STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ENERGY FACILITY SITING BOARD

IN RE: INVENERGY THERMAL DEVELOPMENT LLC's	:	
APPLICATION TO CONSTRUCT THE	:	DOCKET No. SB-2015-06
CLEAR RIVER ENERGY CENTER IN	:	
BURRILLVILLE, RHODE ISLAND	:	

SURREBUTTAL TESTIMONY OF ANTHONY ZEMBA ON BEHALF OF THE TOWN OF BURRILLVILLE

INTRODUCTION

Q. Please state your name, business title, and business address.

A. My name is Anthony Zemba. I am a Senior Ecologist for Fitzgerald and Halliday, Inc. My business address is 416 Asylum Street, Hartford, CT 06103.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Town of Burrillville, Rhode Island as an expert witness in the field of ecology on issues related to the proposed Clear River Energy Center (CREC).

Q. What is the purpose of your surrebuttal testimony?

A. To respond to the rebuttal testimony, filed on September 1, 2017, of Mr. Jason Ringler and Mr. James Riordan who are witnesses for the Applicant, Invenergy Thermal Development, LCC. I am also responding to Invenergy's Biological Inventory Report Dated August 2nd, 2017 which I did not receive until August 7th, 2017. I was not able to complete a thorough review of that report in time to include my comments in my direct testimony, which was filed on August 7th, 2017. My review of the report is attached hereto in Exhibit A.

JASON RINGLER

Q. Have you reviewed the testimony of Mr. Ringler?

A. Yes.

Q. Have you reviewed other documents since your original testimony that have bearing on your surrebuttal herein? If so, which documents have you reviewed?

A. Yes, I have reviewed ESS's Biological Inventory Report for the Clear River Energy Center in Burrillville, Rhode Island. Dated August 2nd, 2017.

Q. What aspect of Mr. Ringler's testimony are you responding to?

A. I am responding to Mr. Ringler's testimony regarding wetland and biodiversity adverse impacts associated with the proposed CREC facility construction, and the proposed new access road construction and temporary laydown areas. This testimony does not include commentary regarding the adverse impacts associated with the related interconnect project described in EFSB Docket No. SB-2017-01.

Q: How have you structured your testimony?

A. I have structured my testimony in two (2) parts, based on the rebuttal testimony of Mr. Ringler. The two (2) sections are: (i) wetlands, and (ii) biodiversity/habitat. I will also respond to relevant sections of the supplemental advisory opinions.

I. WETLANDS ANALYSIS

Q. In your original testimony you testify that there will be significant adverse impacts to wetlands due to the facility's construction, access road construction, and temporary laydown areas. Mr. Ringler did not agree with you because the project has been designed to "*minimize both temporary and permanent disturbance of*

***wetlands*", and that "*temporary disturbances associated with access to construction staging areas has been kept to a minimum by avoidance and minimization measures wherever possible*". Considering Mr. Ringler's response, and additional information made available to you since your original testimony, do you still feel that significant adverse impacts to wetlands due to the proposed project would occur? Please explain why or why not.**

A. Yes. Significant adverse impacts to wetlands will occur. It is possible that minimization measures might reduce the severity of some of the adverse wetland impacts on the site, but in the realm of environmental impact analysis, *significance* is determined by context and intensity. In the case of the proposed CREC facility, there are two wetland resources identified on site as "Special Aquatic Sites". A Special Aquatic Site is defined by the State of Rhode Island Department of Environmental Management (RIDEM) as "*a body of open standing water, either natural or manmade, which does not meet the definition of "pond" but which is capable of supporting and providing habitat for aquatic life forms as documented by: A. presence of standing water during most years as documented on site or by aerial photographs; and B. presence of habitat features necessary to support aquatic life forms of obligate wildlife species, or the presence, documented use, or evidence of aquatic life forms of obligate wildlife species (excluding biting flies)*[1]". One special aquatic site would be completely obliterated due to the construction of the facility. The other would lose the forest cover surrounding it, rendering the supportive habitat for obligate vernal pool species inhabiting that pool severely degraded. Thus, all the obligate

[1] State of Rhode Island Department of Environmental Management Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act April 1998

seasonal pool fauna associated with these pools would lose suitable habitat, either directly or indirectly, as well. The associated loss of these resources and their dependent fauna and habitat is an example of significant negative impact that would neither be minimized nor avoided according to the current design plans, and thus represents a severe and unacceptable adverse environmental impact. Since they are the only two seasonal pools identified on the property, the loss of these pools in that context, coupled with the intensity of the impact, renders it a significant adverse impact.

Minimization measures described for other types of wetland resources on the site are also lacking in detail for certain important aspects, including the following:

Retaining walls along the access road: Although they can be effective in reducing the footprint of wetland fill, retaining walls will create an unacceptable barrier to low vagility species. Low vagility species are animals that are not highly mobile and typically do not travel long distances during their active seasonal periods. For instance, certain herpetofauna species, like turtles and salamanders, will be deterred from effective dispersal across the site due to the wall impediment.

Natural Bottom Culverts: There is no mention as to whether or not the culverts will include dry shelves above the level of the watercourse or if recommended openness ratios will be met. Both are necessary for the culverts to be effective.

Time of year restrictions for tree clearing: These are proposed for June-July. However, Mr. Ringler does not specify exactly what adverse impacts this avoidance measure is proposed to address. Regardless, the proposed restriction is insufficient to protect many of our year-round resident avifauna that tend to begin nesting earlier (March – May) such as Wild Turkey, Ruffed Grouse, Cooper's Hawk, American Woodcock, Barred Owl, Hairy Woodpecker, Pileated Woodpecker and a number of songbirds noted on site during the Biological Inventory work conducted by ESS. Both the Cooper's Hawk and the Pileated Woodpecker are designated on the list of Rare Native Animals of Rhode Island (RIDEM, 2006) as species of "Concern". Species with a "Concern" designation are defined as "*Native Species not considered to be State Endangered or State Threatened at the present time but are listed due to various factors of rarity and or vulnerability. Species listed in this category may warrant endangered or threatened designation, but status information is presently not well known*".

Some of the early-nesting species begin nesting as early as March and would be expected to be incubating eggs outside of (i.e., before) the proposed June-July restriction for tree cutting. Furthermore, May is an important time of year for songbirds. Resident songbirds and migrant songbirds alike (the former which are already nesting during this time period, and the latter that reach their peak migratory abundance in May) depend on the biomass of insects and insect larvae that are abundant in the various vegetation layers throughout the forest during that month.

Q: **Based upon your review of the application to alter freshwater wetlands, the biological inventory report, and other pertinent information, what is your professional opinion of the effectiveness of proposed compensatory wetland mitigation as a strategy to address the unavoidable harmful impacts to the wetland resources on the site and their supporting upland buffers that would occur if the project is licensed?**

A: The use of compensatory mitigation to address unavoidable harmful impacts to wetland resources is unacceptable due to the myriad of variables that combine to shape, form, and drive ecological processes. That is why compensatory mitigation is only used as a last resort – there is still no guarantee that all functions and values of the impacted wetland can readily be replaced at the mitigation site. It is the reason that so many mitigation sites do not meet their mitigation objectives, and it is the reason that the Army Corps of Engineers have developed Wetland In Lieu Fee and Mitigation Banking Programs in many states. Studies have shown that a majority of permittee-responsible wetland mitigation sites are underperforming and not meeting their mitigation objectives. With a site as complex and diverse as the proposed CREC facility site, assume that compensatory mitigation would be extremely challenging and would run a high risk of under-performance and failure.

II. BIODIVERSITY / HABITAT ANALYSIS

Q: In your original testimony, which was based upon your review of Invenergy's application to the RIEFSB, you stated that Invenergy has not sufficiently and accurately characterized the biodiversity of the site. Mr. Ringler does not agree due to the level of effort spent during the summer of 2017 when ..."*thirteen distinct field survey programs were conducted as part of [the] biological inventory*"... after having reviewed the *Application to Alter Freshwater Wetlands* and the *Biological Inventory Report*, are you now satisfied that the biological diversity of the site has been sufficiently addressed?

A: No. The information provided in the *Application to Alter Freshwater Wetlands* and the *Biological Inventory Report*, although helpful, is still lacking sufficient detail for certain taxa that including a number of rare native Rhode Island species. This information is crucial in order to fully understand the magnitude and scale of the resources that will be lost or harmed and what would be required to attempt to address the adverse impacts if the facility is licensed.

Q: How was the biological inventory report helpful?

A: It was helpful in that it confirmed my suspicion that many more species included on the list of *Rare Native Animals of Rhode Island* than were identified in the EFSB Application are expected to occur on the site. In the *Application to Alter Freshwater Wetlands* several native fauna species were identified by the applicant as potentially occurring on the site

based upon computer modelling. It has been my experience that these models are somewhat effective on a regional scale but are poor to fair predictors of the fauna that occur on a given site. Often, they identify species whose range does not overlap the project site and sometimes include species that have long been extirpated from a given state. The computer model generated a list of vertebrate fauna that could potentially occur on the site. The applicant's consultant reviewed the list and presented a refined version that included about 20 listed vertebrate species (a "listed species" is a species listed on the Rare Native Animals of Rhode Island list, revised March, 2006) that could potentially occur on the site. However, among these 20 listed species, some are known to be extirpated as breeding residents in the state long ago, and others are not expected to occur on the site because the site does not provide the species' requisite special habitat attribute(s). No predictive modeling was done for plants.

