



December 9, 2020

Ref: 42707.00

Mr. Christopher Ross
Project Developer
Greenskies Clean Energy
127 Washington Ave, West Building, Garden Level
North Haven, CT 06473

Re: Wetland & Watercourse Delineation
361 Old Tavern Road
Orange, Connecticut

Dear Mr. Ross,

VHB completed an on-site investigation to determine the presence or absence of wetlands and/or watercourses at the property located 361 Old Tavern Road, Orange, CT (Project Site) as requested and authorized. 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 November 5, 2020 with temperatures in the 50s 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 was determined to be present, its boundary was identified with plastic flagging hung from vegetation or flags on small wire stakes if in fields or grass communities. These flags are 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.



State & Local 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).

The Town of Orange's Inland Wetlands and Watercourses Regulations (IWWR) include the definition of a "Regulated Area" in Article 2 of those regulations as "*Any operation or use of a wetland or water course involving removal or deposition of material or any obstruction, construction, alteration or pollution of such wetlands or water courses, and any construction of a residential building, residential institution, commercial and industrial building, site establishment of a new lawn, nonresidential building, deck, pools, parking area or subsurface sewage disposal system with 100 feet of wetlands or water courses, as set forth in Section 22a-42a of the General Statutes, as amended, and 50 feet from wetlands and water courses for any subsurface sewage disposal system up-gradient from wetlands and water courses or in an area of special concern as defined by the Public Health Code, but shall not include the activities specified in Article IV (uses permitted as of right and nonregulated uses) of these regulations.*"

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 and eight (8) potential vernal pools were delineated during the November 5, 2020 site visit. All of the potential vernal pools identified are within Wetland 1.

Wetland 1

Wetland 1 consists of a freshwater palustrine forested (USFWS Classification: PFO1E) wetland system and was delineated using sequentially numbered flags W1-100 to 1-126, W1-200 to 1-296, and W1-300 to 1-322. Wetland 1 consists primarily of a red maple swamp across much of the western portion of the property. The interior of the wetland is largely undisturbed with the exception of a large constructed open field located in the center of the wetland and an associated path leading to the field from the open farmed areas. The wetland drains to the south and under Treat Lane via a culvert; a shallow drainage channel has been constructed from south of the open field to the culvert at Treat Lane. Topography throughout the wetland is relatively flat with a slight grade change to the adjacent uplands. Dominant



vegetation in the wetland community includes red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), American hornbeam (*Carpinus caroliniana*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), American elm (*Ulmus americana*), sweet pepperbush (*Clethra alnifolia*), bristly dewberry (*Rubus hispida*), highbush blueberry (*Vaccinium corymbosum*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), rough stemmed goldenrod (*Solidago rugosa*), smooth arrowwood (*Viburnum dentatum*), and roundleaf greenbrier (*Smilax rotundifolia*).

Potential Vernal Pools

Wetland 1 contains several potential vernal pools (PVPs). PVP-1 is a single isolated depression in an open area within the wetland south of the field. The remaining PVPs comprise a complex of depressions within the northern portion of the wetland (PVP-2, PVP-3, PVP-4, PVP-5, PVP-6, PVP-7 and PVP-8). PVP-1 held approximately one to two inches of water at the time of the investigation; the remaining areas were completely dry. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize these pools.

Wetland 2

Wetland 2 is a large palustrine forested wetland system and was delineated using sequentially numbered flags W2-100 to 144. The composition of Wetland 2 is similar to Wetland 1 and consists mainly of a red maple swamp in the eastern portion of the property. A stream channel is contained within the wetland at the northeast corner of the property and flows southerly, eventually exiting the site through a culvert under Old Tavern Road. The stream is partially dammed and forms a farm pond just north of Old Tavern Road. Portions of the wetland west of the farm pond have been subjected to recent mowing and are currently maintained as lawn. Dominant vegetation within the wetland community includes red maple, spicebush (*Lindera benzoin*), sweet pepperbush, sensitive fern, reed canary grass (*Phalaris arundinacea*), rough-stemmed goldenrod (*Solidago rugosa*), and roundleaf greenbrier.

Wetland 3

Wetland 3 is a small isolated palustrine emergent wetland located along the northern edge of the cornfield. The wetland was delineated with a closed loop of flags numbered 3-100 to 110. The majority of the wetland is within a maintained lawn area, however, along the southern portion of the wetland it is within an active farm field. The vegetation during the investigation was mowed and included soft rush (*Juncus effusus*) and reed canary grass.



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>Betula alleghaniensis</i>	Yellow birch	FAC		X
<i>Carpinus caroliniana</i>	American hornbeam	FAC		X
<i>Eurybia divaricata</i>	White-wood aster	NI	X	
<i>Fagus grandifolia</i>	American beech	FACU	X	X
<i>Hamamelis virginiana</i>	American witch-hazel	FACU	X	
<i>Prunus serotina</i>	Black cherry	FACU	X	
<i>Sassafras albidum</i>	Sassafras	FACU	X	
<i>Quercus rubra</i>	Northern red oak	FACU	X	X
<i>Ulmus americana</i>	American elm	FACW		X

SHRUBS				
Scientific	Common	Indicator	Upland	Wetland
<i>Berberis thunbergii</i> *	Japanese barberry*	FACU	X	
<i>Clethra alnifolia</i>	Sweet-pepperbush	FAC	X	X
<i>Lindera benzoin</i>	Spicebush	FACW		X
<i>Rubus hispidus</i>	Bristly dewberry	FACW		X
<i>Vaccinium corymbosum</i>	Highbush blueberry	FACW		X
<i>Viburnum dentatum</i>	Smooth arrowwood	FAC		X

HERBS & VINES				
Scientific	Common	Indicator	Upland	Wetland
<i>Celastrus orbiculatus</i> *	Oriental bittersweet	UPL	X	
<i>Dendrolycopodium</i> sp.	Ground pine	NI	X	
<i>Juncus effusus</i>	Soft rush	OBL		X
<i>Onoclea sensibilis</i>	Sensitive fern	FACW		X
<i>Osmunda cinnamomea</i>	Cinnamon fern	FACW		X
<i>Phalaris arundinacea</i> *	Reed canary grass*	FACW		X
<i>Smilax rotundifolia</i>	Roundleaf greenbrier	FAC	X	X
<i>Solidago rugosa</i>	Rough-stemmed goldenrod	FAC		X
<i>Viburnum acerifolium</i>	Maple-leaved viburnum	UPL	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

Agawam fine sandy loam (29B)

The Agawam series consists of very deep, well drained soils formed in sandy, water deposited materials. They are level to steep soils on outwash plains and high stream terraces. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is moderately high or high in the upper solum and high or very high in the lower solum and substratum. Diagnostic horizons and features recognized in this pedon include an ochric epipedon (Ap horizons) and cambic horizon (Bw horizons).

Canton and Charlton fine sandy (60B)

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).

Ninigret fine sandy loam (701A & 701B)

The Ninigret series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to strongly sloping soils on glaciofluvial landforms, typically in slight depressions and broad drainage ways. Slope ranges from 0 through 15 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 this pedon include an ochric epipedon (Ap horizon), cambic horizon (Bw horizon), and aquic feature (Bw2 horizon).



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. They 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. 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. 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).

Raypol silt loam (12)

The Raypol series consists of very deep, poorly drained soils formed in loamy over sandy and gravelly outwash. They are nearly level to gently sloping soils in shallow drainageways and low-lying positions on terraces and plains. Slope ranges from 0 to 5 percent. The soils have a water table at or near the surface much of the year. Permeability of the Raypol soils is moderate in the surface layer and subsoil and rapid or very rapid in the substratum. Horizons and diagnostic features typical for the pedon include an ochric epipedon (Ap horizon), cambic horizon (Bg and Bw horizons), and aquic moisture regime (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.

Mr. Christopher Ross
Ref: 42707.00
December 9, 2020
Page 7



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/>.

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



Photographic Log

PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 1 **Date:** 11/5/2020

Description: Overview of Wetland 1 near flag WF1-253.



PHOTOGRAPHIC LOG

Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 2 **Date:** 11/5/2020

Description: Overview of the excavated channel within the interior of Wetland 1.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 3 Date: 11/5/2020

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



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 4 Date: 11/5/2020

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.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 5

Date: 11/5/2020

Description: Overview of PVP 3. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 6

Date: 11/5/2020

Description: Overview of PVP 4. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 7 Date: 11/5/2020

Description: Overview of PVP 5. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 8 Date: 11/5/2020

Description: Overview of PVP 7. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

Photo No. 9 Date: 11/5/2020

Description: Overview of PVP 8. A vernal pool investigation during the breeding season will be necessary to determine if vernal pool breeding species utilize the pool.



Client Name: Greenskies Clean Energy



Site Location: Orange, CT



Project No: 42707.00



Photo No. 10 Date: 11/5/2020



Description: Westerly view of the upland field within Wetland 1.



 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Orange, CT	
Project No: 42707.00			
Photo No. 11	Date: 11/5/2020		
Description: Northerly view of Wetland 2 near flag WF2-217.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Orange, CT	
Project No: 42707.00			
Photo No. 12	Date: 11/5/2020		
Description: Overview of the stream within Wetland 42.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Orange, CT	
Project No: 42707.00			
Photo No. 13	Date: 11/5/2020		
Description: Poned area due to impoundment within Wetland 42. Portions of this wetland to the west are mowed.			

 vhb Engineers Scientists Planners Designers		PHOTOGRAPHIC LOG	
Client Name: Greenskies Clean Energy		Site Location: Orange, CT	
Project No: 42707.00			
Photo No. 14	Date: 11/5/2020		
Description: Overview of Wetland 3. This wetland is regularly maintained and mowed.			

Client Name: Greenskies Clean Energy

Site Location: Orange, CT

Project No: 42707.00

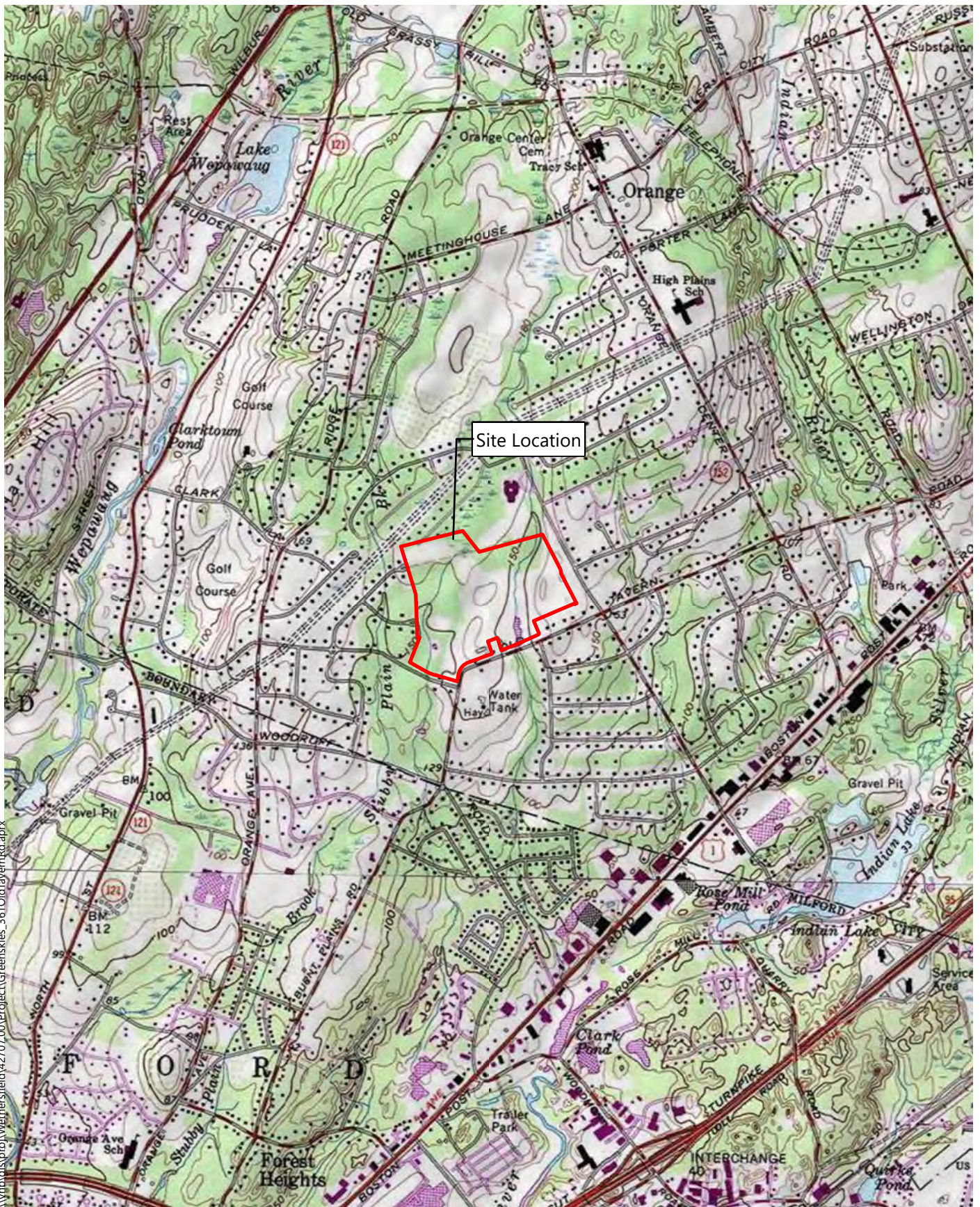
Photo No. 15 Date: 11/5/2020

Description: View of the active farm field, currently planted with corn, within Wetland 3.





