

McGREGOR & LEGERE

ATTORNEYS AT LAW, P.C.

15 COURT SQUARE – SUITE 500
BOSTON, MASSACHUSETTS 02108
(617) 338-6464
FAX (617) 338-0737

LUKE H. LEGERE, ESQ.
E-mail: llegere@mcgregorlaw.com
(617) 338-6464 ext. 126

VIA EMAIL & HAND DELIVERY

November 22, 2017

Jonathan M. Sachs, Chair
Wayland Zoning Board of Appeals
Wayland Town Hall
41 Cochituate Road
Wayland, MA 01778-2614

RE: 113-119 Boston Post Road / Chapter 40B Comprehensive Permit Application

Dear Chairman Sachs and Members of the Board of Appeals:

This Firm represents Protect Wayland with respect to the Comprehensive Permit Application (the “Application”) filed with the Zoning Board of Appeals (the “Board”) by Eden Management, Inc. (the “Applicant”) pursuant to M.G.L. c. 40B, §§20-23.¹ The Applicant seeks approval of a 3-story, 60-unit, 89-bedroom² residential structure (the “Project”) on approximately 6.49 acres of land at 113, 115, 117 and 119 Boston Post Road (the “Property”).

We urge the Board to reject the Application and deny the Project a Comprehensive Permit for the reasons set forth below, and further detailed in the letters submitted herewith from Comprehensive Environmental, Inc. (“CEI”), Ecosystem Solutions, Inc. (“ESI”), and EBT Environmental Consultants, Inc. (“EBT”).

The Project’s design is utterly deficient, largely due to the Applicant’s decision to shoehorn an unreasonably large number of units into an environmentally sensitive site. As a result, the Project would cause significant environmental harm to unique and sensitive wetland Resource Areas, severely degrading valuable and rare wildlife habitat. It would also threaten the health and safety of residents and jeopardize the Town’s ability to meet its obligations to the U.S. Environmental Protection Agency under the NPDES Stormwater Program, as required by its General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s).

¹ Protect Wayland is a local grass-roots organization with a membership of approximately 225 Wayland residents.

² We note that the Application is inconsistent with respect to the number of bedrooms proposed for this Project. Section 9.0 of the Application states there are 89 bedrooms, while Section 5.0 reflects a total of 96 bedrooms (6 studios, 24 one bedrooms, 24 two bedrooms, and 6 three bedrooms).



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In short, the Project as proposed cannot be adequately conditioned to ensure protection of important local concerns relating to the environment and public health and safety. Many of the Applicant's requested waivers would only exacerbate these harms by removing important local safeguards intended to promote public health and safety and protect the environment.³

MASSACHUSETTS COMPREHENSIVE PERMIT ACT

The state Legislature's intent in developing the Comprehensive Permit Act, M.G.L. c. 40B, §§20-23, was " 'to provide relief from exclusionary zoning practices which prevented the construction of badly needed low and moderate income housing' in the Commonwealth." *Standerwick v. Zoning Bd. of Appeals of Andover*, 447 Mass. 20, 28-29 (2006). A rebuttable presumption that regional affordable housing need outweighs local concerns exists where a municipality's stock of low and moderate income housing is below ten percent. *Zoning Bd. of Appeals of Canton v. Housing Appeals Comm.*, 76 Mass.App.Ct. 467, 469-470 (2010).

This does not mean, however, that the Board must simply "rubber-stamp" its approval on any comprehensive permit application to come before it. To the contrary, the Board may "deny a Comprehensive Permit as not Consistent with Local Needs if the Board finds that there are no conditions that will adequately address Local Concerns." 760 CMR 56.05(8)(b)(3). The Legislature charged the Board to balance the need for affordable housing "against the statutorily authorized interests in the protection of the safety and health of the town's residents, development of improved site design and building design, and preservation of open space." *Zoning Bd. of Appeals of Canton*, 76 Mass.App.Ct. at 31.

The Board has significant other review powers as well, including downscaling the Project and denying waivers. The Board may review the Applicant's *pro forma* or other financial submittals to determine whether reducing the number of the Project's proposed dwelling units would render it uneconomic where reduction is "justified by a valid health, safety, environmental, design, open space, planning, or other local concern that directly results from the size of a project on a particular site" 760 CMR 56.05(6)(a)(4). The Board may also deny the Applicant's requests for waivers from local rules and regulations unless and until it has proven that application of those requirements would render the Project uneconomic.⁴ 760 CMR 56.05(6)(b).

Even if the municipality's stock of low and moderate income housing is below ten percent, denial of a comprehensive permit may be upheld "as 'reasonable and consistent with local needs' if the community's need for low or moderate income housing is outweighed by valid planning objections to the proposal based on considerations such as health, site, design, and the

³ The Applicant has submitted a 9-page list of waiver requests seeking to avoid compliance with many important local bylaws including Wayland's Stormwater and Land Disturbance Bylaw, Wetlands and Water Resources Bylaw (as well as general Bylaws dealing with enforcement, Riverfront Area, and Streams), Board of Health Regulations (including regulations regarding groundwater testing and septic system design and siting) and numerous provisions of the Zoning Bylaw.

⁴ The October 26, 2017 letter to the Board from the Wayland Planning Board details the process for considering whether to grant requested waivers.



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need to preserve open space.” *Hingham v. Department of Hous. & Community Dev.*, 451 Mass. 501, 504 n. 6 (2008) (quoting *Zoning Bd. of Appeals of Greenfield v. Housing Appeals Comm.*, 15 Mass.App.Ct. 553, 557 (1983)).⁵ In other words, a board may “justify denying an application for a comprehensive permit by identifying a health or other local concern that (i) supports the denial, (ii) is not adequately addressed by compliance with State standards, and (iii) outweighs the regional housing need.” *Reynolds v. Zoning Bd. of Appeals of Stow*, 88 Mass. App. Ct. 339, 348 (2015).

For example, the Massachusetts Appeals Court rejected a decision by the Stow Zoning Board of Appeals to grant waivers from local waste disposal limitations set forth in its zoning bylaw. *Reynolds v. Zoning Bd. of Appeals of Stow*, 88 Mass. App. Ct. 339 (2015). The Court noted that “in many instances” a permit condition requiring compliance with state standards may be “sufficient to protect local concerns,” but cautioned that “[c]ompliance with State standards ... is not necessarily the end of the inquiry.” *Id.* at 348. In that case, evidence that the project’s septic system “would contaminate the groundwater such that unacceptable levels of nitrogen would reach an abutter’s well demonstrates that compliance with the State standards ... are insufficient to protect the groundwater from being contaminated by the proposed project.” *Id.* at 349-350. Consequently, the plaintiff succeeded in identifying “an important local health issue, maintaining clean groundwater servicing local private wells, that is not adequately protected by compliance with applicable State standards.” *Id.* at 350.

Therefore, the Board should not feel pressured into granting waivers from important local rules and regulations regarding public health, safety, or other local concerns, or granting a conditional approval of the Project based upon compliance with state standards. The Board is authorized to deny the Applicant’s waiver requests unless and until it is satisfied that those waivers are necessary to make the project economic.

If the Project as proposed cannot be adequately conditioned to address Local Concerns, the Board may deny a Comprehensive Permit or explore whether the number of dwelling units could be reduced without rendering the Project uneconomic.

THE PROJECT WOULD GENERATE EXTREME AND UNWARRANTED IMPACTS TO JURISDICTIONAL WETLANDS, RIVERFRONT AND WILDLIFE HABITAT

Pine Brook, a designated cold-water fishery, runs along the southern portion of the Property. Consequently, a majority of the Property lies within the 200-foot Riverfront Area associated with Pine Brook.⁶ Work within jurisdictional Riverfront Area is governed by the Rivers Protection Act and its implementing regulations, promulgated by the Massachusetts Department of Environmental Protection (“MassDEP”) and set forth at 310 CMR 10.58.

⁵ Here, as demonstrated in the Board’s record by submittals from Town officials and boards, the Town of Wayland has in recent years made significant progress toward achieving its ten percent minimum.

⁶ Riverfront Area is defined as “the area of land between a river’s mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away ...” 310 CMR 10.58(2)(a).



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In addition, the Project must satisfy applicable performance standards for work in other jurisdictional wetland Resource Areas on the Property. 310 CMR 10.58(4)(a). At a minimum, the Property contains jurisdictional Bank, Land Under Water, and Bordering Land Subject to Flooding (“BLSF”, the boundary of which follows the FEMA flood zone on the Property) associated with Pine Brook.⁷

Pine Brook is a perennial stream of exceptionally high quality, and provides valuable and unique wildlife habitat, as established in the November 21, 2017 report prepared by EBT. The stream’s water quality and habitat value have been documented by state environmental agencies for decades. The Project would result in extensive, substantial degradation to these values, as discussed in the November 22, 2017 letter from ESI.⁸

Riverfront Area is considered critical to the protection of interests including private or public water supply, groundwater, flood control, storm damage prevention, protection of wildlife habitat, protection of fisheries, and pollution prevention. 310 CMR 10.58(1). The MassDEP regulations establish a presumption that Riverfront Area associated with Pine Brook is significant to protection of these interests. 310 CMR 10.58(3).

MassDEP’s regulations for Riverfront Area establish different standards and requirements for work in undeveloped Riverfront Area and redevelopment in previously developed Riverfront Areas. 310 CMR 10.58(4-5). Redevelopment is defined as “replacement, rehabilitation or expansion of existing structures, improvement of existing roads, or reuse of degraded or previously developed areas.” 310 CMR 10.58(5). “A previously developed riverfront area contains areas degraded prior to August 7, 1996 by impervious surfaces from existing structures or pavement, absence of topsoil, junkyards, or abandoned dumping grounds.” 310 CMR 10.58(5).

The Applicant apparently intends to argue that virtually all work associated with this Project qualifies as redevelopment within previously developed Riverfront Areas, but has not substantiated that position with mapping or other diagrams.⁹ Even assuming, *arguendo*, for the purposes of this letter only, that all work associated with this Project qualifies as redevelopment within previously developed Riverfront Areas, the Applicant would not have a legal right to construct the Project in the Riverfront Area.

⁷ The Applicant has not filed a Notice of Intent with the Wayland Conservation Commission, and has included very little information in its Application regarding the nature and extent of wetland Resource Areas on the Property, so there may be additional Resource Areas affected by the Project of which we are presently unaware.

⁸ As noted in CEI’s letter, although the Property is not within a NHESP priority habitat, Pine Brook flows directly into an NHESP protected habitat (adjacent to Sandy Burr County Country Club) for plants, amphibians, and birds.

⁹ The Applicant’s Stormwater Report attempts to establish that the Project would actually decrease impervious surface at the site, an assertion that appears to ignore or badly mischaracterize the Property’s existing conditions. In a November 6, 2017 memorandum to the Board, Wayland Conservation Administrator Linda Hanson has estimated that only about 5,000 square feet of the Property’s inner 100-foot Riverfront Area is degraded under existing conditions.



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A conservation commission, at its discretion, “may allow work to redevelop a previously developed riverfront area, provided the proposed work improves existing conditions.” 310 CMR 10.58(5).

