 15 to 30 plants.

Conservation Strategy: None planned at this time. The small clusters of the host plant are common but scattered around the edges of farm fields. The proponent would negotiate a mitigation program which might incorporate attempts to establish this annual/biennial host plant into perimeter seed mixes where conditions are suitable.

Freshwater Mussels

The CTDEEP NDDB PA included one State-listed freshwater mussel species. Mussel shells left from depredation have been encountered along Ketch Brook.

Eastern pearlshell (*Margaritifera margaritifera*)

The eastern pearlshell mussel is a state Species of Special Concern. According to the CTDEEP, the eastern pearlshell does not have specific substrate requirements but is most often found in streams and small rivers that support trout or salmon populations (i.e., cold water fishery) (CTDEEP, 2003). We observed brown trout (*Salmo trutta*) and fallfish (*Semotilus corporalis*) in Ketch Brook confirming the presence of a cold water habitat. At present, the greatest risk to water quality in Ketch Brook is from the illicit operation of All-Terrain Vehicles (ATV) in the floodplain and stream crossings. VHB biologists witnessed a heavy rainfall event cause significant turbidity in the stream that was traced back to exposed soils along ATV tracks.

North American beaver (*Castor canadensis*) have also altered the Ketch Brook changing the pool and riffle ratios along some reaches and obstructing fish passage by constructing several dams. They have also felled and girdled trees which once shaded the stream.

Survey Plans/Results: No surveys proposed because the Project will not create impacts to Ketch Brook.

Conservation Strategy: From the planning perspective the Project will:

- Avoid any work within Ketch Brook and its riparian floodplain. No work is proposed along the brook or in its floodplain.
- The Project maintains adequate undisturbed buffers to terrace escarpments bordering the Ketch Brook floodplain and largely avoids work within 200 feet of the stream.

- The stream crossing for the electrical interconnection is proposed to be completed using horizontal directional drilling that will pass under Ketch Brook and its associated floodplain with jacking and receiving pits in uplands.
- The development will seek to curtail illicit ATV operation within the properties it will control with fencing and other barriers (e.g., boulders, bollards, Mafia block, etc.). VHB biologists witnessed turbid flows in Ketch Brook during fair weather and provided photographs of the damage associated with ATV operation (**Attachment C**).
- Once construction is complete, the traffic levels within the site will be greatly reduced in comparison to existing gravel mining and farming operations.
- Establishing grass meadows which will significantly reduce existing soil erosion rates in the proximate watershed of Ketch Brook from farming and gravel mining operations.
- Reduce inputs of nutrients including total ammonia nitrogen, fungicides and pesticides associated with tobacco farming in the Ketch Brook Watershed.
- Stormwater management will focus on maintaining or reducing peak discharge rates and maintaining or increasing groundwater recharge through infiltration. No practices that could increase the temperature of the discharge to Ketch Brook (e.g., discharge from surface detention) will be proposed. Existing drainage patterns will be maintained to the greatest extent practicable.

During Construction:

- The Project will implement enhanced erosion and perimeter sediment control best management practices to control storm water runoff from this site both during construction and after construction. The proponent seeks to install perimeter sediment controls, and sediment traps during the fall preceding spring construction, if possible, so that these features will be mostly stabilized before construction. In addition, where possible fields slated for construction will be seeded in the fall so that array installation will occur in vegetated fields.
- Qualified Environmental Inspector(s) shall be on-site daily during the duration of construction, weekly during stabilization, and within 24 hours of storm events with 0.5 inches of precipitation or more to inspect sedimentation and erosion controls to ensure that they continue to function as intended.
- Stock-piling soils will be minimized and will always be situated at least 100 feet from wetlands or watercourses and will be protected by perimeter sediment protection.
- All chemicals and fuels will be maintained undercover with secondary containment and follow good housekeeping measures prescribed in the Connecticut General Permit for Stormwater Discharges from Construction Sites.
- The proponent will increase typical antitracking construction exits lengths to 75 feet to minimize tracking onto public roads.
- Water will be used to control dust along construction roads.
- Access to the worksite will be strictly controlled to eliminate illicit ATV operation and other vandalism.

Fish

The NDDB PA included the potential for one State-listed fish species to occur within the Project Site. VHB biologists did not conduct aquatic surveys within Ketch Brook as the Project proposes no direct or proximate impacts to this resource. Casual observation of fish species during fieldwork identified brown trout, fallfish, and sea lamprey (*Petromyzon marinus*) present in the brook.

American brook lamprey (*Lethenteron appendix*)

The American brook lamprey is a State Endangered species that prefers cold, clear streams of small to medium size. Adults prefer gravel or sandy riffle areas, whereas ammocoetes are most often found in sandy areas. Ammocoetes transform into adults in the late summer to early fall and spawn the following spring, after which the adults die (Jacobs and O'Donnell, 2009). American brook lamprey populations have been found in a few streams of the Connecticut River drainage, typically above the first barrier to sea lamprey. The greatest existing risk to this species appears to be from previously described illicit ATV operations in and along Ketch Brook.

Survey Plans/Results: No surveys were conducted. While Ketch Brook is a cold-water stream that may provide potentially suitable habitat for this species, the frequent use of ATVs within Ketch Brook and the riparian corridor creates severe turbidity issues that negatively impact the habitat quality. VHB biologists observed sea lamprey spawning in lower reaches of Ketch Brook during wood turtle surveys.

Conservation Strategy: If present, measures to protect Ketch Brook described for eastern pearlshell (see above) will also protect American brook lamprey.

Reptiles

The CTDEEP NDDB PA included one State-listed reptile species that may potentially occur within the Project Site.

Wood turtle (*Glyptemys insculpta*)

Wood turtles require riparian habitats bordered by floodplain, woodland, or meadow. They hibernate in the banks of the river in submerged tree roots and in summer move to adjacent old fields, woodlands and power line corridors (Klemens, 1993). Unlike box turtles, wood turtles have home ranges of several acres, throughout which they freely roam. Their summer habitat focuses within 300 ft of rivers and they regularly travel up to 300m (0.2 mile) from rivers during this time. During summer they seek out early successional habitat: pastures, old fields, woodlands, powerline cuts and railroad beds bordering or adjacent to streams and rivers (CT DEEP). Because of their extensive overland movements, roads traversing wood turtle habitat contribute significantly to mortality due to vehicle conflicts (Klemens, 1993). Suitable habitat for this species may be present within the riparian corridor of Ketch Brook. The powerline ROW crossing of Ketch Brook (though largely inaccessible), gravel pits, and the railroad ROW are potential nesting sites.

Survey Plans/Results: A dedicated wood turtle survey was performed from the late morning of May 5, 2020 and June 2, 2020 through the afternoon hours. VHB biologists used the survey methodology described within Flanagan et al. 2013: wood turtles are most likely to be observed within approximately 33 ft of waterways from spring through July 1 on warm days with temperatures within the 50-75 degrees Fahrenheit range. On the May 5th three biologists walked the length of Ketch Brook upstream from the railroad crossing to the eastern limits of the Project Site: one biologist waded through the stream and paid particular attention to calm pools where turtles may have been resting and sandy

and muddy banks; the two other biologists each walked within 10 m of opposite sides of the stream bank where topography allowed.

The southwestern reach of Ketch Brook was surveyed on June second following similar protocols described above, however the western bank of Ketch Brook is off-site on private property, so it was not surveyed.

Painted turtles (*Chrysemys picta*) were encountered near the Eversource electric transmission lines in a beaver impoundment that flooded a backwater channel of Ketch Brook. During spring flows, the segment of Ketch Brook north of the railroad bridge largely consists of riffles with only a few sluggish pools greater than 18 inches in depth. However, the northern most reach of the stream within the Project Site includes a series of beaver dams that have trapped the fine river bedload. No wood turtles were observed in this series of beaver impoundments.

The southern reach of Ketch Brook which is within the Project Site was surveyed on June second. There are a greater number of pools in this segment, but the stream remains high gradient with substantial velocity even through the pools and scour holes. No turtles were found in this reach of Ketch Brook, however, VHB biologists witnessed two groups of four-five sea lampreys preparing spawning sites. No further surveys are proposed as the proponent will proceed under the assumption that wood turtle is present. The greatest risk to wood turtle at this time appears to be illicit ATV operation in and along Ketch Brook .

