



February 9, 2021

Ref: 42722.00

Mr. Jean-Paul La Marche
Greenskies Clean Energy
127 Washington Ave, West Building, Garden Level
North Haven, CT 06473

Re: Wetland & Watercourse Delineation
Jeremy Hill Road
Stonington and North Stonington, Connecticut

Dear Mr. La Marche,

VHB completed an on-site investigation to determine the presence or absence of wetlands and watercourses on approximately 63-acres on two parcels of land west of Jeremy Hill Road in Stonington and North Stonington, Connecticut (Figure 1-Project Site) as requested and authorized by Greenskies Clean Energy. This investigation involved a wetland/watercourse delineation that was completed by a qualified staff soil scientist and conducted in accordance with the principles and practices noted in the United States Department of Agriculture (USDA) Soil Survey Manual (1993). The soil classification system of the National Cooperative Soil Survey was used in this investigation to identify the soil map units present on the project site.

INVESTIGATION

The Project Site was investigated on December 21 and 30, 2020 with an average temperature in the 30s under cloudy conditions. Soil types are identified by observing soil morphology (soil texture, color, structure, etc.). Soil morphology is evaluated through numerous test pits and/or hand borings (generally to a depth of at least two feet). If a wetland and/or watercourse were determined to be present, their boundaries were identified with flags and hung from vegetation. These flags were labeled "Wetland Delineation" and generally spaced a maximum of approximately 50 feet apart. It is important to note that flagged wetland and watercourse boundaries are subject to change until verified by local, state, or federal regulatory agencies.

REGULATORY INFORMATION

Wetlands and watercourses are regulated by both state and federal law each with different definitions and regulatory requirements. Accordingly, the State may regulate waters that fall outside of federal jurisdiction; however, where federal jurisdiction exists concurrent State jurisdiction is almost always present.

Engineers | Scientists | Planners | Designers

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State Regulation

Wetland determinations are based on the presence of poorly drained, very poorly drained, alluvial, or floodplain soils and submerged land. *Watercourses* are defined as "rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon the state or any portion thereof." *Intermittent watercourse* determinations are made based on the presence of a defined permanent channel and bank, and two of the following characteristics: (1) evidence of scour or deposits of recent alluvium or detritus, (2) the presence of standing or flowing water for a duration longer than a particular storm incident, and (3) the presence of hydrophytic vegetation (See Inland Wetlands and Watercourses Act §22a-38 CGS).

Local Regulation

The Town of North Stonington's Inland Wetlands and Watercourses Regulations (IWWR) include the definition of a "Regulated Area" in Section 2.1 of those regulations as "*any inland wetland or watercourse as defined in these Regulations, whether or not they appear on the official Inland Wetlands and Watercourses Map of the Town of North Stonington, as well as land within 100 feet in a horizontal direction of any wetland or watercourse.*"

The Town of Stonington's IWWR include the definition of a "Regulated Area" in Section 2.1 of those regulations as "*Any wetlands or watercourses as defined in these Regulations, and a horizontal distance of 100 feet from the edge of any wetland or watercourse.*"

WETLAND AND WATERCOURSE SITE DESCRIPTION

Wetland classifications used to identify the type of wetland(s) occurring on the project site are based on guidance from the U.S. Fish and Wildlife Service (USFWS) (Cowardin et.al. 1979). These are further qualified with the Hydrogeomorphic Method of wetland classification (Brinson, 1993).

Wetland/Watercourse Description

Three (3) on-site freshwater inland wetlands watercourses were delineated, and 2 potential vernal pools were identified during the December 21 and 30, 2020 site visits.

Wetland 1

Wetland 1 consists of a freshwater forested depressional wetland system (USFWS classification: PFO1E) and was delineated with sequentially numbered flags WF1-100 to 164. Located along the western edge of the property, the overstory vegetation of this swamp system consists of red maple (*Acer rubrum*) and swamp white oak (*Quercus bicolor*). The understory along the edge of the wetland is thick with invasive species including multiflora rose (*Rosa multiflora*) and Japanese barberry (*Berberis thunbergii*). There small palustrine emergent wet meadow in the southwestern corner of this wetland system. The wetland is fed



by surface water runoff from the field and groundwater. Soils within the wetland were similar to the Ridgebury, Leicester, and Whitman soil series. Dominate vegetation within this wetland community includes red maple, swamp white oak, speckled alder (*Alnus incana*), Japanese barberry (*Berberis thunbergii*), sweet pepper bush (*Clethra alnifolia*), winterberry (*Ilex verticillata*), spice bush (*Lindera benzoin*), multiflora rose (*Rosa multiflora*), highbush blueberry (*Vaccinium corymbosum*), soft rush (*Juncus effusus*), sensitive fern (*Onoclea sensibilis*), and white meadowsweet (*Spiraea alba*) and green brier (*Smilax rotundifolia*).

Potential Vernal Pool 1

Wetland 1 contained 1 potential vernal pool (PVP). PVP-1 is located within the southern portion of the wetland near flag WF1-155. During the time of investigation, PVP-1 held approximate 2-3 inches of water. A layer of ice obscured the view into the pool. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.

Wetland 2

Wetland 2 consists of a freshwater forested depressional wetland system (USFWS classification: PFO1E) and was delineated with sequentially numbered flags WF2-100 to 122 and WF2-200 to 218. This large mixed deciduous wetland system is located southeast of the access road and continues along the edge of an area recently subject to timber harvest. The wetland is fed by groundwater surface water runoff from the roadway and field. Soils in the wetland were similar to the Ridgebury, Leicester, and Whitman soil series. Dominate vegetation within this wetland community includes red maple, shagbark hickory (*Carya ovata*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), speckled alder, spicebush, multiflora rose, highbush blueberry, soft rush, sensitive fern, skunk cabbage, and greenbrier.

Wetland 3

Wetland 3 consists of a freshwater forested depressional wetland system (USFWS classification: PFO1E) and was delineated with sequentially numbered flags WF3-100 to 130. This depressional red maple swamp wetland system is located northwest of the access road. The wetland is fed by groundwater and surface water runoff from the roadway and field. Soils in the wetland were similar to the Ridgebury, Leicester, and Whitman soil series. Dominate wetland vegetation includes red maple, sweet pepper bush, spicebush, highbush blueberry, common blackberry (*Rubus allegheniensis*), multiflora rose, soft rush, sensitive fern, cinnamon fern, and greenbrier.

Potential Vernal Pool 2

Wetland 3 contained 1 potential vernal pool (PVP). PVP-2 is located within the southern portion of the wetland near flag WF3-112. During the time of investigation, PVP-2 held approximate 6 inches of water. A layer of ice obscured the view into the pool. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



TABLE 1: Dominant Vegetation within and adjacent to the wetlands (Common (*Scientific*) names.)

TREES & SAPLINGS				
Scientific	Common	Indicator	Upland	Wetland
<i>Acer rubrum</i>	Red maple	FACW	X	X
<i>Alnus incana</i>	Speckled alder	FACW		X
<i>Carya ovata</i>	Shagbark hickory	FACU	X	X
<i>Fraxinus americana</i>	White ash	FACU	X	X
<i>Quercus alba</i>	White oak	FACU	X	X
<i>Quercus bicolor</i>	Swamp white oak	FACW		X

SHRUBS				
Scientific	Common	Indicator	Upland	Wetland
<i>Berberis thunbergii</i> *	Japanese barberry*	FACU	X	X
<i>Clethra alnifolia</i>	Sweet pepper bush	FAC	X	X
<i>Ilex verticillata</i>	Winterberry	FACW		X
<i>Lindera benzoin</i>	Spicebush	FACW	X	X
<i>Rosa multiflora</i> *	Multiflora rose*	FACU	X	X
<i>Vaccinium corymbosum</i>	High bush blueberry	FACW		X

HERBS & VINES				
Scientific	Common	Indicator	Upland	Wetland
<i>Juncus effusus</i>	Soft rush	OBL		X
<i>Onoclea sensibilis</i>	Sensitive fern	FACW		X
<i>Spiraea alba</i>	White meadowsweet	FACW		X
<i>Rubus allegheniensis</i>	Common blackberry	FACU	X	X
<i>Smilax rotundifolia</i>	Greenbrier	FAC	X	X

NI = Not Indicated, * = CT State Invasive Plant

SOIL MAP TYPES

A brief description of each soil map unit identified on the project site is presented below including information from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil descriptions. Further information on these and other soils, please refer to the internet site at <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/>.

