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August 7, 2015

VIA ELECTRONIC MAIL AND HAND DELIVERY

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Petition 1159: Petition of Lodestar Energy to the Connecticut Siting Council for a Declaratory Ruling for the Location and Construction of a 2.0 Megawatt Solar Electric Generating Facility at 1005 North Street, Suffield, Connecticut

Dear Council Members:

Enclosed please find Lodestar Energy's responses to the Interrogatories issued by the Siting Council on July 24, 2015.

We look forward to the Siting Council's decision in this matter. Please contact me if you have any additional questions or need more information.

Very truly yours,

Patricia Boye-Williams

Enclosures

cc: Jeffrey J. Macel, Esq.
Mark R. Sussman, Esq.

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

PETITION OF LODESTAR ENERGY	:	**PETITION NO. 1159**
FOR A DECLARATORY RULING	:	
THAT NO CERTIFICATE OF ENVIRONMENTAL	:	
COMPATIBILITY AND PUBLIC NEED IS	:	
REQUIRED FOR THE CONSTRUCTION,	:	**AUGUST 7, 2015**
OPERATION, AND MAINTENANCE OF	:	
A 2.0 MW AC SOLAR PHOTOVOLTAIC	:	
FACILITY IN SUFFIELD, CONNECTICUT	:	

RESPONSE TO CONNECTICUT SITING COUNCIL INTERROGATORIES

Lodestar Energy hereby responds to the Connecticut Siting Council Interrogatories issued on July 24, 2015, as follows:

1. Describe the methodologies that Mr. John Ianni (from Highland Soils LLC) used to evaluate the vernal pools in Lodestar Energy's (Lodestar) Overall Site Plan and include the date(s) of his studies. Specifically detail how the egg masses were counted, how many visits over what period of time were made by Mr. Ianni, and indicate if any other techniques such as minnow trapping were used.

Response 1. Please see the attached Exhibit A, letter from John P. Ianni M.S., Professional Soil Scientist, CPESC, of Highland Soils LLC which provides additional information regarding Mr. Ianni's methodologies and includes Mr. Ianni's curriculum vitae. In particular, the attached Exhibit A includes information on Mr. Ianni's sampling methods and dates of field work and the results have been formulated to conform to the Calhoun and Klemens Methodologies.

2. Analyze the five vernal pools using the Calhoun and Klemens methodology. While forested habitat is preferable, open habitat may be used and also can serve as areas that animals move through. Open habitat also over time can improve by regrowth. It cannot be merely discounted as developed habitat as one can have areas that have houses and roads. An excellent example of how to correctly analyze a habitat that has various components is that for Council

Docket 455 (Tab 14 of that application) which clearly shows the correct treatment of wooded, open and grassed areas, versus developed areas. Only the developed areas are considered to be lost habitat. This document, as a sample wetlands and vernal pool analysis, has been attached for your convenience. The map at the end of the document is a useful template or reference.

Response 2. Please see the attached Exhibit A, letter from John P. Ianni M.S., Professional Soil Scientist, CPESC, Highland Soils LLC, which provides additional analysis regarding the vernal pools, using the Calhoun and Klemens methodology.

Based upon this further analysis, solar panels that were originally planned to be placed within one hundred feet of the vernal pools (i.e., the vernal pool envelope or "VPE") are being moved such that there will no longer be any solar panels within 100 feet of the vernal pools. The project has been carefully designed to avoid, minimize and mitigate potential impacts to the amphibian resources. The vernal pools as well as the one-hundred foot VPEs are being protected and the impacts to the critical terrestrial (upland) habitat are within the published acceptable limits for development. This is reflected in the letter prepared by Mr. Ianni. The Site Plans are being revised to incorporate these changes, and will be provided to the Siting Council under separate cover as soon as they are finalized.

Additionally, a portion of the VPE surrounding Vernal Pool #2 has become overgrown with taller, wooded species. Lodestar is proposing to revegetate this area with shrubs and similar vegetation that will prevent shading of the solar panels and promote an amphibian habitat.

Finally, it should be noted that the northern portion of the site was used historically as a gravel pit, mined in the 1950s and 1960s. After that time, the subject property was used for agricultural purposes including row crops and more recently the production of shrubs. The gravel excavation resulted in the creation of regulated wetlands and in the formation of amphibian breeding areas referred to as vernal pools. The historic agricultural use of the land required heavy vehicle use and also resulted in some diminution of existing habitat for the breeding amphibians. By comparison, the proposed use will result in very little continued use of any equipment on the site and a very short (approximately 3 month) construction period.

3. Provide a turtle protection plan including both wood and box turtles. While only wood turtles have been reported in proximity of the site (Philo Brook), the habitat matrix that includes a mosaic of fields, wood, and gravel outwash located at low elevations within the central Connecticut lowland is part of the prime core range of the box turtle in Connecticut (see Klemens, 1993).

Response 3. Please see the attached Exhibit B, *Protection Plan for Wood Turtle and Eastern Box Turtle* prepared by Rema Ecological Services, LLC.

4. Are all of the proposed solar panels facing south? In general, in the case of fixed solar panels, does orienting your solar panels to the south provide a sort of balance (in terms of sun exposure) between the sun rising in the east and setting in the west and ultimately result in optimizing (or attempting to maximize) your total annual energy production (in kilowatt-hours) and your capacity factor? Is it correct to say that the objective of the project, as proposed, is to maximize annual energy production in kilowatt-hours for economic and environmental benefits (e.g. reducing carbon emissions by causing fossil-fueled plants to "ramp down" as renewable power is added to the grid) as opposed to a solar plant designed for peak load shaving?

Response 4. Please see the attached Exhibit C, "Petition #1159 Interrogatories: Responses to Questions 4-6," prepared by Jordan Belknap, Director of Operations, Lodestar Energy.

5. Lodestar provided its capacity factor and total annual energy production in kilowatt-hours for the proposed configuration in its supplemental materials dated May 21, 2015. What would your capacity factor and total annual energy production be in kilowatt-hours if all of the solar panels were facing west? How would this scenario impact the estimated carbon payoff in years noted in the Carbon Debt Analysis? (Given the complexity of these calculations, estimates are acceptable.)

Response 5. Please see the attached Exhibit C, "Petition #1159 Interrogatories: Responses to Questions 4-6," prepared by Jordan Belknap, Director of Operations, Lodestar Energy.

6. Has Lodestar considered a compromise where some percentage of the panels would be oriented to the west to accommodate afternoon sun during periods of peak load? How would such an approach affect your annual energy production, capacity factor, and carbon debt payoff time?

Response 6. Please see the attached Exhibit C, "Petition #1159 Interrogatories: Responses to Questions 4-6," prepared by Jordan Belknap, Director of Operations, Lodestar Energy.

Respectfully submitted,

Lodestar Energy

By: _____

Mark R. Sussman
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Its Attorneys

HIGHLAND SOILS LLC

August 6, 2015

Adam Beal
Lodestar Energy, LLC
3 Ellsworth Place
Suite 122
Avon, CT 06001

RE: CANIS MAJOR SOLAR
ROUTE 75
SUFFIELD, CT

Dear Adam:

Enclosed is additional information in response to the Connecticut Siting Council, Petition No. 1159. This letter responds to items number one and two of the interrogatories.[1]

In December of 2014 wetland delineations were conducted on the subject property. As part of the field work, potential vernal pool areas, that is, habitats that could be used for breeding by obligate amphibians, were identified. In the Spring of 2015 field work was conducted to verify the status of these areas. A number of potential areas were identified based on surface hydrology.