Conservation Strategy: GPS will employ the following mitigative actions to prevent the incidental take or harm to the State-listed wood turtle. From the planning perspective the Project will:

- Avoid any work within Ketch Brook and its riparian floodplain. No work is proposed along the brook or in its floodplain.
- In addition, the Project maintains adequate undisturbed buffers to terrace escarpments bordering the Ketch Brook floodplain and avoids work within 90 m of the stream where practicable.
- The stream crossing for the electrical interconnection is proposed to be completed using directional drilling that will pass under Ketch Brook and its associated floodplain with jacking and receiving pits in uplands.
- The Project will create and maintain cleared areas outside of the fenced solar arrays in early successional habitat potentially suitable for turtle foraging and nesting. These areas will not be mowed between April 30 and November 1.
- Maintain gaps under perimeter fencing to allow turtles to pass through the grassed solar arrays to avoid habitat fragmentation.
- The development will seek to curtail illicit ATV operation within the properties it will control with fencing and other barriers (e.g., boulders, bollards, Mafia block, etc.).
- Once construction is complete, the traffic levels within the site will be greatly reduced in comparison to existing gravel mining and farming operations.
- Stormwater management will focus on maintaining or reducing peak discharge rates and maintaining or increasing groundwater recharge through infiltration. No practices that could increase the temperature of

the discharge to Ketch Brook (e.g., discharge from surface detention) will be proposed. Existing drainage patterns will be maintained to the greatest extent practicable.

Measures proposed to be employed to mitigate potential construction impacts include:

- The use of entrenched silt fence (EF) at least 20-inches tall to isolate any work area within 0.2 miles of Ketch Brook from potential wood turtle between April 1 and November 1 each construction season. Special pervious exclusionary fencing will be used periodically along silt fence lines to release entrapped stormwater and reduce the likelihood of EF failure
- This EF should be installed between November 1 and April 1 when turtles can be presumed to be within the brook. Tree clearing operations within potential habitat should also be undertaken during this period unless previously isolated by this exclusionary fencing.
- The EF shall be regularly maintained (at least bi-weekly and after rainfall events greater than 0.5 inches in 24/hours) to secure any gaps or openings at ground level that may let animal pass through. Debris collected at pervious sections of fencing shall be removed to ensure function during the next storm.
- Should the previous condition not be met, it is essential that all existing open sands, unvegetated soil areas and other early successional habitats in work areas within 0.2 miles of Ketch Brook be isolated with exclusionary fencing prior to May 15 to prevent female turtles from nesting in the work area. This will include the portion of the gravel access road to the Gravel Pit from Wapping Road.
- Because exclusionary measure can potentially fail, the Contractor must search the work areas within 0.2 miles of Ketch Brook each morning prior to beginning work.
- All construction personnel working within the turtle habitat must be apprised of the species description and the possible presence of a listed species.
- Any turtles encountered within the work area shall be carefully moved to an adjacent area outside of the excluded area and fencing should be inspected to identify and eliminate the suspected access point. These animals are protected by law and no turtles should be relocated from the site.
- In areas where silt fence is used for exclusion, it shall be removed as soon as the area is stable to allow for reptile and amphibian passage to resume.
- No heavy machinery or vehicles may be parked in any turtle habitat not previously secured by EF.
- Special precautions must be taken to avoid degradation of wetland habitats including any wet meadows and seasonal pools.
- Encounters with any State-listed species encounters will be reported to the CTDEEP NDDB.

Birds

The NDDB PA included five bird species that were thought to have the potential for nesting at the Project Site as provided in Table 2.

Table 2. State-listed Bird Species Provided in the NDDB Preliminary Assessments

Common Name	Scientific Name	State Status	Habitat Type(s)[1]
American kestrel	*Falco sparverius*	Special concern	Open areas with short ground vegetation and sparse trees, meadows, grasslands, parks, and farm fields. Require nesting cavity.
Red-headed woodpecker	*Melanerpes erythrocephalus*	Endangered	Deciduous woodlands with snags, recent clearings, beaver swamps, farmland, grasslands with scattered trees, forest edges, and roadsides.
Sharp-shinned hawk	*Accipiter striatus*	Endangered	Forest and forest edges; require dense forest with closed canopy for breeding
Short-eared owl	*Asio flammeus*	Threatened	Winter habitat large open areas within woodlots, stubble fields, marshes, weedy fields, dumps, gravel pits, rock quarries, and shrub thickets. If food is plentiful, winter habitat may be used for breeding.
Savannah sparrow	*Passerculus sandwichensis*	Special concern	Grassy fields with low densities of shrubs and trees.

1 Habitat types based on descriptions from Bevier, ed. 1994, The Atlas of Breeding Birds of Connecticut and from the Cornell Lab of Ornithology (allaboutbirds.org).

An inventory of potential and observed breeding birds has been developed from field observations, the Atlas of Breeding Birds of Connecticut (Bevier ed. 1994), and New England Wildlife (DeGraaf and Yamasaki 2001) and is provided in **Attachment F**. According to the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool, there are no Federally-listed bird species within the Project Site. Surveys were conducted on April 28, May 4, May 5, June 2, and July 14, 2020.

American kestrel (*Falco sparverius*)

The American kestrel is North America's smallest falcon and is a cavity nester. This was the first NDDB-listed taxa encountered at the site during delineation work conducted in early March 2020.

Survey Plans/Results: Split party surveys determined that at least two pairs of American kestrels use the Project Site as part of their territories. One pair observed mating appears to utilize the roof eaves of a tobacco barn near Plantation Road as a nesting site. This has not been definitively confirmed, though a nest was observed. A second pair spends much of its time patrolling the mixed grassland/shrubland associated with off-site closed landfills. These birds enter the Project Site at the gravel pit and perch on trees at the edge of farm fields. These birds appear to be habituated to high levels of human disturbance associated with shade tobacco cultivation and gravel mining. The nesting site for this pair was not confirmed during surveys.

A kestrel nest box has been installed in the eastern part of the Project Site along Plantation Road. The box is apparently monitored because after it was not selected by kestrels for nesting this spring, the entrance to the box was blocked, presumably to exclude starlings.

Conservation Strategy: In addition to State protection, American kestrel are migratory birds and if an active nest is discovered during construction of the Project, the nest will be avoideduntil young are fledged. The proponent will install nest boxes outside the fenced perimeter of the solar arrays along the Project Site. Solar farms maintain open ground between the perimeter fencing and forests which may potentially shade the panels. These areas will be maintained in native grasses and forbs mixed with conservation grasses providing foraging habitat for American kestrel.

The American Kestrel Partnership provides guidance of the placement and monitoring of nest boxes (Hilleary, undated). A minimum spacing of one-half mile between boxes is recommended. The proponent agrees to purchase and install up to five kestrel nest boxes. Final locations for nest boxes will follow any guidance provided by the CT DEEP. The proponent will monitor the boxes each year or seek to assist the successful Kestrel Nest Box Program of Northwest and North Central Connecticut operated by the Connecticut Audubon Society (CT Audubon Society, 2019).

Red-headed woodpecker (*Melanerpes erythrocephalus*)

This State-endangered woodpecker is associated with open woodlands and mid-successional forest patches. Its calls are loud and as unmistakable as its plumage. Veit and Peterson (1993) describe the occurrence of this species in Massachusetts as always rare and sporadic varying geographically from year to year. Egg dates are given as May 28 to June 17.

Survey Plans/Results: Surveys, including call back surveys, were conducted during other bird survey dates noted above. No visual or auditory observations of this species were made.

Proposed Conservation Strategy: No conservation measures are proposed. The project is utilizing existing agricultural and gravel excavation areas and has minimized tree clearing, including mid-successional habitats, that are potentially suitable habitat for this species.

Sharp-shinned hawk (*Accipiter striatus*)

Sharp-shinned hawks are common spring migrants across southern New England, though they rarely breed in this region. In their annotated checklist of birds of Massachusetts, Griscom and Snyder (1955) attributed the steep decline in population to forest clearing during the late 1800s. Despite the recovery of forests across the State, this accipiter has not returned as a summer resident. Egg dates for this species in Massachusetts are given as May to June (Veit and Petersen 1993).

Survey Plans/Results: A sharp-shinned hawk was potentially heard calling from the forest along Ketch Brook during the early spring 2020 vernal pool investigations, but an individual was never spotted. Blue jays (*Cyanocitta cristata*) are known to mimic this species, so this tentative identification is uncertain. Calls were traced to the section of forest where Ketch Brook sweeps west off of the Project Site before crossing Rye Street. Attempts to elicit responses in forested parts of the Project Site by playing recorded sharp-shinned hawk calls during May and June bird surveys were unsuccessful; however, these calls did evoke responses from blue jays and red-tailed hawk (*Buteo jamaicensis*). Should the NDDB hold an EO records for this species in the vicinity of the Project Site, we would respectfully request locational data.

Conservation Strategy: No specific measures are proposed at this time. No work is proposed in the heaviest forested ravines along the southern reach of Ketch Brook which provide some of the most suitable potential nesting habitat.