Upland Soils

Woodbridge, fine sandy loams: (45A) 0 to 3 percent slopes; (45B) 3 to 8 percent slopes; (46B) 0 to 8 percent slopes, very stony; (46C) 8 to 15 percent slopes, very stony

The Woodbridge series consists of moderately well drained loamy soils formed in lodgment till. They are very deep to bedrock and moderately deep to a densic contact. These soils are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines with slope ranging from 0 to 25 percent.



Saturated hydraulic conductivity ranges from moderately high to high in the surface layer and subsoil and low or moderately low in the dense substratum. Diagnostic features and horizons recognized in this pedon include an ochric epipedon (Ap horizon), cambic horizon (Bw horizon), aquic feature (Bw2 horizon), and densic materials (Cd1 and Cd2 horizons).

Sutton fine sandy loam: (52C) 2 to 15 percent slopes, extremely stony

The Sutton series consists of very deep, moderately well drained loamy soils formed in melt-out till. They are nearly level to strongly sloping soils on hills, low ridges, and ground moraines, most typically found on footslopes, lower backslopes and in slight depressions. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is moderately high or high throughout. Diagnostic features and horizons recognized in this pedon include an ochric epipedon (Oe and A horizons), cambic horizon (Bw horizon), and redox depletions with a chroma 2 or less (Bw2, Bw3, and C1 horizons).

Canton and Charlton fine sandy loams: (62D) 15 to 35 percent slopes, extremely stony

Canton Soils

The Canton series consists of very deep, well drained soils formed in a loamy mantle underlain by sandy till. They are on nearly level to very steep moraines, hills, and ridges. Slope ranges from 0 to 45 percent. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. Diagnostic horizons and features recognized in the pedon include an ochric epipedon (Oi and A horizons), cambic horizon (Bw1, Bw2, and Bw3 horizons), and lithologic discontinuity (2C horizon).

Charlton soils

The Charlton series consists of very deep, well drained soils formed in loamy melt-out till. They are nearly level to very steep soils on moraines, hills, and ridges. Slope ranges from 0 to 60 percent. Saturated hydraulic conductivity is moderately high or high. Diagnostic horizons and features recognized in this pedon include an ochric epipedon (Oe and A horizons) and cambic horizon (Bw horizons).

Paxton and Montauk fine sandy loams: (84C) 8 to 15 percent slopes; (86C) 3 to 15 percent slopes extremely stony

Paxton Soils

The Paxton series consists of well drained loamy soils formed in lodgment till. These soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level to steep soils on hills, drumlins, till plains, and ground moraines with slope ranging from 0 to 45 percent. Saturated hydraulic conductivity is moderately high or high in the surface layer and subsoil and low or moderately low in the substratum. Diagnostic features and horizons recognized in this pedon include an ochric epipedon (Ap horizon), cambic horizon (Bw horizon), and densic materials (Cd horizon).

Montauk soils

The Montauk series consists of well drained soils formed in lodgment or flow till derived primarily from granitic materials with lesser amounts of gneiss and schist. These soils are very deep to bedrock and moderately deep to a densic contact. They are found on upland hills and moraines with slope ranges from 0 to 35 percent. Saturated hydraulic conductivity is moderately high or high in the mineral solum and low to moderately high in the substratum. Diagnostic features and horizons



recognized in this pedon include an ochric epipedon (Ap horizon), cambic horizon (Bw1 and Bw2 horizons), and densic materials (2Cd1 and 2Cd2 horizons).

Wetland Soils

Ridgebury, Leicester, and Whitman soils (3)

Ridgebury soils

The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in lodgment till derived mainly from granite, gneiss and/or schist. These soils are commonly shallow to a densic contact. They are nearly level to gently sloping soils in depressions in uplands. They also occur in drainageways in uplands, in toe slope positions of hills, drumlins, and ground moraines, and in till plains with slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum. Diagnostic horizons and features in this pedon include an ochric epipedon (A horizon), aeric feature (Bw1 horizon), cambic horizon (Bw and Bg horizons) and densic contact root limiting material (Cd horizon).

Leicester soils

The Leicester series consists of very deep, poorly drained soils formed in coarse-loamy till. They are nearly level or gently sloping soils in drainageways and low-lying positions on hills with slope ranges from 0 to 8 percent. Permeability is moderate or moderately rapid in the surface layer and subsoil and moderate to rapid in the substratum. Diagnostic horizons and features in this pedon include an ochric epipedon (Oe and A horizon), cambic horizon (Bg horizon), and an aquic moisture regime (Bg horizon).

Whitman soils

The Whitman series consists of very deep, very poorly drained soils formed in lodgment till derived mainly from granite, gneiss, and schist. They are shallow to a densic contact. These soils are nearly level or gently sloping soils in depressions and drainageways on uplands. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum. Diagnostic horizons and features in this pedon include an ochric epipedon (Ap horizon), cambic horizon (Bg horizon), and aquic conditions (Bg horizon).

REFERENCES

1. Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. Tech. Rpt.WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
2. Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service. Washington, D.C. FWS/OBS-79/31.
3. United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil descriptions. Internet site:
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/>.

Mr. La Marche
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CLOSING

Thank for the opportunity to work with you on this project. Please contact me at 860-807-4388 if you have any questions or require additional assistance.

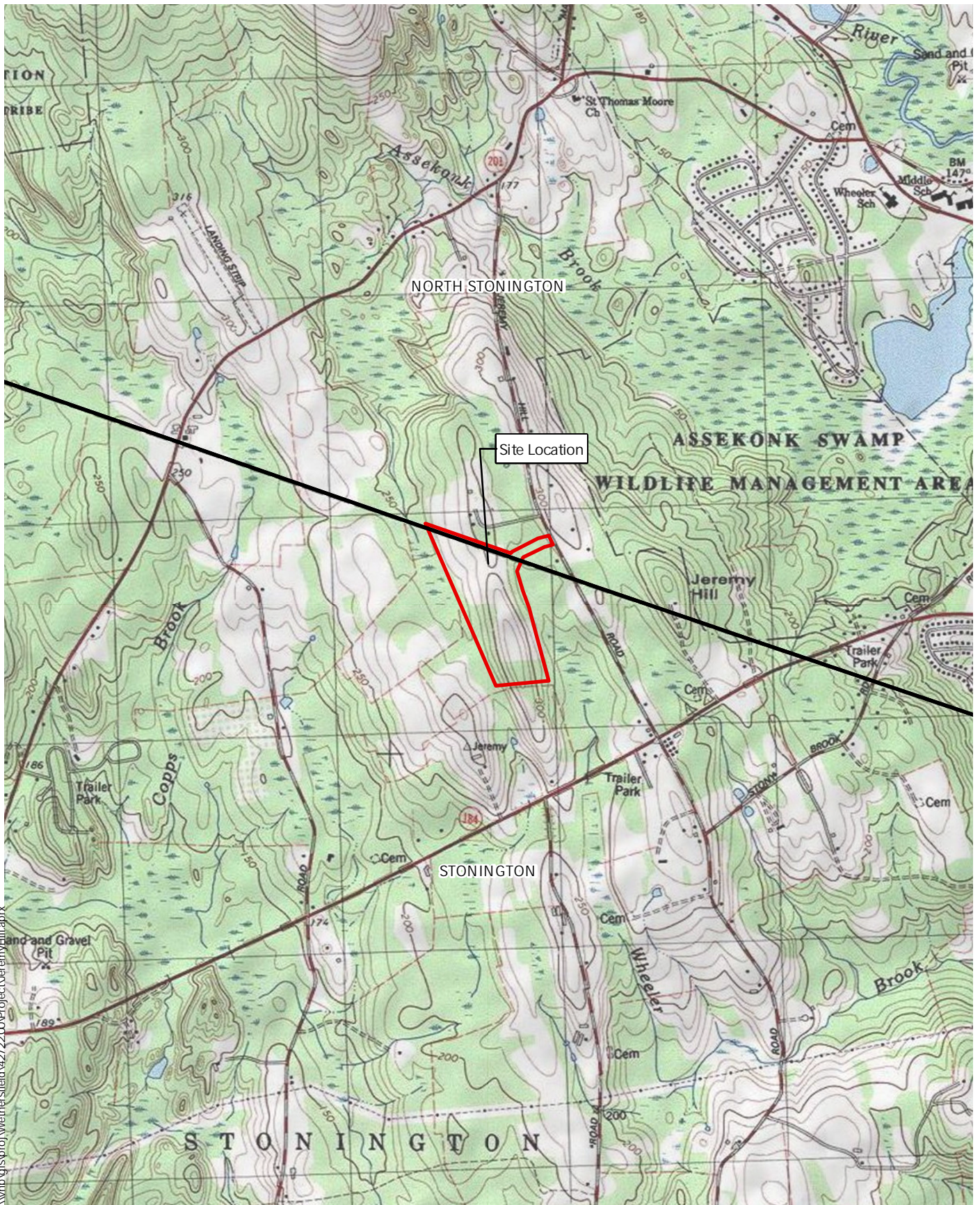
Sincerely,

A handwritten signature in black ink, appearing to read "J. Shamas".

