June 9, 2020

VIA ELECTRONIC MAIL

Commissioner Katie Dykes
Connecticut Dept. of Energy and Envtl. Protection
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RE: Sierra Club Comments on Eversource Application for Section 401 Water Quality Certification for Pomfret to Killingly Pipeline Project

Commissioner Dykes:

The Sierra Club respectfully submits the following comments to the Department of Energy and Environmental Protection (DEEP) regarding Eversource's Application for a Section 401 Water Quality Certification for the Pomfret to Killingly Pipeline Project. Sierra Club retained experts from Downstream Strategies, an environmental and economic development consulting firm located in Morgantown, West Virginia, to review the application and evaluate the project's consistency with Connecticut's Water Quality Standards (CTWQS). As detailed in the comments below and in the attached report prepared by Downstream Strategies, the proposed pipeline would have detrimental impacts on streams, wetlands, and the aquatic ecosystems and wildlife they support, in violation of the CTWQS. Specifically, the proposed project would have the following damaging impacts, in violation of the CTWQS:

(1) Degrade water quality in several streams crossed by the proposed pipeline route in the Durkee Brook watershed, as well as in Durkee Brook itself, jeopardizing the continuing viability of trout habitat in that documented Brook trout stream;
(2) Adversely affect DEEP's own plans to restore Wyndham marsh to create nesting habitat for state endangered species;
(3) Introduce risk of inadvertent returns from horizontal directional drilling under the Quinebaug River and a tributary of Bark Meadow Brook, potentially discharging drilling fluid into these waterways and degrading water quality;
(4) Destroy habitat for state-listed species including the Northern long-eared owl (endangered), American bittern (endangered), Eastern box turtle (special concern), and Wood turtle (special concern), resulting in loss of a designated use.

DEEP must act to protect these valuable ecosystems and wildlife. Approval of the proposed pipeline would risk harm to rivers, streams, and wetlands that support endangered species and is irreconcilable with DEEP's own conservation plans. DEEP should deny Eversource's application for certification under section 401 of the Clean Water Act because the project would cause multiple violations of the CTWQS.

I. The Proposed Project

Eversource filed an application on January 14, 2020 with DEEP for certification under Section 401 of the Clean Water Act of a proposed 2.8-mile gas pipeline in Windham County, Connecticut, running from Wrights Crossing Road in Pomfret to Lake Road in Killingly. Eversource, *Application for a Section 401 Water Quality Certification for the Pomfret to Killingly Pipeline Project* (January 2020), master p. 20 [hereinafter "Eversource Application"]. Eversource also seeks approval from the U.S. Army Corps of Engineers for use of General Permit 6 under Section 404 of the Clean Water Act, triggering the obligation to obtain certification from DEEP under Section 401. *Id.* at 2. The new 16-inch pipeline would run parallel to an existing 6-inch welded steel gas pipeline constructed in the 1950s and would be sited within or adjacent to the right-of-way for the existing pipeline. *Id.* at 20. The proposed gas pipeline would connect a proposed 650 MW gas-powered electricity facility to the gas distribution system. *Id.*

The proposed pipeline route crosses seven watercourses, including the Quinebaug River, five intermittent streams, and a pond. *Id.* at 190. Eversource has proposed horizontal directional drilling (HDD) under the Quinebaug of approximately 600 feet, 195 feet of which would be under the river itself. *Id.* at 168, 190. The proposed project would also cross a tributary to Bark Meadow Brook adjacent to the Airline State Park trail via HDD, which would necessitate 210 feet of drilling. *Id*. at 168. Eversource proposes to cross the other watercourses using a dam and pump method or flume method, to be determined at the time of construction. *Id*. at 103. The length of the proposed pipeline is contained within the Durkee Brook watershed, running parallel to the watercourse for 2.5 miles. Downstream Strategies, *Potential Impacts from Eversource's Proposed Pomfret to Killingly Pipeline Project* (June 3, 2020), at 20 [hereinafter "Downstream Report"]. Five of the watercourses crossed by the proposed pipeline route are tributaries of Durkee Brook, forming headwaters of the stream. *Id.*

The project would also cross fourteen wetlands, twelve of which are delineated in the application as federal jurisdictional wetlands, while one qualifies as a State-regulated wetland based on its floodplain soils. *Eversource Application*, p. 210. Eleven of the wetlands crossed by the proposed pipeline are in the Durkee Brook watershed. *Downstream Report*, at 2. Eversource predicts that the project would result in temporary direct wetland impacts totaling 16,416 sf (0.38 acres) during construction from trenching, backfilling, and restoration, and an additional 121,479 sf (2.79 acres) of temporary timber matting. *Eversource Application*, p. 20. The company further predicts that tree clearing within wetlands would result in 17,424 sf (0.40 acres) of conversion from forested wetland to scrub-shrub and emergent wetland habitats. *Id.* Eversource anticipates that approximately 5,248 cubic yards of temporary discharge would occur but that no permanent fills to wetlands or watercourses would occur. *Id.* Eversource has proposed various restoration strategies to address these wetland impacts, including reestablishment of existing grades and hydrology, replacement of wetland topsoil, and re-vegetation with a wetland seed mix. *Id.* Among the wetlands crossed by the proposed pipeline is Wyndham marsh, a 65-acre marsh located on the Wyndham Land Trust. *Downstream Report*, at 25; Email from Min Huang, Migratory Bird Program Leader, DEEP, *Re: Water Control System—Wyndham Marsh*, May 16, 2020. This wetland previously supported nesting for populations of American bittern, Sora, and Virginia rail, and at present supports nesting Waterfowl. Email from Min Huang, Migratory Bird Program Leader, DEEP, *Re: Water Control System—Wyndham Marsh*, May 19, 2020.

DEEP is currently engaged in a permitting process to install a water control system to restore this marsh and to reestablish breeding habitat for the state-listed endangered American bittern and other bird species. *Id.*

II. Connecticut's Water Quality Standards and DEEP's Obligation to Ensure Compliance with Those Standards Pursuant to Section 401 of the Clean Water Act

Subsection 401(a)(1) of the Clean Water Act (CWA) empowers states to review any proposed facility or activity that (1) requires a federal permit and (2) that may result in a "discharge" into waters of the United States, for compliance with the Clean Water Act. 33 U.S.C.A. § 1341(a)(1). A state may deny certification based on inconsistency with Sections 301, 302, 306, or 307 of the Clean Water Act, or with state water quality standards adopted pursuant to Section 303. 33 U.S.C.A. § 1341(a)(1). Section 303 directs states to craft water quality standards protecting the following characteristics of waterbodies: "use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and… use and value for navigation." 33 U.S.C § 1313 (c)(2)(A).

Consistent with Section 303 of the CWA, Connecticut has adopted water quality standards that protect the state's watercourses and wetlands. *See* Regulations of Connecticut State Agencies, §§ 22a-426-1 to 22a-426-9. The Connecticut Water Quality Standards (CTWQS) outline standards for surface water quality and delineate the various classes of surface water and their designated uses. CTWQS § 22a-426-4. These standards protect, among other things, "rivers and streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, federal jurisdictional wetlands, and other natural or artificial, public or private, vernal or intermittent bodies of water." CTWQS § 22a-426-1(60). Connecticut has included standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition of surface waters, among others. CTWQS § 22a-426-9(a)(1). The standards dictate that these characteristics shall not exceed levels necessary to protect and maintain all designated uses. *Id.* Durkee Brook and its tributaries are designated Class A waters, with the following designated uses: (1) habitat for fish and other aquatic life and wildlife, (2) potential drinking water supplies, (3) recreation, (4) navigation, and (5) water supply for industry and agriculture. *See* DEEP, Water Quality Classifications, Killingly, CT Map (October 2018); CTWQS § 22a-426-4. The Quinebaug River has been designated as a Class B surface water, which has the same designated uses as Class A waters with the exception of potential drinking water supply. *Id.*

The CTWQS also include antidegradation standards, which dictate that "existing and designated uses such as propagation of fish, shellfish and wildlife, recreation, public water supply, and agriculture, industrial use and navigation, and the water quality necessary for their protection are to be maintained and protected." CTWQS § 22a-426-8. Wetlands are explicitly included in the antidegradation policy and are subject to Tiers 1 and 2 of antidegradation review. *Id*. The antidegradation policy states that "[t]he Commissioner shall not issue any permit, water quality certificate or authorization for a discharge or activity unless the Commissioner finds that all existing and designated uses… will be fully protected and the discharge or activity is consistent with the designated uses established in the Connecticut Water Quality Standards for the class of water affected by the discharge or activity… and [the Antidegradation Standards]." *Id*.

States are obligated to ensure compliance with their water quality standards for projects that will result in a discharge or harm to protected waters, as well as to projects that merely create a risk of discharge or harm to those waters. *Delaware Riverkeeper Network v. Fed. Energy Regulatory Comm'n*, 857 F.3d 388, 392 (D.C. Cir. 2017) (finding that because expansion of natural gas pipeline "*might* result in discharges into navigable waters" the company was obligated by § 401 to obtain a water quality certification) (emphasis added). *See also Islander E. Pipeline Co., LLC v. McCarthy*, 525 F.3d 141 (2d Cir. 2008). For example, in a prior denial of a Section 401 certification, Connecticut reasoned that the Islander East Pipeline carried a risk of drilling fluid escaping into Long Island Sound through fissures in the bedrock, basing certification denial in part on this risk. *Id.* at 147. Connecticut further found that Islander East's proposed means of remediating project impacts were uncertain to be effective, concluding that the company had failed to demonstrate that the pipeline project would comply with state water quality standards as necessary to secure certification. *Id.* at 152.

States may use Section 401 to ensure that the whole of an activity meets state water quality requirements, rather than only the pollution tied directly to the discharge. *PUD No. 1 of Jefferson Cty. v. Washington Dep't of Ecology*, 511 U.S. 700, 712 (1994) (holding that states are authorized to impose conditions "on the activity as a whole once the threshold condition, the existence of a discharge, is satisfied."). *See also* 40 C.F.R. § 121.2(3) (stating that 401 certification shall include "[a] statement that there is a reasonable assurance that *the activity* will be conducted in a manner which will not violate applicable water quality standards.") (emphasis added). States may deny 401 certification where the whole of the activity, rather than the discharge itself, will violate state water quality standards. *See e.g. Islander E. Pipeline Co., LLC v. McCarthy*, at 154 (upholding CTDEP's denial of 401 certification for pipeline based on impacts unrelated to the discharge and stating that "CTDEP's findings as to the lost shellfishing use caused by anchor strikes and cable sweeps, *by itself*, warrants our denial of Islander East's petition") (emphasis added). In reviewing an activity, states may consider damage to watercourses from point-sources and non-point sources. *See generally PUD No. 1 of Jefferson Cty. v. Washington Dep't of Ecology* (upholding denial of 401 certification based on non-point source impacts to water quality).

III. DEEP Should Deny Eversource's Application for Certification Under Section 401 of the Clean Water Act Because the Project Would Cause Violations of the CTWQS

Construction of the proposed pipeline would damage streams and wetlands beyond the impacts identified by the Eversource Application, despite use of best management practices. *Downstream Report*, at 1-3 (concluding that "[e]ven with the use of best management practices (BMPs), sediment delivery to streams and wetlands will likely cause violations of Connecticut water quality standards—including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition."). Durkee Brook, its tributaries, and wetlands in the project area would all be harmed by construction of the proposed pipeline, and wildlife that depends on these aquatic ecosystems would be adversely impacted, including state-listed endangered species such as the American bittern, the Northern long-eared owl, Wood and Eastern box turtles, as well as Brook trout and other aquatic life. *Id.* These impacts would result in loss of designated uses of these aquatic resources in violation of the CTWQS. *Id.*

a. Cumulative Impacts to Durkee Brook Would Lower Water Quality in the Stream and Harm Brook Trout Populations, in Violation of the CTWQS

Construction of the proposed pipeline would cause cumulative damage to the hydrology of Durkee Brook and its tributaries, harming Brook trout populations and violating the CTWQS. *Id.* at 20-23. As Downstream Strategies concluded, "[e]rosion and resulting sedimentation in Durkee Brook… pose a significant risk to water quality and trout habitat. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated and trout habitat is likely to be damaged." *Id.* at 20. Figures 1 and 2 below illustrate the damage to streams and wetlands from erosion and sedimentation caused by pipeline construction.

Figure 1: Tributary containing sediment due to construction of the Mountain Valley Pipeline.

Downstream Report, at 12.

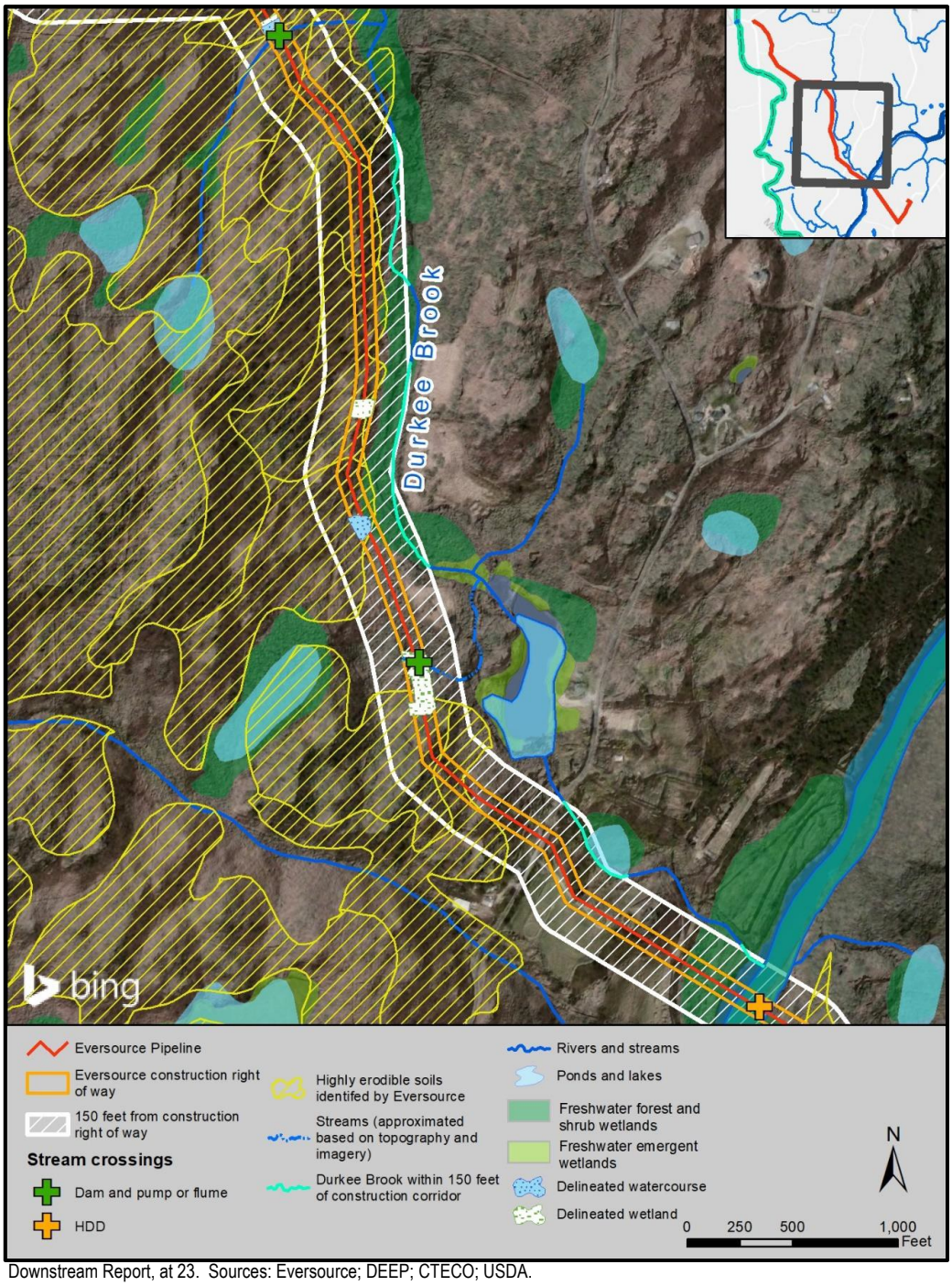
Figure 2: Sedimentation of Kincheloe Creek wetland due to BMP failures

Downstream Report, at 11.