Short-eared Owl (*Asio flammeus*)

According to the CTDEEP Factsheet (1999), short-eared owls nested in Connecticut in the 1800s where it bred north of Hartford in the Connecticut River Valley before the 1860s and was considered a resident. There are no confirmed breeding populations of short-eared owls in Connecticut(CTDEEP, 1999). The small wintering population is considered threatened. Breeding season studies conducted cooperatively in eight states in the western U.S. found short-eared owl to have low year to year site fidelity and highly variable distributions (Miller et al., 2019).

Survey Plans/Results: VHB field staff did not encounter this species during late winter/early spring wetland delineation and vernal pool investigations. Tobacco tent frames covered most of the large fields north and south of Plantation Road through the winter until they were removed in April. A male northern harrier (*Circus hudsonius*) was observed skimming these fields in April. The best wintering habitat for short-eared owl may be provided by the two capped landfills that flank the southern bank of Ketch Brook on either side of the railroad. The mix of grassland and shrub cover appears ideal. Call-back surveys were conducted at the gravel pits and near the landfills during the early spring, but these calls never elicited a response.

Conservation Strategy: No measures are proposed..

Savannah Sparrow (*Passerculus sandwichensis*)

According to Veit and Peterson (1993), the Savannah sparrow's preferred breeding habitats are dunes along the coast, agricultural fields in the Connecticut River Valley and grassy fields next to airports. While these sparrows will tolerate some successional growth and often use small trees, shrubs, and fence posts as singing perches, their presence is negatively associated with total amounts of woody cover (Vickery et al. 1994, 1999; Bollinger 1995; Jones and Vickery 1997). In Connecticut, this species is most often found in grassy fields with damp soil. Of the grassland sparrows in that state, this species tends to occupy the wettest sites (Rosenberg, 2000). The size of breeding territories varies with some records indicating that contiguous grasslands of approximately 25 acres are correlated with 50 percent incidence of occurrence (Vickery et al., 1994). A survey of of 91 breeding territories in Wisconsin indicated that the size of the territories ranged from 0.4 to 4.3 acres (Wiens, 1969). The edges of the agricultural fields throughout the Project Site may provide marginally suitable habitat for this species.

Survey Plans/Results: VHB biologists surveyed plowed fields, their edges and early succession grassland/shrubland in gravel pits. These surveys also included call-back recordings sincethis species is known to aggressively defends its territory. Savannah sparrow was not encountered during these surveys. It is likely that farming activities eliminated nesting opportunities for this species across most of the otherwise suitable open habitat. Field sparrow (*Spizella pusilla*) and prairie warbler (*Dendroica discolor*) occupied early successional habitats in the gravel pits and adjacent closed landfills, but savannah sparrow was not detected in these areas.

Conservation Strategy: No conservation practices are proposed for this species..

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Attachment A: Figures

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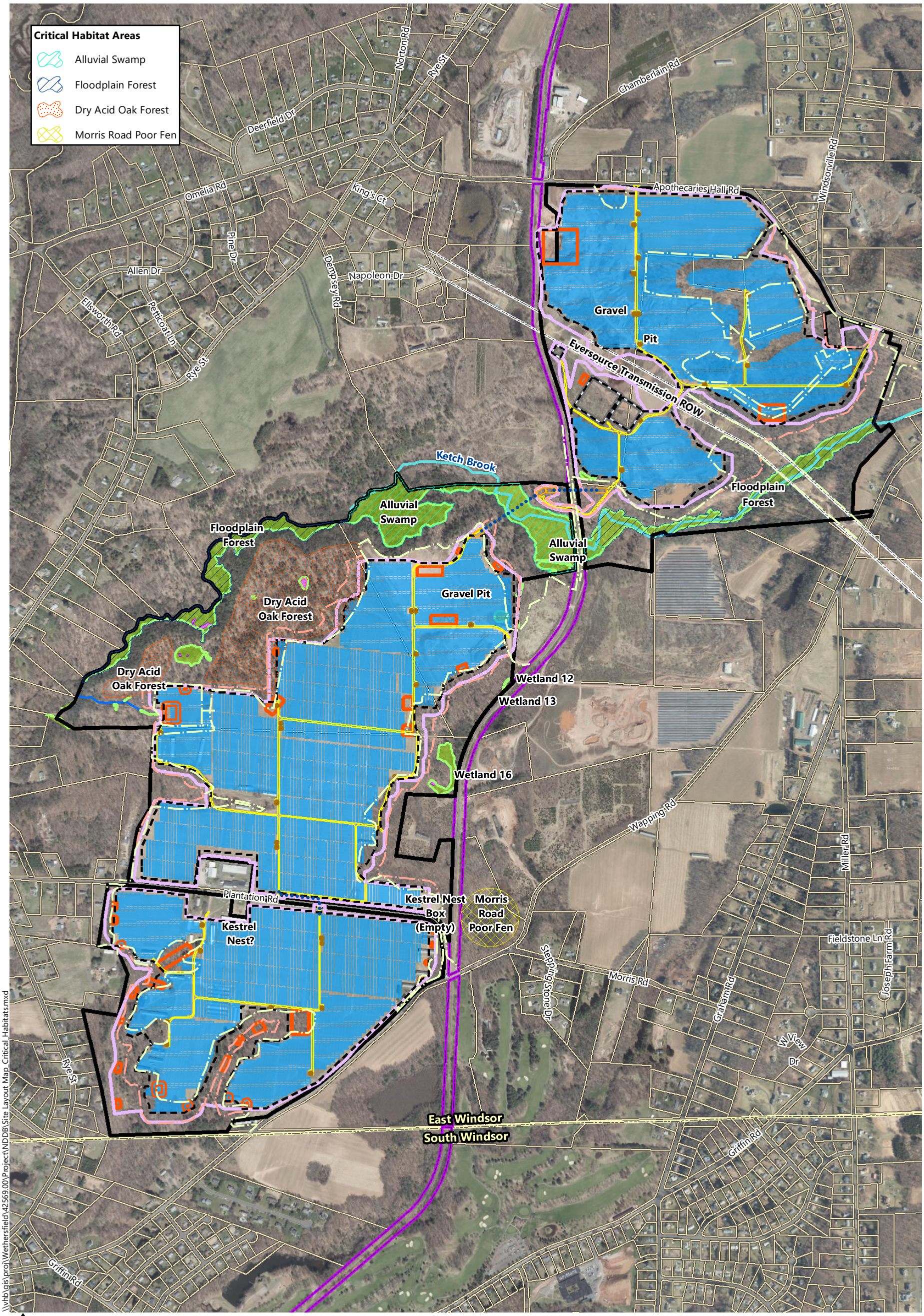
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

