FINAL
RESTORATION PLAN AND
ENVIRONMENTAL ASSESSMENT

HOLYOKE COAL TAR DEPOSITS AND
FORMER HOLYOKE GAS WORKS
CONNECTICUT RIVER

HOLYOKE, HAMPDEN COUNTY, MASSACHUSETTS

April 2012

Prepared by:

National Oceanic and Atmospheric Administration,
Massachusetts Executive Office of Energy and Environmental Affairs
and
United States Fish and Wildlife Service

EXECUTIVE SUMMARY

This Final Restoration Plan and Environmental Assessment (Final RP/EA) has been prepared by the National Oceanic and Atmospheric Administration (NOAA) on behalf of the U. S. Department of Commerce, the United States Fish and Wildlife Service (USFWS) on behalf of the U. S. Department of the Interior (DOI), and the Massachusetts Department of Environmental Protection (MassDEP) on behalf of the Executive Office of Energy and Environmental Affairs (EEA) to address natural resources, including ecological services injured, lost or destroyed due to releases of hazardous substances in areas at or impacted by release from the Holyoke Coal Tar Site (the "Site") in Holyoke, Hampden County, Massachusetts. Pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), NOAA, USFWS, and EEA share trusteeship authority over the natural resources affected by releases at or from the Site and are collectively referred to as the Natural Resource Trustees ("the Trustees"). See, 42 USC § 9607(f)(2).

Under CERCLA, the Trustees are authorized to act on behalf of the public to assess and recover damages for injury to, destruction of, or loss of natural resources caused by the release, or threatened release, of hazardous substances, and to hold responsible parties liable for those damages including the costs of assessing the damages (42 USC 9607). Natural resource trustees are required to use the funds recovered from responsible parties to, "restore, replace or acquire the equivalent" of the natural resources that were injured and ecological services that were lost. See, 42 USC § 9607(f)(1).

At the Holyoke Site, coal tar produced from a former manufactured gas plant was released to adjacent soil, groundwater, sediment, and surface water, including the Connecticut River. Tar deposits impacted aquatic habitat for benthic organisms as well as fish and freshwater mussels that utilize these river habitats. In 1996, the Trustees reached a settlement with the Responsible Parties for the Site (the Holyoke Water Power Company and the City of Holyoke Gas and Electric Department). The Responsible Parties agreed to pay the Trustees $345,000 to compensate for impacts to natural resources, including federally-endangered shortnose sturgeon, endangered and/or state protected freshwater mussels, benthic habitat, and other biologic resources (Consent Decree 2004). The settlement amount was calculated based on the costs of restoration actions that the Trustees determined would be needed to compensate the public for natural resources and services harmed or lost due to environmental contamination from the Holyoke Gas coal tar deposits. Interest earned on the settlement funds over time has increased the total amount of funds available for restoration planning, implementation and case administration to $395,000.

This Final RP/EA identifies and evaluates a number of alternatives to restore the natural resources injured at the Site. The Trustees have identified and considered multiple restoration alternatives through consultation with the public and governmental agencies. The Trustees developed and utilized eligibility and evaluation criteria to guide their evaluation of restoration alternatives and selection of the preferred alternatives. In addition, a public informational meeting was held in Holyoke, MA on April 7th, 2011 to describe the restoration planning process and to solicit the public for input on potential projects.

In this Final RP/EA document, the Trustees present the preferred restoration alternatives for implementation. The Trustees identified two Tiers of preferred restoration alternatives, as well as additional non-preferred alternatives. The Tier I preferred alternatives are projects that the Trustees view as providing the most appropriate restoration of the natural resources injured, and for which they propose to allocate settlement funds, first. The Tier I preferred restoration alternatives include: (1) removal of the Bartlett Fish Rod Co. dam on Amethyst Brook in Pelham, MA; (2) construction completion of the Manhan River fishway in Easthampton, MA; and (3) field survey and monitoring of freshwater mussels in targeted reaches of the Connecticut River and tributaries. The Tier II preferred restoration alternatives are projects that would also result in appropriate restoration of the injured natural resources, but which the Trustees will allocate settlement funds to, only if settlement monies remain after the funding of Tier I projects. The Tier II preferred alternatives include: (1) removal of the Orient Springs dam on Amethyst Brook in Pelham, MA; and (2) removal of invasive water chestnut from Log Cove on the Connecticut River in Holyoke, MA. The implementation of these projects will reconnect the upstream headwaters to downstream riverine habitat for anadromous fish passage, improve water quality, restore natural transport processes for coarse particulate organic matter, improve habitat for freshwater mussels and their larval host species, and restore the natural movement of sediment improving the condition of downstream benthic habitat for mussels and other aquatic organisms.

The Trustees made the Draft RP/EA available for public review and comment for a period of 30 days in accordance with the National Environmental Policy Act (NEPA). The Trustees then reviewed and considered the comments received. Summaries of the comments and the Trustees' responses to comments are provided in Appendix II. After consideration of the comments received and the environmental assessment prepared in the Draft RP/EA NOAA, on behalf of the Holyoke Trustees, has issued a Finding of No Significant Impact (FONSI) for the selected project alternatives. The Trustees expect implementation of the selected restoration projects later in 2012 following the release of this Final RP/EA.

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1.0 INTRODUCTION

1.1 OVERVIEW OF THE SITE

The Holyoke Gas Works, a defunct manufactured gas plant (MGP), produced gas from coal and petroleum for use in residential, commercial and industrial lighting between 1852 and 1952. The Site is located in Holyoke, Massachusetts, on the west bank of the Connecticut River (Figure 1). During its operation, the facility generated approximately ten million gallons of coal tar waste. Between 1905 and 1952, at least 120,000 gallons of coal tar wastes were released from the Gas Works Site to the Connecticut River. While no records were available for the period from 1852 to 1905, routine industrial practices for MGPs indicate that releases were common. The releases from the Holyoke Gas Works occurred during flood events via drain and overflow pipes which originated from on-site underground storage tanks used to temporarily contain the coal tar wastes. In addition, the facility occasionally directly discharged coal tar to the Connecticut River. In 1990, the City of Holyoke Gas & Electric Department conducted a limited site investigation which confirmed that coal tar had entered the Connecticut River from the Site. Subsequent investigations identified at least 27 coal tar patches along the western side of the Connecticut River covering approximately 72,810 square feet (1.7 acres) of river bottom. In addition, the No. 2 Overflow Raceway of the Holyoke Canal System was determined to be contaminated with coal tar affecting as much as 42,000 square feet (0.9 acres) of raceway bottom sediment. As set forth in the Consent Decree signed in 2004, a total of 114,810 square feet (2.6 acres) of river and raceway benthic habitat has been injured at the described locations due to coal tar deposits. These patches of tar and contaminated sediment are known for purposes of this document as the Holyoke Gas Tar Deposits.

The Site property, currently owned by the City of Holyoke, is bordered by the Connecticut River to the north and east, industrial properties and the Route 116 Bridge to the south, and Gatehouse Road and the First and Third Level Canals to the west. South Hadley Falls is located adjacent to the property on the Connecticut River. The surrounding area is a mix of residential and industrial properties. Surface runoff and groundwater from the Site flows either directly or via the canals into the Connecticut River. The Massachusetts Department of Environmental Protection (MassDEP), acting under the authority of the Massachusetts Oil and Hazardous Material Release Prevention and Response Act (M.G.L.c.21E) and the Massachusetts Contingency Plan (310 CMR 40.0000), required the Responsible Parties (RPs) to remove Site-related oil, coal tar, and contaminated sediments adversely affecting the Connecticut River. The RPs worked with MassDEP to develop remedies for three operable units or "Site Portions." Site Portion 1 included the stretch of the Connecticut River from 600 feet above the Route 116 Bridge to Riverside Station. Site Portion 2 included the stretch of the river downstream of Riverside Station to Riverside Park. Site Portion 3 targeted the No. 2 Overflow Raceway. Removal of coal tar and contaminated sediments in all three portions of the river began in 2001. The recovered coal tar was then shipped to an off-site recycling facility. MassDEP considers a Site Portion remediated once all identified coal tar is removed from the visible (dry excavation) portions of the riverbed, and benthic samples

taken in the non-visible (wet excavation) portions of the river do not exceed 1,000 mg/kg (1,000 ppm) total polycyclic aromatic hydrocarbons (PAH).

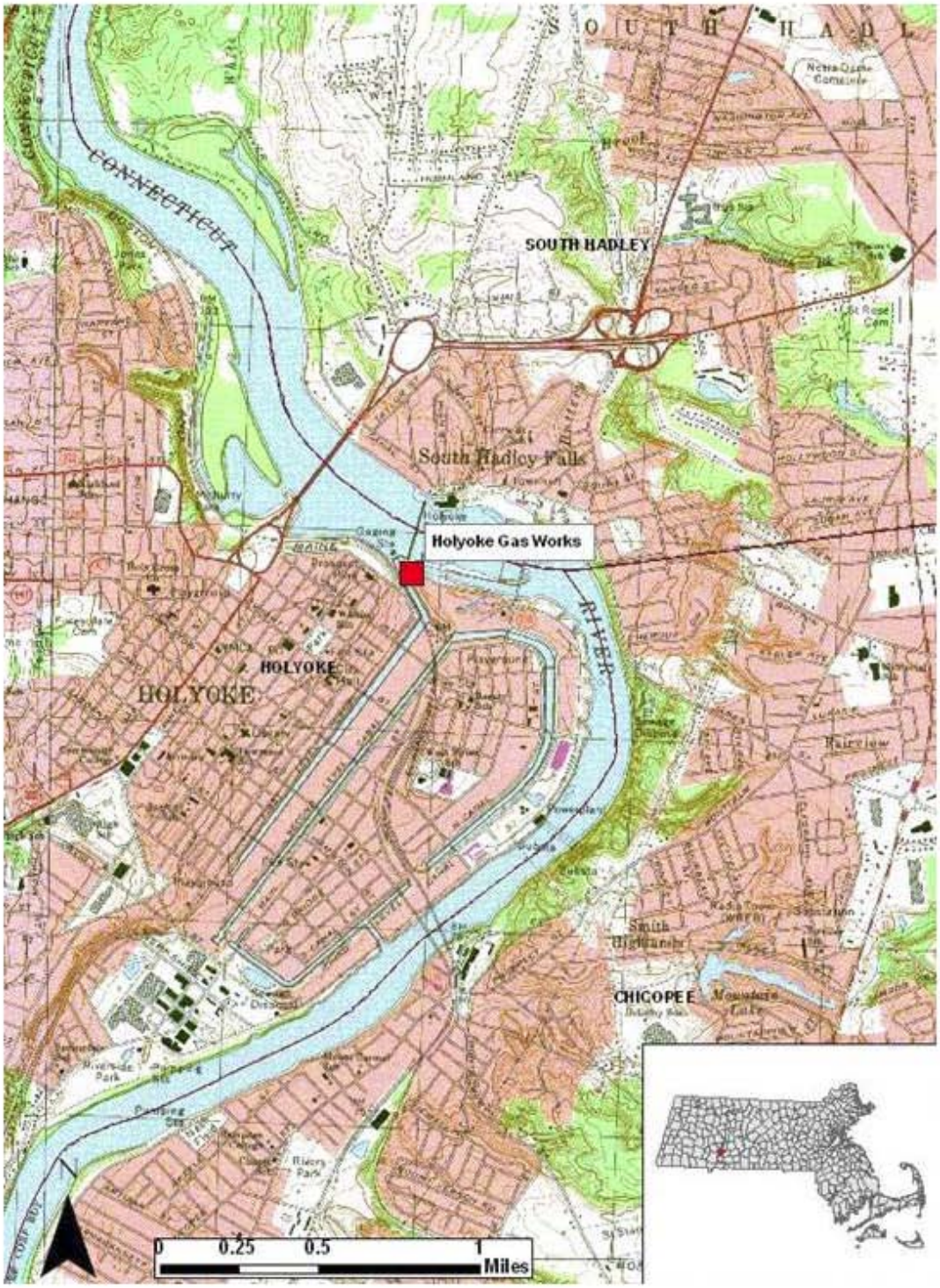

Figure 1. Location of the Holyoke Gas Works Site on the Connecticut River in Holyoke, MA. Coal tar injuries extend from South Hadley Falls proximate to the Site, south to Riverside Park (See map, lower left).

1.2 AUTHORITY

This Final RP/EA was prepared jointly by the Trustees pursuant to their respective authority and responsibilities as natural resource Trustees under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601, *et seq*.; the Federal Water Pollution Control Act, 33 U.S.C. § 1251, *et seq*. (also known as the Clean Water Act [CWA]), and other applicable federal or state laws, including Subpart G of the National Oil and Hazardous Substances Contingency Plan (NCP), at 40 C.F.R. §§ 300.600 through 300.615, and in accordance with DOI's natural resource damages regulations at 43 C.F.R. Part 11, which provide additional guidance for the restoration planning process under CERCLA and CWA.

1.3 PUBLIC PARTICIPATION

The Trustees held a public informational meeting on April 7, 2011 to seek input on potential restoration alternatives. At the public meeting, the Trustees discussed potential restoration alternatives, provided criteria for alternative evaluation, and identified generic project examples for both appropriate and inappropriate restoration projects. A summary of the public meeting is presented in Appendix 1.

The Trustees have prepared this Final RP/EA to provide the public with information on the natural resource injuries and service losses associated with the Site, the restoration objectives that have guided the Trustees in developing this plan, the restoration alternatives that were identified and evaluated by the Trustees, the process used by the Trustees to select preferred restoration alternatives and the rationale for the Trustees decisions.

Public review of the restoration plan proposed in this Final RP/EA was an integral and important part of the restoration planning process, and is consistent with all applicable state and federal laws and regulations, including NEPA and its implementing regulations, and the guidance for restoration planning found within 43 C.F.R. Part 11.

The Trustees published notice of the availability of the Draft RP/EA in *The Republican* and issued a press release to local and regional newspapers. The document was available for review at the following web sites: http://www.mass.gov/dep/cleanup/sites/nrd/nrdhol.htm or http://www.darrp.noaa.gov. The Draft RP/EA was available for public review and comment for a period of 30 days.

The Trustees have considered all written comments received during the public comment period, and have summarized those in Appendix II. After consideration of all public comments received, NOAA has issued a Finding of No Significant Impact (FONSI).

1.4 ADMINISTRATIVE RECORD

Records documenting the information considered and actions taken by the Trustees during this restoration planning process comprise the Trustees' administrative record (AR) supporting this Final RP/EA. These records are available for review by interested parties. Interested persons can access or view these records at the offices of:

NOAA Restoration Center
28 Tarzwell Drive
Narragansett, RI 02882
Attention: James G. Turek
Phone: 401-782-3338
Fax: 401-782-3201

Arrangements must be made in advance to review or to obtain copies of these records by contacting the person listed above. Access to and copying of these records is subject to all applicable laws and policies including, but not limited to, laws and policies relating to copying fees and the reproduction or use of any material that is copyrighted.

2.0 PURPOSE AND NEED FOR RESTORATION

The purpose of the proposed action is to restore natural resources injured, lost or destroyed due to releases of hazardous substances at or from the Holyoke Gas Works Site, in Holyoke, Hampden County, Massachusetts. Restoration is needed to compensate the public for the injuries to natural resources caused by the release of hazardous substances from the Holyoke Site. Damages were recovered by the Trustees for these injuries under the authority of CERCLA, which establishes liability for the injury to, destruction of, or loss of natural resources caused by releases of hazardous substances. These damages recovered must be used to restore, replace, rehabilitate or acquire equivalent natural resources or services, in accordance with a restoration plan developed by designated natural resource trustees.

The Trustees and the Responsible Party reached a settlement agreement concerning natural resource injuries at or adjacent to the Site in an effort to avoid costly litigation and because of a mutual desire to find an acceptable resolution to the Trustees' natural resource injury claims. According to the 2004 Consent Decree, restoration actions would be undertaken to compensate for injured natural resources, including shortnose sturgeon, endangered and/or state protected freshwater mussels, benthic habitat, and other biological and biotic resources. Specifically, the parties agreed that the natural resources damages settlement funds would be used to fund projects that would restore habitat and ecological services and/or monitoring activities for those species injured by releases from the Site, in accord with CERCLA. The restoration projects will be implemented under Trustee supervision.

2.1 NEPA COMPLIANCE

Actions undertaken by the Trustees to restore natural resources or services under CERCLA and other federal laws are subject to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, and the regulations guiding its implementation at 40 C.F.R. Parts 1500 through 1517. Under NEPA, federal agencies are responsible for preparing sufficient environmental documentation. In general, federal agencies contemplating implementation of a major federal action must produce an environmental impact statement (EIS) if the action is expected to have significant impacts on the quality of the human environment. When it is

unlikely that, or uncertain whether a proposed action is likely to have significant impacts, federal agencies prepare an environmental assessment (EA) to evaluate the need for an EIS. If the EA demonstrates that the proposed action will not significantly impact the quality of the human environment, the agency issues a Finding of No Significant Impact (FONSI), which satisfies the requirements of NEPA, and no EIS is required. For a proposed restoration plan, if a FONSI determination is made, the Trustees may then issue a final restoration plan describing the selected restoration action(s).