The *Biological Inventory Report* provided more information on the flora of the site and helped to remove some but not all of the uncertainty inherent in the computer-generated model output for fauna. The results of the *Biological Inventory Report* confirmed my suspicion that a variety of rare native animals of Rhode Island use the habitats of the site, and would be harmed if the construction of the facility is licensed.

Q: Can you provide an example of a listed species that would be harmed by the facility construction?

A: Yes. For one, the Black-throated Blue Warbler which is designated as "State Threatened" in Rhode Island. State Threatened species are defined as "*Native species that are likely to*

become State Endangered in the future if current trends in habitat loss or other detrimental factors remain unchanged. In general, these taxa have 3-5 known or estimated populations and are especially vulnerable to habitat loss" (RIDEM, 2006).

Q: How would it be harmed?

A: Through loss of suitable breeding habitat. The proposed facility would be developed in the core habitat on site that provides special habitat attributes required for breeding by this species.

Q: Where is the report still lacking in sufficient detail?

A: Some sampling efforts likely represent sufficient survey effort and have identified most species that occur on the site for the season in which the survey was conducted. For instance, the breeding bird survey results included a performance curve where the total cumulative number of species seen on site was plotted against the survey dates. One can see from the graph which is presented as Figure 10 in the Biological Inventory Report, that this was likely a sufficient effort to identify a majority of the birds that occur on the site during the breeding season as the "*Total Number of Species*" curve has begun to flatten out at about 64 species by the eighth site visit, while the "*Number of New Species Seen*" curve is at or near zero. However, similar curves were not produced for other taxa with large cumulative species lists such as plants and the major insect orders, so we do not know if the sampling efforts are sufficient to fully inventory those taxa. Many of those taxa have representative species that are rare in Rhode Island.

Q: Were proper sampling protocols used to inventory the biota on the site?

A: All materials and methods used appear to be legitimate methods of sampling the taxa they were used for and intended to sample. However, few biological sampling techniques alone are sufficient to identify all species in a given taxa. Two or more sampling techniques/methodologies should be used depending on the taxa being sampled. Due to the wide diversity of the taxon, the Lepidoptera are a prime example. Whereas direct observation and light trap surveys resulted in the identification of 131 species of moths, use of additional sampling methods (e.g., sheet lighting, mercury vapor lighting, bush-beating, bait traps, Malaise traps, etc.) would have likely added additional moth species to the cumulative list of species found on site, including species that may be identified as a Rare Native Rhode Island Species (RIDEM, 2006; 2016), or a Species of Greatest Conservation Need (SGCN) as identified in the Rhode Island Wildlife Action Plan (RI WAP, 2015) by RIDEM[2].

For instance, the Noctuid moth *Acronicta lanceolaria,* a species included on the *Rare Native Animals of Rhode Island* list with a "Concern" designation status (RIDEM, 2006), is best searched for on a given site by searching for their larvae in late spring by bush-beating shrubs and small oaks. This is because adults are rarely collected from light traps or bait. The larvae are not uncommon in suitable habitats (Schweitzer at al., 2011). ESS's surveys for Lepidoptera started after the peak occurrence of some early-emerging butterflies (e.g., many of the Lycaenids) and ended before some later-occurring species

[2] SCGN species are species that are declining in the state. They include threatened and endangered species, as well as many other species whose populations are of concern in the state because they are vulnerable to one or more threats, and are otherwise at risk of declining.

tend to be most abundant. For instance, the flight of Frosted Elfin (*Callophyrs [incisalia] irus*) occurs from late April to mid-June, while that of Hessel's Hairstreak (*Mitoura hesseli*) occurs from mid-May to mid-June. Both species are included on the list of Rare Native Rhode Island Species as ("Concern") (RIDEM, 2006) and are listed as Greatest Conservation Need in the RI WAP (2015). Further, the host plants of both species occur on site, so there is cause to believe they may exist on the site. September tends to be the best time of year to find many of the skippers (Hesperiidae). Unfortunately, the butterfly surveys did not extend past August. Only one grass skipper species was reported by ESS as a result of their Lepidoptera surveys.

For butterflies, ESS reported that more species were detected incidentally (n=14), than during taxa-specific surveys (n=6), and two additional species were noted by FHI during the July 26th site visit, calling into question the effectiveness of the taxa-specific surveys conducted by ESS for this insect Order. The two additional Lepidoptera species noted on the site by FHI that are not reported in the Biological Survey Report are as follows:

- Common Buckeye (*Junonia coenia*), and
- Northern Pearly-eye (*Lethe anthedon*) – which is listed as a Species of Concern on the *Rare Native Animals of Rhode Island* list (RIDEM, 2006).

The plant surveys focused on habitat(s) where rare plants, known to occur in the area by the RI Natural Heritage, would likely be found. A more comprehensive systematic sampling approach covering the whole site, should have been used. Multiple surveys conducted over early spring, late spring, early summer and late summer should have been

conducted to provide a proper botanical inventory, and species-sample curves should have been generated to show that the majority of plant species were, in fact, encountered as a result of the inventory efforts.

Additional effort to identify the reported *Crataegus* sp., *Lycopus* sp., and *Xyris* sp. to species level should have been conducted since these genera have representative species included on the Rare Plants of Rhode Island List (2016). This could result in additional listed species recorded for the site.

The above are just some of the major examples of the sampling protocol inadequacies. Additional information and discussion is provided in FHI's *Third Party Review of Biodiversity Information* report which is attached as **Exhibit A** and incorporated by reference in this testimony.

Q: In your opinion, has Invenergy conducted an appropriate comprehensive assessment of CREC's biodiversity impacts?

A: No. Due to the many problems with the sampling efforts discussed above and in my Report in Exhibit A, it is my professional opinion that the inventory does not provide sufficient, comprehensive coverage of all taxa that occur on the site, and their analysis of some adverse impacts was conducted using an insufficient metric.

Q: Mr. Ringler states that "*while a multiyear, multi-seasonal inventory may provide a more refined list of species, it would not change the fact that the local site (67 acres) habitat is currently used by a variety of bird, mammal, reptile, and amphibian species....*". What value would additional multi-year, multi-seasonal surveys serve at this point in the ecological assessment of the property?

A: A more complete picture of the flora and faunal community would provide additional detail regarding the magnitude and scale of harm that the proposed construction of the facility would have on the environment, especially the site's wetland and watercourse resources, and the multitude of rare Rhode Island fauna that inhabit the area. The additional information would benefit environmental regulators as it would better inform them as to why this project presents an unacceptable harm to the environment and should not be licensed as a result. If the project does get licensed the additional information would help to determine what would be required to address the adverse impacts whether it be through avoidance, minimization, or compensatory mitigation measures (if mitigation is even possible given the combination of species and habitats that would be adversely impacted).

RIDEM ADVISORY OPINION

Q: In RIDEM's advisory opinion to the energy facility siting board (as amended on July 2016), RIDEM states that "*the Rhode Island Resource Protection Project developed resource protection areas, one of which was the Moosup River/Western Blackstone Resource Protection Area, which includes the Chepacet, Clear River, and*

Moosup River Sub-Basins". **RIDEM also points out that the area inclusive of the site is identified as a land conservation priority area in RIDEM's 2010 state priority forest planning initiative. Do you, based upon the information provided to date, see evidence that supports the designation of the area inclusive of the site in these regional conservation planning initiatives?**

A: Yes. The site's habitats exhibit many indicators of Biological Integrity, Diversity, and Ecosystem Health (BIDEH) many of which are not present in smaller habitat blocks of urban, suburban, or even other rural areas. Indicators of BIDEH that occur on site include, but are not necessarily limited to, the following:

- Presence of Top Carnivores
- Use of the site by area-sensitive species
- Use of the site by species of varying trophic levels
- Use of the site by wetland-dependent species
- Use of the site by habitat specialists
- Use of the site by species indicative of excellent water quality
- Presence of rare plant and animal species representative of multiple taxa with state and federal conservation designations
- Low incidence and distribution of invasive plant species across the site
- Presence of varying microtopography and resulting in microhabitat formation, and
- There is still a high probability of encountering additional biota with state and even federal conservation designations on the site.

Q: Do you agree with RIDEM that the assumption of a 300-foot distance beyond the area of impact is insufficient to address indirect impacts to forest fragmentation?