Although the proposed pipeline does not cross Durkee Brook, the watercourse would be significantly impacted by sedimentation caused by construction of the proposed pipeline. *Id.* at 21-23. The watercourse runs parallel to the proposed pipeline route for 2.5 miles and is located within approximately 150 feet and downgradient from the construction right-of-way, meaning that any dislodged soil would flow down to Durkee Brook. *Id*. at 20-21. Further, the length of the proposed pipeline is within the Durkee Brook watershed and five tributaries to Durkee Brook, making up headwaters of the stream, would be crossed by the pipeline. *Id*. Such headwater streams "directly impact the integrity of downstream water resources." *Id*. Two of these tributary crossings are just upstream from their confluences with Durkee Brook, making sediment delivery to Durkee Brook exceedingly likely. *Id*. at 21. Three crossings are on tributaries that combine to form a main tributary to Bark Meadow Brook, the largest tributary to Durkee Brook. *Id.*

The impacts of the proposed crossings and construction activities would be concentrated in Durkee Brook because water from each crossing converges downstream, increasing impacts to downstream waterways. *Id.* As concluded by Downstream Strategies, "[t]hese five crossings are likely to have cumulative impacts with significant delivery of sediment to Durkee Brook…. sediment introduced to headwaters streams and tributaries to Durkee Brook will likely lead to violations of water quality standards—including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition." *Id.* Figure 3 below illustrates the proximity of the proposed pipeline route to Durkee Brook and the crossings of its tributaries.

Figure 3: Eversource Pipeline in proximity to Durkee Brook



Downstream Report, at 23. Sources: Eversource; DEEP; CTECO; USDA.

Durkee Brook is especially valuable as habitat for Brook trout, which populate the watercourse, according to DEEP fisheries data. Connecticut Environmental Conditions Online, *Connecticut DEEP Fish Community Data-Inland Waters Interactive map*, https://cteco.uconn.edu/projects/fish/viewer/index.html (2015). Increased sedimentation caused by the proposed project would harm the Brook trout population, impairing the existing designated use of Durkee Brook as fish and wildlife habitat. *Downstream Report*, at 20. Increased sedimentation

negatively impacts brook trout populations because fine sediments can smother fish eggs and aquatic invertebrates that trout rely on for food. *Id.* Fine sediments also cause alterations to the streambed, covering the gravel and small cobble substrates used by trout for depositing their eggs. *Id.* Further, temporary increases in turbidity can reduce dissolved oxygen levels in the water, impeding trout from finding food and avoiding predators. *Id.* In addition, removal of tree cover in riparian zones and wetlands that feed small streams contributes to increased water temperatures and reduced oxygen levels in the water. *Id.*

Pipeline construction causes erosion at stream crossings and upland areas. *Id.* at 5. As explained by Downstream Strategies, "stream and wetland crossings, extensive use of construction mats in wetland areas, and disturbance of streambanks and upland areas from pipeline construction will cause erosion" that would increase sediment delivery to streams and wetlands. *Id.* at 2-3. Even with the use of erosion and sediment control best management practices, soil would be dislodged when it rains, transported downhill, and deposited in Durkee Brook and its tributaries. *Id.* As described by Downstream Strategies, "[s]edimentation would likely result in additional suspended and settleable solids, silt or sand deposits, increased turbidity, and impacts to aquatic habitat that would harm the biological condition of the surface waters." *Id.* Such impacts would violate CTWQS and threaten the designated use of Durkee Brook as Brook trout habitat. *Id.* at 20.

Sediment delivery to Durkee Brook would be exacerbated by erosion-prone soils and steep slopes present along the pipeline route. *Id.* at 14. Fifty-five percent of the pipeline corridor contains soil with high erosion potential and five of the proposed stream crossings are within these severe erosion zones. *Id.* Construction will destabilize streambanks, and any rain event would contact bare ground, initiate erosion, and mobilize sediment—a process unlikely to be entirely prevented by mitigation efforts. *Id.* at 16, 21. Table 1 below further explains the erosion-prone soil types in the project area.

Table 1: Locations most susceptible to erosion and sedimentation

Location	Eversource erosion classification	DEEP erosion	Approximate slope	Description
A	Severe	Highly erodible	10–15%	The pipeline will cross a steep slope upgradient of its crossing of a tributary to Durkee Brook
B	Severe	Highly erodible	10–15%	The pipeline will run along a steep slope upgradient of Durkee Brook through highly erodible soil for approximately 500
C	Severe	Highly erodible	10–15%	The pipeline will pass over a steep slope with highly erodible soils upgradient of a stocked fishing pond located at the Pomfret Gun and Rod Club
D	Moderate	Highly erodible	10–15%	The pipeline will descend over a steep slope with highly erodible soils to its crossing of the Quinebaug River
E	Severe	Highly erodible	5–10%	The pipeline will ascend a steep slope with highly erodible soils east of the Quinebaug River crossing

Downstream Report, at 14. Sources: Eversource; CTECO; U.S. Geological Survey.

These water quality impacts would persist over the 18 to 24-month construction timescale of the project and beyond, as areas cleared for construction will continue to cause increased sedimentation to waterways until these areas are fully revegetated. *Id.* at 20. Additionally, the cleared pipeline path could increase the speed of runoff compared to thick woody cover from trees and shrubs, a long-term impact which Downstream Strategies explained "can increase flows in streams during storm events, which can exacerbate existing streambank erosion problems or create new streambank instability." *Id.*

Impacts from pipeline construction would be further exacerbated by numerous conservation constraints on the project, as construction would have to move throughout the corridor for an extended period of time to adhere to such constraints. *Id*. at 28. Stream crossings created for vehicle and equipment traffic and construction mats in wetland areas may have to stay in place for months or be installed and removed multiple times to complete the project. *Id*. As explained by Downstream Strategies, "[t]hese kinds of complications increase the chances for erosion and sediment control structures to need maintenance and/or fail during storm events." *Id*. Given these limitations, multiple stream crossings would likely be constructed at the same time, which Downstream Strategies concluded would "increase[e] the area that will be exposed as bare soil and mak[e] it even more likely that the project would cause cumulative impacts in Durkee Brook." *Id.* at 21. Table 2 below examines the numerous activity constraints the project must implement due to conservation measures.

Table 2: Construction activity constraints due to conservation measures

Species of concern	Reason for constraint	Construction constraint	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wood, box turtle	Inactive season	No digging in upland or within 10 meters of river	√	√	√								√	√
Wood, box turtle	Active season	Fencing and survey for individuals				√	√	√	√	√	√	√		
American bittern	Breeding season	No new activity, noise 100 feet from Wyndham Marsh, confirmed presence areas				√	√	√	√	√				
American bittern	Breeding season	No water quality changes in Wyndham Marsh, confirmed presence areas				√	√	√	√	√				
N. long-eared bat	Breeding season	No tree clearing						√	√					
Amphibians	Breeding season	No activity in vernal pools, vernal pool envelope, or critical terrestrial habitat			√	√	√							
N. long-eared owl	Breeding season	No new traffic or noise 200 meters from nest			√	√	√	√	√					
N. long-eared owl	Roosting habitat	No new traffic or noise 200 meters from winter roost	√	√	√								√	√
Brook trout	Spawning season	No open cut stream crossings	√	√	√	√	√					√	√	√

Sources: Eversource, 2020; DEEP, 2020h.

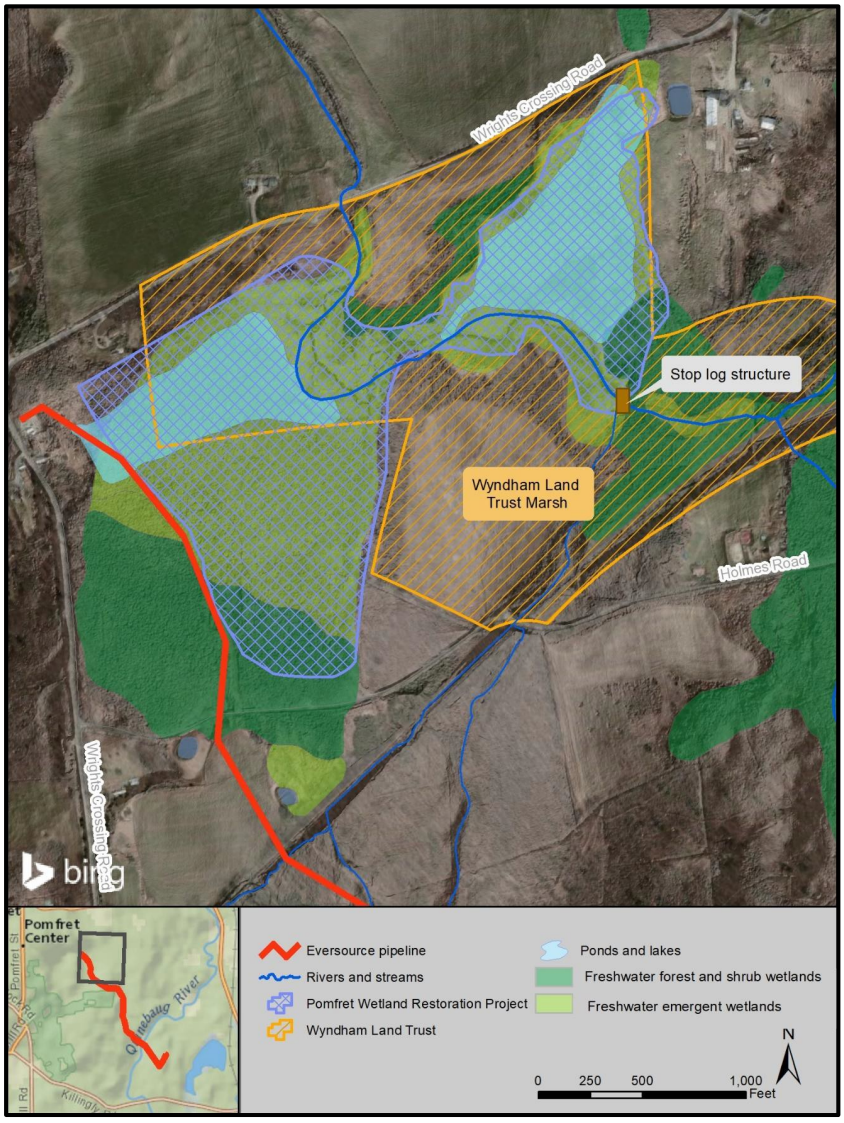
Downstream Report, at 29.

b. <u>The Project is Inconsistent with DEEP's Own Plans to Restore Wyndham Marsh Habitat for Endangered Species Nesting</u>

The proposed pipeline is inconsistent with the CTWQS and with DEEP's own plans to restore Wyndham marsh and reestablish nesting habitat for state-listed bird species in the wetland. The proposed pipeline would cross Wyndham marsh, a 65-acre marsh located on the Wyndham Land Trust. Email from Min Huang, Migratory Bird Program Leader, DEEP, Re: Water Control System—Wyndham Marsh, May 16, 2020. DEEP is currently engaged in a permitting process to install a water control system to restore this marsh and reestablish breeding

habitat for several bird species. *Id.* This wetland previously supported nesting for populations of American bittern, Sora, and Virginia rail, and at present supports nesting waterfowl. *Id.* DEEP noted in its Natural Diversity Data Base (NDDB) review of the proposed pipeline that "Wyndham marsh has been identified as important inland marshbird habitat because of its retention of native vegetation compared to other inland wetlands in Connecticut." *Eversource Application*, at 283. DEEP's plan to create a water control system to restore the marsh is indicative of Wyndham marsh's value as an essential wetland resource. Plans to direct resources to Wyndham marsh to restore nesting habitat, in recognition of the wetland's ecological value, are irreconcilable with allowing construction of a pipeline to tear through the area and destroy the wetland habitat. Figure 4 below illustrates the pipeline route and its intersection with Wyndham marsh and the proposed restoration project.

Figure 4: Water level stabilization project at the Wyndham Land Trust Marsh



Downstream Report, at 27. Sources: Eversource; DEEP; CTECO. Note: Both the Eversource Pipeline route and the boundary of the Pomfret Wetland Restoration Project were approximated using geospatial methods. Thus, some level of error exists in the exact location of each.

c. Construction of the Proposed Pipeline Risks Inadvertent Returns from Horizontal Directional Drilling Under the Quinebaug River and Under a Tributary to Bark Meadow Brook, Which Would Degrade Water Quality and Violate the CTWQS

Eversource has proposed the use of horizontal directional drilling (HDD) to cross under the Quinebaug River and under a tributary of Bark Meadow Brook adjacent to the Airline State Park trail. *Eversource Application*, at 22. HDD runs the risk of inadvertent returns—wherein drilling fluid, composed of clay, water, and other additives, is released without authorization to the ground or any surface water at the drill site or adjacent to the drill site. *Downstream Report*, at 18. Such inadvertent returns of drilling fluids and runoff from work areas can introduce polluted water into streams, rivers, and wetlands and would violate the CTWQS. *Id.*

As detailed in the Downstream report, HDD-related fluid spills have contaminated streams and wetlands during construction of numerous pipeline projects, including during construction of the Mariner East II Pipeline in Pennsylvania and the Rover Pipeline in Ohio, Pennsylvania, and West Virginia, spilling millions of gallons of drilling fluid into multiple waterways. *Id.* These spills led to significant water quality issues and costly cleanup efforts. *Id.* In one stream contamination event due to inadvertent returns in the Juniata River, drilling fluid was visible in the river for 1.5 miles downstream of the incident. *Id.* Figures 5 and 6 below illustrate the consequences of inadvertent returns in other failed HDD projects, and the impairment to water quality they caused. DEEP should deny water quality certification for the proposed pipeline to avoid the risk of harm to water quality resulting from drilling-related inadvertent returns under the Quinebaug River and the Meadow Brook tributary.

Figure 5: Inadvertent returns during pipeline construction in Pennsylvania

Downstream Report, at 19. Source: Laura Evangelisto and Middletown Coalition for Community Safety. Note: Left: Drilling mud released during an inadvertent return in Middletown, Pennsylvania (Dauphin County). Right: Sandbags used to contain leak of drilling fluid on Chester Creek in Brookhaven, Pennsylvania (Delaware County).

Figure 6: Cleanup of drilling fluid in the Tuscarawas River wetlands

Downstream Report, at 19. Source: Ohio Environmental Protection Agency.

d. The Proposed Pipeline Would Damage Habitat for State-Listed Species, Including the Northern Long-Eared Owl, American Bittern, Eastern Box Turtle, and Wood Turtle, Resulting in Loss of a Designated Use and Violating the CTWQS

The proposed pipeline would cross habitat for several state-listed species, causing loss of the designated use of these aquatic ecosystems as wildlife habitat and violating the CTWQS. *Id.* at 24-26. Several endangered species and species of concern will be impacted by project construction, including the Northern long-eared owl, American bittern, Eastern box turtle, and Wood turtle.

Northern long-eared owl. Local naturalists have documented the presence of Northern long-eared owls, a state-listed endangered species, in the project area from April 2020 through the present. *See* Photograph of Northern long-eared owl in Figure 7 below, dated May 2020; CT DEEP, *Wildlife Division, Long Eared Owl*, https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/Long-eared-Owl (last visited May 27, 2020). The noise and construction traffic from the project could reduce the foraging efficiency of owls, which depend almost entirely on sound to hunt for prey. *Downstream Report*, at 24. Such disturbance could drive the owls from the habitat entirely, effectively resulting in habitat loss. *Id*. This loss of a designated use is inconsistent with the CTWQS. Figure 7 below depicts a Northern long-eared owl photographed in the project area in May 2020.

Figure 7: Northern long-eared owl photographed in May 2020 in Wyndham Marsh

Source: A. Rzeznikiewicz, Connecticut Audubon Society.

American bittern. Although the American bittern's numbers have declined in Connecticut, these birds have been documented calling in the marsh at the northwest end of the proposed pipeline path in recent months and to the southwest of the proposed pipeline in Wyndham marsh. *Downstream Report*, at 25. The proposed project would reduce water quality in the marshes, increase cover of non-native species, and otherwise disturb the ecosystem's vegetation, reducing food available to bitterns and their prey. *Id.* Further, traffic and construction noise from the project would interfere with the birds' ability to find food. *Id.* As Downstream Strategies concluded in its report, "[g]iven the location of the pipeline path through American bittern habitat, significant impacts to this endangered species are possible." *Id*. The anticipated loss of bittern habitat is yet another designated use that will be harmed by the proposed pipeline, in violation of the CTWQS.