In accordance with NEPA, this Final RP/EA summarizes the current environmental setting, describes the purpose and need for restoration actions, identifies alternative actions, assesses their applicability and potential impact on the quality of the physical, biological and cultural environment, and summarizes the public's opportunity to participate in the restoration process. The federal Trustees have determined that the proposed restoration actions do not meet the threshold requiring an EIS. After consideration of public comments received by the Trustees, NOAA has issued a Finding of No Significant Impact (FONSI).

3.0 ASSESSING RESOURCE INJURIES

The natural resource damage assessment undertaken was directed at identifying the type and degree of injuries sustained by natural resources as a result of the releases of hazardous substances from the Holyoke Coal Tar Site. This was done both to support development and resolution of the Trustees' natural resource damages claim, and to guide and direct the Trustees in choosing and then implementing appropriate restoration. The injury assessment process can involve both injury evaluation and resource and service loss quantification. To evaluate potential injury to resources, the Trustees reviewed existing information, including Site remedial investigation data and published scientific literature. Based on information from these sources and with an understanding of the ecological functions of the terrestrial and aquatic ecosystems at and near the Site, the Trustees evaluated injury to natural resources. The Trustees considered multiple factors when making this evaluation, including, but not limited to:

- Specific natural resources and ecological services of concern;
- Evidence indicating contaminant exposure, pathway and injury;
- Mechanisms by which injury occurred;
- Probable type, degree, spatial and temporal extent of the injuries; and
- Types of restoration actions that are appropriate and feasible.

For each resource category (either a group of organisms or a habitat type) that was potentially affected, the Trustees identified a pathway linking the injury to releases at or from the Site, determined whether an injury occurred or is likely to occur and estimated the extent and magnitude of past and future injuries to the resources.

Releases of coal tar attributable to the MGP facility have caused past and present injuries to natural resources, namely surface water resources and biological resources, as defined in the

CERCLA Natural Resource Damage Assessment Regulations (43 CFR §11.14). Natural resource injuries also include the habitats of those biological resources. Natural resources in the vicinity of the Holyoke MGP coal tar patches have suffered adverse physical, chemical, and ecological effects. Natural resource injuries are also likely to have been incurred as a direct result of remedial activities (e.g., riverbed excavation) that result in unavoidable but temporary disturbance of natural resource habitat. Natural resource injuries will continue until remedial actions and habitat recovery are completed.

3.1 SETTLEMENT

The Natural Resource Trustees negotiated a $345,000 settlement for natural resource damages with the Holyoke Water Power Company, the City of Holyoke Gas & Electric Department, and the City of Holyoke, Massachusetts (Consent Decree 2004). This settlement amount was calculated based on the costs of restoration actions that the Trustees determined would be needed to compensate the public for natural resources and services harmed or lost due to environmental contamination from the Holyoke Gas coal tar deposits. Interest earned since the settlement has increased the total amount of funds available for restoration planning, implementation and administrative oversight to $395,000. The Consent Decree states that the settlement funds shall be used for the "restoration of natural resource categories and concerns which may include, without limitation, shortnose sturgeon, endangered and/or state protected freshwater mussels, and benthic habitat."

4.0 THE AFFECTED ENVIRONMENT AT THE SITE

This section describes the physical, biological and cultural environment at the Site and the proposed restoration areas, and forms the basis for evaluation of the potential environmental impacts of the selected restoration actions.

4.1 THE PHYSICAL ENVIRONMENT

The Site is located on the west bank of the Connecticut River, as depicted in Figure 1. Contaminants from the Site reached adjacent surface waters via direct storm water discharge and surface runoff.

Connecticut River surface water has been affected by coal tar releases south of Hadley Falls to Riverside Park in Holyoke, MA. The Connecticut River, a designated American Heritage River, originates in northern New Hampshire and Vermont, runs south along the states' border, through western Massachusetts and central Connecticut, and discharges into the northern shore and eastern Long Island Sound in Old Saybrook, CT. The hydrologic river flow regime in Holyoke is affected by the Holyoke Dam at South Hadley Falls, one of over 1,000 dams in the Connecticut River watershed, and 13 of which are on the mainstem.

4.2 THE BIOLOGICAL ENVIRONMENT

The Connecticut River at Holyoke contains numerous migratory fish species including: the federally-endangered Atlantic salmon (*Salmo salar*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), sea lamprey (*Petromyzon marinus*), gizzard shad (*Dorosoma cepedianum)*, American eel (*Anguilla rostrata*), striped bass (*Morone saxatilis*), and the federally-endangered shortnose sturgeon (*Acipenser brevirostrum*). Twelve freshwater mussel species are believed to be present in this region of the Connecticut River and its tributaries, including the federally-endangered dwarf wedge mussel (*Alasmidonta heterodon*), state-endangered brook floater mussel (*Alasmidonta varicosa*) and yellow lamp mussel (*Lampsilis cariosa*), as well as four state-listed species of special concern.

Wildlife that utilizes the river and adjacent habitat in the Holyoke area include white-tailed deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), beaver *(Castor canadensis)*, opossum (*Didelphis virginiana*) and coyote (*Canis latrans*). Large numbers of birds seasonally use and migrate along the Connecticut River, including raptors such as Cooper's hawk (*Accipiter cooperii*, broad-winged hawk (*Buteo platypterus*), and sharp-shinned hawk (*Accipiter striatus)*, as well as osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*). Songbirds such as warblers, orioles, and blackbirds, as well as waterfowl (ducks and geese) and shorebirds also migrate along the Connecticut River corridor. Suburban shrubby areas and riparian marshes and meadows in the vicinity of Holyoke provide nesting habitat for a variety of species, including flycatchers, swallows, thrushes, woodpeckers and warblers.

The 7.2 million-acre Connecticut River watershed includes the Silvio O. Conte National Fish and Wildlife Refuge. The Refuge aims to acquire and protect over 26,000 acres of special focus areas within the watershed. Many of these areas are located near the Site and include: the mouth of the Chicopee River, the Mill River, and the Hatfield Oxbow.

4.3 THE CULTURAL AND HUMAN ENVIRONMENT

The project Site is located in the City of Holyoke, Massachusetts, a municipality with a population of 39,880, according to the 2010 U.S. Census. Eight miles south of Holyoke is Springfield, the largest City in the Massachusetts portion of the Connecticut River watershed. Holyoke was one of the first planned industrial areas in the U.S. and between the late 1880s and mid 1900s, Holyoke was the world's largest paper manufacturer. The City was thus nicknamed "The Paper City" due to its paper production.

An elaborate canal system that is part of the Connecticut River flow through Holyoke was constructed beginning in 1848 for purposes of powering the paper and textiles mills. Today, redevelopment of Holyoke's economy includes a high-tech sector with energy-efficient, high performance computer centers and academic institutions.

The City of Holyoke population density is 1,871 people per square mile (Year 2010 Census) with the racial make-up being 65% white, 3.7% Afro-American, 0.38% Native American, 0.81% Asian, and 26% as other races. Hispanics and Latinos comprise 41% of the combined

race population. The City of Holyoke median household income per the 2000 Census was $30,441, and the median family income was $36,130. The per capita income for Holyoke was $15,913 with 26.4% of the population below the poverty level.

Due to the highly urbanized nature of the Holyoke area, limited undeveloped natural lands are available within the municipality. Recreational activities, such as swimming, boating, fishing, and hunting, are limited near the Site due to lack of public access and the industrialized nature of the Connecticut River mainstem. In contrast, these water-based recreational activities are more common in the nearby tributaries and oxbows of the Connecticut River.

4.3.1 ENVIRONMENTAL JUSTICE

The neighborhoods located along the Connecticut River in the City of Holyoke have been designated as Environmental Justice Populations. By definition[1], Environmental Justice is based on the principle that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. Environmental Justice is the equal protection and meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies and the equitable distribution of environmental benefits. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed by President Clinton on February 11, 1994 calling on each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and Commonwealth of the Mariana Islands.

Environmental Justice Populations are those segments of the population that the Executive Office of Energy and Environmental Affairs (EEA) has determined to be most at risk of being unaware of or unable to participate in environmental decision-making or to gain access to state environmental resources. They are defined as neighborhoods (U.S. Census Bureau census block groups) that meet *one or more* of the following criteria: The median annual household income is at or below 65 percent of the statewide median income for Massachusetts; *or* 25 percent of the residents are minority; *or* 25 percent of the residents are foreign born, *or* 25 percent of the residents are lacking English language proficiency.

The Massachusetts EEA has established an Environmental Justice Policy that is a key factor in decision-making by its agencies. Information on the policy can be found as multi-lingual options at the following web sites:

http://www.mass.gov/Eoeea/docs/eea/ej/ej_policy_english.pdf

http://www.mass.gov/Eoeea/docs/eea/ej/ej_factsheet_spanish.pdf

[1] http://www.mass.gov/Eoeea/docs/eea/ej/ej_policy_english.pdf

http://www.mass.gov/Eoeea/docs/eea/ej/ej_factsheet_port.pdf

This Environmental Justice Policy applies to all agencies of the EEA. It is the policy of the EEA that environmental justice shall be an integral consideration to the extent applicable and allowable by law in the implementation of all EEA programs, including but not limited to, the granting of financial resources; the promulgation, implementation and enforcement of laws, regulations, and policies; and the provision of public access to both active and passive open space.

4.4 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) of 1973 (16 U.S.C. §§1531, *et seq*.) requires federal agencies to list, conserve, and recover endangered and threatened species and to conserve the ecosystems upon which these species depend. In the Holyoke area, two species are federally and state listed as endangered in the state of Massachusetts: the shortnose sturgeon (*Acipenser brevirostrum*), and the dwarf wedgemussel (*Alasmidonta heterodon*). The Connecticut River also has a run of Atlantic salmon (*Salmo salar*), although the Connecticut River population is not considered one of the eight distinct Atlantic salmon river populations with ESA designation.

The Massachusetts Division of Fisheries and Wildlife also identifies species that are of special concern to the State[2]. Of the 12 species of freshwater mussels occurring in Massachusetts (Table 1), seven are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L c.131A and regulations 321 CMR 10.00). In the City of Holyoke, MA, these include the following riverine mussel species: triangle floater (*Alasmidonta undulata*), yellow lampmussel (*Lampsilis cariosa*), tidewater mucket (*Leptodea ochracea*), and creeper (*Strophitus undulatus*). The complete Massachusetts list of endangered, threatened and species of concern for the City of Holyoke can be found at:

http://www.mass.gov/dfwele/dfw/nhesp/species_info/town_h.htm

[2] From Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program (MA NHESP)

Family	Scientific Name	Common Name	MA Status
Unionidae			
	Alasmidonta heterodon	Dwarf Wedgemussel	E, FE
	Alasmidonta undulata	Triangle Floater	SC
	Alasmidonta varicosa	Swollen Wedgemussel	E
	Anodonta implicata	Alewife Floater	Not listed
	Elliptio complanata	Eastern Elliptio	Not listed
	Lampsilis cariosa	Yellow Lampmussel	E
	Lampsilis radiata	Eastern Lampmussel	Not listed
	Ligumia nasuta	Eastern Pondmussel	SC
	Ligumia ochracea	Tidewater Mucket	SC
	Pyganodon cataracta	Eastern Floater	Not listed
	Strophitus undulatus	Creeper	SC
Margaritiferidae			
	Margaritifera margaritifera	Eastern Pearlshell	Not listed

FE = Federally Endangered, E = State Endangered, SC = State Special Concern

Table 1. Freshwater mussel species of Massachusetts and their state-designated vulnerability status

5.0 THE RESTORATION PLANNING PROCESS

5.1 RESTORATION STRATEGY

The strategy of the restoration planning process is to identify restoration alternatives that are appropriate to restore, rehabilitate, replace or acquire the equivalent of the natural resources and their services injured or lost as a result of releases of hazardous substances from the Holyoke Tar Site. The restoration planning process may involve two components: primary restoration and compensatory restoration. Primary restoration actions are actions designed to assist or accelerate the return of resources and services to their pre-injury or baseline levels. In contrast, compensatory restoration includes actions taken to compensate for interim losses of natural resources and services, pending return of the resources and their services to baseline levels (condition of the natural resources within the subject area prior to contamination).

For this case, the Trustees determined that cleanup actions undertaken at the Site were sufficient to protect natural resources in the vicinity of the Site from further or future harm and allow natural resources to return to pre-injury or baseline conditions within a reasonable period of time. Under these circumstances, it was unnecessary for the Trustees to consider or plan for primary restoration actions. Accordingly, this Final RP/EA only addresses the need for compensatory restoration.

Project opportunities near the Site boundaries were limited due to the dense urban development in this area. However, priority was given to nearby projects that could enhance or restore habitat for the Trustee resource injuries.

In accordance with Natural Resource Damage Assessment and Restoration (NRDAR) regulations, the Trustees identified and evaluated multiple project alternatives to compensate for natural resource injuries, including a "no action" alternative. The Trustees visited project sites and consulted with individuals who suggested and/or were familiar with potential projects. The proposed alternatives identified by the Trustees are restoration projects that cumulatively aim to compensate for injuries to natural resources at the Site. The restoration project alternatives were evaluated utilizing the criteria outlined below (See Section 5.2). The preferred restoration project alternatives are identified in Section 6, "Evaluation of Reasonable Range of Restoration Alternatives." In this section, the Trustees also describe some restoration alternatives that were considered but not recommended for funding.

The funding provided is to compensate for impacts to natural resources including the federally-endangered shortnose sturgeon, endangered and/or state protected freshwater mussels, benthic habitat, and other biologic resources. The Trustees conducted a thorough, multi-year investigation into potential habitat restoration projects that would target these resources. The shortnose sturgeon utilizes larger river systems, with specific benthic condition and structure as its preferred habitat. The Connecticut River shortnose sturgeon population in the vicinity of the Site is not thought to make distant migrations from its primary habitat. The relatively limited habitat used by the shortnose sturgeon makes identifying feasible habitat restoration alternatives that benefit the shortnose sturgeon difficult. The Trustees were unable to identify a feasible, cost-effective project, with a high likelihood of success that would directly benefit shortnose sturgeon or its habitat.

The preferred alternatives presented by the Trustees have been categorized into two tiers for the purpose of prioritizing the projects due to funding limitations. Tier I preferred alternatives are projects that the Trustees view as providing the most appropriate restoration of the natural resources injured, and can be funded using the settlement funds to complete the project. Tier II preferred alternatives are projects that would also result in appropriate restoration of the injured natural resources, but would only be funded if settlement monies remain after funding of the higher priority Tier I projects.

The Trustees have sufficient funding available to fund the Tier I preferred projects at the current proposed funding levels. The Trustees acknowledge, however, that uncertainties may arise as the preferred projects are implemented. For some projects, the Trustees may be able to modify the scale of the project, increasing or decreasing the scope of the project to accommodate financial limitations, or make the most cost effective use of funds relative to the environmental gains to be realized by a project. Thus, final funding levels will be based, in part, on the final cost of each selected project and Trustee judgments regarding what actions are most pertinent to compensate for natural resource injuries associated with the Holyoke Coal Tar Deposits. The Trustees may choose to increase funding levels of one or more Tier I preferred projects, if determined necessary to complete the project in a manner that best compensates for natural resource injuries. Conversely, if a preferred project is not progressing in a timely manner that the Trustees deem suitable to compensate for natural resource injuries in a reasonable timeframe, the Trustees may withdraw those funds from the project and reallocate the funds to another Tier I or Tier II preferred project.

5.2 EVALUATION CRITERIA

Consistent with the NRDAR regulations, the following criteria were used to evaluate restoration project alternatives and identify the projects preferred for implementation under this plan:

The extent to which each alternative is expected to meet the Trustees' restoration goals and objectives: The primary goal of any compensatory restoration project is to provide a level and quality of resources and services comparable to those lost due to the hazardous release. In meeting that goal, the Trustees consider the potential relative productivity of the habitat to be restored and whether the habitat is being created or enhanced. Proximity to the injury and future management of the restoration site also are considered because management issues can influence the extent to which a restoration action meets its goals.

The reasonableness of cost to carry out the alternative: The ability of the Trustees to implement projects with the available funds is a major factor in evaluating restoration alternatives. Factors that can affect and increase the costs of implementing the restoration alternatives may include project timing, access to the restoration site (*e.g.,* with heavy equipment or for public use), acquisition of state or federal permits, acquisition of land necessary to complete a project, measures necessary to provide for long-term protection of the restoration site, and the potential liability from project construction.

The likelihood of success of each project alternative: The Trustees consider technical factors that represent risk to successful project construction, project function, or long-term viability of the restored habitat. Alternatives that are susceptible to future degradation or loss through contaminant releases or erosion are considered less viable. The Trustees also consider whether difficulties in project implementation are likely and whether long-term maintenance of project features is likely to be necessary and/or feasible.

The extent to which each alternative will avoid collateral injury to natural resources as a result of implementing the alternative: Restoration actions should not result in additional losses of natural resources and should minimize the potential to affect surrounding resources during implementation. Projects with less potential to adversely impact surrounding resources are generally viewed more favorably. Compatibility of the project with the surrounding land use and potential conflicts with endangered species are also considered.

The extent to which each alternative benefits more than one natural resource or service: This criterion addresses the interrelationships among natural resources, and between natural resources and the services they provide. Projects that provide benefits to more than one resource and/or yield more beneficial services overall, are viewed more favorably. For example, although recreational benefits are not an explicit objective in this Final RP/EA, the potential for a restoration project to enhance recreational use of an area was considered favorably.

The effect of each alternative on public health and safety: Projects that would negatively affect public health or safety are not considered by Trustees as appropriate.