A: Yes. The use of 300 feet is offered by some planners as an average metric of all potential adverse impacts to both the natural and built environment associated with highway corridor construction. It is used in order to assess multiple alignment alternatives for comparative purposes. However, in terms of biodiversity, many of the indirect adverse impacts are specifically associated with forest fragmentation. Therefore, metrics need to be used that address this specific adverse impact. For instance, the distance of recommended forest envelope that should be retained around a vernal pool ranges from 400 to 750 feet from the edge of the pool measured from the spring high-water mark (Calhoun and Klemens, 2002; Calhoun and deMaynadier, 2004). As another example, the distance from the forest edge that the incidence of Cowbird parasitism in forest songbird nests is significantly greater when compared to nests in forest interiors is nearly 2,000 ft (Wilcove, 1986). Thus, a more accurate metric should be used to assess indirect adverse impacts specifically related to forest fragmentation.

JAMES RIORDAN

Q. Have you also reviewed the testimony of Mr. James Riordan?

A. Yes.

Q. Have you reviewed other documents since your original testimony that have bearing on your surrebuttal herein? If so, which documents have you reviewed?

A. Yes, I have reviewed portions of the Stormwater Management Plan for Clear River Energy Center.

Q. What aspect of Mr. Riordans's testimony are you responding to?

A. I am responding to Mr. Riordan's testimony regarding the significance of wetland and biodiversity impacts associated with the discharge of stormwater generated from the proposed CREC facility construction, the new access road construction, and the temporary laydown areas. This testimony does not include commentary regarding the adverse impacts associated with the related interconnect project described in EFSB Docket No. SB-2017-01.

Q: You stated in your original testimony that the applicant has not addressed how stormwater discharge at the CREC facility will cause adverse impacts to biodiversity. Mr. Riordan said that the facility was designed to meet the requisite state standards for stormwater discharge and referenced the stormwater management plan that was submitted as part of the application to alter freshwater wetlands. If the stormwater system has been designed to meet the requisite design criteria protective of water quality criteria, does the system as it is currently designed, still present an unacceptable harm to biodiversity?

A: Yes, for the following reasons: 1) the development of the CREC facility would completely obliterate Special Aquatic Site (SAS) No. 1. The proposed stormwater

system forebay and the detention basin are proposed to be constructed approximately 50 feet southwest of SAS No. 2 which is depicted on Plan Sheet 01C302 to be at elevation 566 and 567. The proposed forebay and detention basin floor are depicted at elevation 561 and 558 respectively which means during construction, Special Aquatic Site (SAS) No. 2 could be drained as a result of construction of the stormwater system. Depending on when this construction would take place, (i.e., what time of year in comparison to the hydroperiod of that pool which is unknown at this point because p. 8 of the Sediment and Erosion Control plan says that timing will be left up to the contractor) the draining of that SAS could result in adverse impacts to obligate vernal pool fauna that use that resource for breeding and other life history stages. Construction dewatering could also impact SAS 3 (which is not depicted on the plans) and Biological Wetland No. 2. Under Section 2.1 of the Sediment and Erosion Control Plan (page 7) - "*Avoid and Protect Sensitive Areas and Natural Features*", SAS Nos. 2 and 3 are not included in the table under the column with the header that reads "Feature Requiring Protection", but they should have been.

2) Even if there was no impact from construction dewatering, the plan set shows the limits of disturbance at the site will surround SAS No. 2. If this "disturbance" is grading and land clearing, then SAS No. 2 would lose the supporting forested land cover surrounding the pool rendering it unsuitable for breeding obligate vernal pool fauna. The construction of the stormwater detention basin and forebay will also adversely impact the upland pool envelope to the northwest of SAS No. 3 located just across the property line to the south.

3) The Operation and Management plan provides a table (Table G-3, page 11) of grass species to be used for ground cover but three of the four species (Tall Fescue, Kentucky Bluegrass, and Perennial Ryegrass) are currently considered invasive to natural systems[3]and are therefore inappropriate.

4) Topsoils temporarily stockpiled on site are proposed to be reused after construction and final grading when the undeveloped portions of the site within the limits of disturbance are revegetated. This reuse would in all likelihood spread non-native invasive plants to other locations of the site where they currently do not occur. This is not acceptable.

5) Pollutant calculations for the discharged stormwater are provided for TSS, Phosphate, Coliform bacteria, etc. to show pre- and post-construction conditions. However, this has not been done for the entire suite of chemical compounds that typically occur in roadway runoff such as heavy metals, antifreeze, polycyclic aromatic hydrocarbons, total petroleum compounds, etc. Where these compounds enter the site soil, water, and sediment, they adversely impact the site biota.

Q: Based upon what you know so far, should a permit be issued for this facility?

A: No. The proposed facility would cause significant and unacceptable harm to the environment in that it would adversely impact biodiversity, including rare native Rhode

[3] https://www.invasiveplantatlas.org/grass.html

Island Species, and additional Species of Greatest Conservation Need . The proposed project would have direct or indirect adverse impacts on the myriad of native rare species known to occur on site. ESS reports "*Seventeen (17) state-listed species – including one state-endangered species, four state-threatened species, ten species of concern, and two protected species – as well as 47 Species of Greatest Conservation Need (SGCN) that were detected in the study area*". **I count eighteen (18) state-listed species** (with the addition of the Northern Pearly-eye that was seen and photographed by both Alex Patterson of ESS and me on the July 26th, 2017). **In addition, there are three additional plants reported only to genus level (*Crataegus* sp., *Lycopus* sp., and *Xyris* sp.) yet these genera include listed native rare species in RI.** Also, the host plants of two listed butterfly species occur on or proximal to the site raising the probability that two more listed species may occur on the site as well.

For SGCN species I count 48. Curved Halter Moth (*Capis curvata*) was not identified as an SGCN species in the ESS Biological Inventory Report. Eastern Cottontail (*Sylvilagus floridanus*) cannot be definitively identified as such in the inventory report since it was reportedly documented on site only by "sign". There is no reliable way to tell this species apart from the New England Cottontail (*S. transitionalis*) solely be sight or by sign of cottontail activity since the two species look so similar, raising the probability that yet another SGCN species may occur on the site.

The powerline right of way which will be disturbed and widened for the interconnect will likely yield additional state listed species and SGCN species as well. Since no

comprehensive, multiyear, multi-seasonal, multi-taxa surveys have been completed for the powerline interconnect, one cannot assess the magnitude and scale of adverse impacts that are expected from the proposed CREC facility. Due to the seasonal / temporal / and geographical limitations of the various sampling methodologies employed for the 2017 Biological Inventory, we have no idea just how many more rare species occur on the site.

Q. Does this conclude your surrebuttal testimony?

A. Yes.

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EXHIBIT A
REPORT OF FINDINGS
Third-Party Biodiversity Review of the Clear River Energy Project
Burrillville, RI
Anthony J. Zemba, CHMM
Certified Ecologist & Soil Scientist

1.0 INTRODUCTION & PROJECT UNDERSTANDING

Invenergy Thermal Development LLC (Invenergy) is a company that develops, owns, and operates power generating facilities across North America and Europe. Invenergy has proposed the construction of a natural gas-powered with oil back-up energy facility in the State of Rhode Island and Providence Plantations (RI). This facility is called the Clear River Energy Center which is proposed for construction adjacent to the Spectra Energy Algonquin Compressor Station site on Wallum Lake Road (State Route 100) in Burrillville, RI. Invenergy is currently requesting approval from the Rhode Island Energy Facility Siting Board (RIEFSB) for approval of this proposed facility.

The Town of Burrillville (The Town), the RIEFSB, and other stakeholders are currently assessing the potential environmental impact that could occur due to the construction of the proposed facility. The Town requested a third-party assessment of the biodiversity information that was presented by Invenergy's consultants – ESS Group – to the RIEFSB. On behalf of the Town, CDR Maguire (Client) contracted with Fitzgerald and Halliday, Incorporated (FHI) to assess the site conditions, review the RIEFSB Application and associated documents, and provide an expert opinion on likely biodiversity impacts associated with the construction of the facility.

This report provides details on my review of biodiversity information submitted by Invenergy to the Rhode Island Energy Facility Siting Board. It includes our findings, our evaluation as to the completeness, accuracy, and usefulness of the data presented and our professional opinion that due to the adverse environmental impact to biodiversity construction of the proposed facility would cause unacceptable harm to the environment including but not limited to the land and its wildlife and resources

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2.0 METHODS

FHI conducted a review of the environmental documentation submitted to Town of Burrillville regarding the potential impact to biodiversity at the current proposed location of the Clear River Energy Center (CERC) in Burrillville, RI.

2.1 Personnel

FHI's field work and data analysis was conducted by Anthony Zemba, a Sr. Ecologist (Certified Ecologist, Ecological Society of America; Certified Soil Scientist, New England Regional Certification, and Certified Hazardous Materials Manager, Institute of Hazardous Materials Management). Mr. Zemba's *Curriculum Vitae* is attached as **Appendix A.**

To conduct a thorough review of the submitted documentation, FHI completed the following:

2.2 Collection of Appropriate Background Information

FHI collected publicly available information pertinent to the conservation value status of the site. Such information was obtained, as available, from on-line sources and included the following:

- Mapped wetland resources depicted by the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping.
- Mapped surficial and bedrock geologic resources
- Topographic data and other site features as may appear on now or former site plans, etc.
- Biodiversity information available from on-line sources or the Rhode Island Natural History Survey for the State of Rhode Island and Providence Plantations.