The initial site visit was conducted on April 6, 2015. A total of six hours were spent on site with the majority of time spent in the vernal pool complex (3 pools) in the former gravel pit, located in the northwestern section of the subject site (see enclosed plan/aerial photograph prepared by J.R. Russo & Associates, LLC). An additional site visit (four hours) was conducted on April 7, 2015 to complete the survey of the Vernal Pools along the southern property line.

During the initial site visits (i.e. 4/6 & 4/7/2015) the vernal pools were entered and a sweep of the pools was conducted for purposes of identifying and counting amphibian egg masses. In those pools which were shallow enough to survey the entire water column, egg masses were identified and counted by a visual survey. A dip net was used to survey deeper parts of the pools. An initial egg mass count was conducted and a grid map was produced indicating the location and quantities of egg masses.

A third investigation was conducted on April 21, 2015. All on-site vernal pools were entered and an egg mass verification count was conducted. No additional egg masses were noted and the original count was entered into the report. No other survey methods other than a visual survey and a dip net survey were utilized.

[1] It should be noted that Mr. George T. Logan, MS, PWS, CSE, of Rema Ecological Services, LLC has reviewed this document, concurring with its recommendations and conclusions. Mr. Logan visited the property on April 7, 2015 to perform targeted listed-species surveys, which is the subject of a separate report, dated April 8, 2015. At that time he also observed the vernal pool habitats at the site, as well as amphibian breeding activity.

In total, five individual vernal pools were identified in two distinct areas. Two pools were identified along the southern limits of the site with one pool located entirely off-site, but adjacent to the property line. Three vernal pools were located within close proximity to each other in the southern limits of the former gravel pit, located in the northwestern section of the site.

It should be noted that Vernal Pool Assessments (Assessment Sheets attached) were conducted in accordance with the methodology contained in the following publication, hereafter referred to as the BDP:

> *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.*

VERNAL POOL DESCRIPTIONS

Southern Vernal Pool Complex

Vernal Pool 1 is located off-site along the southern property limits. This pool is embedded in a small wooded area just north of a large active horse pasture. The pool is a small depressional feature within an isolated wetland area. The area surrounding this pool is wooded with mature Red Oak and Black Oak trees. Since Vernal Pool 1 is located off-site, the identification of species and counting of egg masses was conducted visually from the property line using binoculars. Wood Frogs were noted to be actively calling from the pool during the April 7, 2015 survey.

Vernal Pool 1 was assessed per the BDP using the Vernal Pool Assessment Sheet. For the Biological Value, it contained a single species (Wood Frog) with an egg mass count of under 25 (i.e. 12). The Critical Terrestrial Habitat (CTH) formulation indicates that greater than 75% of the Vernal Pool Envelope ("VPE", that area within 100 feet of the vernal pool), and at least 50% of the Critical Terrestrial Habitat (that area between 100 to 750 feet from the pool) is undeveloped as defined in the document. The cumulative Assessment for this resource is a ***Tier III***.[2]

Vernal Pool 2 is located just north and west of the previously described resource. The pool is embedded within a wetland area that has been previously impacted by agricultural activity. The southern and eastern areas surrounding the pool are wooded with mixed hardwood and softwood species. Red and Black Oak as well as White Pine dominate the canopy. The understory consists of shrub species that include Highbush blueberry and saplings of the aforementioned tree species. The northern side of the wetland is wooded and contains a regrowth of mixed hardwoods. Two mature trees are located in the northern wooded area and consist of a single Cottonwood tree and a single species of Red Oak. The remaining vegetation is saplings and small, pole-sized tree species of Oak and Shagbark Hickory. The understory is thick and contains Honeysuckle and Multiflora rose.

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[2] **"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 only to 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)."

The vegetation in the western side of the wetland transitions from the wooded environment immediately surrounding the pool, to a wet meadow, then to abandoned field growth. During the time the property was used as a gravel pit and for agriculture, soil and other land clearing debris was pushed into the wetland.

Vernal Pool 2 is located in the eastern side of the delineated wetland and consists of a deeper depression that can hold water year round. The pool has many snags and attachment points for amphibian egg masses and contains a stand of Button bush as well as Cat-tails and Eastern Bur-reed. Two obligate amphibian species (Spotted Salamander and Wood Frog) were noted in this resource in relatively low egg mass numbers (i.e. 6 and 15, respectively). As with the adjacent pool, the VPE and the CTH are undeveloped with at least 75% of the VPE and at least 50% of the CTH undeveloped. This pool has a cumulative assessment of ***Tier I.***

Gravel Pit Vernal Pool Complex

Three vernal pools were identified in the southern limits of the former gravel pit at the northwestern section of the site. Two pools were located at the southern limits of the former excavation and at the base of a steep slope. The two pools are separated by a small mound of gravel left over from the excavation activities. The pools are in slight depressions within an undulating but flat area. Cottonwood trees dominate the canopy and an almost impenetrable growth of Multiflora rose surrounds the two pools. There is a slight gradient to the north from the pools and surface water and shallow ground water flows from south to north through the area. Ground water seepage or exfiltration was present along the southern limits of the wetlands.

Vernal Pool 3 is located in the southeastern part of the complex and contained a single species (Wood Frog) with greater than 25 egg masses (i.e. 32) than were recorded in the other pools. Both the VPE and CTH are completely undeveloped. The cumulative assessment for this resource is ***Tier I.***

Vernal Pool 4, located just westerly of Pool 3 is in a similar hydrologic and vegetative setting. This pool, although larger in aerial extent, is shallower and contains a single species (Wood Frog) with low egg mass counts (less than 25) (i.e. 14). As with the previously described pool the CTH is completely undeveloped. The cumulative assessment for this resource is ***Tier III.***

The third component of the gravel pit complex is Vernal Pool 5, an existing man-made pond ("pond" is defined as a permanent water body with a permanent outlet). Vernal Pool 5 was found to have breeding Wood Frogs along the southwestern limit of the open water. Vernal Pool 5 is adjacent to an agricultural field and was used for irrigation. The eastern side of the wetland contains abandoned field growth along with a stand of Rough alder. The southern and western sides are dominated by a thick growth of Multiflora rose with Cottonwoods established along the edges. By mid-summer the margins of the pond are dry and the remaining water surface is covered by duckweed. In early August of 2015 the pond was still discharging surface water. This resource, with low egg mass counts (i.e. 21) and a single species has a ***Tier III*** rating.

Terrestrial Habitat Impacts

No direct physical impacts are proposed to the site's Vernal Pools. Activities proposed within the VPE and CTH and are outlined below.

Although five Vernal Pools were identified, the pools are concentrated in two areas and for purposes of CTH impacts will be discussed as the "Southern Pool Complex" and "Gravel Pit Complex" (see enclosed map). It should be noted that the area computations were performed by J.R. Russo & Associates, LLC.

