

DRAFT
ENVIRONMENTAL ASSESSMENT
FINDING OF NO SIGNIFICANT IMPACT

HOUSATONIC RIVER BASIN
NAUGATUCK RIVER WATERSHED

HOP BROOK LAKE SEEPAGE REMEDIATION
WATERBURY AND NAUGATUCK , CONNECTICUT

September 2008

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

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ACRONYMNS AND ABBREVIATIONS

ACOE	Army Corps of Engineers
Cfs	Cubic feet per second
CAA	Clean Air Act
Cy	Cubic yard
CTDEP	Connecticut Department of Environmental Protection
DO	Dissolved oxygen
EA	Environmental Assessment
FONSI	Finding of No Significant Impact
Ft.	Feet
Lf.	Linear feet
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
PEC	Probable Effects Concentration
RONA	Record of Non-applicability
RM	River mile
SIP	State Implementation Plan
UDV	Unit Day Value
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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1.0 Introduction

1.1 Purpose

The purpose of this Environmental Assessment (EA) is to evaluate the environmental impacts associated with a proposed seepage repair project at the Hop Brook Lake Flood Control Project.

Hop Brook Dam has experienced seepage problems in the past during high pool events in 1984 and 1986. After the 1986 high pool event, project personnel observed a depression on the downstream embankment slope and remedial repairs were undertaken in 1988 to try to control the foundation seepage problems at the dam. The 1988 remedial repairs consisted of sand injection and installation of a toe drain to establish adequate filter zones in the seepage areas and prevent the continued movement of embankment material. Fifteen piezometers were also installed at the dam to monitor seepage through the embankment and foundation. Further analysis (see the Hop Brook Lake Dam Safety Deficiency Modification Report) shows measures are needed to reduce seepage. Failure of the dam due to continued seepage would result in loss of life and severe economic and environmental impacts.

1.2 Project Location

Hop Brook Lake is located in western Connecticut in the lower Naugatuck River Watershed of the Housatonic River Basin (see Figure 1). The Naugatuck River watershed drains over 16 percent of the Housatonic River Basin. The dam is located on Hop Brook, 1.4 miles above its confluence with the Naugatuck River, 3 miles southwest of Waterbury, Connecticut in New Haven County.

For this analysis, the study area is defined as the Hop Brook Lake and the area which would be significantly affected by the failure of Hop Brook Dam based on the results of the dam-breach analysis. This area includes the city of Naugatuck as well as Waterbury and Middlebury and the downstream communities of Beacon Falls, Seymour, Ansonia and Derby.

1.3 Project Authorization and Purpose

Hop Brook Lake is an element of the flood protection plan for the Housatonic River Basin which is authorized by the Flood Control Act of 14 July 1960 (Public Law 86-645, 86th Congress). The development and use of reservoirs for public recreation and other uses is authorized by the Flood Control Act of 1944 (Public Law 534, 78th Congress, 2nd Session), as amended. Hop Brook Lake was completed in October 1968 at a cost of \$5,340,000.

The Corps of Engineers' comprehensive flood control plan for the Naugatuck River Watershed consists of seven dams and reservoirs and four local protection projects. As part of this program, the operation of Hop Brook Lake provides flood protection primarily to

Naugatuck, Connecticut and also to small towns downstream along the Naugatuck River to Derby, Connecticut. The optimum flood control protection is provided by close coordination among all the dams. The Hop Brook Lake project also provides recreational opportunities and practices forest and fish and wildlife management on project lands compatible with the primary function of flood control.

1.4 Purpose of the Environmental Assessment

This EA was prepared to comply with Council of Environmental Quality and Corps of Engineers regulations for implementing the National Environmental Policy Act of 1969 (NEPA). NEPA requires Federal agencies to consider the environmental effects of a proposed action and solicit comments during the planning process from government agencies and the interested public

The EA serves as a disclosure document that describes the proposed action and alternatives, environmental resources in the affected area, and the environmental effects of the proposed action. The EA also provides decision makers with sufficient information to determine whether a Finding of No Significant Impact (FONSI) or a more elaborate review, culminating in preparation of an Environmental Impact Statement (EIS), is appropriate.

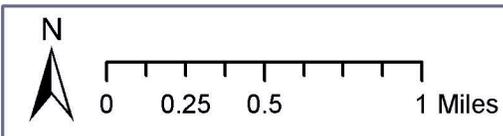
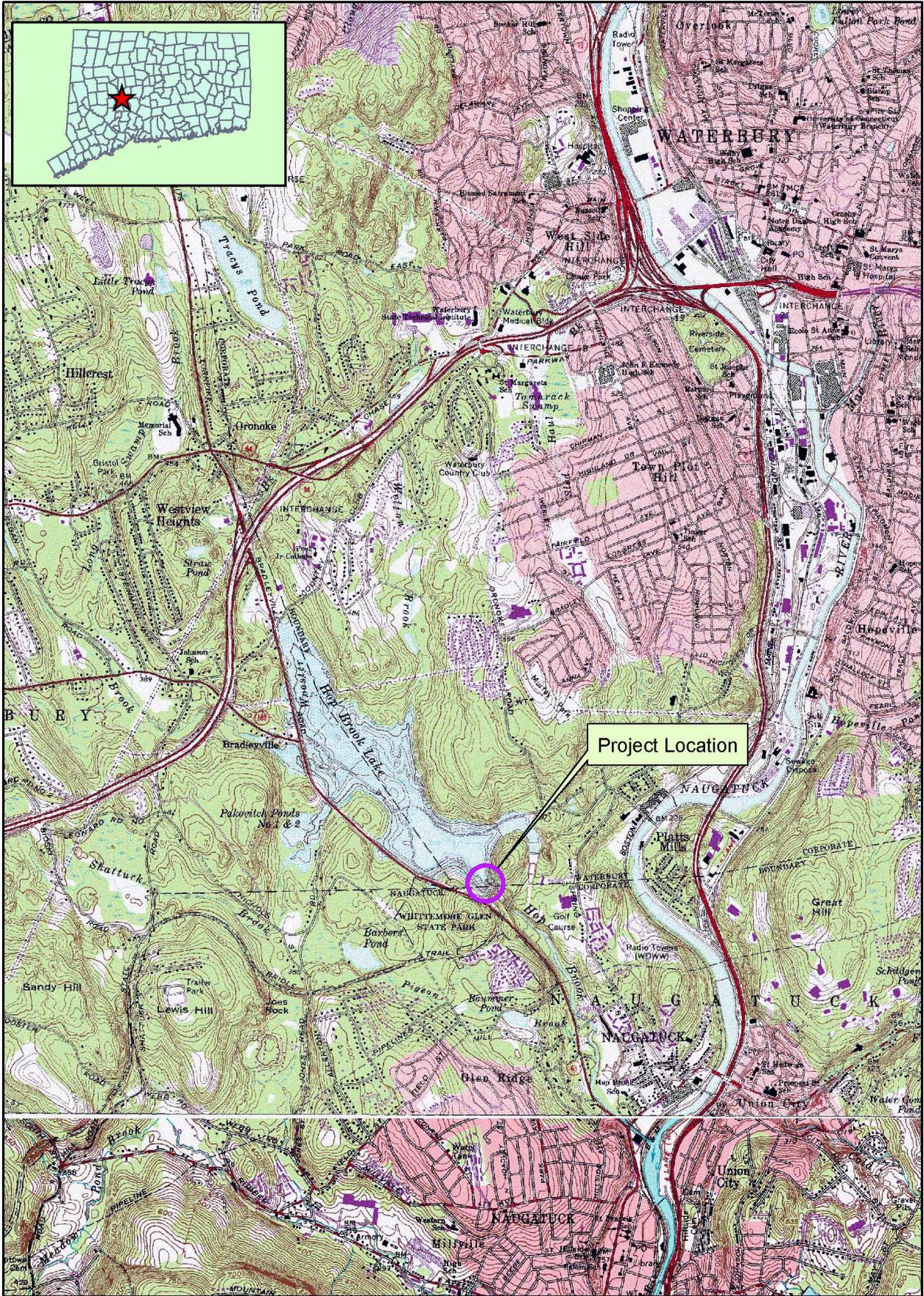
The EA includes information about the alternatives considered (Section 3), the recommended plan (Section 4.0), the affected environment (Section 5.0), the environmental effects of the recommended plan and alternative plans (Sections 6.0 and 7), the environmental effects of dam failure (Section 8), measures to minimize adverse environmental effects (Section 9), and coordination with agencies and the interested public (Section 10.0).

The draft EA is made available for public review. The Corps will carefully consider all comments received during the public review period, and modify the draft EA as appropriate. Based on the level of anticipated environmental impacts, the Corps expects to issue a FONSI upon completion of the EA.

2.0 General Setting - Hop Brook Lake

2.1 Structural Components

The project area contains a total of 538 acres in fee and 15 acres in flowage easement. The dam is a rolled-earth fill embankment with rock slope protection which is 520 feet long at an elevation of 381 feet National Geodetic Vertical Datum (NGVD) with a maximum height of 97 feet. The top of the dam contains a paved access road. The overflow concrete broad-crested chute spillway is located in a saddle about 1200 feet northeast of the left abutment of the dam. The spillway crest elevation is 364 feet NGVD. An earth dike 400 feet long and 33 feet high is located on the left side of the channel to contain the discharge within the spillway.



Hop Brook Lake
Seepage Remediation Project
Location Map



Hop Brook Dam and Hop Brook Lake

The outlet works consists of an intake channel, a concrete weir to maintain the permanent pool, a control tower, a 425-foot long and 3 x 5-foot high rectangular conduit with an invert elevation at 292 feet NGVD, a stilling basin, and an outlet channel. The intake channel weir is located just upstream of gate 1. The six stoplog openings of the control weir are 4 feet deep for flexibility in maintaining the level of the permanent pool. The control tower contains the gate chamber with two 3 x 4-foot high slide gates.



Hop Brook Dam Outlet

The recreational facilities at Hop Brook Lake include picnic shelters, picnic tables, parking lots, a playing field and a swimming beach. The 7.3 miles of hiking trails throughout the project area enable visitor access to varying upland and wetland communities.

2.2 Reservoir

Normal elevation of the permanent recreational pool at Hop Brook Lake is 310 feet NGVD. It has a surface area of 21 acres and a storage volume of about 330 acre-feet. At spillway crest the flood control storage capacity is 6,850 acre-feet, which is equivalent to 7.8 inches of runoff from the drainage area of 16.4 square miles. If filled to capacity, the reservoir would have a water surface area of 270 acres, a maximum depth of 84 feet and extend 1.6 miles upstream.