USGS Site Location & Wetland Resource Figures



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Site Location

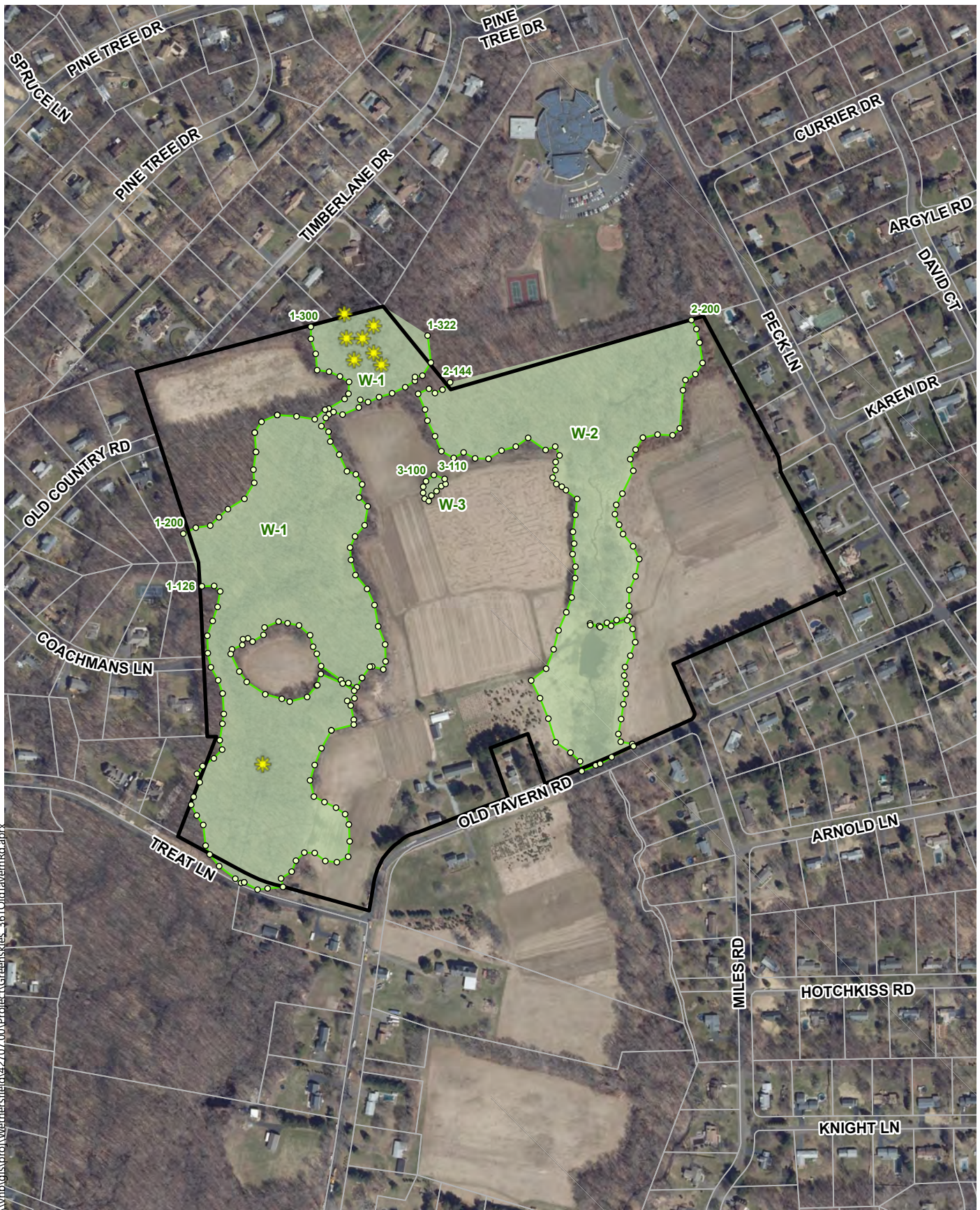
USA Topo Maps

Greensies Solar

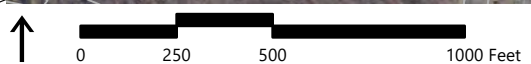
Orange, Connecticut

USGS Site Location Map

Source: VHB, CTDEEP, ArcGIS Online



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Greenskies Solar

Orange, Connecticut

- Project Site
- Delineated Wetland Edge
- Wetland Delineation Flags
- Wetland Resource Area
- Potential Vernal Pool
- Parcel Boundary

Wetland Delineation Map

Source: VHB, CTDEEP, ArcGIS Online



NRCS Soil Survey Report

Soil Map—State of Connecticut
(Greenskies - Orange)



Map Scale: 1:5,810 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 250 500 1000 1500 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut

Survey Area Data: Version 20, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 27, 2014—Jul 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	22.5	26.5%
12	Raypol silt loam	6.3	7.4%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	11.9	14.0%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	33.1	38.9%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	9.2	10.9%
701B	Ninigret fine sandy loam, 3 to 8 percent slopes	2.0	2.4%
Totals for Area of Interest		85.0	100.0%



To: Ms. Bonnie Potocki
Project Developer
Greenskies Clean Energy

Date: June 11, 2021

Project #: 42707.00

Memorandum

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

Re: Vernal Pool Survey, 361 Old Tavern Road
Orange, Connecticut

Greenskies Clean Energy is proposing to construct an approximately 5 MW solar photovoltaic (PV) development (the Project) on an approximately 86.7-acre parcel of land located at 361 Old Tavern Road in Orange, 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 the fall of 2020. During the delineation, several 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 four 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 is located on the north side of Old Tavern Road and Treat Lane (Figure 1). The majority of the Site is currently occupied by an active farm operation, which includes an existing house, barn, and other associated buildings as well as agricultural fields. Forested areas consisting mainly of wooded wetlands are present along the western and northern boundaries of the Site, and a perennial stream flowing from north to south is present east of the house and farm buildings. In addition to the farm buildings and agricultural fields, the Site contains other altered areas including maintained open field areas that have been constructed within the forested wetlands on the west side of the Site and in the northwest corner of the Site. The Site is surrounded on all sides mainly by residential areas, with a school to the north and additional farm fields to the south.

The forested areas on the Site consist primarily of a red maple swamp with other areas of mixed deciduous palustrine forested wetlands, with a fringe of wooded deciduous upland between the wetlands and the managed areas of the farm (Photos 1-4). The interior of the forested area on the west side of the Site (Wetland 1) is a swath of wooded wetlands ranging from approximately 300 to 600 feet wide. Large portions of this area are undisturbed, but prior site activity is evident including a constructed open field approximately 300 feet in diameter and a path leading to the field from the farm buildings (Photos 5-6) as well as remnants of previous farm roads. The wetlands in this area gradually drain from north to south around the constructed field along a low gradient change in topography, with a slight and gradual grade change up to the adjacent uplands in many places. A depression south of the constructed field collects much of the drainage from this side of the Site; an intermittent, shallow, and at times indistinct manmade drainage channel subsequently drains the area to the south and under Treat Lane via a culvert. Dominant wetland vegetation includes red maple (*Acer rubrum*), sweet pepperbush (*Clethra alnifolia*), northern spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), green brier (*Smilax rotundifolia*), cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), musclewood (*Carpinus caroliniana*), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), yellow birch (*Betula alleghaniensis*), bristly dewberry (*Rubus hispidus*), arrowwood (*Viburnum dentatum*), and rough-stemmed goldenrod (*Solidago rugosa*). Dominant upland vegetation includes northern red oak, red maple, black cherry (*Prunus serotina*), American beech, Oriental bittersweet (*Celastrus orbiculatus*), green brier, witch hazel (*Hamamelis virginiana*), sweet pepperbush, maple-leaved viburnum (*Viburnum acerifolium*), Japanese barberry (*Berberis thunbergii*), sassafras (*Sassafras albidum*), white wood aster (*Eurybia divaricata*), and ground pine (*Lycopodium obscurum*).

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

The forested wetlands on the north side of the Site (Wetland 2) have a similar composition to those on the west side (Photo 15) and drain south into a perennial stream (Photos 16-17) which eventually flows under Old Tavern Road. From the forested wetlands, the stream flows south within a floodplain corridor approximately 175 feet wide in between actively farmed areas of the Site (Photo 18). The corridor consists of a mix of forested deciduous and scrub-shrub wetlands. A pronounced two- to three-foot break in slope between wetlands and uplands is present along most of this corridor, but some areas have a more gradual transition. A beaver impoundment was observed within the wooded northern section of the stream and the stream has also been partially dammed via human action to form a farm pond and flooded shrub swamp north of Old Tavern Road (Photos 19-20).

Wetland resource areas were delineated in the fall of 2020. During the delineation, several areas were noted as having the potential to support vernal pool habitat. These areas were largely vegetation-free depressions that were dry or mostly dry at the time of the delineation but 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.

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 19, 2021 via walking/wading transects throughout the Site. 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. In addition to the standard walking transects throughout the property, VHB specifically investigated the depressions identified during the 2020 wetland delineation of the Site and any other areas that appeared inundated in a review of aerial imagery. 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

Four areas on the Site were confirmed to have vernal pool activity (Figure 2). All four 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 four 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 1, in the depression south of the constructed field on the west side of the Site. The pool is approximately 175 feet south of the constructed field at its closest point, and is surrounded by red maple swamp wetlands on all sides. VP-1 has an open water center visible on aerial imagery, with a broad and indistinct boundary of herbaceous vegetation and a sparse shrub understory at the edges of the pool as the vegetation transitions to the red maple swamp (Photos 7-8 and see Attachment 2 for additional photos). A mat of sedges (*Carex* sp.) occupies approximately 30 percent of the eastern side of the pool. The pool is fed by groundwater flow from the surrounding wetlands, and drains out the nearly level manmade drainage channel to the south. VP-1 measures approximately 90 feet by 140 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-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 35 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 scattered throughout the pool. There are relatively few fallen branches or other attachment points within the pool; many egg masses were observed resting unattached on the bottom of the pool in shallower areas. The boundary of VP-1 was delineated with blue flags labeled VP1-1 through VP1-11.

Based on GIS measurements, the breeding area of VP-1 is approximately 9,443 square feet (0.22 ac). GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 70% of the 750-foot critical terrestrial habitat envelope around VP-1 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 complex in the northernmost corner of the Site. VP-2 consists of multiple interconnected depressions within a much broader contiguous flooded area of the larger surrounding forested wetlands of Wetland 1. Portions of the pool contain dense shrub thickets interspersed with hummocks containing mainly live trees and little herbaceous ground cover, with some standing dead snags and a mostly closed overstory (Photos 9-10 and see Attachment 2 for additional photos). Areas of open water are present in the largest depressions within the pool and multiple treefalls are present throughout the pool. VP-2 is fed by groundwater flow from the surrounding wetlands and drains southwest into the large wetland complex of Wetland 1 that makes up most of the western side of the Site. The onsite flooded area encompassed by the interconnected depressions of VP-2 measures approximately 220 feet by 340 feet and the pool extends further offsite to the northeast for at least another 100 feet. A portion of the southern boundary of VP-2 is coincident with the delineated boundary of Wetland 1 and directly abuts one of the managed farm fields. Depth throughout the pool is variable, ranging from a few inches in the shallowest flooded areas to a maximum depth of approximately 18 to 24 inches in the deepest depressions. Most areas of the pool range from approximately 6 to 12 inches deep. The water in VP-2 is moderately tannic but the generally shallow depth gives good visibility throughout the pool. The pool generally has a firm bottom consisting mainly of leaf litter from the surrounding woods. Approximately 50 spotted salamander egg masses were observed in various deeper depressions throughout the pool on the day of the survey. Most egg masses were observed singly or in small clusters of a few egg masses scattered throughout the pool, with one large cluster of approximately 20 egg masses just offsite to the north. 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. The extent of the onsite portion of VP-2 was delineated with blue flags labeled VP2-1 through VP2-26. The extent of the offsite portion of VP-2 has been estimated via aerial photography.