Data acquired was used to guide our field observations during our site visits.

2.3 Review of the Invenergy's Environmental Documentation

FHI reviewed information pertaining to the biodiversity of the site presented in the following documents submitted to the RIEFSB:

- *Rhode Island Energy Facility Siting Board Application. Clear River Energy Center. Burrillville, RI.* Prepared for: Invenergy Thermal Development LLC. By: ESS Group, Inc. Dated October 28, 2015.

- *Invenergy Thermal Development LLC's Responses to The Town of Burrillville's 24th set of Data Requests in Regard to Invenergy Thermal Development LLC's Application to*

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Construct the Clear River Energy Center in Burrillville, Rhode Island. Docket No. SB-2015-06. Submitted by Adler Pollock & Sheehan P.C. Dated March 10, 2017.

- *Biological Inventory Report Clear River Energy Center Burrillville, Rhode Island.* Prepared for Invenergy, LLC Prepared by ESS Group, Inc. Dated August 2nd, 2017.

2.4 Site Visits to View the Site Resources

FHI Ecologists conducted two site visits to observe the site's resources described in the above documents. The purpose of the site visits was to verify site characteristics described in the submittals, determine if existing data gaps are present, and help inform our review of the information presented.

3.0 RESULTS

FHI's findings, based upon our review of the documents cited above and supplemented by our site visits, is presented in this section. In Section 3.1, we provide a general overview of the major over-arching issues associated with the biodiversity impacts. Section 3.2 identifies specific information / statements provided by Invenergy as it appears within their EFSB documents. The specific information / statement in question, the issue or concern associated with that statement, our understanding of the status of the issue or concern to date, and our professional opinions are presented in tabular form (Refer to Table 3-1) in this section. Further qualifying information to address noted data gaps is provided in Section 4.0, and conclusions are provided in Section 5.0.

3.1 General Findings - Major Biodiversity Issues of the Proposed CREC

Direct adverse impacts to wildlife would occur from the proposed CREC facility construction in Burrillville at Algonquin Drive due to resultant habitat loss, fragmentation, habitat degradation, or a combination of these factors. Habitat loss would be caused by development of the existing land area, or the onset of large scale changes in community composition. Direct loss and degradation of both upland and wetland habitat -- impacting wildlife -- would occur, and indirect adverse impacts would occur due to the expected changes in hydrology, light regime, proliferation of invasive species, and other impacts discussed herein.

Wildlife adverse impacts associated with the proposed facility would vary among taxa and depend on habitat conditions. The value of forest as habitat for wildlife is a direct function of the suitability of cover (structure and composition), feeding, and presence or absence of nesting or breeding areas. Changes to the quality and quantity of these areas will adversely affect the survivorship, fecundity, and other aspects of wildlife ecology which influence the sustainability of the population within a given area.

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Invertebrate fauna: Invertebrate fauna data presented in the EFSB application lacked the necessary detail to assess the invertebrate biodiversity of the site. The focus was on aquatic insects from stream sampling, and adult stage Odonata and Lepidoptera sampling. Data for various upland invertebrate taxa, invertebrates from special aquatic sites, and potential rare Lepidoptera is lacking. During site visits, host plants for two rare Lepidoptera species in particular were noted within or adjacent to the project area. Wild Indigo (*Baptisia tinctoria*), a perennial herb of dry, open woods and fields was found in the transmission line right-of-way (ROW). Cech and Tudor (2005) identify this plant as the host plant for the Frosted Elfin (*Callophrys irus*) which is a RI Threatened species of butterfly. Habitat for this species includes early successional shrubland containing the host plant. This hostplant, and the various nectar plants and other habitat attributes of the Frosted Elfin should be identified within and near the electric transmission line interconnection and gas line crossing and mapped for inclusion on site plans in order to determine if shrubland areas containing this host plant would be impacted by clearing and the construction of the interconnections. Likewise, Atlantic White Cedar (*Chamaecyparis thyoides*) – identified by Cech and Tudor (2005) as the host plant for the Hessel's Hairstreak (*Callophrys hesseli*) butterfly – was found in the northern limits of Wetland 2 at or proximal to the proposed transmission line ROW where it crosses the existing Algonquin Gas ROW.

During Odonata surveys conducted by ESS in the summer of 2017, one species of state-listed dragonfly was reportedly found by ESS personnel. The habitat requirements and special habitat attributes required for the various stages of this species' life history should be identified on the site and appropriate avoidance and mitigation measures need to be identified.

Additional sampling conducted by ESS in the summer of 2017 provided more data to address the lack of adequate invertebrate data in the ESFB application. Results of the 2017 Biological Survey sampling identified 147 species of Lepidoptera and 25 species of Odonata, and confirmed the presence of Arrowhead Spiketail - a RI Threatened species - on the site. Still, data gaps likely remain due to the sampling regimen. These data gaps are discussed in Section 4.0.

Herpetofauna: Direct adverse impacts to herpetofauna that will occur from this project include the destruction or alteration of foraging and breeding habitat, potential water quality degradation, or the creation of barriers to movement such as canopy gaps, steep embankments, road surfaces, retaining walls, etc. The filling or draining of wetland areas can lead to destruction of a major breeding habitat. Two Special Aquatic Sites (SAS) occur on site at two locations and a third is located just off site but adjacent to the property. These resources are ephemeral woodland ponds often referred to as "vernal pools." They typically fill with water in the early spring due to rainfall and snowmelt but tend to dry up by summer. There is a whole suite of fauna that is adapted to this unique hydrology -- some depend on it for survival and are referred to as obligate vernal pool species while others use these pools and other types of wetlands opportunistically and are referred to as "facultative" vernal pool species. Both obligate and facultative vernal pool species were observed by ESS in these pools. ESS documented these observations in the *Application to Alter Freshwater Wetlands* dated March 2017 prepared for Invenergy for the proposed CREC project. Clearing of forest

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cover from around these pools will adversely impact obligate and facultative seasonal pool herpetofauna by rendering the pool unfavorable as breeding habitat.

Forest dwelling species of herpetofauna that require two or more habitat types or a range of microhabitats are especially susceptible to fragmentation (Wilcove et. al.,1986). Examples of this requirement include certain salamanders and tree frogs that require ponds or pools for breeding and forested areas for shelter, or snakes that require certain areas that are suitable for hibernation and other areas suitable for foraging and breeding. Construction of a roadway through previously unfragmented forest blocks will pose a barrier to movement of certain herpetofauna. The degree of the adverse impact will depend upon the roadway characteristics.

The 2017 Biological Surveys conducted by ESS served to identify the herpetofauna in the project area that require two or more habitat types, forested habitats, or that disperse long distances and thus would adversely be impacted by new roadway construction. Illustrative examples of herpetofauna that require two or more habitat types and that were frequently encountered in the project area include the Wood Frog (*Lithobates sylvaticus*). This species is also known to disperse from its natal pool for distances that exceed 1,000 feet (Calhoun and Klemens, 2002; Calhoun and DeMaynadier, 2004). An illustrative example of a herpetofauna species that was also encountered within the project area that requires a range of microhabitats in both wetland and woodland settings includes the Eastern Box Turtle (*Terrapene c. carolina*) (Dodd, 2001). Eastern Box Turtle was reported to have been encountered by ESS during the Summer 2017 Biological Surveys.

Avifauna: As would be expected, species that require specific types of habitat or occupy narrow niches (specialists) are more susceptible to environmental disturbance than those which are more adaptable to changes in their environment (generalists). Both groups were noted among the avifauna of the proposed CREC site. Avifauna specialists noted within the project corridor generally included various forest interior specialists, habitat specialists (e.g., wetland dependent species), and top carnivores. Wetland-dependent species noted, such as the Veery (*Catharus fuscescens*), are susceptible to changes in wetland hydrology, vegetational composition, and other disturbances associated with wetland impact. A habitat specialist with a state Threatened designation, the Black-throated Blue Warbler (*Setophaga caerulescens*), would be directly adversely impacted by the footprint of the proposed facility and construction. This species is partial to nesting in dense stands of Mountain Laurel (*Kalmia latifolia*) (DeGraaf et. al., 1991) most of which occurs on site of the proposed facility and associated construction zones.

The loss of mature forest trees due to land clearing for the proposed facility would represent a loss of habitat for species preferring the taller trees of climax and later successional upland forests such as the Pileated Woodpecker (*Dryocopus pileatus*), a RIDEM Species of Concern. This species requires forest trees with a diameter at breast height (DBH) of over 18 inches (DeGraaf and Yamasaki, 2001) which were noted on site within the footprint of the proposed facility.