At a permanent pool elevation of 310 feet NGVD, Hop Brook Lake, upon completion of the dam, had a maximum depth of 18 feet, a mean depth of 6 feet and a total volume of 120 acre-feet. The lake was dredged in the fall and winter of 1979-80, 1987, 1988 and the winter of 1990-91 to reduce beach siltation, improve beach aesthetics, improve fish habitat and improve flow/flushing action. Currently the recreation pool has a maximum depth of 30 feet deep (average depth of 16 feet) and is maintained by a concrete weir and stoplog structure upstream of gate 1.

2.3 Reservoir Operation

Normal Periods During normal periods, outflow is set equal to inflow. When outflow must be reduced for maintenance work, reductions are made gradually, in several steps, to minimize stranding of downstream aquatic life. Periodically, the permanent pool is lowered to perform beach maintenance and/or dam maintenance.

Flood Periods Hop Brook Lake is operated in concert with other projects in the Housatonic River Basin to reduce downstream flooding along the Naugatuck and Housatonic Rivers. Operation for floods may be considered in three phases. Phase I - appraisal of storm and river conditions during development of a flood, Phase II - flow regulation and storage of flood runoff at the reservoir, and Phase III - emptying the reservoir following downstream recession of the flood. The regulation procedures are detailed in the Master Water Control Manual for the Housatonic River Basin.

A minimum release of about 10-20 cubic feet per second (cfs) is recommended to be maintained during periods of flood regulation in order to sustain downstream aquatic life. The maximum non-damaging safe discharge capacity immediately downstream is estimated to be 550 cubic feet per second (cfs). Releases at or near this rate can be expected as a result of a significant storage event and generally occur during the reservoir emptying phase provided meteorological and hydrologic conditions permit such releases.

Since it was constructed in 1968, Hop Brook has impounded significant amounts of water numerous times. A list of significant storages is shown on Table 1. Although floods

can occur at any time of the year, about two-third's of the events occurred during the months of January through April.

2.4 Drought Assistance Plan Section 301 of the Water Supply Act of 1958, as amended by Section 932 of the 1986 Water Resources Development Act, authorizes the Corps of Engineers to include municipal and industrial water supply storage in Corps of Engineers reservoir projects. Engineering Regulation (ER) 1110-2-1941, dated 15 September 1981, provides that water control managers continually review and when appropriate, adjust water control plans in response to changing public needs.

A proposed drought contingency storage plan at Hop Brook Lake would raise the pool 2.0 feet above its current elevation of 310.0 to 312.0 feet NGVD, and from a maximum depth of 30 to 32 feet. The proposed increase would only occur during a declared drought emergency. In consideration of the impacts associated with storage of addition water at Hop Brook Lake during a drought emergency, drought contingency storage is not recommended at Hop Brook Lake at this time. Should future evaluations reveal significant changes to water quality at Hop Brook Lake, this project may be reconsidered. An Environmental Assessment and appropriate coordination would be required to assess impacts to wetlands and fish and wildlife habitat prior to implementation.

3.0 Seepage Remediation Alternatives

Several alternatives are under consideration in response to the seepage problem:

No Action. The first alternative considered is to do nothing to prevent future seepage issues. This alternative would allow continued degradation of the embankment and foundation. The ultimate consequence of no action could be catastrophic failure of the embankment with a resulting loss of life and property in downstream areas. For this reason, this alternative is unacceptable.

Removal of dam. This alternative would have a high initial cost, with the resulting situation being that the downstream areas would loose flood protection. Since its completion in 1961, Hop Brook Dam has prevented \$48 million in flood damages. Because of the loss of flood control benefits, and the high initial removal costs, this is not considered an acceptable alternative.

Modification of reservoir operational procedures and pool level restrictions. Attempting to operate the project in the future as a limited capacity reservoir could potentially decrease seepage-related risks, but would also decrease annual flood control benefits realized downstream of the dam. Therefore, this is not considered an acceptable alternative.

Table 1: Significant Storages for Hop Brook Lake (1969 – June 2008)

Date (Year)	Month	Peak Pool Level (ft. NGVD)	Storage Utilized (Acre-Feet)	Storage Utilized (Percent)
1969	April	37.8	916	13
1970	April	40.6	1189	17
1971	August	33.5	593	9
1972	March	38.0	933	14
1973	June	47.0	1962	29
1973	December	45.8	1806	26
1975	September	44.1	1585	23
1976	January	47.2	1988	29
1977	February	36.5	806	12
1978	January	40.3	1157	17
1979	January	50.7	2488	36
1980	March	45.9	1819	27
1981	February	38.2	952	14
1982	June	57.7	3269	53
1983	March	47.3	2001	29
1984	June	55.4	3227	47
1985	September	25.6	214	3
1986	March	41.4	1275	19
1987	April	50.5	2458	36
1988	July	21.4	85	1
1988	November	30.8	433	6
1989	October	46.9	1949	28
1991	August	31.4	462	7
1992	June	32.4	518	8
1993	March	33.0	559	8
1994	August	29.6	375	5
1995	March	23.7	150	2
1996	January	38.8	1012	15
1996	October	44.5	1632	24
1998	March	31.3	457	7
1999	September	42.7	1416	21
2000	July	23.5	143	2
2001	June	33.8	610	9
2002	May	22.5	116	2
2003	June	25.2	199	3
2004	April	30.9	438	6
2005	April	31.3	460	7
2006	April	44.3	1625	23
2007	April	47.8	2065	31
2008	February	35.9	764	11

Drainage Area = 16.4 square miles; 1 inch runoff = 875 acre-feet

Upstream Impervious Blanket. The New England District has constructed several projects that include upstream impervious blankets, and have found that they generally do not work well. The lateral extent of a blanket needs to be excessive in order to prevent

underseepage, and even a thin, small gravel layer (which can be quite common in glacial outwash sediments) can render the upstream impervious blanket useless.

Toe Drains/Downstream Drainage Blanket. Hop Brook Dam already has a toe drain (also called a filter trench). It was installed in 1988 prior to the sand injection program. Additionally, this alternative would not stop the seepage through the bedrock foundation.

Relief wells. Relief wells work well in a sandy or fine-grained foundation that has a confining layer over it. Hop Brook Dam's foundation does not fit into this situation. Additionally, the seepage under the dam is suspected to be traveling through fractures in the bedrock, and the likelihood of the relief wells intersecting all of the fracture zones is small.

Concrete cut-off wall. The cut-off wall would consist of large diameter overlapping holes that would be drilled through high-density metamorphic rock and filled with concrete. Since grouting (see below) would achieve almost the same decrease in permeability for less cost, this alternative was deemed too costly for the additional benefit, and therefore dropped.

Grouting around conduit only. This option does not address the seepage exiting through the left abutment bedrock, and would serve as a partial fix only.

Grout curtain through left side only. This option would install a grout curtain to address foundation and abutment seepage that is known via observations and piezometric data. However, there are no piezometers in the right side of the dam, so the seepage regime present there is uncertain. There is a risk of generating new seepage through the right side once the left side is blocked due to the presence of the grout curtain.

Grout curtain through entire embankment. This alternative presents an attractive semi-permanent fix that controls seepage both through and underneath the left and right embankments while maintaining the flood control performance of the dam. It performs nearly as well as a concrete cut off wall but is much less costly.

4.0 Recommended Alternative

The recommended alternative would construct a 700-foot-long grout curtain along the existing foundation cut-off alignment (Figure 2). This has a surface expression of a chevron shape that runs from the crest at the right end down to El. 315 (five feet above the normal pool elevation), underneath the service tower bridge, and up the upstream face to the crest at the left end. Due to the fractured bedrock present at the left abutment, the curtain would run an additional 80 feet along the left groin on the downstream side. The grout curtain would consist of 3 lines, 5 feet apart, with primary holes drilled 10 feet apart, to a depth of 65 feet below the top-of-rock. Secondary holes would be drilled at 5 feet basis. The outer two lines would consist of vertical holes, with the central line holes inclined 15 degrees. Inclined drilling would be incorporated to construct the curtain around the conduit. Grout would be a Type III Portland cement-based stable balanced grout with 2-5% bentonite and admixtures like pozzolans and superplasticizers to improve rheology. A computerized control system

[{e.g. Intelligrout (TM)}] would be utilized for aiding in grout placement. There would likely be no need to lower Hop Brook Lake or alter flood control protocols during construction. Because grout could seep through fissures in bedrock and reach Hop Brook water quality will be closely monitored during construction. If any grout reaches the brook immediate measures would be taken to reduce and contain the seepage.

5.0 Affected Environment

5.1 Physical Setting

5.1.1 Climate. The Naugatuck River Basin has a variable climate characterized by frequent but short periods of heavy precipitation produced by thunder storms and larger weather systems of tropical origin. The basin lies in the path of "prevailing westerlies" which generally travel across the country in an easterly or northeasterly direction, producing frequent weather changes. The basin is occasionally exposed to coastal storms, some of which originate in the tropics and are of hurricane intensity, heavily laden with moisture from the ocean.

The average annual precipitation over the Housatonic River Basin is about 46 inches with a fairly even distribution throughout the year. For the Housatonic River Basin, upstream from the confluence of the Housatonic and Naugatuck Rivers, the average annual runoff is 22.5 inches, just under 50 percent of the annual precipitation.

The average annual temperature in the basin is about 47° Fahrenheit (F). The southern part of the Housatonic River Basin, which includes the Naugatuck River Basin, has a slightly milder climate than the northern part, due to the moderating influence of Long Island Sound. Average monthly temperatures range from about 73°F in July to 28°F in January and February. Air temperature extremes range from occasional highs over 100°F to lows in the minus teens.

5.1.2 Topography and Geography. The topography surrounding the Hop Brook Lake is characterized by hilly terrain with moderate to steep relief surrounding the reservoir. Above the reservoir, Hop Brook flows through a relatively narrow valley flanked by low, flat, or gently rolling land in some places and high, steep sided hills elsewhere. Within and below the reservoir, the valley widens somewhat. Elevations in the vicinity of the reservoir range from 284 feet NGVD in the streambed at the base of the dam, to about 610 feet NGVD in Murray Park in Waterbury, east of the reservoir.