Based on GIS measurements, the breeding area of VP-2 is approximately 79,388 square feet (1.82 ac). GIS analyses of the surrounding upland areas indicate that approximately 95% of the 100-foot vernal pool envelope and approximately 63% of the 750-foot critical terrestrial habitat envelope around VP-2 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 and VP-4

VP-3 and VP-4 are adjacent cryptic vernal pools located within Wetland 1, north of the constructed field on the west side of the Site. VP-4 is approximately 85 feet from the constructed field at its closest point; both pools are surrounded by red maple swamp wetlands on all sides. The pools are similar in composition, consisting of shallow broad open water areas interspersed with shrub and tree hummocks with little herbaceous ground cover and a mostly closed overstory (Photos 11-14 and see Attachment 2 for additional photos). The pools are fed by groundwater flow from the surrounding wetlands and drain to the southwest, eventually draining around the constructed field and into VP-1 and the surrounding wetlands. VP-3 measures approximately 70 feet by 85 feet and VP-4 measures approximately 130 feet by 150 feet. Remnants of a farm road (tire ruts) are present in the westernmost portion of VP-4. The two pools are separated by a strip of land approximately 25 feet wide. Average depth throughout both pools ranges from approximately 6 to 12 inches, with a maximum depth of approximately 12 inches in VP-3 and 12 to 15 inches in VP-4 and gradual margins in both pools. The water in VP-3 is clear to lightly tannic; the water in VP-4 is moderately tannic but the shallow depth gives good visibility throughout the pool. Both pools generally have a firm bottom consisting mainly of leaf litter from the surrounding woods. Six spotted salamander egg masses were observed in VP-3 and approximately 15 spotted salamander egg masses were observed in VP-4 on the day of the survey, singly or in small clusters of a few egg masses scattered throughout the pool. Ample attachment points are present throughout both pools; some egg masses were also observed resting unattached on the bottom of the pools in shallower areas. VP-4 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-3 was delineated with blue flags labeled VP3-1 through VP3-7. The boundary of VP-4 was delineated with blue flags labeled VP4-1 through VP4-15.

Based on GIS measurements, the breeding area of VP-3 is approximately 5,317 square feet (0.12 ac) and the breeding area of VP-4 is approximately 16,496 square feet (0.38 ac). GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 92% of the 750-foot critical terrestrial habitat envelope around VP-3 is undeveloped, while approximately 100% of the 100-foot vernal pool envelope and approximately 86% of the 750-foot critical terrestrial habitat envelope around VP-4 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 III and VP-4 has a rating of Tier I according to Calhoun and Klemens' Vernal Pool Assessment Sheet. See the attached VP-3 and VP-4 CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets for additional details and photographs of VP-3 and VP-4.

Table 2 Land Use Calculations for Upland Vernal Pool Habitats

Habitat Zone	Category	VP-1	VP-2	VP-3	VP-4
Vernal Pool Envelope (0-100 ft)	Undeveloped ¹	100%	95%	100%	100%
	Developed	0%	5%	0%	0%
Critical Terrestrial Habitat (100-750 ft)	Undeveloped	70%	63%	92%	86%
	Developed	30%	37%	8%	14%

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."

Other Findings

An isolated wetland is present in a portion of one of the cornfields on the Site (Photos 21-22). The wetland has formed in a slight topographical depression in the northwest corner of the Site’s large central cornfield and part of the surrounding area, which is maintained as open agricultural land. The area was observed holding water on the day of the survey, with an average depth of approximately two to three inches and a maximum depth of approximately six inches. The area did not exhibit any vernal pool activity and does not provide any likely habitat due to its active management, short hydroperiod, and lack of suitable surrounding uplands. Other small shallow isolated depressions within the wooded wetlands on the Site do not appear to have a sufficiently long hydroperiod to support vernal pool activity. VHB also surveyed the farm pond and flooded shrub swamp area north of Old Tavern Road on the east side of the Site and did not observe any vernal pool activity in these areas, or in any pockets within the stream corridor.

Conclusions

In April 2021, VHB identified four 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 do not contain water throughout the year, as documented by visual observations in the fall of 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	9,443	No	Yes	~35 spotted salamander egg masses	No	Cryptic	Tier I
VP-2	79,388	No	Yes	~50 spotted salamander egg masses	No	Cryptic	Tier I
VP-3	5,317	No	Yes	6 spotted salamander egg masses	No	Cryptic	Tier III
VP-4	16,498	No	Yes	<ul style="list-style-type: none"> • ~15 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 remaining undeveloped upland areas surrounding the pools support significant populations of vernal pool species that have limited breeding habitat. The managed farm use of much of the upland area and limited suitable wooded upland habitat may result in 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 – Wetland and Vernal Pool Resource Areas

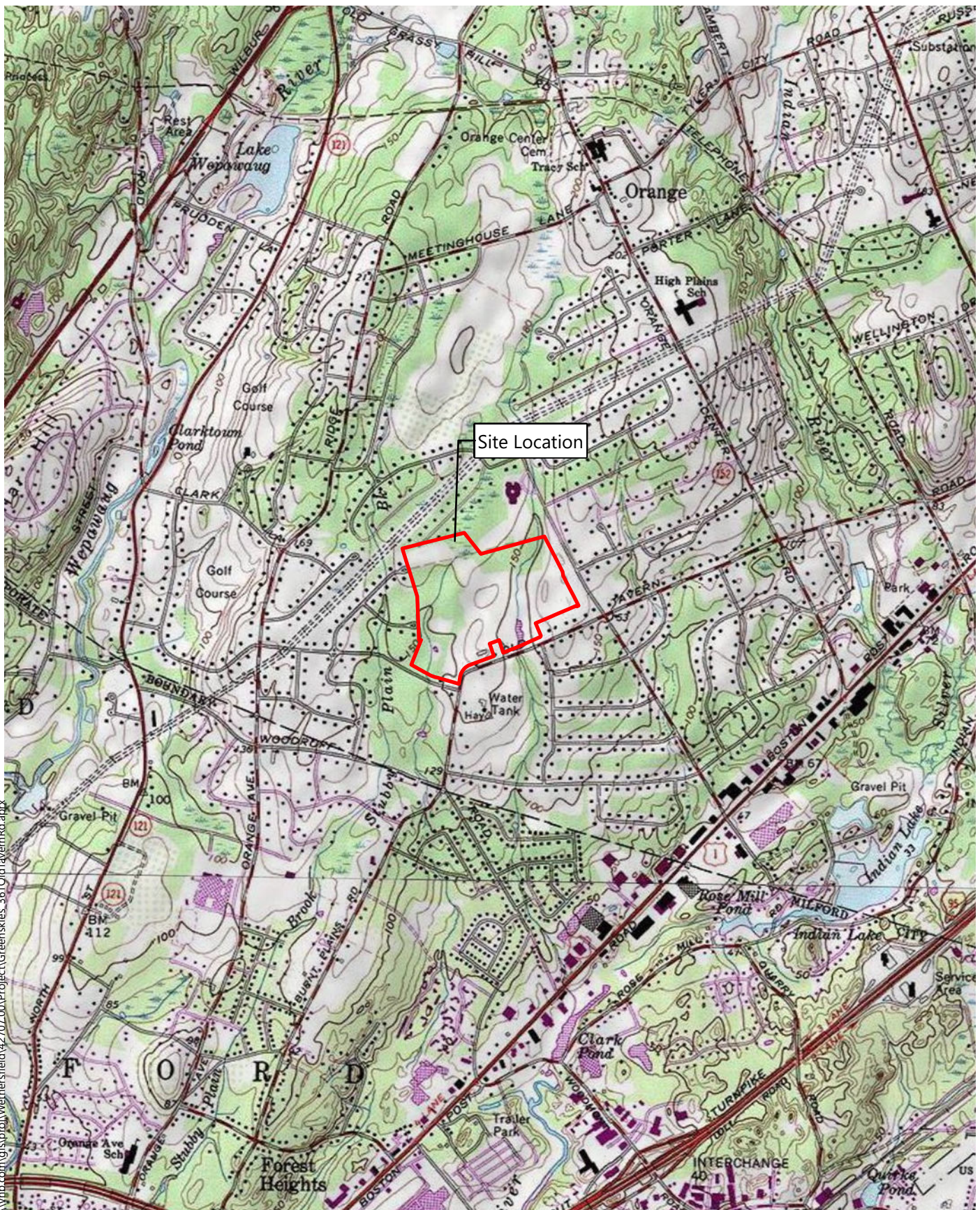
Attachments:

Site Photographs

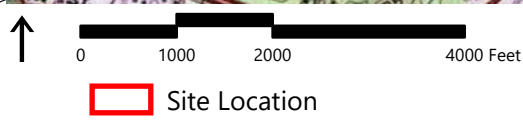
CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets

Figures

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



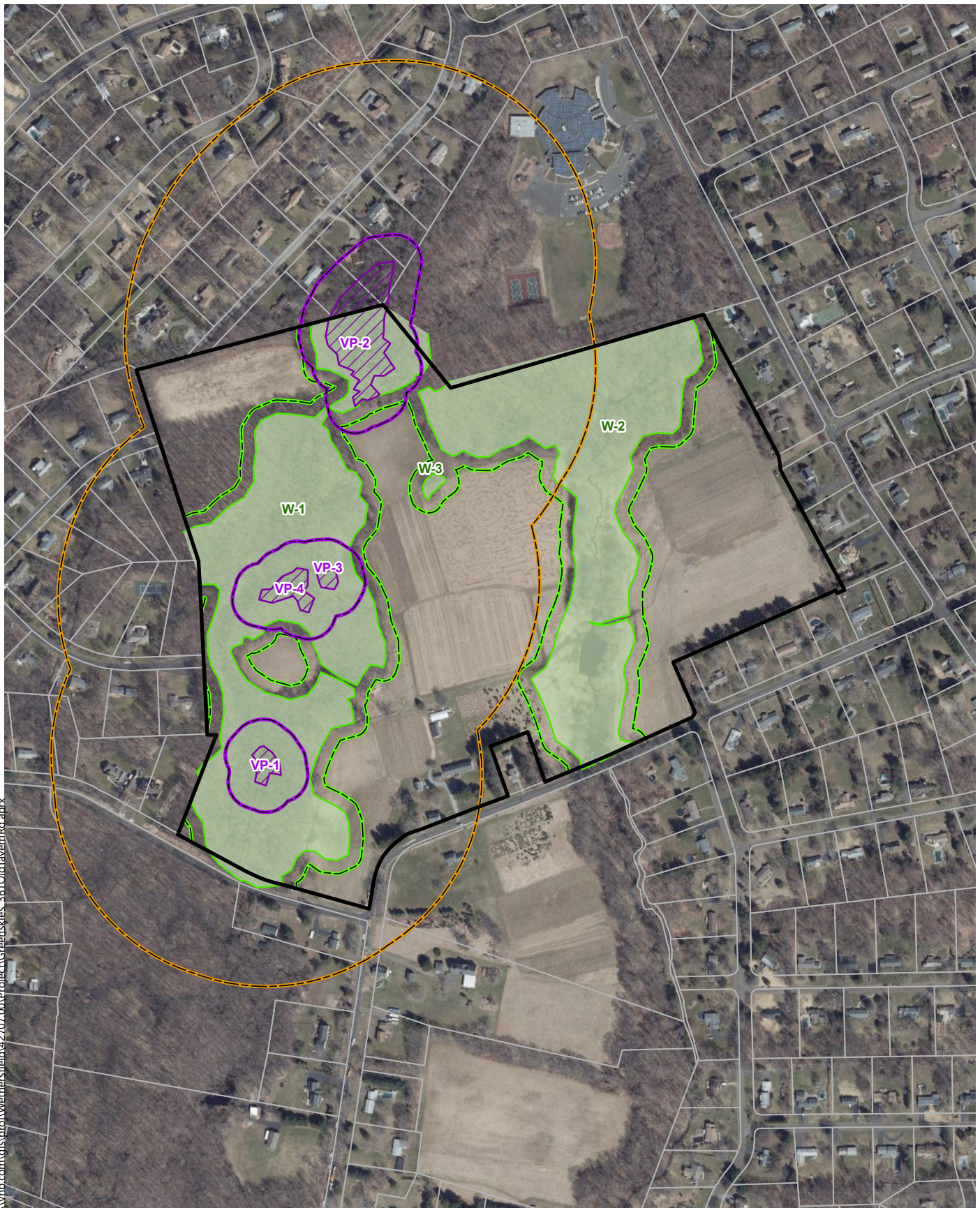
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Greensies Solar

Orange, Connecticut

USGS Site Location Map



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Greenskies Solar

Orange, Connecticut

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

Wetland and Vernal Pool Resource Areas

Source: VHB, CTDEEP, ArcGIS Online

Attachment 1

Site Photographs

Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 10/28/20

Location: E side of Wetland 1, E of constructed field

View: NW

Description:

Typical wooded deciduous upland fringe transitioning to Wetland 1.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 10/28/20

Location: E side of Wetland 1, E of constructed field

View: SE

Description:

Typical wooded deciduous upland area adjacent to Wetland 1, with farm fields visible in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 11/5/20

Location: E side of Wetland 1, E of VP-1

View: W

Description:

Red maple swamp interior of Wetland 1. Some areas of the wetland are characterized by a sparse understory and trees with slightly buttressed roots, indicating long-term hydrology in the area.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 10/28/20

Location: W side of Wetland 1, W of constructed field

View: E

Description:

Red maple swamp interior of Wetland 1. Other areas of Wetland 1 have a thicker shrub understory, with small isolated pockets of shallow inundation in the spring.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 11/9/20

Location: E side of constructed field

View: W

Description:

Maintained/mowed interior of constructed field within Wetland 1. Dirt path leading to the field from the farm in foreground.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 11/9/20

Location: E side of constructed field

View: E

Description:

Dirt path leading to the field from the farm, with Wetland 1 on either side (pink flags denote wetland boundary). Farm fields and buildings in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 11/9/20

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom with small area of holding 1-2" of water indicates long-term hydrology. Constructed intermittent drainage channel draining S to Treat Lane in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in spring 2021. Center of pool is approximately 15-18" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 9

Date: 11/9/20

Location: Interior of VP-2

View: N

Description:

Interior of VP-2 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 10

Date: 4/19/21

Location: Interior of VP-2

View: W

Description:

Interior of VP-2 in spring 2021. VP-2 is an interconnected complex of flooded depressions with a maximum depth ranging from 18-24" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 11 **Date:** 11/9/20

Location: Center of VP-3

View: W

Description:

Interior of VP-3 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 12 **Date:** 4/19/21

Location: E side of VP-3

View: W

Description:

Interior of VP-3 in spring 2021. Center of pool is approximately 12" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 13 **Date:** 11/9/20

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom and vegetated hummocks indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 14 **Date:** 4/19/21

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in spring 2021. Center of pool is approximately 12-15" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 15 **Date:** 11/5/20

Location: W side of Wetland 2, N of corn field

View: N

Description:

Typical wooded interior of Wetland 2.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 16 **Date:** 11/5/20

Location: Interior of Wetland 2, E side of stream channel

View: N

Description:

Stream channel and associated forested wetlands of Wetland 2. Beaver impoundment in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 17 **Date:** 11/5/20

Location: Interior of Wetland 2, E side of stream channel

View: SW

Description:

Stream channel and associated forested wetlands of Wetland 2. Central cornfield in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 18 **Date:** 11/5/20

Location: E side of Wetland 2, along stream corridor

View: N

Description:

Managed farm fields sloping down toward wooded and scrub-shrub stream corridor.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 19 **Date:** 11/5/20

Location: Wetland 2, N of farm pond

View: S

Description:

Manmade farm pond within stream corridor of Wetland 2. The area did not exhibit any vernal pool activity on the day of the survey.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 20 **Date:** 11/5/20

Location: SE corner of Wetland 2, along Old Tavern Road

View: NW

Description:

Flooded portion of stream corridor within Wetland 2. Manmade dam with sluiceway in foreground, farm fields and house in background. The area did not exhibit any vernal pool activity on the day of the survey.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 21 **Date:** 11/5/20

Location: W side of Wetland 3

View: E

Description:

Small depression in NW corner of central cornfield and adjacent lawn area that comprises Wetland 3 in fall 2020.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 22 **Date:** 4/19/21

Location: W of Wetland 3

View: E

Description:

Wetland 3 in spring 2021. The depression holds approximately 3-6" of water on average. The area did not exhibit any vernal pool activity on the day of the survey.



Attachment 2

CAWS Vernal Pool Data Sheets and Vernal Pool Assessment Sheets

- > VP-1
- > VP-2
- > VP-3
- > VP-4

VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-1	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 8:30 AM
 End time: 10:00 AM

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

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~35 Total Number: ~35
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-1 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 1. Breeding area measures approximately 90' by 140' 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. VP-1 drains south via a manmade drainage channel.

~35 spotted salamander egg masses were observed in VP-1 singly or in small clusters of egg masses scattered throughout the pool. The boundary of VP-1 was delineated with blue flags labeled VP1-1 through VP1-11.

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: Carex spp.
 Percent tree canopy closure? 25%
 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: 41.25955° N, 73.03467° W

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

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 100% shrubland _____ meadow _____
 pasture _____ lawn _____ building _____
 exposed soil _____ 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 1.

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: Carex spp.

ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-1	CAWS Project #:
Project/property name: 361 Old Tavern 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)

Small clusters of egg masses observed scattered throughout pool; no central cluster

Drainage channel

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 almost entirely of wooded wetlands with a wooded upland fringe and portions of managed farm fields

Drainage channel

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	
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: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 11/9/20

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom with small area of holding 1-2" of water indicates long-term hydrology. Constructed drainage channel draining S to Treat Lane in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in spring 2021. Center of pool is approximately 15-18" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 11/9/20

Location: Center of VP-1

View: E

Description:

Eastern side of pool in fall 2020. The area is dominated by sedges (*Carex* sp.) interspersed with open unvegetated areas. Farm fields and buildings in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: Center of VP-1

View: SE

Description:

Eastern side of pool in spring 2021. Sedge mat covers eastern side of pool.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: NW side of VP-1

View: N

Description:

Red maple swamp wetlands surrounding VP-1. Constructed field in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 4/19/21

Location: NW side of VP-1

View: SW

Description:

Red maple swamp wetlands along western edge of VP-1. Much of the pool has an average depth of 6-12". Fallen branches provide attachment points for egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 4/19/21

Location: VP-1

Description:

Single spotted salamander egg masses were observed scattered throughout the pool, often resting unattached on the leaf litter bottom in shallower areas.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: VP-1

Description:

Small cluster of spotted salamander egg masses attached to a twig.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-2	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/>	Reference: <input type="checkbox"/>
Address/location (or include annotated map): 361 Old Tavern 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: 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:

Abundance categories	Count
1-25	<input checked="" type="checkbox"/>
26-49	<input checked="" type="checkbox"/>
50-75	<input type="checkbox"/>
75-100	<input type="checkbox"/>
100-150	<input type="checkbox"/>
150-200	<input type="checkbox"/>
200-250	<input type="checkbox"/>
250-300	<input type="checkbox"/>
300-400	<input type="checkbox"/>
400-500	<input type="checkbox"/>
500-750	<input type="checkbox"/>
750-1000	<input type="checkbox"/>
1000-1250	<input type="checkbox"/>
>1250	<input type="checkbox"/>

condition: 50-75
 If condition mixed, note "some", "many" or "most"
 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~50 Total Number: ~50
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-2 is a cryptic pool complex of multiple inundated depressions connected by a broader flooded area within the larger palustrine forested area of Wetland 1. Breeding area onsite measures approximately 220' by 340' with additional area offsite. The pool has a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 18-24" and moderately tannic water.

~50 spotted salamander egg masses were observed in VP-2 singly or in small clusters of egg masses scattered throughout the pool, with one large cluster of ~20 egg masses just offsite to the north. The boundary of VP-2 was delineated with blue flags labeled VP2-1 through VP2-26.

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: 18-24"

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 (µS/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: 41.26391° N, 73.03334° 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 _____ grading _____ ag. field 25%
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-2 is surrounded by red maple swamp and wooded areas of Wetland 1 and to the south by one of the farm fields.

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

Cover Objects:

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

Dominant vegetation (optional)
 Trees/saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: None

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VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-2	CAWS Project #:
Project/property name: 361 Old Tavern 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: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 11/9/20

Location: Interior of VP-2

View: N

Description:

Interior of VP-2 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: Interior of VP-2

View: E

Description:

Interior of VP-2 in spring 2021. VP-2 is an interconnected complex of flooded depressions with a maximum depth ranging from approximately 18-24" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: Interior of VP-2

View: NW

Description:

View of deepest portion of pool. Broader areas of open water with fewer shrub thickets interspersed with hummocks. Residences on adjacent street in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: Interior of VP-2

View: SW

Description:

Large portions of the pool are flooded to an average depth of 6" or less. Multiple treefalls are present throughout the pool. Portions of the adjacent wetlands contain a dense shrub understory.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-2

Description:

Single spotted salamander egg masses (noted with arrows) were observed scattered throughout the pool, often resting unattached on the leaf litter bottom.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

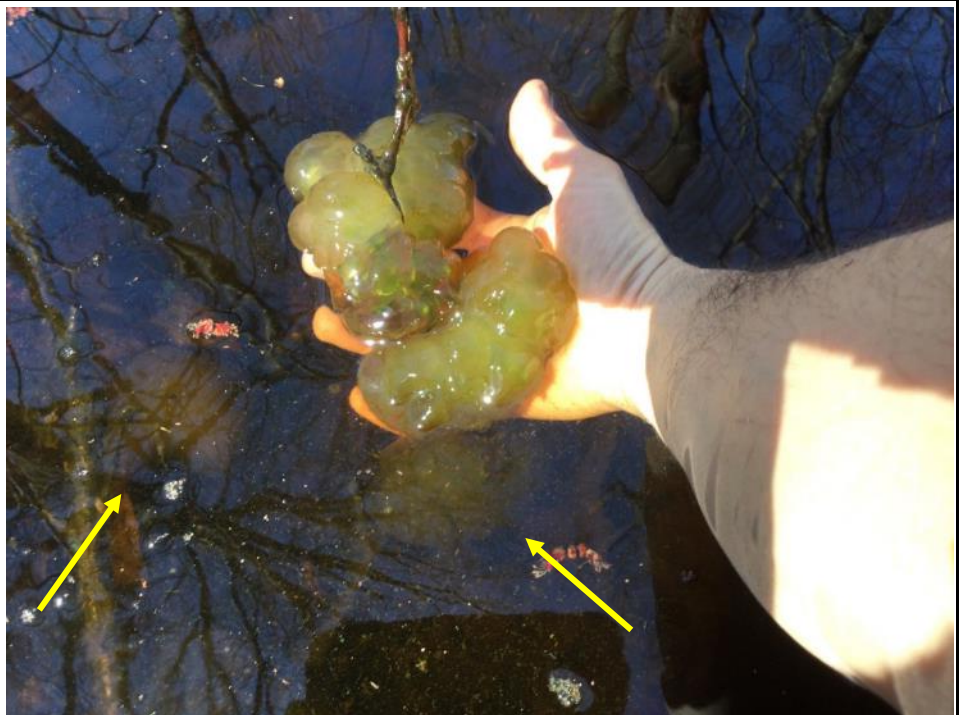
Photo No.: 6

Date: 4/19/21

Location: VP-2

Description:

A portion of the large cluster of ~20 egg masses just offsite to the north. Additional egg masses noted with arrows. Water is moderately tannic. Other egg masses were observed singly or in small clusters scattered throughout the pool.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-3	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 12:00 PM
 End time: 1:00 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 50-75 76-100 101-150 151-200 201-250 250-300 300-400 400-500 500-750 750-1000 1000-1250 >1250

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: 6 Total Number: 6
 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 70' by 85' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 12" and clear to lightly tannic water.

6 spotted salamander egg masses were observed in VP-3 singly or in small clusters of egg masses scattered throughout the pool. The boundary of VP-3 was delineated with blue flags labeled VP3-1 through VP3-7.

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? 85%
 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 (µS/cm) _____ temperature (°C) _____
 Nitrate-N (mg/l) _____ Total P (µg/l) _____ DO (mg/l) _____
 turbidity (NTU's) _____ Sulphidic odor? No Yes
 Approximate % cover by algal mat or duckweed? _____
 GPS coordinates: 41.26141° N, 73.03378° W

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

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 100% shrubland _____ meadow _____
 pasture _____ lawn _____ building _____
 exposed soil _____ grading _____ ag. field _____
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-3 is surrounded by red maple swamp and wooded areas of Wetland 1.

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: None

ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-3	CAWS Project #:
Project/property name: 361 Old Tavern 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)

Small clusters of egg masses observed scattered throughout pool; no central cluster

Approx. 100 feet

VP-4

VP-3

N

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 almost entirely of wooded wetlands with a wooded upland fringe and portions of managed farm fields

Approx. 200 feet

VP-4

VP-3

N

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: 361 Old Tavern Rd., Orange, CT

Project No.: 42707.00

Photo No.: 1 **Date:** 11/9/20

Location: Center of VP-3

View: W

Description:

Interior of VP-3 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No.: 42707.00

Photo No.: 2 **Date:** 4/19/21

Location: E side of VP-3

View: W

Description:

Interior of VP-3 in spring 2021. Center of pool is approximately 12" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: E side of VP-3

View: E

Description:

Margins of pool are 6" deep or less in places.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: E side of VP-3

View: N

Description:

Woody debris provides attachment points for egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-3

Description:

Spotted salamander egg masses were observed resting unattached on the leaf litter bottom.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-4	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 1:00 PM
 End time: 2:00 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 50-75 75-100 100-150 150-200 200-250

Abundance categories:
 250-300
 300-400
 400-500
 500-750
 750-1000
 1000-1250
 >1250

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: ~5

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: 15 Total Number: ~20
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-4 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 1. Breeding area measures approximately 130' by 150' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 12-15" and moderately tannic water.