Southern Pool Complex

The existing terrestrial habitat for the Southern Pools is as follows:

Vernal Pool Envelope: 2.6 acres
Wooded.....1.9 ac., 73.1% of VPE
Field.....0.7 ac., 26.9% of VPE
Developed.....0.0 ac., 0.0% of VPE

Proposed development impacts on the Southern Pools:

Vernal Pool Envelope: 2.6 acres
Wooded.....1.8 ac., 69.2% of VPE
Field.....0.8 ac., 30.7% of VPE
Developed.....0.0 ac., 0.0% of VPE

The proposed impact within the VPE is the proposed improvement of the existing farm road. As proposed mitigation, an area of woody growth of saplings and small tree species along the northern side of the wetland will be removed and converted to native and naturalized shrub species. This mitigation is being proposed as a long-term alternative to maintenance of the canopy along the north side of the wetland which has the added value of increasing the wooded habitat around the resource.

Existing Critical Terrestrial Habitat: 53.3 acres
Wooded.....28.9 ac., 54.2% of CTH
Field.....22.9 ac., 43.0% of CTH
Developed.....1.5 ac., 2.8% of CTH

Proposed Critical Terrestrial Habitat (Post Development)
Wooded.....26.4 ac., 49.5% of CTH
Field.....16.2 ac., 30.4% of CTH
Developed.....10.7 ac., 20.1% of CTH[3]

Gravel Pit Pool Complex

The existing terrestrial habitat for the Gravel Pit Pools is as follows:

Vernal Pool Envelope: 3.5 acres
Wooded.....3.1 ac., 89.0% of VPE

[3] As cited in the literature, less than 25 to 30% development within the CTH is desired to avoid diminution of amphibian populations. Alterations to surface and near surface hydrology are not anticipated due to the lack of grading or other soil disturbances that may impact the direction or quantities or runoff.

Pond.....0.4 ac., 11.0% of VPE
Developed.....0.0 ac., 0.0% of VPE

Proposed development impacts on the Gravel Pit Pools:

Vernal Pool Envelope: 3.5 acres
Wooded.....2.6 ac., 74.3% of VPE
Pond.....0.4 ac., 11.4% of VPE
Field.....0.5 ac., 14.3% of VPE
Developed.....0.0 ac., 0.0% of VPE

There are no proposed impacts within the VPE.

Existing Critical Terrestrial Habitat: 56.7 acres
Wooded.....43.6 ac., 76.9% of CTH
Field.....12.3 ac., 21.7% of CTH
Developed.....0.8 ac., 1.4% of CTH

Proposed Critical Terrestrial Habitat (Post-Development)
Wooded.....32.9 ac., 58.0% of CTH
Field.....12.2 ac., 21.5% of CTH
Developed.....11.6 ac., 20.5% of CTH

As cited in the literature, less than 25 to 30% development within the CTH is desired to avoid diminution of amphibian populations. Alterations to surface and near surface hydrology are not anticipated due to the lack of grading or other soil disturbances that may impact the direction or quantities or surface runoff or shallow ground water flows.

Best Management Practices and Recommendations

As proposed, no solar panels are within 100 feet of the vernal pools. The only activity within the VPE is the existing access drive which will be improved with runoff controls. Once improved, the gravel access drive should not have a significant impact on the vernal pool habitat or species based on the low number of anticipated trips (estimated at 2 per year) to service the solar panel arrays. The final activity within the VPE is the management of a small wooded area northerly of Vernal Pool 2 and the mitigation plantings of shrub species westerly of the pool. This wooded area is the result of regrowth of woody species following the cessation of agricultural activities in that area a few years ago. The growth of trees along this area interferes with the solar panels and it is desirable to maintain lower growth species that will not impact the habitat value of the upland habitat.

The CTH for both complexes is being reduced by the placement of the solar panels. However, the CTH for both Vernal Pool complexes are within thresholds of less than 25% of the CTH being developed, per the Calhoun and Klemens (2002) assessment methodology. Therefore based on the application of the BDP both vernal pool complexes would be conserved.

We should note that reductions of CTH for both complexes (i.e. -17.3% for southern pools, and -19.1% for gravel pit pools) are based on considering solar panel array areas as "developed" land, which is unsuitable for amphibians. However, these areas will not be maintained as a typical lawn, which is

excluded by the BDP as suitable habitat. They will be seeded to low or no-mow grasses and only mowed every other year in the summer to exclude woody species. Therefore, these areas will not prohibit movement of vernal pool amphibians as they move between habitats or disperse, as would a manicured lawn.

Erosion and Sedimentation Control

Seasonal restrictions will be required on the project to protect and accommodate migrating amphibians. It is recommended that an Environmental Monitor be used to implement and monitor the project with specific goals of protection of amphibian populations. It is recommended that the Environmental Monitor write and implement a management plan specific to the timing of construction activities as they relate to amphibian activities. Since amphibian activities are seasonal, it is critical to know the timing of construction. Once the timing of construction is set, the Environmental Monitor would be able to tailor the plan along with the appropriate seasonal detail needed for successful implementation. Zones of exclusion may have to be implemented and construction activities must be timed in a manner that avoids unintended impacts to amphibians. Recommendations for the management plan include:

Erosion and Sedimentation Controls

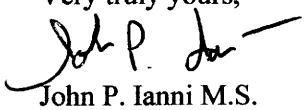
Erosion control mattings have been specified for slopes greater than three to one. Plastic netting can trap and entangle wildlife, and erosion control blankets should be limited to those products that have biodegradable or woven fibers or mechanically bound fibers that do not include plastic nettings. Another option would be hydro seeding that includes a soil binding agent.

Silt fencing is a barrier to amphibian movements and should only be used where exclusion of amphibian species is desired. Where silt fencing or other barriers are to be used, consideration should be given to deflecting migrating amphibians from active work zones. The Environmental Monitor should perform sweeps of hard barriers and relocate any herpetofauna. More importantly, the plan must be time-specific to construction activities and the timing of amphibian movements.

Exclusion barriers for construction activities should not restrict amphibian movements unless desired. No vehicles or construction activities are to occur outside of barriers. A Pollution Control Plan will be required prior to construction. The plan will detail Petroleum and Hazardous Materials Storage and refueling as well as general construction activities.

If you have any questions, or require additional information, please call me at (860) 742-5868.

Very truly yours,



John P. Ianni M.S.
Professional Soil Scientist
CPESC

Vernal Pool #1 (off-site)

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes_____ No__NO__

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ 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).

Vernal Pool #2 (Southern Property Line)

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_X_____

(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_X_____ 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_X_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes_X_____ No_____

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes_X_____ 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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Vernal Pool #3 (S.E. of Pond)

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__X__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ 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).

Vernal Pool #4 (S.W. of Pond)

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes_____ No__X__

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ 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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Vernal Pool #5 (Pond Margin)

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_X_____

(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_X_____

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes_____ No_X_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes_X_ No_____

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes_X_ 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).