Eastern box turtle and Wood turtle. DEEP has recognized the presence of two species of turtle in the project area, the Eastern box turtle and the Wood turtle. *Eversource Application*, p. 283-285. Both are species of special concern in Connecticut and would be harmed by project construction, as these turtles are susceptible to being crushed during digging and by equipment and vehicle traffic. *Downstream Report*, at 25. Further, clearing of upland forest reduces wintering habitat for the Eastern box turtle. *Id*. at 26. The loss of habitat of these turtle species is inconsistent with the CTWQS, which protect designated uses including habitat for wildlife.

IV. Conclusion

As detailed above, the proposed pipeline would damage Connecticut's rivers, streams, and wetlands, causing violations of the CTWQS for suspended and settleable solids, silt or sand

deposits, turbidity, and biological condition. Degraded water quality in the watercourses and wetlands crossed by the pipeline would destroy habitat for Brook trout in Durkee Brook, as well as habitat for state-listed species including the Northern long-eared owl, American bittern, Eastern box turtle, and Wood turtle along the proposed project route. The project is inconsistent with DEEP's own plans to restore Wyndham marsh, and runs the risk of further degrading water quality through the introduction of inadvertent returns from HDD. Given the potential for damage to the state's waterways and wildlife those ecosystems support, DEEP should not grant 401 certification for the proposed pipeline.

Sincerely,

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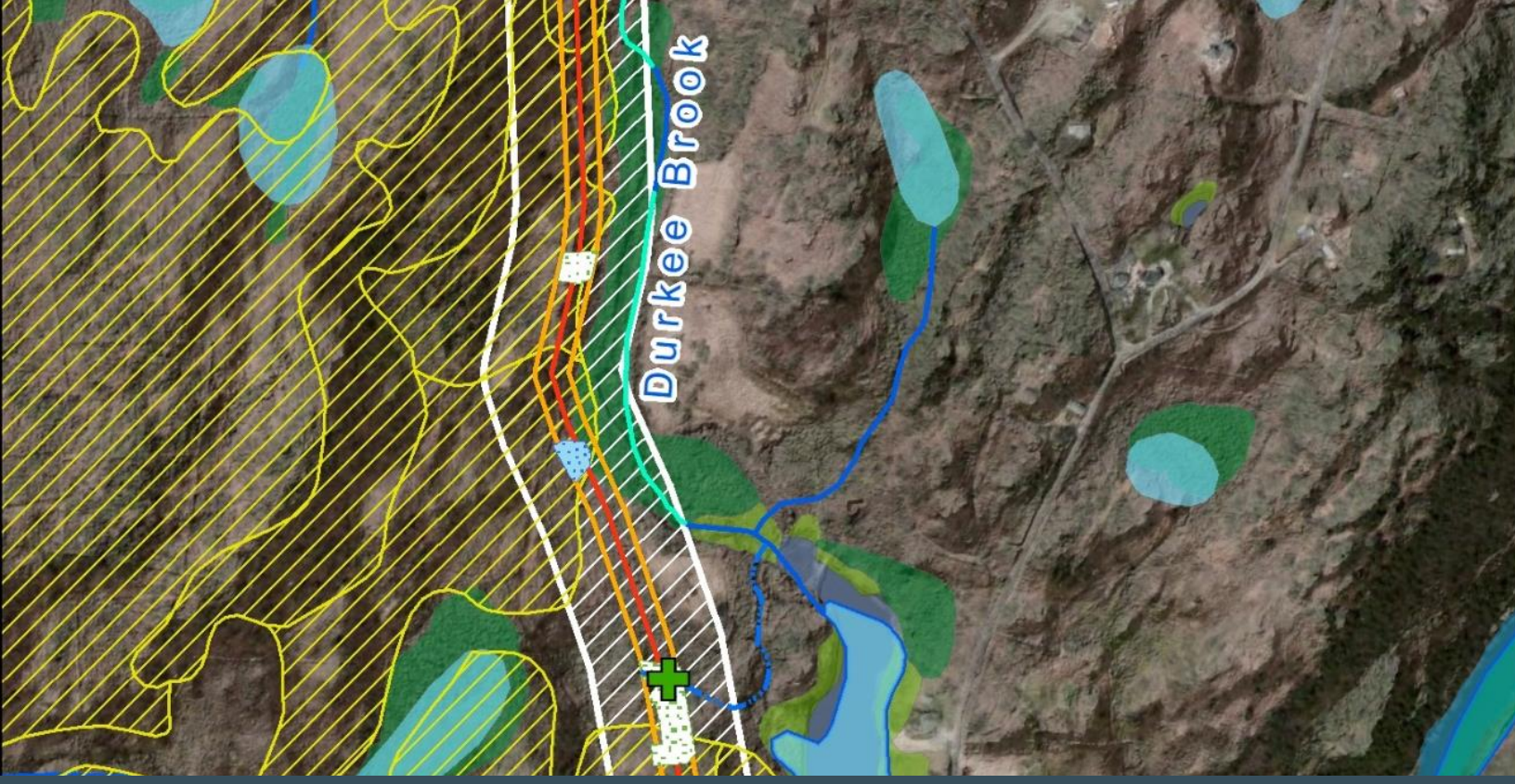

Potential Impacts from Eversource's Proposed Pomfret to Killingly Pipeline Project

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Ideas that sustain.

June 3, 2020

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ABBREVIATIONS

BMP	best management practice
CTECO	Connecticut Environmental Conditions Online
DEEP	Department of Energy and Environmental Protection
EA	environmental assessment
GP	General Permit
HDD	horizontal directional drilling
L	liter
mg	milligram
PADEP	Pennsylvania Department of Environmental Protection
PEM	palustrian emergent wetland
PFO	palustrian forested wetland
POW	palustrian open water pond
PSS	palustrian scrub-shrub wetland
ROW	right-of-way
SV	self-verification
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

In January 2020, Eversource Energy Service Company ("Eversource") submitted a Section 401 Water Quality Certification application to the Connecticut Department of Energy and Environmental Protection (DEEP) for the construction of a pipeline from Pomfret to Killingly, Connecticut (the "Eversource Pipeline"). (Eversource, 2020)

In addition to the 401 application, Eversource submitted a pre-construction notice to the New England District of the U.S. Army Corps of Engineers (USACE) seeking approval of the project under Connecticut's Section 404 General Permit (GP) 6, which applies to certain utility line activities. Unless it waives the certification requirement, DEEP must verify that the project will comply with Connecticut water quality standards in order to grant the 401 Certification.

The proposed project would construct approximately 2.8 miles of new 16-inch pipeline, co-located within an existing Eversource right-of-way (ROW) where a six-inch steel natural gas pipeline is currently located. The proposed project also includes a new section that would extend for a short distance along an existing roadway ROW. The purpose of the new pipeline is to supply natural gas to existing customers and a new 650-megawatt gas-fired power plant in the town of Killingly. (Eversource, 2020)

The proposed pipeline path crosses through rural areas in the towns of Killingly and Pomfret. Current land uses include rural residential areas, agricultural lands, and recreational areas, including three separate properties that include conservation lands (Figure 1). The area is part of the Southern New England Coastal Plains and Hills and is characterized by low hills covered by oak and oak-pine forests, along with some elm, ash, and red maple in forested wetlands. Soils are generally derived from glacial deposits and form a complex pattern of soil types. (Griffith et al., 2009)

As illustrated in Table 1, the pipeline path will cross seven water courses, including one pond, one perennial river, and five intermittent streams. The proposed path will also cross 14 wetlands (Table 2). (Eversource, 2020)

Table 1: Surface water crossings

Waterbody name	Type	Length (feet)	Method
Manmade farm pond	POW	0	HDD or avoided
Unnamed tributary to Bark Meadow Brook	Intermittent	5	HDD
Unnamed tributary to Bark Meadow Brook	Intermittent	5	Flume or dam-and-pump
Unnamed tributary to Bark Meadow Brook	Intermittent	2	Flume or dam-and-pump
Unnamed tributary to Durkee Brook	Intermittent	10	Flume or dam-and-pump
Unnamed tributary to Durkee Brook	Intermittent	6	Flume or dam-and-pump
Quinebaug River	Perennial	195	HDD

Source: Eversource, 2020. Note: POW = palustrian open water pond.

Starting in the northwest, the pipeline path crosses a ridge approximately 440 feet above sea level and then parallels Durkee Brook. It descends with Durkee Brook down to 220 feet in elevation, where it crosses the Quinebaug River. The pipeline path then climbs another ridge to 370 feet on the southeast side of the Quinebaug River. Most of the ROW is within the Durkee Brook watershed.

Table 2: Wetland crossings

ID	Classification	Length (feet)	Direct impacts from trenching (square feet)	Construc-tion matting (square feet)	Tree clearing (square feet)
Inside Durkee Brook watershed					
P-W2	PFO (vernal pool)	236	1,416	12,677	3,731
P-W3	PFO	0	0	1,121	1,224
P-W4	PFO (vernal pool)	24	144	1,930	987
P-W5	PEM/PFO	39	234	1,376	348
P-W6	PFO	26	156	1,051	228
P-W7	PFO (vernal pool)	266	1,596	11,040	3,685
P-W8	PFO (vernal pool)	122	732	5,401	1,523
P-W9	PFO	103	618	4,326	0
P-W10	PEM/PFO	56	0	0	0
P-W11	PEM	333	1,998	12,702	0
P-W12	PEM/PSS/PFO	1,493	8,958	65,357	4,424
Subtotal		**2,698**	**15,852**	**116,981**	**16,150**
Outside Durkee Brook watershed					
K-CTW1	N/A	205	564	4,393	1,165
K-W1	PFO	0	0	0	0
P-W1	PFO	184	0	105	105
Subtotal		**389**	**564**	**4,498**	**1,270**
Total		**3,087**	**16,416**	**121,479**	**17,420**

Source: Eversource, 2020. Note: PEM = palustrian emergent wetland, PSS = palustrian scrub-shrub wetland, PFO = palustrian forested wetland.

In general, pipeline construction often significantly impacts both upland and riparian areas through a number of processes:

- Soil erosion contributes sediment to waterways, thus increasing sediment loading in streams (Environmental Solutions & Innovations, 2017; Clingerman and Hansen, 2016).
- Inadvertent returns from horizontal directional drilling (HDD) at river crossings can introduce pollution into streams and rivers being crossed (PADEP, 2017).
- Fish and macroinvertebrate habitat quality may be diminished by removal of vegetation, disturbance of substrates, grading of channels, increased sedimentation, and placement of structures (USFWS, 2019).
- Excavation, compaction, and disturbance of soils can impact water flow patterns and can increase the quantity of stormwater runoff from the ROW, causing downstream erosion (Glass et al., 2016; Williams, 2012).
- Disturbances in wetland and vernal pool habitats can negatively impact state-listed species of concern and sensitive amphibian species (DEEP, 2020a; DEEP, 2020b; DEEP, 2020c; DEEP, 2020d; USACE, 2015).

As discussed in more detail in this report, construction of the Eversource Pipeline will likely have many of these impacts. As documented in Chapter 4, stream and wetland crossings, extensive use of construction mats in wetland areas, and disturbance of streambanks and upland areas from pipeline construction will cause erosion. Even with the use of best management practices (BMPs), sediment delivery to streams and wetlands will likely cause

violations of Connecticut water quality standards—including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

As documented in Chapter 5, these violations are even more likely from pipeline construction in the most erosion-prone areas. Also, as discussed in Chapter 8, cumulative impacts are likely to be observed in Durkee Brook because the pipeline path includes two tributary crossings just upstream from their confluences with Durkee Brook and three crossings on tributaries that combine to form a main tributary to Bark Meadow Brook.

Sedimentation in Durkee Brook, a documented brook trout stream, poses a significant risk to trout habitat (Chapter 7). Further, as described in Chapter 6, inadvertent returns, which have occurred frequently when HDD was used at other pipeline construction projects, may cause additional violations of water quality standards.

In addition to impacts to streams, wetlands, and aquatic life, terrestrial habitat for endangered species and species of special concern will also be impacted. Chapter 9 documents likely impacts to Northern long-eared owls, American bitterns, Eastern wood turtles, box turtles, and Northern long-eared bats.

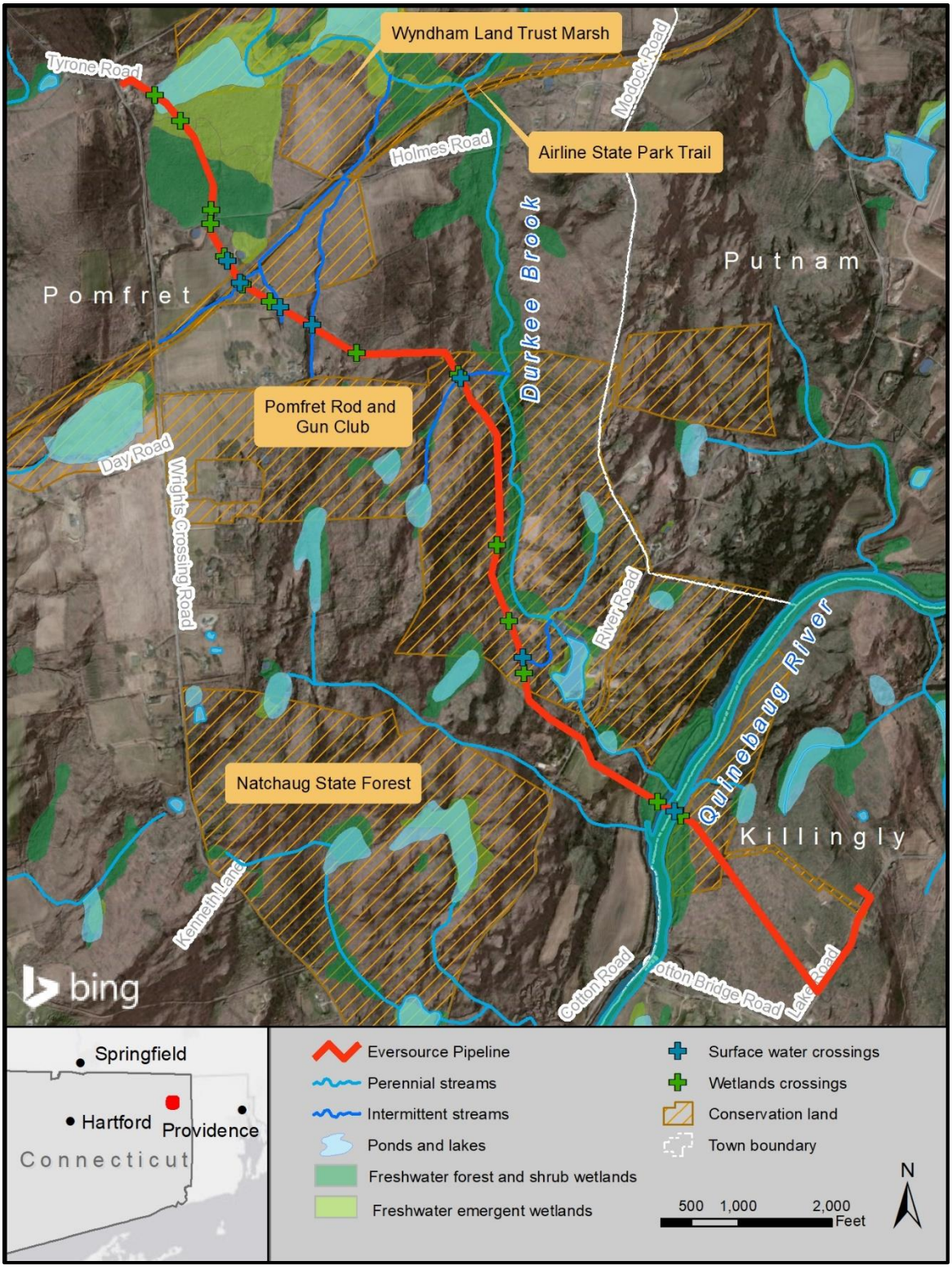
A further complication is the planned wetland restoration in Wyndham Marsh. If this restoration occurs before pipeline construction, high-quality American bittern habitat will be created along the section of the pipeline in the vicinity of Wyndham Marsh, limiting the allowable construction period.

Also, due to constraints to protect the endangered species and species of special concern, certain aspects of construction will be impacted in each month, leading to a complex construction schedule that will increase the time required to build the pipeline (Section 9.5). This increases direct impacts on these species and increases the chance of erosion from storm events. If the conservation measures are not fully implemented, then direct impacts on wildlife species are likely.