The MassDEP regulations, 310 CMR 10.58(5), establish the following criteria for proposed redevelopment in previously degraded Riverfront:

- “At a minimum, proposed work shall result in an improvement over existing conditions of the capacity of the riverfront area to protect the interests identified in” the state Wetlands Protection Act;
- The Project must comply with and satisfy MassDEP’s stormwater management standards;
- “Proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less, or not closer than existing conditions within 25 foot riverfront areas” (unless sufficient on-site or off-site restoration or mitigation is provided);
- “Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river” (unless sufficient on-site or off-site restoration or mitigation is provided); and
- “The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area” (unless sufficient on-site or off-site restoration or mitigation is provided).

The Project fails to satisfy any of these standards for redevelopment, which are less restrictive than those for work in undeveloped Riverfront.

First, there is nothing in the Application to suggest that the Project as proposed would improve the Riverfront Area’s existing conditions or its capacity to protect wildlife habitat, fisheries, groundwater, water supply, to prevent storm damage or pollution, or to provide flood control. To the contrary, the Project proposes extensive new alteration within jurisdictional Riverfront Area, including two septic leaching fields, building foundation, underground garage and foundation, the structure itself, infiltration basin, septic tanks, extensive regrading and a very large volume of fill necessary for septic system construction. Many trees would also be cut down. The “construction area” in the Application’s Site Plan is located within ten feet of Pine Brook in a number of areas and closes to within two feet at one point.

Second, as detailed in the November 22, 2017 letter from CEI, the Project’s stormwater management system is not adequately designed and fails to comply with state standards. Specifically, the Application does not reflect compliance with Massachusetts Stormwater Management Standards, including standards 4 (requiring treatment of runoff from all impervious surfaces for at least 80% TSS removal) and 6 (applicable to Critical Areas like cold-water fisheries). The design is flawed in other ways, including underestimating the volume of stormwater to be handled by failing to account for flows that originate off-site and for snow



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storage. Furthermore, the Stormwater Report skews the data in favor of the Applicant by overestimating existing flows and underestimating post-development flows. As a result, the Applicant has failed to properly mitigate the Project's stormwater impacts on and off of the site, including impacts to Pine Brook and the wildlife that relies upon it for habitat.¹⁰

Third, the Applicant proposes work closer to Pine Brook than existing conditions, and according to the site plan, the "construction area" would come within approximately 2 feet of Mean Annual High Water.

Fourth, the Project would greatly surpass the amount of existing degraded Riverfront Area, with alterations far in excess of 10% of the Property's Riverfront Area.

Finally, the Applicant has not proposed any restoration or mitigation (indeed, the Project design leaves no space for on-site restoration or mitigation), and is not entitled to benefit from the more lenient standards that apply where restoration or mitigation is part of a project.

It also appears that the Project fails to satisfy performance standards for work within, or in the Buffer Zone to, Bank, Land Under Water, and BLSF on the Property (as noted above, there may be other jurisdictional wetland Resource Areas on the Property).

It is critical that the precise boundary of BLSF be identified to address inconsistencies between the FEMA mapping and the Property's topography. Regardless, the Applicant must provide compensatory flood storage for "all flood storage volume that will be lost as the result of a proposed project within" BLSF where "said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows." 310 CMR 10.57(4)(a)(1). The Project must not restrict flows as to cause an increase in flood storage or velocity, nor impair wildlife habitat functions. 310 CMR 10.57(4)(a)(2-3).

The Applicant has offered no evidence that any of these standards can or will be met for this Project. In light of the amount of fill required for the proposed septic system, size of foundations and underground garage, and other work proposed in BLSF, the Project will result in a significant loss of flood storage.

In our opinion, the Board would be warranted in issuing a denial of the Project based upon the irreparable harm that the Project as proposed would cause to the natural environment and related threats to public health and safety. At a minimum, the Board should deny the Applicant's request for waivers from local wetlands bylaw and stormwater regulations, and condition any approval on compliance with all state and local wetlands and stormwater laws and regulations.

¹⁰ As explained in CEI's letter, the ZBA should not grant a waiver of the application of the Stormwater and Land Disturbance Bylaw, which ensures that the Town of Wayland is able to comply with federal regulations. Specifically, the Town is required to regulate stormwater discharges pursuant to the US EPA NPDES Program General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). Waiver of this Bylaw may impair the Town's ability to manage stormwater discharges in compliance with its federal permit; compliance with state law would not be sufficient to protect this important local concern.



THE PROJECT'S SEPTIC SYSTEM FAILS TO SATISFY STATE AND LOCAL DESIGN REQUIREMENTS AND IS TOO CLOSE TO PINE BROOK

MassDEP requires that the Project's septic system be designed to accommodate a flow of 110 gallons per day (gpd) for each bedroom. 310 CMR 15.203. As noted above, the Application contains conflicting information on whether the Project would include 89 or 96 bedrooms.¹¹ If 89 bedrooms is the correct number, the septic system must be designed to accommodate at least 9,790 gpd, based upon bedrooms alone (it seems likely that other aspects of the Project – such as the management office, conference rooms, work bar, multi-purpose room, and pet grooming facility – would push the total design flow over 10,000 gpd).

The Application indicates that the Project will generate approximately 4,450 gpd of wastewater requiring treatment, but no supporting information is provided to substantiate this number. The Applicant must provide an explanation for this number, which equates to a flow of only 50 gpd per bedroom, less than half of the 110 gpd required under Title 5.

The Applicant's proposed system is designed to accommodate a design flow of only 9,900 gpd, which would barely be large enough to accommodate 89 bedrooms alone, assuming that the Project generates no other wastewater.

Soil and percolation testing at the Property generated mixed results, reflecting a variety of soils and percolations rates. CEI pointed out fundamental mistakes in the forms included in the Application.¹² Soil testing was conducted during the winter months, outside of the time allowed by the Wayland Board of Health Regulations. Both CEI and the Board of Health have noted that there are insufficient deep test pits to support the system's design.

Furthermore, the Wayland Board of Health Regulations require a design flow of 165 gpd per bedroom. They also require a 100-foot setback from wetlands for a Project of this magnitude (over 1,000 gpd). The Project as designed would place the leaching areas (and associated work and features) approximately 59 feet from Pine Brook.

In other words, the Applicant has not performed the basic design work or provided the fundamental information necessary to establish that the proposed septic system has been properly sited pursuant to state and local law.

These regulations are particularly important in light of Pine Brook's unique characteristics and designation as an important cold water fishery providing habitat for native Eastern Brook Trout. Wastewater is relatively warm compared to naturally-occurring groundwater, and the proximity of the two large septic leaching areas to Pine Brook creates an

¹¹ If the Project is for 96 bedrooms, its septic system must be designed to accommodate at least 10,560 gpd, and would require the Applicant to obtain a Ground Water Discharge Permit from MassDEP pursuant to 314 CMR 5.00.

¹² The Applicant's forms indicate the test pit data is from Brookfield, Mass., and Figure 1 accompanying the test pit data shows more than one location for TP-8.



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unjustifiable risk to the stream's habitat value and water quality in general.¹³ Specifically, this increases the likelihood of phosphorous and nitrogen loading into Pine Brook, which may trigger algae growth, as discussed in the November 22, 2017 letter from ESI.¹⁴

In addition, introduction of a large volume of fill, creation of steep slopes, removal of large mature trees (which provide important shade to Pine Brook to maintain the low water temperature in the summer), and impairment of natural vegetation all in close proximity to Pine Brook will further threaten to raise the water temperature and otherwise degrade this valuable natural resource.

Consequently, we request that the Board deny the Project a Comprehensive Permit because there are no conditions that would adequately address these impacts on local health, safety and the environment.

Alternatively, we ask that the ZBA not grant a waiver of the application of Wayland's Board of Health Regulations requiring design based on a flow of 165 gpd per bedroom, and a 100-foot setback from Pine Brook, which are intended to protect public health and safety based upon local conditions and experience. The important local health and environmental issues presented by the proposed septic system design and location are not adequately protected by compliance with MassDEP's standards.

CONCLUSION

The Project's design threatens local interests including protection of public health and safety, the environment (including preservation of the important Pine Brook and protection of significant NHESP habitat downstream), and the Town's compliance with federal regulations and permits. Much of the Project's inability to comply with local and state laws stems directly from the size and scale of the Project relative to the Property's size and environmental constraints.

In our opinion, the Board should deny the Project a Comprehensive Permit because there are no conditions that would adequately address the Project's impacts on local health, safety and environmental concerns.

¹³ The Applicant has requested a waiver from the Wayland Board of Health Regulation relative to floor drains. The Project includes an underground garage, and the finished floor elevation appears to be lower than the seasonal high groundwater table. Contaminated runoff from the garage cannot be discharged to the septic system or the stormwater system. As noted in CEI's letter, the Board should not grant this waiver unless the Applicant provides documentation to verify the system design will provide an equivalent level of protection to the local standard, which is intended to protect public health and safety based on local conditions and experience.

¹⁴ This fact offers further support for the comment offered by Wayland Conservation Administrator Linda Hanson in her August 16, 2017 memorandum that "the proximity of the leaching field to the perennial stream will negatively impact the stream and the eastern brook trout habitat." It also provides further support for the comment provided by Wayland Director of Public Health Julia Junghanns in her August 17, 2017 memorandum to the Board that the "design flow for the project is too large for the property due to soil conditions, the high ground water table, and the environmental sensitivity of the area due to the close proximity to Pine Brook."

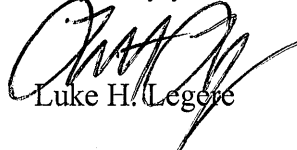


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At a minimum, the Board should deny the Applicant's request for waivers from local wetlands bylaw, Board of Health Regulations, and stormwater regulations, and should condition any approval on compliance with all state and local wetlands and stormwater laws and regulations. The Project introduces important local health and environmental issues that are not adequately protected by compliance with state standards.

Thank you for your attention to this matter. Please do not hesitate to contact me should you have any questions.

Very truly yours,



Luke H. Legere

cc: Joseph D. Peznola, P.E. (via email only)
Paul Haverty, Esq. (via email only)
Amy Kwessel, Esq. (via email only)
Sarkis Sarkisian, Wayland Town Planner (via email only)
Linda Hansen, Wayland Conservation Administrator (via email only)
Julia Junghanns, Wayland Director of Public Health (via email only)
Paul Brinkman, Wayland Town Engineer (via email only)





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November 22, 2017

Wayland Zoning Board of Appeals
41 Cochituate Road
Wayland, MA 01778

RE: CASCADE WAYLAND, BOSTON POST ROAD, WAYLAND, MA
REVIEW OF COMPREHENSIVE PERMIT APPLICATION (40B)

Dear Members of the Wayland Zoning Board of Appeals:

At the request of ProtectWayland.org, Comprehensive Environmental Inc. (CEI) has conducted a technical review of the multi-family residential structure proposed for construction at 113, 115, 117, and 119 Boston Post Road. Our review focuses on stormwater management, wastewater management, and related water resources impacts of the project as currently designed.