Elevations along the Naugatuck River from the Hop Brook confluence to the Housatonic River confluence range from about 200 to 20 feet NGVD. The river is generally confined in a narrow (0.1 to 0.5 mile) valley until Ansonia and Derby where it broadens near the Housatonic Confluence. Peak elevations in near the river are about 700 feet in Naugatuck State Forest in Naugatuck.

The study area is located in the Western Connecticut (Hudson Highlands) Ecoregion (CTDEP, 2006a).

5.2 Geology.

The project is located in the western Connecticut highlands area of plateau remnants sloping gently to the southeast. The topography is of moderate relief consisting of steep-sided bedrock-controlled valleys overlain by glacial till. The glacial till in most areas is in turn overlain by fluvial glacial deposits deposited in temporary lakes formed by local damming of the valleys by remnant ice blocks during glacial recession. The bedrock consists of pretriassic metamorphic rocks which have been later intruded by granite bodies and traprock dikes.

Bedrock, as exposed on the easterly side of the streambed and at higher elevations on the left abutment, consists of granitized schist. Construction records describe the bedrock surface exposed for the foundation cutoff and outlet works construction as being extremely rough with steep rock faces, overhangs, and depressions which required special compaction effort. Also, at least the top five feet of bedrock was described as consisting of either highly fractured or disintegrated rock.

5.3 Land Use

Land use within the Hop Brook Lake watershed is mostly residential. The eastern portion of the watershed is within the city of Waterbury and contains a number of housing developments. Route 84 intersects Route 63 within the watershed boundary. The western portion of the watershed is in Middlebury, a suburb of Waterbury. There is extensive residential development near the lake, but the northwestern portion of the watershed is fairly undeveloped. It contains some large dairy farms and many hills and swamps. There is little industrial development with the watershed.

Land use along the Naugatuck between Hop Brook and the Housatonic River is mixed. There are densely developed urban areas centers in Naugatuck, Seymour, and Ansonia and low to moderate development elsewhere. State Highway 8 runs along the river from Waterbury to Ansonia. South of Naugatuck and north of Beacon Falls, the river passes through the 2225 acre undeveloped "West Block" of the Naugatuck State Forest.

Two Corps of Engineers local flood control projects occur in the study area. The Ansonia Local Protection Project is located along the Naugatuck River and Beaver Brook in southwestern Ansonia and along the Naugatuck River in northwestern Derby. It provides substantial protection for 440 acres of highly developed industrial, commercial, and residential land in Ansonia and Derby. About 10,400 feet of earthfill dikes and 5,600 feet of concrete floodwall constitute the major portion of the project. Four pumping stations are

provided to handle storm drainage and sanitary sewage. Work also included the widening and straightening of 13,000 feet of river channel; the construction of a 1,400-foot conduit along Beaver Brook; and the construction of five swing gates that allow the passage of railroad and vehicular traffic.

The Derby Local Protection Project is located at the junction of the Housatonic and Naugatuck rivers in Derby. It provides substantial protection to about 70 acres of highly developed industrial, residential, and commercial property. The project consists of earthfill dikes and concrete floodwalls along the Housatonic and Naugatuck Rivers. The system includes four floodgates at railroad crossings and a pumping station near the confluence of the two rivers to handle storm drainage.

5.4 Water Resources

The Naugatuck River, of which Hop Brook is a tributary, is the largest watershed in the Housatonic River Basin and has a drainage area of 312 square miles. The Hop Brook Lake watershed consists of 16.4 square miles.

Hop Brook flows south of the dam for 1.4 miles before entering the Naugatuck River. The Naugatuck flows in a southerly direction for about 14 miles to its confluence with the Housatonic River in Derby, Connecticut. The Naugatuck drops in elevation from about 17 ft/mile from the Hop Brook Confluence to the Housatonic. Downstream of Hop Brook confluence the Naugatuck is mostly confined to a narrow (ca. 600 to 1220 feet) valley. Surrounding hills range in elevation to about 650 feet.

Hop Brook below Hop Brook Dam is designated as a Class A surface water by the Connecticut Department of Environmental Protection (CT DEP). Hop Brook Lake and the Naugatuck River below the Hop Brook confluence are designated as Class B.

Class B waters are suitable for bathing and other recreational purposes, agricultural uses, certain industrial processes, and cooling. Class B waters should be excellent fish and wildlife habitat, and have good aesthetic value. Class A waters are suitable for the above uses and, may be considered for public drinking water supply in the future. Technical requirements for Class A and B waters are summarized in Table 2.

Hop Brook Lake, Hop Brook below the Hop Brook Dam, and the Naugatuck River fail to meet designated criteria for Recreation because of elevated *Escherichia coli* levels. (CTDEP, 2006b). The Hop Brook Lake swimming beach is occasionally closed because of elevated bacteria or algae counts. Hop Brook below the Hop Brook Dam and the Naugatuck River also fail to attain Class B criteria as habitat for fish, other aquatic life, and wildlife.

Table 2: Connecticut Water Quality Standards

CT WQS and present 305(b)/303(d) Designated Use	Applicable Class of Water	Functional Definition
Recreation	AA, A, B, SA, SB	Swimming, water skiing, surfing or other full body contact activities (primary contact), as well as boating, canoeing, kayaking, fishing, aesthetic appreciation or other activities that do not require full body contact (secondary contact).
Habitat for fish and other aquatic life and wildlife.	AA, A, B, SA, SB	Waters suitable for the protection, maintenance and propagation of a viable community of aquatic life and associated wildlife.
Fish Consumption	AA, A, B, SA, SB	Waters supporting fish that do not contain concentrations of contaminants, which would limit consumption to protect human health.
Potential drinking water supplies.	A	Waters that have not been identified, officially, but may be considered for public drinking water supply in the future.
Navigation	SA, SB	Waters capable of being used for shipping, travel or other transportation by private, military or commercial vessels.
Industrial Water Supply	AA, A, B, SA, SB	Waters suitable for industrial supply.
Agriculture	AA, A, B	Waters suitable for general agricultural purposes.

Priority pollutant scans were also performed at Hop Brook Lake. Water and sediment samples were collected from the lake in September 1991 and analyzed for metals, polychlorinated Biphenyls (PCBs), pesticides, volatile and semi-volatile organics and dioxins. Results showed primarily low to very low concentrations, although some parameters were at levels typical of slightly contaminated conditions. Hop Brook Lake is a sink for fine-grained particulate matter. Because metals and organics compounds tend to bind to such particles, elevated levels are found in sediments in deeper places in the lake. No compounds were at levels harmful to aquatic life forms likely to be found in Hop Brook Lake, or recreational users of the lake.

5.5. Biological Resources

5.5.1 Vegetation

Uplands

Hop Brook Lake is located in the northeastern part of the central hardwood region of the United States, immediately below the northern hardwood forest type. The predominant cover type is transition hardwoods: oak-hickory (*Quercus spp.* - *Carya spp.*) with a number of other associations in this region. These include maple-ash-elm type (*Acer spp.* - *Fraxinus spp.* - *Ulmus spp.*), aspen-birch type (*Populus spp.* - *Betula spp.*); mixed hardwood type and hemlock (*Tsuga canadensis*) types. Of these types, oak, mixed hardwoods and maple-ash-elm are predominant members at Hop Brook Lake.

The upland forest around the lake consists primarily of white oak (*Quercus alba*), red oak (*Q. rubra*) and black oak (*Q. velutina*) with smaller numbers of shagbark hickory (*Carya ovata*), sugar maple (*Acer saccharum*), red maple (*A. rubrum*), black birch (*Betula lenta*) and black cherry (*Prunus serotina*). Shrubs and vines in the understory consist of sparse regeneration of overstory species, poison ivy (*Rhus radicans*), grape (*Vitis sp.*), witch-hazel (*Hamamelis virginiana*), highbush blueberry (*Vaccinium corymbosum*) and some dense concentrations of mountain laurel (*Kalmia latifolia*).

The recreation area is landscaped with maintained grass (turf) native trees and shrubs and nursery stock. Species used for landscaping in lower areas are tolerant of periodic inundation.

The stone revetment of Hop Brook Dam is maintained largely free of vegetation. Vegetation consists only of scattered weeds and tree or shrub seedlings.

Wetland Vegetation

Wetlands present at Hop Brook Lake were mapped in the late 1990's (ACOE, 1998). The wetlands were classified according to the Cowardin et al. (1978) system. This classification system divides wetlands into systems, subsystems, classes and subclasses. Of interest in the watershed are the following wetland systems:

Lacustrine - generally areas of open water greater than 20 acres or more than 6.6 feet in depth.

Riverine - generally all wetlands and deepwater habitats contained within a channel.

Palustrine - all non-tidal wetlands dominated by trees, shrubs and persistent emergent herbaceous plants.

Wetland acreages for the project area include approximately 20 acres of lacustrine wetland, 28 acres of palustrine forested wetland, 12 acres of palustrine scrub/shrub wetland, 2 acres of palustrine emergent wetland, 2 acres of palustrine open water/aquatic bed wetland and a total of 2.8 miles of riverine wetland. There are also several unnamed and intermittent streams throughout the project area.

The Hop Brook Lake conservation pool and lacustrine emergent wetland is approximately 21 acres in size. At conservation pool level, water depth precludes the development of aquatic vegetation throughout much of the lake. Emergent vegetation is limited to a narrow zone along approximately half of the shore perimeter. Species present include arrowhead (*Sagittaria latifolia*), soft-stem bulrush (*Scirpus validus*), wool-grass (*Scirpus cyperinus*), yellow loosestrife (*Lysimachia terrestris*), speckled alder (*Alnus rugosa*) and black willow (*Salix nigra*).

5.5.2 Wildlife

The Hop Brook Lake project area provides habitat to a variety of upland mammals and birds. Some of the species likely to occur in the project area are listed in Table 3. Chapter 4 of Connecticut's Comprehensive Wildlife Conservation Strategy (http://www.ct.gov/dep/cwp/view.asp?a=2723&q=329520&depNav_GID=1719) provides additional information on wildlife use of common Connecticut habitat types.

Wildlife utilization of the dam embankment is minimal. The embankment is covered with stone protection and maintained largely free of vegetation (<<1 % cover). The crevices provided by stone slope protection likely provide habitat for small mammals and snakes. No birds are likely to nest on the embankment. Areas maintained as turf which may be used for staging activities also have low value for wildlife. Species most likely to use these areas for foraging include American robin, killdeer, rabbit, moles, mice, and snakes.