5.3 TIERS OF SCREENING

The NRDAR regulations allow the Trustees discretion to prioritize the evaluation criteria and to use additional criteria, as appropriate. In developing this Final RP/EA, the Trustees gave the first two criteria listed as primary consideration since these factors are paramount to ensuring that the restoration action will compensate the public for the injuries attributable to the Site releases, and can be completed within a reasonable timeframe, using the settlement funds available.

Additionally, the Trustees developed criteria supplemental to the NRDA regulatory criteria (40 CFR §11.82(d)) for which to evaluate potential restoration projects for the Holyoke Coal Tar settlement. These criteria included: benefit to shortnose sturgeon populations; restoration of shortnose sturgeon habitat and/or restored shortnose sturgeon access to their habitat; freshwater mussel population benefits; restoration of riverine benthic habitats; geographic proximity to the injury site; the relative timeframe to implementing and completing the project; the long-term benefits to the Connecticut River watershed; and the likelihood of project success and evaluation of project performance. The summary results of the Trustee evaluation are presented in Table 2 of this document (p. 49). It is noted that the Trustees thoroughly searched for and consulted with others on potential projects to benefit shortnose sturgeon, although no projects were identified to directly address the injuries to this species.

6.0 EVALUATION OF RESTORATION ALTERNATIVES AND THEIR AFFECTED ENVIRONMENT

6.1 TIER I PREFERRED ALTERNATIVE: BARTLETT ROD SHOP COMPANY DAM REMOVAL

Amethyst Brook is a tributary to the Fort River, a river system that is habitat to some of the most diverse aquatic biota in the Commonwealth[3], including the federally-endangered dwarf wedgemussel. The Fort River flows into the Connecticut River in the town of Hadley, MA, approximately 9.7 miles upstream of the Holyoke dam. The Bartlett Rod Shop Company dam is the first dam upstream from the confluence of Amethyst Brook and the Fort River (Figure 2), in Pelham, MA. The Holyoke dam, on the mainstem of the Connecticut River, is the only dam that exists downstream, and thus is otherwise free-flowing to Long Island Sound. The Orient Springs dam, located 0.6 miles upstream of the Bartlett Rod Shop Company dam, presents a second barrier to fish passage, and is a Tier II preferred alternative discussed later in this document. The upstream watershed of these two dams is largely protected open space (91% forested) due in part to the presence of upstream public drinking water supply reservoirs for the Town of Amherst. Approximately 8 miles of high quality stream habitat is upstream of the Bartlett and Orient Springs dams (Figure 3). The Bartlett Rod Co. dam is in poor condition and is designated as a 'significant hazard' structure by the Massachusetts

[3] The Massachusetts Natural Heritage and Endangered Species Program (MA NHESP) have the entire downstream area of the Fort River classified as (1) BioMap Core Habitat, (2) Living Waters Core Habitat, and Priority Habitat for Rare Species.

Office of Dam Safety. The dam is a complete barrier to passage by diadromous and resident fishes.

The Bartlett Rod Co. dam is a stone masonry structure with concrete facing on portions of the dam including the crest. The dam is approximately 20 feet tall, 170 feet long (including abutments), and 6 feet wide at the crest/spillway. The dam has two mid-level outlets, each approximately 3 feet by 3 feet, which are now permanently open to prevent stress on the aging and failing structure (Figure 4). The effective hydraulic height of the dam, with the mid-level outlet openings, is approximately 10 feet.

In early 2010, a proposal to remove the dam, submitted by the Town of Amherst, was awarded *Priority Project* status by the Massachusetts Department of Ecological Restoration (DER), based on the high ecological resource value associated with dam removal at this location. In April 2010, DER hired consultants to develop preliminary engineering design plans that were completed by mid-summer 2010. Final design plans have been completed, and project permitting is expected to be completed by early 2012.

To ensure effective diadromous and resident fish passage, the proposed dam removal work activities have been designed to specify: full removal of the structure; restoration of the stream as a natural streambed; and installation of adaptive management practices (e.g., boulder weirs) to address potential exposed natural bedrock that could adversely affect fish passage. During dam removal, contractors would be instructed to over-excavate the dam removal site to ensure that no buried remnants of the dam are left in place. Impounded sediments would be mechanically excavated to form a starter channel through the project area during the dam removal process. An estimated 3,500 cubic yards of uncontaminated, mostly cobble, sand, and organic matter dredged from the former impoundment would be re-used on-site in previously disturbed areas. These areas would be vegetatively stabilized and restored via bioengineering techniques. Channel evolution after the full dam removal would be expected to mobilize portions of the remaining impounded sediment during storm events.

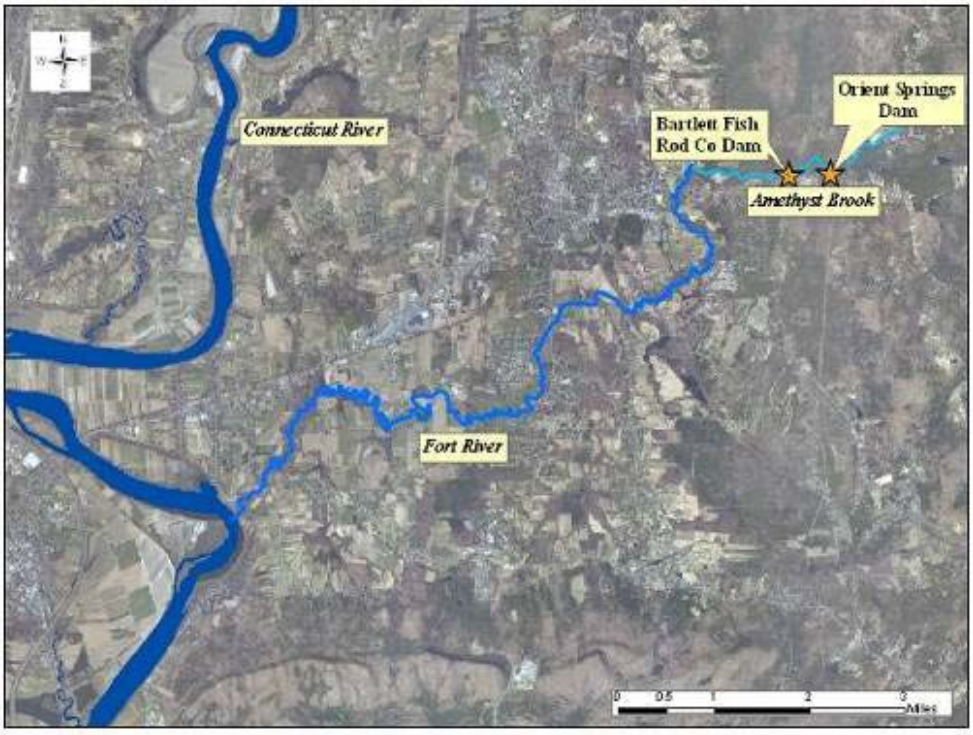

Figure 2. The Connecticut River, Fort River, and Amethyst Brook where the Bartlett Rod Shop Company dam and Orient Springs dam are located.

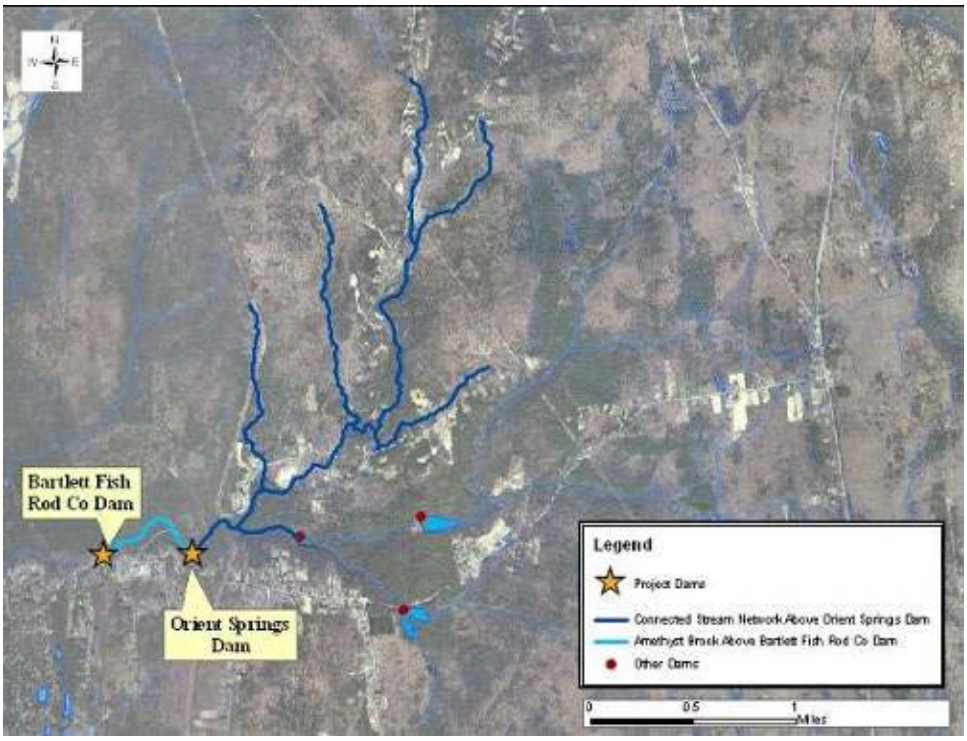

Figure 3. The upstream riverine habitat that would be connected to downstream reaches after removal of the Bartlett Rod Company and Orient Spring dams.

Figure 4. Downstream face of the Bartlett Rod Shop Company dam with mid-level outlet, releasing Amethyst Brook flows.

The sediment mobilization and downstream transport would be expected to provide substantial benefits to downstream benthic and diadromous fish spawning and rearing habitats, over time. Implementation of the dam removal and stream restoration would be expected to result in effective passage by diadromous fishes and contribute to rehabilitating diadromous fish populations in the Connecticut River watershed.

6.1.1 EVALUATION OF THE ALTERNATIVE

Diadromous fish species including American eel, sea lamprey, and Atlantic salmon fry and parr have been documented in Amethyst Brook below the Bartlett Rod Shop Company dam, but not above (U.S. Forest Service and the Massachusetts Division of Fisheries and Wildlife, unpublished data). Resident species found above and below the dam, including brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*) and slimy sculpin (*Cottidae cognatus*), are similarly prevented from upstream and downstream passage by the dam. Removal of the dam would re-connect downstream areas to 0.6 miles of high-quality, cold water habitat in Amethyst Brook upstream to the Orient Springs dam. The proposed removal of the upstream Orient Springs dam, planned in conjunction with the removal of the Bartlett Rod Shop Company dam, is expected to reconnect another 7.9 miles of high quality headwaters habitat. Through these combined actions, it is anticipated that diadromous (and resident) fish species would have effective passage to this high quality upstream habitat. Dam removal would also reconnect the upstream headwaters to approximately 253 miles of connected downstream riverine habitat.

Dam removal typically improves water quality in the former impoundment. Impoundments created by dams can cause water to stagnate, surface temperatures to increase, and dissolved oxygen concentrations in the lower depths of the impoundment to decrease (if the impoundment thermally stratifies). In some instances, surface flow impoundments discharge thermal pollution to downstream habitats. This can be a profound stressor to species that have evolved to flowing coldwater. While the impoundment at the Bartlett Rod Shop Company dam is small (~1 acre) and currently drained (to prevent failure), future repair could result in the re-establishment of a permanent pond in the midst of a high-gradient lotic system. Removing the dam would prevent this adverse condition and improve water quality. Impoundments can also alter the delivery of nutrients (dissolved or adsorbed) to downstream reaches. Even in this small impoundment, observations of accumulated layers of organic detritus suggest that, at a minimum, the presence of the dam is altering the delivery of inorganic sediments and coarse particulate organic matter to downstream areas. Improving the delivery of base resources has cascading beneficial effects on the health of biological food webs, from increase production of benthic macroinvertebrates, to increased food availability to fish. As filter feeders, mussels in downstream reaches would also benefit from additional suspended organic matter and grain-size changes to the channel substrate.

In addition to improving the aquatic food web, the project would indirectly benefit freshwater mussels that rely on a variety of fish to serve as attachment 'hosts' for larval life stages and distribution. Removal of the Bartlett Rod Shop Company dam is expected to benefit a range of fish species that are known hosts to mussels and increase distribution in the Amethyst Brook watershed.

Removal of the dam would also restore the natural movement of sediment to downstream reaches within Amethyst Brook and the Fort River, thus improving the condition of downstream benthic habitat. For nearly 200 years, the presence of the dam and associated impoundment has altered the natural sediment regime. Minimum observed sediment depths recorded during a June 2009 site reconnaissance were ≥10 feet along the thalweg (i.e., centerline of channel flow) and ≥15 feet adjacent to the thalweg in the impoundment of the dam. Recent field sampling (coring) and laboratory analysis indicates that impounded sediment behind the dam consists of approximately 90% sand [note that such sampling cannot include cobble and boulders, which are also present in the impoundment]. Removal of the dam would establish natural sediment transport processes through the restored reach and through downstream benthic habitat.

The Amethyst Brook reach downstream of the dam suffers from sediment depletion caused by the trapping and deposition of materials behind the dam. This sediment depletion is most likely limiting the spawning and rearing habitat of fish, mussels and specifically sea lamprey, which require gravel-cobble substrate for redd (spawning sites) building. In New England, sea lampreys provide a number of key ecological contributions, such as nutrient enrichments, through their migration and post-spawning mortality in local natal rivers. They are also highly effective in physically restructuring the riverbed when making redds, which creates rearing and spawning habitat for many species by increasing river substrate complexity.

Restoration of the natural sediment regime will greatly improve spawning opportunities for sea lamprey benefiting this important member of the riverine community.

Documentation of the resulting downstream habitat changes by comparing the current habitat conditions with modeled scenarios and ultimately re-surveying the future conditions is an important step in planning and monitoring the dam's removal. As part of the dam removal project, a monitoring survey on Amethyst Brook downstream of the dam would occur, with the development of a habitat model for sea lamprey and other key species in the river. The monitoring survey would take place prior to the dam's removal and during the sea lamprey spring spawning season. Work activities would involve mapping habitat conditions in the brook under spawning flow conditions, including the distributions of substrate types from the current dam to the confluence of Amethyst Brook with the Fort River. Additionally, a selected portion of river upstream of the dam would be mapped to use as a model for the substrate and meso-habitat restoration model. Additionally, survey monuments at three or four strategic locations would be installed and tied into vertical datum to develop monitoring cross-sections of riverbed elevation at these locations, and to allow for the determination of changes in the river's bed elevation due to sediment redistribution after the dam is removed. The habitat and substrate mapping would serve as a baseline condition for future comparative analysis. The habitat model produced can be used to determine the changes in habitat distribution as a consequence of a new substrate regime and predict the benefits of the dam's removal.

A substantial amount of project partner funds has already been contributed to the project to accomplish much of the pre-construction tasks, including engineering design, sediment evaluation and management planning and permitting, bid package preparation, and site observation. Contributors towards this design work include the Massachusetts Division of Ecological Restoration (DER), U.S. Fish and Wildlife Service, the American Rivers-NOAA Community Based Partnership funds, and a cash contribution from the private dam owner.

The DER retained a consultant to provide professional services including development of an opinion of probable cost (OPC) for removal of the dam. The OPC for dam removal including contingency is $315,405, which includes funds required to complete the benthic sediment monitoring and lamprey habitat models. Partial funding for construction and dam removal has already been awarded to DER from NOAA-Fish America Foundation Community Based Partnership funds and US Fish and Wildlife Service habitat restoration funds, and an award from the Massachusetts Environmental Trust (MET). The remaining funding required for the dam removal and associated monitoring is estimated at $168,500.

6.1.2 ENVIRONMENTAL CONSEQUENCES

The Trustees evaluated the potential for the project to impact the natural environment, the built environment and public health and safety.

Water Quality: In the short term, during the period of construction, earth moving activities (either the mining or placement of sediments) may increase turbidity in the immediate project vicinity, though actions during construction will minimize this effect. During the low flow

season, the impoundment behind the Bartlett Rod Shop Company dam retains very little water, and impoundment sediments are dry. After construction is completed, the sediments would be stable as the material removed from the levee has already been dewatered. The newly created substrate should colonize quickly with new vegetation, and much of the dry impoundment will have already colonized. Vegetation helps stabilize sediments, reducing sediment transport during runoff events. Over the long-term, the proposed restoration action would re-establish, enhance and increase riverine habitat at the site, and help improve downstream water quality.

Water Resources: During the construction phase of the project, some short-term and localized adverse impacts would occur. As a result of earth-moving activities, there would be localized, temporary increases in turbidity and sedimentation near the project area; however, this will be minimized due to the typically low flow though the impoundment during the low-flow construction season. These conditions may affect fish and filter feeders in the local area, by clogging gills, increasing mucus production and smothering organisms found in the shallow open-water area. Mobile fish and invertebrates would not likely be affected, since these would most likely leave the area, and return after project completion and channel stabilization. Increased noise levels due to the operation of earth-moving equipment would also cause mobile fish to leave the area until operations end. Rare mussels do not exist close enough to the limits of disturbance to be affected by the potential short-term increased turbidity.

Air Quality: Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions from earth-moving equipment contain pollutants, but these emissions would only occur over short periods during the construction phase of the project. The exhausts would be localized and are expected to quickly dissipate. There would be no long-term negative impacts to air quality.