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Forest fragmentation resulting from the construction of the entrance road and utility ROWs will adversely affect certain bird species within the project area. Neotropical migrants are most susceptible to forest fragmentation, which may be one factor that has contributed to their well-documented nationwide decline (Wilcove, 1988; Askins 1995). Several forest interior species, composed of year-round residents, breeding resident neotropical migrants, and transitory Neotropical migrant species were noted within the project corridor during FHI's site visits and have since been documented by ESS's Breeding Bird Surveys which were conducted as part of the 2017 Biological Surveys. The species that prefer the interior of large tracts of un-fragmented woodland for breeding that were observed on site during site visits conducted in June and July are listed in Table 3-2 below. Some of these species have specific habitat requirements within these large forest blocks. Some are characteristic species of more northern woodlands and reach the southern limits of their range in the northern half of the state. Studies in mid-Atlantic states have shown that some specialist passerines have disappeared from historic breeding areas fragmented or reduced by increased urbanization (Wilcove 1988; Askins 1995).

Table 3-2. Bird Species Considered Forest Interior Habitat Specialists (Askins et al., 1987) Observed at the Proposed CREC Site

Common Name	***Scientific Name***	**Observed by**
Broad-winged Hawk	*Buteo platypterus*	FHI, ESS
Barred Owl	*Strix varia*	ESS
Hairy Woodpecker	*Picoides villosus*	FHI, ESS
Pileated Woodpecker	*Dryocopus pileatus*	FHI, ESS
White-breasted Nuthatch	*Sitta carolinensis*	FHI, ESS
Brown Creeper	*Certhia americana*	ESS
Veery	*Catharus fuscescens*	FHI, ESS
Hermit Thrush	*Catharus guttatus*	FHI, ESS
Black-throated Green Warbler	*Setophaga virens*	ESS
Cerulean Warbler	*Setophaga cerulea*	ESS
Black-and-White Warbler	*Mniotilta varia*	FHI, ESS
Worm-eating Warbler	*Helmitheros vermivorus*	ESS
Ovenbird	*Seiurus aurocapillus*	FHI, ESS
American Redstart	*Setophaga ruticilla*	FHI, ESS
Scarlet Tanager	*Piranga olivacea*	FHI, ESS

Among the list of forest interior species observed or expected to occur on the site during the breeding season, two species, the Barred Owl and the Broad-winged Hawk, are also considered area sensitive. These species not only prefer forest interiors, but also require large acreage within their home ranges inside the forest interior. Therefore, when considering adverse impact to forest interior birds due to habitat fragmentation, two thresholds apply: one for forest interior species and one for area-sensitive interior species.

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Generally, an area of 40± ha. (100± ac.) or greater is considered important habitat for forest interior species (Askins, personal communication). Moreover, the surrounding landscape will have an impact on the suitability of the small forest fragments to nesting birds. Forest fragments that are surrounded by intensely agricultural areas or dense urban areas will have less value to the reproductive success of forest interior species than forested fragments surrounded by other land uses. (e.g., rural residential, wetlands, or an interspersion of various rural land types) (Wilcove 1988; Askins 1995). This is due largely to the fact that many of the neotropical migrant forest interior bird species are sensitive to nest predation which occurs more heavily along edge habitat than within deeper forest interiors. In addition, rates of brood parasitism from the Brown-headed Cowbird (*Molothorus ater*) are typically higher at or near forest edges as well (Wilcove 1988). The effect of heavy predation and increased rates of brood parasitism will extend into the habitat block for as far as 300m to 600m (985 ft to 1,970 ft) (Wilcove et al. 1986). Therefore, an increase in forest edge habitat associated with the proposed facility due to the entrance road and the utility connections will increase the rates of brood parasitism by the Brown-headed Cowbird.

A threshold value of approximately 100 m (328 ft) is typically used in determining potential adverse impact to area sensitive forest interior bird species such as raptors. As top predators, raptors require larger home ranges within their preferred habitat type in order to acquire enough food to sustain a viable population.

Therefore, some avifauna species (forest interior dwelling, neotropical migrants, and other habitat specialists) will be adversely affected by fragmentation of the forest caused by the proposed facility and its utility connections. Others (habitat generalists) will be resilient to habitat disturbances (e.g. the catbird [*Dumetella carolinensis*] and Song Sparrow (*Melospiza melodia*)]. Still other species may benefit from forest fragmentation, usually to the detriment of habitat specialists. Disturbance may cause initial, short term increases in species richness. However, as generalists begin to out-compete (or parasitize) specialists, overall species diversity will decrease concurrently with the elimination of specialists.

Beyond habitat loss and fragmentation, additional adverse impacts (direct and indirect) attributed to forest bird communities typically associated with the proposed facility will also occur. They include noise aversion, visual impacts, pollution, and direct mortality. The effects of roadways on resident forest birds will vary with each species and their individual breeding ecology. An effects distance range of 60-300m (197-985 ft) from the road edge has been reported for a variety of forest birds adjacent to a moderately busy roadway due to traffic disturbance (Forman, 2003). Reijnen et. al., (1995) demonstrated that noise load is the most important cause of adverse impact (reduced breeding density) that roads have on woodland bird breeding populations. Birds that delineate their nesting territories via vocalizations (e.g., a majority of the forest songbirds) will avoid roadway edges to avoid competing with the noise of roadways during singing.

Other adverse impacts to avifauna from the construction and operation of the CREC facility will occur as well. Direct mortality of avifauna will occur from collisions with powerlines, the tall stack that would extend above the existing tree canopy, and plate glass windows if the latter is used within the proposed building.

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Small Mammals: Invenergy's application to the EFSB did not include direct observations of small mammals on the site, but provided a list of mammals expected to occur on the property based upon habitat type. The 2017 Biological Survey Report conducted by ESS provided additional information on the small mammal community, but still contains data gaps which are discussed further in Section 4.0.

Deforestation and conversion of native habitats to human development pose a threat to bat conservation. Deforestation and forest management practices that favor monocultures, even-aged stands, selective removal of dead and dying trees or a combination of these practices serves to eliminate or reduce the availability of roosting sites for a variety of tree-roosting bat species (Kunz et. al., 2003). Most of the tree-roosting bat species are uncommon to rare in the Northeast and are becoming rarer due to the impact of White-Nose Syndrome (WNS). Large contiguous tracts of forests covering a variety of soil types, slopes, and aspects resulting in high vegetation diversity and structure offer a range of roosting options (e.g., exfoliating bark, dense canopy, tree cavities, etc.). The diversity of vegetation structure and species composition (mostly native species) also contributes to a variety of food sources for the region's insectivorous bats. Therefore, the same forest conservation techniques identified to avoid or reduce adverse impacts to forest interior bird species will also benefit arboreal bats. They include: avoidance of clearing large contiguous forested habitat blocks, and protection of wetland and riparian habitats. Wetlands and watercourses not only provide a source of water to foraging bats but also produce an abundance of insect prey, and many bat species forage over open water or along watercourse features.

Enacting further conservation measures can help offset adverse impacts to forest canopy-roosting bats, such as retaining potential roost trees that are easily accessible to bats, that provide adequate insulation to roosting bats, or that have moderate to high levels of exposure to solar radiation. Often, suitable roost trees are those that protrude above the surrounding canopy, occur as large specimen or "wolf" trees adjacent to forest blocks or within forest gaps, have large trunk diameters or thick bark in order to provide better insulation to interior cavities, are still alive, and typically uncluttered by surrounding vegetation (Kunz and Lumsden, 2003). Artificial roosts are often used by cavity roosting bats in the northeast as well, since forest management practices in northeastern forests tend to eliminate natural roost trees forcing cavity nesting bats to look for alternative sites. These artificial roosts include bridges, bat houses, abandoned barns, silos, etc..

Larger Mammals: Loss of forest area will result in a decrease in the carrying capacity of the forest for sustaining larger mammalian species, especially predators. Top carnivores such as the Bobcat (*Felix rufus*), Gray Fox (*Urocyon cinereoargenteus*), and Fisher (*Martes pennanti*) are most susceptible to a loss of habitat area due to their large home ranges. All have been documented by ESS to have occurred on the site. The Bobcat is a RI Threatened species.

Adverse impacts to individuals of numerous wildlife species would occur because the proposed facility would invariably be constructed within the home ranges of large mammal species. As a result, individuals of some species will be forced to abandon the site and search for new territory where they may face severe competition from established individuals

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determined to defend their territory. In such cases the previously established individual typically has the advantage over the immigrant; however, competition may decrease the survivorship of both interacting individuals if the conflict occurs during periods of other environmental stress (e.g., drought, extreme temperatures, etc.).

The factors that influence mammalian diversity are likely similar to those that influence avifaunal diversity (previously discussed). Mammalian community composition is likely a function of size, floristic complexity and structure, and the presence of greater community diversity and microhabitat variability within the larger habitat blocks. Therefore, the greatest mammal diversity is expected to be within the largest forest habitat blocks, with smaller forest blocks providing a supporting role in population ecology (e.g., dispersal corridors, geneflow through metapopulations, etc.).

3.2 Specific Commentary addressing Invenergy's EFSB Application

This section addresses specific statements and information pertaining to Invenergy's Application to the RIEFSB. The application is divided into several sections, with Section 6.0 entitled "Assessment of Environmental Impacts". Since FHI was contracted to conduct a 3rd party review of the Application's assessment of biodiversity, our review and analysis is limited to Section 6.0 of the Application. Our review comments are presented in tabular form in Table 3-2. The table matrix provides a column for the subsection and page number where each issue was identified, followed by the issue itself, then pertinent background information and our conclusion in light of information received to date.