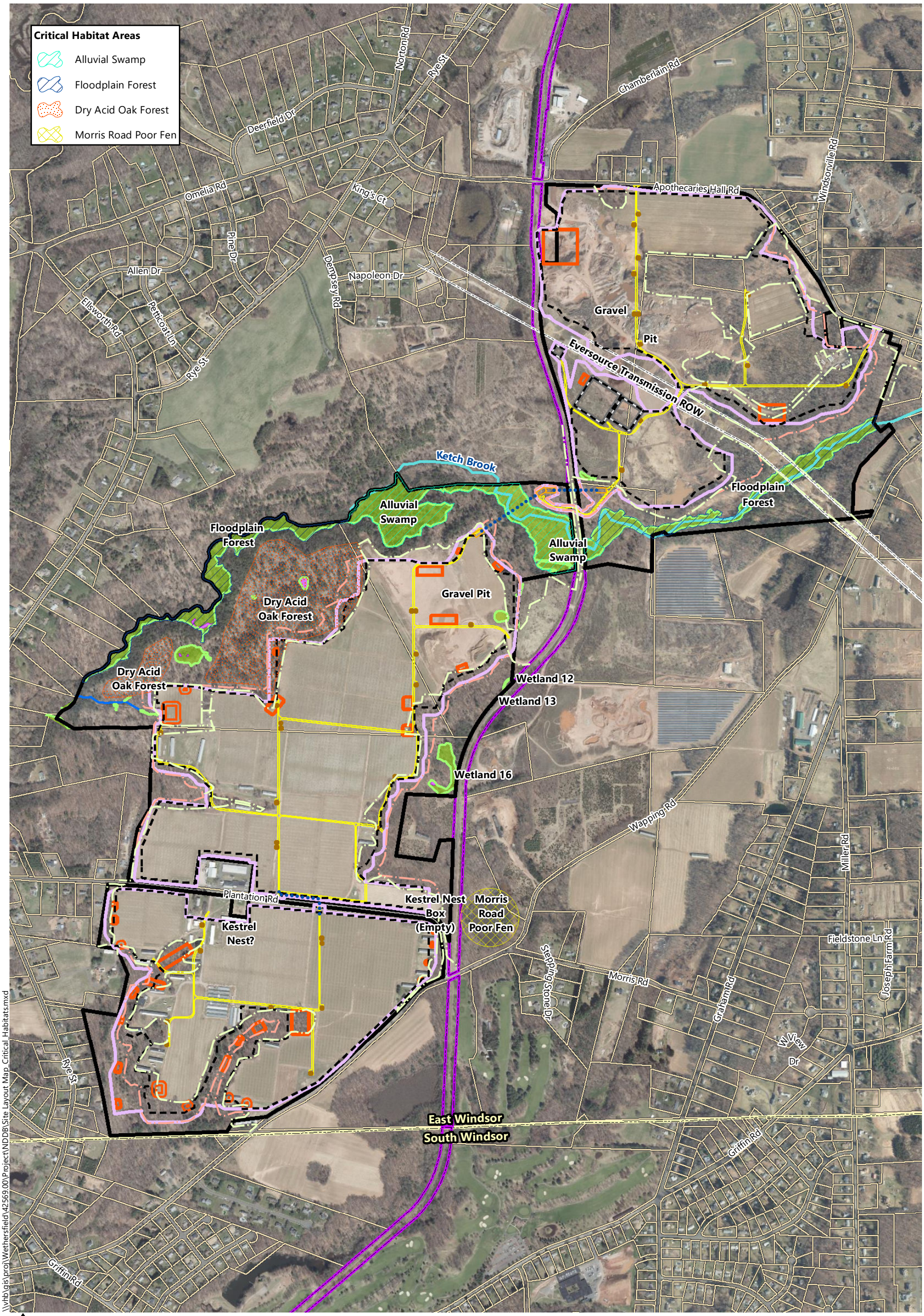
July 17, 2020



Gravel Pit Solar | East Windsor, Connecticut

Figure 1. Project Layout and Critical Habitat Map

Source: VHB, CTDEEP, ESRI



Gravel Pit Solar | East Windsor, Connecticut

Figure 2. Project Layout and Critical Habitat Map (without Solar Array)

Source: VHB, CTDEEP, ESRI

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Attachment B: Gravel Pit Solar Project T&E Species – Survey/Conservation Measures Summary

Status	Species Name	Common Name	Conservation Measures/Impact Avoidance & Minimization Measure
Invertebrates			
SC	*Cicindela formosa generosa*	Big sand tiger beetle	Species not observed during spring and early summer surveys. No conservation measures proposed.
SC	*Lycaena epixanthe*	Bog Copper	No suitable habitat; no conservation measures proposed.
SC	*Margaritifera margaritifera*	Eastern Pearlshell	No survey conducted. No work proposed in streams. Rigorous E&S control measures for work on slopes of Ketch Brook. Stormwater measures avoid thermal impacts.
SC	*Sympistis perscripta*	Scribbled sallow moth	Surveys were conducted for stands of host plant, Canada toadflax. Some small stations were observed at field edges and on gravel pit spoil piles, but none of these populations numbered more than 15 to 30 plants. This annual/biennial host plant may be incorporated into perimeter seed mixes where conditions are suitable
Vascular Plants			
T	*Alopecurus aequalis*	Short-awned meadow foxtail	No element occurrence found; no conservation measures.
SC	*Asclepias purpurascens*	Purple milkweed	No element occurrence found; no conservation measures.
T	*Gaylussacia bigeloviana*	Dwarf huckleberry	Surveys not conducted because there is no suitable habitat within Project Site.
SC	*Lygodium palmatum*	Climbing fern	No element occurrence found; no conservation measures proposed.
Vertebrates			
E	*Accipiter striatus*	Sharp-shinned hawk	Calls potentially heard from a southwestern corner of Project Site north of Plantation Road in March/April (potential migrant). Later surveys did not identify this species on site. Avoid work in thickest forested areas along southern reach of Ketch Brook.
T	*Asio flammeus*	Short-eared owl	Wintering population threatened. No detections in early spring. No conservation measures proposed.
SC	Falco sparverius	American Kestrel	At least two breeding pair utilize site; one pair potentially nesting in tobacco barn south of Plantation Road. Manage cleared areas outside security fence as early successional habitat, install nest boxes.
SC	*Glyptemys insculpta*	Wood turtle	No element occurrence found; however, presence will be assumed based on availability of suitable habitat. Develop and implement contractor awareness program, construction monitoring in habitat areas, minimize shrub removal, leave stumps. Isolate work areas with embedded silt fence.
E	*Lethenteron appendix*	American brook lamprey	Survey not conducted because no work is proposed in streams. Rigorous E&S control measures for work on slopes of Ketch Brook. Stormwater measures will avoid thermal impacts to the stream.
E	Melanerpes erythrocephalus	Red-headed woodpecker	No element occurrence found; no conservation measures proposed.
SC	*Passerculus sandwichensis*	Savannah sparrow	No detections in agricultural fields during late spring surveys. Suitable grassland habitat is not present as open areas in active agriculture. No special conservation measures proposed.

Ref: 42569.0
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Attachment C: Site Photos

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 1 | **Date:** 11/6/19

Description: View of Ketch Brook during high flow late fall period.

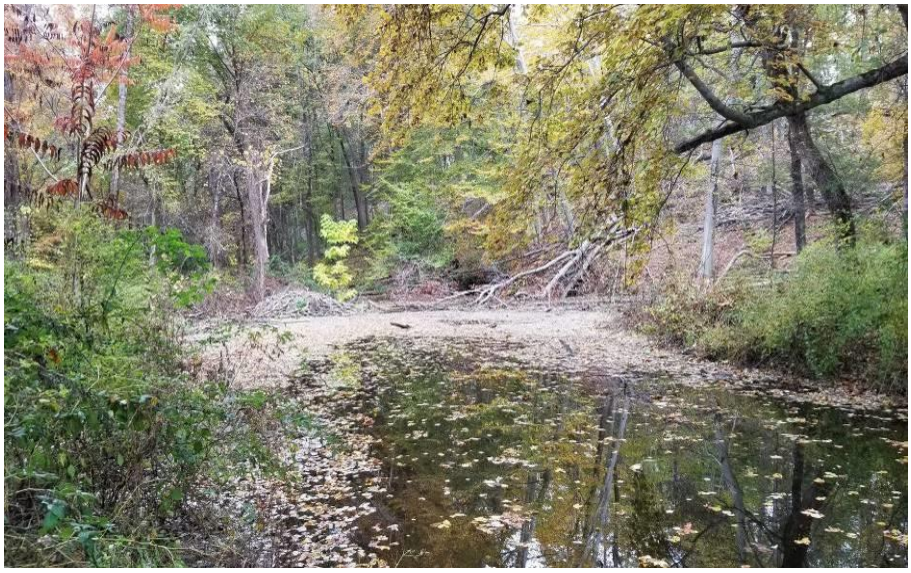
vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 2 | **Date:** 10/16/19

Description: View of beaver lodge and impounded backwater in the where Ketch Brook enters Northeast corner of the Project Site. Beavers have felled or girdled most of a stand of American beech on the escarpment above the western bank (right side) of the brook.



vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 3 | **Date:** 03/05/20

Description: South of the railroad bridge, the Ketch Brook floodplain transitions to Alluvial Swamp. The Illicit operation of all-terrain vehicles has caused significant damage to vegetation and turbidity levels in Ketch Brook.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 4 | **Date:** 04/30/20

Description: View of tobacco fields with annual rye cover crop looking south towards Plantation Road. The silt loam soils are susceptible to compaction and puddling along dirt farm roads.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 5 | **Date:** 3/30/20

Description: View of Vernal Pool 2, the largest and most diverse pool within the Project Site. It is situated in ice contact stratified drift east of Ketch Brook. The higher terrace positions and kames in this area support dry acid oak forest.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 6 | **Date:** 06/02/20

Description: Sea lamprey were observed preparing spawning nests in gravel bottom segments of Ketch Brook.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 7 | **Date:** 3/24/20

Description: Vernal Pool 3 occupies and abandoned meander channel at the base of a steep terrace escarpment. The terrace face is forested with white pine, eastern hemlock, red oak and black birch with evergreen woodfern common. The floristics of the floodplain forest is described Conservation Measures Memorandum.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 8 | **Date:** 11/5/19

Description: Portions of the Project Site are underlain by silty clay glaciolacustral deposits of glacial Lake Hitchcock. Across much of the Project Site these deposits underlay outwash sand and gravels and aeolian mantles of silt loam or fine sandy loam. Where exposed, these lakebed deposits are highly erodible and sources of sediment for Ketch Brook. This feature begins at the bottom of a farm field north of Plantation Road.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 9 | **Date:** 3/3/20