Because of the impacts described above and documented in more detail in the body of this report, we conclude that DEEP should withhold its 401 Certification for this project.

In addition to these concerns about water quality and habitat, our analysis found certain procedural concerns. First, as documented in Chapter 2, Connecticut's Tier 2 antidegradation protections should be afforded to all wetlands and high-quality surface waters potentially impacted by construction. Second, as documented in Chapter 3, Eversource's GP 6 application is not complete.

Figure 1: Eversource Pipeline setting



Sources: Eversource, 2020; DEEP, 2020e; CTECO, 2020. Note: Streams labeled as intermittent are those identified as such in Eversource's 401 application (Eversource, 2020).

2. APPLICABLE WATER QUALITY STANDARDS

Connecticut's water quality standards apply to a number of surface waters potentially impacted by construction of the Eversource Pipeline, including the Quinebaug River, Durkee Brook, tributaries of Durkee Brook, and wetlands. Connecticut's surface waters are classified into different designated uses. Durkee Brook and its tributaries are Class A waters, with the following designated uses:

(1) habitat for fish and other aquatic life and wildlife,
(2) potential drinking water supplies,
(3) recreation,
(4) navigation, and
(5) water supply for industry and agriculture.

The Quinebaug River is a Class B water. Class B waters have the same designated uses as Class A waters, except for "potential drinking water supplies."

Table 3 illustrates the four narrative water quality standards most relevant to this project: suspended and settleable solids, silt or sand deposits, turbidity, and biological condition. Protections for Class A and Class B waters are the same for these standards except for suspended and settleable solids, which includes an additional requirement for Class B that water quality shall not exceed 10 milligrams per liter (mg/L) over ambient concentrations.[1]

Pipeline construction causes erosion at stream crossings and at upland areas. Even with the use of erosion and sediment control BMPs, soil will be dislodged when it rains and flow downhill, and sediment will be transported offsite to downgradient streams and wetlands. Sedimentation would likely result in additional suspended and settleable solids, silt or sand deposits, increased turbidity, and impacts to aquatic habitat that would harm the biological condition of the surface waters. These impacts may be observed for a short duration, on the order of hours or days, but may also be of longer duration in periods of prolonged, intense rainfall, if revegetation has not been successful, or if BMPs are not properly designed, installed, and maintained.

2.1 Antidegradation

DEEP should ensure that Tier 1 antidegradation protections are provided for all wetlands and surface waters potentially impacted by construction. Further, DEEP should ensure that Tier 2 antidegradation protections are provided for all wetlands and high-quality surface waters potentially impacted by construction, rather than deeming the two-year construction process to be a temporary activity.

Connecticut's water quality standards regulation also includes the state's antidegradation standards and implementation policies. The broad goal of antidegradation is to protect water quality necessary to meet designated uses.

Antidegradation applies to this project, because it may affect water quality and it requires a 401 Certification.[2] DEEP cannot issue the 401 Certification without first finding that:

- all existing and designated uses will be fully protected, and
- the discharge or activity is consistent with the antidegradation provisions.[3]

[1] Other small differences between the Class A and Class B standards do not appear to be substantive.
[2] Connecticut Regulation of the DEEP §22a-426-8(b)(1).
[3] Connecticut Regulation of the DEEP §22a-426-8(c).

Table 3: Applicable Connecticut water quality standards

Water quality standard	Class A	Class B
Suspended and settleable solids	None in concentrations or combinations which would impair designated uses; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; none which would adversely impact aquatic organisms living in or on the bottom substrate.	None in concentrations or combinations which would impair the most sensitive designated use; none aesthetically objectionable; none which would significantly alter the physical or chemical composition of the bottom; and none which would adversely impact aquatic organisms living in or on the bottom sediments; shall not exceed 10 mg/l over ambient concentrations.
Silt or sand deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, dredging activity or the discharge of dredged or fill materials provided all reasonable controls or Best Management Practices are used in such activities and all designated uses are protected and maintained.	Same as Class A
Turbidity	Shall not exceed 5 NTU over ambient levels and none exceeding levels necessary to protect and maintain all designated uses. All reasonable controls or Best Management Practices are to be used to control turbidity.	Same as Class A
Biological condition	Sustainable, diverse biological communities of indigenous taxa shall be present. Moderate changes, from natural conditions, in the structure of the biological communities, and minimal changes in ecosystem function may be evident; however, water quality shall be sufficient to sustain a biological condition within the range of Connecticut Biological Condition Gradient Tiers 1-4 as assessed along a 6 tier stressor gradient of Biological Condition Gradient (See section 22a-426-5 of the Regulations of Connecticut State Agencies).	Same as Class A

Source: Connecticut Regulation of the DEEP §22a-426-9, Table 1.

2.1.1 Tier 1

All surface waters potentially impacted by the Eversource Pipeline—including the Quinebaug River, Durkee Run, its tributaries, and wetlands—must receive Tier 1 antidegradation reviews.

The Tier 1 antidegradation evaluation and implementation review process requires DEEP to determine whether the activity:

> "is consistent with the maintenance, restoration, and protection of existing and designated uses assigned to the receiving water body by considering all relevant available data and the best professional judgment of department staff. All narrative and numeric water quality standards, criteria and associated policies contained in the Connecticut Water Quality Standards shall form the basis for such evaluation..."[4]

In short, the Tier 1 process ensures that the additional pollutants expected to be discharged from the Eversource Pipeline project will not violate the applicable narrative water quality standards summarized in Table 3.

2.1.2 Tier 2

Tier 2 applies to all wetlands, as well as high-quality surface waters where water quality is better than necessary to meet the minimum criteria for the water's classification.[5] A stricter process is in place for Tier 2 waters. If an activity will result in a significant lowering of water quality in a high-quality water or any wetland, then certain Tier 2 processes kick in. DEEP may determine that a temporary activity—simply by nature of its being temporary—will not reasonably be expected to significantly lower water quality in high quality waters or wetlands.[6] However, in this case, construction of the Eversource Pipeline will take up to two years (Eversource, 2020), during which time erosion and sedimentation will occur during and after rainfall and snowmelt events. Therefore, DEEP should not allow the Eversource Pipeline to skirt the Tier 2 process by deeming it a temporary activity.

More specifically, DEEP should not issue the 401 Certification unless it finds that there is no technically or economically feasible alternative to the discharge or activity and that allowing lower water quality is necessary to accommodate overriding economic or social benefits to the state and in the area in which the receiving water is located.[7]

[4] Connecticut Regulation of the DEEP §22a-426-8(f).
[5] Connecticut Regulation of the DEEP §22a-426-8(e).
[6] Connecticut Regulation of the DEEP §22a-426-8(g)(1).
[7] Connecticut Regulation of the DEEP §22a-426-8(g)(2).

3. INCOMPLETE APPLICATION

Eversource's 401 application is incomplete for the reasons set forth below.

3.1 Ephemeral streams

Without documentation of ephemeral streams, Eversource's 401 application is incomplete.

Eversource's 401 application does not mention ephemeral streams; however, projects like the proposed pipeline that require a pre-construction notice are required to delineate all wetlands and streams in the proposed project area, including ephemeral streams. If Eversource has found that there are no ephemeral streams in the project area, this must be documented in the application. Eversource's application cites Section 404 of the Clean Water Act, which mentions intermittent but not ephemeral streams (Eversource, 2020). However, GP 6's General Condition 2 clearly states that ephemeral streams be delineated (Department of the Army, 2016).

3.2 Mitigation

Compensatory mitigation to replace lost wetland functions and values is not addressed in the 401 application; therefore, the application is incomplete.

USACE New England District's General Condition 3 for GPs in Connecticut states:

> "Compensatory mitigation for effects to waters of the U.S., including direct, secondary and temporal will generally be required for projects with permanent impacts that exceed the [self-verification] (SV) area limits, and may be required for temporary impacts that exceed the SV area limits, to offset unavoidable impacts which remain after all appropriate and practicable avoidance and minimization has been achieved and to ensure that the adverse effects to the aquatic environment are no more than minimal." (Department of the Army, 2016, Appendix B, p. 1)

The SV limit for GP 6 is 5,000 square feet of permanent or temporary fill. According to the Environmental Assessment (EA), 16,416 square feet of wetlands will be directly impacted by trenching (Eversource, 2020). Eversource intends to restore the directly impacted wetlands by removing and replacing wetland soils and reseeding with a native wetland seed mix. However, this does not meet the requirement for compensatory mitigation listed in General Condition 3. In communication with the New England District of USACE, an official noted that for compensatory impacts: "Usually in CT, the automatic qualifier is when the self-verification thresholds area for impact are exceeded." (USACE, 2020)

In the USACE New England District Compensatory Mitigation Guidance document, the conversion of forested and scrub-shrub wetlands is specifically mentioned as a secondary impact that may require compensatory mitigation:

> "...conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level." (USACE, 2016, p. 15)

Eversource's 401 application notes 0.4 acres of forested wetland will be cleared. Scrub-shrub areas in the Wyndham Marsh area will also be cleared, but the area of this impact is not mentioned in the application.

In addition, a New England District USACE official notes, “Impacts to Vernal Pools and their [critical terrestrial habitat] have generally required compensatory mitigation for any impact.” (USACE, 2020) No mention is made of mitigation for impacts to vernal pools in Eversource’s application.

3.3 Vernal pools

The applicant does not document critical terrestrial habitats that might exist within the project area, either associated with vernal pools in the ROW or vernal pools that might exist adjacent to the ROW.

General Condition 24 discusses impacts to vernal pools. Eversource has included BMPs to minimize impacts to vernal pools, the vernal pool envelope, and critical terrestrial habitat within the proposed ROW. Given the relative frequency of vernal pools discovered in the proposed pipeline ROW, we question whether the path crosses vernal pool envelopes and critical habitat areas for vernal pools outside the proposed ROW. No mention was made of any efforts to determine if additional vernal pools exist near the proposed path.

4. PROPOSED EROSION AND SEDIMENT CONTROLS

4.1 Importance of erosion and sediment controls

Erosion and resulting sedimentation in streams and wetlands pose a significant risk to water quality within the proposed pipeline path and to sensitive habitats located near the proposed path. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

Erosion and sedimentation are generally among the most significant and visible impacts from pipeline construction. While some amount of sedimentation occurs naturally, excess sediment in streams and wetlands is considered a pollutant and regulated under Connecticut water quality standards as discussed in Chapter 2. Construction activities, including pipeline construction, cause erosion and sedimentation—even when BMPs are used. These activities include stream crossings, wetland crossings, and upland pipeline construction. (Betcher et al., 2019)

Even if implemented perfectly, erosion and sediment control BMPs are not always able to prevent violations of water quality standards. Based on a past review of many pipeline construction projects, BMPs may not properly prevent contamination events for several reasons:

1. the correct BMPs were planned but were not installed correctly or at all,
2. inappropriate BMPs were installed,
3. BMPs were inadequate for the conditions, or
4. BMPs were improperly operated and maintained. (Betcher et al., 2019)

Eversource plans seven stream, river, and pond crossings and 14 wetland crossings. Regardless of method used and care taken during construction, crossings disturb streambanks, streambeds, and wetland soils, causing a marked increase in sedimentation and turbidity for a period of unknown duration—both during the period of initial disturbance and when flow is reestablished over the construction area. Moderate—and perhaps intermittent—increases in sedimentation and turbidity would continue until revegetation occurs in the area immediately adjacent to the construction site. Sediment contributions from upland pipeline corridors could also result in measurable increases in sedimentation and turbidity during construction and for as long as bare or poorly revegetated soils are exposed to the erosive force of rain and surface runoff. These impacts put habitat and water quality standards at risk in Durkee Brook, its tributaries, wetlands, and the Quinebaug River.

An example of an incident where erosion and sediment control BMP failures led to sedimentation in a wetland during construction of the Mountain Valley Pipeline in West Virginia is illustrated in Figure 2.

Figure 2: Sedimentation of Kincheloe Creek wetland due to BMP failures

4.2 Erosion and sediment control for stream crossings

Proposed stream trenching methods will disrupt fish life and kill benthic macroinvertebrate organisms within the construction corridor of the crossing. Streambank erosion is also a risk because of the destabilizing effect of unvegetated streambanks or poorly installed riprap. Eversource's application lacks appropriate guidance for revegetating streambanks, increasing the likelihood of long-term erosion and sedimentation and negative impacts to water quality in the Durkee Brook watershed. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

The proposed pipeline will need to cross six streams and rivers of various sizes. Eversource proposes to use four methods for crossing streams. One method is HDD, in which a tunnel to house a pipeline is drilled beneath a waterway or other feature. HDD is proposed for the crossing of the Quinebaug River and the Airline State Park Trail and a nearby stream. An additional farm pond may be crossed by HDD or avoided (Eversource, 2020). This method is often implemented to lower the risk of sedimentation impacts to surface waters; however, as described in Chapter 6, HDD does pose risks to surface waters, primarily due to inadvertent returns.

Eversource proposes two different crossing methods for trenching across flowing streams. The first, the dam-and-pump method, involves building a dam above the construction site and pumping stream water to the downstream side. The second, the flume method, uses pipes to dewater the construction site. Eversource proposes a third crossing method, the open-cut method, for crossings with no flowing water. The method of construction will be determined by the construction contractor at the time of crossing. (Eversource, 2020)

The proposed methods for streams with flowing water would disrupt fish life and kill benthic macroinvertebrate organisms within the construction corridor of the crossing. The crossed streams are listed as intermittent in Eversource's EA (Eversource, 2020), but depending on season of construction and weather conditions, flow is possible in these streams during construction. No mention is made of allowing for fish or other aquatic organism passage during construction.

A potential long-term impact is the destabilizing effect of unvegetated streambanks or poorly installed riprap stabilization of streambanks. Streambank erosion on all stream types, including intermittent streams, could result if appropriate streambank revegetation techniques are not used. Streams are systems, and streambank erosion in one location—even if it starts out as a short stream length—has the potential to spread both upstream and downstream because unstable streambanks make adjacent streambanks more susceptible to erosion. (Rosgen, 1996)

Eversource's 401 application notes that streambanks will be restored and stabilized as required (Eversource, 2020). This language is unclear and does not state who makes the determination of when and what stabilization methods are required. A description of when restoration and stabilization is required should be included in the 401 application and be a required component of construction drawings.

A typical construction drawing for riprap is included in the 401 application, but a description of how streambanks will be revegetated is not included. The use of natural fiber mats, bioengineering like livestakes or living brush mattresses, and planting native shrubs should be included. These should be the standard BMPs for stabilizing streambanks after construction, and riprap should only be used when "flowing conditions prevent effective vegetative stabilization techniques" (Eversource, 2020, Attachment Q, p. 9-10).

Figure 3 depicts an example of a tributary containing sediment resulting from erosion during construction of the Mountain Valley Pipeline in West Virginia.

Figure 3: Tributary containing sediment due to construction of the Mountain Valley Pipeline

4.3 Stream and wetland crossings for vehicles

Construction and removal of temporary crossings for equipment and vehicles will likely increase sediment delivery to nearby streams and wetlands. Storm events causing high flows also present a significant threat of erosion and sedimentation to nearby water courses. These temporary crossings are therefore likely to cause violations of water quality standards, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

In addition to installing pipeline across streams in the proposed path, construction equipment and vehicles will also have to travel along the ROW. Eversource includes typical drawings for two methods for vehicles to cross streams and wetlands. The proposed temporary crossings would be constructed using straw bales or earthen berms to support construction mats or bridge platforms. Erosion and sedimentation to streams and wetlands during construction and deconstruction of these bridges is likely. These risks are increased for the four crossings located on highly erodible soils, as shown in Figure 4 in Chapter 5. Because these crossings are located on top of stream beds, any erosion at these crossings is likely to cause direct sediment release to streams and wetlands, leading to violations of water quality standards.

Storm events while temporary crossing structures are in place present an additional risk of erosion and sedimentation to water courses. If storms cause streams to flow over their banks, earthen berms are at risk of washing away, causing sedimentation to water courses. Also, temporary crossings will constrict high stream flows and could cause unpredictable flow patterns and erosion upstream and downstream of the crossings, again causing negative impacts to water quality.

4.4 Construction mats in wetlands and vernal pools

Eversource does not include sufficient details on the use of construction mats in sensitive wetland areas to ensure the mats are used appropriately and minimize impacts to wetlands and vernal pools. Without this detail, it is likely that water quality standards will be violated in wetlands, state species of concern could be directly impacted, and wetland habitat could be degraded.