~15 spotted salamander egg masses were observed in VP-4 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-4 was delineated with blue flags labeled VP4-1 through VP4-15.

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? 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: 41.26138° N, 73.03426° 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 _____ grading _____ ag. field 25%
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-4 is surrounded by red maple swamp and wooded areas of Wetland 1.

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: None

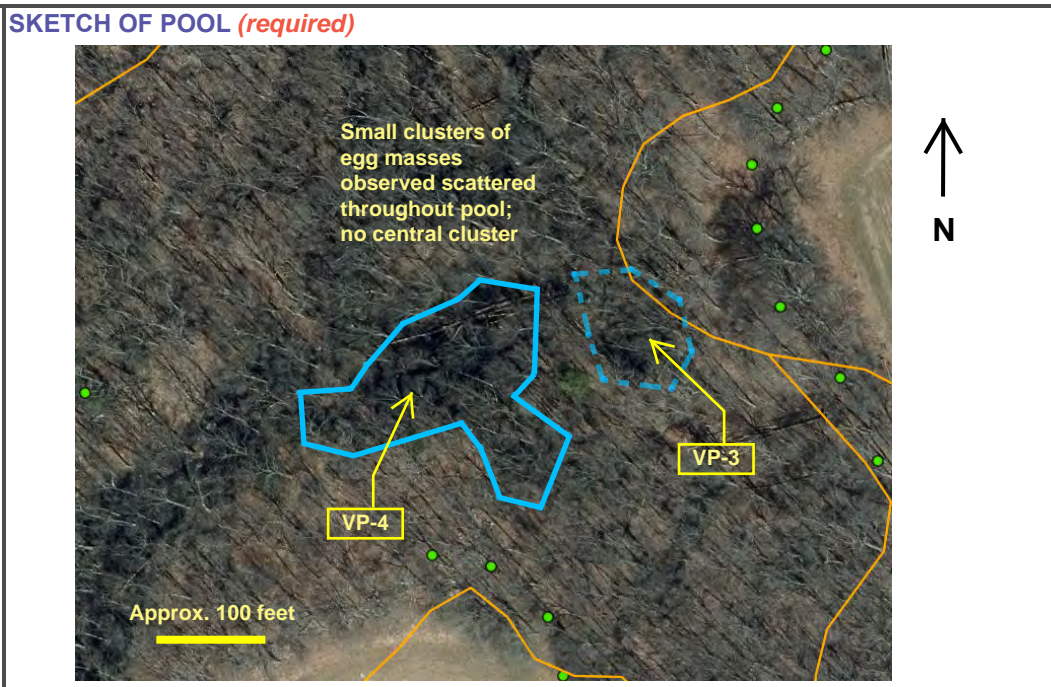
Blank area for additional notes or sketches.

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-4	CAWS Project #:
Project/property name: 361 Old Tavern Road			Pool Type:	Development: <input type="checkbox"/> Reference <input type="checkbox"/>

SKETCH OF POOL (required)

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.



WILDLIFE OBSERVATIONS: (optional)

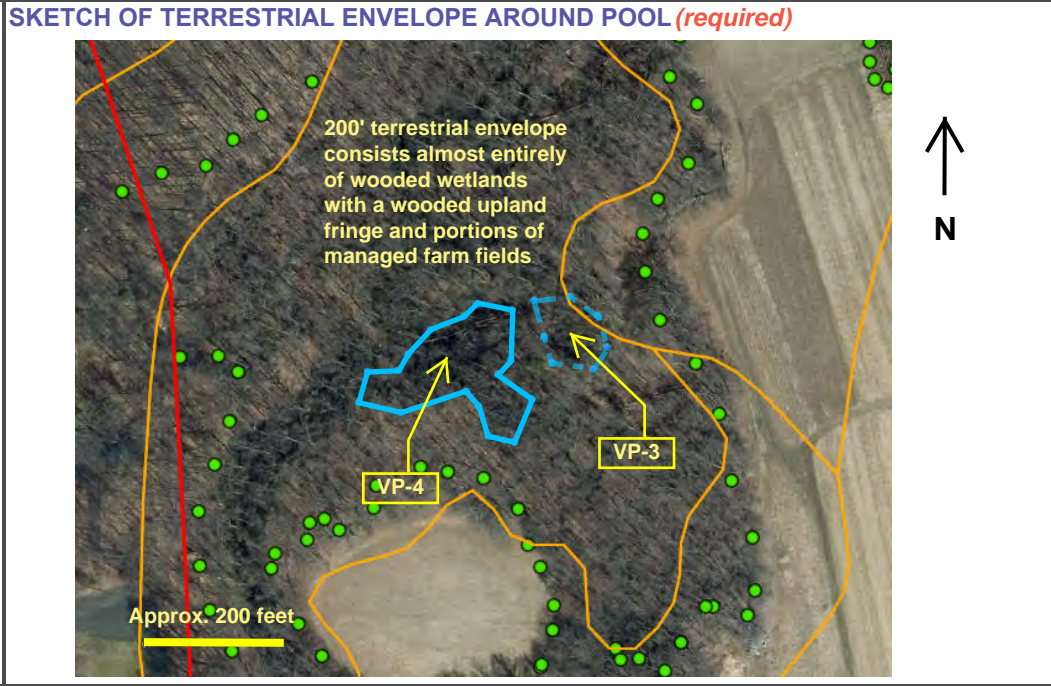
Checklist of Facultative Herptile Fauna (Pool & Fringe):

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):

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)

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.



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: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 11/9/20

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom and vegetated hummocks indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in spring 2021. Center of pool is approximately 12-15" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: E side of VP-4

View: N

Description:

Margins of pool are 6" deep or less in places.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: W side of VP-4

View: N

Description:

Evidence of prior site activity (tire ruts) within a portion of the pool.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-4

Description:

Spotted salamander egg masses (noted with arrows) were observed resting unattached on the leaf litter bottom.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 4/19/21

Location: VP-4

Description:

Spotted salamander egg masses in moderately tannic water.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 4/19/21

Location: VP-4

Description:

Remains of hatched wood frog egg masses (circled). Wood frog tadpoles (not visible) were observed swimming in and around the egg mass remains.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: VP-4

Description:

Remains of hatched wood frog egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 9

Date: 4/19/21

Location: VP-4

Description:

Wood frog tadpoles captured around the remains of the hatched egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 10

Date: 4/19/21

Location: VP-4

Description:

Wood frog tadpole with diagnostic gold flecking on underside.





To: Ms. Bonnie Potocki
Project Developer
Greenskies Clean Energy

Date: June 11, 2021
Revised September 27, 2021

Project #: 42707.00

Memorandum

From: Christopher Wagner, PWS, Senior
Environmental Scientist
Steve Kochis, PE, Senior Project
Engineer

Re: Vernal Pool Survey, 361 Old Tavern Road
Orange, Connecticut

Greenskies Clean Energy is proposing to construct an approximately 5 MW solar photovoltaic (PV) development (the Project) on an approximately 86.7-acre parcel of land located at 361 Old Tavern Road in Orange, 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 the fall of 2020. During the delineation, several 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 four 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 is located on the north side of Old Tavern Road and Treat Lane (Figure 1). The majority of the Site is currently occupied by an active farm operation, which includes an existing house, barn, and other associated buildings as well as agricultural fields. Forested areas consisting mainly of wooded wetlands are present along the western and northern boundaries of the Site, and a perennial stream flowing from north to south is present east of the house and farm buildings. In addition to the farm buildings and agricultural fields, the Site contains other altered areas including maintained open field areas that have been constructed within the forested wetlands on the west side of the Site and in the northwest corner of the Site. The Site is surrounded on all sides mainly by residential areas, with a school to the north and additional farm fields to the south.

The forested areas on the Site consist primarily of a red maple swamp with other areas of mixed deciduous palustrine forested wetlands, with a fringe of wooded deciduous upland between the wetlands and the managed areas of the farm (Photos 1-4). The interior of the forested area on the west side of the Site (Wetland 1) is a swath of wooded wetlands ranging from approximately 300 to 600 feet wide. Large portions of this area are undisturbed, but prior site activity is evident including a constructed open field approximately 300 feet in diameter and a path leading to the field from the farm buildings (Photos 5-6) as well as remnants of previous farm roads. The wetlands in this area gradually drain from north to south around the constructed field along a low gradient change in topography, with a slight and gradual grade change up to the adjacent uplands in many places. A depression south of the constructed field collects much of the drainage from this side of the Site; an intermittent, shallow, and at times indistinct manmade drainage channel subsequently drains the area to the south and under Treat Lane via a culvert. Dominant wetland vegetation includes red maple (*Acer rubrum*), sweet pepperbush (*Clethra alnifolia*), northern spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), green brier (*Smilax rotundifolia*), cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), musclewood (*Carpinus caroliniana*), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), yellow birch (*Betula alleghaniensis*), bristly dewberry (*Rubus hispida*), arrowwood (*Viburnum dentatum*), and rough-stemmed goldenrod (*Solidago rugosa*). Dominant upland vegetation includes northern red oak, red maple, black cherry (*Prunus serotina*), American beech, Oriental bittersweet (*Celastrus orbiculatus*), green brier, witch hazel (*Hamamelis virginiana*), sweet pepperbush, maple-leaved viburnum (*Viburnum acerifolium*), Japanese barberry (*Berberis thunbergii*), sassafras (*Sassafras albidum*), white wood aster (*Eurybia divaricata*), and ground pine (*Lycopodium obscurum*).

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

The forested wetlands on the north side of the Site (Wetland 2) have a similar composition to those on the west side (Photo 15) and drain south into a perennial stream (Photos 16-17) which eventually flows under Old Tavern Road. From the forested wetlands, the stream flows south within a floodplain corridor approximately 175 feet wide in between actively farmed areas of the Site (Photo 18). The corridor consists of a mix of forested deciduous and scrub-shrub wetlands. A pronounced two- to three-foot break in slope between wetlands and uplands is present along most of this corridor, but some areas have a more gradual transition. A beaver impoundment was observed within the wooded northern section of the stream and the stream has also been partially dammed via human action to form a farm pond and flooded shrub swamp north of Old Tavern Road (Photos 19-20).

Wetland resource areas were delineated in the fall of 2020. During the delineation, several areas were noted as having the potential to support vernal pool habitat. These areas were largely vegetation-free depressions that were dry or mostly dry at the time of the delineation but 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.

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>Eubbranchipus 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 19, 2021 via walking/wading transects throughout the Site. 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. In addition to the standard walking transects throughout the property, VHB specifically investigated the depressions identified during the 2020 wetland delineation of the Site and any other areas that appeared inundated in a review of aerial imagery. 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

Four areas on the Site were confirmed to have vernal pool activity (Figure 2). All four 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 four 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 1, in the depression south of the constructed field on the west side of the Site. The pool is approximately 175 feet south of the constructed field at its closest point, and is surrounded by red maple swamp wetlands on all sides. VP-1 has an open water center visible on aerial imagery, with a broad and indistinct boundary of herbaceous vegetation and a sparse shrub understory at the edges of the pool as the vegetation transitions to the red maple swamp (Photos 7-8 and see Attachment 2 for additional photos). A mat of sedges (*Carex* sp.) occupies approximately 30 percent of the eastern side of the pool. The pool is fed by groundwater flow from the surrounding wetlands, and drains out the nearly level manmade drainage channel to the south. VP-1 measures approximately 90 feet by 140 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-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 35 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 scattered throughout the pool. There are relatively few fallen branches or other attachment points within the pool; many egg masses were observed resting unattached on the bottom of the pool in shallower areas. The boundary of VP-1 was delineated with blue flags labeled VP1-1 through VP1-11.

Based on GIS measurements, the breeding area of VP-1 is approximately 9,443 square feet (0.22 ac). GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 70% of the 750-foot critical terrestrial habitat envelope around VP-1 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 complex in the northernmost corner of the Site. VP-2 consists of multiple interconnected depressions within a much broader contiguous flooded area of the larger surrounding forested wetlands of Wetland 1. Portions of the pool contain dense shrub thickets interspersed with hummocks containing mainly live trees and little herbaceous ground cover, with some standing dead snags and a mostly closed overstory (Photos 9-10 and see Attachment 2 for additional photos). Areas of open water are present in the largest depressions within the pool and multiple treefalls are present throughout the pool. VP-2 is fed by groundwater flow from the surrounding wetlands and drains southwest into the large wetland complex of Wetland 1 that makes up most of the western side of the Site. The onsite flooded area encompassed by the interconnected depressions of VP-2 measures approximately 220 feet by 340 feet and the pool extends further offsite to the northeast for at least another 100 feet. A portion of the southern boundary of VP-2 is coincident with the delineated boundary of Wetland 1 and directly abuts one of the managed farm fields. Depth throughout the pool is variable, ranging from a few inches in the shallowest flooded areas to a maximum depth of approximately 18 to 24 inches in the deepest depressions. Most areas of the pool range from approximately 6 to 12 inches deep. The water in VP-2 is moderately tannic but the generally shallow depth gives good visibility throughout the pool. The pool generally has a firm bottom consisting mainly of leaf litter from the surrounding woods. Approximately 50 spotted salamander egg masses were observed in various deeper depressions throughout the pool on the day of the survey. Most egg masses were observed singly or in small clusters of a few egg masses scattered throughout the pool, with one large cluster of approximately 20 egg masses just offsite to the north. 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. The extent of the onsite portion of VP-2 was delineated with blue flags labeled VP2-1 through VP2-26. The extent of the offsite portion of VP-2 has been estimated via aerial photography.