Description: Glacial meltwater valley south of Plantation Road are fill with sediment derived from decades of farm operations on the adjacent terraces. These forests are dominated by sugar maple, black birch, and red oak with large white pine scattered throughout. These forested groves were searched for red-headed woodpecker including thought the use of call back surveys, but no detections were made anywhere on or off the Project Site.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 10 | **Date:** 11/5/19

Description: View of the Gravel Pit northeast of Plantation Road looking east. This pit is still operating, and big sand tiger beetle was not observed. This pit also attracts illicit ATV recreationists.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 11 | **Date:** 6/3/20

Description: Early successional habitat within the Sand & Gravel Pit south of Apothecaries Hall Road. Surveys for savannah sparrow, including call backs, did not lead to detection. Field sparrow, song sparrow, and willow flycatcher were among the songbirds utilizing this area. Despite being a S&G pit, the substrate in the pit floor was mostly sandy loam or silt loam and was unsuitable for big sands tiger beetle.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar I, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 12 | **Date:** 6/3/20

Description: A suspected American kestrel next under a tobacco barn roof eve south of Plantation Road. A mated pair of kestrel were observed flying up to the eve in May and later this nest was found in the same location in early June. It is not known if this next is being utilized.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar IV, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.00

Photo No. 13 | **Date:** 6/3/20

Description: Turbidity in Ketch Brook can be elevated during fair weather if ATVs are operating in upstream parts of the floodplain and brook.

vhb Engineers | Scientists | Planners | Designers

PHOTOGRAPHIC LOG

Client Name: Gravel Pit Solar IV, LLC | **Site Location:** East Windsor, CT | **Project No**: 42569.01

Photo No. 14 | **Date:** 3/3/20

Description: Some abandoned farmland soil on the northern face of the Sand & Gravel Pit northeast of Plantation Road have been subject to severe erosion. The steep head cut into the gully is in the process of advancing south. These existing problems will be addressed during the initial deployment of erosion and sediment controls.

Ref: 42569.0
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Attachment D: Resumes of Preparers

Jeffrey C. Peterson, CPSS, PWS, CPESC, ENV SP

Senior Soil and Wetland Scientist

Education

Graduate Coursework, Soil Science, University of Massachusetts, 2003

Graduate Coursework, Soil Science, The University of Connecticut, 1996

BS, Biology, Plant Ecology, The University of Connecticut, 1977

Registrations/Certifications

Certified Professional in Erosion and Sediment Control (Erosion and Sediment Control Planning), 2003

Professional Wetland Scientist (Wetland Science), 2015

Certified Soil Scientist (Soil Science), 2001

Licensed Soil Evaluator (Soil Evaluation) RI, 2001

Certified Wetland Delineator (Wetland Delineation) MD, 1993

Envision™ Sustainability Professional, 2013

Affiliations/Memberships

Soil Science Society of America

Society of Soil Scientists of Southern New England

Soil and Water Conservation Society

Society of Wetland Scientists

Jeffrey Peterson is a Senior Soil and Wetland Scientist at VHB with 36 years' experience. He has worked for VHB the last 24 years. His academic and professional background in soil science and ecology includes skills in wetland delineation, soil description, soil classification, erosion and sediment control planning, plant identification, environmental permitting and project impact evaluation. He holds SSSA certification as a Certified Professional Soil Scientist, PWS as a Professional Wetland Scientist, CPESC certification as a professional in erosion and sediment control, and is certified by the Baltimore District of the Army Corps of Engineers as a Wetland Delineator. He has served on the New England Hydric Soils Technical Committee, responsible for establishing criteria for identifying wetland soils, since 1999.

As VHB's principal soil scientist, he is consulted on projects which involve soils related issues such as wetland delineation, soil stabilization, storm water management site selection and design, soil/chemical interactions, wetland mitigation site selection and design, wetland functional assessments, and monitoring studies. Jeffrey also is skilled in field ecology and botany and has conducted pool breeding amphibian, breeding bird, and rare plant surveys for projects in Connecticut, Rhode Island, and Massachusetts. He has coauthored studies of breeding birds along recreational trails and power line corridors and used in successful state and federal permit applications. Representative projects include:

40 years of professional experience

Connecticut Airport Authority, 2016 Groton New London Airport Rare Species Surveys, Wetland Mitigation Monitoring Report, and Invasive Species Report, Groton, CT

Under an on-call environmental services contract with the CAA, Jeff led a small team conducting field surveys for two state-listed rare plants present on the airfield and reported on the populations trends by reviewing previous reports. He also completed an annual wetland mitigation monitoring report required by the U.S. Army Corps of Engineers and the Connecticut Department of Energy (CTDEEP) for a tidal wetland creation and enhancement project along the Poquonnock River on airport property. Additionally, he completed an invasive species field investigation and management report for the Connecticut Airport Authority (CAA). Jeff led these efforts and coordinated with CAA and airfield staff to maximize the efficiency of field efforts.

Northeast Utilities Mill Stone Transmission Line Separation Project, Waterford CT

Jeff conducted a vernal pool survey, avian and rare species surveys in the nearly four-mile long project corridor. He reported previously undocumented populations of low frostweed (Crocanthemum propinquum) and brown thrasher (Toxostoma rufum) and confirmed other listed plant records. Jeff prepared reports in support of state and federal permit applications under Sections 401 and 404 of the Clean Water Act.

Massachusetts Association of Wetland Scientists

Connecticut Association of Wetland Scientists

International Erosion Control Association

Northeast Utilities Transmission Line Environmental Assessment, Watertown to Bloomfield, CT
As part of the regional New England East-West Solution project, VHB was retained to perform environmental and constructability assessments on an existing 35-mile transmission corridor in Connecticut. Jeffrey led an effort to identify and evaluate vernal pool habitat along the right-of-way and produced a report classifying the sixty vernal pools encountered. He also coordinated with CTDEEP staff to obtain information and conduct field surveys for rare plant (*Carex davisii*, *Crocanthemum propinquum*, & *Potentilla arguta*), and wildlife species. Element occurrence forms were completed to document the rare taxa encountered in the field. These forms were forwarded to the client and subsequently the Connecticut Natural Diversity Data Base to update records.

Jeff conducted avian surveys along the ROW that located bobolink (*Dolichonyx oryzivorus*) breeding in a transmission line ROW. He also conducted night times surveys for eastern whip-poor-will (*Antrostomus vociferous*) along roadsides and in state forests in Litchfield County.

National Grid 21 Transmission Line Reconstruction, Fall River to Dartmouth, MA
Jeff completed the wetland delineation and survey of rare plants along the back country 21 electric transmission line ROW. He documented several populations of the state-threatened long-leaved panic grass (*Panicum rigidulum* ssp *pubescens*) in the ROW and along access routes to the project. Jeff prepared the conservation plan for this species that was accepted by the Massachusetts Natural Heritage Endangered Species Program. He also coauthored state and federal wetland permits for the project and conducted post-construction monitoring.

National Grid Rhode Island Reliability Project, North Smithfield to Warwick, RI
Jeffrey completed vernal pool and rare, threatened and endangered species surveys along the 24-mile long project corridor that passes through six Rhode Island municipalities. Data collected were used to complete the successful RIDEM Application to Alter a Freshwater Wetland and USACE Category II Programmatic General Permit application. Jeffrey responded to requests by the RIDEM for field locations of rare taxa (*Schoenoplectiella smithii*) in the northern portion of the project and produced figures included in the approval documents issued by the RIDEM.

Calais LNG Wildlife Habitat Assessment, Calais, ME
Calais LNG retained VHB to document wildlife and vegetation necessary for a proposal to the Federal Energy Regulatory Committee to construct a liquefied natural gas receiving terminal and gas transmission pipeline. Jeffrey conducted habitat assessments along portions of the 21-mile alignment, focusing on the vegetation in umbrotrophic bogs. He also assisted in the collection of bird survey data use in the preparation of state and federal applications.

Public Water Supply Monitoring Study, Dartmouth, MA
The Town of Dartmouth hired VHB to establish a monitoring system that could detect changes in wetlands associated with groundwater withdrawals from adjacent public water supply wells to meet a Massachusetts Department of Environmental Protection (MADEP) Water Management Permit. The permit required the wetlands to be monitored for a period of five years. The objective of monitoring was to detect potential adverse impacts the withdrawals may have had on the wetlands. Jeffrey

worked with MADEP to develop an acceptable monitoring protocol that related soil morphology, plant association structure and floristic composition and hydrogeomorphic setting along with published data to develop ecological models for each wetland. These models were used to predict a range of hydrologic regimes for each wetland which were later compared with monitoring data collected in the field. Changes in plant associations were also evaluated to detect trends. Hydrologic data was found consistent with the wetland models at five well locations and wetlands associated with two wells were recommended for further monitoring. The MADEP accepted the study findings and renewed the municipality's Water Management Permit.