CEI has based the review on the following information on file on the Town of Wayland's webpage dedicated to the Cascade Wayland Project:

1. A Comprehensive Permit Application entitled " Properties located at 113, 115, 117 & 119 Boston Post Road, Wayland, Massachusetts Assessor's Map 30 Parcel 71 and Map 30 Parcel 70" dated July 25, 2017.
2. Drawings entitled "Cascade Wayland" dated July 21, 2017 prepared by Finegold Alexander Architects. The drawings consist of 24 sheets.
3. Drawings C000, C101, C201, C301, C401, C501, and C502, dated 11/13/2017 prepared by Finegold Alexander Architects.
4. A stormwater management report entitled, "113 & 115 Boston Post Road", dated 11/10/2017, prepared by Beals and Thomas, Inc.
5. Cascade Wayland project feedback letters to/from various individuals and organizations contained in the August, September, October, and November files.

CEI offers the following comments from our review of the referenced materials:

- Engineering
- Design
- Construction
- Inspection

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excellence

- Drainage & Flooding
- Energy & Sustainability
- Hazardous Waste
- Permitting & NEPA
- Stormwater & LID
- Transportation
- Water & Wastewater
- Watershed Restoration



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B. General

1. The Comprehensive Permit Application includes a list of requested waivers from provisions of local bylaws and regulations. In CEI's experience in the review of these types of projects, waiver requests need to be supported by an explanation of why the waiver is required, and how the lack of a waiver would place an unreasonable financial burden on the project.
 - a. The list of waivers does not provide the rationale for each waiver requested.
 - b. The Zoning Board of Appeals (ZBA) should not grant waivers of local provisions that are no stricter than state or federal regulations that apply to the site development. For example, those provisions of the local Stormwater and Land Disturbance Bylaw or Wetlands Protection Bylaw that are consistent with Massachusetts Wetlands Protection Act regulations should still apply to the site.
 - c. Where local bylaws (such as the Board of Health regulations of wastewater systems) are protective of public health and safety, a waiver should not be granted unless the applicant demonstrates that the alternative design is equally protective of the public interest.
2. We recommend that the ZBA not grant a waiver of the application of the Stormwater and Land Disturbance Bylaw. This Bylaw enables the Town of Wayland to comply with its obligations under federal regulations. See further comments below under Stormwater Management Design
3. We recommend that the ZBA not grant a waiver of the application of Wayland's Board of Health Regulation requiring design based on a flow of 165gpd per bedroom, as the local requirement is based on protection of public health and safety, with consideration of local conditions and experience. See further discussion below under Wastewater Management Design.
4. The Applicant should confirm the correct test pit data has been submitted. The forms included in the Comprehensive Permit Application indicate the test pit data is from Brookfield, Massachusetts. Also, Figure 1 accompanying the test pit data shows more than one location for TP-8.

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5. In Section 9.0 of the Application, the Applicant states there are 89 bedrooms; however, this is not consistent with Section 5.0 which states there are 6 studios, 24 one bedrooms, 24 two bedrooms, and 6 three bedrooms, or a total of 96 bedrooms. See further comments below under Wastewater Management Design.
6. There is no specific reference or calculation supplied supporting the water use estimate of 4450 gallons per day. The applicant should document the derivation of this figure relative to water use. (See separate comments below relative to the appropriate figures to use for the design of the wastewater system).
7. Based on our review of the file materials at the Town web-site for this project, the existing conditions drawings appear to be either incomplete, or incorrect:
 - a. The drawings do not show the correct water main from which the project would obtain service.
 - b. The drawings do not show drainage system piping serving the Boston Post Road, including outlet pipes that transect the project site in at least two locations. See additional comments below relative to stormwater system design.
8. The building has an underground garage:
 - a. The finished floor elevation appears to be lower than the seasonal high groundwater table. The drawings do not show how the groundwater will be intercepted, conveyed, and discharged.
 - b. Floor drainage facilities are not indicated. The drawings do not show how runoff from the garage floor will be intercepted, stored and disposed.
 - c. The Applicant has requested a waiver from the town of Wayland's Board of Health Regulation relative to floor drains. Where the local requirement is based on protection of public health and safety, with consideration of local conditions and experience, the Zoning Board of Appeals (ZBA) should not grant a waiver unless the Applicant



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provides documentation to verify the system design will provide an equivalent level of protection to the local standard.

9. In section 6.0, the application states the project is not within a NHESP priority habitat; however, we note that Pine Brook accepts stormwater runoff from the proposed development and flows directly into an NHESP protected habitat (protected plants, amphibians, and birds) north and west of Sandy Burr County Country Club.

C. Wastewater Management Design

1. Based on the information discussed below, the on-site wastewater disposal system may require permitting under the Groundwater Discharge Permit Program. Further clarification of the number of bedrooms and ancillary facilities (e.g., conference and work rooms) is needed to confirm whether design flows exceed 10,000gpd, the threshold for this permit. See the regulations at 310 CMR 15.006 (Title 5) and 314 CMR 5.00 (Ground Water Discharge Permit Program).
2. The septic system is currently only sized for 9,900gpd as shown on drawing C301. The derivation of this design flow should be documented.
 - a. The number of bedrooms proposed should be clarified. We understand that the applicant has indicated a reduction in project scale to 89 bedrooms are now proposed. This number is not consistent with the architectural drawings provided, nor with Section 5.0 of the Comprehensive Permit Application, Project Description, which states that there are 6 studio apartments, 24 one-bedroom units, 24 two-bedroom units, and 6 three-bedroom units, or a total of 96 bedrooms within 60 units. 310 CMR 15.203 requires the system to be designed for a minimum of 110 gallons per day (gpd) per bedroom. $96 \text{ bedrooms} \times 110 \text{ gpd/bedroom} = 10,560 \text{ gpd}$.
 - b. The design flow should also account for ancillary uses. The architectural drawings show a management office, conference rooms, work bar, multi-purpose room, and what appears to be a pet grooming facility. The application submittal contains no

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information documenting the design flows corresponding to these uses.

3. The application narrative notes a flow of 4,450gpd, but does not provide an adequate citation to support this figure. The introductory paragraph of 310 CMR 15.203 explicitly requires the use of flows specified in the table provided in the regulation.
4. The Applicant has requested a waiver from the town of Wayland's Board of Health Regulation requiring design based on a flow of 165gpd per bedroom. Where the local requirement is based on protection of public health and safety, with consideration of local conditions and experience, the Zoning Board of Appeals (ZBA) should not grant a waiver unless the Applicant provides documentation to verify the system design will provide an equivalent level of protection to the local standard.
5. We concur with the Wayland Board of Health's comments in a letter to the Zoning Board of Appeals dated August 17, 2017 indicating that there are insufficient deep test pits to support the design of the system, as shown on the drawings. We understand from our client that Board of Health personnel noted additional tests holes were performed, some of which were observed to encounter ledge, that have not been depicted in the information provided in the application.
6. The wastewater system design as shown on the drawings would result in deep fills, with site disturbance within the Riverfront Area in proximity to a stream classified as a cold-water fishery. The applicant should address the following:
 - a. Information should be provided to document impacts on the cold-water fishery resulting from changes in groundwater hydrology. There will be a substantial increase in flow into the groundwater from the septic system.
 - b. Information should be provided to document the impacts of changes in groundwater temperature, as a result of the septic system.
 - c. The presence of the septic system will interfere with the ability to re-establish a wooded buffer within the inner riparian zone (within

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100 feet of the stream). If the septic system and embankments need to be kept free of woody vegetation, this will hamper the long-term development of canopy and understory vegetation that would provide riparian habitat buffer and shade along the stream.

- d. The construction of the septic system results in an extensive, steeply sloped bank that can potentially serve as a source of increased sediment load to the sensitive stream, and warrants an aggressive permanent erosion and sediment control design to prevent sediment impacts on the stream.

In summary, the Applicant has presented insufficient information to document the amount of wastewater that the Project would generate, and has not accounted for additional facilities included in the building plan. Failure to properly account for these flows could result in an undersized system. The documentation that has been produced reflects insufficient deep test pits to support the design of the system and a failure to account for the system's proximity to Pine Brook. Even were these shortcomings addressed, the ZBA should not waive local Board of Health requirements, which protect public health and safety based upon local conditions and experience, unless the Applicant provides documentation to verify the system design will provide an equivalent level of protection to the local standard.

D. Stormwater Management Design

1. The stormwater management system design does not adequately account for flows originating off of the site and discharging onto or through the site:
 - a. Wayland public works personnel have indicated that existing drainage piping from Boston Post Road transects the site. The existing piping must be shown. The design must show how the pipes will be integrated into the design. If the pipes must be relocated, the new locations should be indicated. If the outlets at Pine Brook are altered or relocated, the applicant should provide information regarding how impacts will be addressed. Pine Brook will be particularly sensitive to disturbances on and near its bank. In addition, the presence of spawning redds (see letter from EBT Environmental Consultants dated November 2017) along the brook adjacent to the project warrants special care in preventing erosion,

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sedimentation, surface flow alteration, and groundwater flow alteration that can significantly affect this habitat.

- b. Topographic data indicates that property to the east of the project site drains onto the site. The site drainage system design calculations do not include a mapping of the contributing watershed area or the inclusion of this area in the sizing of the drainage system. The model analyzing impacts on peak rates does not include the magnitude of these flows in either pre- or post-development conditions
2. The Massachusetts Stormwater Management Standards require the runoff from all impervious surfaces to be treated (Standard 4) for at least 80% TSS removal. The drawings and calculations do not clearly indicate compliance with this requirement:
 - a. The graded depression between the visitor parking area and the greenhouse drains to an area drain, without apparent treatment. The greenhouse roof and a paved walkway drain to this area.
 - b. While the main building roof appears to drain to an infiltration basin, the TSS removal calculations do not tabulate the storage volume required to capture the necessary water quality volume for treatment.
 - c. The design shows the use of Stormceptor® units and derives treatment efficiencies using manufacturer-prescribed methods. The removal rates should be supported by a third-party independent evaluation of the Proprietary Separator's performance, to document credit for these removal rates.
3. The selected stormwater treatment measures shown on the drawings do not comply with the requirements of the Massachusetts Stormwater Management Standard applicable to Critical Areas (Standard 6), which applies because Pine Brook supports a cold-water fishery:
 - a. Compliance with 310 CMR 10 requires designs to be in accordance with the Massachusetts Stormwater Handbook. The Stormceptor® is classified as a Proprietary Separator in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook. Therefore, the

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Stormceptor® “Must be used for pretreatment and be placed first in the treatment train to receive TSS removal credit.”

- b. The Massachusetts Stormwater Handbook, Volume 1, Chapter 1 includes a table entitled “Best Management Practices for Cold-Water Fisheries” which stipulates that proprietary BMPs may be used for pretreatment only, unless verified for such other uses by STEP or TARP (technology verification protocols specified by MassDEP). No data has been included to indicate verification of the Stormceptor® for this purpose.
 - c. The Stormceptor® provides no treatment process to reduce the temperature of runoff from contributing paved areas. The cold-water fishery is particularly sensitive to temperature impacts. This proprietary device is therefore not suitable as the primary treatment in this setting.
 - d. The Stormceptor® provides no treatment process to remove road salt or other chemicals in solution that would impact the cold-water fishery.
 - e. As noted in Stormwater Management Design Comment 2, there is drainage area near the greenhouse that receives no treatment of runoff prior to discharge.
4. The design provides for an infiltration basin to treat roof runoff, located between the building and Pine Brook. The application materials fail to show that this facility fully complies with the standards presented in the Massachusetts Stormwater Handbook:
 - a. The application contains no subsurface data on soils textures or groundwater elevations in the vicinity of this basin, sufficient to support the design.
 - b. If groundwater depth is less than 2 feet from the bottom of the infiltration basin, the design is non-compliant. The calculation assumes a groundwater depth of exactly 2 feet without any evidence.