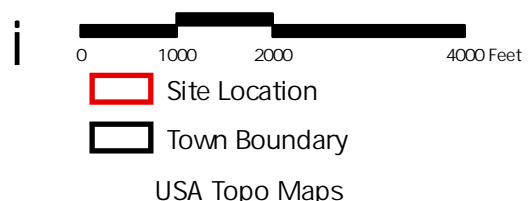
Jeffrey R. Shamas, CSS, CE, Sr. PWS
Director of Environmental Services
jshamas@vhb.com

Enclosures

- Figures
 - Figure 1 – USGS Topo
 - Figure 2 – Wetland & Watercourses Delineation Figure
- Photographic Log

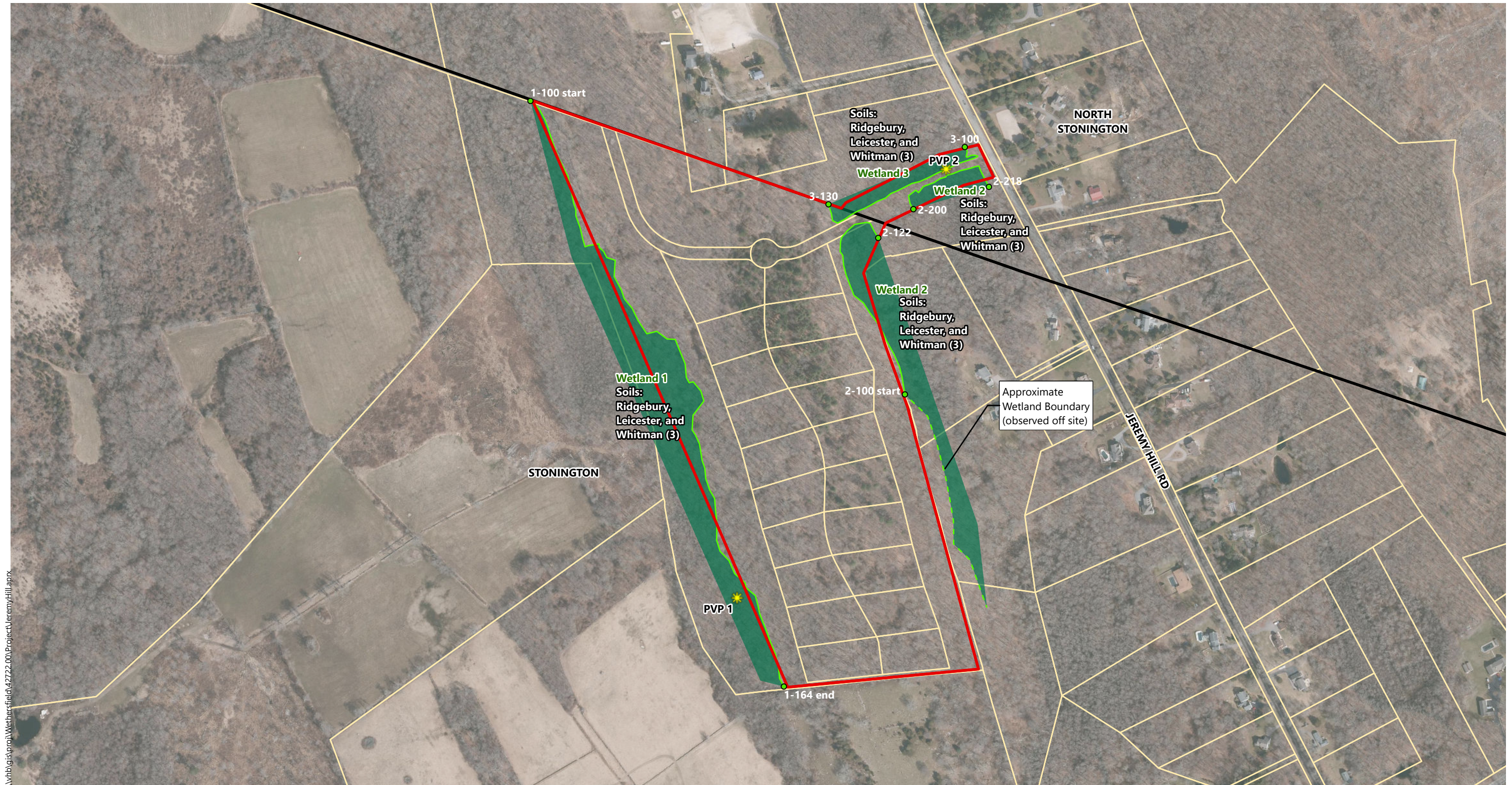


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Jeremy Hill | Stonington, Connecticut

USGS Site Location Map



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Jeremy Hill

Stonington, Connecticut

- Study Area
- Delineated Wetland Edge
- Approximate Wetland Edge
- ✱ Potential Vernal Pool
- Wetland Resource Area
- Parcel Boundary
- Town Boundary

Delineated Wetland Resources

DataCollection_DelineationFlags

Flag Type

- Wetland Flag

Source: CTDEEP, VHB, ArcGIS Online

PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT

Project No: 42722.00

Photo No. 1 **Date:** 12/21/20

Description: View facing southwest of Wetland 1 near flag WF1-109.



PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT

Project No: 42722.00

Photo No. 2 **Date:** 12/21/20

Description: View facing northwest of small palustrine emergent area in the southeastern corner of the northern field.



PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT

Project No: 42722.00

Photo No. 3 **Date:** 12/21/20

Description: View facing southwest of Wetland 1 near flag WF1-150.



PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy



Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT



Project No: 42722.00



Photo No. 4 **Date:** 12/21/20



Description: View facing southwest of PVP 1. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT	Project No: 42722.00
Photo No. 5	Date: 12/30/20		
Description: View facing southeast of the interior of Wetland 2 near flag WF2-203.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT	Project No: 42722.00
Photo No. 6	Date: 12/30/20		
Description: View facing southwest of Wetland 2, to the left of the entrance driveway near WF2-214. Wetland 3 is to the right of the entrance driveway.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT	Project No: 42722.00
Photo No. 7	Date: 12/30/20		
Description: View facing southeast of Wetland 3 near flag WF3-310.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT	Project No: 42722.00
Photo No. 8	Date: 12/30/20		
Description: View facing southwest of Wetland 3 near flag WF3-106.			

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd, Stonington & North Stonington, CT

Project No: 42722.00

Photo No. 9 **Date:** 12/30/20

Description: Overview of PVP 2. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.





To: Ms. Bonnie Potocki
Project Developer
Greenskies Clean Energy

Date: June 11, 2021

Project #: 42722.00

Memorandum

From: Christopher Wagner, PWS, Senior
Environmental Scientist
Jeffrey Shamas, CSS, CE, PWS

Re: Vernal Pool Survey, Jeremy Hill Road
Stonington and N. Stonington, Connecticut

Greenskies Clean Energy is proposing to construct an approximately 5 MW solar photovoltaic (PV) development (the Project) on two parcels of land totaling approximately 63 acres on Jeremy Hill Road in Stonington and North Stonington, Connecticut (the Site). As part of the pre-construction environmental due diligence and permitting for the Project, VHB delineated jurisdictional wetlands resource areas on the Site in late 2020. During the delineation, areas that exhibited signs of long-term hydrology were identified as potential vernal pools. VHB environmental scientists surveyed the Site for vernal pools in April 2021 and identified three vernal pools. A summary of site conditions, criteria for identifying vernal pools, and the findings of VHB's survey are presented below.

Site Description

The Site consists of two adjacent parcels on the west side of Jeremy Hill Road (Figure 1). An existing dirt and gravel access road leads west from Jeremy Hill Road into the Site through the small North Stonington parcel to the much larger Stonington parcel where the Project is proposed (Photos 1-2). The Site is currently undeveloped and initially consisted entirely of wooded uplands and wetlands. A large portion of the Site was cleared in approximately 2018. The access road has been expanded with a logging road that extends further into the Site and much of the central upland area of the Site has been cleared of trees (Photos 5-6). The cleared area is generally open with a few individual trees. Much of the open area is being colonized by invasive and opportunistic species such as multiflora rose (*Rosa multiflora*) and common blackberry (*Rubus allegheniensis*) (Photos 7-8). There are signs of relatively recent disturbance in the open areas with exposed soil and woody debris from the clearing operation, and some brush piles are still present on the Site. The Site is mainly surrounded by areas of undeveloped or lightly developed land, with a mixture of forested areas and agricultural fields to the south and west, forested areas and single family homes along Jeremy Hill Road to the east, and a few houses and another recently cleared area to the north.