Narragansett Electric Company Transmission Line Extension Project, Southern, RI
VHB was retained by the Narragansett Electric Company (TNEC) to delineate and inventory wetlands and prepare an Application to Alter Freshwater Wetlands for the RI Department of Environmental Management Office of Water Resources and an Individual Permit Application from the Army Corps of Engineers for a 12-mile long 115 kV transmission construction project. Jeffrey directed an effort to inventory breeding bird and wildlife habitat associated with the corridor and coordinate with the RI Natural Heritage Program. Jeffrey worked with TNEC staff to develop access plans and methods for clearing the corridor that would minimize habitat impacts. He authored portions of the permit applications dealing with wetland functions and values, existing wildlife habitat, and assessments of project impacts to existing resources.

Blackstone River Bikeway, Central RI
Jeffrey directed efforts to delineate wetlands along the 20-mile long historic corridor paralleling the Blackstone River from Providence to the Massachusetts border. He has successfully prepared four RIDEM Applications to Alter Freshwater Wetlands Permit Applications for segments of the bikeway that traverse wetland areas along the Blackstone River. Utilizing the Highway Methodology, he authored the approved Army Corps of Engineers 404 application. Jeffrey also conducted rare plant and breeding bird surveys along constructed and proposed segments of the Bikeway and coauthored a paper that evaluated the impacts of non-consumptive recreation on this wildlife resource.

Chelsea Glinka, ENV SP

Environmental Scientist

Education

MS, Natural Resource Science with a concentration in Aquatic Toxicology, University of Connecticut, 2013

BS, Environmental Science and Management, University of Rhode Island, 2010

Registrations/Certifications

Envision™ Sustainability Professional, 2017

Chelsea Glinka is an Environmental Scientist in VHB's Providence, Rhode Island office. Her experience includes environmental permitting assessments and applications, natural resource documentation, wetland delineation, and flora and fauna surveys

10 years of professional experience

Tobacco Valley Solar Natural Resource Documentation, Connecticut

Chelsea was part of the team that prepared documentation for the TVS project that analyzed natural resources within the proposed 300-acre solar development area. This natural resource assessment included breeding bird surveys that targeted State-listed grassland and shrubland species, vernal pool surveys, rare flora and fauna surveys, and thorough documentation of the different vegetative communities and Key Habitat types present within the project area. Bird survey techniques employed passive acoustic and visual observations in line-transect surveys which followed pre-determined survey routes to maximize the opportunities to observe State-listed species. Call-back surveys were conducted following the passive acoustic surveys to further target the State-listed species. Chelsea also helped to develop conservation measures to protect sensitive resources within the project area that were approved by the Connecticut Natural Diversity Database Program. Chelsea incorporated these conservation measures into a Resource Protection Plan that was provided to the client and subcontractors to ensure compliance with conservation and resource protection measures that are required by permit conditions.

Acoustic Bat Surveys and Habitat Assessments, Massachusetts

Chelsea has conducted northern long-eared bat acoustic surveys for the Massachusetts Department of Transportation (MassDOT) and the Norwood Municipal Light Department. Surveys included multiple locations and multiple detector nights. Her project responsibilities included technical guidance on field survey plans and equipment operation, completion of automated and qualitative acoustic data analysis, report writing and review, and coordination with the U.S. Fish and Wildlife Service.

Lawton Farm Recreation Area, Scituate, RI

Prior to joining VHB, Chelsea worked with the Scituate Land Trust to perform breeding bird point count surveys at the Lawton Farm Recreation Area and documented the findings in annual reports in 2014 and 2015. The land trust was specifically interested in the use of the property by grassland species such as bobolink and meadowlark.

CAA, Groton – New London Airport, Wetland Mitigation Assessment, New London, CT

Under an on-call environmental services contract with the Connecticut Airport Authority (CAA), Chelsea was part of a team that conducted field surveys for two state-listed rare plants present on the airfield and reported on the populations trends by reviewing previous reports. She also conducted bird surveys of the airfield space and documented nesting activities by grassland species. Other components of this Project included an annual wetland mitigation monitoring report required by the U.S. Army Corps of Engineers (USACE) and the Connecticut Department of Energy (CTDEEP) for a tidal

wetland creation and enhancement project along the Poquonnock River on airport property.

National Grid, Aquidneck Island Reliability Project, Middletown and Newport, RI
Chelsea was part of a team responsible for the complex permitting needs of the Aquidneck Island Reliability Project (AIRP). This project has required the careful documentation of the environmental resources within the project area, which included an inventory of the environmental, social, and economic assets of the project area. Chelsea also described the anticipated effects from the project on habitat structure, water resources, and wildlife, and the measures that will be taken to minimize impact to the surrounding environment while ensuring successful completion of the project.

MassDOT/MBTA, South Coast Rail Commuter Rail Extension, New Bedford to Fall River, MA
For the Massachusetts Department of Transportation (MassDOT) and the Massachusetts Bay Transportation Authority (MBTA), Chelsea has helped to document the natural resources present along the route of the planned commuter rail extension by performing wetland delineation and vernal pool surveys. The information gather in these natural resource assessments has been used in both state and federal environmental permits for the project.

National Grid, Z1/Y2 Transmission Line Refurbishment, Somerset & Fall River, MA
Chelsea is working to secure the applicable local, state, and federal environmental permits for the completion of the Z1Y2 Transmission Line Project. The Z1Y2 lines pass through several freshwater wetland areas and they span the tidal Taunton River which presents unique permitting and project design challenges. Chelsea has assisted in documenting natural resources within the transmission right-of-way (ROW) and wetland delineation as well as developing the different environmental permit applications necessary for the project to be completed.

Narragansett Indian Tribe Natural Resource Resiliency Assessment and Action Plan, Charlestown, RI
Chelsea was part of a team that performed a natural resource resiliency assessment of the Narragansett Indian Tribe's (NIT) coastal forest to determine the effects of wind damage from previous storms such as Superstorm Sandy. She collected field data to illustrate the baseline conditions of the forest and conducted an extensive literature review of similar studies to understand the forest's long-term vulnerability to significant storm events. The forest provides fish and wildlife habitat and is also an important cultural resource to the NIT. Chelsea helped to identify options for the protection and recovery of the NIT's natural resources and helped to make recommendations to improve the resiliency of the forest against future storms and climate change.

Ref: 42569.0
July 19, 2020

Attachment E: NDDB Preliminary Assessments

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

December 31, 2019

Ms. Susan Moberg
Vanasse Hangen Brustlin
100 Great Meadow Road, Suite 200
Wethersfield. CT 06109
smoberg@VHB.com

Project: Preliminary Assessment for Gravel Pit Solar I, Development of a Solar Photovoltaic Electric Generating Facility on a 451Acre Site (Collection of 5 Properties) Located south of Apothecaries Hall Road in East Windsor, Connecticut
NDDB Preliminary Assessment No.: 201914275

Dear Susan Moberg,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map provided for the Gravel Pit Solar I, Development of a Solar Photovoltaic Electric Generating Facility on 451Acre Site (Collection of 5 Properties) Located south of Apothecaries Hall Road in East Windsor, Connecticut.

According to our records there are known extant populations of State Listed Species known that occur within or close to the boundaries of this property. I have attached a list of these species to this letter. Please be advised that this is a preliminary review and not a final determination. A more detailed review will be necessary to move forward with any subsequent environmental permit applications submitted to DEEP for the proposed project. **This preliminary assessment letter cannot be used or submitted with your permit applications at DEEP**. This letter is valid for one year.

To prevent impacts to State-listed species, field surveys of the site should be performed by a qualified biologist when these target species are identifiable. A report summarizing the results of such surveys should include:

1. Survey date(s) and duration
2. Site descriptions and photographs
3. List of component vascular plant and animal species within the survey area (including scientific binomials). A complete ecological description of the habitats on site.
4. Data regarding population numbers and/or area occupied by State-listed species
5. Detailed maps of the area surveyed including the survey route and locations of State-listed species present on the site.
6. Statement/résumé indicating the biologist's qualifications. Please be sure when you hire a consulting qualified biologist to help conduct this site survey that they have the proper experience with target taxon and have a CT scientific collectors permit to work with state listed species for this specific project.

7. Protection strategies and/or mitigation for state listed species included in this letter.
The site surveys report should be sent to our CT DEEP-NDDB Program (deep.nddbrequest@ct.gov) for further review by our program biologists along with an updated request for another NDDB review. Incomplete reports may not be accepted.