Noise: Noise associated with earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, such disruption would be limited to the construction phase, and there are many comparable substitute recreation sites readily available within the adjoining forested area along Amethyst Brook. No long-term effects would occur as a result of noise during construction.

Geology: The project design plans would include the potential requirement of adaptive field measures should fish passage conditions be preventing target species from effective passage. As corrective adaptive measures, the project would use onsite materials such as boulders and rock to create stone weirs to improve passage, or potentially reduce the height of site-localized, limited, exposed bedrock, via a hydraulic hammer, that may be exposed post-dam removal. Fish biologists and the project engineer would inspect the site during construction, evaluate conditions for passage of target species, and recommend implementation of adaptive measures, if needed.

Recreation: The project would be expected to increase long-term recreational opportunities at and around the project site by increasing ease of site access and enhancing fish and wildlife viewing and recreational fishing opportunities. In the short-term, noise and increased turbidity of surface waters arising from earth-moving activities during project construction would be expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such affect would be limited to the period of construction and should be minor. There are many comparable substitute recreation sites readily available along the Amethyst Brook and Fort River.

Traffic: Local traffic would increase at the site during the period of construction. Constituents most affected by the traffic will be the owners and employees of HRD Press, Inc. The owner of HRD Press and the dam is highly supportive of removing the dam, and is aware of the increased temporary traffic and associated construction equipment activities that would occur on the property during construction. Short-term construction vehicles on the local roads would be expected, but very limited to nearby roads and during the relatively short construction period (less than 2 months). It is expected that proper safety measures would be employed throughout construction so that potential traffic congestion is minimized.

Contaminants: Simple diversion of the river during construction, careful sequencing, and removal of a portion of the impounded sediment (mostly sand, gravel and cobble) for beneficial re-use would be expected to limit any short-term negative impacts related to sediment transport. The impoundment sediments have no significant contaminant levels, and the upstream watershed is predominantly undeveloped, based on the existing land uses and associated municipal land use mapping. No sediment contaminant issues are anticipated with the dam removal and natural sediment processes.

Cultural and Historic Resources: The Bartlett Rod Shop Company Dam and Factory within and adjacent to the project area of potential effect are included in the Inventory of Historical and Archaeological Assets of the Commonwealth, and under the opinion of the Massachusetts Historical Commission (MHC) meet the criteria of eligibility (36 CFR 60) for listing in the National Register of Historic Places under criteria A and C at the local level as a historic district. NOAA, as the lead federal agency, agrees with MHC and has made the determination that demolition of the dam constitutes and adverse effect (36 CFR 800.5(a)(2)(i)) to the historic district. NOAA has provided notice of this determination to the Advisory Council for Historic Preservation (ACHP) (36 CFR 800.6(a)(1)). NOAA and the project partners plan to seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). NOAA plans to enter into a Memorandum of Agreement (MOA) with MHC which incorporates stipulations to mitigate the effect of the project to the historic district. The MOA will be completed prior to project implementation.

6.1.2.1 CUMULATIVE IMPACTS

NOAA has determined that the proposed Bartlett Rod Shop Company Dam removal project constitutes and adverse effect to the historic district. This project, in combination with a potential dam removal project immediately upstream (Orient Spring Dam, described as a Tier

II project, later in this document) will collectively affect the historic district. NOAA, its co-trustee agencies, and the other project partners will seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). The proposed project, in combination with other present or foreseeable projects in the vicinity, would not change the larger current pattern of hydrologic discharge, economic activity or land-use in the watershed. The proposed action would restore habitat that originally existed and occurred naturally at this location. Further, the actions proposed are intended to compensate the public, *i.e.*, make the public and the environment whole for resource injuries caused by releases of hazardous substances into the watershed. If unimpeded fish passage is afforded at the Bartlett Rod Shop Company dam and Orient Spring dam, this proposed restoration action would substantially increase the total river miles accessible to diadromous fish runs.

6.2 TIER I PREFERRED ALTERNATIVE: RESTORATION OF FISH PASSAGE AND FISHWAY INSTALLATION AT THE MANHAN RIVER DAM, EASTHAMPTON, MA

The Manhan River is a tributary that joins the Connecticut River approximately seven miles upstream of the Holyoke Dam. The Manhan River watershed is comprised of the mainstem, the North Branch and numerous smaller tributaries. The Manhan River dam is located approximately three miles upstream from the confluence of the Manhan River with the Connecticut River in Easthampton, MA (Figure 5). It is the most downstream dam of the 11 dams located on the mainstem of the Manhan and the North Branch, the main tributary to the Manhan River. The next upstream dams are located eight miles upstream on the mainstem and three miles upstream on the North Branch.

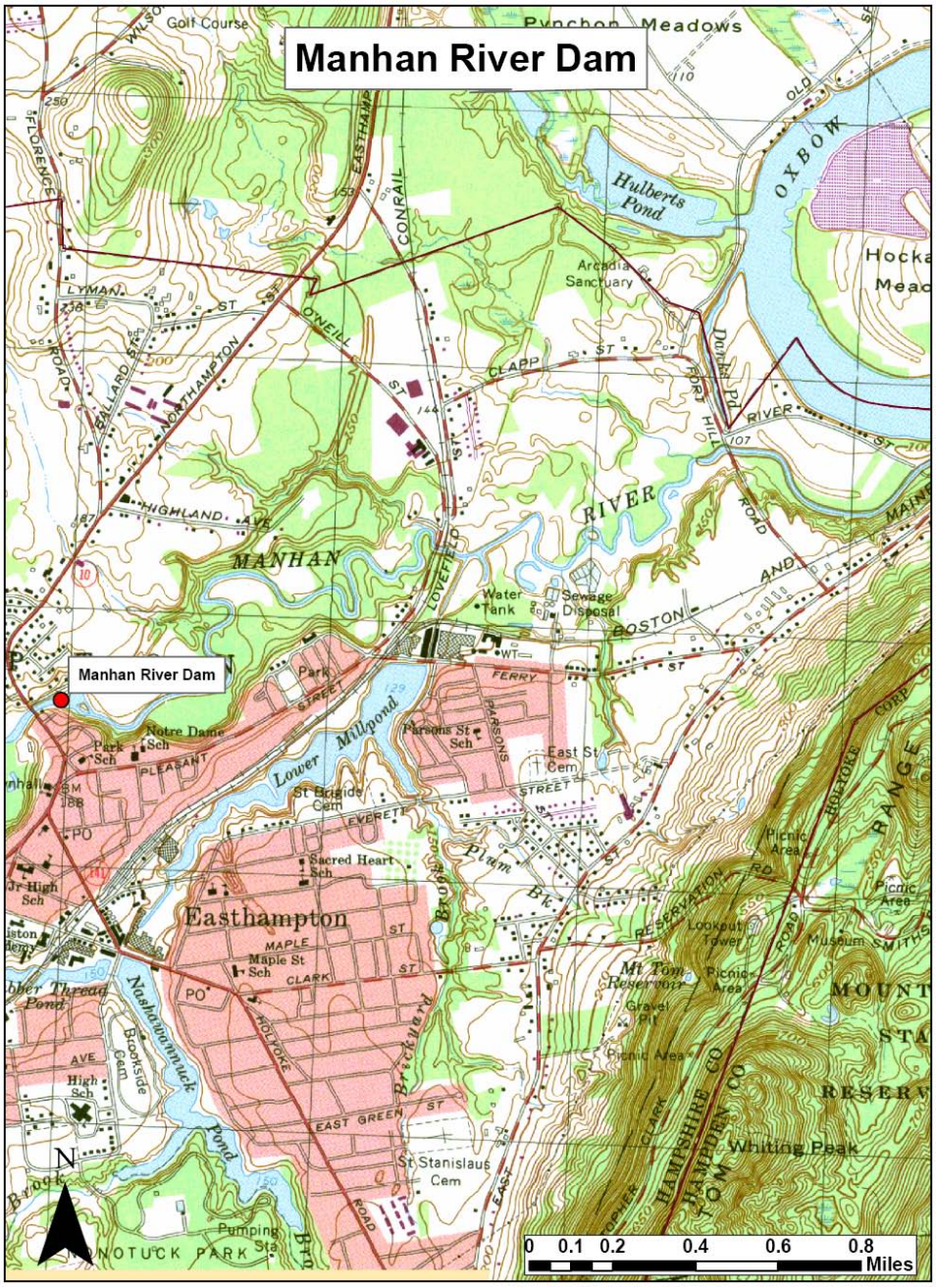

Figure 5. The Manhan River dam located on the Manhan River in Easthampton, MA. The Manhan River is a tributary to the Connecticut River, and the project site is 10 river miles upstream of the Site.

While the existing City-owned Manhan River dam (aka, Waterworks dam) was built in the early 1900s, dam structures have been in place at this location since 1686. Historically used in the early 1900s as the City's backup water supply, and more recently (until 1947) for hydroelectric power, the dam is no longer used for either purpose. Currently, the dam provides a recreational impoundment opportunity, and the waters are fished for trout and other species, particularly at the base of the bedrock outcrop and falls. The current dam is a 6-foot high open concrete spillway approximately 100 feet long. It is constructed on a 13-

foot high bedrock (sandstone) ledge outcrop, which extends approximately 100 feet downstream and forms the discharge area.

In 2009, the USFWS awarded the City of Easthampton with an American Recovery and Reinvestment Act funding award to construct a structural fishway at the site, with matching funds provided by various project partners including the City and U.S. Geological Survey. The structural fishway will provide fish access to approximately 11 river miles and target blueback herring, Atlantic salmon, American shad, sea lamprey, American eel and resident fishes including trout.

Following the commencement of construction in 2010, it was determined that construction modifications of the fishway were required, as well additional investigation into the structural composition of the existing dam. Due to the required modifications, there is a funding shortfall for completing the fishway. This alternative would include providing the Manhan River structural fishway with additional funds to complete the project construction.

Figure 6. Partially completed Manhan River dam fishway in Easthampton, MA. Settlement funds would contribute to the overall funds needed to complete the Denil fishway for anadromous fish passage.

6.2.1 EVALUATION OF THE ALTERNATIVE

The Manhan River has been stocked with 50,000 to 75,000 Atlantic salmon fry, annually in locations upstream of the Manhan River Dam, annually since 1994. Habitat assessments have shown that in addition to acceptable water quality, high-quality salmonid spawning habitat is present in the watershed. There have been recent reports of occasional American shad and

blueback herring gathering at the base of the Manhan Dam each spring (possibly stray fish from runs from downstream river). The river supports a self-sustaining population of brown trout, brook trout, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), blacknose dace (*Rhinichthys atratulus*), slimy sculpin, creek chub (*Semolitus atromaculatus*), fallfish (*Semotilus corporalis*), tessellated darter (*Etheostoma olmstedi*), common shiner (*Luxilus cornutus*), and brown bullhead (*Ameiurus nebulosus*). Several state-listed rare species have been reported in the vicinity of the Manhan Dam, including wood turtle (*Glyptemys insculpta*), eastern pondmussel (species), triangle floater (species), zebra clubtail (*Stylurus scudderi*), and brook snaketail (*Stylurus scudderi*). This project would create access to spawning and nursery habitat in the Manhan River mainstem and its tributary, the North Branch for resident fish as well as blueback herring, Atlantic salmon, American shad, sea lamprey, and American eel. Shortnose sturgeon would not substantially benefit from this project, except as a potential rare visitor to the base of the falls where benthic forage organisms would be available. Benefits to benthic habitat from the fishway construction would be negligible, although fishes using the fishway to migrate upriver may provide opportunities for freshwater mussel translocation (i.e., mussel larvae temporarily attach to certain host fish).

The Trustees propose to assist with the implementation of the restoration of fish passage on The Manhan River in Easthampton, MA. The project is moving forward as an Army Corps of Engineer (ACOE) Section 206 - Aquatic Ecosystem Restoration Project. Through that program, the estimated required funds necessary for project completion is $654,755, of which $425,591 is covered by the ACOE federal cost share. The remaining requirement of $229,164 is partially funded by U.S. Fish and Wildlife Service habitat restoration funds, cash contributions from the City of Easthampton, and several small community grants. The Trustees propose to use a portion of settlement funds (up to $150,000) to complete the fishway construction. The Manhan River fishway project provides the Trustees with an opportunity to leverage settlement funds and thus complete a significant restoration effort for minimal cost to the Trustees.

6.2.2 ENVIRONMENTAL CONSEQUENCES

In the spring of 2009, the Manhan Dam fish passage project was selected as a candidate for USFWS funding through the American Recovery and Reinvestment Act (ARRA). The USFWS fully evaluated this project in an Environmental Assessment (EA) that was completed in January 2010 (Environmental Assessment: Manhan River Dam Fish Passage Project, City of Easthampton, Massachusetts, dated January 2010, United States Fish and Wildlife Service), and is incorporated by reference in this Final RP/EA. The USFWS adopted and updated the New England District U.S. Army Corps of Engineers' EA for the project (Manhan River Dam Aquatic Restoration Project, Easthampton, Massachusetts, Environmental Assessment, Finding of No Significant Impact, and Section 404(b)(1) Evaluation for Construction of Fish Ladder, April 2002, U.S. Army Corps of Engineers, New England District, which was publically noticed on April 24, 2002).

Water Quality: The construction of the proposed Denil fishway on the Manhan River Dam is not expected to have any long-term negative impacts on the water quality of the Manhan River downstream of the project area itself, including the impoundment behind the dam.

Discharges will not be significantly altered in the area of the dam itself, and will be unchanged downstream of the fish ladder. The hydraulic residence time of the water behind the impoundment will not change substantially by the construction of the fish ladder; therefore, no change is expected of the existing water quality, either upstream or downstream of the impoundment.

During construction of the dam, water quality could be temporarily affected, however, it is anticipated that construction will occur during times of low flow, with erosion control measures in place in order to minimize any impact. An Order of Conditions from the Easthampton Conservation Commission has been issued for the project. Any impacts resulting from construction would be expected to be short-term and minor. Once the project is completed, any excavated banks or stream-bed would be stabilized or restored.

Water Resources: During the construction phase of the project, some short-term and localized adverse impacts will occur. In order to construct the fishway, small areas upstream and downstream of the dam will need to be dewatered for short periods of time. As a result of coffer damming, these areas will be temporarily unavailable to fish; but once the work is complete and the area restored, fish will again be able to utilize the habitat. Also, there will be localized increases in turbidity and sedimentation near the project area. Potential turbidity will be minimized by implementing best management practices for erosion and sediment control, and timing the majority of the construction to occur during the low flow season. These conditions may affect fish and filter feeding organisms in the local area by clogging gills, increasing mucus production and smothering organisms found in the shallow open-water area. Fish and mobile invertebrates would be less likely affected, since they would be able to leave or avoid the work area, and recolonize the area after project completion and site stabilization. Temporary increased noise levels from heavy equipment (e.g., excavator, concrete mixer/pump truck) would also cause fish to leave the area, but they would be expected to return once construction noise ceases.

Air Quality: Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions from earth-moving equipment contain pollutants, but these emissions would only occur during the construction phase of the project. The amounts would be localized and would be expected to quickly dissipate. There would be no long-term negative impacts to air quality.

Noise: Noise associated with earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, persons involved with water recreation may avoid this area due to noise during construction, but as with wildlife, such disruption will be limited to the construction phase, and there are many comparable substitute recreation sites readily available within the municipality (e.g., Nashawannuck Pond). No long-term effects would occur as a result of noise during the relatively brief construction period.

Geology: The construction of the Manhan River dam fishway is not expected to have any significant adverse effects on the existing geology of the site. The existing dam is built on

bedrock (sandstone), which forms the stream bed downstream from the dam. A small section of bedrock will be excavated (by mechanical equipment operating in the wet) in order to create the proper discharge elevation depths for the Denil fishway and to support the piers that will hold the pre-cast floor slab sections of the ladder; however, this will not significantly alter the overall configuration of the underlying bedrock bottom. The construction will not involve the removal of topsoil in order to place the channel for the fish ladder. At the downstream end of the ladder, piles would be drilled into the bedrock to provide adequate support for the turn or resting pool.

Recreation: Noise and increased turbidity of surface waters arising from earth-moving activities during project construction may discourage and decrease recreational activities in the vicinity of the site during the construction period. Any such affect would be limited to the period of construction and would be minor. There are many comparable substitute recreation sites readily available along the Manhan River. Following project completion, the fishway would be expected to provide opportunities for the public to view upstream migrating fish using the Denil fishway. Fishways are well known to provide important passive recreational viewing opportunities in New England settings and elsewhere.

Traffic: Traffic would increase at the site during construction. Persons most affected by the traffic will be vehicle travelers on nearby Route 10, the owners of the Waterworks building (currently unoccupied and up for sale), and one private residence located immediately upstream of the dam site property. Construction equipment entering and exiting the construction site may have a temporary effect on traffic flow, but would be very brief, occasional events during the construction period. The construction period is expected to be approximately 1-3 months.

Precedential Effects of Implementing the Project: Technical fishway projects are regularly implemented along waterways with migratory fish restoration programs, and have been used as a means of mitigating for the impact dams cause to migratory fish by limiting access to spawning and/or rearing habitat. Therefore, the decision to implement the proposed project does not represent or create a precedent for decisions on potential future restoration actions. The environmental impacts of any potential future restoration actions that are not analyzed in this EA would be fully evaluated under NEPA in the future analysis.