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- c. If groundwater is between 2 and 4 feet of the invert of the infiltration chamber the Applicant must include a mounding analysis, where the basin is used to control peak rates for storms equal to or exceeding the 10-year frequency event. No mounding analysis has been provided.
 - d. Table RR of the Massachusetts Stormwater Handbook requires a 50ft setback from an infiltration basin to other surface waters. The infiltration basin is shown to be approximately 30ft from the mean annual highwater line of Pine Brook.
 - e. Table IB.1 of the Massachusetts Stormwater Handbook requires infiltration basins to be a minimum of 50' of any slope greater than 15%. The designed infiltration basin is within 15' to 20' of the steep bank (slope of approximately 30%) abutting Pine Brook.
 - f. Both the primary overflow outlet and the emergency spillway for this basin are positioned where flows exiting the spillway will discharge onto steep slopes. This presents a risk of severe erosion and potential slope failure adjacent to Pine Brook.
5. The drawings show the outlet from the piped stormwater system at the southeast corner of the site.
 - a. As noted in the above comment, locating the outlet at mid-bank level risks erosion of the bank below the riprap apron.
 - b. The location creates a point discharge that did not previously exist. Under existing conditions, the topographic data shows flows being dispersed along the western and southern boundaries of the site, not concentrated in a single location. Such flow dispersion would maximize the potential for infiltration of stormwater, and minimize potential for erosion.
 - c. The location directs stormwater discharge onto an adjacent property where there currently is no direct discharge.
 - d. The outlet is located immediately adjacent to a spawning redd, as identified in information included with EBT Environmental Consultants' letter dated November 2017. This habitat feature would be highly sensitive to any changes in surface and groundwater flow, water quality, and sediment inputs. The design



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does not adequately address any of these potential impacts to stream habitat, as a result of placing the outlet so close to the spawning redd.

6. The drawings show the use of bioretention areas in the stormwater system.
 - a. The drawings do not show details for the bioretention area or vegetated filter strip. A full technical review cannot be completed until all details are supplied by the Applicant.
 - b. Because they are shown with no underdrain, it appears the bioretention areas are intended to drain by infiltration. Additional information is required to document this function, including supporting calculations showing drawdown within 72 hours following any storm event.
 - c. Soil test pits should be provided at each location of the bioretention areas.
7. The Applicant has not described how snow storage will be managed on the site to prevent impacts to the stormwater management facilities (especially the bioretention areas), as well as to the stream.
8. As noted above, we recommend that the ZBA deny the requested waiver of the application of the Stormwater and Land Disturbance Bylaw. This Bylaw enables the Town of Wayland to comply with its obligations to the US EPA under the NPDES Stormwater Program, General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). That permit requires Wayland to regulate stormwater discharges, and on-going maintenance of systems extends beyond the initial development and construction of a stormwater discharge. Waiver of this bylaw may hamper the Town's ability to manage stormwater discharges in compliance with its federal permit.

In summary, the information furnished by the Applicant fails to document that the stormwater management complies with a number of the state Stormwater Management Standards. The system design also underestimates the volume of stormwater to be handled by failing to account for flows that originate off-site, and by incorrectly modeling on-site flows. As a result of these deficiencies, the Applicant has failed to account for or properly mitigate the Project's stormwater

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impacts on and off of the site, including impacts to Pine Brook and the wildlife that relies upon it for habitat.

E. Flood Plain Management

1. The development is currently shown within a flood zone, which is depicted by scale from FEMA Flood Hazard mapping. The flood zone does not relate to the topographic features shown on the drawings:
 - a. The location of the flood plain boundary is critical to the analysis of impacts at this site. If any of the proposed fill constricts the existing flood plain, increases in flow or velocity would be likely, with the potential for adverse impacts to upstream and downstream properties, as well as impacts within the sensitive stream resource. The applicant should be required to delineate the 100-year flood plain by accepted engineering methods, complying with the methodology specified in the Wetlands Protection Act Regulations at 310 CMR 10.57.
 - b. Existing flood plain “pockets” within the site appear particularly inconsistent with the topographic mapping. The applicant should document that prior floodplain within the site has not been filled (please refer to comments in the letter from the YMCA to the ZBA dated September 25, 2017).
 - c. The design shows placement of fills within flood plain (Bordering Land Subject to Flooding). No compensatory flood storage is shown, as required under the Wetlands Protection Regulations. Furthermore, provision of compensatory storage could require additional land disturbance at or near the bank of the stream, with potential additional impacts to that important resource area.

In summary, accurate flood zone delineation is a crucial component in analyzing the Project’s impacts both on-site and off-site. This information must be properly calculated and provided, along with information regarding the location and extent of compensatory flood storage, to enable complete review of the project’s impacts on the floodplain and the stream.

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G. Stormwater Management Report and Calculations

The Stormwater Report calculations contain deficiencies which do not allow comparison of pre- and post-development discharge rates. The calculations need to be corrected to allow review of the conclusion whether the project design would adequately control peak rates and volumes of discharge from the site, in compliance with the Massachusetts Stormwater Management Standards.

1. The predevelopment analysis overestimates peak flows and volumes.
 - a. The hydrologic model fails to use the longest time to concentration (T_c) path for existing conditions, artificially shortening the time to peak, which will underestimate peak rate of the stormwater flow of the predeveloped area.
 - b. The predevelopment analysis also does not account for ponding within existing low areas on the site, such as found adjacent to the east side of the existing building, or any infiltration that occurs as the result of such ponding.
2. The peak flow analysis underestimates the flow rates and volumes in the post-development analysis. The post-development area PDA-1B needs to be broken down into smaller, homogenous sub-catchments, with each routed to outlets following the contours of the site, to accurately model the stormwater flow of the developed site.
 - a. A significant portion of PDA-1B does not drain through the drainage system contained in the paved area, but should be routed directly to the stream in the model.
 - b. Flow from the remaining landscaped area is piped directly to outlet. Combining this area with the pavement in developing curve numbers and times of concentration will artificially distort the estimate of runoff, underestimating the contribution from the paved surface. The parking lot/driveway area should be treated as a separate sub-catchment, and routed independently to the design point from the landscaped portions of the catchment.

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In summary, the Stormwater Report calculations overestimate existing flows and underestimate post-development flows. These deficiencies preclude a meaningful comparison of pre- and post-development discharge rates and must be corrected.

H. CONCLUSION

In conclusion, the Project design and supporting materials present a number of critical shortcomings with respect to stormwater management, wastewater management, and related water resources impacts. The Applicant has inadequately documented the amount of wastewater that the Project would generate, and has failed to establish that site conditions support the design of the system. The stormwater management system fails to satisfy a number of the state Stormwater Management Standards, underestimates the volume of stormwater, and inadequately addresses the Project's stormwater impacts on and off of the site. The Stormwater Report calculations require correction to properly estimate existing flows and post-development flows. An accurate flood plain boundary delineation has not been produced, which is critical to analyze the Project's impacts both on-site and off-site. The project design inadequately addresses the system's proximity to Pine Brook, including impacts to the stream and the wildlife that relies upon it for habitat.

The ZBA should not waive the Wayland Stormwater and Land Disturbance Bylaw or Board of Health requirements, both of which protect public health and safety based upon local conditions and experience. The Stormwater and Land Disturbance Bylaw also enables the Town of Wayland to meet its obligations under federal regulation.

If you have any questions or comments regarding this report please contact either Matt Doyon or Dave Nyman at 508-281-5160.

Sincerely,
COMPREHENSIVE ENVIRONMENTAL INC

Matthew P. Doyon, P.E.
Project Engineer

David C. Nyman, P.E.
Senior Civil Engineer

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Ecosystem Solutions, Inc.

P.O. Box 1293 / 24 Kenmore Street
West Warwick, RI 02893

RI: 401-615-8885
MA: 508-997-0268
www.ecosystem-solutions.com

November 22, 2017

Project no. W17-945

Jonathan M. Sachs, Chair
Wayland Zoning Board of Appeals
Wayland Town Hall
41 Cochituate Road
Wayland, MA 01778-2614

**RE: CHAPTER 40B COMPREHENSIVE PERMIT APPLICATION
'Cascade' Wayland
113-119 Boston Post Road
Wayland, Massachusetts**

Chairman Sachs,

This firm represents Protect Wayland in regards to the above-referenced application (Application). We have reviewed the following:

- Application by Eden Management, dated 7/25/17;
- Letter to ZBA from EBT Environmental Consultants, Inc., last revised 11/21/17;
- Letter to ZBA from McGregor & Legere, dated 11/22/17;
- Letter to ZBA from the West Suburban YMCA-Camp Chickami, dated 9/25/17;
- Memo to ZBA from the Wayland Conservation Commission, dated 8/16/17 and 11/6/17;
- Memo to ZBA from the Wayland Board of Health, dated 8/17/17;
- Memo to ZBA from the Wayland Building Department, dated 8/22/17;
- Memo to Geoff Larson, Building Commissioner from Paul Brinkman, Town Engineer, dated 8/17/17;
- Memo to ZBA from Fire Chief David Houghton, dated 8/7/17;

This firm regularly represents abutters and citizens groups in matters regarding wetland science and the Massachusetts Wetlands Protection Act at M.G.L. c. 131, §40 (WPA) and its Regulations at 310 CMR 10.00, as well as local bylaws in the Commonwealth, in front of local boards and commissions and the Department of Environmental Protection (DEP). My personal credentials are included as an attachment to this letter.

Conservation Commission

It is my opinion that the current iteration of the Application is deficient in regards to basic compliance with the WPA and Regulations, as outlined in the Conservation Commission's memo of 8/16/17 and 11/6/17. We firmly support the findings of both of the Conservation Commission's memo. I would like to add the following commentary to supplement the Commission's:

-
1. 310 CMR 10.00 allows stormwater structures within 100' of a perennial stream, at the Commission's discretion and only when the Applicant has satisfied the Commission that no practical alternatives exist. This is a common theme in the Commission's comments; that much of what the Applicant has proposed is *discretionary* to the Commission. To-date, the Application does not meet the basic requirements of the WPA, never mind the Commission's discretion that the project will *not* cause significant impact to the wetland resources on-site.
 2. Advanced & alternative septic technology is imperative to the continued protection of Pine Brook. Per the report by EBT Environmental Associates, Inc. (EBT), Pine Brook is an outstanding cold water fishery (see below).
 3. Although I have not been on-site, I cannot see from aerial photography how the Applicant can qualify for the Riverfront Area Redevelopment provisions. We support the Commission's findings on lack of "degraded" areas on-site and apply most, if not all development as new development.