If you do not intend to do site surveys to determine the presence or absence of state-listed species, assume they are present and please provide a protection plan to let us how you will protect the state-listed species from being impacted by this project. You may submit these protection plans with your new request for an NDDB review.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available. The result of this review does not preclude the possibility that listed species may be encountered on site and that additional action may be necessary to remain in compliance with certain state permits.

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

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

Species List for NDDB Request

Scientific Name	Common Name	State Status
Freshwater Community - Other Classification		
Alluvial swamp		
Poor fen		
Invertebrate Animal		
Lycaena epixanthe	Bog copper	SC
Margaritifera margaritifera	Eastern pearlshell	SC
Sympistis perscripta	Scribbled sallow moth	SC
Cicindela formosa generosa	Big sand tiger beetle	SC
Terrestrial Community - Other Classification		
Dry acidic oak forest on stratified sand and gravel		
Floodplain forest		
Vascular Plant		
Alopecurus aequalis	Short-awned meadow foxtail	T
Asclepias purpurascens	Purple milkweed	SC
Gaylussacia bigeloviana	Dwarf huckleberry	T
Lygodium palmatum	Climbing fern	SC
Vertebrate Animal		
Accipiter striatus	Sharp-shinned hawk	E
Asio flammeus	Short-eared owl	T
Falco sparverius	American kestrel	SC
Glyptemys insculpta	Wood turtle	SC
Lethenteron appendix	American brook lamprey	E
Melanerpes erythrocephalus	Red-headed woodpecker	E
Passerculus sandwichensis	Savannah sparrow	SC

E = Endangered, T = Threatened, SC = Special Concern, * Extirpated

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

March 4, 2020

Susan Moberg
Vanasse Hangen Brustlin
100 Great Meadow Rd Suite 200
Wethersfield, CT 06109
smoberg@VHB.com

Project: Preliminary Assessment of Gravel Pit Solar IV, 250 acres north and south of Plantation Road in East Windsor, CT
NDDB Preliminary Assessment No.: 202002957

Dear Ms. Moberg,

I have reviewed Natural Diversity Database maps and files regarding the area delineated on the map provided for a preliminary assessment of the Gravel Pit Solar IV, on 250 acres north and south of Plantation Road in East Windsor, Connecticut.

According to our records there are known populations of State Listed Species that occur in the vicinity of this property. This property is primarily highlighted due to its proximity to riparian habitat and freshwater resources on surrounding properties including the Scantic River, Ketch Brook and the Morris Road Poor Fen. I have attached a list of species known from this area. Project design should consider maintaining or creating vegetated buffers to protect water quality and habitat for surrounding resources. We have not visited this site and were not provided any project plan details. Depending on the habitat available, these or other species may be present. Please be advised that this is a preliminary review and not a final determination. A more detailed review will be necessary to move forward with any environmental permit applications submitted to DEEP for the proposed project. **This preliminary assessment letter cannot be used or submitted with permit applications at DEEP**. This letter is valid for one year.

To better evaluate the property and to plan for management activities that may enhance habitat or prevent impacts to State-listed species, field surveys of the site should be performed by a qualified biologist with the appropriate scientific collecting permits at a time when these target species are identifiable. A report summarizing the results of such surveys should include:

1. Survey date(s) and duration
2. Site descriptions and photographs
3. List of component vascular plant and animal species within the survey area (including scientific binomials)
4. Data regarding population numbers and/or area occupied by State-listed species
5. Detailed maps of the area surveyed including the survey route and locations of State listed species
6. Conservation strategies or protection plans that indicate how impacts may be avoided for all state listed species present on the site
7. Statement/résumé indicating the biologist's qualifications. Please be sure when you hire a consulting qualified biologist to help conduct this site survey that they have the

proper experience with target taxon and have a CT scientific collectors permit to work with state listed species for this specific project.

The site surveys report should be sent to our CT DEEP-NDDB Program (deep.nddbrequest@ct.gov) for further review by our program biologists along with an updated request for another NDDB review. Incomplete reports may not be accepted.

If you do not intend to do site surveys to determine the presence or absence of state-listed species, then you should presume species are present and let us know how you will protect the state-listed species from being impacted by this project. You may submit these best management practices or protection plans with your new request for an NDDB review. After reviewing your new NDDB request form and the documents describing how you will protect this species from project impacts we will make a final determination and provide you with a letter from our program to use with DEEP-Permits.

Natural Diversity Database information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey, cooperating units of DEEP, landowners, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the NDDB should not be substitutes for onsite surveys necessary for a thorough environmental impact assessment. The result of this review does not preclude the possibility that listed species may be encountered on site and that additional action may be necessary to remain in compliance with certain state permits.

Please contact me if you have further questions at (860) 424-3378, or karen.zyko@ct.gov . Thank you for consulting the Natural Diversity Data Base.

Sincerely,

Karen Zyko
Environmental Analyst

Species List for NDDB Request

Scientific Name	Common Name	State Status
Vertebrate Animal		
Falco sparverius	American kestrel	SC
Glyptemys insculpta	Wood turtle	SC
Invertebrate Animal		
Lycaena epixanthe	Bronze copper	SC
Margaritifera margaritifera	Eastern pearlshell	SC
Vascular Plant		
Gaylussacia bigeloviana	Dwarf huckleberry	T
Critical Habitat		
Poor fen		

Additional Species Information:
American kestrel: Habitat for this bird consists of open grassy or shrubby areas with short vegetation and natural tree cavities or nest boxes for nesting. This bird is limited by habitat availability in Connecticut and it can benefit from adding and maintaining artificial nest boxes.

Poor fens are natural peatlands (bogs) occupying topographically defined basins; influenced by acidic ground water; on deep, poorly decomposed peats; dominated primarily by ericaceous shrubs.
Poor fens are primarily threatened by inputs of salts, minerals, and nutrients in both stormwater runoff and groundwater.

E = State Endangered, T = State Threatened, SC = State Special Concern
FE = Federally Endangered, FT = Federally Threatened

Ref: 42569.0
July 19, 2020

Attachment F: Species Observation and Potential Occurrence Table

Table F-1 Observed and Potential Bird Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Least Bittern[B] (S-T)									
Great Blue Heron[B]							P	**O**	
Green Heron[B]		P					P	**O**	
Turkey Vulture[B]		P	P	P	P	P			
Canada Goose[B]	O								
Wood Duck[B]							P	O	
Hooded Merganser[B]							P	**O**	
Mallard[B]					P		P	P	
Sharp-shinned Hawk[M] (S-E)	P	P	P						
Cooper's Hawk[B]	P	P	P	P	P	P			
Northern Goshawk[B] (S-T)	P	P	P			P			
Red-shouldered Hawk[B]	P		**O**	**O**			**O**		

P = Potential to occur O = observed by VHB from Sept. 2019 to July 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Broad-winged Hawk[B (S-SC)]	P	P			P	P			
Red-tailed Hawk[B]	P	O	O	P	P	O	P		
Rough-legged Hawk[M]			P	P	P	P	P		
American Kestrel[B (S-SC)]		P	**O**	**O**	P	P			
Ring-necked Pheasant[B]			P						
Ruffed Grouse[B]									
Wild Turkey[B]	P	P	P	P	P	P			
Northern Bobwhite[B]									
Killdeer[B]	P	P							
Spotted Sandpiper[B]		O							
Wilson's (Common) Snipe[M]			P				P		
American Woodcock[B]			P	P	P				
Rock Dove[B]									P
Mourning Dove[B]	O	P	O	O	P	O			
Black-billed Cuckoo[B]			P	P					

P = Potential to occur O = observed by VHB from Sept. 2019 to July 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Yellow-billed Cuckoo[B]			P						
Eastern Screech-Owl[B]			P	P	P				
Great Horned Owl[B]		P	P	P	P	P			
Barred Owl[B]	P	P	P	P	P	P			
Northern Saw-whet Owl[B (S-SC)]	P	P	P	P	P				
Common Nighthawk[B (S-E)]									
Whip-poor-will[B (S-SC)]									
Chimney Swift[B]									P
Ruby-throated Hummingbird[B]			P						P
Belted Kingfisher[B]					O		O		
Red-bellied Woodpecker[B]				O	O				
Pileated Woodpecker[B]				O	O				
Yellow-bellied Sapsucker[B]									