• Ecology
• Soil & Wetland Studies
• Water Quality Monitoring • GPS
• Environmental Planning & Management
• Ecological Restoration & Habitat Mitigation
• Aquatic, Wildlife and Listed Species Surveys
• Application Reviews • Permitting & Compliance

August 6, 2015

Lodestar Energy
3 Ellsworth Place, Suite 122
Avon, CT 06001

ATTN: Mr. Adam Beal, Director of Development

RE: ***Protection Plan for Wood Turtle and Eastern box Turtle***
Petition No. 1159 by Lodestar Energy, LLC
Canis Major Solar Farm, 1005R North Street, Suffield, CT

REMA Job No.: 15-1792-SUF39

Dear Mr. Beal:

As noted in an e-mail communication from Attorney Patricia Boye-Williams to the project team, dated July 24, 2015, the Connecticut Siting Council has requested that we provide a turtle protection plan. This was the third of six Interrogatories that were received from the Siting Council at the public meeting on July 23, 2015.

We were asked to include Eastern box turtle (*Terrapene c. carolina*) in the plan, as it is likely to occur here, although only wood turtle (*Glyptemys insculpta*) has been documented by the CT Department of Energy and Environmental Protection (CT DEEP) in the project vicinity. Since the behavior and life cycle timing of the two species are similar, both will be protected by the attached plan.

In our professional opinion, the Turtle Protection Plan will ensure the protection of the two Connecticut-listed turtle species, should they occur on the subject site, not only during the construction phase, but also long-term.

Please feel free to contact our office with any questions on the above.

Respectfully submitted,

Respectfully submitted,

REMA ECOLOGICAL SERVICES, LLC

George T. Logan, MS, PWS, CSE
Professional Wetland Scientist
Registered Soil Scientist
Certified Senior Ecologist

Sigrun N. Gadwa, MS, PWS
Ecologist, Registered Soil Scientist
Professional Wetland Scientist

VIA E-MAIL

Attachment: Turtle Protection Plan – Sullivan Solar Farm

PROTECTION PLAN

FOR

WOOD TURTLE AND EASTERN BOX TURTLE

CANIS MAJOR SOLAR FARM, SUFFIELD, CONNECTICUT

AUGUST 7, 2015

PREPARED BY REMA ECOLOGICAL SERVICES, LLC

GOAL 1: Prevent mortality or injury of turtles during construction

Objective 1: *Prevent encounters between construction equipment and active turtles*.

Task 1: To the extent possible, time construction outside of the hibernating period for the turtles (i.e. between Oct 1 and April 1). If not possible, the following objectives and tasks shall be undertaken.

Objective 2: *Prevent turtles from entering the site during construction.*

Task 1: Erect silt fence all around the work area (i.e., construction envelope), making sure it is properly trenched, so that turtles cannot move under it, and avoiding the use of netting that can entangle wildlife.

Objective 3: *Make sure that no turtles are already within construction envelope.*

Task 1: After erecting the perimeter silt fence, a systematic sweep of the construction envelope shall be conducted by a qualified professional[1] at a time when turtles are active. Avoid harming hibernating box turtles. Place any turtles found to the outside of the silt fence enclosure, facing in the same direction they were walking.

[1] A qualified professional could be an ecologist, herpetologist, or wildlife biologist. This individual should have an active scientific collection permit from the CT DEEP's Wildlife Division.

Task 2: The next day following the initial sweep, the whole silt fence perimeter shall be inspected by the qualified professional for any turtles (or other wildlife) that may be trying to exit the area, but blocked by the fence.

Turtle Sweep Timing

1) Conduct the sweep during the growing season, not during the hibernation season (i.e. mid-October to mid-April).

2) Search during the morning or late afternoon, not during the hot middle of the day, when turtles are likely to be resting in the shade or buried under leaf litter.

3) If possible search on a sunny day after a rainstorm, when they are most likely to be active.

4) Search in fair, pleasant weather. Avoid searching during a hot period in summer, when both wood and box turtles bury themselves and go dormant for several days or weeks. In cool weather they may not be active but can readily be found basking in sunshine.

Objective 3: *Inform the workers on the site about both turtle species.*

Task 1: Print photos and fact sheets for both species off the CTDEEP web site, or from other sources, and distribute. The construction workers should be informed that these are declining protected species, which should be moved out of harm's way, such as off the entry road, on the side they were moving towards but should never be moved away from the site vicinity. The construction supervisor should immediately alert the project's qualified professional (e.g. ecologist).

Objective 4: *Prevent crushing of turtles and their habitat by heavy vehicles.*

Task 1: Do not allow vehicles or heavy machinery to park outside the work area in turtle habitats (e.g. fields or woods edges). Erect "no parking" placards in habitat

areas where parking seems likely. Designate defined worker parking areas *within* the perimeter silt fence.

GOAL 2: Prevent mortality or injury of turtles following construction

Task 1: Maintain the chain-link fences that surround the solar arrays, making sure gaps at bottom could not let turtles through.

Task 2: Grassy buffer areas between the clearing limits and the chain link fence will provide meadow habitat for many species and for turtles if they utilize the subject site. Mow these areas every other year in mid-summer on a hot day, after July 15th, when turtles are not active.

Note that any wood turtles at the site would be infrequent, temporary visitors, passing though as part of an extensive terrestrial foraging area (up to 1,000 feet from stream habitats per CTDEEP). However, if Eastern box turtles are found at the site, they are either long-term residents or regular nesters.

LODESTAR ENERGY

Aug 6, 2015

Petition # 1159 Interrogatories: Responses to Questions 4-6

Lodestar Energy, LLC, a developer of renewable energy projects, is providing the following information in response to interrogatories 4-6 of the Petition # 1159 Interrogatories, dated July 27, 2015. These questions focus on the area of system design, panel orientation, and its relationship to the energy production of the proposed photovoltaic system.

Interrogatory 4:

Are all of the proposed solar panels pointing south?

Yes.

In general, in the case of fixed solar panels, does orientating your solar panels to the south provide a sort of balance (in terms of sun exposure) between the sun rising in the east and setting in the west and ultimately result in optimizing (or attempting to maximize) your total annual energy production (in kilowatt-hours) and your capacity factor?

Yes. The design goal of the system is to *maximize total annual energy production* within the constraints of the physical site, and the maximum AC system size allowed by the interconnection agreement with Eversource (2MW AC). The capacity factor of the system is directly related to the annual production of the system. The capacity factor increases as annual production increases given the same AC system size. It is also true that, in general, due south orientation provides a balance of daily sun exposure. The key factor is that due south orientation maximizes the total annual solar irradiation on the panels, which maximizes the annual energy production.

Is it correct to say that the objective of the project, as proposed, is to maximize the annual energy production in kilowatt-hours for economic and environmental benefits (e.g reducing carbon emissions by causing fossil-fueled plants to "ramp down" as renewable power is added to the grid) as opposed to a solar plant designed for peak load shaving?

Yes. The objective of the project was to maximize the annual solar energy production. This maximizes the avoided energy that otherwise would be produced by fossil-fuel generation, or produced from other energy sources. Maximizing the annual solar energy production will have the greatest environmental benefit by maximizing the reduction in carbon emissions. Maximizing the total annual energy production will maximize the project's economic value. The proposed project's revenue streams are generated from net metering credits and Low Emission Renewable Energy Credits (LRECs), both of which are based on kilowatt-hours produced by the photovoltaic system. The proposed system is not designed for optimum peak load shaving. By comparison, systems designed for peak load shaving typically involve

onsite battery storage rather than changing the orientation of the panels from due south. Batteries allow some of the solar energy to be stored and released at different times. In our view, this is a better and more flexible approach to peak load shaving but in light of the current costs associated with battery storage, it is not economically feasible to use batteries for this project. As battery prices come down, more solar photovoltaic systems will installed with battery storage.