The forested wetlands on the Site include areas of red maple swamp and other mixed deciduous palustrine forested wetlands, transitioning to forested and cleared upland areas (Photo 9). Most of the forested wetlands consist of a mature canopy with a dense shrub understory. The wetlands are fed mainly by groundwater with some surface water runoff from the surrounding area. Wetland 1 on the west side of the Site and Wetland 3 north of the access road drain north toward Assekong Brook in North Stonington; Wetland 2 on the east side of the Site drains south toward Wheeler Brook in Stonington. Dominant wetland vegetation includes red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), sweet pepperbush (*Clethra alnifolia*), northern spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), speckled alder (*Alnus incana*), green brier (*Smilax rotundifolia*), multiflora rose, Japanese barberry (*Berberis thunbergii*), sensitive fern (*Onoclea sensibilis*), soft rush (*Juncus tenuis*), and meadowsweet (*Spiraea alba*). Dominant upland vegetation includes red maple, shagbark hickory (*Carya ovata*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), multiflora rose, Japanese barberry, common blackberry, and sweet pepperbush.

Wetland resource areas were delineated in December 2020. During the delineation, two areas were noted as having the potential to support vernal pool habitat. The areas were largely vegetation-free depressions that held some water at the time of the delineation and appeared to hold water for extended periods in a typical spring. These areas were assessed in the spring of 2021 to determine their capacity as vernal pools.

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Vernal Pool Identification and Assessment

Although Connecticut's municipal inland wetlands agencies regulate vernal pools, the Connecticut Department of Energy and Environmental Protection (CT DEEP) does not provide a formal definition of vernal pool (CT DEEP 2020). Acknowledging the lack of an official definition for vernal pools in Connecticut, in a technical paper addressing vernal pool considerations for site development, Calhoun and Klemens (2002) note that vernal pools generally occupy less than 2 acres and recommend following guidance provided by Donahue (1996), which includes the following factors:

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

The Connecticut Association of Wetland Scientist (CAWS) Vernal Pool Monitoring webpage (CAWS 2020) provides the following vernal pool definition:

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

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

Table 1 Obligate Vernal Pool Species

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

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

Survey Methodology

VHB surveyed the property for vernal pool indicators on April 26, 2021. To conduct the survey, a VHB senior biologist traversed the Site wearing waders and polarized glasses in search of inundated depressions capable of supporting vernal pool breeding. VHB specifically investigated the depressions identified during the 2020 wetland delineation of the Site. Dip nets were used to sample for biological indicators within areas of standing water. Discretion was used during dipnet sweeps such that small, shallow areas containing obligate vernal pool indicators were disrupted as little as possible. Field notes and supporting photographs were taken at areas that were found to meet the vernal pool criteria discussed above. The boundaries of vernal pool habitat were delineated with blue sequentially numbered plastic flags and the flag locations were recorded using a global positioning device. CAWS vernal pool observation forms and Vernal Pool Assessment Sheets were prepared for each vernal pool identified. Geographic information system (GIS) tools and aerial imagery were used to determine land use surrounding breeding areas and calculate percentages of functional habitat.

Survey Findings

Three areas on the Site were confirmed to have vernal pool activity (Figure 2). All three areas are cryptic vernal pool habitats consisting of inundated depressions within broader surrounding vegetated wetlands. No isolated vernal pool depressions surrounded by uplands were observed. The three vernal pool areas identified on the day of the survey are described in more detail below. Photographs, CAWS vernal pool observation forms, and a Vernal Pool Assessment Sheet for each area are included with this report.

VP-1

VP-1 is a cryptic vernal pool located within Wetland 3 on the north side of the access road that leads into the Site from Jeremy Hill Road. The pool has formed against the northern edge of the road berm. VP-1 is surrounded by red maple swamp wetlands to the west, north, and east, and by the access road and additional wetlands (Wetland 2) to the south. VP-2 is immediately adjacent to the west of VP-1. VP-1 consists of a mostly open water area adjacent to the roadway berm interspersed with shrub and tree hummocks with little herbaceous ground cover and a semi-open overstory, due in part to the opening in the canopy made by the access road (Photo 3 and see Attachment 2 for additional photos). The pool is fed by groundwater flow from the surrounding wetlands and the area eventually drains north toward Assekong Brook. VP-1 measures approximately 80 feet by 100 feet and is generally shallow, with an average depth ranging from approximately 6 to 12 inches across its much of its area. A smaller portion of the pool close to the access road has a maximum depth of approximately 15 to 18 inches. The water in VP-1 is lightly to moderately tannic, but the generally shallow depth gives good visibility throughout the pool. The pool has a firm bottom consisting mainly of leaf litter from the surrounding woods. Approximately 15 spotted salamander (*Ambystoma maculatum*) egg masses were observed in VP-1 on the day of the survey, singly or in small clusters of a few egg masses mostly in the deepest section of the pool by the access road. Ample attachment points are present throughout the pool; some egg masses were also observed resting unattached on the bottom of the pool in shallower areas. VP-1 also contained the remnants of several wood frog (*Lithobates sylvaticus*) egg masses, and several hundred wood frog tadpoles were observed in the pool. The boundary of VP-1 was delineated with blue flags labeled VP1-100 through VP1-128.

Based on GIS measurements, the breeding area of VP-1 is 10,415 square feet. GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 66% of the 750-foot critical terrestrial habitat envelope is undeveloped (see Table 2). These percentages, combined with the presence of vernal pool indicator species within the pool, indicate that VP-1 has a rating of Tier I according to

Calhoun and Klemens' Vernal Pool Assessment Sheet. See the attached VP-1 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of VP-1.

VP-2

VP-2 is a cryptic vernal pool located within Wetland 3, directly to the west of VP-1 on the north side of the access road that leads into the Site from Jeremy Hill Road. VP-2 is a much smaller pool than VP-1 and is situated at a slightly higher elevation. VP-2 consists of a single open water depression with no hummocks, bounded by a low manmade berm to the north and the roadway berm to the south (Photo 4 and see Attachment 2 for additional photos). VP-2 measures approximately 20 feet by 45 feet and is generally shallow throughout with an average depth of approximately 6 inches or less throughout most of its area and a maximum depth of approximately 12 inches. The pool is fed by groundwater flow from the surrounding wetlands; in periods of high groundwater, VP-2 drains into VP-1. The water in VP-2 is moderately tannic, but the generally shallow depth gives good visibility throughout the pool. The pool has a firm bottom consisting mainly of leaf litter from the surrounding woods. Two spotted salamander egg masses were observed in VP-2 on the day of the survey, and approximately 100 to 200 wood frog tadpoles were also observed in the pool. The boundary of VP-2 was delineated with blue flags labeled VP2-100 through VP2-105.

Based on GIS measurements, the breeding area of VP-2 is 1,196 square feet. GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 73% of the 750-foot critical terrestrial habitat envelope is undeveloped (see Table 2). These percentages, combined with the presence of vernal pool indicator species within the pool, indicate that VP-2 has a rating of Tier I according to Calhoun and Klemens' Vernal Pool Assessment Sheet. See the attached VP-2 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of VP-2.

VP-3

VP-3 is a cryptic vernal pool located within Wetland 1 in the southwest corner of the Site. VP-3 consists of a mostly open water area interspersed with a few shrub and tree hummocks and a dense mat of submergent and emergent herbaceous vegetation in places. The pool is approximately 50 feet from the wetland boundary at its closest point and is surrounded by forested wetlands on all sides with a dense shrub understory and a mostly closed canopy (Photo 10 and see Attachment 2 for additional photos). The pool is fed by groundwater flow from the surrounding wetlands and the area eventually drains north toward Assekonk Brook. VP-3 measures approximately 30 feet by 100 feet and is generally shallow, with an average depth ranging from approximately 6 to 12 inches across its much of its area. A smaller central portion of the pool has a maximum depth of approximately 15 to 18 inches. The water in VP-3 is generally clear, giving good visibility throughout the pool in undisturbed conditions. The pool has a semi-soft bottom consisting of leaf litter from the surrounding woods mixed with 2-3 inches of fine silt. A single cluster of approximately 30 spotted salamander egg masses was observed in VP-3 on the day of the survey, attached to submerged fallen branches near the surface of the water. Several hundred wood frog tadpoles were also observed in the pool. The boundary of VP-3 was delineated with blue flags labeled VP3-100 through VP3-110.