P = Potential to occur O = observed by VHB from Sept. 2019 to July 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Downy Woodpecker[B]				O	O				
Hairy Woodpecker[B]				O	O				
Northern Flicker[B]	P	P	O	O	P	O			P
Eastern Wood-Pewee[B]				P	P				
Acadian Flycatcher[B]									
Willow Flycatcher[B]									
Least Flycatcher[B]									
Eastern Phoebe[B]			O		O	O	O		O
Great Crested Flycatcher[B]				O	O	P			
Eastern Kingbird[B]			P	P	P	P			
Northern Shrike[M]									
White-eyed Vireo[B]									
Yellow-throated Vireo[B]			P	P					
Warbling Vireo[B]				O	O	O			
Red-eyed Vireo[B]				P	P				
Blue Jay[B]	O		P	O	O	O			
American Crow[B]	P		O	O	P	P			O

P = Potential to occur O = observed by VHB from Sept. 2019 to July 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Fish Crow[B]			P	P	P				
Horned Lark [B (S-E)]		P							
Purple Martin[B (S-SC)]									
Tree Swallow[B]	O	O	O			O			
Northern Rough-winged Swallow[B]									
Bank Swallow[B]		O							
Barn Swallow[B]	O	O							O
Black-capped Chickadee[B]			P	O	O				
Tufted Titmouse[B]			O	O	O				
Red-breasted Nuthatch[B]									
White-breasted Nuthatch[B]			O	O	O				
Brown Creeper[B]				P	P				
Carolina Wren[B]			O	O	O				
House Wren[B]						P			P
Winter Wren[B]									
Golden-crowned Kinglet[B]									

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Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Ruby-crowned Kinglet[M]									
Blue-gray Gnatcatcher[B]				O	O				
Eastern Bluebird[B]	O		O						
Veery[B]				P	P				
Hermit Thrush[B]				P	P				
Wood Thrush[B]				O	O				
American Robin[B]	O		O	O	P	O			
Gray Catbird[B]	O		O	O		O			
Northern Mockingbird[B]		O	O						
Brown Thrasher[B (S-SC)]			P						
European Starling[B]	O		O			O			P
Cedar Waxwing[B]			P	P	P	P	P		
Blue-winged Warbler[B]	O		P			P			
Golden-winged Warbler[B (S-E)]									
Nashville Warbler[B]							P		
Yellow Warbler[B]		P	O				O		

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Yellow-rumped warbler[M]					O				
Chestnut-sided Warbler[B]			P	P	P	P			
Blackpoll Warbler[M]				O	O				
Black-throated Green Warbler[B]				P	P				
Pine Warbler[B]				O	P				
Prairie Warbler[B]			O						
Black–and-white Warbler[B]			P	P	P				
American Redstart[B]			P	P	P	P			
Worm-eating Warbler[B]				P	P				
Ovenbird[B]				P					
Northern Waterthrush[B]					P				
Louisiana Waterthrush[B]					P				
Common Yellowthroat[B]			O			P			

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Hooded Warbler[B]									
Canada Warbler[B]									
Scarlet Tanager[B]				O	P				
Eastern Towhee[B]			P	P		P			
American Tree Sparrow[M]			P						
Chipping Sparrow[B]	O		O			O			
Field Sparrow[B]			O						
Savannah Sparrow[B] (S-SC)			P						
Grasshopper Sparrow[B] (S-E)									
Vesper Sparrow[B] (S-E)									
Fox Sparrow[M]									
Song Sparrow[B]	P	O	O			O			
Swamp Sparrow[B]									
White-throated Sparrow[M]	P		O			P			
Dark-eyed Junco [B]	P		O			O			
Lapland Longspur[M]									
Snow Bunting[M]	P		P						

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Northern Cardinal[B]			O	O	O	O			
Rose-breasted Grosbeak[B]	P	P		O					
Indigo Bunting[B]			P			P			
Bobolink[B (S-SC)]			P						
Red-winged Blackbird[B]	O		O		P	P			
Eastern Meadowlark[B (S-T)]		P	P						
Common Grackle[B]	O	P	O	O	P	P			
Brown-headed Cowbird[B]	O	O	O	O	P	O			
Orchard Oriole[B]									
Baltimore Oriole[B]			O	O					
Pine Grosbeak[M]									
Purple Finch[B]									
House Finch[B]									P
Common Redpoll[M]									
Pine Siskin[M]				P	P				
American Goldfinch[B]	P		O	O	P	O			
Evening Grosbeak[B]									

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
House Sparrow[P]	P					P			O

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Table F-2 Observed and Potential Amphibian and Reptile Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
AMPHIBIANS AND REPTILES									
Marbled Salamander[B]	P	P			P		P		
Spotted Salamander[B]	P	P					O		
Red Spotted Newt[B]	P	P			P		P	P	
Northern Dusky Salamander[B]	P	P					P	P	
Northern Redback Salamander[B]	P	P							
Four-toed Salamander[B]									
Northern Two-Lined Salamander[B]	P	P						P	
American Toad[B]	P	P	P		P	P	P		

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Fowler's Toad[B]		P	P		P	P	P		
Northern Spring Peeper[B]	P	P			O		O		
Gray Treefrog[B]		O			P		O		
American Bullfrog[B]									
Green Frog[B]					O		O	O	
Wood Frog[B]	P	P			P		O		
Pickerel Frog[B]		P				P	P	P	
Common Snapping Turtle[B]		P	P	P	P	P	P	P	
Painted Turtle[B]								O	
Spotted Turtle[B] (S-SC)	P	P	P	P	P	P	P	P	
Wood Turtle[B] (S-SC)	P	P	P	P	P	P	P	P	
Eastern Box Turtle[B] (S-SC)	P	P	P		P	P		P	
Common Musk Turtle[B]								P	
Northern Water Snake[B]							P	P	P

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Northern Red-bellied Snake[B]	P	P	P						P
Common Garter Snake[B]	P	P	P	O	O	P	P	P	P
Eastern Ribbon Snake[B] (S-SC)		P					P	P	P
Eastern Hognose Snake[B] (S-SC)		P	P			P			
Northern Ringneck Snake[B]	P	P							
Eastern Worm Snake[B]	P	P	P	P					
Northern Black Racer[B]		P	P		P	P			P
Eastern Smooth Green Snake[B] (S-SC)		P	P		P	P			
Black Rat Snake[B]		P	P		P	P			P
Eastern Milk Snake[B]		P	P		P	P			P

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Table F-3 Observed and Potential Mammal Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Virginia Opossum[B]		P	P	P	P	P			
Masked Shrew [B]	P	P	P		P	P			
Water Shrew[B]	P	P				P	P	P	
Northern Short-tailed Shrew[B]	P	P	P		P	P			
Star-nosed Mole[B]					P	P	P	P	
Little Brown Bat[B (S-E)]	P	P	P	P	P	P	P	P	P
Silver-haired Bat[M (S-SC)]	P	P	P	P	P	P	P	P	
Eastern Pipistrelle[B]	P	P	P	P	P	P	P	P	P
Big Brown Bat[B]	P	P	P	P	P	P	P	P	P
Red Bat[B (S-SC)]	P	P	P	P	P	P	P	P	
Hoary Bat[M (S-SC)]	P	P	P	P	P	P	P	P	
Northern Long-eared Bat[B (S-E and federally Threatened)]	P	P	P	P	P	P	P	P	P
Eastern Cottontail[B]	P	P	P		P	P			

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
New England Cottontail[B]		P	P		P	P			
Snowshoe Hare[B]	P	P	P			P			
Eastern Chipmunk[B]	P	P	O		P				
Woodchuck[B]	P	P	P	P	P				
Gray Squirrel[B]	O	O				O			
Red Squirrel[B]	P	P							
Southern Flying Squirrel[B]		P							
Beaver[B]								O	
White-footed Mouse[B]	P	P	P		P				P
Southern Red-backed Vole[B]	P	P	P	P	P				
Meadow Vole[B]	P	P	P		P	P			
Woodland Vole[B]		P	P		P				
Muskrat[B]						P	P	P	
Southern Bog Lemming[B (S-SC)]		P	P		P	P			
Norway Rat[B]			P	P	P				P

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	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
House Mouse			P	P	P				P
Meadow Jumping Mouse[B]	P	P	P		P	P			
Coyote[B]	P	P	P		P	P			
Red Fox[B]	P	P	P	P	P	P			
Gray Fox[B]		P	P			P			
Raccoon[B]	P	P	P	P	P	P	O	O	
Ermine[B]	P	P	P	P	P	P			P
Fisher[B]	P	P	P						
Long-tailed Weasel[B]	P	P	P	P	P	P			P
Mink[B]	P	P		P		P	P	P	
Striped Skunk[B]	P	P	P	P	P	P			P
River Otter[B]	P	P		P		P	P	P	
White-tailed Deer[B]	P	O	O	P	P	P			
Black Bear[B]	P	P	P	P	P	P	P	P	
Bobcat[B]	P	P	P	P	P	P	P	P	

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