Interrogatory 5:

Lodestar provided its capacity factor and total annual energy production in kilowatt-hours for the proposed configuration in its supplemental materials dated May 21, 2015. What would your capacity factor and total annual energy production be in kilowatt-hours if all of the solar panels were facing west? How would this scenario impact the estimated carbon payoff in years noted in the Carbon Debt Analysis? (Given the complexity of these calculations, estimates are acceptable)

Lodestar has run production estimates based on 180, 225, and 270 degree panel orientations. The estimates were run with using PVWatts, which is a publicly available production estimator created by the National Renewable Energy Laboratory. Each production estimate uses the same input variables except for orientation. The estimates are attached hereto. The table below summarizes the results:

Configuration	Orientation	Annual Production	Capacity Factor
South	180 Degrees	3,572,265 kWh	20.44%
Southwest	225 Degrees	3,414,326 kWh	19.53%
West	270 Degrees	3,004,764 kWh	17.19%

Panel orientation would have no factor in the carbon footprint estimated for the production and installation of the components of the solar array. The annual photovoltaic production benefits would be directly proportional to the annual solar production by definition. The table below summarizes the effect of different panel orientations on the carbon debt analysis submitted by Lodestar.

LODESTAR ENERGY

Configuration	Orientation	CO2 To Payback (Metric Tons)	Annual Production Benefit (Metric Tons)	Carbon Payback (Years)
South	180	5,461	2,173	2.51
Southwest	225	5,461	2,077	2.63
West	270	5,461	1827	2.99

Interrogatory 6:

Has Lodestar considered a compromise where some percentage of the panels would be oriented to the west to accommodate afternoon sun during periods of peak load? How would such an approach affect you annual energy production, capacity factor, and carbon debt payoff time?

Lodestar designs its systems in accordance with standard industry best practices. Aligning panels in different orientations would not follow best practices. Furthermore, as explained below, our proposed design maximizes annual production and environmental benefit.

Energy production and capacity factor would be reduced and carbon debt payoff time would be increased if any panels are shifted away from due south. The production table provided shows the extremes of due south and due west production estimates. A system with multiple panel orientations would fall within the extremes of the production estimates. Estimates would depend on the actual panel counts and orientations, the permutations are many. A system with multiple orientations would also either require an increase in project footprint, or a reduction in electrical size, to physically accommodate racking structures that would have to be arranged in multiple orientations to match the panels.

Sincerely,

Jordan Belknap
Director of Operations
Lodestar Energy
NABCEP Certified
Solar Installation Professional

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

RESULTS

3,572,265 kWh per Year *

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.82	220,631	48,958
February	3.68	253,495	56,251
March	4.30	316,866	70,312
April	5.16	348,785	77,395
May	5.35	366,500	81,326
June	5.90	382,811	84,946
July	5.71	378,794	84,054
August	5.40	360,633	80,024
September	4.70	313,887	69,651
October	3.67	263,261	58,418
November	2.60	187,738	41,659
December	2.31	178,864	39,690
Annual	4.30	3,572,265	$ 792,684

Location and Station Identification

Requested Location	Suffield, CT	
Weather Data Source	(TMY2) HARTFORD, CT	4.2 mi
Latitude	41.93° N	
Longitude	72.68° W	

PV System Specifications *(Commercial)*

DC System Size	2879 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	25°
Array Azimuth	180°
System Losses	15.10%
Inverter Efficiency	96%
DC to AC Size Ratio	1.44

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.22 $/kWh
Initial Cost	2.60 $/Wdc
Cost of Electricity Generated by System	0.08 $/kWh

Selected Incentives

Investment Tax Credit (ITC)	Residential Renewable Energy Tax Credit Percent of Cost: 30%

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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RESULTS

3,414,327 kWh per Year *

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	2.53	196,337	43,567
February	3.39	235,372	52,229
March	4.07	303,408	67,326
April	4.98	338,325	75,074
May	5.28	362,504	80,440
June	5.85	380,732	84,485
July	5.78	383,615	85,124
August	5.19	347,780	77,172
September	4.45	297,341	65,980
October	3.38	241,796	53,654
November	2.32	167,138	37,088
December	2.08	159,978	35,499
Annual	4.11	3,414,326	$ 757,638

Location and Station Identification

Requested Location	Suffield, CT	
Weather Data Source	(TMY2) HARTFORD, CT	4.2 mi
Latitude	41.93° N	
Longitude	72.68° W	

PV System Specifications *(Commercial)*

DC System Size	2879 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	25°
Array Azimuth	225°
System Losses	15.10%
Inverter Efficiency	96%
DC to AC Size Ratio	1.44

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.22 $/kWh
Initial Cost	2.60 $/Wdc
Cost of Electricity Generated by System	0.08 $/kWh

Selected Incentives

Investment Tax Credit (ITC)	Residential Renewable Energy Tax Credit Percent of Cost: 30%

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at http://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

RESULTS

3,004,765 kWh per Year *

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)	Energy Value ($)
January	1.86	142,088	31,529
February	2.69	185,502	41,163
March	3.47	261,552	58,038
April	4.51	312,016	69,236
May	5.03	348,119	77,248
June	5.65	369,707	82,038
July	5.61	374,035	82,998
August	4.77	320,725	71,169
September	3.84	257,166	57,065
October	2.73	194,785	43,223
November	1.75	124,070	27,531
December	1.53	114,999	25,518
Annual	3.62	3,004,764	$ 666,756

Location and Station Identification

Requested Location	Suffield, CT	
Weather Data Source	(TMY2) HARTFORD, CT	4.2 mi
Latitude	41.93° N	
Longitude	72.68° W	

PV System Specifications *(Commercial)*

DC System Size	2879 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	25°
Array Azimuth	270°
System Losses	15.10%
Inverter Efficiency	96%
DC to AC Size Ratio	1.44

Initial Economic Comparison

Average Cost of Electricity Purchased from Utility	0.22 $/kWh
Initial Cost	2.60 $/Wdc
Cost of Electricity Generated by System	0.09 $/kWh

Selected Incentives

Investment Tax Credit (ITC)	Residential Renewable Energy Tax Credit Percent of Cost: 30%

These values can be compared to get an idea of the cost-effectiveness of this system. However, system costs, system financing

Statement of Qualifications

John P. Ianni

Professional Soil Scientist

Education:

1986 — M.S. Soil Science. The University of Connecticut, Storrs, CT.
Thesis Title: Movement and Total Concentration of Heavy Metals in Sludge Amended Soils.

1983 — B.S. Plant Science. The University of Connecticut, Storrs, CT.

1979 — A.A.S. Forestry. Paul Smith's College, Paul Smiths, NY.

Experience:

1986 - Present — **Professional Soil Scientist and owner of Highland Soils LLC.**
Services include:

- Conducting wetland delineations per State and Federal definitions.
- Designing and supervising wetland mitigation projects.
- Preparing Functions and Values assessments, biological evaluations and impact evaluations for residential and commercial projects in the State of Connecticut.
- Conducting laboratory analysis of soils and erosion control supervision.
- Performing Vernal Pool Surveys

1986-1987 — **Assistant Sanitarian, Assistant to the Town Planner, Town of Tolland, CT.**
Responsible for site testing for proposed subsurface sewage disposal systems, review of subdivision applications for compliance to wetland, subdivision and zoning regulations. Erosion control officer.