Based on GIS measurements, the breeding area of VP-3 is 3,292 square feet. GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 100% of the 750-foot critical terrestrial habitat envelope is undeveloped (see Table 2). These percentages, combined with the presence of vernal pool indicator species within the pool, indicate that VP-3 has a rating of Tier I according to Calhoun and Klemens' Vernal Pool Assessment Sheet. See the attached VP-3 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of VP-3.

Table 2 Land Use Calculations for Upland Vernal Pool Habitats

Habitat Zone	Category	VP-1	VP-2	VP-3
Vernal Pool Envelope (0-100 ft)	Undeveloped ¹	100%	100%	100%
	Developed	0%	5%	0%
Critical Terrestrial Habitat (100-750 ft)	Undeveloped	66%	73%	100%
	Developed	34%	27%	0%

¹ From the Vernal Pool Assessment Sheet: "For these purposes, "undeveloped" means open land largely free of roads, structures, and other infrastructure. It can be forested, partially forested, or open agricultural land."

Conclusions

In April 2021, VHB identified three vernal pools on the Site. The pools are all cryptic vernal pool areas within larger wetlands; no isolated pools surrounded by uplands were observed. The pools are all shallow and seasonally dry out or hold little water at other times of the year, as documented by visual observations in late 2020. All areas satisfy the vernal pool criteria established by Calhoun and Klemens as well as CAWS.

Table 3 summarizes the observations made for each pool. The attached CAWS Vernal Pool Observation Forms provide further details for each area. The attached Vernal Pool Assessment Sheets provide a summary of biological value and land use surrounding each pool.

Table 3 Summary of Findings

Pool ID	Area (ft ²)	Permanent Outlet	Appropriate Hydrology	Obligate Species Observed	Fish Present	Vernal Pool Classification	VP Tier
VP-1	10,415	No	Yes	<ul style="list-style-type: none"> • ~15 spotted salamander egg masses • Wood frog tadpoles 	No	Cryptic	Tier I
VP-2	1,196	No	Yes	<ul style="list-style-type: none"> • 2 spotted salamander egg masses • Wood frog tadpoles 	No	Cryptic	Tier I
VP-3	3,292	No	Yes	<ul style="list-style-type: none"> • ~30 spotted salamander egg masses • Wood frog tadpoles 	No	Cryptic	Tier I

Based on the high number of obligate vernal pool amphibians breeding within the cryptic pools identified on the Site, it appears that the undeveloped upland areas surrounding the pools support significant populations of vernal pool species that have limited breeding habitat. These upland areas include undisturbed forested areas as well as cleared areas, which provide limited but less suitable upland habitat. The existing upland habitat on the Site supports the concentrated use of the cryptic vernal pool breeding habitat within the vernal pools on the Site.

References:

- Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.
- Connecticut Association of Wetland Scientists (CAWS). 2020. Vernal Pool Monitoring webpage: <http://www.ctwetlands.org/vernal-pool-monitoring.html>; last accessed 6/8/21.
- Connecticut Department of Energy and Environmental Protection (CT DEEP). 2020. Vernal Pools webpage: <https://portal.ct.gov/DEEP/Water/Wetlands/Vernal-Pools>; last accessed 6/8/21.
- Donahue, D. F. 1996. A guide to the identification and protection of vernal pool wetlands in Connecticut. University of Connecticut Cooperative Extension Program.
- Klemens, M. W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History
- Whitworth, W. R. 1996. Freshwater Fishes of Connecticut. 2nd ed. State Geological and Natural History Survey of Connecticut Bulletin 114, Connecticut Department of Environmental Protection, Hartford, CT.

Figures:

Figure 1 – USGS Site Location Map

Figure 2 – Vernal Pool and Wetland Resource Areas

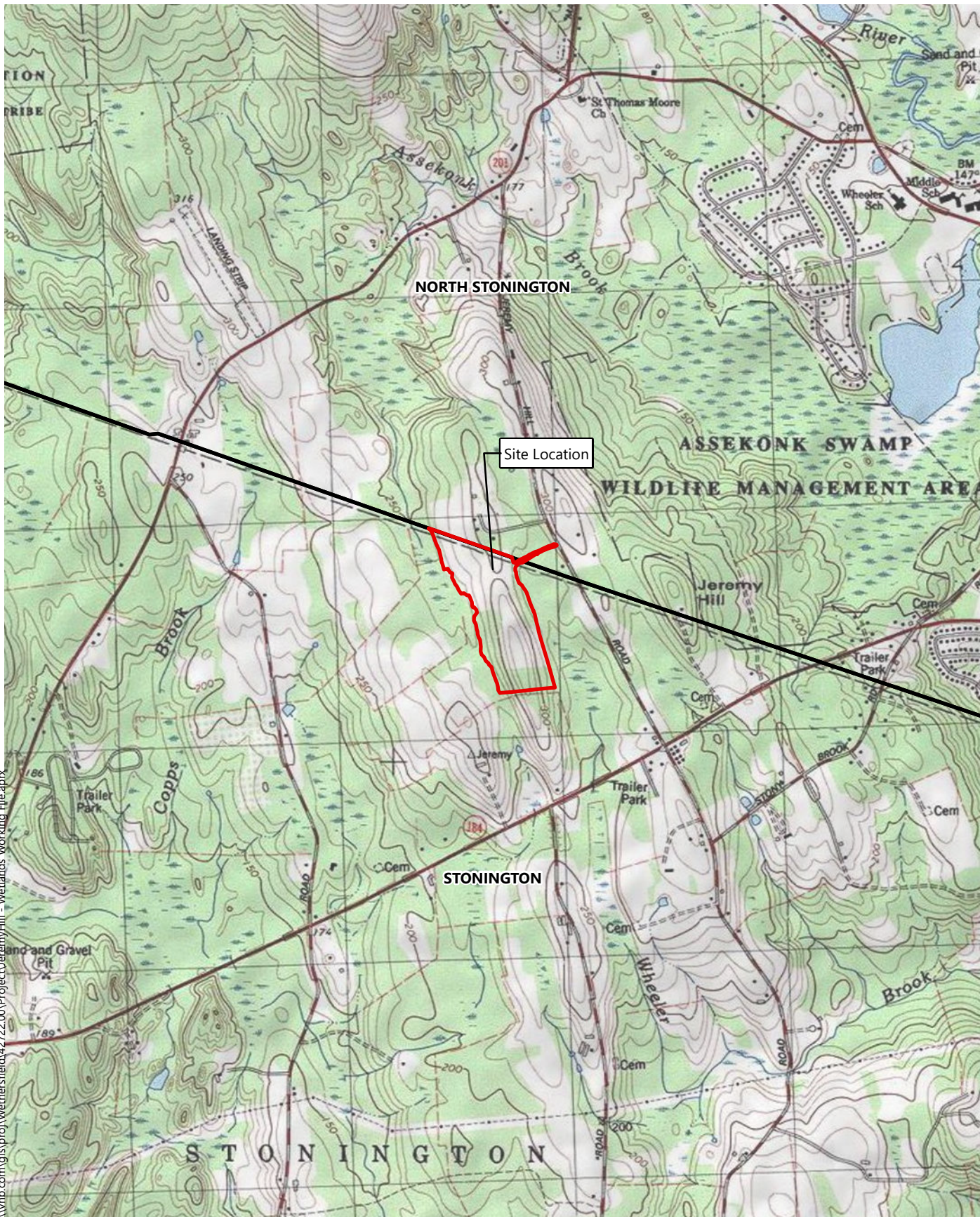
Attachments:

Site Photographs

CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets

Figures

- › Figure 1 – USGS Site Location Map
- › Figure 2 – Wetland and Vernal Pool Resource Areas