Riparian habitat downstream of Hop Brook Dam to the Naugatuck River supports many wildlife species but is compromised by development. The riparian corridor along the Naugatuck downstream of the Hop Brook confluence is largely confined by state Highway 8 and an active railroad bed. The width of the riparian corridor varies, but often is less than 200 feet. Floodwalls and dikes further confine the river and limit wildlife habitat value in Ansonia and Derby.

5.5.3 Fish

Hop Brook and Hop Brook Lake

Fish species commonly found in contributory streams to Hop Brook include the brook trout (*Salvelinus fontinalis*), blacknose dace (*Rhinichthys atratulus*), longnose dace (*R. cataractae*), tessellated darter (*Etheostoma olmstedi*), pumpkinseed (*Lepomis gibbosus*), creek chub (*Semotilus atromaculatus*), common shiner (*Notropis cornutus*) and white sucker (*Catostomus commersoni*). Brown trout (*Salmo trutta*) was also found in the upper portion

of Hop Brook (upstream of the project area) and the grass pickerel (*Esox americanus vermiculatus*) was found in Meshaddock Brook (also upstream of the project area) (CTDEP, 1991).

A biological survey was conducted by the Army Corps of Engineers in 1981 (Trinchero, 1981). This survey sampled streams within the project area and some additional species were noted. These species include bluegill (*Lepomis macrochirus*), golden shiner (*Notemigonus crysoleucas*), brown bullhead (*Ictalurus nebulosus*), yellow perch (*Perca flavescens*), redfin pickerel (*Esox americanus americanus*), johnny darter (*Etheostoma nigrum*) and smallmouth bass (*Micropterus dolomieu*).

A survey was performed in 1986 of Hop Brook Lake to determine species composition and appraise bass and trout status. Twelve species of fish were collected including pumpkinseed, bluegill, spottail shiner (*Notropis hudsonius*), golden shiner, white sucker, tessellated darter, brown trout, rainbow trout, and yellow perch. Species found in Hop Brook Lake but not in contributing streams included the largemouth bass (*Micropterus salmoides*), goldfish (*Carassius auratus*) and black crappie (*Pomoxis nigromaculatus*). Yellow perch (33%) was the most abundant species in the littoral area. Largemouth bass (23%), white sucker (17%), bluegill (19%) and pumpkinseed (9%) were moderately abundant. Golden shiner (42%) was the most abundant species in the deeper water with white sucker (19%) and yellow perch (21%) being moderately abundant (ACOE, 1987). Fish species composition reflects a warm, slow water fishery. Trout seem poorly suited to the lake as indicated by their poor condition and absence of young. Water temperatures in Hop Brook Lake frequently exceed the range for optimal growth for trout.

Fishing is a great attraction to Hop Brook Lake. Hop Brook and its contributing streams are basically a warm water fishery with a seasonal cold water "put and take" fishery. The cold water fishery has no natural reproduction.

Naugatuck River

The Naugatuck River supports a diverse warmwater resident warmwater fish community. Species present include white sucker, brown trout, brook trout (*Salvelinus fontinalis*), rainbow trout, smallmouth bass, common carp (*Cyprinus carpio*), largemouth bass, sunfish, channel catfish (*Ictalurus punctatus*), and walleye (*Stizostedion vitreum*). The CT DEP stocks trout and broodstock Atlantic salmon (*Salmo salar*) on certain sections of the river and has designated the Naugatuck Mainstem - from the confluence of the East and West Branches in Torrington to the Kinneytown Dam in Seymour - as a Trophy Trout Stream.

Anadromous fish present include American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*), alewife (*Alosa pseudoharengus*) sea-run brown trout, sea-run tiger trout (*Salmo trutta x Salvelinus fontinalis*), sea lamprey (*Petromyzon marinus*), and Atlantic salmon (juveniles and surplus broodstock). A catadromous species, American eel (*Anguilla rostrata*) is also present (Naugatuck River Watershed Association, 2008).

Table 3: Wildlife Likely to Occur Near the Dam Repair Area

Class	Common Name	Scientific Name
Mammals	Red fox	<i>Vulpes vulpes</i>
	White-tailed deer	<i>Odocoileus virginianus</i>
	Virginia opossum	<i>Didelphis virginiana</i>
	Eastern cottontail	<i>Sylvilagus floridanus</i>
	Eastern chipmunk	<i>Tamias striatus</i>
	Gray squirrel	<i>Sciurus caroliensis</i>
	Red squirrel	<i>Tamiasciurus hudsonicus</i>
	Raccoon	<i>Procyon lotor</i>
	Skunk	<i>Mephitis mephitis</i>
	Opossum	<i>Didelphis marsupialis</i>
	Woodchuck	<i>Marmota monax</i>
	Mice	<i>Peromyscus spp.</i>
	Voles	<i>Microtus spp.</i>
Birds	Canada goose	<i>Branta canadensis</i>
	Mallard duck	<i>Anas platyrhynchos</i>
	Song sparrow	<i>Melospiza melodia</i>
	Blue jay	<i>Cyanocitta cristata</i>
	Northern cardinal	<i>Cardinalis cardinalis</i>
	Common yellowthroat	<i>Geothlypis trichas</i>
	Black-capped chickadee	<i>Parus atricapillus</i>
	Tufted titmouse	<i>Parus bicolor</i>
	Brown-headed cowbird	<i>Molothrus ater</i>
	Red-tailed hawk	<i>Buteo jamaicensis</i>
	Killdeer	<i>Charadrius vociferus</i>
	American crow	<i>Corvus brachyrhynchos</i>
	Great blue heron	<i>Ardea herodias</i>
	American goldfinch	<i>Carduelis tristis</i>
	Redwing blackbird	<i>Agelaius phoeniceus</i>
	Belted kingfisher	<i>Ceryle alcyon</i>
	Downy woodpecker	<i>Picoides pubescens</i>
	White-breasted nuthatch	<i>Sitta carolinensis</i>
	Swamp sparrow	<i>Melospiza georgiana</i>
	Song sparrow	<i>Melospiza melodia</i>
Mockingbird	<i>Mimus polyglottos</i>	
Mourning dove	<i>Zenaida macroura</i>	
Reptiles	Painted turtle	<i>Chysemys picta</i>
	Garter snake	<i>Thamnophis sirtalis sirtalis</i>
	Black racer snake	<i>Coluber constrictor constrictor</i>
Amphibians	Bull frog	<i>Rana catesbeiana</i>
	Wood frog	<i>Rana sylvatica</i>
	Spring peeper	<i>Hyla crucifer</i>

Plans are underway to restore to restore anadromous fish passage to approximately 30 miles of the lower Naugatuck River. The Connecticut DEP anticipates that annual runs of 23,000 American shad could be restored, making the long-troubled Naugatuck the third largest American shad fishery in the state. The project will restore other species of migratory fish as well, including blueback herring, alewife, and sea-run brown trout (TU, 1999).

The restoration effort includes dam removals, provision of fish passage facilities, and upgrades of several wastewater treatment plants to improve water quality. Five mainstem dams have been removed or breached. In 1999, dams in Waterbury (Anaconda, Freight Street and Platt's Mill) and the Union City Dam in Naugatuck were removed or breached. The Chase Brass Dam in Watertown was removed in 2004. Fish passage has been provided at the Kinneytown Dam in Seymour, including a fishway in 1999 and an eel bypass in 2003. A fish passage and recreational bypass at the Rimmon-Tingue Dam is designed and permitted but not yet constructed.

Kinneytown Fishway passage numbers for the spring 2007 season are as follows: sea-run brown trout (46), sea lamprey (354), striped bass (4), gizzard shad (15), tiger trout (4), brown trout (19), brook trout (1), white sucker (439) and smallmouth bass (42), walleye (1), sunfish (1), catfish (7) and carp (11)..

In 2007 a total of 710 tiger trout and brown trout were stocked for "sea-runs" in the Naugatuck River in early April.

5.5.4 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat" (EFH), and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. "

The Housatonic River (into which the Naugatuck River eventually flows) has been designated EFH for Atlantic salmon and for one or more life stage(s) of several marine, estuarine, and anadromous finfish species. Although salmon broodstock are stocked in the Naugatuck River for a recreational fishery, the river is not stocked with juvenile salmon or support a self reproducing salmon population.

The proposed project involves no work in Hop Brook or the Naugatuck River so a formal EFH review is not required.

5.6 Rare and Protected Species

5.6.1 Federally Proposed Threatened or Endangered Species

In a letter dated June 5, 2008 the U.S. Fish and Wildlife Service determined that no

Federally listed or proposed threatened or endangered species are known to occur in the project area.

5.6.2 State-listed Species

The bird survey conducted in June of 1991 by the Audubon Society and project personnel at the Hop Brook Lake project observed the sharp-shinned hawk (*Accipiter striatus*), a State threatened species utilizing the project area. The great blue heron (*Ardea herodias*) and the little blue heron (*Hydranassa tricolor*), both State Species of Special Concern and 16 species experiencing population decline in Connecticut were also observed at that time.

An endangered species survey was undertaken by the Connecticut Department of Environmental Protection, Natural Resources Center under contract with the Corps during the growing season of 1997 to determine the status of rare and protected species and outstanding natural communities in the Hop Brook Lake project area (CTDEP, 1998). This inventory evaluated the status of moths, butterflies, beetles, dragonflies and damselflies, freshwater mussels, freshwater snails, crayfish, fish, reptiles, amphibians, birds, small mammals and vascular plants.

During the aforementioned survey, a small population of Bush's sedge (*Carex bushii*), a Connecticut Species of Special Concern was discovered in a relatively undisturbed upland section of the site. This was a somewhat unexpected find, although the habitat in which it was found was similar to that of other known extant Connecticut populations. In addition, the eastern hognose snake (*Heterodon platirhinos*) and the ribbon snake (*Thamnaphis sauritus*), also Special Concern species were observed in the project area. One rare bird (proposed Special Concern), the brown thrasher (*Toxostoma rufum*), was previously recorded as confirmed in area which includes Hop Brook. No other rare occurrences were found.

In a letter dated July 29, 2008 the CT DEP Division of Wildlife indicated that the eastern hognose snake occurs in the vicinity of Hop Brook Dam. The CT DEP recommended measures to protect the snake during project construction in a letter dated August 12, 2008 (see Section 6.3).

5.7 Historic and Archaeological Resources

Archaeological survey and testing of several flood control projects in New England including Hop Brook Lake in the 1960's were conducted by Salwen (1966, 1967). Three pre-Contact sites were identified primarily through private collections and isolated finds. These sites are described in further detail below. Testing in these locations failed to uncover additional artifactual evidence.