Based on GIS measurements, the breeding area of VP-2 is approximately 79,388 square feet (1.82 ac). GIS analyses of the surrounding upland areas indicate that approximately 95% of the 100-foot vernal pool envelope and approximately 63% of the 750-foot critical terrestrial habitat envelope around VP-2 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 and VP-4

VP-3 and VP-4 are adjacent cryptic vernal pools located within Wetland 1, north of the constructed field on the west side of the Site. VP-4 is approximately 85 feet from the constructed field at its closest point; both pools are surrounded by red maple swamp wetlands on all sides. The pools are similar in composition, consisting of shallow broad open water areas interspersed with shrub and tree hummocks with little herbaceous ground cover and a mostly closed overstory (Photos 11-14 and see Attachment 2 for additional photos). The pools are fed by groundwater flow from the surrounding wetlands and drain to the southwest, eventually draining around the constructed field and into VP-1 and the surrounding wetlands. VP-3 measures approximately 70 feet by 85 feet and VP-4 measures approximately 130 feet by 150 feet. Remnants of a farm road (tire ruts) are present in the westernmost portion of VP-4. The two pools are separated by a strip of land approximately 25 feet wide. Average depth throughout both pools ranges from approximately 6 to 12 inches, with a maximum depth of approximately 12 inches in VP-3 and 12 to 15 inches in VP-4 and gradual margins in both pools. The water in VP-3 is clear to lightly tannic; the water in VP-4 is moderately tannic but the shallow depth gives good visibility throughout the pool. Both pools generally have a firm bottom consisting mainly of leaf litter from the surrounding woods. Six spotted salamander egg masses were observed in VP-3 and approximately 15 spotted salamander egg masses were observed in VP-4 on the day of the survey, singly or in small clusters of a few egg masses scattered throughout the pool. Ample attachment points are present throughout both pools; some egg masses were also observed resting unattached on the bottom of the pools in shallower areas. VP-4 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-3 was delineated with blue flags labeled VP3-1 through VP3-7. The boundary of VP-4 was delineated with blue flags labeled VP4-1 through VP4-15.

Based on GIS measurements, the breeding area of VP-3 is approximately 5,317 square feet (0.12 ac) and the breeding area of VP-4 is approximately 16,496 square feet (0.38 ac). GIS analyses of the surrounding upland areas indicate that approximately 100% of the 100-foot vernal pool envelope and approximately 92% of the 750-foot critical terrestrial habitat envelope around VP-3 is undeveloped, while approximately 100% of the 100-foot vernal pool envelope and approximately 86% of the 750-foot critical terrestrial habitat envelope around VP-4 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 III and VP-4 has a rating of Tier I according to Calhoun and Klemens' Vernal Pool Assessment Sheet. See the attached VP-3 and VP-4 CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets for additional details and photographs of VP-3 and VP-4.

Table 2 Land Use Calculations for Upland Vernal Pool Habitats

Habitat Zone	Category	VP-1	VP-2	VP-3	VP-4
Vernal Pool Envelope (0-100 ft)	Undeveloped ¹	100%	95%	100%	100%
	Developed	0%	5%	0%	0%
Critical Terrestrial Habitat (100-750 ft)	Undeveloped	70%	63%	92%	86%
	Developed	30%	37%	8%	14%

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."

Other Findings

An isolated wetland is present in a portion of one of the cornfields on the Site (Photos 21-22). The wetland has formed in a slight topographical depression in the northwest corner of the Site's large central cornfield and part of the surrounding area, which is maintained as open agricultural land. The area was observed holding water on the day of the survey, with an average depth of approximately two to three inches and a maximum depth of approximately six inches. The area did not exhibit any vernal pool activity and does not provide any likely habitat due to its active management, short hydroperiod, and lack of suitable surrounding uplands. Other small shallow isolated depressions within the wooded wetlands on the Site do not appear to have a sufficiently long hydroperiod to support vernal pool activity. VHB also surveyed the farm pond and flooded shrub swamp area north of Old Tavern Road on the east side of the Site and did not observe any vernal pool activity in these areas, or in any pockets within the stream corridor.

Impact Assessment

The Project will construct an approximately 2.5 MW ground-mounted solar array within an area of existing agricultural fields and surrounding maintained lawn areas on the Site. The Project does not propose any direct impacts to any wetland resource areas on the Site, and therefore will not directly impact any vernal pools on the Site.

Generally speaking, indirect impacts to vernal pools can occur when a project impacts wooded upland habitat surrounding a vernal pool or creates an impediment or physical barrier to animals migrating from upland habitat to a vernal pool or from pool to pool. As proposed, the Project will have minimal indirect impacts to the existing vernal pools on the Site. The majority of the Project area is located within areas of the Site that are heavily managed with agricultural activities. This use is typically not conducive to supporting obligate vernal pool species. Additionally, the Project is unlikely to alter any migration across the fields because the proposed fencing around the array will have a gap of approximately 4-6 inches at the bottom to allow for animal passage. Again, due to the nature of the existing land use, migration by vernal pool species through the area of the proposed Project is not likely. The existing wooded corridor on the west side of the Site contains all the vernal pools observed on the Site as well as areas of wooded upland that these species utilize for the remainder of the year. Aside from a dirt farm road that connects to the managed pasture in the northwest corner of the Site, there is a contiguous connection between the northernmost pool (VP-2) and the southernmost pool (VP-1).

Conclusions

In April 2021, VHB identified four 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 do not contain

water throughout the year, as documented by visual observations in the fall of 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	9,443	No	Yes	~35 spotted salamander egg masses	No	Cryptic	Tier I
VP-2	79,388	No	Yes	~50 spotted salamander egg masses	No	Cryptic	Tier I
VP-3	5,317	No	Yes	6 spotted salamander egg masses	No	Cryptic	Tier III
VP-4	16,498	No	Yes	<ul style="list-style-type: none"> • ~15 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 remaining undeveloped upland areas surrounding the pools support significant populations of vernal pool species that have limited breeding habitat. The managed farm use of much of the upland area and limited suitable wooded upland habitat may result in concentrated use of the cryptic vernal pool breeding habitat within the vernal pools on the Site. The proposed Project is unlikely to affect use of the existing pools or animal migration because of the heavily managed use of the existing area as agricultural fields.

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
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Figures:

Figure 1 – USGS Site Location Map

Figure 2 – Wetland and Vernal Pool Resource Areas

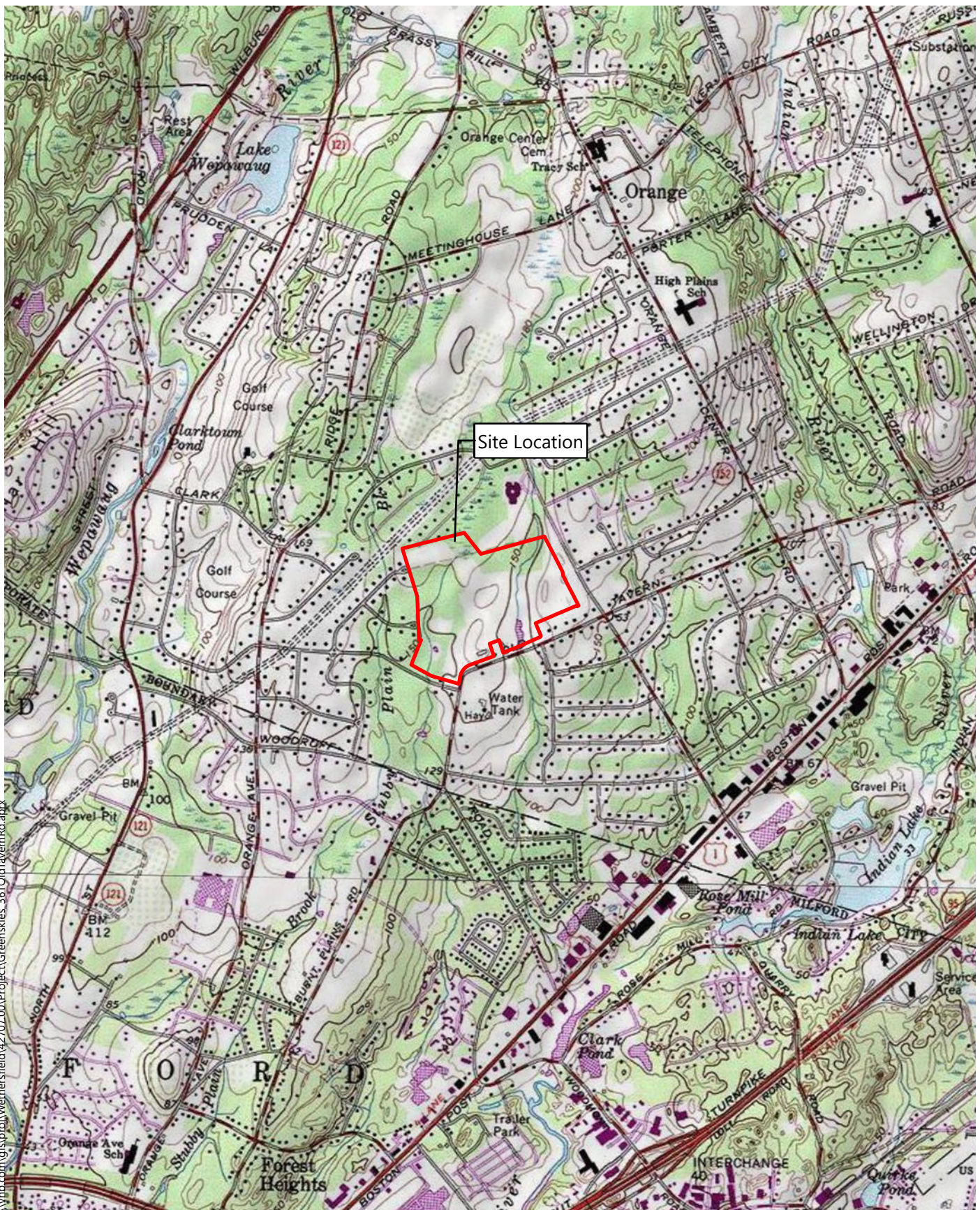
Attachments:

Site Photographs

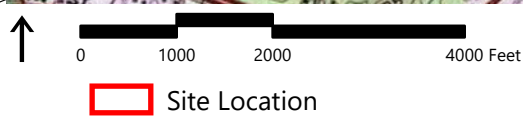
CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets

Figures

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



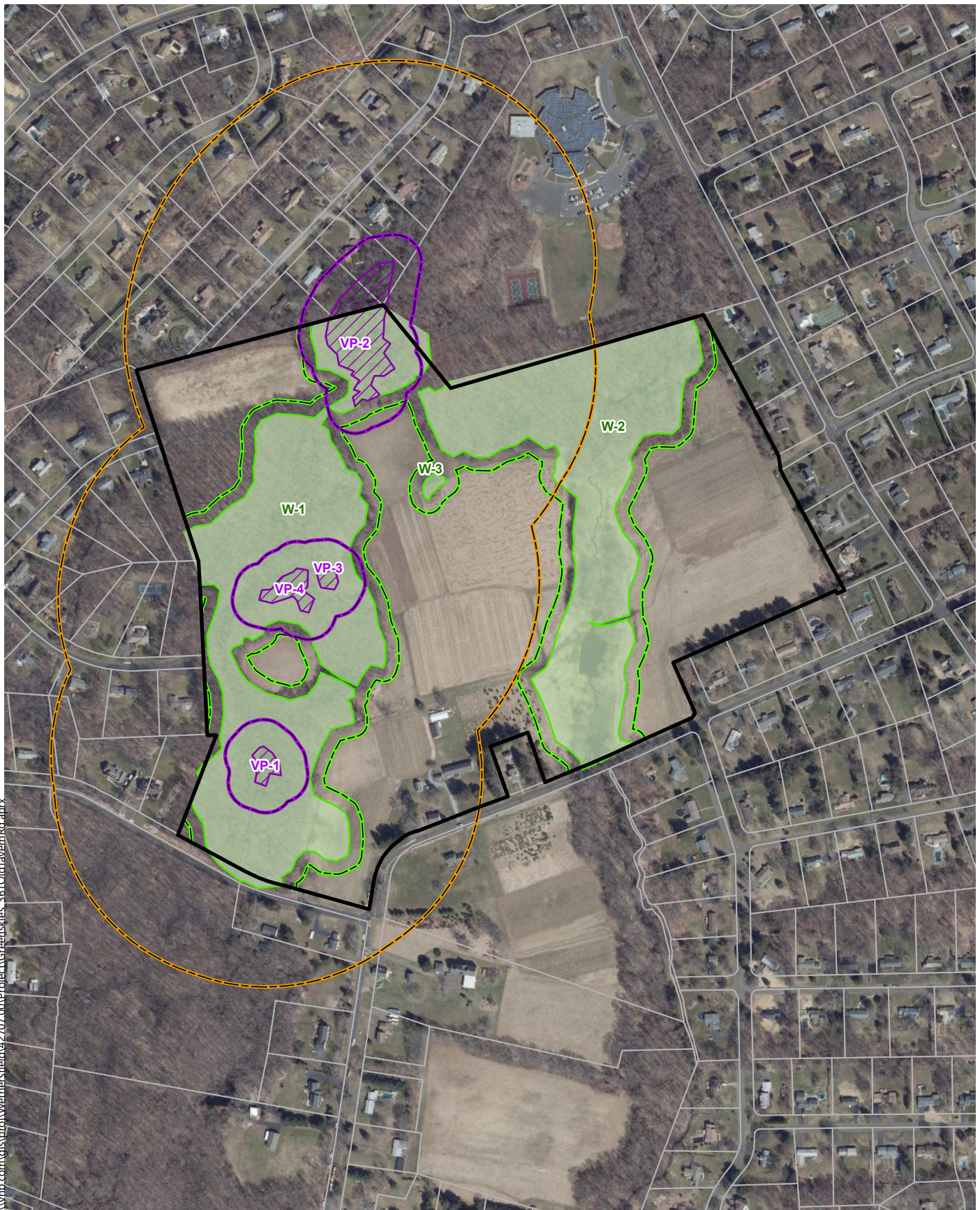
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Greensies Solar