Cultural and Historic Resources: By letter dated January 24, 2002, the Massachusetts Deputy State Historic Preservation Officer (SHPO) issued a determination to the lead federal agency, USFWS, that the project will have no adverse effect on the Manhan Dam and Waterworks complex. The construction of the fish ladder at the Manhan River Dam will have no effect upon any structure or site of historic, architectural, or archaeological significance as defined by the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR 800. As lead federal agency, the USFWS will continue coordination with SHPO and consult accordingly as project completion progresses.

6.2.2.1 CUMULATIVE IMPACTS

The proposed project would not be expected to have any adverse cumulative effects on the human environment since it alone, or in combination with other present or foreseeable projects in the vicinity, would not change the existing pattern of hydrologic discharge, economic activity or land-use in the watershed. The proposed action would restore access to high quality spawning and/or rearing habitat for diadromous fish species that historically occurred at this location. Further, the proposed actions are intended to compensate the public, *i.e.*, make the public and the environment whole for resource injuries caused by releases of hazardous substances into the watershed. The proposed restoration action will assist in achieving goals and objectives identified in the Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River (Revised July 1, 1998).

6.3 TIER I PREFERRED ALTERNATIVE: ENDANGERED MUSSEL SURVEY

To compensate for impacts to freshwater mussels from the Holyoke coal tar deposits, the Trustees propose to conduct scientific surveys to delineate and monitor freshwater mussels and their associated habitat within selective areas of the Connecticut River mainstem. These data will benefit mussel populations, as well as help protect and conserve existing mussel populations under the Massachusetts Endangered Species Act (MESA) (M.G.L c.131A and regulations 321 CMR 10.00). Regulatory protection of these populations under MESA only applies to occurrences less than 25 years old. Thus, additional surveys will help to ensure that conservation and restoration efforts, as well as regulatory protection, can be effectively targeted.

Approximately 14-river miles of the Connecticut River mainstem between Holyoke, MA and the Connecticut-Massachusetts state-line have been proposed for field survey. Additionally, approximately 25 river miles of Connecticut River tributaries have been initially identified (Running Gutter Brook, Broad Brook, Mill River, Lower Westfield River, Bachelor Brook, and Ware River) for mussel surveys.

The MA NHESP has previously funded very limited, intermittent surveys in the area between Holyoke, MA and Connecticut border which yielded a single live *L. cariosa* and four spent shells; a population of this endangered mussel may be present but further surveying is necessary in order to find and delineate the population(s). If populations are found, their presence will afford greater resource protection through state statutes.

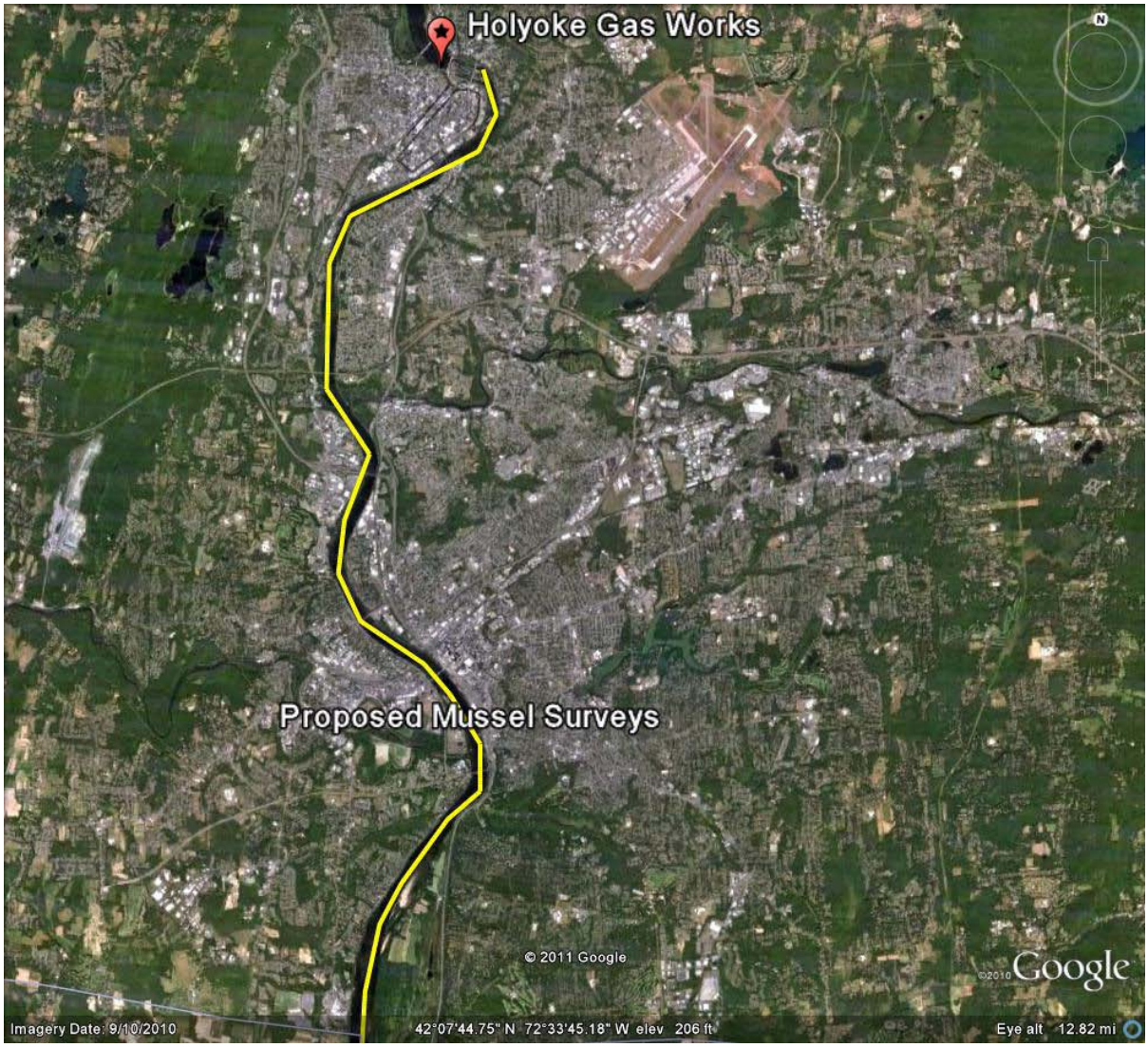

Figure 7. Proposed mussel survey location (in yellow) on the Connecticut River mainstem. Surveys on tributaries would also be completed as part of the project.

6.3.1 EVALUATION OF THE ALTERNATIVE

Freshwater mussels are considered to be the most imperiled animal group in North America. Over 70% of the nearly 300 native mussel species in the US are considered Endangered, Threatened, or Special Concern in some part of their range (Williams and Neves 1995). Of the 12 species of freshwater mussels in Massachusetts (Table 1, Sec. 4.4), seven are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L c.131A and regulations 321 CMR 10.00).

In the mid 1990s, the Massachusetts Natural Heritage & Endangered Species Program (MA NHESP) began conducting statewide freshwater mussel surveys. These data were, and continue to be, critically needed in order to (1) assess the status of state-listed species; and

(2) develop and implement appropriate conservation strategies for species at risk. These objectives parallel those outlined in the *National Strategy for the Conservation of Native Freshwater Mussels* (1998), specifically to:

- Increase knowledge of the status and trends of native mussel populations so that resource managers and administrators can better determine the species and populations most at risk
- Increase fundamental knowledge of basic biology and habitat requirements of mussels so that mangers can more effectively conserve and manage our mussel fauna
- Protect and reverse the decline of quality mussel habitat
- Determine how various environmental perturbations impact mussels and their habitat, and provide managers with the information needed to minimize or eliminate threats and protect quality mussel habitat

The Trustees evaluated a number of mussel survey alternatives in the Connecticut River watershed suggested by the MA NHESP. Proposed projects included short-term intensive surveys on a portion of the Connecticut River mainstem, as well as multiple Connecticut River tributaries. The mussel surveys proposed by the Trustees will benefit freshwater mussel populations by increasing the NHESP's capacity to adequately assess population dynamics (e.g. age and size structure) and current population statuses (e.g. density, distribution, abundance), assess, characterize and delineate benthic habitat and substrate conditions, and recommend conservation strategies. The Trustees propose to fund surveying of a portion of the Connecticut River mainstem and several tributaries (as described in Section 6.3). Estimated funding required to complete this level of field freshwater mussel survey is $45,000.

6.3.2 ENVIRONMENTAL CONSEQUENCES

The proposed action entails surveying mussel habitat within the river utilizing underwater divers. The proposed project is not expected to have any potential direct and indirect impacts the natural or human environment.

6.3.2.1 CUMULATIVE IMPACTS

The proposed project would not be expected to have any adverse cumulative effects on the human environment since it alone, or in combination with other present or foreseeable projects in the vicinity, would not change the existing pattern of hydrologic discharge, economic activity or land-use in the watershed.

6.4 TIER II PREFERRED ALTERNATIVE: ORIENT SPRINGS DAM REMOVAL

Approximately 0.6 miles upstream of the Bartlett Rod Shop Company dam is a smaller structure known as the Orient Springs dam (See Figure 2). This dam is non-jurisdictional, not regulated by the Massachusetts Office of Dam Safety, and not recorded on any inventory of known dams. It was identified during a field inspection of Amethyst Brook by DER,

NOAA, USFWS, and other project partners. Upon discovery of the dam, DER secured support for dam removal from both the local Conservation Commission and the private dam owner. Removal of the Orient Springs dam is now considered part of the overall effort to restore ecological conditions and fish passage in Amethyst Brook.

As noted above, Amethyst Brook is a high-quality, cold water tributary to the Fort River, and removal of the Bartlett Rod Shop Company Dam and Orient Springs dam is expected to provide improvements in natural river processes, habitat, water quality, and fish passage opportunities for resident and migratory fish. Removing both dams is expected to re-connect a total of 8.5 miles of headwaters habitat to downstream areas.

The Orient Springs dam is approximately 6 feet in height, 30 feet in length (including abutments), and 2-feet wide (Figure 8). The dam appears to have a non-functioning low level outlet. The effective hydraulic height is approximately 4 feet. Access to the dam appears to be straightforward via an existing forest road. Visual inspection of the site by DER indicates that the dam impoundment is relatively small and well-defined based upon the stream reach just upstream. Sediment accumulation in the impoundment is limited, and is likely due to the low impact of development in the upstream watershed.

The DER has agreed to manage the engineering design, permitting, and removal of the Orient Springs dam as complimentary work to the downstream *Priority Project* status of the Bartlett Rod Shop Company Dam removal. DER anticipates contracting with a qualified engineering firm to develop basic plans for dam removal and complete project permitting (which is expected to be limited given the size of the dam). Coordination with the Massachusetts Natural Heritage and Endangered Species Program (MA NHESP) and Massachusetts Historical Commission would be required.

To provide diadromous and resident fish passage, the dam removal would be designed to allow full removal of the structure to expose native streambed material. During dam removal, contractors will be instructed to over-excavate to ensure that no buried remnants of the dam are left in place. The dam removal/breach would be designed to convey the 500-year storm event. The proposed approach to dam removal includes natural downstream redistribution of impounded sediment and a very limited area of work to remove the structure. Implementation of the dam removal and stream restoration design would be expected to result in effective passage by diadromous fishes and contribute to rehabilitating to populations in the Connecticut River watershed.

Figure 8. Orient Springs dam in Pelham, MA. Removal of this dam would provide access to spawning and rearing habitat for diadromous fish.

6.4.1 EVALUATION OF THE ALTERNATIVE

Diadromous fish species including American eel, sea lamprey, and Atlantic salmon juveniles have been documented in the lower portion of Amethyst Brook (See Section 6.1.1). Removal of the Orient Spring dam would re-connect downstream areas to more than 7 miles of upstream high quality habitat. When combined with the removal of the Bartlett Rod Shop Company dam removal, the total combined re-connected stream length is 8.5 miles in Amethyst Brook and its headwaters (Figure 3).

Removal of the dam would restore the natural movement of sediment to downstream reaches within Amethyst Brook and the Fort River, thus improving the condition of downstream benthic habitat. Although the exact age of the Orient Springs Dam is unknown at this time, information provided from the Pelham Historical Society suggest construction about 1900. Thus, for more than 100 years, the presence of the dam and associated impoundment has altered the natural sediment regime. Observations by DER suggest the impoundment contains clean, fine to course grained gravel, and the natural redistribution of this material to downstream areas is expected to be ecologically beneficial to benthic fauna and diadromous

and resident fishes. Once the dam is removed, the natural sediment transport processes in Amethyst Brook will be restored with permanent downstream benefits.

Dam removal typically improves water quality in the former impoundment. Impoundments created by dams can cause water to stagnate, surface temperatures to increase, and dissolved oxygen concentrations in the lower depths of the impoundment to decrease (if the impoundment thermally stratifies). In some instances, surface flow impoundments discharge thermal pollution to downstream habitats. This can be a profound stressor to species that have evolved to flowing coldwater. While the impoundment at the Orient Springs dam is small (less than 1 acre), the elimination of the impoundment is expected to positively influence water quality. In addition, dam removal will restore the natural movement of particulate organic matter to downstream areas. Improved delivery of basal resources has cascading beneficial effects on the health of the aquatic food web, from increased production of benthic macro-invertebrates, to increased food availability to fish.

In addition to improving the food web, the project will indirectly benefit freshwater mussels that rely on a variety of fish to serve as attachment hosts for larval life stages and distribution. Removal of the Bartlett Rod Shop Company dam is expected to benefit a range of fish species that are known hosts to mussels present in the downstream Fort River.

Given the recent discovery of the dam, no cash funding has been expended to date on design or permitting work. Partners on the downstream Bartlett Rod Shop Company Dam Removal project have expressed a strong interest in removing the Orient Springs Dam (e.g. Town of Amherst, USFWS, NOAA, and Trout Unlimited). The DER is anticipating issuing a bid request to qualified, pre-approved vendors to perform the necessary design and permitting services. Preliminarily, a cost of $40,000 is estimated to complete site base-mapping, final design, and permitting. An estimated additional cost of $75,000 is anticipated for the dam removal implementation. Therefore, the range of costs for Trustee funds for the Orient Springs dam removal is $40,000-$115,000.

6.4.2 ENVIRONMENTAL CONSEQUENCES

The Trustees evaluated the potential for the proposed restoration action to impact the natural environment, the built environment and public health and safety.

Water Quality: In the short-term, during the period of construction, earth moving activities (either the excavation or upland placement of sediments) may increase turbidity in the immediate project vicinity, though actions during construction will minimize this effect. After construction is completed, the sediments, mostly courser sands, gravel and cobble would settle out of suspension quickly. Over the longer-term, the proposed restoration action would re-establish, enhance and increase riverine habitat at the site and help improve local water quality by establishing a healthy benthic macro-invertebrate community.

Water Resources: During the construction phase of the project, some short-term and localized adverse impacts will occur. As a result of earth-moving activities, there will be localized, temporary increases in turbidity and sedimentation near the project area; however, this will be minimized due to the typically low flow though the impoundment during the low-

flow seasons. These conditions may affect fish and filter feeders in the local area, by clogging gills, increasing mucus production and smothering organisms found in the shallow open-water area. Mobile fish and invertebrates would probably not be affected, since these would most likely leave the area, and return after project completion. Increased noise levels due to the operation of earth-moving equipment would also cause mobile fish to leave the area until operations end.

Air Quality: Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions from earth-moving equipment contain pollutants, but these emissions would only occur during the construction phase of the project. The amounts would be small, and should be quickly dissipated by prevailing winds. There would be no long-term negative impacts to air quality.

Noise: Noise associated with earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, such disruption will be limited to the construction phase, and there are many comparable substitute recreation sites readily available within the adjoining forested area along Amethyst Brook. No long-term effects would occur as a result of noise during construction.

Geology: No long-term geological impacts are expected. By removing the dam and releasing the impounded sediment, natural stream bed characteristics will be restored at and downstream of the project site.

Recreation: The project is expected to increase long-term recreational opportunities at and around the project site by increasing ease of site access and enhancing fish and wildlife viewing and recreational fishing opportunities. In the short-term, noise and increased turbidity of surface waters arising from earth-moving activities are expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such affect would be limited to the period of construction and should be minor. There are many comparable substitute recreation sites readily available along the Amethyst Brook and Fort River.

Traffic: The site is easily accessible via an access road. The site is a forested site, well removed from a heavily trafficked area. No impacts to traffic are expected. Any increase or disruption in traffic would coincide with proper safety measures employed throughout construction so that potential accidents are minimized.

Contaminants: The project has not yet made a determination on the potential for contaminants in the impounded sediments. However, given that sediments at the Bartlett Rod Company dam, 0.6 miles downstream, were determined not to contain contaminants, it is anticipated that the Orient Springs dam will be characterized by similar conditions. The upstream watershed is predominantly undeveloped, and no sediment quality issues are anticipated. Simple diversion of the river during construction, careful sequencing, and

removal of the impounded sediment (mostly cobble) for beneficial re-use is expected to limit any short-term negative impacts related to potentially contaminated sediment.

Cultural and Historic Resources: The project partners have not yet made a determination on the potential of the project to adversely affect cultural and historic resources. However, based on the historical use of the surrounding dam property, there is potential that demolition of the dam may constitute an adverse effect on historic resources and/or the historic district. If a finding of adverse effect is determined by the lead federal agency, the project partners will seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800).