We do not believe that the ZBA should waive the local Wetlands and Water Resources Protection Bylaw (Chapter 194), which is a crucial document protecting this critical wetland and water resource. Specifically, it is of utmost importance to assure that the Commission have purview under Bylaw §194-2(A) "Alter" (7) and (8), which outline the Commission's ability to perform pre-construction review for projects that may change water temperature, biochemical oxygen demand and other natural characteristics of a receiving water, and any activity, change, or work which pollutes or degrades the quality of any stream, body of water, wetland, buffer zone, or water resource area whether located in or out of the Town of Wayland.

The unique and important component that Chapter 194 brings to the table, as opposed to the WPA and 310 CMR 10.00 is that Chapter 194 gives the local Conservation Commission purview over water quality *directly* through the stated interest of "water quality" and "stormwater quality" under §194-1. The WPA and 310 CMR 10.00 have an interest in protecting water quality, but water quality is specifically addressed under 314 CMR 4.00, the Massachusetts Water Quality Standards, which is administered by MADEP. The WPA gives Commissions purview of projects for the protection, for example, of Public and Private Water Supply, and Groundwater Supply, as well as Prevention of Pollution, but these are public interests that focus more on water *quantity* and not so much as *quality*.

This firm strongly believes that by maintaining the Commission's authority under Chapter 194, it will be better equipped to regulate potential impacts that would present significant and adverse impacts directly to the water and water quality of Pine Brook itself. These concerns are not adequately protected by compliance with state standards alone.

Further, Chapter 194 is important in that it recognizes "passive recreation and aquaculture values" as part of the Bylaw's purpose (§194-1), which the WPA and Regulations do *not* include. This is important given the large recreational component of the YMCA, downstream, in recreational and even educational activities. As written in the YMCA's letter to the ZBA, they serve nearly 1,000 children per year at Camp

Chickami, which is downstream of this proposed Project. A decrease in water quality resulting from insufficient stormwater or septic effluent attenuation, or increase in water quantity resulting from poor site design in a floodplain, will adversely impact the recreational values currently supported at Camp Chickami. Without Chapter 194, the Commission will have no vehicle by which to voice concern about these potential impacts.

Board of Health

We support the Board of Health's memo of 8/17/17. I especially would like to point out the BOH's commentary about the fact that testing was performed outside of the high groundwater season. I have reviewed the soil suitability data forms (Form 11) and am concerned about how the Applicant came about making their determination regarding water tables. For example, the test holes show no color or percent coverage data on redoximorphic features (i.e. mottling) that are common in the determination of water tables. They only show depths.

We also agree that it is important to maintain the cold temperatures of the stream, given that wastewater is hot in temperature and eastern brook trout require lower temperatures. A septic system of this size and scope is more likely than not to impact not only water temperatures, but nutrient loading that could negatively impact water quality and therefore fisheries habitat.

EBT Environmental Associates (EBT)

Protect Wayland hired Ecosystem Solutions, Inc., who subcontracted EBT to perform a stream analysis. It is EBT's analysis, in addition to Massachusetts Fish & Wildlife data since the 1980's, on-the-record interviews with Fish & Wildlife personnel regarding the ecological integrity of Pine Brook, that lead us to believe that there is solid and substantial evidence that this watercourse deserved protections above-and-beyond those afforded by the minimum, state-level standards even if the Applicant reduces the development footprint to meet them. The level of water quality and fisheries habitat in Pine Brook is rare for eastern Massachusetts and unparalleled in the northeast region. We urge the ZBA, at a minimum, to preserve the Conservation Commission's ability to retain the use of Chapter 194, and the Board of Health should be able to maintain their "Regulations for On-Site Subsurface Sewage Disposal Systems."

If you have any questions or concerns, please contact me using the information above.

Sincerely,
Ecosystem Solutions, Inc.
Brandon B. Faneuf, Principal
PWS, RPSS, CWB, CPESC

BF/bf



Professional Resume

Brandon B. Faneuf, Principal
Ecosystem Solutions, Inc.
P.O. Box 1293 / 24 Kenmore Street
West Warwick, RI

EDUCATION

May 1997	University of Massachusetts Bachelor of Science, Wildlife Biology	Amherst, MA
May 1999	University of Massachusetts Master of Science, Wetlands Conservation	Amherst, MA
May 2006	University of Rhode Island 12 Post-Graduate Credits, Soil Science	Kingston, RI

EXPERIENCE

7/03–Present	Principal Scientist Ecosystem Solutions, Inc.	West Warwick, RI
--------------	---	------------------

- Erosion & sediment control design and monitoring
 - MassHighway and RIDOT experience, including delineations, wetland restoration/replication design and construction oversight, environmental/erosion control monitoring
 - Peer Reviews for Massachusetts municipalities
 - Wetland delineations in Massachusetts, Connecticut, & Rhode Island using state and federal methodology
 - Wildlife habitat assessments under the Massachusetts Wetlands Protection Act (310 CMR) & the Corps of Engineers Highway Method
 - All wetland permit application types, preparation, submission and representation at Massachusetts Conservation Commissions, Planning, and Zoning, etc.
 - Wetland replication & restoration plan creation, construction oversight, and long-term monitoring.
 - Section 404 application preparation and submission; U.S. Army Corps of Engineers
 - Section 401 Water Quality Certification application preparation and submission; Massachusetts Department of Environmental Protection and Rhode Island Department of Environmental Management
 - All wetland permit application types; Rhode Island Department of Environmental Management, including wildlife habitat evaluations
 - Massachusetts Environmental Policy Act application preparation (ENF, EIR)
 - Guiding and offering land use planning advice and alternative design analysis to clients throughout Massachusetts and Rhode Island
 - Performing soil evaluations for septic and stormwater infiltration system installation for clients throughout Rhode Island
 - Vernal pool certifications
 - Rare species studies/Massachusetts Endangered Species Act Filings
-

1/02–7/03

Environmental Scientist

RI Department of Environmental Management Providence, RI
Shellfish Program

- Sanitary shoreline surveys for open, closed, and conditionally open/closed shellfishing waters, including the Narragansett Bay and the South County Salt Ponds
- Characterizing water pollution problems in coastal shellfishing waters, as well as designing and executing field investigations to characterize water quality conditions, determining the degree of pollution, including the collection of physical, hydrological, and biological data via manual and mechanical methods
- Reviewing staff surveys, interpreting the results of their findings; as well as preparing written shoreline survey reports (1, 3, and 12-year); and recommendations for future shellfish classification
- Working knowledge of National Sanitary Shellfish Program (NSSP) requirements

7/00-7/03

Environmental Scientist

RI Department of Environmental Management Providence, RI
Water Quality Assessments Program (TMDL)

- Development of water assessment and restoration projects (Total Maximum Daily Load-TMDL) per Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40CFR Part 130), including project management of the Saugatucket River watershed pathogen TMDL, Indian Run Brook heavy metals (copper, lead, and zinc- using clean hands, dirty hands collection method) TMDL, Saugatucket Pond water quality and noxious aquatic plant investigation, and the Point Judith Pond pathogen TMDL within the Towns of Narragansett and South Kingstown
- Public presentations for local government and various private and public organizations, public meetings. Includes the Town of South Kingstown, the Saugatucket River Heritage Corridor Coalition, and the Salt Ponds Coalition.
- Characterization of water pollution problems in rivers, streams, and reservoirs, including the design, supervision, and execution of field investigations to characterize water quality conditions, determine the degree of pollution, including the collection of physical, hydrological, and biological data (i.e. Winkler titrations & YSI meters)
- In-depth analysis of water quality data combined with a thorough knowledge of watershed processes to assess and locate pollution sources
- Review of research proposals and reports including the review of staff surveys and investigations of TMDL's in other regions of the state, interpreting those findings, preparing written reports; and making recommendations for water quality restoration in waters throughout the state
- Coordinate between Rhode Island Pollution Discharge Elimination System (RIPDES) Phase II Program and Municipalities regarding TMDL studies and subsequent BMP recommendations
- A working knowledge of RI Water Quality Regulations

05/98-7/00

Senior Natural Resource Specialist

RI Department of Environmental Management Providence, RI
Freshwater Wetlands Permitting Program

- Review of applications for wetland presence determinations, wetland edge delineation verification, preliminary determinations, and applications to alter wetlands
- Review of permit applications, including single-family house lots, subdivisions, condominium developments, hotels, emergency agricultural permits, golf courses, commercial properties, bridge construction, highway improvements, utility lines, sand and gravel operations, and CERCLA (Superfund) sites
- Review of permit applications throughout the State of Rhode Island.
- Fluency with the Rhode Island Freshwater Wetlands Act and Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (Regulations)

CERTIFICATIONS & LICENCES

Certified Wildlife Biologist

The Wildlife Society, 2010

Washington, DC

Certified Professional in Soil Erosion & Sediment Control

Soil & Water Conservation Society & International Erosion
Control Association, 2003 (cert. no. 2691)

Class IV Soil Evaluator (license no. D4059)

State of Rhode Island, 2003

Professional Wetland Scientist (cert. no. 1614)

Society of Wetland Scientists, 2006

Virginia

New England Regional Soil Science Certificate

University of Massachusetts, 2006

Massachusetts

Registered Professional Soil Scientist

Society of Soil Scientists of Southern New England, 2006

..... Connecticut

Certified Invasives Manager

RI Coastal Resources Management Council, 2009

Commercial Pesticide Applicator (license no. 5321)

State of Rhode Island, 2009

QUALIFICATIONS

Wetland Delineation

Qualified to perform wetland delineations under the RIDEM Freshwater Wetlands Program Guidelines, Connecticut DEP, and Massachusetts Wetlands Protection Act

Wildlife & Wildlife Habitat

Qualified to perform wildlife & wildlife habitat assessments under the RIDEM Freshwater Wetlands Program Guidelines

Qualified to perform wildlife habitat evaluations under the MADEP Wetlands Protection Act

Prequalified under the Massachusetts Natural Heritage & Endangered Species Program for rare species habitat assessments (Box and Blanding Turtles).

Coverts Cooperator Training Completion Certificate, 2010

PROFESSIONAL ORGANIZATIONS

Director (Board of Directors), 2009-2017

Massachusetts Association of Conservation Commissions

Rhode Island Representative, 2010-2012

International Erosion Control Association

Rhode Island Director, 2009-2011

Soil & Water Conservation Society

Corporate Member

Rhode Island Natural History Survey

Member & Wetland Scientist

Rhode Island Association of Wetland Scientists

Corporate Member

Association of Massachusetts Wetland Scientists

Member

Society of Wetland Scientists

Member

The Wildlife Society

Member

Society of Soil Scientists of Southern New England

Member

Rhode Island Forest Conservator's Org.

EXPERT QUALIFICATIONS

Expert in Wetland Science

Massachusetts Department of Environmental Protection
Office of Appeals and Dispute Resolution.

Expert in Wetland Science

RI Coastal Resources Management Council

OTHER

Chair, IECA Northeast Chapter 2013 Annual Conference

Warwick, RI

Environmental Instructor- Wetlands, 2005-2013

Rhode Island Realtors Association

EBT Environmental Consultants, Inc.
GLENN E. KREVOSKY, CONSULTANT

601 Main Street
North Oxford, MA 01537
glenn.krevosky@charter.net
Cell: (508)769-3659 Office: (508)987-0979

Wayland Zoning Board of Appeals
41 Cochituate Road
Wayland, MA 01778

September 26, 2017
Revised: November 21, 2017

Re. Pine Brook's Eastern Brook Trout Cold-water Fishery

Dear Wayland Zoning Board of Appeals,

ProtectWayland.Org has retained EBT Environmental Consultants, Inc. (EBT, Inc.) through Ecosystem Solutions, Inc. to investigate the quality of the Eastern Brook Trout (EBT) (*Salvelinus fontinalis*) Cold-water Fishery in Pine Brook and the potential effect of the proposed development at 115 Boston Post Road on the fishery.