Orange, Connecticut

USGS Site Location Map



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Greenskies Solar

Orange, Connecticut

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

Wetland and Vernal Pool Resource Areas

Source: VHB, CTDEEP, ArcGIS Online

Attachment 1

Site Photographs

Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 10/28/20

Location: E side of Wetland 1, E of constructed field

View: NW

Description:

Typical wooded deciduous upland fringe transitioning to Wetland 1.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 10/28/20

Location: E side of Wetland 1, E of constructed field

View: SE

Description:

Typical wooded deciduous upland area adjacent to Wetland 1, with farm fields visible in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 11/5/20

Location: E side of Wetland 1, E of VP-1

View: W

Description:

Red maple swamp interior of Wetland 1. Some areas of the wetland are characterized by a sparse understory and trees with slightly buttressed roots, indicating long-term hydrology in the area.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 10/28/20

Location: W side of Wetland 1, W of constructed field

View: E

Description:

Red maple swamp interior of Wetland 1. Other areas of Wetland 1 have a thicker shrub understory, with small isolated pockets of shallow inundation in the spring.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 11/9/20

Location: E side of constructed field

View: W

Description:

Maintained/mowed interior of constructed field within Wetland 1. Dirt path leading to the field from the farm in foreground.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 11/9/20

Location: E side of constructed field

View: E

Description:

Dirt path leading to the field from the farm, with Wetland 1 on either side (pink flags denote wetland boundary). Farm fields and buildings in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 11/9/20

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom with small area of holding 1-2" of water indicates long-term hydrology. Constructed intermittent drainage channel draining S to Treat Lane in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in spring 2021. Center of pool is approximately 15-18" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 9

Date: 11/9/20

Location: Interior of VP-2

View: N

Description:

Interior of VP-2 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 10

Date: 4/19/21

Location: Interior of VP-2

View: W

Description:

Interior of VP-2 in spring 2021. VP-2 is an interconnected complex of flooded depressions with a maximum depth ranging from 18-24" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 11 **Date:** 11/9/20

Location: Center of VP-3

View: W

Description:

Interior of VP-3 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 12 **Date:** 4/19/21

Location: E side of VP-3

View: W

Description:

Interior of VP-3 in spring 2021. Center of pool is approximately 12" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 13 **Date:** 11/9/20

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom and vegetated hummocks indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 14 **Date:** 4/19/21

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in spring 2021. Center of pool is approximately 12-15" deep. See Attachment 2 for additional photos.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 15 **Date:** 11/5/20

Location: W side of Wetland 2, N of corn field

View: N

Description:

Typical wooded interior of Wetland 2.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 16 **Date:** 11/5/20

Location: Interior of Wetland 2, E side of stream channel

View: N

Description:

Stream channel and associated forested wetlands of Wetland 2. Beaver impoundment in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 17 **Date:** 11/5/20

Location: Interior of Wetland 2, E side of stream channel

View: SW

Description:

Stream channel and associated forested wetlands of Wetland 2. Central cornfield in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 18 **Date:** 11/5/20

Location: E side of Wetland 2, along stream corridor

View: N

Description:

Managed farm fields sloping down toward wooded and scrub-shrub stream corridor.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 19 **Date:** 11/5/20

Location: Wetland 2, N of farm pond

View: S

Description:

Manmade farm pond within stream corridor of Wetland 2. The area did not exhibit any vernal pool activity on the day of the survey.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 20 **Date:** 11/5/20

Location: SE corner of Wetland 2, along Old Tavern Road

View: NW

Description:

Flooded portion of stream corridor within Wetland 2. Manmade dam with sluiceway in foreground, farm fields and house in background. The area did not exhibit any vernal pool activity on the day of the survey.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 21 **Date:** 11/5/20

Location: W side of Wetland 3

View: E

Description:

Small depression in NW corner of central cornfield and adjacent lawn area that comprises Wetland 3 in fall 2020.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 22 **Date:** 4/19/21

Location: W of Wetland 3

View: E

Description:

Wetland 3 in spring 2021. The depression holds approximately 3-6" of water on average. The area did not exhibit any vernal pool activity on the day of the survey.



Attachment 2

CAWS Vernal Pool Data Sheets and Vernal Pool Assessment Sheets

- > VP-1
- > VP-2
- > VP-3
- > VP-4

VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-1	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 8:30 AM
 End time: 10:00 AM

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 76-100 101-150 151-200 201-250 250-300 300-400 400-500 500-750 750-1000 1000-1250 >1250

Abundance categories

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~35 Total Number: ~35
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-1 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 1. Breeding area measures approximately 90' by 140' 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. VP-1 drains south via a manmade drainage channel.

~35 spotted salamander egg masses were observed in VP-1 singly or in small clusters of egg masses scattered throughout the pool. The boundary of VP-1 was delineated with blue flags labeled VP1-1 through VP1-11.

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: Carex spp.
 Percent tree canopy closure? 25%
 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: 41.25955° N, 73.03467° W

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

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 100% shrubland _____ meadow _____
 pasture _____ lawn _____ building _____
 exposed soil _____ 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 1.

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: Carex spp.

ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-1	CAWS Project #:
Project/property name: 361 Old Tavern 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)

Small clusters of egg masses observed scattered throughout pool; no central cluster

Drainage channel

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 almost entirely of wooded wetlands with a wooded upland fringe and portions of managed farm fields

Drainage channel

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	
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: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

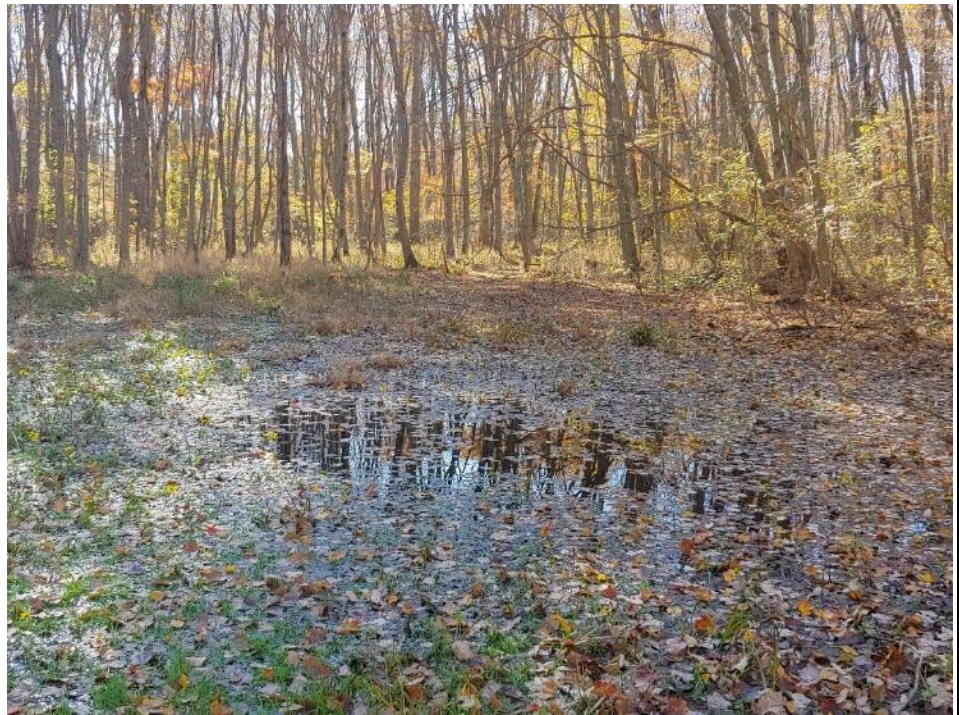
Date: 11/9/20

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom with small area of holding 1-2" of water indicates long-term hydrology. Constructed drainage channel draining S to Treat Lane in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: Center of VP-1

View: S

Description:

Open center of VP-1 in spring 2021. Center of pool is approximately 15-18" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 11/9/20

Location: Center of VP-1

View: E

Description:

Eastern side of pool in fall 2020. The area is dominated by sedges (*Carex* sp.) interspersed with open unvegetated areas. Farm fields and buildings in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: Center of VP-1

View: SE

Description:

Eastern side of pool in spring 2021. Sedge mat covers eastern side of pool.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: NW side of VP-1

View: N

Description:

Red maple swamp wetlands surrounding VP-1. Constructed field in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 4/19/21

Location: NW side of VP-1

View: SW

Description:

Red maple swamp wetlands along western edge of VP-1. Much of the pool has an average depth of 6-12". Fallen branches provide attachment points for egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 4/19/21

Location: VP-1

Description:

Single spotted salamander egg masses were observed scattered throughout the pool, often resting unattached on the leaf litter bottom in shallower areas.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: VP-1

Description:

Small cluster of spotted salamander egg masses attached to a twig.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-2	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/>	Reference: <input type="checkbox"/>
Address/location (or include annotated map): 361 Old Tavern 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: 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 50-75 76-100 101-150 151-200 201-250 250-300 300-400 400-500 500-750 750-1000 1000-1250 >1250

Abundance categories

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: ~50 Total Number: ~50
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-2 is a cryptic pool complex of multiple inundated depressions connected by a broader flooded area within the larger palustrine forested area of Wetland 1. Breeding area onsite measures approximately 220' by 340' with additional area offsite. The pool has a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 18-24" and moderately tannic water.

~50 spotted salamander egg masses were observed in VP-2 singly or in small clusters of egg masses scattered throughout the pool, with one large cluster of ~20 egg masses just offsite to the north. The boundary of VP-2 was delineated with blue flags labeled VP2-1 through VP2-26.

CONDITIONS/OBSERVATIONS WITHIN POOL (required data)

Inlet observed? No Yes Flowing Not flowing
 Outlet observed? No Yes Flowing Not flowing
 finfish observed? No Yes Flowing Not flowing

Estimated water depth range? Avg: 6-12"; Max: 18-24"

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: 41.26391° N, 73.03334° 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 _____ grading _____ ag. field 25%
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-2 is surrounded by red maple swamp and wooded areas of Wetland 1 and to the south by one of the farm fields.