A cultural resource survey of proposed recreational facilities at the day-use area of Hop Brook Lake by Wilson (1977) failed to yield any pre-Contact or Historic Period deposits.

Currently, a Historic Properties Management Plan developed for Hop Brook Lake (Atwood 1997) is used to manage the historic and archaeological resources of the project area and to serve as a guide for future planning and historic preservation activities in accordance with Section 110 of the National Historic Preservation Act (NHPA) of 1966, as amended.

Pre-Contact Period

An archaeological reconnaissance survey of the Hop Brook Lake project area was completed in 1986 by the Public Archaeology Laboratory, Inc. (PAL) of Rhode Island (Leveillee et al. 1986). Three pre-Contact sites mentioned in the literature (Salwen 1966, 1967) were field checked during the survey. The first, the Baker site, was located where the present permanent pool now stands and was probably destroyed during dredging operations for the pool. Project personnel have indicated that during these dredging operations “arrowheads” were found. No evidence or remains from this site were found during the reconnaissance.

The second site known as the Reagan site was located near the confluence of Welton and Hop Brooks. Salwen indicated that artifacts were found which indicated a series of occupations from the Laurentian (Late Archaic - 5,000-3,000 Years Before Present (B.P.)) through the Woodland Periods (2600-450 B.P.), although he concluded that no further work was required at the site. This area has since been severely impacted through the construction of a road, picnic areas and parking lot for the nearby beach at Hop Brook Lake.

The final pre-Contact site indicated was the Bradleyville site within the former settlement of Bradleyville located at the junctions of Routes 63 and 188. Stone implements had been found there in the nineteenth century, however excavations within portions of the project area revealed no evidence of pre-Contact remains.

Historic Period

There were four buildings and two small industries in the Hop Brook Lake project area by 1868. Most of the remainder of the 60 or so dwellings and outbuildings that were located in the project area date to the end of the nineteenth and the first half of the twentieth century. All standing buildings were demolished during the construction of the dam; the two industries were already absent by the time the dam was built in 1965. One, a blacksmith shop was apparently destroyed during the construction of Hop Brook as no remains were found. The other industry was the L. Bradley and Company Sawmill and Knife Factory whose mill and dwellings gave the name of Bradleyville to this location. Remains of this industrial site include foundations and stone work from the mill along Hop Brook together with several slab concrete foundations and stone walls which account for the only remaining evidence of Bradleyville within the project area.

5.8 Socio Economic Resources

5.8.1 General Setting

For this analysis, the study area is defined as the area which would be significantly affected by the failure of Hop Brook Dam based on the results of the dam-breach analysis. Socio-economic statistics for the study area are provided in Table 4.

The Hop Brook Lake flood control project is located on Hop Brook, in southwestern Connecticut. The reservoir lands include land in three communities, Naugatuck, Middlebury and Waterbury, Connecticut. The dam for the project is located in Naugatuck. The project reduces flows on Hop Brook and on the Naugatuck River, preventing flood damages in the towns of Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby, Connecticut. These towns line the Naugatuck River stretching from Naugatuck in the north to Derby in the south, where the Naugatuck River joins the Housatonic River. The cities and towns in which the project is located and which are protected by the project are all located within New Haven County.

The city of Waterbury, in which a portion of the reservoir land are located, is the second largest city in Connecticut in terms of population, and is the fifth largest city in the state in terms of labor force. The other towns in which the project is located and which are protected by the project are smaller, with populations ranging from about 5,000 to 31,000.

The city of Waterbury contains a large variety of commercial, industrial, and retail development and accordingly, the city has a large and diverse economic base. Due to its size, the city of Waterbury is very important to the economy of the western Connecticut area. The towns of Middlebury and Naugatuck, which border Waterbury to the west and south, respectively, are part of the Waterbury Labor Market Area and share in the economy of the Waterbury area. The towns of Beacon Falls, Seymour, Ansonia and Derby, towns which are protected by the project are all part of the Bridgeport Labor Market Area. Like Waterbury, Bridgeport is a large city with significant amounts of commercial and industrial development and a large and diverse number of employers. Between Waterbury and Bridgeport, the cities and towns in which the project is located and which are protected by the project are part of the large, diverse economy of southwestern Connecticut.

5.8.2 Flood Damage Reduction

The Hop Brook Lake flood control project reduces flood flows on the Naugatuck River, preventing flood damages in Waterbury, Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby, Connecticut. The project also reduces flows on the lower Housatonic River, contributing to flood damage prevention in the communities of Shelton, Orange, Milford, and Straford, Connecticut.

Since its construction in 1968, Hop Brook Dam has prevented a total of \$81,347,700 in flood damages. Averaged over 40 years (2007 – 1968), this yields average annual damages

Table 4: Socioeconomic Statistics for the Study Area.

Statistic	State of Connecticut	Waterbury	Middlebury	Naugatuck	Seymour	Antonia	Derby	Beacon Falls
Population (2007)	3,549,606	108751	6833	31365	15834	18880	12804	5393
Population density (persons per square mile land area, 2001)	709	3808	385	1914	1087	3131	2751	551
Median household Income (2007)	65859	41470	84214	61944	63639	51998	55360	68265
% of individuals below poverty level (1990)	7.9	16.0	2.7	6.4	3.7	7.6	8.3	5.9
Percent non-white (2001)	19.0	30.8	5.5	10.1	7.6	15.3	11.5	5.5
Infant mortality rate per 1000 live births (2001)	4.5	8.6	0.0	n.a.	n.a.	n.a.	0.0	0.0
Percent adults with college or advanced degree	31	14	42	19	19	15	18	27

prevented of \$2,033,700. Damages prevented by Hop Brook Dam for the past 14 years are shown in Table 5.

Table 5: Damages Prevented Hop Brook (1994-2007).

Year	Damages Prevented	
2007	7,550,00	7,701,000
2006	9,890,00	10,384,500
2005	0	0
2004	29,000	32,770
2003	0	0
2002	0	0
2001	0	0
2000	0	0
1999	291,000	375,390
1998	0	0
1997	494,000	661,960
1996	74,000	101,380
1995	0	0
1994	0	0

5.8.3 Recreation

The development and use of the Hop Brook Lake project as a recreational area was authorized by the Flood Control Act of 1944 (Public Law 534, 78th Congress, 2nd Session), as amended. Due to its close proximity to several large population areas, Hop Brook Lake is a popular recreation area. Even through periodic closings due to flood control activities and water quality problems the Hop Brook Lake project receives thousands of visitors annually.

The recreational facilities at the dam include picnic tables, fireplaces, a beach, three parking areas, sanitary facilities, a boat ramp, drinking water supply, and a changing house. The recreational facilities are managed by the Corps of Engineers. Recreational uses at the project include swimming, fishing, non-motorized boating, hiking, and picnicking. In Fiscal Year 2007 Hop Brook Lake accommodated 184,448 visitors.

The value of this recreational usage was estimated using the Unit Day Value (UDV) method (see Appendix B). With the UDV method, point values are assigned to five different aspects of the recreational resource being analyzed. Point values were assigned for the recreational resources at Hop Brook Dam as shown in Table 6.

Table 6: Unit Day Value Point Assignment Hop Brook

Criteria	Point Assignment
Recreation Experience	12
Availability of Opportunity	10
Carrying Capacity	3
Accessibility	12
Environmental	14
Total	51

These points are converted to a dollar value using the table contained in Economic Guidance Memorandum 08-02 (ACOE, 2007). The recreational usage at Hop Brook Dam is considered General Recreation. The 51 points convert to a dollar value of \$7.29 per user per day. Multiplying this value by the total number of visits per year of 184,448 yields a total annual value of the recreational use at Hop Brook Dam of \$1,344,000.

5.8.4 Infrastructure

The riparian corridor along the Naugatuck River downstream of the Hop Brook confluence is heavily developed (Figure 3). Infrastructure present includes 2 dams, 6 wastewater treatment plants, numerous bridges and a major north-south Connecticut state highway (Route 8). All of the treatment plants have been upgraded. The Waterbury Waste Water Treatment Plant (WWTP) upgrade was completed in 2000 at a cost of \$124 million. In recent years 5 dams have been removed from the Naugatuck River (The Annaconda, Freight Street Dam, Platt Mill Dam, Union City Dam in 1999, and the Chase Brass Dam in 2004). Two dams remain downstream of the Hop Brook confluence: the Rimmon-Tingue Dam and the Kinneytown Hydroelectric Project Dam. A fish passage ladder was constructed at the Kinneytown project in 1999 and an eel bypass in 2003. A recreational bypass and fish passage at the Rimmon-Tingue dam is designed and permitted. Corps of Engineers local flood control protection projects are present in Ansonia and Derby.

6.0 Environmental Consequences of the Recommended Plan

6.1 Overview

The recommended plan will reduce the risk of catastrophic failure of Hop Brook Dam. The plan would realize \$2,635,400 in net annual benefits, and a Benefit-to-Cost Ratio (BCR) of 28.3. The recommended plan will repair an existing dam and have no significant adverse effects on environmental resources.

6.2 Water Quality

Construction of the recommended plan is expected to have no impact on the water quality of Hop Brook Lake. All work will occur on the dam. Erosion controls measures will be in place to prevent waste material discharged during drilling and grouting operations from reaching the lake or Hop Brook. There is a risk that grout may seep through fissures in bedrock and enter Hop Brook downstream of the dam. A discharge would consist mostly of fine grained (clay) material. Because the grout is cement based, a discharge would likely have a high pH and be toxic to aquatic life. The extent of the downstream impact would depend on the volume of the discharge and the flow in Hop Brook. Mixing and dilution would occur and the impact would likely be limited to a several hundred feet downstream of the dam. An impact on Naugatuck River water quality is unlikely. Water quality of Hop Brook will be closely monitored during installation of the grout curtain. If any discharge into the brook is detected during grouting measures will be taken to reduce or eliminate the discharge. These measures may include changes in the composition of the grout mixture, relocation of the grout curtain, and capture or treatment of the grout plume at the discharge point.

6.3 Biological Resources

6.3.1 Aquatic Life

Construction of the recommended plan is expected to have no impact on aquatic life in Hop Brook Lake or Hop Brook. Some adverse effect on aquatic life in Hop Brook could occur if grout seeps into the brook during construction (see above, Water Quality). Measures employed to reduce and contain a discharge would protect aquatic life. Any adverse effects on aquatic life in Hop Brook would occur only near the dam and not extend to the Naugatuck River.