On 9/10/17, 9/19/17 & 10/19/17 Glenn Krevosky of EBT Inc. investigated Pine Brook upgradient and downgradient of three culvert crossings: Pine Brook Road culvert, the YMCA camp road brook culvert and at the Old Connecticut Path culvert. EBT, Inc. confirmed all three locations had substantial Eastern Brook Trout (EBT) numbers. This reconfirms the substantial data from MA Fish & Wildlife generated through their Biological Assessments between 1984 & 2013. Baseline sampling was performed on 9/19/17 to establish existing summer low-water water quality conditions (outside of a rain event) and also what total suspended solid (TSS) levels would be during a first flush storm event. Results were received from Alpha Analytical on 9/26/17 (see attached). TSS numbers were non-detectable at 12:35pm (outside of a storm event) and 180 mg/L at 12:59pm (during a downpour storm event). The pH was 7.3 and results showed a high alkalinity of 41.5 mg/L. High alkalinity indicates excellent calcium levels for insect shell production which ultimately can lead to denser fish populations – which is the case in Pine Brook. The summer low volume of Pine Brook at the time of the water sampling was directly measured through capture of the napes at each of the twin culvert outflows on the western side of Pine Brook Road. The volume was measured to be 245.9 gallons per minute. The water temperature at the time of sampling was 61°F. The remaining water sampling identify NH₃, TKN, and TP_{HOS} levels, all of which are nutrients for plant growth. These three compounds were within standard range/were not excessive.

Baseline aquatic macroinvertebrate seining was performed to identify the species and density of the aquatic food supply within the system. i.e. Isopods, Stone Fly Larva, 3 species of Caddisfly Larva, Dragonfly Larva, Damsel Fly. A species of Stone Casemaker, with a density of approximately 1 per 2 sq inches of rock surface, was the most abundant species of macroinvertebrates found. In addition to the macroinvertebrate population, a number of Spring Salamanders was seined. This salamander is an additional aquatic food source for trout found almost exclusively in cold, spring fed brook systems.

EBT Inc. had two discussions this September with Mr. John Sheedy, Fishery Biologist from MA Fish & Wildlife Northeast Region, relative to the density of Eastern Brook Trout in Pine Brook. In both cases Mr. Sheedy stated, Pine Brook has the highest trout numbers of any stream assessed (since the early 80s) in MA Fish & Wildlife's Northeast Region, which includes Middlesex, Suffolk, Norfolk and

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Essex counties (see attached 1984-2013 MA F&W Biological Survey data and map indicating the Northeast Wildlife District).

Although EBT, Inc.'s work on the assessment of the brook over multiple seasons is ongoing (ie. trout hatch in late winter), it is not difficult to draw a conclusion as to the importance of the referenced cold-water fishery, relative to Critical Areas (beaches, drinking supplies and cold-water fisheries) under "MA DEP Stormwater Regulations". Recent comments by Richard Hartley, Fishery Biologist & Environmental Review Project Leader with Mass Fish & Wildlife, on cold-water fisheries, as they relate to direct storm water input is as follows.

"Per DEP's stormwater management standards for critical areas such as cold-water fisheries resources, BMPs are required that assure no untreated or warm water runoff from impervious surfaces directly enters these resource, recent studies have shown that stormwater BMPs that allow standing, surface water function as "heat sinks" in summer and loose heat in winter. As such, retention and detention ponds, vegetated swales and hydrodynamic separators have little value as stormwater BMPs in the vicinity of cold-water resources. Stormwater systems that have been found to be most protective of these resources are subsurface, infiltration, gravel wetlands an bioretention. Ideally, a chain of cold-water BMPs (e.g., bioretention to gravel wetland to an infiltration system) with deep infiltration and filtration capabilities will cool the stormwater to ground temperature in both summer and winter thereby providing the most effective long-term protection of the cold-water resources."

Additional water sampling should be conducted during winter base flow conditions to identify whether water quality parameters have fluctuated from summer low flow conditions. A more comprehensive understanding of the water quality throughout multiple seasons during those seasons base flows would give a better understanding as to the effect of the installed 89-bedroom septic leech field adjacent to the brook system. Any increase in nutrient levels assessed downgradient of the proposed project could be associated with nutrient derived from the leech area (as long as no significant upgradient parameters have changed).

Any stormwater input, not treated as indicated, would have a degrading effect on the brook temperature regime (in addition to food supply and spawning ability) of the Eastern Brook Trout. ProtectWayland.Org strongly urges the Wayland Zoning Board of Appeals require strict compliance with the Town Zoning Regulations to help to ensure, along with environmental safe guards, the continued sustainability of the trout fishery within Pine Brook.

Respectfully,


Glenn E. Krevosky, Consultant

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Attached:

- Alpha Analytical Baseline Water Quality Report – 9/26/17
- 2' Contour & NRCS Soil Mapping
- Road Sanding, Redd Development & Water Sampling Locations
- Wayland Assessors/Storm drain Map 30 showing Sand, Colloidal, Nutrient & Heated Stormwater Inputs
- Redd Development Photo Exhibit



ANALYTICAL REPORT

Lab Number:	L1733296
Client:	EBT Environmental 601 Main Street Oxford, MA 01537
ATTN:	Glenn Krevosky
Phone:	(508) 769-3659
Project Name:	PINE BROOK CWF
Project Number:	101
Report Date:	09/26/17

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1733296-01	8 PINE BROOK ROAD CWF	WATER	PINE BROOK WAYLAND, MA	09/19/17 12:41	09/19/17
L1733296-02	8 PINE BROOK ROAD CWF DOWN POUR EVENT	WATER	PINE BROOK WAYLAND, MA	09/19/17 12:58	09/19/17

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

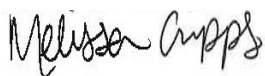
Case Narrative (continued)

Report Revision

September 26, 2017: The collection time for sample L1733296-02 has been amended.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Melissa Cripps

Title: Technical Director/Representative

Date: 09/26/17

INORGANICS & MISCELLANEOUS

Project Name: PINE BROOK CWF

Project Number: 101

Lab Number: L1733296

Report Date: 09/26/17

SAMPLE RESULTS

Lab ID: L1733296-01
 Client ID: 8 PINE BROOK ROAD CWF
 Sample Location: PINE BROOK WAYLAND, MA
 Matrix: Water

Date Collected: 09/19/17 12:41
 Date Received: 09/19/17
 Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Turbidity	1.6		NTU	0.20	--	1	-	09/19/17 22:13	44,180.1	AS
Alkalinity, Total	41.5		mg CaCO3/L	2.00	NA	1	-	09/20/17 09:37	121,2320B	BR
Alkalinity, Carbonate	ND		mg CaCO3/L	2.00	NA	1	-	09/20/17 09:37	121,2320B	BR
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	09/20/17 04:15	121,2540D	VB
pH (H)	7.3		SU	-	NA	1	-	09/19/17 23:53	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/20/17 15:44	09/25/17 20:43	121,4500NH3-BH	AT
Nitrogen, Nitrite	ND		mg/l	0.050	--	1	-	09/19/17 22:38	44,353.2	MR
Nitrogen, Nitrate	2.0		mg/l	0.10	--	1	-	09/19/17 22:38	44,353.2	CW
Nitrogen, Total Kjeldahl	0.530		mg/l	0.300	--	1	09/21/17 14:31	09/25/17 21:28	121,4500NH3-H	AT
Phosphorus, Total	0.021		mg/l	0.010	--	1	09/22/17 11:45	09/22/17 16:22	121,4500P-E	SD



Project Name: PINE BROOK CWF**Project Number:** 101**Lab Number:** L1733296**Report Date:** 09/26/17**SAMPLE RESULTS****Lab ID:** L1733296-02**Client ID:** 8 PINE BROOK ROAD CWF DOWN POU**Sample Location:** PINE BROOK WAYLAND, MA**Matrix:** Water**Date Collected:** 09/19/17 12:58**Date Received:** 09/19/17**Field Prep:** Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total Suspended	180		mg/l	5.0	NA	1	-	09/20/17 04:15	121,2540D	VB



Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043382-1										
Nitrogen, Nitrate	ND		mg/l	0.10	--	1	-	09/19/17 20:34	44,353.2	CW
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043385-1										
Nitrogen, Nitrite	ND		mg/l	0.050	--	1	-	09/19/17 20:43	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043459-1										
Turbidity	ND		NTU	0.20	--	1	-	09/19/17 22:13	44,180.1	AS
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1043506-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	09/20/17 04:15	121,2540D	VB
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043596-1										
Alkalinity, Carbonate	ND		mg CaCO3/L	2.00	NA	1	-	09/20/17 09:37	121,2320B	BR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043603-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	09/20/17 09:37	121,2320B	BR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1043731-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/20/17 15:44	09/25/17 20:13	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1044197-1										
Nitrogen, Total Kjeldahl	ND		mg/l	0.300	--	1	09/21/17 14:31	09/25/17 21:25	121,4500NH3-H	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1044497-1										
Phosphorus, Total	ND		mg/l	0.010	--	1	09/22/17 11:45	09/22/17 16:03	121,4500P-E	SD

Lab Control Sample Analysis

Batch Quality Control

Project Name: PINE BROOK CWF

Project Number: 101

Lab Number: L1733296

Report Date: 09/26/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043382-2								
Nitrogen, Nitrate	94		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043385-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043459-2								
Turbidity	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043477-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043603-2								
Alkalinity, Total	105		-		90-110	-		10
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1043731-2								
Nitrogen, Ammonia	105		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1044197-2								
Nitrogen, Total Kjeldahl	100		-		78-122	-		

Lab Control Sample Analysis
Batch Quality Control**Project Name:** PINE BROOK CWF**Project Number:** 101**Lab Number:** L1733296**Report Date:** 09/26/17

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1044497-2					
Phosphorus, Total	102	-	80-120	-	

Matrix Spike Analysis **Batch Quality Control**

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043382-4 QC Sample: L1733161-01 Client ID: MS Sample												
Nitrogen, Nitrate	0.77	4	4.3	88		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043385-4 QC Sample: L1733161-01 Client ID: MS Sample												
Nitrogen, Nitrite	ND	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043603-4 QC Sample: L1733098-01 Client ID: MS Sample												
Alkalinity, Total	70.3	100	171	101		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043731-4 QC Sample: L1733134-01 Client ID: MS Sample												
Nitrogen, Ammonia	1.17	4	5.05	97		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1044197-4 QC Sample: L1733280-01 Client ID: MS Sample												
Nitrogen, Total Kjeldahl	0.505	8	8.28	97		-	-		77-111	-		24
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1044497-3 QC Sample: L1732266-01 Client ID: MS Sample												
Phosphorus, Total	0.034	0.5	0.533	100		-	-		75-125	-		20