Our commentary is centered about the following:

- An evaluation of the methodologies, data and the information presented by ESS.
- A determination of the validity of conclusions presented by Invenergy's consultant's in the environmental documentation.
- FHI's professional opinion that due to the many adverse impacts that would occur to biodiversity, construction of the proposed facility would, based on the relevant information made available to date, cause unacceptable harm to the environment, including but not limited to the land and its wildlife resources.

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
6.1 – Air				
6.1.2 – Facility Emissions	Six criteria pollutants – two contributing to Ozone (O_3) non-attainment	O_3 is the most widespread air pollutant in the US, causing more damage to vegetation than any other air pollutant (Skelly et. al., 1987)	Adverse O_3 impacts to vegetation were not addressed.	Adverse O_3 impacts to vegetation should be addressed.
	Methane and other Green House Gases (GHG)	No mention of GHG emissions and adverse impacts	The adverse impacts to biodiversity from GHG emissions were not addressed.	Adverse impacts of these air pollutants to biodiversity should be addressed
p. 33	19 Hazardous Air Pollutants (HAPS) will be emitted	Ecological toxicity of certain HAPs above the Major HAP source threshold include; ▪ Naphthalene ▪ Nickel ▪ Propylene Oxide ▪ Toluene ▪ Xylenes	The adverse impacts to biodiversity from HAP emissions were not addressed.	The ecological toxicity of these contaminants should be addressed in addition to human health.
p. 33 & 39	Air Quality Impact Assessment (AQIA) Modeling Report	The AQIA is human-health based.	No mention of ecological risk	Everything provided for each air pollutant should also be done for ecological risk concerns as well
Page 39	The isopleths in the location and magnitude of the maximum predicted impacts for each modelled		No depiction of HAPs in comparison to ecological screening criteria (ESC) as well.	Show isopleths in relation to ESC for applicable receptor media.

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Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
	pollutant in averaging time			
			In the second paragraph: A risk assessment should also be done for ecological receptors.	Ecological risk assessment must address all pathways of exposure
p. 34	Stack Height of 200 feet	The height of the stack will create a supracanopy obstruction which poses a potential migratory bird and bat collision hazard (Sovacool, 2009)	Mitigation measures are not addressed	Invenergy needs to assess feasibility and effectiveness of available mitigation measures
6.2 Water				
6.2.1 / Page 40 - Groundwater	Construction Dewatering Impact on wetlands, and watercourses	Existing conditions. Reference is made to a shallow ground water table in the vicinity of the tributaries to Dry Arm Brook.	Groundwater withdrawal will have adverse impacts on the site's wetlands and watercourses.	The adverse impacts to the wetland and watercourse resources on site from groundwater withdrawal need to be addressed.
Page 42 - Groundwater	Construction Dewatering Impact on local water supply wells, wetlands, and watercourses	There is reference to dewatering during construction depending on the time of year that construction takes place.	Dewatering will have adverse impacts on the biological communities supported by these wetlands.	Adverse impacts should be determined and mitigation measures assessed.
Page 43 - Surfacewater	Intermittent stream hydrology and aquatic invertebrate resources	The second paragraph notes that two intermittent streams were not sampled because they were not flowing on July 23, 2015.	There are other sample methods that can be used if the stream is not flowing. Stream invertebrate communities should still have been sampled using alternative methodology.	Aquatic invertebrate diversity information may still have major data gaps

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Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
Page 43 - Surfacewater	Intermittent stream hydrology and aquatic invertebrate resources	On the third paragraph there is mention of canopy vegetation but no plant species are noted		Example species to illustrate / characterize the floristic composition should be included.
Page 43 Surfacewater	Intermittent Stream hydrology and aquatic invertebrate resources	The second to the last paragraph mentions that there are no fish in the reach of Iron Mine Brook that was sampled.	At what point downstream from the site does Iron Mine Brook sustain a fisheries? Do these fish species travel upstream to the site during times of higher flows?	Further information regarding fish passage must be provided for Iron Mine Brook, esp. due to the fact that downstream reaches may sustain a fisheries and could be directly adversely impacted from pollutants leaving the site
6.2.2 Surfacewater	Iron Mine Brook: *Cordulegaster* sp. identified during stream bioassessment	*C. obliqua* is listed in RI as a Species of Concern	Adult *C. obliqua* captured on site during Odonata surveys.	Site likely supports a breeding population of *C. obliqua.* No impact assessment was provided to address potential impact to this species due to land clearing and construction dewatering
	(2) unnamed intermittent streams (east)	No stream bioassessment data presented for these two streams; No impact assessment is provided to address potential impact to these streams due to	Aquatic invertebrate fauna remains un-sampled, therefore the contributions to the site's biodiversity from these streams is unknown.	Impact of the proposed facility on these habitats cannot be assessed due to the data gaps

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
		land clearing and construction dewatering		
	Unnamed perennial trib. to Dry Arm Brook	No stream bioassessment data presented for these two streams Sustaining hydrology - groundwater drawdowns for water usage and its potential adverse impact to this watercourse	Stream Bioassessment conducted during July 2017 Biological Survey	Modeling needs to demonstrate that there is no predicted adverse impact associated with construction dewatering, but this was not done.
	(2) unnamed intermittent streams (west)	No stream bioassessment data presented for these two streams; No impact assessment is provided to address potential adverse impacts to these streams due to land clearing and construction dewatering	Aquatic invertebrate fauna remains un-sampled, therefore the contributions to the site's biodiversity from these streams is unknown.	Adverse impacts of the proposed facility on these habitats cannot be assessed due to the data gaps
Section 6.2.2.2 - Page 45	Potential impacts to surface water	Adverse impacts associated with the removal of riparian vegetation along the banks of the streams resulting in increased light penetration to the streams. This would result in an increase to the water temperature in this reach resulting in negative impacts to fish, amphibians, and other	No mention of mitigation	Mitigation measures should be assessed and offered by applicant in the event the plant is licensed.

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
		aquatic organisms that inhabit the streams.		
Page 44 table 6.2–1	Macroinvertebrate taxonomic evaluation - Identification down to genus level only	Macroinvertebrate analysis down to the genus level identified the presence of the Odonata Genus *Cordulegaster* at one station. The species was not determined. In Rhode Island, the Arrowhead Spiketail is listed as a rare species with a "Concern" designation. It is found in semi-permanent streams and seeps in forested areas (Nikula, et al., 2003) – a description that fits conditions on site. The presence of a *Cordulegaster* species at station ID 1/1 needs to be further investigated to determine species.	Adult Arrowhead Spiketail was documented on site by ESS during the 2017 Biological Surveys	Requisite habitat and special habitat attributes used by this species should be identified on the site, delineated and depicted on site plans in order to assess potential impact to this rare species. Adverse impacts to these attributes need to be identified.
Page 64 (Figure 6.3–4)	Delineated wetlands - wetland numbers are missing from the Figure			Wetland numbers should be added to the figure depicted
Page 65	Presence or absence of Potential Vernal Pools on the site.	In the second paragraph, reference to the presence of water-stained leaves and drainage pathways suggest that vernal pools may exist	ESS identified the presence of special aquatic sites on the property in the *Application to Alter Freshwater Wetlands.*	

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
		within the boundaries of this wetland. However, no mention of vernal pools or vernal pool like characteristics are included in the wetland description on Page 66 (Section 6.3.3.1)	Supsequent to the application, a third resource was identified by RIDEM off site but adjacent to the site.	
	Palustrine forested wetlands	Mitigation constraints associated with permanent impacts to wetlands not included along with the description of wetland impacts for forested wetland conversion.		The temporal constraints to mitigating the loss of forested wetlands need to be addressed.
Page 65	Potential Vernal Pools and "perimeter wetlands"	There is reference to 1.39 acres of the perimeter wetlands associated with Wetlands 2, 3 and 4. The impact to the upland envelopes surrounding potential vernal pools (special aquatic sites or "SAS") on the property was not specifically assessed and should be addressed separately	Attributes of potential SAS resource and potential impact to their surrounding upland envelopes remains unaddressed	Adverse impact to the flora and fauna of obligate vernal pool species were not addressed in the EFSB Application

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Section Topic/ Pg. No.	Issue	Background Information	Concern	Conclusion
Page 66	Other permanent wetland impacts	No quantities for additional wetland fill are provided.	Additional wetland fill is expected due to pole foundations, gravel road access and installation of culverts. The area of adverse wetland impact could far exceed the area of impact associated with the building footprint	The complete magnitude and scale of wetland impacts associated with the project cannot be determined from the EFSB Application since these quantities are missing. Application is incomplete in this regard.
Page 69		The list of BMPs to be utilized in final design refers to reforestation. Under Item No. 11, it indicates that it is included as part of any wetlands reconstruction. However, it is not really "any" wetland reconstruction because the wetland portions that are bisected by the transmission powerlines will presumably not be returned to forested wetland.	Statement, as written, is inaccurate	
section 6.5.1 C Page 69	Vegetation - Oak Forest	The deciduous forest with ericaceous shrub understory is a vegetation community with a high potential for rare Lepidoptera yet that fact was not addressed in the RIEFSB Application	Lepidoptera sampling was subsequently conducted in Summer 2017. Results are provided in the Biological Survey Report	Results of sampling identified 147_species of Lepidoptera inhabiting the site, but data gaps remain in assessing Lepidopteran community. See further discussion in Section 4.0.