6.3.2 Wildlife

Noise and other construction activity will disturb wildlife occurring near the work area for about 6 -8 months. Little actual wildlife habitat will be directly disturbed because. Work will be confined to already developed areas (the dam and nearby staging areas current maintained as turf). Construction of the recommended alternative would have no long-term

adverse effects on wildlife or wildlife habitat.

6.3.3 Vegetation

Except for weeds growing on the dam embankment and turf in staging areas, no vegetation would be impacted by project construction. No work would occur in forested areas or shrubland. Turf disturbed during construction would be reseeded and should recover within one growing season.

6.3.4 Wetlands

No wetlands would be affected by construction of the recommended alternative.

6.3.5 Rare and Endangered Species

Construction of the recommend plan would not impact and federally listed threaten or endangered species (USFWS, 2008).

In a letter dated July 29, 2008 the CT DEP Division of Wildlife indicated that the eastern hognose snake occurs in the vicinity of Hop Brook Dam. Dirt or gravel roads or sandy areas near the work site may be suitable habitat for the snake. The CT DEP recommended measures to protect the snake during project construction in a letter dated August 12, 2008. These recommendations are listed below and will be incorporated into project plans and specifications.

- 1) No vehicles or heavy machinery should be parked overnight in any sandy areas adjacent to the dam, which Eastern hognose snakes may favor.
- 2) Excavated or stockpiled materials must not be located in any sandy areas adjacent to the dam which Eastern hognose snakes may favor.
- 3) Construction should be done during the active seasob for Eastern hognose snake, which is April 1 through November 1 since the snakes may be hibernating in sandy soil areas.
- 4) Silt fences should be removed as soon as the project is completed.
- 5) Construction workers should be apprised of the species description and possible presence and that any snakes encountered, while vehicles are traveling to and from the dam, or by workers at the dam should not be killed.

6.4 Historic and Archaeological Resources

In addition to the previously identified historic and archaeological sites at Hop Brook Lake (see above in “Affected Environment – Historic and Archaeological Resources”), several areas of moderate and high archaeological sensitivity were identified upstream of the dam primarily in the vicinity of Welton, Wooster, and Meshoddock Brooks (ACOE, 1986). However, the areas immediately surrounding the dam, spillway and conservation pool have all been assessed as having low archaeological sensitivity due to the original disturbance

from dam construction. Since the recommended plan of constructing a grout curtain would be confined to the existing footprint of the dam, no impacts to significant cultural resources are expected.

Therefore, the seepage repair remedy proposed for the Hop Brook Lake dam will have no effect upon any site or structure of historic, architectural or archaeological significance as defined by Section 106 of the NHPA and implementing regulations 36 CFR 800. The Connecticut State Historic Preservation Officer concurred with this determination in a letter dated May 27, 2008.

6.5 Socioeconomic Resources

6.5.1 Flood Damage Reduction and Economic Benefits

The total cost of the recommended alternative for repairs to Hop Brook Dam is estimated at \$1,800,000. This figure is converted to an annual value based on the fiscal year 2008 Federal interest rate for water resources projects of 4 7/8% and a period of analysis of 50 years, yielding an annual cost of \$96,700. This annual cost is compared to the annual benefits provided by the dam of \$1,562,100 to determine economic justification (see Appendix B). These figures are shown in Table 7.

Table 7: Economic Justification, Repairs to Hop Brook Dam

Annual Benefit	\$\$
Flood Damage Reduction	\$1,388,100
Recreation	\$1,344,000
Total Annual Benefit	\$2,732,100
Annual Cost	\$96,700
Net Annual Benefit	\$2,635,400
Benefit to Cost Ratio	28.3

6.5.2 Recreational Resources and Visitation

Construction of the recommend plan would have no significant adverse effect on recreational use of the Hop Brook Lake project. Although the construction site is normally accessible to the public, it is an infrequently visited location. Noise generated during construction could reduce the quality of the recreation experience at the nearby Hop Brook Lake swimming beach. The noise level is expected to be moderate however, and is unlikely to discourage many people from using the beach. Other day use areas at Hop Brook Lake are more distant from the construction site and should not be impacted by noise. During construction, access to Hop Brook near the dam outlet for fishermen may be restricted.

6.5.3 Environmental Justice and Protection of Children

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of an agency's programs, policies, and activities on minority populations and low-income populations. The proposed project is not expected to pose impacts upon any minority or low-income neighborhoods adjacent to or in the vicinity of the project pursuant to Executive Order 12898. Construction of the proposed project will be beneficial to all citizens of Waterbury and downstream communities. Therefore, no disproportionately high and adverse impacts specific to any minority or low-income neighborhood would occur as a result of the proposed project.

Executive Order 13045 “Protection of Children from Environmental Health Risks and Safety Risks” requires federal agencies to examine proposed actions to determine whether they will have disproportionately high human health or safety risks on children. During the construction phase of the proposed project, heavy construction equipment and vehicles will be transported to and stored at the site or at a nearby staging area. The actual site will be fenced off to prevent unauthorized personnel (including children) from entering the work area. There will be a temporary increase in truck traffic transporting materials to and from the site. These trucks will be limited to public roadways and increased traffic will be of short duration and temporary. Therefore, the proposed project is not expected to cause any disproportionate direct, or indirect or cumulative environmental health or safety risks to children.

6.6 Clean Air Act Conformity

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA state implementation plans for geographic areas designated as non-attainment and maintenance areas under the CAA. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The State of Connecticut is designated as attainment or non-attainment with respect to the NAAQS for 7 criteria air pollutants: particulate matter no greater than 10 micrometers in diameter (PM₁₀); particulate matter no greater than 2.5 micrometers in diameter (PM_{2.5}), sulfur dioxide (SO₂); ozone (O₃); nitrogen dioxide (NO₂); carbon monoxide (CO); and lead (Pb).

The USEPA has developed NAAQS for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The State of Connecticut is designated as attainment or non-attainment with respect to the NAAQS for 7 criteria air pollutants: particulate matter no greater than 2.5 micrometers in

diameter (PM₁₀); sulfur dioxide (SO₂); ozone (O₃); nitrogen dioxide (NO₂); carbon monoxide (CO); and lead (Pb).

Hop Brook Dam is located in Waterbury, New Haven County, has been designated as a non-attainment zone for two criteria pollutants. New Haven County is contained within a non-attainment zone for 8-hour ozone referred to as the “New York, N. – New Jersey – Long Island, NY-NJ-CT Region 1 – Connecticut” zone and is designated to be a region considered “moderate” non-attainment for the 8-hour ozone standard. The U.S. EPA promulgated NAAQS for fine particulate matter, i.e. particles with a mean aerodynamic diameter less than or equal to 2.5 micrometers (PM_{2.5}), on July 18, 1997. In January 2005, EPA designated New Haven County as non-attainment for PM_{2.5}. They based their conclusion on the premise that these counties were contributing to PM_{2.5} non-attainment in New York City. New Haven County is in attainment for all other criteria pollutants.

Section 176c of the CAA requires that Federal agencies assure that their activities are in conformity with state plans for non-attainment areas. The Corps must evaluate and determine if the proposed action will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone. If the total direct and indirect emissions caused by the operation of the federal action/facility are less than *de minimus* levels established in the rule, then a Record of Non-applicability (RONA) is prepared and signed by the facilities environmental coordinator.

Construction would occur over a period of about 6 months, and would use utilize bulldozers, dump trucks, pick-up trucks, drill rigs, front-end loaders, and other construction equipment. The State of Connecticut does not have requirements for non-road construction vehicle emissions, but does follow the final federal rules that establish emission standards for non road land based diesel engines. These are engines used mainly in construction, agricultural, industrial and mining operations. The federal engine standards, adopted in June 2004, are applicable to new equipment effective in the 2008 model year, phasing in over a number of years (40 Code of Federal Regulations Part 9).

Ana analysis of emissions of VOC’s and NOX expected to be emitted during project construction indicates the activity meets the *de minimus* requirement established by the EPA’s General Conformity Rule (see Attachment C for supporting documentation). Expected emissions are less than 10% the regional standard.

By requiring the road-based vehicles to comply with state emissions requirements, the Hop Brook Project will conform to the requirements of the Connecticut State Implementation Plan (SIP). Therefore, the proposed Corps activity will not worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SIP attainment schedule of the NAAQS, or otherwise contradict SIP requirements for the State of Connecticut.

In addition to the criteria pollutants, a wide variety of substances are classified as toxic or hazardous air pollutants (HAP). Toxic pollutants or HAP, such as benzene or chromium, present serious threats to human health and the environment. Toxic air pollution is a health

concern both in the vicinity of the emitting source and beyond. Exposure to toxic pollutants may yield various short- or long-term effects in humans. Short term effects include eye irritation, nausea, or difficulty breathing. Longer effects can include damage to the respiratory or nervous systems, birth defects, reproductive effects or cancer. The type and severity of the effect is determined by the toxicity of the pollutant, the quantity of the pollutant, the duration and frequency of exposure, and the general health and level of resistance or susceptibility of the person exposed. Toxic air pollutants can have indirect effects on human health through deposition onto soil or into lakes and streams, potentially affecting ecological systems and eventually human health through consumption of contaminated food (CTDEP, 2004a).

6.7 Cumulative Impacts

There are no other current or anticipated future actions related or unrelated to this project which would adversely affect aquatic habitat or riparian habitat along the Hop Brook or the Naugatuck River.

6.8 Relative Impacts of Alternative Plans

This section briefly compares the environmental consequences of the recommended versus alternative plans (see Section 3 for a description of alternative plans). The plans differ in cost, effectiveness, habitat impacts, and aesthetic impacts (Table 8). Based on this analysis, the recommended plan is the preferred plan based on cost and effectiveness, and has minimal environmental impacts.

7.0 Environmental Consequences of Dam Failure

This section assesses the impact of failure of the Hop Brook Dam on environmental resources, including natural resources, agricultural land, cultural resources, and recreation. The damage assessment describes the incremental damages caused by dam failure during a probable maximum flood (PMF).

A dam break analysis indicates that failure of the dam during a PMF flood would inundate areas along Hop Brook and the Naugatuck River. Flooding along the Naugatuck River would extend to the Naugatuck River-Housatonic River confluence, about 20 miles downstream of Hop Brook Dam (Figure 3). Portions of Waterbury and the towns of Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby, Connecticut would be affected. Dam break during a PMF event would inundate 3.5 square miles (2,240 acres).