Lab Duplicate Analysis Batch Quality Control

Project Name: PINE BROOK CWF

Project Number: 101

Lab Number: L1733296

Report Date: 09/26/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043382-3 QC Sample: L1733161-01 Client ID: DUP Sample						
Nitrogen, Nitrate	0.77	0.84	mg/l	9	Q	6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043385-3 QC Sample: L1733161-01 Client ID: DUP Sample						
Nitrogen, Nitrite	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043459-3 QC Sample: L1733348-02 Client ID: DUP Sample						
Turbidity	1.5	1.5	NTU	0		13
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043477-2 QC Sample: L1733348-01 Client ID: DUP Sample						
pH	8.2	8.2	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1043506-2 QC Sample: L1733247-01 Client ID: DUP Sample						
Solids, Total Suspended	130	120	mg/l	8		29
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043596-2 QC Sample: L1733296-01 Client ID: 8 PINE BROOK ROAD CWF						
Alkalinity, Carbonate	ND	ND	mg CaCO3/L	NC		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043603-3 QC Sample: L1733098-01 Client ID: DUP Sample						
Alkalinity, Total	70.3	70.4	mg CaCO3/L	0		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1043731-3 QC Sample: L1733134-01 Client ID: DUP Sample						
Nitrogen, Ammonia	1.17	1.20	mg/l	3		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1044197-3 QC Sample: L1733280-01 Client ID: DUP Sample						
Nitrogen, Total Kjeldahl	0.505	0.537	mg/l	6		24

Lab Duplicate Analysis
Batch Quality Control

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1044497-4 QC Sample: L1732266-01 Client ID: DUP Sample					
Phosphorus, Total	0.034	0.032	mg/l	6	20

Project Name: PINE BROOK CWF
Project Number: 101

Serial_No:09261717:29
Lab Number: L1733296
Report Date: 09/26/17

Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1733296-01A	Plastic 250ml unpreserved/No Headspace	A	NA		5.2	Y	Absent		ALK-T-2320(14),ALK-CO3-2320(14)
L1733296-01B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.2	Y	Absent		TKN-4500(28),TPHOS-4500(28),NH3-4500(28)
L1733296-01C	Plastic 250ml unpreserved	A	7	7	5.2	Y	Absent		NO2-353(2),TURB-180(2),NO3-353(2),PH-4500(.01)
L1733296-01D	Plastic 950ml unpreserved	A	7	7	5.2	Y	Absent		TSS-2540(7)
L1733296-02A	Plastic 950ml unpreserved	A	7	7	5.2	Y	Absent		TSS-2540(7)

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related

Report Format: Data Usability Report



Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

Data Qualifiers

projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

Project Name: PINE BROOK CWF
Project Number: 101

Lab Number: L1733296
Report Date: 09/26/17

REFERENCES

- 44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Alpha Analytical, Inc.

ID No.:17873

Facility: **Company-wide**

Revision 10

Department: **Quality Assurance**

Published Date: 1/16/2017 11:00:05 AM

Title: **Certificate/Approval Program Summary**

Page 1 of 1

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility**EPA 624:** m/p-xylene, o-xylene**EPA 8260C:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.**EPA 8270D:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.**EPA 300:** DW: Bromide**EPA 6860:** NPW and SCM: Perchlorate**EPA 9010:** NPW and SCM: Amenable Cyanide Distillation**EPA 9012B:** NPW: Total Cyanide**EPA 9050A:** NPW: Specific Conductance**SM3500:** NPW: Ferrous Iron**SM4500:** NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO₂, NO₃.**SM5310C:** DW: Dissolved Organic Carbon**Mansfield Facility****SM 2540D:** TSS**EPA 3005A** NPW**EPA 8082A:** NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:**Drinking Water****EPA 300.0:** Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B****EPA 332:** Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.**Microbiology:** **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.****Non-Potable Water****SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, EPA 350.1:** Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F, EPA 353.2:** Nitrate-N, **EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.****EPA 624:** Volatile Halocarbons & Aromatics,**EPA 608:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs**EPA 625:** SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.**Microbiology:** **SM9223B-Colilert-QT; Enterolert-QT, SM9221E.****Mansfield Facility:****Drinking Water****EPA 200.7:** Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1 Hg.****Non-Potable Water****EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.**EPA 245.1 Hg.****SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

PAGE OF

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Project Information

Project #: 101

ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!!)

Date Due:

Additional Project Information:

ALPHA Job #: L1733296

Report Information - Data Deliverables

☐ ADEx ☐ EMAIL

Billing Information

☐ Same as Client info	PO #:
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Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program Criteria 20

ANALYSIS		SAMPLE INFO
VOC: ☐ 8260 ☐ 624 ☐ 524.2		Filtration ☐ Field ☐ Lab to do
SVOC: ☐ ABN ☐ PAH		Preservation ☐ Lab to do
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15		
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13		
VPH: ☐ Ranges & Targets ☐ Ranges Only		
☐ PCB ☐ PEST		
TPH: ☐ Quant Only ☐ Fingerprint		
PH TURB, NO ₃ , NO ₂		
ISS		
NH ₃		
ALK-T-2320, ALK-CO ₂ -2320		
		Sample Comments

BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection PM		Sample Matrix	Sampler Initials
		Date	Time		
33296-01	8 PINE BROOK ROAD	9/19/17	12:41	H ₂ O	GEK
01	11 CWF	"	12:35	H ₂ O	GEK
01	11	"	12:37	H ₂ O	GEK
01	11	"	12:40	H ₂ O	GEK
02	11 DOWN POUR EVENT	"	12:58	H ₂ O	GEK

P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

A= None
B= HCl
C= HNO₃
D= H₂SO₄
E= NaOH
F= MeOH
G= NaHSO₄
H = Na₂S₂O₃
I= Ascorbic Acid
J = NH₄Cl
K= Zn Acetate
O= Other

Container Type

Preservative

Relinquished By:

Date/Time

Received By:

Date/Time

All samples submitted are subject to Alpha's Terms and Conditions.
See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)



73B - Whitman (Hydrologic Soil Group D)

416B - Narragansett (Hydrologic Soil Group A)

624B - Haven-Urban Land Complex (Hydrologic Soil Group B)

6A - Scarboro (Hydrologic Soil Group A-D)

254C - Merrimac (Hydrologic Soil Group A)

251B - Hinkley (Hydrologic Soil Group A)

73B - Whitman (Hydrologic Soil Group D)

106D - Narragansett (Hydrologic Soil Group A)

The 1.14 square mile drainage area of Pine Brook, with gravel valley walls rising as high as 22' above the brook draining to Pine Road is surrounded by Hydrologic Soil Group A Glacial Out-wash. This type of topography leads to constant, cold ground water discharge to the brook proper (249.5 gpm @ Pine Road on 9/17.17).

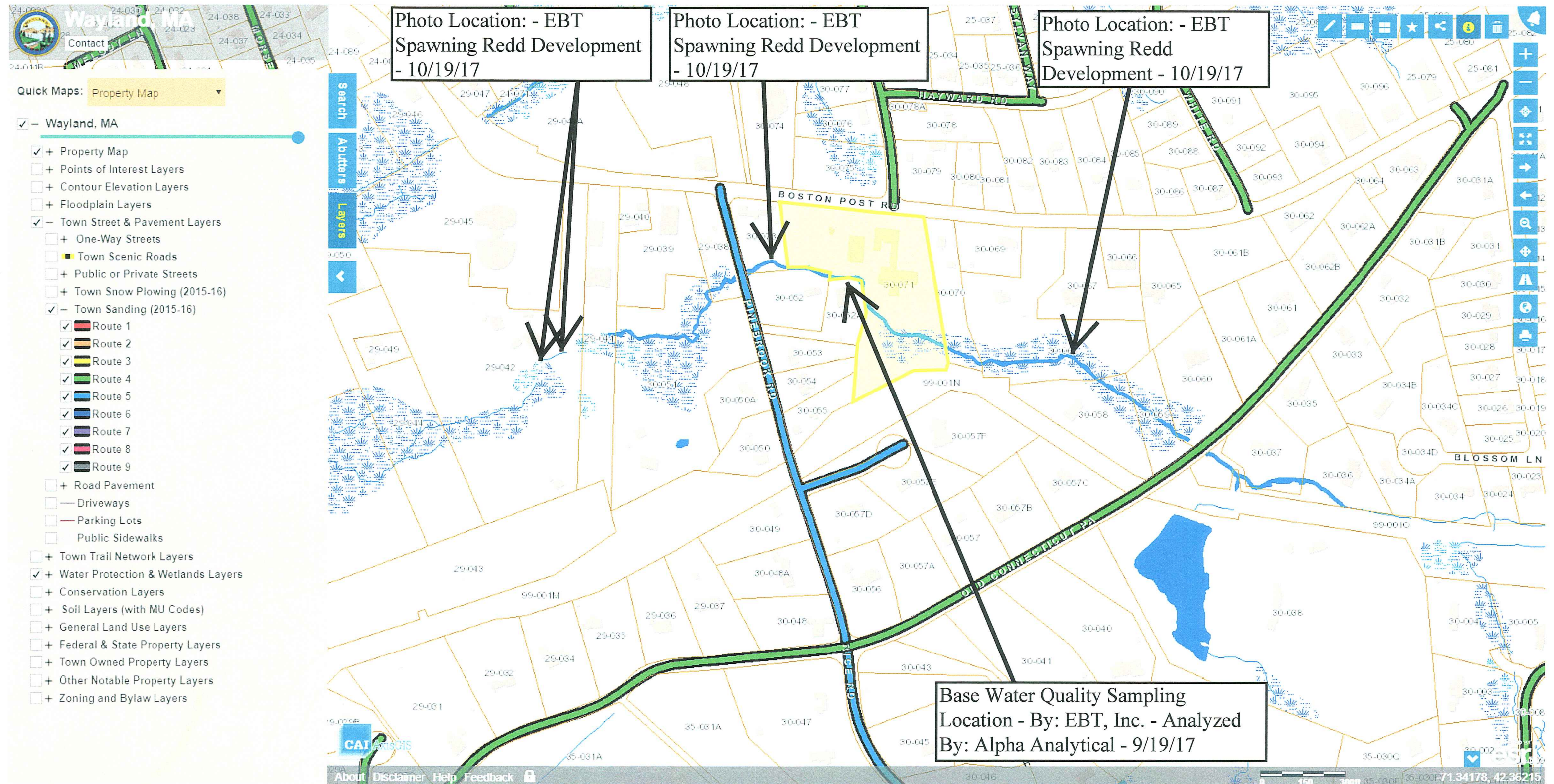




Photo 1 taken by EBT on 10/19/17 – Showing a riffle area of Pine Brook approximately 100' upgradient of Pine Road.



Photo 2 taken by EBT on 10/19/17 – Pool area directly upgradient of riffle showing Redd development (silt, sand and pebbles moved aside by tail action of the EBT female).



Photo 3 taken by EBT on 10/19/17 – Showing log cover habitat in bend in Pine Brook approximately 530' downgradient of Old Connecticut Path.



Photo 4 taken by EBT on 10/19/17 – Showing Redd development under log. Two approx. 6-7" EBTs were seen under the log.



Photo 5 taken by EBT on 10/19/17 – Redd development pool directly downgradient of YMCA Camp road crossing.