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Section Topic/ Pg. No.	Issue	Background Information	Concern	Conclusion
Page 70	Vegetation – Conifer Stand	The coniferous cover on site offers potential roosting habitat for owls, raptors, and rare bats	Application does not address whether or not searches have been conducted for owl roosts, nesting raptors, and rare bats in stands of conifers on the site.	Additional surveys for sensitive environmental receptors within stands of conifers are needed.
Page 70	Last sentence reads" "the primary vegetation species found at the site are given in Table 6.5–1".	What about species of conservation concern? Biodiversity conservation is not just the preservation of species that are listed as Threatened or Endangered in the State and by default, Federal, Endangered Species Acts, it is also about the conservation of species identified in the State's Wildlife Action Plan (RIDEM/TNC, 2015) as vulnerable to threat impacts such as land development. A comprehensive list of all plants at the site should have been provided. A comprehensive list of flora could only be composed as a result of multiple field excursions across different	Flora surveys were conducted in Summer 2017 to supplement Invenergy's RIEFSB Application	A list of plant species was provided in ESS's Biological Survey Report completed in August 2017. Data gaps remain due to notable constraints in the methodology used. Further commentary regarding this issue is provided in Section 4.0 below.

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Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
		seasons since the identification of many plants is dependent upon flowering parts and different species of plants flower at different time periods.		
Section 6.5 Page 72	Invasive plant colonization of disturbed areas: No mitigative measures proposed	The last two sentences of the second paragraph under Section 6.5.2 Construction Impacts identifies the potential for invasive shrubs to colonize the areas where the forest canopy has been disturbed (such as along the utility right of way) but offers no potential mitigation measures.	Examples of invasive species were presented but no assessment of their distribution and abundance is provided.	Mitigative measures such as active invasive species control or "edge sealing" using native plantings may help to prevent or reduce invasive species proliferation into the forest interior at the site (Cadenasso and Pickett, 2001). A list of invasive plant species identified at the site should be provided.

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
	Insecta - Very little information regarding upland species was provided in the RIEFSB Application	The listing of just three insects under the invertebrate section provides very little useful information. Information regarding this taxa should be greatly expanded.	Additional surveys for select insect orders (Odonata, Lepidoptera) were conducted in Summer of 2017, as was an additional stream bioassessment data point.	Results of sampling revealed the RI Threatened Arrowhead Spiketail dragonfly on site. Moth sampling revealed 131 species of moths, but data gaps remain. See further commentary in Section 4.0
Table 6.6–1/Page 73	Populations of obligate vernal pool species reside on site	The presence of Wood Frog observed on site suggests that vernal or seasonal pool wetlands exist in proximity to the site if not on the site, since Wood Frogs are obligate vernal pool species (Klemens, 1993). No information on the presence/absence of seasonal pools was provided in the report.	Vernal/seasonal pools information was addressed in the wetland application (Identified as "Special Aquatic Sites".	Mitigation measures should be proposed for direct and indirect adverse impacts to the seasonal pools. Although the pools themselves would not be directly impacted, development and land disturbances around the pools would render those resources unsuitable for obligate seasonal pool species.
Table 6.6–2/ p. 75	Wildlife species expected to occur at the proposed project site	Listing provided in the application is incomplete A number of indicator species representing multiple taxa are missing from the list of observed and expected fauna. Upland invertebrate (esp. Lepidoptera, Coleoptera,	A number of new sampling techniques were deployed to address wildlife usage on the property including baited game cameras and winter track surveys. Pitfall arrays set for amphibians and Sherman traps have also captured additional	Despite the additional sampling efforts and methodology, significant data gaps remain that could have been better addressed using relatively simple sampling methods in addition to the methods

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application				
Section Topic/ Pg. No.	**Issue**	**Background Information**	**Concern**	**Conclusion**
		Hymenoptera) are particularly under-represented in the information provided. Additional species are expected, especially Mustellid mammalian species, certain small mammals, and bats	small mammals. Results were presented in the 2017 Biological Survey Report	used. Further detail is provided in Section 4.0
Table 6.6–3 Page 77	Avian list appears incomplete	Additional forest interior species or species of conservation concern are expected to occur on the site than what was identified in the RIEFSB Application	Breeding bird surveys were conducted in the Summer of 2017 to further address this concern. Results were presented in the Biological Survey Report provided by Invenergy	Additional species of conservation concern were noted including Cerulean Warbler, Blackburnian Warbler, and Pileated Woodpecker, all of which are RI Greatest Conservation Need Species. Still other bird species that do not appear on the comprehensive species list provided by ESS in the Biological Survey Report were observed by FHI during the two site visits. See further discussion in Section 4.0
Section 6.6.3.4	Erosion & Sedimentation Controls	No commitment to maintenance of controls	No statement about the commitment to periodically inspect/monitor and maintain the controls is made.	Invenergy should commit to installation of E & S Controls, routine inspection of the controls and maintenance of the controls as needed

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Table 3-2. Issues, Concerns, Status and Conclusions Rendered by FHI Following Our Review of Invenergy's RIEFSB Application

Section Topic/ Pg. No.	Issue	Background Information	Concern	Conclusion
	Reuse of excavated soil materials on the site	Surplus soils used on site are a prime medium for invasive species colonization	Current plans are to re-use surplus soil materials on site	Effort should be made to prevent re-used soils from being colonized by invasive plants. A monitoring and management plan should be prepared for areas where surplus soils are re-used on site.

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4.0 OUTSTANDING DATA GAPS

The biological diversity information provided in the RIEFSB Application was inadequate to determine the status of biodiversity at the site. It did not present a complete "presence/not detected" level assessment of the site's Biological Indicators of Diversity and Ecosystem Health for the reasons stated in Table 3-2 above and further discussed in this section. A discussion of the conclusions presented in Table 3-2 follows below by respective taxa.

4.1 Flora

Proposed actions will directly adversely impact intact vegetation communities with low incidence of invasive species. Completeness of the surveys was constrained by the methodology, as it appears that Dr. Connelly was asked to focus on specific areas where representative habitat of rare species known to occur in the general vicinity of the site were reported by RIDEM.

Completeness of the flora surveys could not be assessed especially because a species-sample curve was not provided. In a species-sample curve, the cumulative number of species is plotted against the cumulative number of samples (Brower et al., 1989). As the curve flattens out despite an increasing number of samples (i.e., no new species are encountered) one can conclude that a sufficient number of samples were likely collected to determine the total number of species at a given site.

Revisits in additional seasons is needed because different flower species bloom at different times during the growing season and flower structure is often needed to identify a plant species to species level. Additional surveys conducted in the early spring and late summer/early fall would likely add a number of additional plant species to the cumulative list especially during the following time periods:

- Early spring for spring ephemeral species, and
- Late summer early fall for various goldenrods, asters, and other composites

In addition, the following is also needed:

- Transects across all impact areas should be conducted in order to provide a more complete coverage of the site.
- The *Xyris* sp., *Crataegus* sp., and *Lycopus* sp. identified on the site should be identified down to species level since there are species of these genera on the list of rare native flora of Rhode Island.
- The locations of host plants to Rhode Island listed Lepidoptera should be mapped on the project plans so that potential impact can be assessed
- The extent of Mountain Laurel coverage on the site should be mapped and depicted on site plans in relation to the impact areas in order to ascertain the amount of suitable breeding habitat for Black-throated Blue Warbler that would be lost .

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4.2 Invertebrates

Species-sample curves for the invertebrate surveys were not provided so completeness of Odonata and Lepidoptera sampling could not be assessed.

Additional insect orders were either not included in sampling or were overlooked, especially for upland species. Examples of insect orders of conservation concern include such diverse groups as Hymenoptera (ants, bees and wasps) and Coleoptera (beetles).

Special habitat attributes of Arrowhead Spiketail should be identified and the location of these attributes should be mapped on project plans in order to depict and assess potential impact to this State Threatened species.

Completeness of the invertebrate surveys was constrained by the methodology since only one sampling method was used. Use of additional sampling techniques for moth species is warranted. Use of additional sampling methods (e.g., sheet lighting, mercury vapor lighting, bush-beating, bait traps, Malaise traps, etc.) would have likely added additional moth species to the cumulative list of species found on site, including species that may be identified as species of conservation concern by RIDEM. For instance, the Noctuid moth *Acronicta lanceolaria* a species included on the *Rare Native Animals of Rhode Island* list with a "Concern" designation status (RIDEM, 2006) is best searched for on a given site by searching for their larvae in late spring by bush-beating shrubs and small oaks. This is because adults are rarely collected from light traps or bait. The larvae are not uncommon in suitable habitats (Schweitzer at al., 2011).