* Professional member of the Society of Soil Scientists of Southern New England since 1983.
* Certified Professional in Erosion and Sedimentation Control #2694

PROFESSIONAL RESUME

George T. Logan, MS, PWS, CSE

Principal Environmental Scientist/Senior Ecologist

EDUCATION:

M.S. Natural Resources, *Wildlife Management & Conservation Biology,* University of Rhode Island, Kingston, R.I., 1989.

B.S. Natural Resources, *Wildlife Management & Wetlands Ecology,* University of Rhode Island, Kingston, R.I., 1986.

Continuing Education

The Transportation Project Development Process: Training in the PennDOT Environmental Impact Statement Handbook, Harrisburg, PA, January 1994

Rapid Bioassessment Protocols of Aquatic Systems (EPA Protocols), Wetland Training Institute, Williamsport, PA, August 3-6, 1993

CERTIFICICATIONS: ***(current)***

Certified Senior Ecologist *(2014)* - The Ecological Society of America

Certified Professional Wetland Scientist (No. 581) *(1994)* - Society of Wetland Scientists

Registered Soil Scientist *(1989)* - Society of Soil Scientists of Southern New England

Certified Associate Wildlife Biologist *(1989)* – The Wildlife Society

EXPERIENCE:

Mr. Logan is the Co-Owner and *Principal Environmental Scientist* and *Senior Ecologist* for Rema Ecological Services, LLC. He specializes in tidal and inland wetland delineations and evaluation, permitting, wetland mitigation design, implementation and monitoring, and the preparation of environmental compliance documents in accordance with national (NEPA), state (e.g., CEPA, MEPA), and local criteria and guidelines. He also provides design, construction supervision and implementation for a wide variety of habitat restoration and enhancement projects. Mr. Logan performs watershed-wide and surface water quality evaluations and provides guidance in the design of stormwater Best Management Practices (BMPs), including stormwater wetlands and bioretention basins, as well as for LID (low impact development) practices.

Mr. Logan has nearly 27 years of experience as a wildlife biologist/ecologist conducting wildlife habitat evaluations and focused avian, mammalian, invertebrate, and herpetofaunal surveys using both active and passive methods. He frequently conducts targeted surveys for sensitive, rare, and "listed" species (i.e. endangered, threatened, special concern), and aquatic biosurveys to assess the biodiversity and biotic health of ponds, lakes, vernal pools, rivers, and streams. Mr. Logan has extensive experience in performing herpetological surveys, including over 175 vernal pool investigations and evaluations.

Mr. Logan has participated in nearly 2,300 individual projects in New England and the Mid-Atlantic States and in 157 of 169 municipalities in Connecticut.

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

PROFESSIONAL AFFILIATIONS:

Society of Soil Scientists of Southern New England
Society of Wetland Scientists
Association of Massachusetts Wetland Scientists
Ecological Society of America
The American Birding Association
The Wildlife Society
Soil & Water Conservation Society
Connecticut Association of Wetland Scientists (CAWS) *(Past-President, Charter member)*

PUBLICATIONS: ***(selected)***

Logan, G.T. & S.N. Gadwa. 1999. Quinnipiac River Watershed Association Stream Study. Water Quality in the Quinnipiac River. Proceedings of a Symposium on the Impact of Nonpoint Source Pollution in the Quinnipiac River Watershed, pp. 66-70.

Logan, G.T. & S.N. Gadwa. 1998. Stream Biosurveys: *A Primer.* Quinnipiac River Watershed Association Educational Series for the Adopt-the-River Programs.

Pawlak, E.M. & G.T. Logan. 1996. Town of Cromwell Wetland Evaluation Project. Connecticut Association of Conservation and Inland Wetlands Commissions. The Habitat, Vol. 10:1

Logan, G.T., F.B. Titlow & D.G. Schall. 1995. The Scientific Basis for Protecting Buffer Zones. Proceedings of the 16th Annual Meeting of the Society of Wetland Scientists.

Pawlak, E.M. & G.T. Logan. 1995. Town of Cromwell Wetland Buffer Zone Designation Methodology. Proceedings of the 16th Annual Meeting of the Society of Wetland Scientists.

Logan, G.T., J.H. Brown, Jr., T.P. Husband & M.C. Nicholson. 1994. Conservation Biology of the Cretan Agrimi (*Capra aegagrus cretensis*). Biologia Gallo-Hellenica, Vol. 21, pp. 51-57.

Nicholson, M.C., T.P. Husband, J.H. Brown, Jr. and G.T. Logan. 1994. Implications of behavior on the management of the Cretan Agrimi (*Capra aegagrus cretensis*). Biologia Gallo-Hellenica, Vol. 21, pp. 45-50.

WORKSHOPS & CONFERENCES: ***(selected)***

Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Corps Training Workshop. May 2011. *(sponsor, participant)*

Vernal Pools: *The Jewels of the Forest.* Technical Workshop for the Town of Southwick Conservation Commission. January 2005. *(Guest Lecturer)*

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

WORKSHOPS & CONFERENCES: ***(selected)***

The Importance of Habitat Edges. Riverside Landscaping Conference. The Rivers Alliance of Connecticut. June 1998. (*Guest Lecturer*)

Riparian Buffer Function, Performance & Limitations. Urban Riparian Buffers Conference & Technical Training Session. April 1999. *(Guest Lecturer)*

Sedimentation and Erosion Control Review Session. USDA. Natural Resource Conservation Service and CPESC (Certified Professionals in Erosion Control), Concord, NH. September 2001.

Buffer Strips as Storm Water Quality Controls. EnviroExpo, Boston. May 1999. *(Guest Speaker)*

Identifying Wetland Soils, Fauna and Flora. Municipal Inland Wetland Staff Technical Workshops. June 1999. *(Guest Speaker)*

Water Quality in the Quinnipiac River: A Symposium on the Impact of Non Point Source Pollution in the Quinnipiac River Watershed. November 1998. *(Presenter)*

Our Hidden Wetlands: Vernal Pools in Connecticut. Co-sponsored by CT DEP and the Center for Coastal and Watershed Systems. November 1997 and January 1998 *(Workshop Leader)*

Aquatic Invertebrate & Stream Ecology Workshop. Quinnipiac River Watershed Association Workshop Series. September 1997, May 1998, June 1999, January 2000 (*Workshop Leader*)

The Massachusetts Association of Conservation Commissions Third Annual Conference: Wetland Buffer Zones, March 1996 (*Guest Lecturer*)

16th Annual Conference of the Society of Wetland Scientists: Wetland Understanding, Wetland Education, May 1995 (*Presenter*)

Quinnipiac River Watershed Association Forum on Non-Point Pollution: Significance of Wetlands and Wetland Buffers, October 1992 (*Guest Lecturer*)

The Massachusetts Association of Conservation Commissions Second Annual Conference, April 1995 (*Guest Lecturer*)

The Society of Soil Scientists of Southern New England Riparian Buffer Zone Conference, November 1994 (*Presenter*)

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

SUPPLEMENTARY INFORMATION:

1996 to present

Rema Ecological Services, LLC
Principal Environmental Scientist/Ecologist, Co-Owner

- Founded the company to provide natural resources management, environmental planning, compliance and permitting services, and client advocacy throughout the Northeast.
- Has participated in over 1,800 individual projects since the company's inception, including four gas-fired, combined-cycle power plant projects, numerous municipal projects, including over 20 new schools, several higher education projects, numerous wetland replacement projects, and many large residential, industrial and commercial endeavors.
- Was the Interim Environmental Planner for the Town of Waterford, Connecticut, during a ten-month tenure. Responsibilities included providing procedural and technical support to the town's Conservation Commission (a.k.a. Inland Wetlands and Watercourses Agency), and working closely with Planning Department staff.