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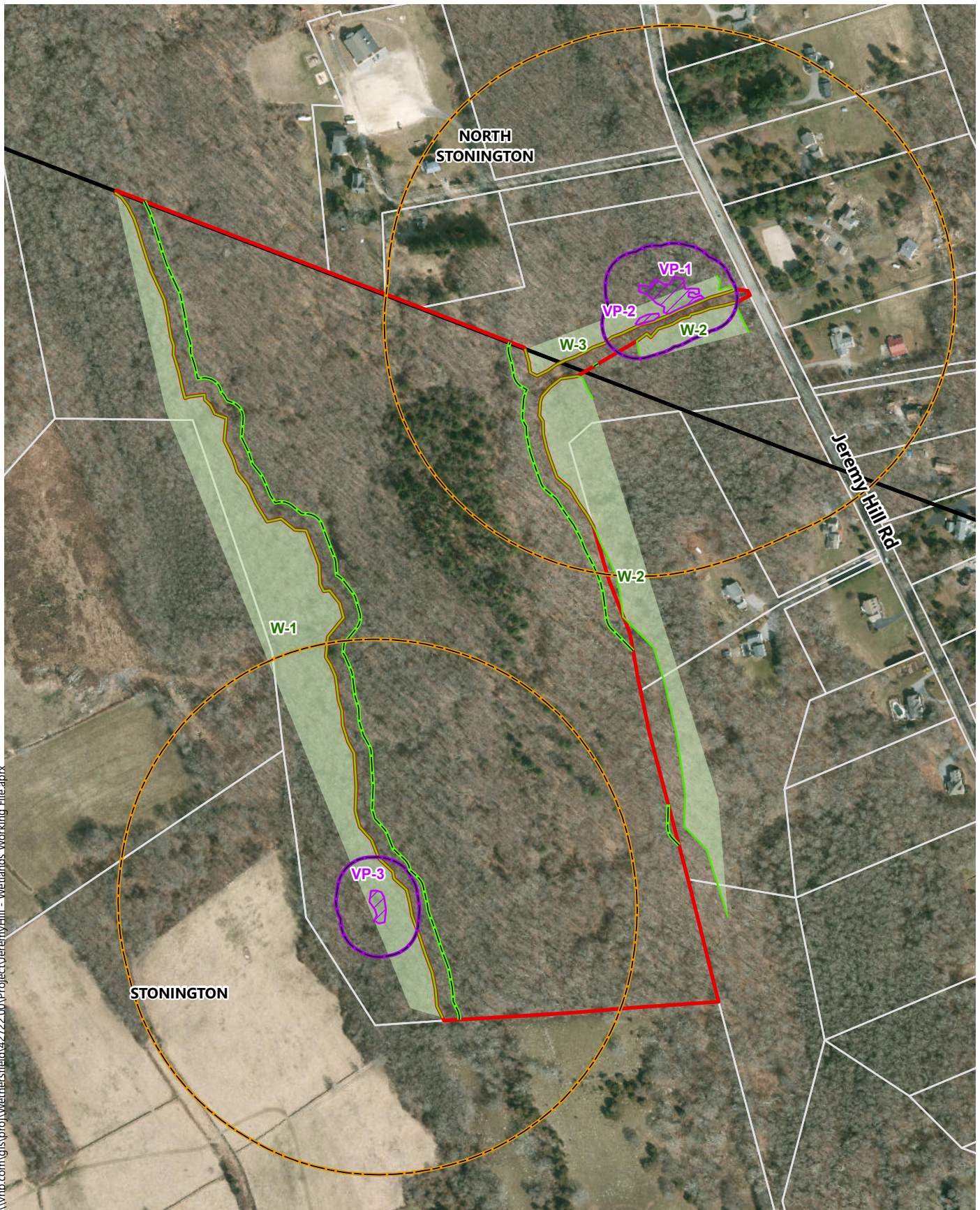


Jeremy Hill

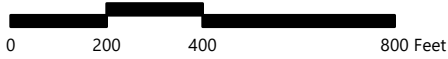
Stonington, Connecticut

USGS Site Location Map

Source: VHB, ArcGIS Online, CTDEEP



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Jeremy Hill

Stonington, Connecticut

- Project Location
- Delineated Wetland Edge
- 100' Vernal Pool Envelope
- Town Boundary
- Wetland Resource Area
- 50' Wetland Buffer
- Parcel Boundary
- Delineated Vernal Pool Area
- 750' Critical Terrestrial Habitat Zone

Wetland and Vernal Pool Resource Areas

Source: VHB, ArcGIS Online, CTDEEP

Attachment 1

Site Photographs

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 1

Date: 4/26/21

Location: Access road into Site, W of Jeremy Hill Rd.

View: E

Description:

Maintained dirt and gravel access road into Site from Jeremy Hill Road.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 2

Date: 4/26/21

Location: Access road into Site, W of Jeremy Hill Rd.

View: W

Description:

Access road leading to Site interior from Jeremy Hill Road. Forested wetlands on both sides of access road; VP-1 and VP-2 are along northern boundary of road berm.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 3

Date: 4/26/21

Location: Access road into Site, S of VP-1

View: N

Description:

View of VP-1 from access road, with surrounding red maple swamp of Wetland 3. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 4

Date: 4/26/21

Location: Access road into Site, S of VP-2

View: N

Description:

View of VP-2 from access road. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 5

Date: 4/26/21

Location: W end of access road into Site

View: E

Description:

View of access road leading into site fro Jeremy Hill Road, at the point where the road extension begins (stone in foreground).



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 6

Date: 4/26/21

Location: W end of access road into Site

View: S

Description:

Access road has been extended into cleared areas of Site.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 7

Date: 4/26/21

Location: Interior of Site, upgradient of Wetland 1

View: S

Description:

Cleared area of Site interior. The area is revegetating with a number of invasive and opportunistic shrubs.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 8

Date: 4/26/21

Location: Interior of Site, upgradient of Wetland 1

View: W

Description:

Cleared area looking down toward forested areas of Wetland 1.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 9

Date: 4/26/21

Location: Edge of Wetland 1, upgradient of VP-3

View: S

Description:

Cleared area of the Site transitioning to forested wetlands in the vicinity of VP-3.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 10

Date: 4/26/21

Location: E side of VP-3

View: W

Description:

Open water area of VP-3 with surrounding forested wetlands of Wetland 1. See Attachment 2 for additional photos.



Attachment 2

CAWS Vernal Pool Data Sheets and Vernal Pool Assessment Sheets

- › VP-1
- › VP-2
- › VP-3

VERNAL POOL DATA SHEET

Survey Date(s): 4/26/21 Investigator(s): C. Wagner Town: N. Stonington CAWS Pool #: VP-1 CAWS Project #:

Town Staff Contacted? Yes No Project/property name: Jeremy Hill Road Pool Type: Development: Reference:

Address/location (or include annotated map): Jeremy Hill Road (see Figures 1 and 2) Investigator's Contact information: cwagner@vhb.com

SEARCH CONDITIONS AND METHODS (required)

WEATHER:
 Precipitation: Within last 24 hours
 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 10:00 AM
 End time: 12:00 PM

Methods used:
 Visual
 Dipnetting

Type of Inspection:
 baseline Polarized sunglasses used? Yes
 during construction No
 post construction

Comments:
 Temporary flagging used to mark egg masses? Yes No

AMPHIBIAN EGG MASS COUNTS (required)

Wood frogs:
 1-25 26-49 ~~30~~ Abundance categories

condition	50-75	<input type="checkbox"/>	250-300	<input type="checkbox"/>
If condition mixed, note "some", "many" or "most"	75-100	<input type="checkbox"/>	300-400	<input type="checkbox"/>
	100-150	<input type="checkbox"/>	400-500	<input type="checkbox"/>
	150-200	<input type="checkbox"/>	500-750	<input type="checkbox"/>
	200-250	<input type="checkbox"/>	750-1000	<input type="checkbox"/>
		<input type="checkbox"/>	1000-1250	<input type="checkbox"/>
		<input type="checkbox"/>	>1250	<input type="checkbox"/>

intact: _____
 breaking up: _____
 hatching: ~5

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~15
 breaking up: _____
 hatching: _____

Total Number	~20
--------------	-----

ADDITIONAL NOTES: (optional)

VP-1 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 3. Breeding area measures approximately 80' by 100' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 15-18" with lightly to moderately tannic water.

~15 spotted salamander egg masses were observed in VP-1 singly or in small clusters of egg masses scattered throughout the pool. Remnants of wood frog egg masses and wood frog tadpoles were also observed. The boundary of VP-1 was delineated with blue flags labeled VP1-100 through VP1-128.