General Condition 14 included in Connecticut GP provides instructions for the use of construction mats in wetland areas including requirements that the mats be in good condition, that they not be dragged, and that they are placed into position from solid ground or another mat. The general condition requires BMPs to be provided that include details on how mats should be used to minimize impacts to wetland areas. Eversource proposes to use construction mats over an extensive portion of the construction area, 2.8 acres, to minimize the impacts to wetland soils and vegetation. The 401 application includes typical drawings of where construction mats will be placed in wetland areas, but no details are included about the condition of the mats or how to place and remove the mats.

5. RISKS FROM STEEP SLOPES AND HIGHLY ERODIBLE SOILS

While erosion and subsequent sedimentation of waterways is an issue that must be addressed in general on pipeline construction projects, steep slopes and certain soil types can create conditions that are especially prone to harm nearby waterways. In areas with erodible soils and significant slopes, extra precautions must be taken to adequately prevent violations of Connecticut water quality standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

The soils report included in Eversource's 401 application describes four soil types—comprising a total of 55% of the pipeline corridor—where erosion potential due to soil type is "severe," meaning "erosion is very likely and that erosion control measures, including revegetation of bare areas, are advised." (Eversource, 2020, Attachment J, p. A-2) As depicted in Figure 4, five of the proposed surface water crossings are within these severe erosion zones.

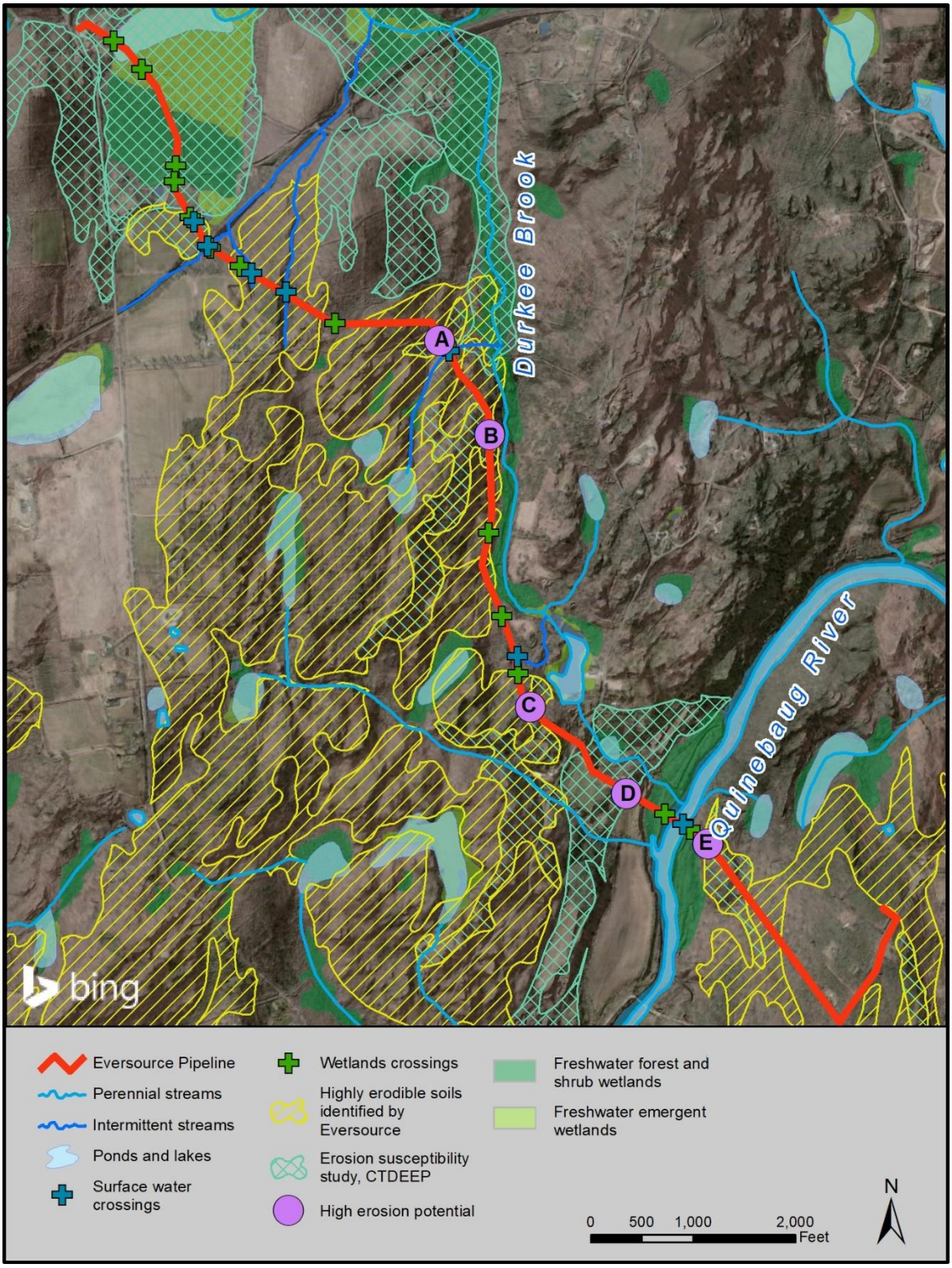
The State of Connecticut and DEEP created a spatial dataset for use in predicting areas most susceptible to terrace escarpment–type erosion. This dataset was developed utilizing soils and quaternary geology spatial data and has been field tested (CTECO, 2005). The proposed Eversource Pipeline route passes through almost one mile of soils determined to be highly susceptible to erosion based on this analysis. Five of these areas are characterized by steep slopes and are upgradient of surface waters and wetlands. These areas, labeled "A" through "E" in Figure 4 and Table 4, require extra precautions to minimize harm to water quality.

Table 4: Locations most susceptible to erosion and sedimentation

Location	Eversource erosion classification	DEEP erosion classification	Approximate slope	Description
A	Severe	Highly erodible	10–15%	The pipeline will cross a steep slope upgradient of its crossing of a tributary to Durkee Brook
B	Severe	Highly erodible	10–15%	The pipeline will run along a steep slope upgradient of Durkee Brook through highly erodible soil for approximately 500 feet
C	Severe	Highly erodible	10–15%	The pipeline will pass over a steep slope with highly erodible soils upgradient of a stocked fishing pond located at the Pomfret Gun and Rod Club
D	Moderate	Highly erodible	10–15%	The pipeline will descend over a steep slope with highly erodible soils to its crossing of the Quinebaug River
E	Severe	Highly erodible	5–10%	The pipeline will ascend a steep slope with highly erodible soils east of the Quinebaug River crossing

Sources: Eversource, 2020; CTECO, 2005; U.S. Geological Survey, 2020.

Figure 4: Erosion potential along the Eversource Pipeline



Sources: Eversource, 2020; DEEP, 2020e; CTECO, 2020; CTECO, 2005; USDA, 2020. Note: Streams indicated as intermittent are those identified as such in Eversource's 401 application (Eversource, 2020).

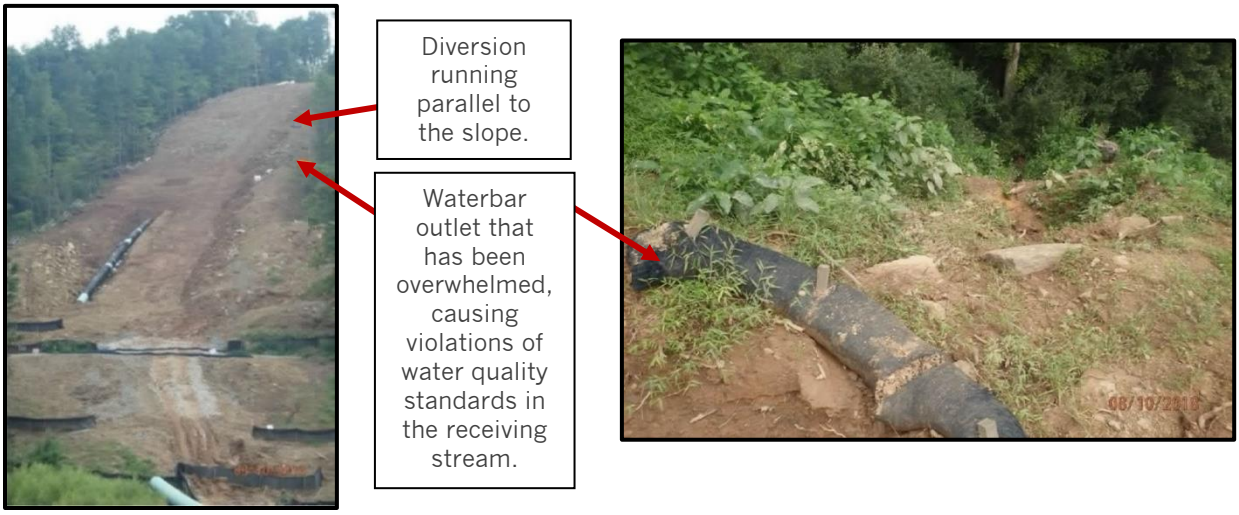
5.1 Eversource's plans to prevent erosion and sedimentation in sensitive areas

Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated downstream from the most erosion-prone areas, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

Eversource describes BMPs to address erosion and sedimentation in its 401 application. These BMPs include the use of slope breakers or water bars, prompt revegetation, and erosion control barriers such as silt fences, straw bales, and sandbags.

The proposed methods are standard practices; however, these practices must be installed correctly and maintained routinely to function properly. A review of notices of violation issued by regulatory agencies during construction of four pipeline projects in West Virginia, Virginia, Pennsylvania, and Ohio identified improper installation and a lack of proper maintenance as the cause of numerous permit violations involving sedimentation of surface waters (Betcher et al., 2019). For example, as illustrated in Figure 5, the improper installation and maintenance of BMPs on the Mountain Valley Pipeline in West Virginia led to sedimentation in nearby streams.

Figure 5: Improper installation and maintenance of BMPs on the Mountain Valley Pipeline



Eversource intends to employ an environmental inspector to ensure contractors properly install and maintain erosion and sediment control BMPs during construction (Eversource, 2020). Frequent oversight by a well-trained inspector not employed by the company, such as by regulatory agency staff, would go further toward ensuring that all erosion and sediment control practices are functioning properly, thus reducing the potential for discharge events that violate water quality standards.

Eversource's plans call for immediate seeding on the steepest slopes to ensure hasty revegetation, which is especially important for preventing erosion on denuded lands (Eversource, 2020). Oftentimes, revegetation efforts fail due to weather conditions, which are outside of the control of construction crews and difficult to predict. Vegetation growth must be monitored closely, and controls must be maintained in place until proper revegetation is established.

Short-duration, heavy-precipitation events often overwhelm commonly used controls, resulting in discharges of sediment to waterways. These types of storms have become more frequent in recent years, and commonly implemented BMPs are often proving insufficient during these storm events. Extra precautions not included in the application—such as supplemental controls and routine inspections and maintenance—are necessary to protect waterways during intense storms in the areas characterized by steep slopes and erodible soils.

6. HORIZONTAL DIRECTIONAL DRILLING

Inadvertent returns have occurred frequently when HDD was used at other pipeline construction projects, causing violations of water quality standards and necessitating expensive remediation operations. Should inadvertent returns also occur during the construction of the Eversource Pipeline, water quality standards would likely be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition

HDD—a stream crossing method in which a tunnel to house the pipeline is drilled underneath a surface water, roadway, or trail—is the planned crossing method for the Quinebaug River and the Airline Trail State Park Trail and a nearby stream. It may also be used to cross a farm pond. These HDD crossings are illustrated in Figure 8, below.

This crossing method is often touted as having minimal impacts to surface waters and wetlands (Penn-East Pipeline, 2019; National Energy Board, 2019). However, HDD is not always free of impacts to waterways; inadvertent returns of drilling fluids and runoff from work areas can introduce polluted water into streams, rivers, and wetlands (PADEP, 2017; PADEP, 2019a; PADEP, 2019b). An inadvertent return occurs when drilling fluid used in HDD is released without authorization to the ground or any surface water at the drill site or adjacent to the drill site. This includes releases to wetlands, streams, and upland areas, among others (PADEP, 2018a). Drilling fluid is composed of bentonite clay, water, and additives chosen by the company (PADEP, 2018a). Bentonite is a type of natural clay; however, releasing it into streams and wetlands can introduce sediment to those areas.

HDD-related fluid spills have contaminated streams and wetlands during construction of numerous pipeline projects. For example, drilling fluids spilled during HDD led to significant water quality issues during construction of both the Mariner East II Pipeline in Pennsylvania and the Rover Pipeline in Ohio, Pennsylvania, and West Virginia. (Betcher et al., 2019) Both pipelines are significantly longer than the Eversource Pipeline, but the HDD technology utilized is similar regardless of the length of the pipeline project and thus, similar impacts may occur.

During construction of the Mariner East II Pipeline, the Pennsylvania Department of Environmental Protection (PADEP) issued at least 87 notices of violation that cited at least one inadvertent return. Many of these inadvertent returns impacted more than one location—for example, drilling fluids from the same inadvertent return impacted both a stream and a wetland (PADEP, 2019a). One stream contamination event due to inadvertent returns occurred in the Frankstown Branch of the Juniata River when drilling activities caused groundwater to be released at a rate that exceeded the capacity to manage it effectively, which caused the drill pit to overflow and flow into the river. The drilling fluid was visible in the river for 1.5 miles downstream of the incident. (PADEP, 2018b) Photos of similar releases are included in Figure 6.

Construction of the Rover Pipeline resulted in significant fluid spills related to HDD. Millions of gallons of drilling fluid were spilled into protected wetlands, drilling fluid containing petroleum hydrocarbon constituents were released into the Tuscarawas River, and drilling fluid was spilled near a drinking water source for the City of Canton in Ohio during construction of this pipeline (Felan, 2017; Norris, 2017).

Numerous violations of water quality standards due to HDD-related accidents occurred during construction of the Rover Pipeline. As illustrated in Figure 7, an estimated two million gallons of drilling fluid contaminated with diesel fuel were spilled into a pristine, protected

wetland In 2017 and covered it in up to 13 inches of drilling mud while using HDD to drill under the Tuscarawas River in Stark County, Ohio (State of Ohio v. Rover Pipeline, 2017; Rudell, 2017a; Rudell, 2017b). An additional almost 150,000 gallons of drilling fluid were spilled at the same Tuscarawas River drill site in 2018 (Chow, 2018). Further, 50,000 gallons of drilling fluid were spilled one day after the 2017 Stark County incident in Richland County, Ohio, and the following month 10,000 gallons of drilling fluid were spilled into a Harrison County pond and stream (Associated Press, 2017; Hendrix and Renault, 2017).

Figure 6: Inadvertent returns during pipeline construction in Pennsylvania

Source: Laura Evangelisto and Middletown Coalition for Community Safety. Note: Left: Drilling mud released during an inadvertent return in Middletown, Pennsylvania (Dauphin County). Right: Sandbags used to contain leak of drilling fluid on Chester Creek in Brookhaven, Pennsylvania (Delaware County).

Figure 7: Cleanup of drilling fluid in the Tuscarawas River wetlands

Source: Ohio Environmental Protection Agency.

7. IMPACTS TO BROOK TROUT POPULATIONS AND HABITAT

Erosion and resulting sedimentation in Durkee Brook, a documented brook trout stream, pose a significant risk to water quality and trout habitat. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated and trout habitat is likely to be damaged.

Brook trout (*Salvelinus fontinalis*) is the only trout native to Connecticut. Brook trout prefer small, cold streams with gravel or cobble bottoms, tree canopies for shade, and adequate cover—including boulders, logs, and undercut banks (DEEP, 2020f). Sedimentation negatively impacts brook trout populations because fine sediments smother fish eggs and aquatic invertebrates that trout rely on for food. In addition, fine sediments change the conditions at the streambed, covering over the gravel and small cobble substrates used by trout for depositing their eggs. Temporary increases in turbidity can reduce dissolved oxygen levels in the water and make it harder for trout to both find food and avoid predators (Weltman-Fahs and Taylor, 2013; Entrekin et al., 2011; Abrahams et al., 2015; Fesenmyer et al., 2018). Removal of tree cover in riparian zones and wetlands that feed small streams also contribute to increased water temperatures and reduced oxygen levels in the water (Kanno et al., 2015).