1994 to 1996

Fugro East, Inc. *(Currently AECOM)*
Senior Project Manager/Environmental Scientist

- Office Manager for the firm's Connecticut office, responsible for day-to-day operations, marketing, and business development.
- Wetland delineations in accordance with state and federal criteria.
- Natural resource inventories of upland, wetland and aquatic ecosystems, specializing in wildlife habitat assessments.
- Preparation of environmental compliance documentation for over 100 projects including large-scale commercial development.

1993 to 1994

A.D. Marble & Company, Inc.
Senior Environmental Planner/Wildlife Biologist

- Participated in the management of major transportation improvement projects and in the preparation of environmental documents in accordance with the National Environmental Policy Act (NEPA) while continuing involvement in the collection of baseline field data.
- Application of the Pennsylvania Department of Environmental Resources (PADER) hierarchical methodology for the selection of suitable wetland replacement sites.
- Field verification of Threatened, Endangered or Special Concern species listed by the Pennsylvania Game Commission.
- Wetland boundary identification in accordance with the unified PADER and U.S. Army Corps of Engineers (USACOE) methodology.
- Participated in nearly 30 projects, mostly for major transportation corridors, such as the rehabilitation of the I-95 corridor in PA.

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

SUPPLEMENTARY INFORMATION *(continued):*

1989 to 1993

Soil Science & Environmental Services, Inc.
Wildlife Biologist-Ecologist & Soil Scientist

- Project Manager responsible for field operations and report preparation for nearly 300 individual projects in over 75 towns in New England, including one town-wide wetland mapping, inventory and evaluation project (Town of Cromwell).
- Wetland boundary delineation according to state and federal criteria (e.g., Connecticut and Massachusetts Statutes, U.S. Army Corps of Engineers methodologies).
- Ecosystem analyses and biological inventories of upland areas, tidal and inland wetlands, estuaries, streams, rivers, ponds and lakes.
- Environmental impact evaluations, including site plan review, analyses of proposed impacts and design of mitigation strategies.
- Local, state and federal permitting for impacts to natural resources, including wetlands.
- Implementation of water quality monitoring programs for streams and rivers.
- Design, construction supervision, and monitoring of wetland enhancement, restoration and creation.
- Aquatic biosurveys of streams and rivers utilizing standardized methods (e.g. EPA Rapid Bioassessment Protocols).
- Detailed faunal surveys and censuses using both active and passive methods (e.g. direct and indirect observation, live-trapping, point count avian censuses, pellet counts, etc.).
- Expert witness testimony for court and administrative proceedings.

1988 to 1989

Independent Contracts
Soil & Wetland Scientist

- *Summer of 1988*: Was hired by the Town of Canton, CT to identify, inventory, and evaluate wetlands and watercourses within the entire municipality. Was responsible for amending the municipality's *Official Wetland and Watercourses Map*.
- *Spring of 1988*: Was hired by the Connecticut Chapter of the Nature Conservancy to determine and report on the historic expansion of invasive plants (*Phragmites australis, Lythrum salicaria*) on eight TWC preserves. Scope included site visits, remote sensing using archived aerial photographs, and report.

TECHNICAL REPORTS:

Mr. Logan has completed several hundred comprehensive studies (e.g. Wetlands Assessments, Ecological Evaluations, Environmental Impact Analyses/Statements, Vernal Pool Investigations, Listed-Species Surveys & Management Plans, aquatic vegetation surveys, and a variety of other specialized studies. A representative list of these technical reports can be provided upon request.

PROFESSIONAL RESUME

Sigrun N. Gadwa, MS, PWS

Principal Ecologist

EDUCATION:

M.S., Plant Ecology, Natural Resources, University of Connecticut, Storrs, CT, 1997.

B.A., Biology, Brown University, Providence, R.I., 1975.

Continuing Education

16 credit hours in Soil Science and Geology, 1993 – 2001
University of Connecticut, Storrs

Graduate course in Phycology, Pan American University, Brownsville, Texas, 1982

Arboriculture course, Quinnipiac College, Hamden, CT, 1984

Five Plant Pathology courses, Cook College, Rutgers University, New Brunswick, N. J. 1978 - 1979

Series of CT DEEP training workshops: Rapid Bioassessment techniques, & Stream Ecology Training Workshops. Bethany Laboratory & Field Sites. 1996 and 1997.

CERTIFICICATIONS:

Registered Soil Scientist,
Society of Soil Scientists of Southern New England

Certified Professional Wetland Scientist
Society of Wetland Scientists

EXPERIENCE:

An ecologist specializing in the assessment, monitoring, and delineation of wetlands and water resources, in assessment and control of invasive plant species, in botanical and habitat inventories of ecological communities, listed plants, and turtle populations. Nearly twenty five years of experience in site plan reviews, water quality testing and data analysis, preparation of comprehensive mitigation plans and habitat restoration/management plans, open space acquisition planning, highway alternatives analyses, delineation of jurisdictional wetland boundaries (CT and U.S. Army Corps of Engineers), wetland functional assessment & impact analyses, permitting, & low-impact landscaping/ IPM plans. Specialties in stream bio-assessments & wetland mitigation design.

PROFESSIONAL AFFILIATIONS:

Connecticut Botanical Society (Board of Directors)
Long Island Native Plant Initiative (Advisory Board)
Connecticut Invasive Plant Working Group (CIPWG)
Connecticut Association of Wetland Scientists
Society of Soil Scientists of Southern New England
Connecticut Ornithological Society
Ecological Society of America

Professional Resume: *(continued)*

Sigrun N. Gadwa, MS, PWS

PUBLICATIONS:

Lefor, M.W. Barklay, J.S. Cooke, R.S. Craig, S.N. Gadwa, T.S. Murray, April 1990. *Annotated Bibliography for Wetland Mitigation*. M.W.

P.H. Rich & R.S. Siegel. Dept. Civil Engineering. Joint Highway Research Council. Report NO. FHWA-CYT-RD-JH87-6-FAB-90-2. 112 pp.

August 1990. *Patterns of Herb Layer Species Association*. In Lefor, M.W. et al *Wetland Mitigation: Interim Report* No. CT-RD-JHR-90-8, The Transportation Institute, Storrs, Conn. 97 pp.

1994. *Forests.* In Chesanow et al. *Trails*. The Cheshire Land Trust and the Cheshire Environment Commission, Cheshire, CT 96 pp.