6.4.2.1 CUMULATIVE IMPACTS

NOAA has determined that the removal of the dam immediately down-stream of the Orient Spring Dam (Bartlett Rod Shop Company Dam) constitutes and adverse effect to the historic district. This project, in combination with the removal of Bartlett Rod Shop Company Dam will affect the historic district. The project partners plan to seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). The proposed project, in combination with other present or foreseeable projects in the vicinity, would not change the larger current pattern of hydrologic discharge, economic activity or land-use in the watershed. The proposed action would restore habitat that originally existed and occurred naturally at this location. Further, the actions proposed are intended to compensate the public, *i.e.*, make the public and the environment whole for resource injuries caused by releases of hazardous substances into the watershed. If unimpeded fish passage is afforded at the Orient Springs, then this restoration action would substantially increase the total river miles accessible to diadromous fish species.

6.5 TIER II PREFERRED ALTERNATIVE: LOG COVE INVASIVE WATER CHESTNUT CONTROL, CONNECTICUT RIVER, HOLYOKE, MA

Water chestnut (*Trapa natans*) is an aquatic plant with a rosette of floating leaves ½ to 1 inch long, at the tip of a submersed stem, which can reach over 15 feet in length. The fruit is a black, four-horned, nut-like structure that is about an inch wide and weighs approximately 6 grams. Water chestnut can grow in wet, mucky substrates, but prefers shallow, nutrient-rich lakes and rivers. The water chestnut is native to the tropical and warm temperature regions of Eurasia, and has also become naturalized in Australia and northeastern North America. In the United States, this species has been found in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Virginia and Vermont. These plants were first introduced into North America in 1874. Water chestnuts were cultured in 1877 in the botanical garden of a Harvard University botanist. In 1879, water chestnut plants were found to be established in the Charles River in Massachusetts, and have since been found in many locations in the northeastern United States. To date, water chestnut has been found in 38 sites in the Massachusetts portion of the Connecticut River watershed.

Water chestnut is a highly competitive plant that is capable of rapid growth and spread. The invasive Water chestnut displaces native species and reduces biodiversity. It can negatively impact native vegetation and fish populations by forming large dense mats of vegetation on the water surface, thus intercepting sunlight to the exclusion of other submerged plants. The Water chestnut can deplete the available oxygen in the water, and the resulting low oxygen condition (anoxia) can lead to fish kills and harm benthic fauna, such as freshwater mussels, other aquatic organisms. Water chestnut can trap organic matter (which creates breeding grounds for mosquitoes) and silt (leading to increased sediment level).

Since 1999, the Silvio O. Conte National Fish and Wildlife Refuge (Conte Refuge) has held a leadership role working alongside many partners in the Connecticut River watershed to control the invasive water chestnut. The Conte Refuge oversees the program in Massachusetts. In Connecticut, the Connecticut Department of Energy and Environmental Protection (CTDEEP) leads the effort; the Conte Refuge acts to assist CTDEEP, taking responsibility for hand-pulling at some of the sites and assisting with funding for control of larger populations.

At most of the managed sites, plants are pulled by hand, but some require specialized work by contractors. Those water chestnut sites that are too large or dense to be pulled by hand are mechanically harvested or managed with herbicide. The refuge is observing positive trends at many sites in Massachusetts and mixed results at others. After several years of pulling smaller populations, some now appear to be entirely controlled. Monitoring these sites will continue, and is imperative to remove any stray plants that may sprout from an especially long-lived nutlet (unsprouted nutlets can remain viable for up to ~12 years). Some sites vary from year to year, with a few of them displaying disconcerting spikes in populations following a downward trend. This phenomenon makes it difficult to predict how much time to set aside for a given site or when complete control can be claimed. However, major population declines at some managed sites indicate that the current management strategy is effective.

Efforts to eliminate the invasive water chestnut at Log Pond Cove, Holyoke, MA have been occurring since 2000. The 20-acre infestation area in Log Pond Cove (Figure 10) is controlled each year preventing it from setting seed. The refuge enlists large numbers of volunteers and cooperators, who spend many hours hand-pulling the plants. Year 2009 marked the second year that no apparent nutlets were produced. Log Pond Cove has a substantial seed bank, so the use of herbicide is expected to be needed for several years. At Log Pond Cove, a combination of mechanical harvesting and the application of the granular formulation of 2,4-D were employed, but the results of the herbicide treatment was not as effective as it had been at other sites; therefore a new formulation of 2,4-D, the liquid amine (DMA 4-IVM), was recommended, and has been used since 2008. Partners on this project, the City of Holyoke and Holyoke Gas and Electric, were instrumental to implementing the project, with the Holyoke Conservation Commission overseeing and managing the project. This alternative would provide funds to the Conte Refuge to continue management efforts of the invasive water chestnut plant for one or more years, and associated monitoring.

Figure 9. Log Cove located on the Connecticut River immediately upstream of the Holyoke Dam in Holyoke, MA. The cove contains invasive water chestnut that the Trustees propose using settlement funds for 1-3 years of control of this invasive plant.

6.5.1 EVALUATION OF THE ALTERNATIVE

Log Pond Cove is thought to have been one of the largest seed sources of invasive water chestnut in the lower portion of the Connecticut River in Massachusetts. Continued annual management efforts, led by the Conte Refuge have made considerable progress reducing the population of this species at Log Pond Cove. The invasive plant displaces native species and reduces biodiversity. It can negatively impact native vegetation and fish populations by forming large dense mats of vegetation on the water surface, thus intercepting sunlight to the exclusion of other submerged plants. The water chestnut can deplete the available oxygen in the water, and the resulting low oxygen condition (anoxia) can lead to fish kills and harm other aquatic organisms. Massachusetts state fisheries biologists believe that reducing water chestnut at Log Pond Cove restores benthic habitat conditions by increasing light availability and allowing for the return of native benthic plant communities. The restoration of water

column habitat in Log Pond Cove will benefit resident and anadromous fish species utilizing that habitat as annual or seasonal foraging or spawning habitat.

The Trustees propose to fund the continued management and harvesting of water chestnut and associated monitoring at Log Pond Cove for an additional 1-3 years. Based on previous years costs to employ contractors to implement mechanical and herbicidal control methods, estimated annual costs to implement the project are approximately $11,500 per year. Therefore, the cost range for the Log Pond Cove water chestnut control is $12,000-$36,000.

6.5.2 ENVIRONMENTAL CONSEQUENCES

The Trustees evaluated the potential for the proposed restoration action to impact the natural environment, the built environment and public health and safety.

Water Quality: In instances of herbicidal treatment utilizing 2,4-D, there is potential for short-term negative impacts to non-targeted aquatic vegetation. In aquatic environments microorganisms readily degrade 2,4-D. Rates of breakdown increase with increased nutrients, sediment load and dissolved organic carbon. Under oxygenated conditions the half-life can be short, on the order of one week to several weeks. Uptake of the compound is through leaves, stems and roots; however, it is, in general, non-persistent in the environment. Overall, the project would be expected is to improve long-term water column circulation and increase dissolved oxygen levels. These conditions would allow improved water quality, and improved habitat for use by diadromous fish species.

Water Resources: In instances of herbicidal treatment utilizing 2,4-D, there is potential for short-term harmful side effects on fish, aquatic invertebrates and non-targeted aquatic vegetation. In aquatic environments microorganisms readily degrade 2,4-D. Rates of breakdown increase with increased nutrients, sediment load and dissolved organic carbon. Under oxygenated conditions the half-life can be short, in the order of one week to several weeks. Uptake of the compound is through leaves, stems and roots; however, it is, in general, non-persistent. Overall, the project would be expected to improve long-term environmental conditions. Water chestnut is capable of covering nearly 100% of the water surface, resulting in the interception of 95% of incident sunlight, severely affecting plants beneath the water chestnut canopy, and causes shading out of submerged vascular plants and their associated microscopic flora and fauna; ultimately causing high degradation of aquatic habitat. Overall, the project would be expected to improve long-term environmental habitat conditions and conditions for associated fauna and flora.

Air Quality: Neither of the proposed control techniques (herbicidal or mechanical) would be expected to have significant impacts on air quality, however, minor temporary adverse impacts could result from the use of mechanical control via small-engine machines and equipment. Exhaust emissions from equipment contain pollutants, but these emissions would only occur during the mechanical pulling of the invasive plant. The amounts would be small, and should be quickly dissipated by prevailing winds. There would be no long-term negative impacts to air quality.

Noise: Noise associated with equipment used for mechanical control of the invasive plant represents a short-term adverse impact during the mechanical pulling. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, such disruption would be limited to the pulling phase, and there are many comparable substitute recreation sites in the vicinity. No long-term effects would occur as a result of noise during construction.

Geology: No geological impacts would be expected by removing the invasive plant.

Recreation: The project would be expected to increase long-term recreational opportunities at and around the project site by increasing ease of site access and enhancing fish and wildlife viewing and recreational fishing opportunities. In the short-term, increased human activity from those working on the project may discourage and decrease recreational activities in the vicinity of the site. Any such affect would be limited to the period of mechanical control and pulling events and would be minor. Additionally, the project is often volunteer based, and offers a unique opportunity for the public and concerned citizens to participate in an ecological restoration project.

Traffic: No impacts to traffic, other than potential short-term boating would be expected.

Contaminants: The project proposes utilizing one or both techniques to remove the invasive water chestnut; mechanical pulling and herbicidal treatments. In instances of herbicidal treatment utilizing 2,4-D, there is potential for short-term harmful side effects on fish, aquatic invertebrates and non-targeted aquatic vegetation, although no freshwater mussels are expected to be adversely affected by this practice. In aquatic environments microorganisms readily degrade 2,4-D. Rates of breakdown increase with increased nutrients, sediment load and dissolved organic carbon. Under oxygenated conditions the half-life can be short, in the order of one week to several weeks. Uptake of the compound is through leaves, stems and roots; however, it is, in general, non-persistent in the environment. The Holyoke Conservation Commission will review and approve the projects proposed use of herbicide prior to the start of the project. That process includes an application procedure, public hearing, and approval by the MA DEP. The contractor hired will be required to adhere to the herbicide label directions for application and human health protection.

6.5.2.1 CUMULATIVE IMPACTS

The proposed project, in combination with other present or foreseeable projects in the vicinity, would not change the larger current pattern of hydrologic discharge, economic activity or land-use in the watershed. The project will have positive effects on the environmental conditions of the site. By removing the invasive plant, dissolved oxygen will increase and natural water circulation will be restored. The project will ultimately improve benthic and invertebrate density as well as available habitat for resident and diadromous fish species.

6.6 NON-PREFERRED ALTERNATIVE: RESTORATION OF FISH PASSAGE UPSTREAM OF THE HATFIELD DAM ON THE MILL RIVER, HATFIELD, MA

The Mill River is a tributary to the Connecticut River. The Hatfield Dam is located approximately 3.2-river miles upstream from its confluence with the Connecticut River in Hatfield, MA (Figure 11). It is the only dam in the 48-square mile Mill River watershed.

The dam is approximately 150-feet long and 16-ft high. The dam is located on rock outcrop approximately six feet in height. The dam itself is approximately ten feet high for a total approximate height of sixteen feet. This dam, the only one on the mainstem of the Mill River, is no longer functional and blocks the movement of fish and other aquatic organisms between the Connecticut River and the Mill River watershed. The tributaries to the Mill River contain ideal spawning and nursery habitat for Atlantic salmon. The Massachusetts Office of Dam Safety has rated this dam as at risk of failure, raising the possibility of dam removal for purposes of public safety as well as river restoration

This alternative would restore access to approximately 8 river miles for anadromous fish species. This project alternative has several potential restoration options: dam removal, installation of a structural fishway or construction of a rock ramp. If the dam were removed, the project would also provide restoration of high quality benthic riverine habitat, and could benefit federally endangered dwarf wedge mussel, as well as all other mussel species inhabiting the Mill River. The fish species targeted for passage at this site include American shad, Atlantic salmon, blueback herring, sea lamprey, and American eel. Use of this river reach by shortnose sturgeon is remotely possible.

6.6.1 EVALUATION OF THE ALTERNATIVE

A project team led by the University of Massachusetts at Amherst examined the feasibility and potential impact of river restoration through removal of the Hatfield Dam or other design alternatives that help restore one or more ecological functions of the river. The feasibility study was funded by a Massachusetts Environmental Trust and NOAA-CRWC Partnership grant and was completed in January 2007. The feasibility study focused on the comprehensive assessment of ecological impacts of dam removal, the engineering aspects of dam removal, and alternative means of fish passage. The feasibility study examined several important factors, including: the present condition of the dam, the amount and contamination level of sediment accumulation behind the dam, the extent of impoundment water surface elevation changes expected as a result of dam removal, and ecological and benthic habitat changes expected as a result of dam removal or alternative fish passage implementation.

While the feasibility study provided valuable information regarding potential ecological impacts this alternative may have, as well as preliminary technical information regarding alternative options, the Trustees recognize the feasibility study is more than five years old, and therefore, reassessment of the report conclusions may need to be reevaluated.

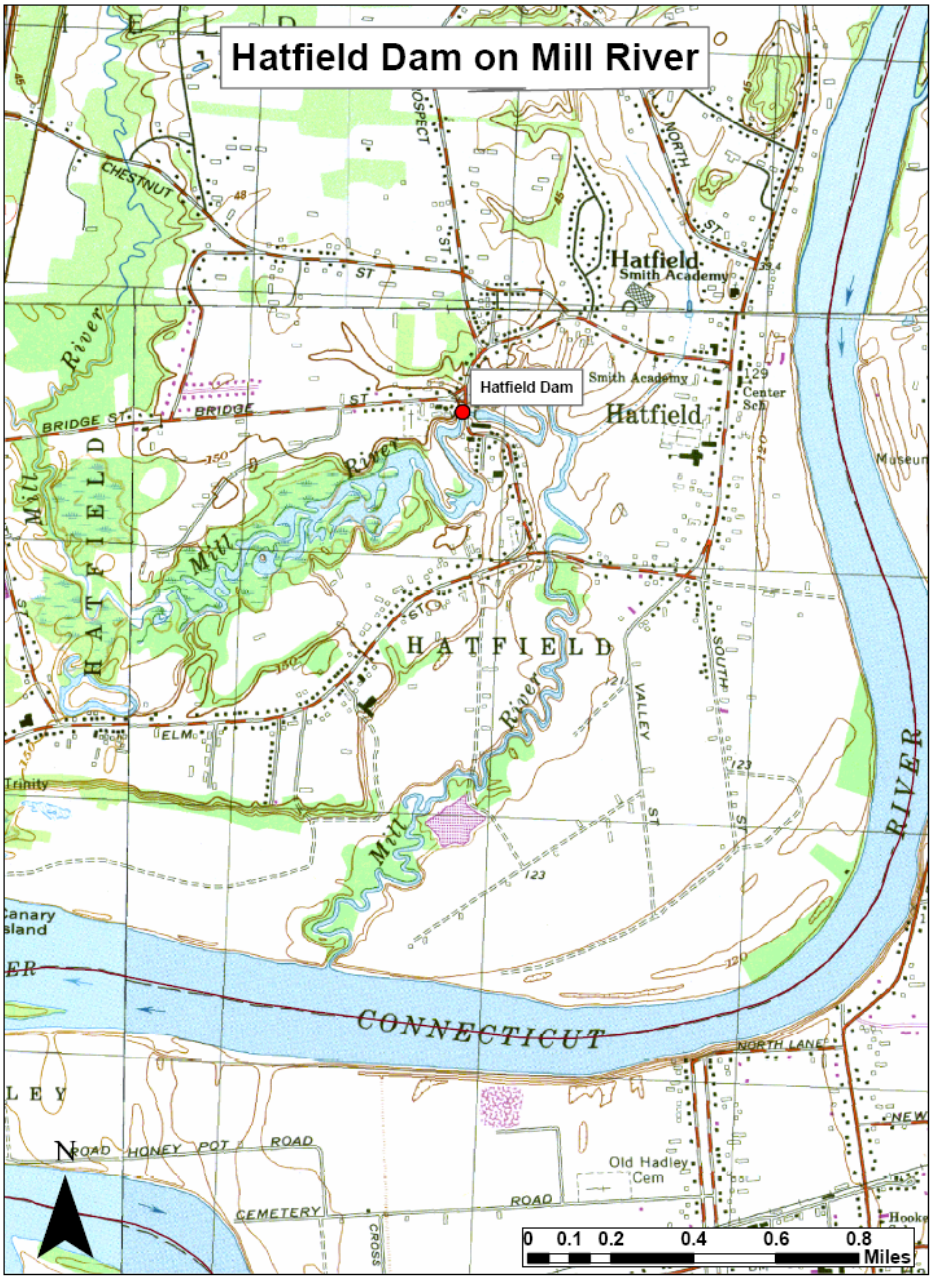

Figure 10. The Hatfield dam is located on the Mill River in Hatfield, MA. The Mill River is a tributary to the Connecticut River approximately 15 river miles upstream of the Site.