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

Cover Objects:

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

Dominant vegetation (optional)
 Trees/saplings: red maple
 Shrubs/Vines: sweet pepperbush, spicebush, highbush blueberry
 Herbs: None

ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-2	CAWS Project #:
Project/property name: 361 Old Tavern 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: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 11/9/20

Location: Interior of VP-2

View: N

Description:

Interior of VP-2 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: Interior of VP-2

View: E

Description:

Interior of VP-2 in spring 2021. VP-2 is an interconnected complex of flooded depressions with a maximum depth ranging from approximately 18-24" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: Interior of VP-2

View: NW

Description:

View of deepest portion of pool. Broader areas of open water with fewer shrub thickets interspersed with hummocks. Residences on adjacent street in background.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: Interior of VP-2

View: SW

Description:

Large portions of the pool are flooded to an average depth of 6" or less. Multiple treefalls are present throughout the pool. Portions of the adjacent wetlands contain a dense shrub understory.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-2

Description:

Single spotted salamander egg masses (noted with arrows) were observed scattered throughout the pool, often resting unattached on the leaf litter bottom.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

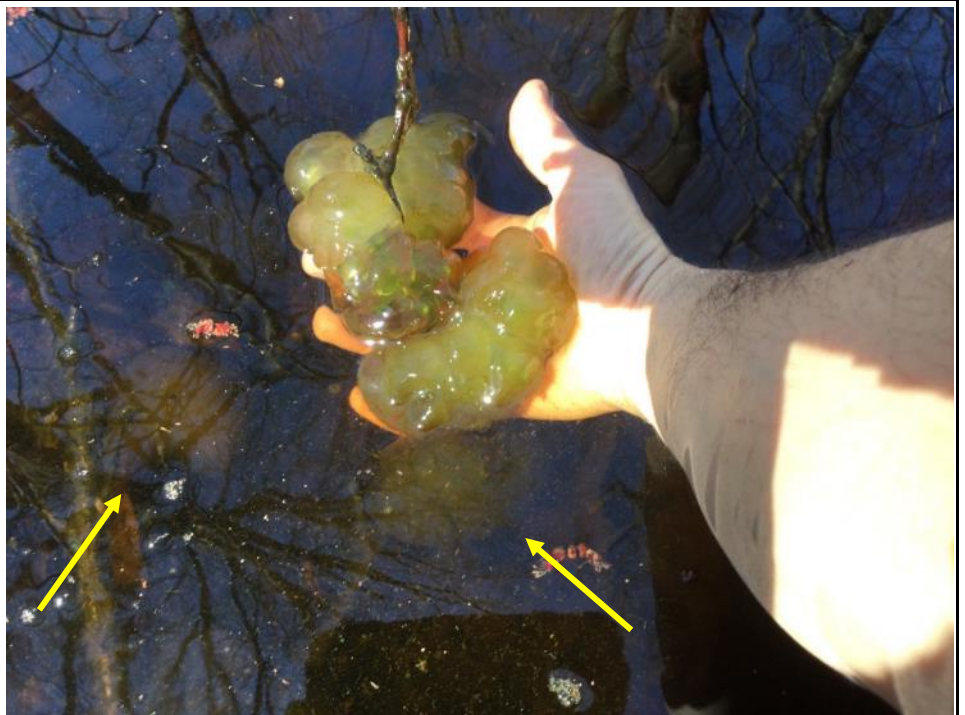
Photo No.: 6

Date: 4/19/21

Location: VP-2

Description:

A portion of the large cluster of ~20 egg masses just offsite to the north. Additional egg masses noted with arrows. Water is moderately tannic. Other egg masses were observed singly or in small clusters scattered throughout the pool.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-3	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 12:00 PM
 End time: 1:00 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 50-75 76-100 101-150 151-200 201-250 250-300 300-400 400-500 500-750 750-1000 1000-1250 >1250

Abundance categories

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: _____

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: 6 Total Number: 6
 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 70' by 85' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 12" and clear to lightly tannic water.

6 spotted salamander egg masses were observed in VP-3 singly or in small clusters of egg masses scattered throughout the pool. The boundary of VP-3 was delineated with blue flags labeled VP3-1 through VP3-7.

CONDITIONS/OBSERVATIONS WITHIN POOL (required data)

Inlet observed? No Yes Flowing Not flowing
 Outlet observed? No Yes Flowing Not flowing
 finfish observed? No Yes Flowing Not flowing

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? 85%
 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: 41.26141° N, 73.03378° W

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

Give approximate percentage or show on sketch on back

Landuses/conditions:
 forest 100% shrubland _____ meadow _____
 pasture _____ lawn _____ building _____
 exposed soil _____ grading _____ ag. field _____
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-3 is surrounded by red maple swamp and wooded areas of Wetland 1.

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: None

Blank area for additional notes or sketches.

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-3	CAWS Project #:
Project/property name: 361 Old Tavern 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)

Small clusters of egg masses observed scattered throughout pool; no central cluster

Approx. 100 feet

VP-4

VP-3

N

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 almost entirely of wooded wetlands with a wooded upland fringe and portions of managed farm fields

Approx. 200 feet

VP-4

VP-3

N

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

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Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1 **Date:** 11/9/20

Location: Center of VP-3

View: W

Description:

Interior of VP-3 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom, vegetated hummocks, and moss line on trees with buttressed roots indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2 **Date:** 4/19/21

Location: E side of VP-3

View: W

Description:

Interior of VP-3 in spring 2021. Center of pool is approximately 12" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: E side of VP-3

View: E

Description:

Margins of pool are 6" deep or less in places.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: E side of VP-3

View: N

Description:

Woody debris provides attachment points for egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-3

Description:

Spotted salamander egg masses were observed resting unattached on the leaf litter bottom.



VERNAL POOL DATA SHEET

Survey Date(s): 4/19/21	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-4	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: 361 Old Tavern Road		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): 361 Old Tavern 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: 0" 0"

Cloud Cover:
 clear
 partly cloudy
 mostly cloudy
 full cloud cover

Start time: 1:00 PM
 End time: 2:00 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 50-75 75-100 100-150 150-200 200-250

Abundance categories:
 250-300
 300-400
 400-500
 500-750
 750-1000
 1000-1250
 >1250

condition: 50-75
 If condition mixed, note "some", "many" or "most": 75-100
 100-150
 150-200
 200-250

intact: _____
 breaking up: _____
 hatching: ~5

Describe estimation method used for a large raft:

Spotted Salamanders:

Condition:
 intact: 15 Total Number: ~20
 breaking up: _____
 hatching: _____

ADDITIONAL NOTES: (optional)

VP-4 is a cryptic vernal pool in an inundated depression within the larger palustrine forested area of Wetland 1. Breeding area measures approximately 130' by 150' with a firm leafy bottom. Average depth ranges from approximately 6-12" with a maximum depth of approximately 12-15" and moderately tannic water.

~15 spotted salamander egg masses were observed in VP-4 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-4 was delineated with blue flags labeled VP4-1 through VP4-15.

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? 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: 41.26138° N, 73.03426° 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 _____ grading _____ ag. field 25%
 road _____ busy (>1 car/10 min.) yes no
 parking lot _____

Comments:
 VP-4 is surrounded by red maple swamp and wooded areas of Wetland 1.

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: None

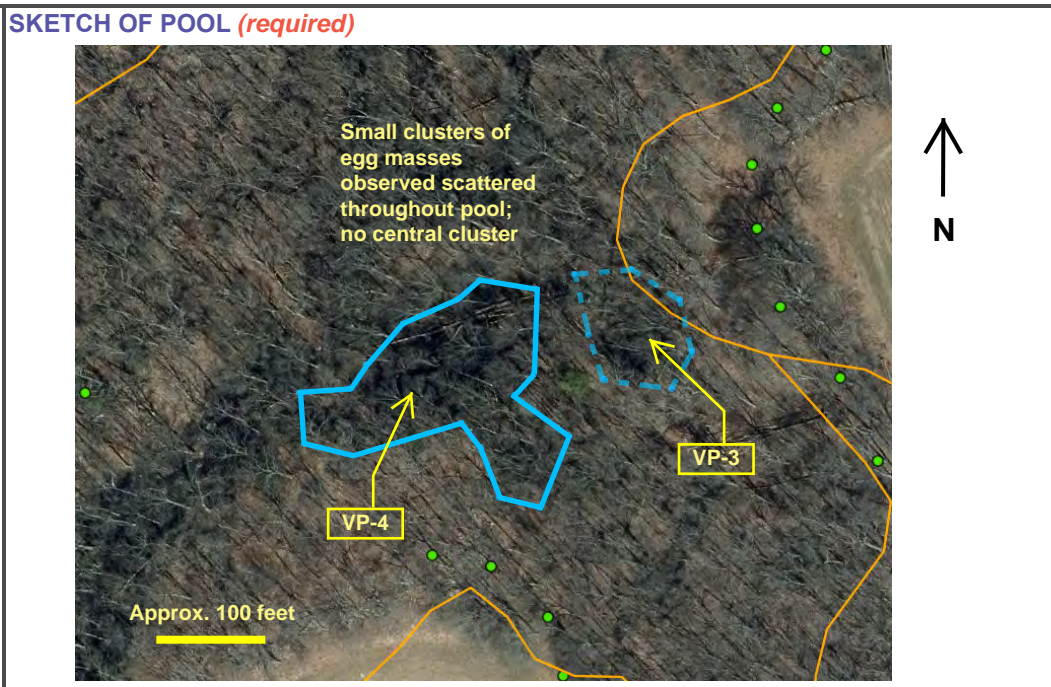
ADDITIONAL NOTES (continued):

VERNAL POOL DATA SHEET, p. 2

Survey Date(s): 4/19/2021	Investigator(s): C. Wagner	Town: Orange	CAWS Pool #: VP-4	CAWS Project #:
Project/property name: 361 Old Tavern Road			Pool Type:	Development: <input type="checkbox"/> Reference <input type="checkbox"/>

SKETCH OF POOL (required)

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.



WILDLIFE OBSERVATIONS: (optional)

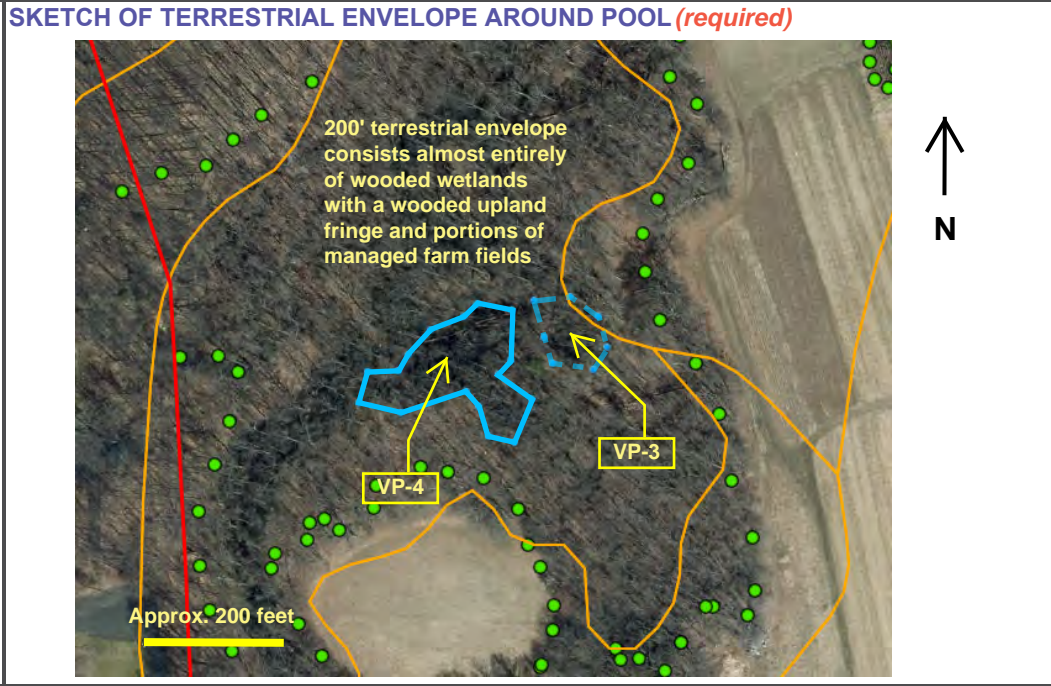
Checklist of Facultative Herptile Fauna (Pool & Fringe):

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):

SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)

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.



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

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Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 1

Date: 11/9/20

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in fall 2020, surrounded by wooded areas of Wetland 1. Open unvegetated bottom and vegetated hummocks indicate long-term hydrology.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 2

Date: 4/19/21

Location: E side of VP-4

View: W

Description:

Interior of VP-4 in spring 2021. Center of pool is approximately 12-15" deep.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 3

Date: 4/19/21

Location: E side of VP-4

View: N

Description:

Margins of pool are 6" deep or less in places.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 4

Date: 4/19/21

Location: W side of VP-4

View: N

Description:

Evidence of prior site activity (tire ruts) within a portion of the pool.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 5

Date: 4/19/21

Location: VP-4

Description:

Spotted salamander egg masses (noted with arrows) were observed resting unattached on the leaf litter bottom.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 6

Date: 4/19/21

Location: VP-4

Description:

Spotted salamander egg masses in moderately tannic water.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 7

Date: 4/19/21

Location: VP-4

Description:

Remains of hatched wood frog egg masses (circled). Wood frog tadpoles (not visible) were observed swimming in and around the egg mass remains.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 8

Date: 4/19/21

Location: VP-4

Description:

Remains of hatched wood frog egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 9

Date: 4/19/21

Location: VP-4

Description:

Wood frog tadpoles captured around the remains of the hatched egg masses.



Client Name: Greenskies Clean Energy

Site Location: 361 Old Tavern Rd., Orange, CT

Project No: 42707.00

Photo No.: 10

Date: 4/19/21

Location: VP-4

Description:

Wood frog tadpole with diagnostic gold flecking on underside.