Table 9: Inundation Caused by Dam failure.

Dambreak Event	Incremental Area Inundated by this Event (acres)	Total Area Inundated by this Event (acres)
Annual Peak	1,025	1,025
10 year	367	1,392
50 year	299	1,691
300 year	237	1,929
PMF	312	2,240

A PMF dam failure would damage a tremendous amount of infrastructure located on or near the river. Floodwaters would inundate several sewage treatment plants, sewer lines, water mains, town well fields, and overtop two functional dams.

A PMF flood with dam failure would severely degrade water quality. Both floods would redistribute thousands of cubic yards of sediment. The dam break scenario would also release hundreds of thousands of cubic yards of compacted fill and sediment from the dam and reservoir. High flows would likely carry much of this material to the Housatonic River. Sands and gravel would mostly settle out in the Naugatuck River behind dams while fine-grained material would likely be washed downstream to the Housatonic. Sediment deposited in the Naugatuck River area would gradually flush from the system.

Water quality of the Naugatuck River would also be severely degraded during both floods by release of petroleum products, raw sewage, industrial materials, and other contaminants from inundated areas. Water quality impacts would extend downstream to the Housatonic River, where for a time, natural flows of the river would be dwarfed by discharge of the sediment and contaminant laden waters from the Naugatuck.

A PMF flood with dam failure would inundate approximately 3.5 square miles. Analysis using CT GIS information shows that dam failure would inundate mostly floodplain habitat and developed areas near the river. Little agricultural land would be inundated. The duration of flooding would likely be short – less than one week in most areas. Although duration of flooding would not be long enough to cause significant mortality of trees and shrubs, considerable dieback of herbaceous vegetation would occur if the event occurred during the growing season. Some riparian habitat would likely be lost due to severe bank erosion. Other areas would be subjected to heavy siltation as floodwaters receded. Disturbed areas would be subject to colonization by invasive species such as Japanese knotweed (*Polygonum cuspidatum*) and common reed (*Phragmites australis*).

A PMF flood with dam failure would disrupt fish and wildlife populations. Most mammals would be unlikely to avoid the flood wave and perish. Morality of adult birds would be low, but most nests and nestling would be lost.

Many fish would be dislodged from their habitat and stranded in upland areas as floodwaters receded or flushed into the Housatonic River. It's unlikely that any fish species would be extirpated from the river, since recolonization would occur from unaffected upstream areas. Fish passage could be impaired by damage to fish ladders at the Kinneytown Dam.

A PMF flood with dam failure would adversely impact populations of rare plants and animals occurring in the Naugatuck River or Naugatuck River floodplain. Some species with limited distribution might be extirpated from the Naugatuck watershed. Erosion of riparian habitat supporting some rare plant populations would likely be more severe under the dam failure scenario.

A PMF flood with dam failure would impact a large number of historic structures. Most of the structures are located in areas that would be inundated under both flood scenarios.

Failure of the Hop Brook Dam would result in loss of all or part of Hop Brook Lake and associated wetlands. Under the worst-case scenario, approximately 22 acres of aquatic and wetland habitat maintained by the dam would be disturbed. If the dam were not rebuilt, hydrology of wetlands supported by the dam would be permanently altered and most of the wetlands would likely no longer be able to support hydrophytic vegetation. Loss of the dam would restore approximately 0.5 mile of free flowing stream habitat. Some new wetland habitat would redevelop along the restored river corridor and associated tributary streams. Much of the remaining former reservoir area would likely revert to forest.

Failure of the dam would result in loss of the warmwater fish community supported by Hop Brook Lake. The existing recreational value of the lake for swimming and fishing would be lost.

If the dam were not rebuilt, it's likely that most of the 558 acres owned in fee would remain in public ownership. If the land were sold to the private sector, open space now protected by the project would be subject to development.

9.0 Measures to Minimize Adverse Environmental Consequences

The following actions will be implemented to reduce adverse environmental affects of the recommended plan:

Erosion/Sedimentation Control and Water Quality Monitoring Plan

A plan will be developed to protect water quality and prevent sediment discharge to Hop Brook Lake. The plan will describe measures to prevent transport of sediment, tailings, and grout from the work areas. The plan will include measures to monitor water quality in Hop Brook for seepage of grout. Water quality will be continuously monitored during



Figure 3

construction. The plan will also describe remedial measures if a seepage event was to occur.

Measures to Protect Eastern hognose snake

Measures to protect the snake recommended by the CTDEP and listed in Section 6.3.5 will be incorporated into project Plans and Specifications.

10.0 Study Coordination

10.1 General

The following is a list of agencies and groups that were coordinated with during the course of the study:

Federal Agencies

U.S. Fish and Wildlife Service

State of Connecticut

Department of Environmental Protection

Bureau of Natural Resources

Connecticut Historical Commission

Tribal Historic Preservation Officers

10.2 Correspondence

During preparation of the draft EA coordination letters were sent to the following agencies

- United States Fish and Wildlife Service New England Field Office
- Connecticut Department of Environmental Protection, Bureau of Natural Resources
- Connecticut Department of Environmental Protection, Natural Diversity Database
- Connecticut Historical Commission, State Historic Preservation Officer

Letters and emails received from agencies and other interested parties are provided in Attachment A.

10.3 Public Notice and Subsequent Coordination

A public notice announcing the availability of the Environmental Assessment for public review was issued on September 20, 2008. The notice was sent to those known to have an interest in the Hop Brook Project and general email lists maintained by New England District Regulatory Division. A copy of the public notice is provided as an attachment.

10.4 Availability of Draft Decision Document and EA

Copies of the draft EA were sent to the following federal, state, and local government agencies:

Town of Naugatuck
Town of Waterbury

The draft EA was also available for review at:

Silas Bronson Public Library, Waterbury
Howard Whittemore Public Library, Naugatuck

11.0 References

40 Code of Federal Regulations Parts 9, 69, et al., Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel; Final Rule: Federal Register / Vol. 69, No. 124 / Tuesday, June 29, 2004 / Rules and Regulations.

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12. Compliance With Federal Environmental Statutes, Executive Orders, and Executive Memoranda.

12.1 Federal Statutes.

1. Archaeological Resources Protection Act of 1979, as amended, 16 USC 470 et seq.

Compliance: Not applicable. Project will not excavate or remove archaeological resources located on public or Indian lands.

2. Preservation of Historic and Archeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: Project has been coordinated with the State Historic Preservation officer. No impacts to archaeological resources are anticipated.

3. American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Compliance: Not applicable. Project will not impact access by Native Americans to sacred sites, possession of sacred objects, or freedom to worship through ceremonials and traditional rites.

4. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Public notice of the availability of this report to the Environmental Protection Agency is required for compliance pursuant to Sections 176c and 309 of the Clean Air Act.

5. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

Compliance: Not applicable. No fill will be placed in waters of the U.S.

6. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.

Compliance: Not applicable. The project is not located in the coastal zone.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish and Wildlife Service determined no formal consultation requirements pursuant to Section 7 of the Endangered Species Act.

8. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Applicable only if report is being submitted to Congress. Project is not in an estuary.

9. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Public notice of availability to the project report to the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

10. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the USFWS and State agencies signifies compliance with the Fish and Wildlife Coordination Act.

11. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Public notice of the availability of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

12. Marine Protection, Research, and Sanctuaries Act of 1971, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not applicable. Project does not involve the transportation or disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

13. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: Coordination with the State Historic Preservation Office signifies compliance.

14. Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3000-3013, 18 U.S.C. 1170

Compliance: Regulations implementing NAGPRA will be followed if discovery of human remains and/or funerary items occur during implementation of this project.

15. National Environmental Policy Act of 1969, as amended, 42 U.S.C 4321 et seq.

Compliance: Preparation of this Environmental Assessment signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

16. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for projects or programs authorized by Congress. The Hop Brook flood control project is Congressionally authorized.

17. Watershed Protection and Flood Prevention Act as amended, 16 U.S.C 1001 et seq.

Compliance: Floodplain impacts have been considered in project planning.

18. Wild and Scenic Rivers Act, as amended, 16 U.S.C 1271 et seq.

Compliance: This project is not located on a designated Wild and Scenic River.

19. Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.

Compliance: Not applicable.

20. Farmland Protection Policy Act, 7 U.S.C. 4201 et. seq.

Compliance: Not applicable. The project will not contribute to the conversion of farmland to nonagricultural uses.

12.2 Executive Orders

1. Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971

Compliance: Coordination with the State Historic Preservation Officer signifies compliance.

2. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2) (ii).

3. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: There will be no wetland impacts. Public notice of the availability of this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b).

4. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable. Applies to projects located outside the United States.

5. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Based on the findings in the EA, the proposed project is not expected to have a disproportionately high and adverse impact to minority or low income populations surrounding the project area.

6. Executive Order 13007, Accommodation of Sacred Sites, 24 May 1996

Compliance: The project area is not a sacred site.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. 21 April, 1997.

Compliance: Based on the findings in the EA, the proposed project will not create a disproportionate environmental health or safety risk for children.

8. Executive Order 13112, Invasive Species

Compliance: Project will not cause or promote introduction or spread of invasive species in the United States.

9. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000.

Compliance: Consultation with Indian Tribal Governments, where applicable, and consistent with executive memoranda, DoD Indian policy, and USACE Tribal Policy Principles signifies compliance.

12.3 Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable. The project does not involve or impact agricultural lands.

2. White House Memorandum, Government-to-Government Relations with Indian Tribes, 29 April 1994.

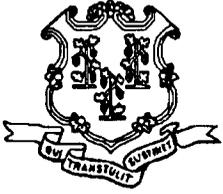
Compliance: Consultation with Federally Recognized Indian Tribes, where appropriate, signifies compliance.

13.0 Required Permits, Evaluations, and Certifications

No permits will be required.

ATTACHMENT A

CORRESPONDENCE RECEIVED



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FRANKLIN WILDLIFE MANAGEMENT AREA



391 ROUTE 32
NORTH FRANKLIN, CT 06254
TELEPHONE: (860) 642-7239

August 12, 2008

Mr. Mike Penko
US Army Corps of Engineers, New England District
696 Virginia Road
Concord, MA 01742-2751

re: Proposed seepage repairs to Hop Brook Dam, Naugatuck

Dear Mr. Penko:

Your request was forwarded to me on 8/6/08 from Dawn McKay of the Department of Environmental Protection's (DEP) Natural Diversity Data Base. Their records indicate that a Species of Special Concern: Eastern Hognose snake (*Heterodon platirhinos*) occurs in the vicinity of the Hop Brook Dam in the Naugatuck area of your project site.