The proposed project's EA does not mention brook trout in the general site description, nor does it discuss any potential impacts on brook trout. But DEEP fisheries data indicate the presence of brook trout in Durkee Brook (CTECO, 2015), and there are significant potential impacts to existing brook trout populations in Durkee Brook. The proposed pipeline path crosses five unnamed tributaries in the Durkee Brook watershed. These unnamed tributaries make up the headwaters of Durkee Brook, and headwater streams directly impact the integrity of downstream water resources (U.S. Environmental Protection Agency, 2015). Small streams contribute flow, leaf litter and other detritus that form the base of aquatic food chains—as well as aquatic organisms—to larger streams. Each crossing in the watershed is likely to increase sedimentation to Durkee Brook.

Almost half of Durkee Brook's 6.5 miles runs within 150 feet of the construction ROW. For that 2.5 miles, any unintentional sediment releases have a high likelihood of delivering sediment to Durkee Brook, negatively impacting brook trout and their habitat. After construction, any exposed soil in the construction corridor has the potential to continue delivering sediment to Durkee Brook.

Eversource notes that any open-cut crossing must occur between June 1 and September 20, but that there are no restrictions for dry crossings or for crossings using dam-and-pump or flume methods (Eversource, 2020). The time-of-year restrictions should be strictly adhered to during the proposed project. While these restrictions are important for the protection of aquatic species such as trout, they cannot ensure the complete elimination of impacts to fish and aquatic species. Even when utilizing time-of-year restrictions, muddy water will still cause decreased feeding and increased stress in some fish, including trout.

Short-term impacts from the pipeline include sedimentation during construction activities, and long-term impacts include sedimentation from the cleared areas after construction until such time as the cleared areas are fully revegetated. The cleared pipeline path could also increase the speed of runoff compared to thick woody cover from trees and shrubs. This long-term impact can increase flows in streams during storm events, which can exacerbate existing streambank erosion problems or create new streambank instability.

8. CUMULATIVE IMPACTS TO DURKEE BROOK

Almost the entire length of the Eversource Pipeline is contained within the Durkee Brook watershed. When construction occurs on multiple tributaries in proximity, impacts accumulate in downstream waterways because waters at each crossing flow to the same downstream point. In this case, cumulative impacts to Durkee Brook are likely to be significant, even though it is not crossed directly. As discussed above, sediment introduced to headwaters streams and tributaries to Durkee Brook will likely lead to violations of water quality standards—including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition—in Durkee Brook even though it is not crossed directly.

8.1 Stream crossings

Although the proposed pipeline pathway does not cross Durkee Brook, sediment delivery to the mainstem is likely from two tributary crossings just upstream from their confluences with Durkee Brook and from three crossings on tributaries that combine to form a main tributary to Bark Meadow Brook. These five crossings are likely to have cumulative impacts with significant delivery of sediment to Durkee Brook.

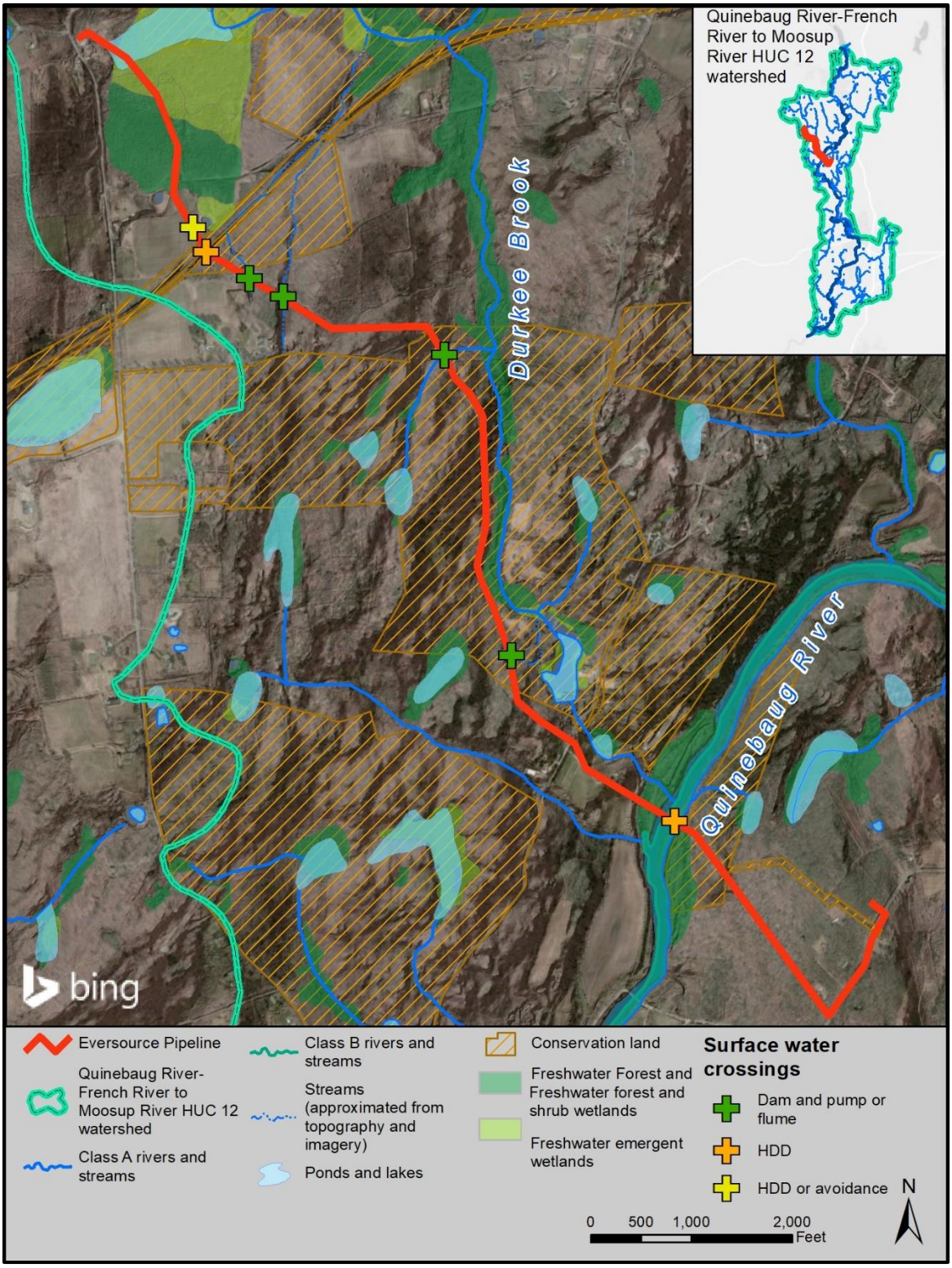
As discussed in the review of potential impacts to native brook trout, five unnamed headwater tributaries in the Durkee Brook watershed will be crossed by the proposed pipeline. Two crossings are close to the tributaries' confluences with Durkee Brook, making it more likely that sediment from these tributaries will impact both the tributaries and the mainstem of Durkee Brook. Three additional crossings are clustered close together on tributaries of Meadow Bark Brook, the largest tributary to Durkee Brook (Figure 8). These crossing are likely to concentrate any impacts in this area. There is no mention of the timing of the construction of these crossings, but given the constraints posed by recommended conservation measures discussed in Chapter 9, it is likely that they would be constructed at the same time, increasing the area that will be exposed as bare soil and making it even more likely that the project would cause cumulative impacts in Durkee Brook.

8.2 Stream corridor

The long length of pipeline ROW that parallels and runs in proximity to Durkee Brook provides ample opportunity for sediment to impact the riparian corridor downslope of the pipeline and Durkee Brook itself. This presents significant risk to habitat and will likely cause violations of water quality standards, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

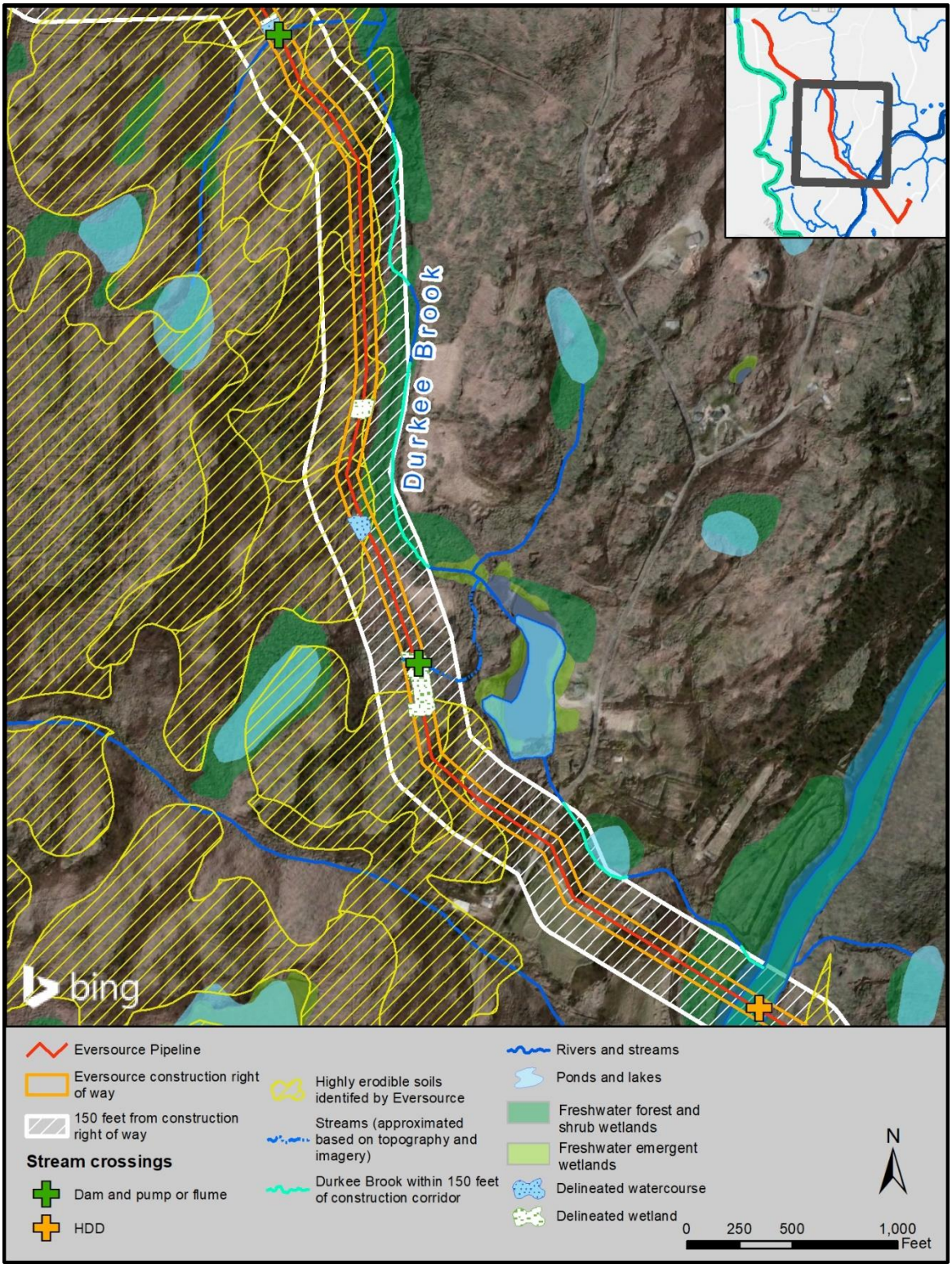
For 2.5 of its 6.5 total miles, Durkee Brook is within approximately 150 feet and downgradient from the construction ROW, as illustrated in Figure 9. Erosion-prone soils are present along much of this stretch of the pipeline. During construction, any rain event will contact bare ground, initiate erosion, and mobilize sediment. BMPs are unlikely to entirely prevent sediment from flowing to Durkee Brook. As long as bare soil remains, erosion and sediment delivery to Durkee Brook will continue, increasing the cumulative impacts in the watershed.

Figure 8: Surface water crossings



Sources: Eversource, 2020; DEEP, 2020e; CTECO, 2020; CTECO, 2005.

Figure 9: Eversource Pipeline in proximity to Durkee Brook



Sources: Eversource, 2020; DEEP, 2020e; CTECO, 2020; CTECO, 2005; USDA, 2020.

9. IMPACTS TO WILDLIFE

Eversource notes in its EA that it consulted with DEEP and the U.S. Fish and Wildlife Service (USFWS) regarding the presence of three state-listed species and one federally listed species. The EA also notes the presence of vernal pools and potential vernal pools along the planned pipeline path. DEEP and USFWS recommended specific conservation measures for each listed species, and the EA also includes conservation measures for vernal pools.

9.1 Northern long-eared owl

If high-quality habitat is impacted by adjacent disturbance, this can drive birds away and effectively reduce habitat. Additional conservation measures must be included to protect the habitat of the Northern long-eared owl.

Although not mentioned in Eversource's 401 application, local naturalists and birders have documented the presence of Northern long-eared owls (*Asio otus*) in the area beginning in April 2020 and continuing through the date of this report (Rzeznikiewicz, 2020). A photo of an owl taken in early May 2020 in Wyndham Marsh is included as Figure 10. Northern long-eared owls are a state-listed endangered species in Connecticut (DEEP, 2020b).

DEEP-recommended conservation measures are:

> "Between March 1- July 31, do not introduce new traffic or noise within 200m of nesting habitat. Between November 1- March 15: do not introduce new traffic or noise within 200m of roosting habitat." (DEEP, 2020h)

Noise and construction traffic reduce the foraging efficiency of owls, which depend almost entirely on sound to hunt for prey (Senzaki et al., 2016). In addition, many birds avoid areas of noise and disturbance. If high-quality habitat is impacted by adjacent disturbance, this can drive birds away (Mcclure et al., 2013), effectively resulting in habitat loss.

Figure 10: Northern long-eared owl photographed in May 2020 in Wyndham Marsh

Source: A. Rzeznikiewicz, Connecticut Audubon Society.

9.2 American bittern

Given the location of the pipeline path through American bittern habitat, significant impacts to this endangered species are possible.

American bittern (*Botaurus lentiginosus*) is a state-listed endangered species in Connecticut (DEEP, 2020a). This secretive wetland bird was once common in Connecticut, but its numbers have declined and only one nesting site has been confirmed in the state in the last decade. American bitterns have been noted calling in a large marsh complex southwest of the proposed pipeline. Also, they have commonly called in the large marsh at the northwest end of the proposed pipeline path in the recent past (Rzeznikiewicz, 2020).

DEEP's review of the state's Natural Diversity Data Base for the project area includes significant discussion of American bittern habitat. The letter specifically mentions the large marsh, referred to as the Wyndham Marsh, and notes that it is an important wetland habitat because of its high-quality native vegetation. (Eversource, 2020) The Wyndham Land Trust manages the marsh, and the area is mapped in Eversource's application as conservation land.

DEEP and the Wyndham Land Trust are planning to stabilize water levels in this wetland, with the goal of permanently stabilizing the water levels to create conditions that favor marshland species like the American bittern (DEEP, 2020g). As illustrated in Figure 12, the proposed pipeline would cross the western edge of the restoration area. If the marsh restoration project is completed before construction on the pipeline begins, detailed studies of this section of the path will be required to determine the presence of American bittern, one of the species that will benefit from the marsh restoration. Given the interest of DEEP in the Wyndham Marsh, it is clear this wetland is of special importance.

DEEP recommended a series of conservation measures to be followed during pipeline construction, and Eversource has incorporated those recommendations into the EA. But the proposed project could still impact American bittern if nesting occurs close the pipeline path. Traffic and construction noise can interfere with the birds' ability to find food. Disturbance during and after construction can lead to reductions in water quality, increased cover of non-native invasive species, and other changes to vegetation. All of these impacts reduce food available to American bitterns and their prey. (Gibbs and Melvin, 1992)

9.3 Eastern box turtle and wood turtle

Recommendations to protect wood and box turtles present challenges to construction scheduling and will require extra work for construction crews. Without careful oversight during construction, direct impacts on turtles in the construction area are likely. Upland forests used by the turtles will also be impacted and these impacts have not been assessed.

DEEP also notes the presence of two species of turtles that are state species of concern: Eastern box turtle (*Terrapene carolina Carolina*) and wood turtle (*Glyptemys insculpta),* shown in Figure 11. Both species are susceptible to being crushed during digging and by equipment and vehicle traffic. DEEP-recommended conservation measures include not digging during the winter months when the turtles are inactive and difficult to locate. During the summer and fall when turtles are active, DEEP recommends exclusion fencing that prevents turtles from entering the area of disturbance during construction and a search of the construction area once the fence is constructed to find and relocate any turtles within the area

(Eversource, 2020). The construction drawings and typical drawings make no mention of the turtle exclusion fencing. This must be corrected.