The Trustees investigated this alternative further by speaking to the public regarding the potential for implementing fish passage at this site. At present, multiple project concerns exist that would need to be addressed before this project could proceed. Further explorations of project alternatives are required for this dam and potential fish passage and/or river restoration. Although the feasibility study conducted in 2005 suggested that the affect of full dam removal on the wetland system upstream of the dam would be limited (primarily due to a second hydrologic control structure and potential for increased beaver activity),

considerable public concern still remains for a full dam removal option. Installation of a fish ladder at the dam may have fewer upstream impacts, but would require significant dam repairs and would result in less efficient fish passage for multiple species. The project, therefore, will require several years of development prior to project implementation. The cost of project development, design and implementation would far exceed available monies. Construction costs for dam removal would likely be in excess of $600,000. Construction costs for a Denil fishway at this site is estimated at $750,000, excluding costs of dam repair.

6.6.2 ENVIRONMENTAL CONSEQUENCES

The Trustees evaluated the potential for the proposed restoration action to impact the natural environment, the built environment and public health and safety.

Water Quality: A complete dam removal project would cause greater water quality disturbances than construction of a Denil fishway. However, with both alternatives short-term adverse impacts would occur during the period of construction, earth moving activities (either the mining or placement of sediments) may increase turbidity in the immediate project vicinity, though actions during construction will minimize this effect. After construction is completed, the sediments should settle out of suspension quickly. In the event of a dam removal, over the longer term, the proposed restoration action will re-establish, enhance and increase riverine habitat at the site and help improve local water quality.

Water Resources: During the construction phase of the project, some short-term and localized adverse impacts would occur. As a result of earth-moving activities, there will be localized increases in turbidity and sedimentation near the project area. These conditions may affect fish and filter feeders in the local area, by clogging gills, increasing mucus production and smothering organisms found in the shallow open-water area. Mobile fish and invertebrates would probably not be affected, since these would most likely leave the area, and return after project completion. Increased noise levels due to the operation of earth-moving equipment would also cause mobile fish to leave the area until operations end.

Air Quality: Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions from earth-moving equipment contain pollutants, but these emissions would only occur during the construction phase of the project. The amounts would be small, and should be quickly dissipated by prevailing winds. There would be no long-term negative impacts to air quality.

Noise: Noise associated with earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, such disruption would be limited to the construction phase. No long-term effects would occur as a result of noise during construction.

Geology: No long-term geological impacts would be expected. In the case of a dam removal alternative, removing the dam and releasing the impounded sediment, natural stream bed

characteristics would be altered but over the long-term would be restored at and downstream of the project site.

Recreation: The project would be expected to increase long-term recreational opportunities at and around the project site by increasing ease of site access and enhancing fish and wildlife viewing and recreational fishing opportunities. In the short-term, noise and increased turbidity of surface waters arising from earth-moving activities during project construction would be expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such affect would be limited to the period of construction and should be minor.

Traffic: Local traffic would increase at the site during the period of construction. It would be expected that proper safety measures will be employed throughout construction so that potential traffic congestion is minimized.

Contaminants: There has not been a significant accumulation of sediment in the channel directly above the dam and dam removal would not result in a significant release of sediment. Sediments within the impoundment are relatively free of contaminants with chemical analyses revealing elevated levels of only one contaminant, chromium. It is unlikely that dam removal would result in any significant threat of downstream contamination.

Cultural and Historic Resources: The project has not yet made a determination on the potential for adversely effecting cultural and historic resources. The dam and the Mill building are listed on the National Register of Historical places, and therefore, demolition of the dam may constitute an adverse effect on the historic district. If a finding of adverse effect is determined by the lead federal agency, the project partners will seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800).

6.6.2.1 CUMULATIVE IMPACTS

The proposed project would not be expected to have any adverse cumulative effects on the human environment since it alone, or in combination with other present or foreseeable projects in the vicinity, would not change the existing pattern of hydrologic discharge, economic activity or land-use in the watershed. The proposed dam removal will restore habitat that originally existed and occurred naturally at this location. Further, the actions proposed are intended to compensate the public, *i.e.*, make the public and the environment whole for resource injuries caused by releases of hazardous substances into the watershed.

6.7 NON-PREFERRED ALTERNATIVE: RESTORATION OF FISH PASSAGE AND BENTHIC RIVERINE HABITAT UPSTREAM OF THE WILEY & RUSSELL DAM AND THE MILL STREET DAM, GREENFIELD, MA

This restoration alternative addresses removal of two town-owned dams located on the Green River in the Town of Greenfield, Franklin County, MA (Figure 12). The Green River flows into the Deerfield River (a tributary to the Connecticut River) approximately 35 miles

upstream of the Holyoke Dam. This alternative would restore diadromous fish passage and high quality benthic riverine habitat upstream of the Wiley & Russell dam.

As a tributary to the Connecticut River, the Green River historically provided migratory, spawning and nursery habitat for native anadromous fish, including Atlantic salmon, American shad, blueback herring and sea lamprey, as well as the catadromous American eel. During the last 200 years, the construction of dams for various industrial uses along many New England rivers and streams including the Connecticut, Deerfield, and Green Rivers has blocked the migration of these species to their historic upstream spawning and rearing habitat. Consequently, their populations have been either eliminated or significantly reduced.

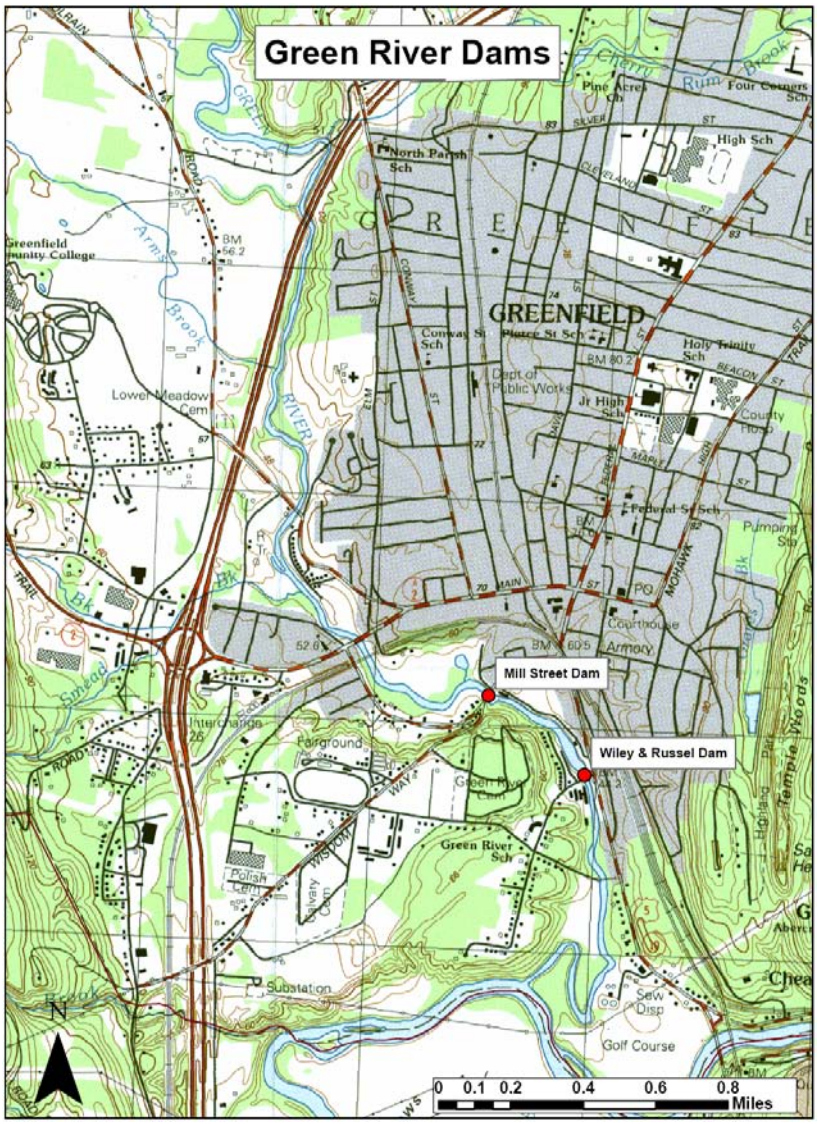

Figure 11. The Wiley & Russell and Mill Street dams located on the Green River, Greenfield, MA. The Green River is a tributary to the Connecticut River located approximately 35 river miles upstream from the Site.

The Green River has four dams along its 22-mile long reach in Massachusetts. The USACE drafted a Feasibility Study and Environmental Assessment for the creation of fish passage through all four dams. The study recommends removal of the Wiley & Russell and the Mill Street dams and fish ladder construction at the upper two dams (the Town Swimming Pool dam and the Town Water Supply dam). Implementing the USACE recommendations at all four dams would reconnect 19.1 river miles of diadromous fish spawning and rearing habitat and restore three miles of high quality benthic riverine habitat.

The Town of Greenfield-owned Wiley & Russell dam is the most downstream dam on the Green River, located approximately 1.2 miles above the confluence with the Deerfield River. The dam is approximately 14-feet high and 165-feet long, constructed of timber crib and concrete. The dam was originally used for water supply to a tap and die complex adjacent to the site (Greenfield Tap and Die, Inc.) however with the closing and demolition of the factory, the dam no longer serves a purpose. It is in need of substantial repairs with the two low-level gates being inoperable.

The Mill Street Dam is located approximately 0.5 miles upstream from the Wiley & Russell Dam, below the Mill Street Bridge (Figure 12). It is a concrete dam with 12-foot height, and was used by the Greenfield Electric Light and Power Company to generate hydroelectric power. It is now also owned by the City of Greenfield, and no longer used for its original purpose.

6.7.1 EVALUATION OF THE ALTERNATIVE

The Wiley & Russell dam, a 14-foot high timber-crib structure in poor condition, and the Main Street dam, a 12-foot high concrete structure in fair condition, are total blockages to fish passage and have resulted in impoundments with lesser quality habitat conditions than a free-flowing river. Restoring fish passage at the Wiley & Russell and Mill Street dams would benefit Atlantic salmon (*Salmo salar*), blueback herring (*Alosa aestivalis*), sea lamprey (*Petromyzon marinus*), American eel (*Anguilla rostrata*), and to a lesser extent American shad (*Alosa sapidissima*). Like other restoration projects identified in this RP/EA, it is improbable that shortnose sturgeon (*Acipenser brevirostrum*) would benefit from these projects due to their habitat preference for the larger rivers, like the Connecticut River in the vicinity of Holyoke.

The Green River projects are important, high priority projects for restoring diadromous fish passage and other ecological services, as well as contributing societal values including recreational canoeing, kayaking, and walking, hiking, bicycling, and wildlife viewing associated with a river trail network system. The Green River begins in southern Vermont, and with a watershed that is largely undeveloped, the river is characterized by high water quality and diverse benthic habitats. While passage at the two dams would open a modest 1.5 miles of river, implementation of these two projects along with fish passage at the two remaining upstream dams (Swimming Pool Dam, Greenfield Water Supply Dam) also owned by the Town of Greenfield would open 19.1 miles of the mainstem plus a substantial number of tributaries, collectively totaling 94 miles of river habitat opened to diadromous fishes. Only one partial barrier to migratory diadromous fish species, the Holyoke dam, is

downstream of the Green River dams, and improvements to the fish lift at the Holyoke dam were completed in 2005 as part of the Federal Energy Regulatory Commission license agreement for this facility. Thus, fish migrating to and from Long Island Sound would have relatively unimpeded access to Green River spawning and rearing habitat once these projects are completed.

It is also noted that the residential area immediately surrounding the two dams has been designated as an environmental justice area based on household income level. Due to the limited income of many households in Greenfield, providing opportunity for public recreation and open space, as indicated above, is listed as an important part of Greenfield's Open Space and Recreation Plan.

As of this writing, the Green River projects are in the design phase. The project designs for these sites are a structural fishway for the Mill Street dam and removal of the Wiley & Russell dam. Dam removal may include the installation of in-river grade controls to address grade drops and prevent potential channel heacutting. Once the designs are completed for each of the sites, permit applications will need to be submitted to the Greenfield Conservation Commission in securing an Order of Conditions; various state authorizations including a Massachusetts Environmental Policy Act (MEPA) certificate, Chapter 91 Waterways Permit, and Section 401 Water Quality Certification; and a permit from the U.S. Army Corps of Engineers (ACOE). The ACOE authorization would require at a minimum a Category II screening; and may require an Individual Permit that will be determined once the design plans are completed and submitted as part of the applications. Coordination with the Massachusetts Historical Commission is ongoing for both of these projects to determine potential historic impacts and mitigative measures, in accordance with Section 106 of the National Historic Preservation Act.

The project design plans need to be completed for each of these sites to then estimate the cost of each fish passage project. It is anticipated that the construction cost for each fish passage project may exceed $500,000, with higher costs expected if a structural fishway and dam repairs are required for the Mill Street dam, and/or in-river grade control structures or bank stabilization measures are required for channel stability and infrastructure (i.e., bridge and utility line) protection with dam removal.

The Trustees have concluded that the Green River fish passage projects can address the Holyoke natural resource injuries, but are not preferred alternatives based on the following factors:

- These projects are situated more than 30 river miles from the Holyoke injury site, and thus not geographical proximate to the injury site;
- Both projects are still in the design phase, and thus substantial time will be required to prepare and submit permit applications and secure all requisite regulatory authorizations needed for construction;
- The implementation costs for each of these projects is currently unknown, since design plans and the bases of cost have not yet been completed;

- Externalities such as potential remedial river sediment clean-up by Berkshire Gas may have an effect on the timing of implementation of the dam removals;
- Matching funds will need to be secured by the Town of Greenfield and its project partners to secure adequate funds for the two fish passage projects; and
- While the Trustees could target the funds toward one of the projects, the most significant benefits to diadromous fishes would be achieved by securing passage at the Wily & Russell dam and Mill Street dam as well as passage at two additional upstream dams; substantial design and permitting work is still needed for these additional project sites on the Green River.

6.7.2 ENVIRONMENTAL CONSEQUENCES

The Trustees evaluated the potential for the proposed restoration action to impact the natural environment, the built environment and public health and safety.

Water Quality: In the short term, during the period of construction, earth moving activities (either the mining or placement of sediments) may increase turbidity in the immediate project vicinity, though actions during construction will minimize this effect. Mechanical removal of contaminated sediments behind the dam is likely. The removal of these sediments would need to be completed prior to breaching and removing the dam, to avoid downstream release of contaminated sediment. Over the long-term, the proposed dam removal restoration action would re-establish, enhance and increase riverine habitat at the site, and help improve downstream water quality.

Water Resources: During the construction phase of the project, some short-term and localized adverse impacts would occur. As a result of earth-moving activities, there would be localized, temporary increases in turbidity and sedimentation near the project area. These conditions may affect fish and filter feeders in the local area, by clogging gills, increasing mucus production and smothering organisms found in the shallow open-water area. Mobile fish and invertebrates would not likely be affected, since these would most likely leave the area, and return after project completion and channel stabilization. Increased noise levels due to the operation of earth-moving equipment would also cause mobile fish to leave the area until operations end.

Air Quality: Minor temporary adverse impacts would result from the proposed construction activities. Exhaust emissions from earth-moving equipment contain pollutants, but these emissions would only occur over short periods during the construction phase of the project. The amounts would be localized and are expected to quickly dissipate. There would be no long-term negative impacts to air quality.

Noise: Noise associated with earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas. Similarly, recreating humans may avoid this area due to noise

during construction, but as with wildlife, such disruption would be limited to the construction phase. No long-term effects would occur as a result of noise during construction.

Geology: Bank stabilization may be required with either of the projects, and will be fully addressed in the final design plans for the two sites. No long-term geological impacts would be expected.

Recreation: The project would be expected to increase long-term recreational opportunities at and around the project site by increasing ease of site access and enhancing fishing and fish and wildlife viewing and recreational fishing opportunities. In the short-term, noise and increased turbidity of surface waters arising from earth-moving activities during project construction would be expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such affect would be limited to the period of construction and should be minor.

Traffic: Local traffic would increase at the site during the period of construction. It would be expected that proper safety measures will be employed throughout construction so that potential traffic congestion is minimized.

Contaminants: Mechanical removal of contaminated sediments behind the dam during dam removal would be likely. The removal of these sediments would need to be completed prior to breaching and removing the dam, to avoid downstream release of contaminated sediment. Over the long-term, the proposed restoration action would re-establish, enhance and increase riverine habitat at the site, and help improve downstream water quality.

Cultural and Historic Resources: The Town-owned Wiley & Russell and Mill Street dams located on the Green River in the Town of Greenfield are included in the Inventory of Historical and Archaeological Assets of the Commonwealth, and under the opinion of the Massachusetts Historical Commission (MHC) meet the criteria of eligibility (36 CFR 60) for listing in the National Register of Historic Places under Criteria A and C at the local level as a historic district. The Town is working with a number of project partners to assess potential cultural and historic resource impacts. In April 2011, NOAA, the Town and other project partners and historic consultant presented the results of the historic assessment at a Section 106 public meeting. The Section 106 report for the two dam sites has been completed with copies provided for review and comment by MHC, consulting parties, and Indian tribes potentially affected by the projects. NOAA, as the lead federal agency for the projects, agrees with MHC and has made the determination that demolition of either of the dams constitutes and adverse effect (36 CFR 800.5(a)(2)(i)) on the historic district.

The preferred alternative for the Wiley & Russell dam is full removal, while very recently, a decision was made by the Town to repair and modify the Mill Street dam to include a structural fishway for fish passage. Following completion of additional assessment and design work, NOAA expects to provide notice of the aforementioned determination to the Advisory Council for Historic Preservation (ACHP) (36 CFR 800.6(a)(1)). NOAA and its project partners will seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended

(36 CFR 800). NOAA will enter into a Memorandum of Agreement (MOA) with the MHC that will incorporate stipulations to mitigate the effect of the project on the historic district. The MOA will be completed prior to implementation of the fish passage projects at each of the two dams.