CONDITIONS/OBSERVATIONS WITHIN POOL (required data)

Inlet observed? No Yes Flowing Not flowing
 Outlet observed? No Yes
 finfish observed? No Yes
 Estimated water depth range? Avg: 6-12"; Max: 15-18"

Optional Data (see also back of sheet)

Other Vernal Pool Species:
 fairy shrimp present? Yes No
 marbled salamander larvae present? Yes No

Vegetation (within or overhanging pool):
 Trees/Saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: none
 Percent tree canopy closure? 50%
 Woody debris content? High Med. Low

Pool Substrate: (top three)
 Mud/muck Sand/Silt Peat
 Leaf Litter Silt/clay Bedrock
 Gravel/cobbles

Water Quality:
 pH _____ conductivity (uS/cm) _____ temperature (°C) _____
 Nitrate-N (mg/l) _____ Total P (ug/l) _____ DO (mg/l) _____
 turbidity (NTU's) _____ Sulphidic odor? No Yes
 Approximate % cover by algal mat or duckweed? _____
 GPS coordinates: 41.42540° N, 71.90800° W

CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 75% shrubland _____ meadow _____
 pasture _____ lawn _____ building _____
 exposed soil 25% grading _____ ag. field _____
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-1 is surrounded by red maple swamp and wooded areas of Wetland 3, adjacent to dirt and gravel access road.

Leaf Litter: If variable, note location (e.g. "N. shore")
 none/low: _____
 moderate:
 high: _____

Cover Objects:	Logs	Rocks
none:		<input checked="" type="checkbox"/>
low:	<input checked="" type="checkbox"/>	
moderate:		
high:		

Dominant vegetation (optional)
 Trees/saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: red maple

Blank area for additional notes or sketches.

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/26/2021	Investigator(s): C. Wagner	Town: N. Stonington	CAWS Pool #: VP-1	CAWS Project #:
Project/property name: Jeremy Hill Road			Pool Type:	Development: <input type="checkbox"/> Reference <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.

SKETCH OF POOL (required)

WILDLIFE OBSERVATIONS: (optional)

Checklist of Facultative Herptile Fauna (Pool & Fringe):

Green Frog	<input type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

Other Observed Fauna (Pool & Fringe):

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)

ADDITIONAL NOTES: (optional)

Note any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Med/High)
1. Surface algae	
2. Surface pollen	
3. Dark, tannin-colored water	Low
4. Deep water	
5. Turbidity	
6. Dense shrubs	
7. Other (specify)	

VERNAL POOL ASSESSMENT SHEET

A. Biological Value of the Vernal Pool

- (1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?
Yes _____ No
- (2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?
Yes No _____
- (3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes _____ No

B. Condition of the Critical Terrestrial Habitat

- (1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes No _____
- (2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes No _____

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

Cumulative Assessment

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

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

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 1

Date: 4/26/21

Location: S side of VP-1, along access road

View: N

Description:

View of VP-1 from access road. Open water area with surrounding red maple swamp of Wetland 3. Fallen branches provide attachment points.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 2

Date: 4/26/21

Location: Center of VP-1

View: W

Description:

Open areas of VP-1 with surrounding wetlands. Center of pool is approximately 15-18" deep.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 3

Date: 4/26/21

Location: Center of VP-1

View: E

Description:

E side of VP-1, with surrounding wetlands and berm of access road.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 4

Date: 4/26/21

Location: VP-1

Description:

Single spotted salamander egg mass attached to a submerged branch.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 5

Date: 4/26/21

Location: VP-1

Description:

Closer view of spotted salamander egg mass.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 6

Date: 4/26/21

Location: VP-1

Description:

Remains of hatched wood frog egg mass.



VERNAL POOL DATA SHEET

Survey Date(s): 4/26/21 Investigator(s): C. Wagner Town: N. Stonington CAWS Pool #: VP-2 CAWS Project #:

Town Staff Contacted? Yes No Project/property name: Jeremy Hill Road Pool Type: Development: Reference:

Address/location (or include annotated map): Jeremy Hill Road (see Figures 1 and 2) Investigator's Contact information: cwagner@vhb.com

SEARCH CONDITIONS AND METHODS (required)

WEATHER:
 Precipitation: Within last 24 hours
 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 11:00 AM
 End time: 12:00 PM

Methods used:
 Visual
 Dipnetting

Type of Inspection:
 baseline Polarized sunglasses used? Yes
 during construction No
 post construction

Comments:
 Temporary flagging used to mark egg masses? Yes No

AMPHIBIAN EGG MASS COUNTS (required)

Wood frogs: 1-25 26-49 ~~50~~ Abundance categories

condition	50-75	<input type="checkbox"/>	250-300	<input type="checkbox"/>
If condition mixed, note "some", "many" or "most"	75-100	<input type="checkbox"/>	300-400	<input type="checkbox"/>
	100-150	<input type="checkbox"/>	400-500	<input type="checkbox"/>
	150-200	<input type="checkbox"/>	500-750	<input type="checkbox"/>
	200-250	<input type="checkbox"/>	750-1000	<input type="checkbox"/>
intact:			1000-1250	<input type="checkbox"/>
breaking up:			>1250	<input type="checkbox"/>
hatching: ~3				

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:		Total Number
intact: 2		
breaking up:		~5
hatching:		

ADDITIONAL NOTES: (optional)

VP-2 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 3. Breeding area measures approximately 20' by 45' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 12" with moderately tannic water.

2 spotted salamander egg masses were observed in VP-2. Wood frog tadpoles were also observed. The boundary of VP-2 was delineated with blue flags labeled VP2-100 through VP2-105.

CONDITIONS/OBSERVATIONS WITHIN POOL (required data)

Inlet observed? No Yes Flowing Not flowing

Outlet observed? No Yes

finfish observed? No Yes

Estimated water depth range? Avg: 6-12"; Max: 12"

Optional Data (see also back of sheet)

Other Vernal Pool Species:
 fairy shrimp present? Yes No
 marbled salamander larvae present? Yes No

Vegetation (within or overhanging pool):
 Trees/Saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: none
 Percent tree canopy closure? 50%
 Woody debris content? High Med. Low

Pool Substrate: (top three)
 Mud/muck Sand/Silt Peat
 Leaf Litter Silt/clay Bedrock
 Gravel/cobbles

Water Quality:
 pH conductivity (uS/cm) temperature (°C)
 Nitrate-N (mg/l) Total P (ug/l) DO (mg/l)
 turbidity (NTU's) Sulphidic odor? No Yes
 Approximate % cover by algal mat or duckweed?
 GPS coordinates: 41.42529° N, 71.90838° W

CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 75% shrubland meadow
 pasture lawn building
 exposed soil 25% grading ag. field
 road busy (>1 car/10 min.) yes no
 parking lot

Comments:
 VP-2 is surrounded by red maple swamp and wooded areas of Wetland 3, adjacent to dirt and gravel access road.

Leaf Litter: If variable, note location (e.g. "N. shore")
 none/low:
 moderate:
 high:

Cover Objects:	Logs	Rocks
none:		
low:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
moderate:		
high:		

Dominant vegetation (optional)
 Trees/saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: red maple

ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/26/2021	Investigator(s): C. Wagner	Town: N. Stonington	CAWS Pool #: VP-2	CAWS Project #:
Project/property name: Jeremy Hill Road			Pool Type:	Development: <input type="checkbox"/> Reference <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.

SKETCH OF POOL (required)

WILDLIFE OBSERVATIONS: (optional)

Checklist of Facultative Herptile Fauna (Pool & Fringe):

Green Frog	<input type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

Other Observed Fauna (Pool & Fringe):

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)

ADDITIONAL NOTES: (optional)

Note any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Med/High)
1. Surface algae	
2. Surface pollen	
3. Dark, tannin-colored water	Low
4. Deep water	
5. Turbidity	
6. Dense shrubs	
7. Other (specify)	

VERNAL POOL ASSESSMENT SHEET

A. Biological Value of the Vernal Pool

- (1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?
Yes _____ No
- (2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?
Yes No _____
- (3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes _____ No

B. Condition of the Critical Terrestrial Habitat

- (1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes No _____
- (2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes No _____

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

Cumulative Assessment

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

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

Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 1

Date: 4/26/21

Location: S side of VP-2, along access road

View: N

Description:

View of VP-2 from access road. Small open water area with surrounding red maple swamp of Wetland 3. Center of pool is approximately 12" deep.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 2

Date: 4/26/21

Location: S side of VP-2

View: W

Description:

Small open water area of VP-2 with surrounding wetlands and berm of access road.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 3

Date: 4/26/21

Location: S side of VP-2

View: E

Description:

E side of VP-2, with surrounding wetlands and berm of access road. Fallen branches provide attachment points.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 4

Date: 4/26/21

Location: VP-2

Description:

One of 2 spotted salamander egg masses observed in VP-2.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 5

Date: 4/26/21

Location: VP-2

Description:

Hatched wood frog tadpoles congregating in open water area of VP-2.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 6

Date: 4/26/21

Location: VP-2

Description:

Wood frog tadpoles captured from VP-2.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 7

Date: 4/26/21

Location: VP-2

Description:

Wood frog tadpoles captured from VP-2.