Another notable constraint to the moth sampling protocol is that only two nights worth of trapping for moths was conducted - one in early June and one in early July. That means that moths with early season and late season flight times would be missed. Various moth species listed as SGCN in the RI WAP are best searched for outside of the seasonal window covered by the moth sampling dates. For instance, the following genera all have representative species listed as SGCN in RI and are best searched for during late summer and early fall: *Papaipema* (2 spp.), *Catocala* (4 spp.), *Euxoa* (2 spp.).

For butterflies, two additional species were noted on the site by FHI that are not reported in the Biological Survey Report. These two additional species are as follows:

- Northern Pearly-eye (*Lethe anthedon*) – which has a "Concern": designation on the *Rare Native Animals of Rhode Island* list (RIDEM, 2006).
- Common Buckeye (*Junonia coenia*)

ESS's Surveys for Lepidoptera started after the peak occurrence of some early-emerging butterflies and ended before some later-occurring species tend to be most abundant. For instance, the flight of Frosted Elfin (*Callophyrs [incisalia] irus*) occurs from late April to mid June, while that of Hessel's Hairstreak (*Mitoura hesseli*) occurs from mid May to mid June. Both

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species are listed as species of Greatest Conservation Need in the RI WAP (2015), and the hosts plants of both species occur on site. September tends to be the best time of year to find Leonard's Skipper (*Hesperia leonardus*), Horace's Duskywing (*Erynnis horatius*), Wild Indigo Duskywing (*Erynnis baptisiae*), Zabulon Skipper (*Poanes zabulon*), and various migrant species such as Sachem Skipper (*Atalopedes campestris*), Fiery Skipper (*Hylephila phyleus*), Ocola Skipper (*Panoquina ocola*), etc. ESS's lepidopteran inventory wase completed by August, and only one grass skipper species was reported by ESS as a result of their Lepidoptera inventory. ESS reported that more butterfly species were detected incidentally (n=14), than during the taxa-specific survey (n=6), and two additional species were noted by FHI during the second site visit, calling into question the effectiveness of the taxa-specific surveys conducted by ESS for this insect Order.

4.3 Herpetofuana

No analysis of adverse impact to special aquatic sites (SAS or "vernal pools") was provided. On Figure 13 of the *ESS Biological Survey Report*, development would eliminate SAS 1 completely and disturbance is depicted all around SAS 2, which would result in the loss of the vernal pool envelopes, rendering these resources unsuitable habitat for obligate vernal pool species known to inhabit the site, some of which can disperse over a thousand feet from the pool (Calhoun and Klemens, 2002; Calhoun and deMaynadier, 2004). A number of SGCN species that use vernal pools were found to occur on the site. Two species (Wood Frog and Spotted Salamander) are obligate vernal pool species requiring vernal pools for breeding. Additional SGCN species noted on site will also frequent vernal pools but will also use other wetland types as well.

4.4 Avifauna

Sampling interval and distribution across the site and representative coverage appeared sufficient to characterize bird community for the breeding season of most species. However, the activity of some breeding birds occurs earlier than the surveys occurred (e.g., American Woodcock, Great Horned Owl). Therefore, additional breeding birds may have been missed. Further confirmation of breeding for species included on the list of Rare Native Animals of Rhode Island (RIDEM 2006) that were detected on site during the breeding season (e.g., Cerulean Warbler, Blackburnian Warbler, Worm-eating Warbler, Black-throated Blue Warbler, Dark-eyed Junco) is also needed.

Three bird species observed on the site by FHI that are not listed by ESS in the Biological Survey Report include the following:

- Eastern Kingbird (*Tyrannus tyrannus*)
- Spotted Sandpiper (*Actitus macularius*)
- Tree Swallow (*Tachycineta bicolor*)

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4.5 Mammals

Additional members of the Order Chiroptera would be expected than what was detected given the number of varying habitats on the site and expected migratory species as well. The survey period extended just 10 days from July 31st to August 9th and thus may have missed certain peak periods of concentration. Periods of concentration for migratory bat species are typically associated with mating, breeding, and hibernation or may occur during times of resource abundance (Feming and Eby, 2003).

To determine whether the New England Cottontail (NEC) occurs within the project corridor, mitochondrial DNA testing of fecal pellets conducted at locations identified to be occupied by lagomorphs should be conducted. Although suitable habitat is quite limited throughout much of the project area, NEC are often found within powerline ROWs that are vegetated with dense shrub coverage and could occur within the existing utility ROWs.

Besides Fisher, additional representatives of the family Mustellidae than were detected on site are expected to occur on the property. Given the size of the habitat block and surrounding supporting resource areas one would likely expect to find weasels, Mink, and possibly River Otter as well.

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5.0 CONCLUSIONS

The information presented by Invenergy for the proposed CREC facility is insufficient to fully understand the magnitude and scale of expected direct and indirect adverse impacts to biodiversity associated with the construction of the facility.

However, based upon the limited site visits conducted as part of FHI's third party review of the RIEFSB application and *Invenergy's Responses to The Town of Burrillville's 24th set of Data Requests,* the Wetland Application, and Invenergy's Biological Survey Report, the site's habitats exhibit many indicators of Biological Integrity, Diversity, and Ecosystem Health (BIDEH) and host species with state and federal conservation designations among a variety of taxa.

Indicators of BIDEH that occur on site include but are not necessarily limited to the following:

- Presence of Top Carnivores
- Use of the site by area-sensitive species
- Use of the site by species of varying trophic levels
- Use of the site by wetland-dependent species
- Use of the site by species indicative of excellent water quality
- Presence of rare plant and animal species representative of multiple taxa
- Low incidence and distribution of invasive plant species across the site
- Presence of varying microtopography and resulting in microhabitat formation

The supplemental information provided by ESS although helpful, is still an insufficient data set in which to assess impact to all taxa. There is a high probability of encountering additional biota with state and even federal conservation designations on the site. This is especially true within the areas that would experience unavoidable direct adverse impacts from loss of habitat or from habitat degradation anticipated to occur from the development.

Threats to biodiversity associated with the prosed CREC facility at Algonquin Drive include but are not necessarily limited to the following:

- Introduction, spread and proliferation of invasive plant species
- Loss of habitat for area-sensitive species
- Loss of habitat for Neotropical migrant avifauna
- Loss or degradation of habitat used by state-listed flora and fauna
- Direct impact to forest avian specialists that currently occur on the site
- Loss of supporting upland habitat for facultative and obligate seasonal pool breeding herpetofauna that currently inhabit the Special Aquatic Sites on the property
- Loss of connectivity to supporting lands adjacent and proximal to the site for lower vagility fauna
- Potential increased mortality to migratory bird and bat species

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Therefore, it is our professional opinion, based upon a reasonable of scientific certainty or probability that, due to the many adverse impacts that would occur to biodiversity, construction of the proposed facility would, based upon the information available to date, cause unacceptable harm to the environment including but not limited to the land and its wildlife and resources.

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6.0 LIMITATIONS

The information provided herein is based upon the review of documentation provided to us by Client, and observations made during limited site observations. The information presented herein reflect our understanding of the site, project status, and our professional roles in preparing the environmental reviews associated with this project. The information provided herein is subject to the following limitations and constraints:

1. In conducting our review FHI observed the level of care and skill generally exercised by other consultants under similar circumstances and conditions. FHI's findings and conclusions resulted in the formation of our professional opinion concerning the significance of the limited data gathered during the course of the review. No other warranty, expressed or implied, is made.

2. The purpose of this study was to assess the biological site conditions, subject to the terms and limitations of the contractual agreement as well as seasonally imposed conditions affecting the conditions and biological diversity present at the time of observation.

3. Our review of existing documentation was only for salient information presented and how it may or may not impact Biological Indicators of Diversity and Ecosystem Health (BIDEH).

4. Our review does not constitute a comprehensive assessment of the risk related to oil or hazardous materials (OHM) or an ecological assessment of potential contamination from the intentional or accidental discharge, loss, seepage, or release of OHM on or proximal to the premises in the past, currently, or in the future.

5. Our work did not include efforts involved with the preparation of, or application for any local, state, or federal wetland permits that may be applicable to the site, nor does it include a formal delineation of wetland and watercourse resource limits, or a verification of the same.

6. Our review did not include any detailed field surveys for state or federal listed species that may be known or reasonably be expected to occur on the site. Such surveys often require specific sampling methodology and equipment deployed during seasonably specific time periods, associated permit approval from natural resource protection regulators, and prior site screening efforts to determine sampling logistics.

7. The conclusions presented in the report were based solely upon the services described therein, The work described in this report was carried out in accordance with the terms and conditions of our contract for this project.

8. The conclusions and recommendations contained in this report are based upon the documents reviewed and supplemented by the limited number of observations made

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on the site as described in the report. There may be variations between these surveys and other past or future surveys due to inherent environmental variability.

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