Clearing of upland forest reduces wintering habitat for the box turtle, but Eversource provides no estimate of total upland forest to be converted to open land (Eversource, 2020). This area should be calculated and included in the EA to help evaluate possible negative impacts to this species of concern.

Figure 11: Eastern box turtle and wood turtle

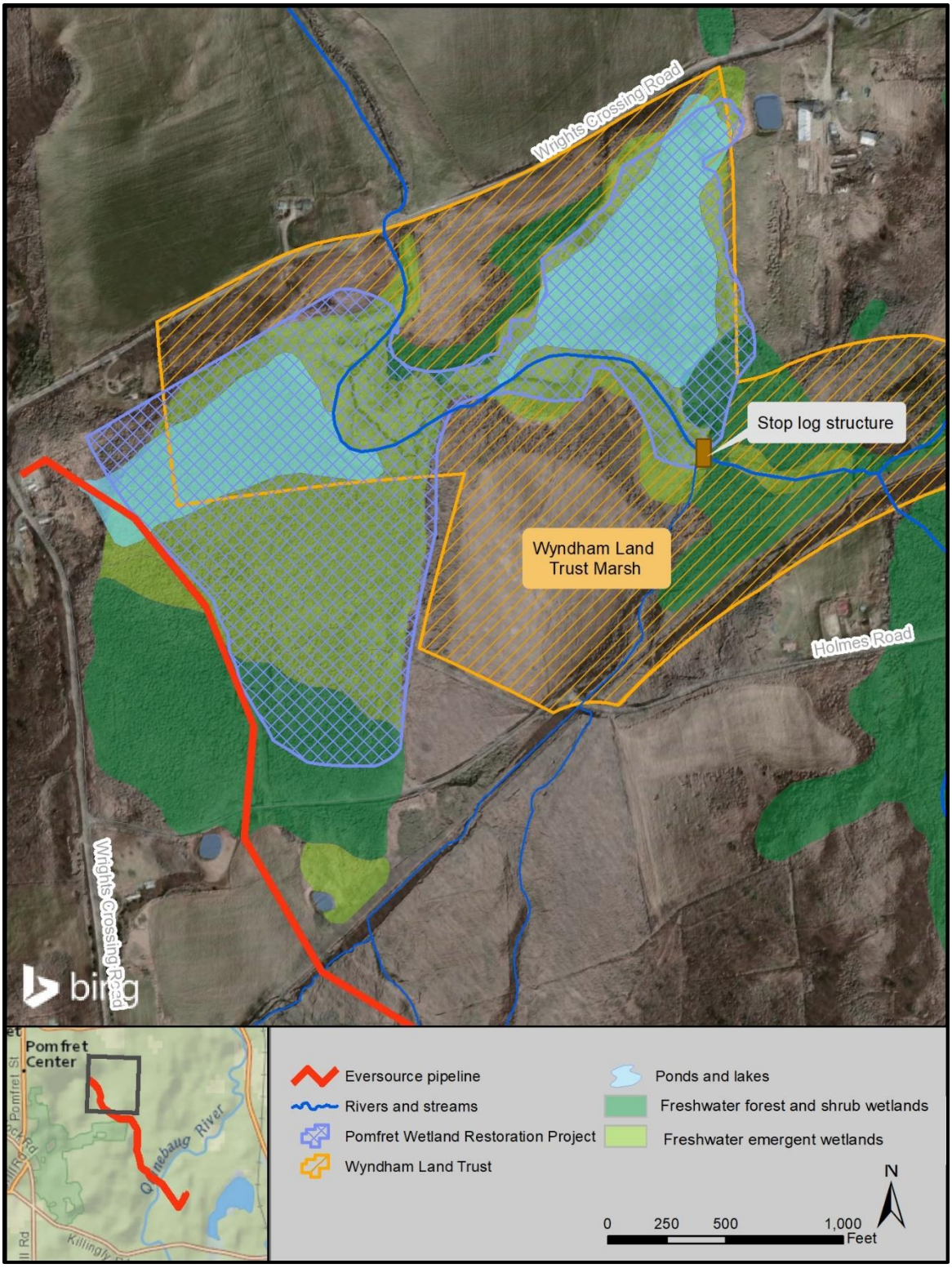
Source: John J. Mosesso, NBII and USFWS.

9.4 Northern long-eared bat

Negative impacts on Northern long-eared bats are possible if Eversource does not implement its voluntary moratorium on tree clearing during bat breeding season.

Eversource notes in the EA that DEEP and USFWS have not identified any hibernacula or maternity roost trees of northern long-eared bat (*Myotis septentrionalis*) close the proposed path (Eversource, 2020). Eversource also notes that because hibernacula and roost trees have not been identified in the project area, "incidental take of Northern long-eared bat as a result of tree clearing is not prohibited." (Eversource, 2020, Attachment K, p. 4-13) Eversource does note that it may voluntarily refrain from clearing trees in June and July, the bat's pup-rearing season.

Figure 12: Water level stabilization project at the Wyndham Land Trust Marsh



Sources: Eversource, 2020; DEEP, 2020e; DEEP, 2020g; CTECO, 2020. Note: Both the Eversource Pipeline route and the boundary of the Pomfret Wetland Restoration Project were approximated using geospatial methods. Thus, some level of error exists in the exact location of each.

9.5 Possible negative impacts from complex construction schedule

If all conservation measures needed to protect endangered species and species of special concern are followed, construction time will increase. This increases direct impacts on these species and increases the chance of erosion from storm events. If the conservation measures are not fully implemented, then direct impacts on wildlife species are likely.

Eversource's proposed conservation measures are aligned with state and federal recommendations. However, in practice, the listed species and special habitat areas present a complex matrix of measures that will require careful management by Eversource and its construction contractors. Table 5 summarizes construction activities that will be constrained by compliance with the conservation measures.

For example, to protect overwintering wood and box turtles, no digging is allowed in upland areas or with 10 meters of streams or rivers from November to March. No disturbance is allowed in vernal pools or the envelope from 0-100 feet around vernal pools during amphibian breeding season, roughly March 1 to July 31. To protect Northern long-eared bat populations, no trees should be removed in June and July, the most sensitive time during the breeding season for this species. If planned wetland restoration in Wyndham Marsh occurs before pipeline construction, high-quality American bittern habitat will be created along the section of the pipeline in the vicinity of Wyndham Marsh. This would limit construction in that area from April to August.

In order to adhere to all of these constraints, construction would have to move around throughout the corridor for an extended period, meaning that stream crossings created for vehicle and equipment traffic—and construction mats in wetland areas—may have to stay in place for months or be installed and removed multiple times. These kinds of complications increase the chances for erosion and sediment control structures to need maintenance and/or fail during storm events.

9.6 Invasive species control

Eversource's proposed invasive species control plan needs to include provisions for controlling invasive species in upland habitats, which are critical to box turtle populations and amphibians.

The introduction of non-native invasive species is a threat to wildlife both within and adjacent to the pipeline corridor. Invasive species outcompete native species and often form thick stands of a single species that provide little habitat value to native wildlife. Any disturbance of native vegetation creates an opening for invasive species, and if invasive species become established in the corridor, they can spread to adjacent areas if adequate control measures are not implemented. Eversource has included an invasive species control plan for wetlands and watercourses. However, the application does not mention control of invasive species in upland habitats, which are critical to box turtle populations and amphibians.

Table 5: Construction activity constraints due to conservation measures

Species of concern	Reason for constraint	Construction constraint	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wood, box turtle	Inactive season	No digging in upland or within 10 meters of river	√	√	√								√	√
Wood, box turtle	Active season	Fencing and survey for individuals				√	√	√	√	√	√	√		
American bittern	Breeding season	No new activity, noise 100 feet from Wyndham Marsh, confirmed presence areas				√	√	√	√	√				
American bittern	Breeding season	No water quality changes in Wyndham Marsh, confirmed presence areas				√	√	√	√	√				
N. long-eared bat	Breeding season	No tree clearing						√	√					
Amphibians	Breeding season	No activity in vernal pools, vernal pool envelope, or critical terrestrial habitat			√	√	√							
N. long-eared owl	Breeding season	No new traffic or noise 200 meters from nest			√	√	√	√	√					
N. long-eared owl	Roosting habitat	No new traffic or noise 200 meters from winter roost	√	√	√								√	√
Brook trout	Spawning season	No open cut stream crossings	√	√	√	√	√					√	√	√

Sources: Eversource, 2020; DEEP, 2020h.

10. CONCLUSIONS

As documented in detail in the body of this report, we offer the following conclusions.

10.1 Applicable water quality standards

- DEEP should ensure that Tier 1 antidegradation protections are provided for all wetlands and surface waters potentially impacted by construction. Further, DEEP should ensure that Tier 2 antidegradation protections are provided for all wetlands and high-quality surface waters potentially impacted by construction, rather than deeming the two-year construction process to be a temporary activity.

10.2 Incomplete application

- Without documentation of ephemeral streams, Eversource's 401 application is incomplete.
- Compensatory mitigation to replace lost wetland functions and values is not addressed in the 401 application; therefore, the application is incomplete.
- The applicant does not document critical terrestrial habitats that might exist within the project area, either associated with vernal pools in the ROW or vernal pools that might exist adjacent to the ROW.

10.3 Proposed erosion and sediment controls

- Erosion and resulting sedimentation in streams and wetlands pose a significant risk to water quality within the proposed pipeline path and to sensitive habitats located near the proposed path. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.
- Proposed stream trenching methods will disrupt fish life and kill benthic macroinvertebrate organisms within the construction corridor of the crossing. Streambank erosion is also a risk because of the destabilizing effect of unvegetated streambanks or poorly installed riprap. Eversource's application lacks appropriate guidance for revegetating streambanks, increasing the likelihood of long-term erosion and sedimentation and negative impacts to water quality in the Durkee Brook watershed. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.
- Construction and removal of temporary crossings for equipment and vehicles will likely increase sediment delivery to nearby streams and wetlands. Storm events causing high flows also present a significant threat of erosion and sedimentation to nearby water courses. These temporary crossings are therefore likely to cause violations of water quality standards, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.
- Eversource does not include sufficient details on the use of construction mats in sensitive wetland areas to ensure the mats are used appropriately and minimize impacts to wetlands and vernal pools. Without this detail, it is likely that water quality standards will be violated in wetlands, state species of concern could be directly impacted, and wetland habitat could be degraded.

10.4 Risks from steep slopes and highly erodible soils

- Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated downstream from the most erosion-prone areas, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

10.5 Horizontal directional drilling

- Inadvertent returns have occurred frequently when HDD was used at other pipeline construction projects, causing violations of water quality standards and necessitating expensive remediation operations. Should inadvertent returns also occur during the construction of the Eversource Pipeline, water quality standards would likely be violated, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition

10.6 Impacts to brook trout populations and habitat

- Erosion and resulting sedimentation in Durkee Brook, a documented brook trout stream, pose a significant risk to water quality and trout habitat. Even with the proper installation and maintenance of erosion and sediment control BMPs, water quality standards are likely to be violated and trout habitat is likely to be damaged.

10.7 Cumulative impacts to Durkee Brook

- Although the proposed pipeline pathway does not cross Durkee Brook, sediment delivery to the mainstem is likely from two tributary crossings just upstream from their confluences with Durkee Brook and from three crossings on tributaries that combine to form a main tributary to Bark Meadow Brook. These five crossings are likely to have cumulative impacts with significant delivery of sediment to Durkee Brook.
- The long length of pipeline ROW that parallels and runs in proximity to Durkee Brook provides ample opportunity for sediment to impact the riparian corridor downslope of the pipeline and Durkee Brook itself. This presents significant risk to habitat and will likely cause violations of water quality standards, including narrative standards for suspended and settleable solids, silt or sand deposits, turbidity, and biological condition.

10.8 Impacts to wildlife

- If high-quality habitat is impacted by adjacent disturbance, this can drive birds away and effectively reduce habitat. Additional conservation measures must be included to protect the habitat of the Northern long-eared owl.
- Given the location of the pipeline path through American bittern habitat, significant impacts to this endangered species are possible.
- Recommendations to protect wood and box turtles present challenges to construction scheduling and will require extra work for construction crews. Without careful oversight during construction, direct impacts on turtles in the construction area are likely. Upland forests used by the turtles will also be impacted and these impacts have not been assessed.
- Negative impacts on Northern long-eared bats are possible if Eversource does not implement its voluntary moratorium on tree clearing during bat breeding season.

- If all conservation measures needed to protect endangered species and species of special concern are followed, construction time will increase. This increases direct impacts on these species and increases the chance of erosion from storm events. If the conservation measures are not fully implemented, then direct impacts on wildlife species are likely.
- Eversource's proposed invasive species control plan needs to include provisions for controlling invasive species in upland habitats, which are critical to box turtle populations and amphibians.

REFERENCES

Abrahams, L., W.M. Griffin, H.S. Matthews. 2015. Assessment of policies to reduce core forest fragmentation from Marcellus shale development in Pennsylvania. Ecological Indicators 52:153-160. https://www.sciencedirect.com/science/article/pii/S1470160X14005664

Associated Press. 2017. Fracking Pipeline Spilled Millions of Gallons of Mud into Ohio Wetlands. WOSU Public Media. Accessed online June 24, 2019 at: https://radio.wosu.org/post/fracking-pipeline-spilled-millions-gallons-mud-ohio-wetlands#stream/0

Betcher, M., A. Hanna, E. Hansen, D. Hirschman. 2019. Pipeline Impacts to Water Quality, Documented Impacts and Recommendations for Improvements. August 21.

Chow, L. 2018 Rover Pipeline Spills Another 150,000 Gallons of Drilling Fluid into Ohio Wetlands. EcoWatch. Published Jan. 17. Accessed online June 25, 2019 at: https://www.ecowatch.com/rover-pipeline-spill-2526282302.html

Clingerman, J. and E. Hansen. 2016. Mountain Valley Pipeline Sediment Modeling Methodology. Downstream Strategies. Prepared for Appalachian Mountain Advocates. December 16.

Connecticut Department of Energy and Environmental Protection (DEEP). 2020a. Wildlife Division. American Bittern. Accessed online May 27 at: https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/American-Bittern

_____. 2020b. Wildlife Division. Long Eared Owl. Accessed online May 27 at: https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/Long-eared-Owl

_____. 2020c. Wildlife Division. Eastern Box Turtle. Accessed online May 27 at: https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/Eastern-Box-Turtle

_____. 2020d. Wildlife Division. Wood Turtle. Accessed online May 27 at: https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/Wood-Turtle

_____. 2020e. Maps and GIS Data Department. Archived GIS Data clearinghouse. Connecticut Town Polygon, Connecticut Final Stream Classifications, Conservation Lands, Watershed Boundaries, Connecticut Hydrography Line and Polygon shapefiles, DEEP Property, Federal Open Space shapefiles utilized. Available online at: https://portal.ct.gov/DEEP/GIS-and-Maps/Data/GIS-DATA

_____. 2020f. Fishing Division. Brook Trout. Accessed online May 27 at: https://portal.ct.gov/DEEP/Fishing/Freshwater/Freshwater-Fishes-of-Connecticut/Brook-Trout

_____. 2020g. Min Huang, Wildlife Biologist. Personal communication. May 16.

_____. 2020h. Shannon Kearney, Wildlife Biologist. Personal communication with author Newland. May 18.

Connecticut Environmental Conditions Online (CTECO). 2020. DEEP and University of Connecticut. Map and Imaging Services. GIS data servers utilized: Connecticut Wetlands, Connecticut Erosion Susceptibility, and hillshade. Available online at: https://cteco.uconn.edu/map_services.htm

_____. 2015. Connecticut DEEP Fish Community Data-Inland Waters. Interactive map. Available online at: https://cteco.uconn.edu/projects/fish/viewer/index.html

_____. 2005. Connecticut Erosion Susceptibility spatial analysis. Spatial data with soil quality metadata. Available online at: http://www.cteco.uconn.edu/metadata/dep/document/EROSION_SUSCEPTIBILITY_FGDC_Plus.htm

Department of the Army. 2016. General Permits for the State of Connecticut and Lands Located within the Boundaries of an Indian Reservation. Effective August 19, 2016-August 19, 2021.