VERNAL POOL DATA SHEET

Survey Date(s): 4/26/21 Investigator(s): C. Wagner Town: Stonington CAWS Pool #: VP-3 CAWS Project #:

Town Staff Contacted? Yes No Project/property name: Jeremy Hill Road Pool Type: Development: Reference:

Address/location (or include annotated map): Jeremy Hill Road (see Figures 1 and 2) Investigator's Contact information: cwagner@vhb.com

SEARCH CONDITIONS AND METHODS (required)

WEATHER:

Precipitation: Within last 24 hours
 Current 24 hours
 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 12:00 PM
 End time: 1:30 PM

Methods used:
 Visual
 Dipnetting

Type of Inspection:
 baseline Polarized sunglasses used? Yes
 during construction No
 post construction

Comments:
 Temporary flagging used to mark egg masses? Yes No

AMPHIBIAN EGG MASS COUNTS (required)

Wood frogs: 1-25 26-49 50-75 75-100 100-150 150-200 200-250 250-300 300-400 400-500 500-750 750-1000 1000-1250 >1250

Abundance categories

condition 50-75 300-400
 If condition mixed, note "some", "many" or "most" 75-100 400-500
 100-150 500-750
 150-200 750-1000
 200-250 1000-1250
 >1250

intact:
 breaking up:
 hatching: ~10

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~30 Total Number ~40
 breaking up:
 hatching:

ADDITIONAL NOTES: (optional)

VP-3 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 1. Breeding area measures approximately 30' by 100' with a semi-soft bottom of leaf litter and 2-3 inches of fine silt. Average depth ranges from approximately 6-12" with a maximum depth of approximately 15-18" with generally clear water.

A single cluster of approximately 30 spotted salamander egg masses was observed in VP-3. Wood frog tadpoles were also observed. The boundary of VP-3 was delineated with blue flags labeled VP3-100 through VP3-110.

CONDITIONS/OBSERVATIONS WITHIN POOL (required data)

Inlet observed? No Yes Flowing Not flowing
 Outlet observed? No Yes
 finfish observed? No Yes
 Estimated water depth range? Avg: 6-12"; Max: 15-18"

Optional Data (see also back of sheet)

Other Vernal Pool Species:
 fairy shrimp present? Yes No
 marbled salamander larvae present? Yes No

Vegetation (within or overhanging pool):
 Trees/Saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: none
 Percent tree canopy closure? 75%
 Woody debris content? High Med. Low

Pool Substrate: (top three)
 Mud/muck Sand/Silt Peat
 Leaf Litter Silt/clay Bedrock
 Gravel/cobbles

Water Quality:
 pH conductivity (uS/cm) temperature (°C)
 Nitrate-N (mg/l) Total P (ug/l) DO (mg/l)
 turbidity (NTU's) Sulphidic odor? No Yes
 Approximate % cover by algal mat or duckweed?
 GPS coordinates: 41.42049° N, 71.91111° W

CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 75% shrubland 25% meadow
 pasture lawn building
 exposed soil grading ag. field
 road busy (>1 car/10 min.) yes no
 parking lot

Comments:
 VP-2 is surrounded by red maple swamp and wooded areas of Wetland 3, adjacent to dirt and gravel access road.

Leaf Litter: If variable, note location (e.g. "N. shore")
 none/low:
 moderate:
 high:

Cover Objects:

	Logs	Rocks
none:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
low:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
moderate:	<input type="checkbox"/>	<input type="checkbox"/>
high:	<input type="checkbox"/>	<input type="checkbox"/>

Dominant vegetation (optional)
 Trees/saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: red maple

ADDITIONAL NOTES: (optional)

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/26/2021	Investigator(s): C. Wagner	Town: N. Stonington	CAWS Pool #:	VP-3	CAWS Project #:
Project/property name: Jeremy Hill Road			Pool Type:	Development:	<input type="checkbox"/> Reference <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.

SKETCH OF POOL (required)

Single cluster of ~30 egg masses observed in deepest area of pool

Approx. 100 feet

WILDLIFE OBSERVATIONS: (optional)

Checklist of Facultative Herptile Fauna (Pool & Fringe):

Green Frog	<input type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

Other Observed Fauna (Pool & Fringe):

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)

200' terrestrial envelope consists of wooded wetlands and shrubby cleared areas in the Site interior

Approx. 200 feet

ADDITIONAL NOTES: (optional)

Note any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Med/High)
1. Surface algae	
2. Surface pollen	
3. Dark, tannin-colored water	Low
4. Deep water	
5. Turbidity	Low
6. Dense shrubs	
7. Other (specify)	

VERNAL POOL ASSESSMENT SHEET

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Yes No _____

B. Condition of the Critical Terrestrial Habitat

- (1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes No _____
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Yes No _____

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

Cumulative Assessment

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0	1-2	Tier III
1-3	0	Tier III

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Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 1

Date: 4/26/21

Location: E side of VP-3

View: W

Description:

Open water area of VP-3 with surrounding forested wetlands of Wetland 1.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 2

Date: 4/26/21

Location: E side of VP-3

View: W

Description:

Open water area of VP-3 with surrounding forested wetlands of Wetland 1. Center of pool is approximately 15-18" deep. Spotted salamander egg mass cluster noted with arrow.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 3

Date: 4/26/21

Location: VP-3

Description:

Cluster of approximately 30 spotted salamander egg masses in open water area of VP-3. Green coloration is due to algae.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

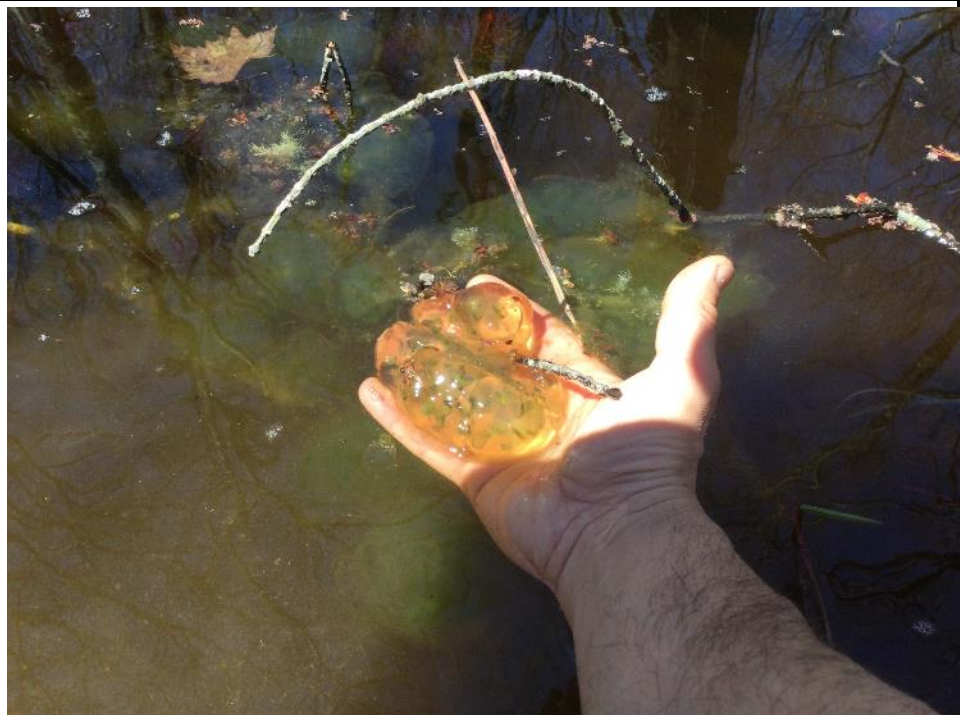
Photo No.: 4

Date: 4/26/21

Location: VP-2

Description:

Closer view of spotted salamander egg cluster. Silt cloud moving in from lower left due to disturbance of the pool bottom.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 5

Date: 4/26/21

Location: VP-3

Description:

Hatched wood frog tadpoles congregating in shallow water at northern edge of pool.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 6

Date: 4/26/21

Location: VP-3

Description:

Wood frog tadpoles captured from VP-3.



Client Name: Greenskies Clean Energy

Site Location: Jeremy Hill Rd., Stonington & N. Stonington, CT

Project No: 42722.00

Photo No.: 7

Date: 4/26/21

Location: VP-3

Description:

Wood frog tadpoles captured from VP-3 with diagnostic gold flecking on underside.