Photo 6 taken by EBT on 10/19/17 – Redd development directly downgradient of YMCA Camp road crossing.

GLENN E. KREVOSKY

601 Main Street, North Oxford, Massachusetts 01537

Cell: 508-769-3659 Office: 508-987-0979 email glenn.krevosky@charter.net

EDUCATION:

University of New Hampshire, Professional Development & Training Course: Soil Genesis	2016
University of New Hampshire, Professional Development & Training Course: Hydric Soils of New England	2016
University of New Hampshire, Center for Graduate & Professional Studies Course: Business Management - Mastering Multiple Projects	2005
University of New Hampshire, Center for Graduate & Professional Studies Course: Wetland Hydrology Parameter Recognition & Definition	2004
University of New Hampshire, Division of Continuing Education Course: Advanced Hydric Soils – Spodic Soils	2003
University of New Hampshire, Division of Continuing Education Course: Hydric Soils in Human Disturbed Sites	2002
University of New Hampshire, Division of Continuing Education Course: U.S. Army Corps of Engineers - Wetland Delineator Certification Program	2001
University of New Hampshire, Division of Continuing Education Course: Wetland Delineator Certification Program	2001
University of New Hampshire, Division of Continuing Education Course: Advanced Hydric Soil Identification	2000
Middlesex Conservation District Wetland Delineator Certification Program	1996
Natural Science Major & Geography Major Worcester State College, Worcester, MA	1975 – 1980 & 2003
Biology Major, Chemistry Minor Northeastern University Boston, MA	1973 - 1974

CREDENTIALS:

Testify as expert witness at an Adjudicatory Hearing (with DEP) on McKinstry Brook Cold Water Fishery, Charlton, MA	2017
Board of Directors, Mass Watershed Coalition	2012-2016
Falmouth, MA, Cell tower site, NHESP Rare Species Permitting	2009
Mashpee, MA, Salt Marsh onsite Wetland Restoration Specialist for the MA Department of Conservation & Recreation (DCR) project at South Cape Beach	2008
Creation of an artificial Eastern Brook Trout fishery including Food Web in a 26,000 sq. ft. by 14 ft. deep maximum pond area blasted out of ledge and supplied with 50 gal. per minute well water. Eastern Brook Trout has successfully reproduced in artificially produced ground water upwelling redd areas in 2005 & 2006. The pond is	2004 - 2007

located at Oakdale Estates, Country Way, Hopkinton, MA.

Collection of Eastern Elliptio (*Elliptio complanata*) from Mumford River, Uxbridge, MA and stocked into a manmade pond blasted out of ledge, lined and supplied with well water and was part of a Food Web creation. The pond measures 26,000 sq. ft. and has a maximum depth of 12'. The pond is located at Oakdale Estates, Country Way, Hopkinton, MA. 2005

Collection of Eastern Elliptio (*Elliptio complanata*) from Thompson Pond Spencer, MA and stocked into a manmade pond created in Hinckley soils out of a gravel pit and was part of a Food Web creation. The pond measures 44,000 sq. ft. and has a maximum depth of 14'. The pond is located at the IPG Photonics facility, Old Webster Road, Oxford, MA. 2003

Work in conjunction with Mass. Division of Fisheries & Wildlife's Riverways Program in order to adopt Lowes Brook and a section of the French River thru the ADOPT-A-STREAM PROGRAM. Utilize inmates from Worcester County House of Correction twice a year for enhancement of bottom substrate habitat (7 year program). 1993 - 2001

Restoration/Enhancement of Brook Trout Fishery at Coal Mine Brook - a tributary to Lake Quinsigamond, Worcester, Mass. supported by Worcester Business Development Corp. and Worcester County League of Sportsmen in cooperation and coordination with EPA New England, Mass. Division of Fish & Wildlife, Worcester Conservation Commission, Mass. Audubon, Regional Environmental Counsel and Blackstone Headwaters Coalition (See attached). 1992 - 2006

WETLAND REPLICATION SPECIALIST

1986-PRESENT

- Worcester Business Development Corp, Worcester Biotechnical Park, Plantation Street
- MassDOT, Hanover
- Mass Highway, Spleen Street, Natick
- Mass Highway, Wayland
- DCR Replication, Mashpee
- Sudbury Industrial Park
- Hampton Inn, Auburn
- Industrial parks, plazas, municipalities, residential

Hired as a Private Consultant by Massachusetts Division of Fisheries & Wildlife - Natural Heritage and Endangered Species Program to locate Wood Turtles in Middleboro, MA in February 1990 (coordinated by Jay Copeland and Steve Robley). 1990

Member of Massachusetts Aquacultural Association 1989 - 1990

Assist in Wetland Plant Identification Workshop with Massachusetts Dept. of Environmental Protection and Audubon for Conservation Commission members 1988, 1990-1991

French River Greenway Committee created to look at upland and wetland plant Communities, historical resources and recreational potential of the French River and its tributaries in Oxford, Webster and Dudley in order to enhance habitats and create habitats and create walkways and parks. 1988 - 1993

Identification of upland and wetland plant species at Spencer State Forest, Buck Hill to educate Conservation Commission members in the state. Work done in cooperation with Boston Dept. of Environmental Protection - Education Coordinator, Nancy Lynn. 1988 - 1989

Co-authored paper with Professor Terry Graham on Foraging Habits of Northern Water Snake (*Nerodia sipedon*) on Eastern Brook Trout (published in Chicago Herpetological Journal). 1988

Vice President of Water Quality and Board of Directors of Quinebaug Rivers Association, Inc.	1987 - 2001
Camp Center Committee Member, 4H Camp Marshall, Spencer, MA. Specifically, educating Conservation Counselors on upland and wetland species and other aspects of the Wetland Protection Act.	1987 - 1994
Environmental Consultant specializing in Massachusetts Wetland Protection Act, Wetland Delineation, Notice of Intents, Riverine Fisheries Restorations/Enhancements and client representation before Conservation Commissions. Clients include town and city Conservation Commissions, Engineering Companies, Surveying Companies, Real Estate Offices, Developers, Law Firms, Single Family Homeowners, Sportsman Clubs and Neighborhood Associations.	1986 - 2001
Board of Directors of Quinebaug Rivers Association, Inc. in MA, CT & RI	1986 - 2001
Creation of a 750 ft. trout accessible spawning stream above Nipmuc Pond at 200 Sportsmen's Club, Webster, MA which had successful reproduction four out of the eight year studied.	1984 – 1992
Research on rare species including Wood Turtles (with radio transmitters working with Professor Terry Graham from fall 1988 to spring 1989) and Spotted Turtles in Wellington Brook Valley and throughout Worcester County.	1984 - 2007
Research and restoration of Eastern Brook Trout Fisheries in Wellington Valley and throughout Worcester County in cooperation with Massachusetts Division of Fisheries & Wildlife (unpublished work).	1979 - 1994
Oxford Conservation Commission Member and Chairman of the Commission 1985	1979 - 1985
Wetland/upland plant identification for Worcester County Extension Service, U.S. Dept. of Agriculture at 4-H Camp, Camp Marshall, Spencer, MA.	1969 - 1971

Wildlife Habitat Evaluation Qualifications

- Recognized during the review of DEP File # 349-1075 in 2014 by Central Region DEP Wetland Section Chief, Mr. Phil Nadeau as being qualified to write Wildlife Habitat Evaluations from his knowledge of Glenn Krevosky's work from 1986 to 2014.
- 1979 to 1991 – Wellington Brook, Oxford, MA Eastern Brook Trout Fishery Restoration and Population Equilibrium Study in cooperation with Mass Fish & Wildlife Fishery Biologist Lee McLaughlin and Worcester State College professor Dr. Terry Graham.
- 1988 - Baiting Brook, Framingham – Bank Wildlife Habitat Evaluation for US Army Corps.
- Fall of 1988 to Late Spring of 1989 – Wellington Brook in conjunction with Dr. Terry Graham, Worcester State College – turtle radio transmitter study on three individual turtles.
- 1990 – Field research for C-FACE (citizens group) on Marble Salamander habitat and larva density in a ground water fed vernal pool downgradient of the proposed BFI & Barletta Landfill off of Route 16, Webster, MA. Wrote portion of first appeal of the project.
- 1991 – Wood turtle nesting study – study of nesting habitat in shaded and nonshaded areas. Temperature study in potential nesting habitat sites along railroad crossings, high power electric transmission line crossings, gas transmission line crossings and new roadway crossings along perennial rivers and streams, reviewed by NHESP as part of the Wood Turtle study for Westbrook Crossing, Shrewsbury, MA.
- 2003 to 2016 - Exotic Invasive plant species – habitat restoration, 601 Main Street, N. Oxford, to design specific species removal protocol
- 2010 to 2015 – Vernal pool habitat monitoring and study to permit under Fish & Wildlife Refuge Vernal Pools in April of 2015, DEP File # 255-750
- 2010 to 2016 – Wood Turtle nesting site enhancement at 601 Main Street, N. Oxford, MA – scientific collection permit received during this time period from NHESP to screen turtle nests from human commensals and photograph and release the hatchlings to enhance the local population.
- Barbers Hollow Brook, Oxford, MA 7,000 linear foot trout fishery restoration in cooperation with Mass Fish & Wildlife, DEP File # 255-706
- 2013 to 2016 - Dolge Court Trout population study and Biological Assessment with Mass Fish & Wildlife
- Recognized Wood Turtle Monitor by NHESP to oversee work on bridge replacements (Mill Street, Holden) and site development (366-368 Main Street, Oxford, MA).
- 2006 to 2007 - Rand Whitney 160 Shrewsbury St., Route 140, Boylston, MA Wood Turtle study, Sewall Brook, Boylston, RT 146 and Sewall Street, reviewed by NHESP
- Headwater Eastern Brook Trout stream habitat creation, work in cooperation with Mass Fish & Wildlife fishery biologists Dave Hallowell and Lee McLaughlin – 200 Sportsmen Club, Webster, MA
- Hired by the Sutton Conservation Commission to ensure the project design for the proposed Route 146 LeClair Plaza (now Market 32) would not adversely affect the habitat of the native spawning population of Eastern Brook Trout downgradient of the EconoLodge at 146 and upgradient of Woodbury Pond.
- Additional Trout Studies: EMC Oakdale Estates Trout Pond, Hopkinton, 2004-2013; IPG World Headquarters Trout Pond, Oxford, 2003-2005; Chapin Brook (electroshock), Leicester, 2009-2016; Kendal Road Brook (electroshock), Holden, 2008-2013; 10 Mile River, Plainville, 2004-2007; Lowes Brook, Oxford, 1982-1991; French River, North Oxford, 1979-2016.
- Requested by the Museum of Science (Curator Lou Stevens) in 2015 to submit a proposal to create an artificial Eastern Brook Trout fishery at the museum. He received EBTs name from Mass Fish & Wildlife.

- 2017 - Design and implement DEP SEP (Supplemental Environmental Project) CWF restoration and enhancement project on an unnamed tributary to Little River, Charlton MA. The project both restored a historic headwater trout pool, enhanced the square footage of pooling areas below the headwater pool, created spawning Redd habitat and removed accumulated road sand below DPW road discharge points from 2 towns.