Entrekin, S., M. Evans-White, B. Johnson, E. Hagenbuch. 2011. Rapid expansion of natural gas development poses a threat to surface waters. Front Ecol Environ 9(9): 503–511. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.453.2912&rep=rep1&type=pdf

Environmental Solutions and Innovations. 2017. Hydrologic Analysis of Sedimentation, Mountain Valley Pipeline, Jefferson National Forest, Eastern Divide Ranger District. Prepared for: USDA, Forest Service. Prepared on behalf of: Mountain Valley Pipeline. March 1.

Eversource Energy Service Company (Eversource). 2020. Application for a Section 401 Water Quality Certification for the Pomfret to Killingly Pipeline Project. January 14.

Felan, M. 2017. Rover Pipeline caused more environmental violations than any other recent pipeline. WOSU Public Media. Published Aug, 23. Accessed online June 24, 2019 at: https://radio.wosu.org/post/rover-pipeline-caused-more-environmental-violations-any-other-recent-pipeline

Fesenmyer, K., D. Kinney, K. Ombalski. 2018. Conservation Planning for Natural Gas Pipeline Routing: Protecting High-Value Natural Resources in the Delaware Basin. Trout Unlimited, Arlington, Virginia. May. https://login.tu.org/sites/default/files/offline/science/Delaware_Basin_High-Value_Natural_Resources_Pipelines_Planning_24May2018.pdf

Gibbs, J.P. and S. Melvin. 1992. American Bittern. *Migratory Nongame Birds of Management Concern in the Northeast,* Schneider, K. J. and D. M. Pence (eds.). USFWS, Newton Corner, MA.

Glass, M., K. Hatcher, M. Betcher, E. Hansen. 2016. Guidance for Monitoring Effects of Gas Pipeline Development on Surface Water and Groundwater Supplies. August 18.

Griffith, G.E., J.M. Omernik, S.A. Bryce, J. Royte, W.D. Hoar, J.W. Homer, D. Keirstead, K.J. Metzler, G. Hellyer. 2009. Ecoregions of New England (color poster with map, descriptive text, summary tables, and photographs). Available online at: http://ecologicalregions.info/data/vt/new_eng_front.pdf

Hendrix, S. and M. Renault. 2017. Stormwater overflow from Rover pipeline construction affecting farm. The Columbus Dispatch. Published May 20. Accessed online June 25, 2019 at: https://www.dispatch.com/news/20170520/stormwater-overflow-from-rover-pipeline-construction-affecting-farms

Kanno, Y., B. H. Letcher, A. L. Rosner, K. P. O'Neil, K. H. Nislow. 2015. Environmental Factors Affecting Brook Trout Occurrence in Headwater Stream Segments. *Transactions of the American Fisheries Society*. 144:373-382.

Leibowitz, S. and R. Brooks. 2007. Hydrology and Landscape Connectivity of Vernal Pools. *Science and Conservation of Vernal Pools in Northeastern North America*, A. Calhoun and P. DeMaynadier, editors, CRC Press.

McClure C.J.W., H.E. Ware, J. Carlisle, G. Kaltenecker, J.R. Barber. 2013. An experimental investigation into the effects of traffic noise on distributions of birds: avoiding the phantom road. *Proc. R. Soc. B* 280, 20132290. https://doi:10.1098/rspb.2013.2290

National Energy Board. 2019. How do pipelines cross rivers and streams? Accessed online June 30, 2019 at: https://www.neb-one.gc.ca/bts/nws/rgltrsnpshts/2016/10rgltrsnpsht-eng.pdf

Norris, C. 2017. The ongoing fight over the Rover pipeline, explained. PBS Newshour. Published Oct. 5. Accessed online June 19 at: https://www.pbs.org/newshour/science/ongoing-fight-rover-pipeline-explained

PennEast Pipeline. 2019. How we cross rivers and streams. Accessed online June 30, 2019 at: https://penneastpipeline.com/wp-content/uploads/2016/03/Rivers_Streams_3-10-16-6pm.pdf.

Pennsylvania Department of Environmental Protection (PADEP). 2019a. Sunoco Mariner East II - Pipeline Construction Inadvertent Returns - Waters of the Commonwealth. Revised April 29, 2019. Accessed online June 25, 2019 at: http://files.dep.state.pa.us/ProgramIntegration/PA%20Pipeline%20Portal/MarinerEastII/Sunoco_Mariner_East_II-Pipeline_Construction_Inadvertent_Returns-Waters_of_the_Commonwealth_Revised.pdf

_____. 2019b. Sunoco Mariner East II - Pipeline Construction Inadvertent Returns – Uplands. Revised May 31, 2019. Accessed online June 25, 2019 at: http://files.dep.state.pa.us/ProgramIntegration/PA%20Pipeline%20Portal/MarinerEastII/Sunoco_Mariner_East_II-Pipeline_Construction_Inadvertent_Returns-Uplands_Revised.pdf

_____. 2018a. Mariner East Pipeline Frequently Asked Questions. Published Aug. 22. Accessed online June 28, 2019 at: https://www.dep.pa.gov/Business/ProgramIntegration/Pennsylvania-Pipeline-Portal/Pages/Mariner-East-II.aspx

_____. 2018b. Notice of Violation, DEP File No NOV 07 18 102. Issued March 19. Accessed online June 26, 2019 at: http://files.dep.state.pa.us/ProgramIntegration/PA%20Pipeline%20Portal/MarinerEastII/NOV/2018/March%2019,%202018%20Blair%20County.pdf

_____. 2017. Consent Assessment of Civil Penalty Issued Under the Clean Streams Law, Pennsylvania Code, Chapters 93 and 102. To Sunoco Pipeline L.P. Dec. 21.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Rudell, T. 2017a. Rover pipeline's 1.5-Million-Gallon Spill Was Near, But Did Not Contaminate, Canton's Water Source. WKSU. Published April 20. Accessed online June 24, 2019 at: https://www.wksu.org/post/rover-pipelines-15-million-gallon-spill-was-near-did-not-contaminate-cantons-water-source

_____. 2017b. Ohio EPA Penalties With The Rover Pipeline Builder Must Be Negotiated. WKSU. Published May 15. Accessed online June 30, 2019 at:

https://www.wksu.org/post/ohio-epa-penalties-rover-pipeline-builder-must-be-negotiated

Rzeznikiewicz, A. 2020. Land Manager, Pomfret and Trail Wood Preserves, Connecticut Audubon Society. Personal communication, May 15.

Schmid and Company, Inc. 2014. The Effects of Converting Forest or Scrub Wetlands to Herbaceous Wetlands in Pennsylvania. Prepared for the Delaware Riverkeeper. Available online at: https://www.delawareriverkeeper.org/sites/default/files/Documents/Wetland%20Conversion%20Report.pdf

Senzaki, M., Y. Yamaura, C.D. Francis, F. Nakamura. 2016. Traffic noise reduces foraging efficiency in wild owls. *Sci Rep* 6, 30602. https://doi.org/10.1038/srep30602

State of Ohio v. Rover Pipeline, LLC. 2017. Complaint for Injunctive Relief and Civil Penalties. Filed Nov. 3. Accessed online at: https://www.ohioattorneygeneral.gov/Files/Briefing-Room/News-Releases/Environmental-Enforcement/2017-11-03-Rover-Complaint-Signed-for-Filing.aspx

U.S. Army Corps of Engineers (USACE). 2020. Taylor M. Bell, Mitigation Program, New England District. Personal communication with author Newland. May 20.

_____. 2016. New England District Compensatory Mitigation Guidance. September 7.

_____. 2015. New England District. Vernal Pool Best Management Practices. January.

U.S. Department of Agriculture (USDA). 2020. Natural Resources Conservation Service. SSURGO Gridded Soil Survey geospatial data. May 20.

U.S. Environmental Protection Agency. 2015. Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-14/475F.

U.S. Fish and Wildlife Service (USFWS). 2019. Energy Development. Oil and Gas Pipelines. Accessed online at: https://www.fws.gov/ecological-services/energy-development/pipelines.html

U.S. Geological Survey. 2020. National Elevation Dataset. Spatial data download for Windham County. May 15.

Weltman-Fahs, M. and J. Taylor. 2013. Hydraulic Fracturing and Brook Trout Habitat in the Marcellus Shale Region: Potential Impacts and Research Needs. Fisheries 38(1):4-15. http://tumadmen.org/assets/documents/Weltman-Fahs%20and%20Taylor%202013.pdf

Williams T. 2012. Pipelines: Environmental Considerations. Publication No. 2012-37-E. Library of Parliament. Ottawa, Canada. July 5.

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Profile

Mr. Hansen explores resource and environmental problems and solutions in three areas: water, energy, and land. He manages interdisciplinary research teams, performs quantitative and qualitative policy and scientific analyses, provides litigation support and expert testimony, develops computer tools, provides training, and performs field monitoring.

Skills and Experience

Overseeing the development of a Source Water Protection Plan and ongoing source water protection activities.

Considerable experience working with watershed organizations and agencies on Clean Water Act and Surface Mining Control and Reclamation Act issues such as permits, TMDLs, antidegradation, and watershed-based plans.

Organized and conducted training workshops for watershed organizations and permittees to promote informed public participation and permit compliance.

Provided expert testimony before appeals boards on NPDES and coal mining permits, before the West Virginia Public Service Commission on water quality issues, and in federal court.

Managed projects related to local economic benefits of acid mine drainage remediation and wind power development.

Researched opportunities for landfill gas-to-energy projects and the generation of carbon credits.

Developed and applied computer models to help clarify solutions to environmental problems.

Served on several committees that help set water-related policies at the state and local levels.

Interfaced effectively with government agencies.

Provided consulting services in Zimbabwe, South Africa, Zambia, Tanzania, Namibia, China, and Egypt.

Education

M.S., Energy and Resources, University of California, Berkeley, 1997. This interdisciplinary program combines environmental science, public policy, economics, and engineering.

B.S., Computer Science and Engineering, Massachusetts Institute of Technology, 1988.

Representative Publications

Hansen E, Gilmer B, Varrato, A, Rosser A. 2014. Potential significant contaminant sources above West Virginia American Water's Charleston intake: A preliminary assessment. Downstream Strategies and West Virginia Rivers Coalition.

Hansen E, Glass M, Gilmer B, Rosser A. 2014. The Freedom Industries spill: Lessons learned and needed reforms. Downstream Strategies and West Virginia Rivers Coalition.

Economic Development Research Group and Downstream Strategies. 2011. Failure to act: the economic impact of current investment trends in water and wastewater treatment infrastructure. Prepared for American Society of Civil Engineers. (DS authors: E Hansen and A Hereford.)

Hansen E, Zegre S, Hereford A. 2011. Elk headwaters watershed protection plan. Submitted to West Virginia Department of Environmental Protection. Downstream Strategies.

Hoornbeek J, Hansen E, Hereford A, Filla J, Satpathi S. 2011. Measuring water quality improvements: TMDL implementation progress, indicators, and tracking. Submitted to United States Environmental Protection Agency. Kent State University Center for Public Administration and Public Policy and Downstream Strategies.

Hansen E, Collins A, Zegre S, Hereford A. 2010. The benefits of acid mine drainage remediation on the North Branch Potomac River. Prepared for Maryland State Water Quality Advisory Committee. Downstream Strategies.

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Profile

Ms. Newland contributes an ecosystem perspective to projects to restore stream, wetland, and upland systems. She brings over 18 years of project management and leadership experience to projects. Ms. Newland has also helped rural public utilities develop long-term plans for improving sanitation infrastructure. Ms. Newland works directly with clients to develop locally appropriate projects that meet landowner, funder, and ecological goals.

Skills and Experience

Manages multi-disciplinary team to design, permit, implement, and monitor stream, wetland, and upland restoration projects. Includes restoration of over10 miles of stream, 32 acres of wetland, and 15 acres of riparian buffers in diverse habitats across the Central Appalachian region.

Applied experience planning and assessing wastewater treatment issues in rural areas to contribute to a report on the regulatory barriers to the deployment of revolutionary wastewater treatment methods in the U.S.

Led a regional nonprofit with an annual budget of $3 million and a staff of 12 professionals working on stream restoration, wastewater treatment, and education projects across the Central Appalachians.

Experienced in developing funding streams and building partnerships to assess, design, and implement solutions.

Coordinated and edited multi-state, regional, and county-level reports with an emphasis on the effects of environmental stressors on both the ecological and economic health of rural communities.

Provided expertise in native plants and sustainable forest management of Central Appalachian forests to stream and wetland restoration projects.

Serves on committees working to address sanitation challenges in West Virginia and regionally.

Invited as a leader in community development to participate in the visit of the U.N. Expert on the Issue of Human Rights Obligations Related to Access to Safe Drinking Water and Sanitation (2011) and U. N Expert on Poverty (2017) and participated in the White House Rural Economic Forum (2012).

Education

M.S, Forestry, University of Montana, 1998. Emphasis on interaction of forest management and soil nitrogen cycles.

B.S., Applied Earth Science and Biological Science, Stanford University, 1992.

Publications

Hansen, E., Newland, J., Fedorko, E. 2020. Sewage Blending: Potentially Impacted Populations.

Cottingham, S, Newland J., Hansen, E. 2019. Regulatory barriers to reinvented toilets.

Newland, J., Fedorko, E., Postlethwait, W. 2019. Opequon Creek Culvert Replacement Prioritization.

Canaan Valley Institute. 2013. Wyoming County Wastewater Treatment Needs. (CVI Authors J Newland and V Fenwick-Judy)

Canaan Valley Institute. 2012. Improving Wastewater Treatment in Eastern West Virginia: Setting Priorities in Difficult Times. (CVI authors J Newland and K Mielcarek)

Canaan Valley Institute. 2002. Highlands Action Program: Transforming the Legacy. (CVI authors J Newland and E Voss)

Newland, J, DeLuca, T. 2000. Influence of fire on native nitrogen-fixing plants and soil nitrogen status in ponderosa pine - Douglas-fir forests in western Montana. *Canadian Journal of Forest Research*. 30(2):274-282.

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Profile

Ms. Betcher is an environmental scientist who focuses on interdisciplinary solutions designed to protect the environment and inform citizens and policy. She offers expertise in a range of scientific subjects, project design, field sampling, geospatial analysis, data analysis and management, and presentation of complex scientific findings to academics, students, and community groups. Her work products are often utilized in litigation, policy recommendations, and citizen education.

Skills and Experience

Extensive experience in designing field sampling strategies, and collection and analysis of field-based data.

Created a variety of reports designed to educate and engage the public in policy related to natural resources protection.

Experienced in preparing source water protection plans—wrote management plans, including public outreach strategies, and completed surveys of potential contaminant sources for more than ten communities across West Virginia.

Performed geospatial modelling to inform policymaking and planning related to coastal zone management in Barbados.

Researched and analyzed coal mining and quarry permits and associated NPDES permits, water quality databases, and mining impacts.

Experienced in spatial data analysis presentation and map creation utilizing GIS and online applications.

Analyzed the role of microbial communities in environmental processes through molecular-based methods, including lignocellulose degradation, forest regeneration following wildfires, and grasslands impacted by invasive plant species.

Presented complex scientific data to academics, professionals, students, and community groups.

Conducted trainings on geospatial models for students, citizens, government officials, and NGO staff.

Provided testimony related to water quality sampling in Federal Court.

Education

M.S., Environmental Science and Engineering-Environmental and Biomolecular Systems focus, Institute of Environmental Health, Oregon Health & Science University, Portland, 2011.

B.A., Microbiology, Microbial Ecology focus, University of Montana, Missoula, 2004.

Relevant Publications

Altamia M, Shipway JR, Betcher M, Stein D, Fung J, Jospin G, Eisen J, Haygood M, Distel D. 2020. Teredinibacter waterburyi sp. nov., a marine, cellulolytic endosymbiotic bacterium isolated from the gills of the wood-boring mollusc Bankia setacea (Bivalvia: Teredinidae), and emended description of the genus Teredinibacter. *International Journal of Systematic and Evolutionary Microbiology.*

Betcher M, Glass M. 2019. Still Wasting Away: Oil and Gas Liquid Waste in West Virginia. Earthworks.

Hansen E, Clingerman J, Betcher M. 2018. Threats to Water Quality from Mountain Valley Pipeline and Atlantic Coast Pipeline Water Crossings in Virginia. Natural Resources Defense Council.

Hansen E, Clingerman J, Betcher M. 2018. Impacts of Mountain Valley Pipeline Stream Crossings within the Jurisdiction of the Virginia Marine Resources Commission. Natural Resources Defense Council.