6.7.2.1 CUMULATIVE IMPACTS

NOAA has determined that the proposed removal of the Wiley & Russell dam constitutes an adverse effect on the historic district. Repair and modification to the Mill Street dam and installation of a structural fishway at the Mill Street dam may be an adverse effect on the historic district, although further engineering tasks still need to be completed before a decision can be rendered. The removal of or modifications to these two Town-owned dams located in Greenfield will likely result in greater adverse effect on the historic district. NOAA, as lead federal agency for these two fish passage projects, and its project partners will seek ways to avoid, minimize, or mitigate the adverse effects in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). Implementation of both of these fish passage projects on the Green River is expected to support restoration of populations of Atlantic salmon, American shad, blueback herring and American eel by opening approximately 4 river miles providing spawning and rearing habitat. These projects may result in increased local eco-tourism associated with viewing seasonal anadromous fish runs on the river. The projects are not expected to change land use in Greenfield. No changes to the Green River watershed are anticipated, other than the beneficial ecological impacts resulting from restored diadromous fish runs that will contribute ecosystem services such as secondary production and nutrient contributions to the Green River.

6.8 NON-PREFERRED ALTERNATIVE: NO ACTION

NEPA requires Trustee agencies to evaluate a No Action Alternative, and it is an option that may be selected under CERCLA. With the No Action Alternative, the Trustees would take no direct action to restore the natural resource injuries or compensate for lost services pending environmental recovery. While natural recovery would occur over varying time scales for the various injured riverine resources, the interim losses incurred would not be compensated for under the No Action Alternative. This alternative would have the lowest funding cost because no action would be taken, however interim losses would remain uncompensated.

The Trustees' responsibility to seek compensation for interim losses pending environmental recovery is clearly set forth in CERCLA, and cannot be achieved through the No Action Alternative. The No Action Alternative is rejected by the Trustees for compensatory restoration for this settlement since substantial interim losses have occurred. Technically feasible and cost-effective alternatives exist to compensate for these losses, and have been addressed through feasible and preferred project alternatives identified as Tier I and Tier II preferred alternatives previously discussed in Sections 6.1-6.5 of this document.

6.9 ALTERNATIVE DECISION MATRIX

	TIER I			TIER II		NON-PREFERRED		
Project Alternative	Bartlett Rod Co. Dam Removal	Manhan River Dam Fishway	Mussel Survey Project	Orient Springs Dam Removal	Log Cove Invasive Plant Control	Mill River Dam Fish Passage	Green River Dams Fish Passage	No Action
Cost	$168,500	≤$150,000	$45,000	$40,000 - $115,000	$12,000 - $36,000	$600,000 - $750,000	$500,000±	
Alternative Evaluation Criteria								
Project Trustee Evaluation Criteria								
Results in shortnose sturgeon population benefit	-	-	-	-	-	-	-	-
Results in shortnose sturgeon habitat or access restoration	-	-	-	-	-	-	-	-
Results in freshwater mussel population(s) benefit	+	-	+	+	-	+	-	-
Results in mussel habitat restoration	+	-	-	+	+	+	+	-
Results in riverine benthic habitat restoration	+	+	-	+	+	+	+	-
Geographical proximity to injury site	+	+	+	+	+	-	-	-
Project implementation timing (≤3 yrs)	+	+	+	+	+	-	+	-
Long-term benefits to Connecticut River watershed	+	+	+	+	-	+	+	-
Likelihood of project success and evaluation of performance	+	+	+	+	+	+	+	-
NRDA Regulatory Criteria*								
Technical feasibility	+	+	+	+	+	-	+	-
Cost-effectiveness	+	+	+	+	+	-	-	-
Results in no additional resource injury	+	+	+	+	+	-	+	+
Supports recovery of the affected resource(s)	+	+	+	+	+	+	+	-
No or minimal adverse effects on human health and safety	+	+	+	+	+	+	+	+
Consistent with state and federal regulations	+	+	+	+	+	+	+	-
In compliance with regulatory requirements	+	+	+	+	+	+	+	-
Preferred Restoration Alternative?	Y	Y	Y	Y	Y	N	N	N

*RESTORATION ALTERNATIVE CRITERIA (40 CFR §11.82(d))

Table 2. Alternative Evaluation Table: + or – indicates whether or not the project meets the given Trustee criteria.

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APPENDIX I

Public Information Meeting
Holyoke Coal Tar NRD Restoration Planning
April 07, 2011, 7-9 pm
Holyoke Health Center
Holyoke, MA

The following summary provides an account of the content and discussion at a public information meeting held April 7th, 2011 in Holyoke, MA to discuss potential compensatory restoration alternatives relating to the Holyoke Coal Tar Natural Resource Damage case.

Trustee Introduction

MassDEP

Brian Harrington (Trustee Representative)
Tom Potter (Alternate)
Karen Pelto (NRD Coordinator)

NOAA

James Turek (Trustee Representative)
Bryan DeAngelis (Restoration Coordinator for Trustee Council)

USFWS

Dave Sternberg (Trustee Representative)
Molly Sperduto (Alternate)
Melissa Grader (Connecticut River Coordinator's Office)

Trustee presentation

Record of Public Questions/Comments

Q: Will funds be awarded via a grant process?

R: Trustees responded that there probably would not be a grant process such as for larger settlements (e.g. New Bedford ($20 million), Housatonic ($15 million)). For the Holyoke Coal Tar settlement, restoration planning will be limited to several projects that will be implemented through cooperative agreements, transfers of funds to a Trustee agency or through a contract with oversight provided by a Trustee agency.

Q: What is a benthic habitat?

R: Trustees described in more detail the substrate of a river and the aquatic invertebrates found there.

Q: Is there a geographic parameter that needs to be met?

R: Yes, Trustees have a preference for conducting restoration close to the site where natural resources were impacted.

Q: Are "shovel-ready" projects preferred over those that require design and engineering?

R: Trustees indicated their interest in achieving some direct restoration, though design may be a necessary component of project implementation.

Q: With regard to the Manhan fishway, someone asked: “Isn’t a 90% completed fishway 100% ineffective?”

R: Yes. In this case, 90% complete would be 100% ineffective, because the fishway ends before the dam. There still is a short portion of fishway needed to tie what has been built into the dam, install the downstream passage pipe, construct the monitoring area (termed a "video cave"), and build the ladder entrance and the bypass exit. The construction will cost roughly $320,000, which includes costs such as mobilization/demobilization and water management. Supervision, administration and contingency costs bring the total cost of the Manhan fishway project to over $400,000.

Q: How much of the coal tar is above and below the dam?

R: All coal tar is above the dam.

Q: When is the coal tar going to be cleaned up?

R: MassDEP is overseeing the cleanup of the remaining coal tar in the river. Removal of 17,000 tons of materials containing tar using a barge mounted excavator was conducted from 2001 to 2006, but halted when additional coal tar was discovered. Northeast Utilities is currently assessing remaining tar areas and will then propose a plan for addressing what is left.

Q: What percentage of the impoundment is covered with coal tar? What is the acreage of the impoundment?

R: The Trustees stressed that the 2004 NRD settlement was based on the impact of coal tar to 2.6 acres of habitat. As mentioned in the previous response, additional coal tar was discovered during the previous remedial dredging work, and Northeast Utilities is currently completing an assessment of potential remaining coal tar deposits.

Q: For the investment, which project has the most value?

R: Trustees will evaluate projects using eligibility and evaluation criteria and propose the alternative or alternatives that present the most effective restoration of the injured resources.

Q: Since the spill was upstream of the dam, do projects need to be upstream as well? Can they be downstream?

R: Trustees responded that projects can be located upstream or downstream of the dam.

Q: Some projects don’t require the full $395K, so could the Trustees do more than one project?

R: Yes. It makes sense to implement one or more projects in this case to to restore benthic habitat, shortnose sturgeon and freshwater mussels that were impacted.

Q: How many mussels do we expect are in the coal tar impact area and what kinds of mussels were they?

R: The Massachusetts Natural Heritage and Endangered Species Program (MA NHESP) has sparse and general historic data for Yellow lampmussel (*Lampsilis cariosa*) in the Connecticut River. The coal tar remediation work that MA NHESP has reviewed to date has occurred in three distinct areas below the dam and it is from these three areas that mussels were removed and then relocated to a nearby area in the river, still below the dam. During 2002, 2003, 2005, and 2006, almost 23,000 mussels were removed during the remediation efforts in these three areas and these included four species: the common Eastern Elliptio (*Elliptio complanata*) and Alewife Floater (*Anodonta implicata*), the state Endangered Yellow Lampmussel (*Lampsilis cariosa*), and the Tidewater Mucket (*Leptodea ochracea*), a species of Special Concern.

Q: Who is proposing to do the mussel work?

R: The MA NHESP has proposed several different mussel projects that would benefit state-listed mussels in the Connecticut River mainstem and tributaries.

Q: What factors affect mussels? What is causing their decline?

R: Because mussels are essentially sedentary filter feeders, they are unable to flee from degraded environments and are vulnerable to the alterations of water bodies. Primary threats to the mainstem Connecticut River where the yellow lampmussel and Tidewater Mucket occur include bank erosion and sedimentation, pollution (especially storm water runoff and combined sewer overflows), alteration of natural flow regimes, encroachment of river corridors by development, habitat fragmentation caused by dams, and a legacy of land use that has greatly altered the natural dynamics of river corridors (for example, Nedeau 2004). In addition, the long-term effects of regional or global problems such as acidic precipitation, mercury, and climate change are considered severe but little empirical data relates these stressors to mussel populations.

Q: What is the current water quality of the Connecticut River?

R: Water quality assessment reports are produced periodically for each watershed by the MassDEP Division of Watershed Management. These reports, including those for the Connecticut River watershed, are available for viewing online at http://www.mass.gov/dep/water/resources/wqassess.htm#wqar.

Q: From the Town of Holyoke: Could under-sized or perched culverts be replaced? Could land acquisition be done?

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4 Nedeau, E.J. 2008. *Freshwater Mussels and the Connecticut River Watershed.* Connecticut River Watershed Council, Greenfield, Massachusetts. xviii+ 132 pp.

R: Yes. Culverts could be replaced if they benefit fish/mussels. Land acquisition could also be done if it can tie back to the natural resources that were impacted by coal tar. Best scenario would be to purchase some property and then restore it, e.g. some riparian habitat that would have a direct connection to the river and the species that were impacted.

Comment: Reducing agricultural pollutants in the river could be a potential restoration project.

Comment: The Trustees should contact municipalities, towns, planning organizations for project ideas.

Comment: Tannery Brook is a tributary to the Connecticut River in Holyoke. It is heavily impacted by development. There are opportunities for streambank restoration and day-lighting the stream channel for anadromous fish restoration.

Comment: Keep the restoration local. Keep the restoration in Holyoke.

The following projects were proposed at or after the April 7, 2011 public meeting.

South Hadley, Bicentennial Park, Connecticut River Bank Stabilization:
Bicentennial Park on the main stem of the Connecticut River has a significant shoreline erosion problem, and riverbank restoration has been proposed. The project is relatively close to the affected resources and on the main stem of the Connecticut River. Project proponents believe that the project would improve the benthic habitat in that area by reducing the additional sediment from the shoreline erosion. It also believes that the project can be accomplished in a short period of time and would be relatively inexpensive.

The Trustees determined that under the criteria of the consent decree, the project is eligible to be considered as a project alternative. The Trustees further determined that the project would not result in a significant amount of restoration relevant to the trust resources and has not been included as an alternative.

Holyoke, Debris Removal, Connecticut River:
The Holyoke Friends of the River have been working to remove large pieces of debris from the River, particularly the removal of the drum from a concrete truck that was dumped in the Connecticut River several years ago. The group proposes to use settlement funds to fund the removal of the drum from the river and potentially other debris items.

The Trustees determined that under the criteria of the consent decree, the project is eligible to be considered as a project alternative. The Trustees further determined that the project would not result in a significant amount of restoration specific to the natural resources injured, and thus, this project was not further considered as an alternative for implementation.

Holyoke, Tannery Brook Restoration:
Tannery Brook is a small tributary to the Connecticut River with a 1,400-acre watershed. The watershed is extensively urbanized with sections of Tannery Brook culverted, piped and

rerouted. Approximately 0.5 miles upstream of the confluence of Connecticut River and Tannery Brook a significant erosion problem has developed. Studies already performed have identified specific causes including; a large hillside undergoing mass wasting which is being carried into Connecticut River and scouring and eroding of a large culvert downstream from the hillside. Although the culvert provides minimal sediment deposition to Connecticut River, it creates a 12-inch elevation difference with the brook resulting in a barrier to anadromous and migratory fish. The deposition of sediment is visible in aerial photos and reportedly extends about 130 feet into the river covering an area just under 40,000 sf.

The Trustees determined that under the criteria of the Consent Decree, the project is eligible to be considered as a project alternative. The Trustees further determined that the project would not be cost effective in relation to the amount of restoration achieved, and thus, this alternative was not included as an alternative for further consideration for implementation.

Region, Assessment of Culvert Barriers to Fish and Wildlife Passage:
This project would identify the most important culverts to improve or replace in order to restore habitat continuity. The proposal would include development of a model Best Management Practices (BMP) plan and workshops for local Departments of Public Works. Additional work would include cross referencing the finding with priority culvert lists kept by local Department of Public Works and seeking additional monies to fund replacement of these priority stream crossings.

The Trustees determined that under the criteria of the Consent Decree, the project is eligible to be considered as a project alternative. The Trustees further determined that the project would have limited value for trust resources injured by the coal tar deposits. Additionally, the Trustees are seeking projects for direct implementation, and feasible projects are now available.

Holyoke, Sturgeon Habitat Project, Connecticut River:
A project in Connecticut River, below the Holyoke Dam in Holyoke was proposed that is based on work done in western states for trout and salmon habitat. Conceptually, the plan involves the placement of rocks in the river below the dam. As described by the project proponent, the force of the dam scours the area below the dam leaving it without any significant benthic habitat. The strategic placement of boulders in the river would result in the creation of increased benthic habitat for shortnose sturgeon. A second alternative suggested for restoring and increasing benthic habitat for shortnose sturgeon included blasting of material to increase and create the appropriately sized benthic habitat structure.

The Trustees determined that under the criteria of the Consent Decree, the project may eligible to be considered as a project alternative. However, if this activity is associated with the FERC-licensed Holyoke dam, this concern would have been identified and addressed through the FERC relicensing process as needing to be a mitigative measure to be addressed by the dam owners. The Trustees determined that the project would not be cost effective in relation to the amount of potential bottom substrate restoration achieved, and thus, has not been included as an alternative.

APPENDIX II

Trustee Responses to Public Comment on the Draft Restoration Plan and Environmental Assessment

The Draft RP/EA was released for a 30-day public comment period. Two written comments were received from the public. The Trustees have considered all written comments received and have addressed them below:

Comment1. *American Rivers River Restoration Program reviewed the Draft RP/EA and indicated that the Trustees have completed a thorough effort to find appropriate projects to compensate for the damages to and loss of natural resources on the Connecticut River. In particular, American Rivers supports the use of funds to remove the Bartlett Rod Shop Company Dam on Amethyst Brook in Pelham, Massachusetts.*

Response: The Trustees recognize American Rivers River Restoration Program recommendation and support of the proposed restoration alternatives, particularly Bartlett Rod Shop Company Dam on Amethyst Brook in Pelham, MA.

Comment2. *The Commonwealth of Massachusetts Division of Fisheries and Wildlife reviewed the Draft RP/EA and supports all of the proposed restoration alternatives being considered. The Department, however, proposes redefining the removal of the Orient Springs dam to Tier I status and designating the completion of the Manhan River fishway as a Tier II status. Because of the close proximity (one-half mile) of the Orient Springs dam to the Bartlett Fish Rod Co. dam, removal of the Bartlett Fish Rod Co. dam and the Orient Springs dam should be considered as one project. Removing both dams is expected to re-connect a total of 8.5 miles of headwaters habitat to downstream areas. The Manhan River fishway project already has considerable "inertia" with the majority of the fishway already completed; as such alternative sources of funding to complete that project should be available if no funds from this settlement are available for Tier II projects.*

Response: The Trustees have reviewed and considered the comments submitted by the Massachusetts Division of Fisheries and Wildlife (Division). After careful consideration, it remains the intent of the Trustees to fund and help complete the Manhan River fishway project, as described in the Draft and Final RP/EA. The Trustees recognize the great progress referenced by the Division (the fishway is nearly complete); however, the implication that "alternative source of funding….are available" is not accurate. Holyoke settlement monies will partially fulfill the project funding gap, and are critical to completing the project. Should funding shortfalls persist despite the addition of the Holyoke funds, and the Manhan River fishway project is unable to be completed within a reasonable timeframe, the Trustees will re-allocate the funds to complete one or more of the Tier II projects identified in the Final RP/EA. To help ensure that the Trustee funds are used and the fishway is completed in a timely manner, the USFWS will provide written documentation indicating that all of the funds required to complete the project have been secured by December 31, 2012. The final portion of the Manhan River fishway project is expected to be completed shortly after all of funds required to complete the project have been secured.