May 1995. *Wetland Mitigation: Botany.* Volume 1 of 6. Lefor, M.W. and S.N. Gadwa. Report No. JR95-241. Dept. Civil Engineering, Joint Highway Research Council, Transportation Institute, Storrs, Conn. 259 pp.

River Resources Education Series, Quinnipiac River Watershed Association, Meriden, CT.

May 1995	*New Haven Oysters.*
June 1996	*What Good are Streamside Woods*
August 1996	*Taking a Close Look at Streamside Woods*
June 1997	*Foraging in the Quinnipiac Estuary*
March 1998	*Stream Biosurveys* (G.T. Logan & S. Gadwa)
Sept. 2000	*Muddy Waters*

December 1997. *Plant Colonization Processes and Patterns along Shorelines of Man-made Mitigation Basins in Relation to Reproductive and Life History Traits.* MS Thesis. Dept. Ecology & Evolutionary Biology. Univ. of Connecticut, Storrs, CT. 181 pp.

1999. Logan, G.T. & S.N. Gadwa. *Quinnipiac River Watershed Association Stream Study.* Water Quality in the Quinnipiac River. Proceedings of a Symposium on the Impact of Nonpoint Source Pollution in the Quinnipiac River Watershed, pp. 66-70.

October 2000. *A Report on the Water Quality of the Quinnipiac River.* M. Tyrell, C. Cappannari, D. Galt, S. Gadwa, L. MacMillan, R. Walters. Report to the Steering Committee of the Quinnipiac River Watershed Partnership. Q.R.W.P. Water Quality Workgroup, New Haven, CT. 19 pp.

Winter 2003. *Management of Invasive Plants: On-Site Open Space Management.* The Habitat 15(2):3-4. Connecticut Association of Conservation and Inland Wetland Commissions, Inc.

Spring 2003. *Management of Invasive Plants: Protecting Open Space and Wetlands, Tools for Land Use Boards and Town Staff.* The Habitat 15(3):4-5. Connecticut Association of Conservation and Inland Wetland Commissions, Inc.

Professional Resume: *(continued)*

Sigrun N. Gadwa, MS, PWS

PUBLICATIONS:

July 2003. Interpreting Quinnipiac Songbird Surveys: Effects of Landscape Setting on Avian Community Composition. *The Connecticut Warbler*. 23(3):81-114.

June 2004. *Connecticut Turtles of Special Concern*. Quinnipiac River Watershed Association. 4pp. (with Tony Ianello)

Fall 2004, revised Fall 2005. S. N. Gadwa. *Preliminary Assessment of the Habitat & Historic Resources in North Cheshire, West of Route 10 & recommended Protection Measures.* The Cheshire Land Trust & the Habitat Workgroup of the Watershed Partnership.

October 2011 S. N. Gadwa & G.T. Logan. *The Scientific Basis for Wetland & Watercourse Buffer Zones*. 23 pp. White Paper. Rema Ecological Services, LLC.

WORKSHOPS & CONFERENCES *(selected)*:

ESA Mid-Atlantic Chapter Symposium, Blacksburg Virginia
Lessons for Mitigation Design from Shoreline Seedling Colonization Patterns April 12-14. 2012. (*Poster Presentation)*

New England Invasive Plant Summit, Framingham Massachusetts: Wetlands permitting – a potentially powerful tool to control invasive plants. September 19-20. 2003. (*Poster Presentation).*

Freshwater Mussel Workshop. New Hampshire Department of Environmental Conservation. August 2004.

Sedimentation and Erosion Control Review Session. USDA Natural Resource Conservation Service and CPESC (Certified Professionals in Erosion Control), Concord, NH, September, 2001.

Riparian Buffer Function, Performance & Limitations. Urban Riparian Buffers Conference & Technical Training Session. April 1999.

Environmentally Sensitive Development along the Ten Mile River. Riverside Landscaping Conference. The Rivers Alliance of Connecticut. June 1998. (*Guest Lecturer*)

Water Quality in the Quinnipiac River: A Symposium on the Impact of Non Point Source Pollution in the Quinnipiac River Watershed. November 1998. *(Presenter)*

Our Hidden Wetlands: Vernal Pools in Connecticut. Co-sponsored by CT DEP & Center for Coastal & Watershed Systems. November. 1997

Instructor: Quinnipiac River Watershed Association Workshop Series. September 1997, May 1998, June 1999, January 2000.

Professional Resume: *(continued)*

Sigrun N. Gadwa, MS, PWS

EMPLOYMENT HISTORY:

1999 to present

Rema Ecological Services, LLC
(an environmental science collaborative in Manchester, CT)

Principal Ecologist/Wetland Scientist
Ecological fieldwork and reporting: vegetation, invasives, and wetland inventories, site plan reviews; listed plant species searches, baseline biological data collection, wetland impacts assessment, vernal pool surveys, wildlife habitat monitoring, stream bio-assessments (EPA family level macro-invertebrate RBA protocol); preparing wetland restoration & mitigation plans and low impact landscaping plans; water quality monitoring; wetland delineation & boundary verification (ACOE plots); sedimentation & erosion inspections; over 140 projects.

Contractor for **CTDEP Wildlife Division**: vegetation and wetland inventories & mapping of large Wildlife Management Areas (WMAs). For the **Quinnipiac River Watershed Association**, developed purple loosestrife biological control program, and advisor for turtle monitoring program. Active in the Habitat Work Group of the **Watershed Partnership**, directed project to identify and document Quinnipiac watershed habitats in need of protection or restoration 1998 to 2003.

2003 to present

Ships Hole Farm Partnership, Smithtown, Long Island, NY
Partner

Responsible for vegetation management & invasives control; growing seed and nursery stock of native species (small scale at present). Assisting with other farm management.

1995 to 1999

Quinnipiac River Watershed Association, Meriden, CT
Executive Director and Staff Scientist

Development & coordination of volunteer monitoring program, including stream bioassessments, turbidity monitoring, and bird and wildlife surveys; site plan reviews of projects impacting the watershed; writing testimony, publicity, educational materials, and grant reports and applications; organizing canoe trips, ecology workshops, and clean-ups; liaison with town and state officials.

1991 to 1995

De Leuw-Cather, Inc., East Haven, CT
Environmental Planner/Field Ecologist

Field data collection, analysis, and report preparation, primarily for large highway projects; specialties included listed plant searches, wetland functional assessments, mitigation design, vegetation monitoring, & wetland delineation (ACOE method).

Professional Resume: *(continued)*

Sigrun N. Gadwa, MS, PWS

EMPLOYMENT HISTORY:
(continued)

1987 to 1991 — **University of Connecticut Department of Civil Engineering**
Storrs, CT

Wetlands Researcher

Part of an interdisciplinary team, studying man-made replication wetlands and natural reference wetlands. Took part in research design; collected vegetation, soils, & hydrologic data; literature searches; data analysis. Research used in producing a wetlands mitigation-related manual for the Connecticut Department of Transportation and for master's thesis.

1974 to 1975 — **Brown University, Teaching Assistant, Plant Systematics**

1968 to 1975 — **Long Island Nature Conservancy, Stewardship Volunteer**

Nature trail development & maintenance, botanical inventories, wrote preserve descriptions & self-guided nature trail brochures.