Eastern hognose snakes favor dry sandy areas with well drained gravelly soils. This species has recently been negatively impacted by the loss of suitable habitat and is dormant from November 1 to April 1.

While work on the Hop Brook Dam should not affect the Eastern Hognose snake, the Wildlife Division has concerns that any dirt or gravel roads in the area may be suitable habitat for the species. Therefore, the Wildlife Division recommends that:

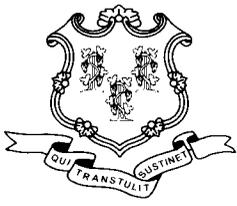
1. No vehicles or heavy machinery should be parked overnight in any sandy areas adjacent to the dam, which Eastern hognose snakes may favor.
2. Excavated or stockpiled materials must not be located in any sandy areas adjacent to the dam which Eastern hognose snakes may favor.
3. Construction should be done during the active season for Eastern hognose snake, which is April 1 through November 1 since the snakes maybe hibernating in sandy soil areas.
4. Silt fences should be removed as soon as the project is completed.
5. Construction workers should be apprised of the species description and possible presence and that any snakes encountered, while vehicles are traveling to and from the dam, or by workers at the dam should not be killed.

Please be advised that the Wildlife Division has not made a field inspection of the project nor have we seen detailed timetables for work to be done. Should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested. Consultation with the Wildlife Division should not be substituted for on-site surveys required for environmental assessments. If the proposed project has not been initiated within 6 months of this review, contact the NDDB for an updated review. If you have any additional questions, please feel free to contact me at Julie.Victoria@ct.gov, please reference the NDDB # at the bottom of this letter when you e-mail. Thank you for the opportunity to comment.

Sincerely,

Julie Victoria
Wildlife Biologist
Franklin Wildlife Management Area
391 Route 32
N. Franklin, CT 06254

cc: NDDB – 16234



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Natural Resources
Division of Wildlife
79 Elm Street, 6th Floor
Hartford, CT 06106
Natural Diversity Data Base

July 29, 2008

Mike Penko
US Army Corps of Engineers, New England District
696 Virginia Road
Concord, MA 01742-2751

RE: Proposed seepage repairs to Hop Brook Dam in Naugatuck, Seymour, Ansonia and Derby
Connecticut

Dear Mr. Penko:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed seepage repairs to Hop Brook Dam in Naugatuck, Seymour, Ansonia and Derby Connecticut. According to our information, there are records for State Special Concern *Heterodon platirhinos* (eastern hognose snake) from the vicinity of this project site. I have sent your letter to Julie Victoria (DEP-Wildlife; 860-642-7239) for further review. She will write to you directly with her comments.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Environmental Protection's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at (860) 424-3592. Thank you for consulting the Natural Diversity Data Base. Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Sincerely,



Dawn M. McKay
Biologist/Environmental Analyst

Cc: Julie Victoria, NDDB#16234

DMM/ss



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087
<http://www.fws.gov/northeast/newenglandfieldoffice>

June 5, 2008

Reference:	<u>Project</u>	<u>Location</u>
	Dam seepage repair study	Hop Brook Lake, Middlebury, Naugatuck, CT

H. Farrell McMillan
Chief, Engineering/Planning Division
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Dear Mr. McMillan:

This responds to your recent correspondence requesting information on the presence of federally-listed and/or proposed endangered or threatened species in relation to the proposed activity(ies) referenced above.

Based on information currently available to us, no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under Section 7 of the Endangered Species Act is not required.

This concludes our review of listed species and critical habitat in the project location(s) and environs referenced above. No further Endangered Species Act coordination of this type is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

In order to curtail the need to contact this office in the future for updated lists of federally-listed or proposed threatened or endangered species and critical habitats, please visit the Endangered Species Consultation page on the New England Field Office's website:

www.fws.gov/northeast/newenglandfieldoffice/EndangeredSpec-Consultation.htm

In addition, there is a link to procedures that may allow you to conclude if habitat for a listed species is present in the project area. If no habitat exists, then no federally-listed species are present in the project area and there is no need to contact us for further consultation. If the above conclusion cannot be reached, further consultation with this office is advised. Information describing the nature and location of the proposed activity that should be provided to us for further informal consultation can be found at the above-referenced site.

Thank you for your coordination. Please contact us at 603-223-2541 if we can be of further assistance.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Anthony P. Tur". The signature is written in a cursive style with a prominent initial "A".

Anthony P. Tur
Endangered Species Specialist
New England Field Office



Connecticut Commission on Culture & Tourism

May 27, 2008

Historic Preservation
and Museum Division

One Constitution Plaza
Second Floor
Hartford, Connecticut
06103

860.256.2800
860.256.2763 (T)

Mr. H. Farrell McMillan
Engineering/Planning Division
US Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Subject: Hop Brook Lake
Seepage Remediation Project
Middlebury and Naugatuck, CT

Dear Mr. McMillan:

The State Historic Preservation Office has reviewed the above-named project. This office expects that the proposed undertaking will have no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places.

This office appreciates the opportunity to have reviewed and commented upon the proposed undertaking.

This comment is provided in accordance with the National Historic Preservation Act and the Connecticut Environmental Policy Act.

For further information, please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,

Karen Senich
State Historic Preservation Officer

cc: Dr. Nicholas Bellantoni/OSA

ATTACHMENT B

FINDING OF NO SIGNIFICANT IMPACT

FINDING OF NO SIGNIFICANT IMPACT

Hop Brook Lake Seepage Control Project Waterbury, Connecticut

Hop Brook Dam has experienced seepage problems in the past during high pool events in 1984 and 1986. After the 1986 high pool event, project personnel observed a depression on the downstream embankment slope and remedial repairs were undertaken in 1988 to try to control the foundation seepage problems at the dam. The 1988 remedial repairs consisted of sand injection and installation of a toe drain to establish adequate filter zones in the seepage areas and prevent the continued movement of embankment material. Further analysis shows measures are needed to reduce seepage. Failure of the dam due to continued seepage would result in loss of life and severe economic and environmental impacts.

The recommended alternative would construct a 700-foot-long grout curtain within the existing dam. This plan is the preferred plan based on cost and effectiveness and has minimal environmental impacts.

I find that based on the evaluation of environmental effects discussed in this document, the decision on this application is not a major federal action significantly affecting the quality of the human environment. Under the Council on Environmental Quality (“CEQ”) National Environmental Policy Act regulations, “NEPA significance” is a concept dependent upon context and intensity (40 C.F.R. § 1508.27). When considering a site-specific action like the proposed project, significance is measured by the impacts felt at a local scale, as opposed to a regional or nationwide context. The CEQ regulations identify a number of factors to measure the intensity of impact. These factors are discussed below, and none are implicated here to warrant a finding of NEPA significance. A review of these NEPA “intensity” factors reveals that the proposed action would not result in a significant impact—neither beneficial nor detrimental—to the human environment.

Impacts on public health or safety: The project is expected to have no effect on public health and safety. The work will greatly reduce the risk of dam failure and associated economic losses.

Unique characteristics: None.

Controversy: The proposed project is not controversial. State and federal resource agencies agree with the Corps impact assessment.

Uncertain impacts: The impacts of the proposed project are not uncertain, they are readily understood based on past experiences the Corps has had with similar projects.

Precedent for future actions: The proposed project is authorized under an existing

federal law and will not establish a precedent for future actions.

Cumulative significance: As discussed in the Environmental Assessment, to the extent that other actions are expected to be related to project as proposed, these actions will provide little measurable cumulative impact.

Historic resources: The project will have no known negative impacts on any pre-contact archaeological sites recorded by the State of Connecticut.

Endangered species: The project will have no known positive or negative impacts on any Federal threatened or endangered species. Measures will be taken to protect the Eastern hognose snake, a state listed “special concern” species.

Potential Violation of State or Federal Law: This action will not violate federal law. The local sponsor will be responsible for obtaining necessary state and local permits.

There would likely be no need to lower Hop Brook Lake or alter flood control protocols during construction. Because grout could seep through fissures in bedrock and reach Hop Brook, water quality will be closely monitored during construction. If any grout reaches the brook immediate measures would be taken to reduce and contain the seepage. Measures to minimize adverse environmental affects of the proposed action are discussed in Section 9 of the Environmental Assessment.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the Hop Brook Seepage Repair Project is not a major Federal action significantly affecting the quality of the human environment. Therefore, I have determined that this project is exempt from requirements to prepare an Environmental Impact Statement.

Date

Philip T. Feir
Colonel, Corps of Engineers
District Engineer

ATTACHMENT C

AIR QUALITY CONFORMITY

GENERAL CONFORMITY - RECORD OF NON-APPLICABILITY

Project/Action Name: Hop Brook Seepage Repair Project
Waterbury, Conencticut

Project/Action Point of Contact: *Jay Mackay, Chief Environmental Resources Section*
phone: 978-318-8142

General Conformity under the Clean Air Act, Section 176 has been evaluated for the Mill River Section 206 Project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because: The State of Connecticut does not regulate emissions for non road construction equipment. By requiring the road-based vehicles to comply with state emissions requirements, the Hop Brook Project will conform to the requirements of the Connecticut State Implementation Plan (SIP).

Supporting documentation and emissions estimates are:

- ATTACHED
- APPEAR IN THE NEPA DOCUMENTATION (Section 6.8)
- OTHER

SIGNED

Jay Mackay, Evaluation Branch

General Conformity Review and Emission Inventory for the Hop Brook Seepage Repair Project														
(Worst Case Analysis)														
1	2	3	4	5	6	7	8	9	10	11				
Project Emission Sources and Estimated Power							NOx Emission Estimates		VOC Emission Estimates					
	# of	hp	LF	hrs/day	Days of	hp-hr	NOx EF	NOx Emissions	VOC EF	VOC Emissions				
Equipment/Engine Category	Engines	hp	LF	hrs/day	Operation	hp-hr	(g/hp-hr)	(tons)	(g/hp-hr)	(tons)				
Pick-up Truck	3	200	1.00	3	270	486,000	9.200	4.93	1.300	0.70				
Pumps	1	5	1.00	2	100	1,000	9.200	0.01	1.300	0.00				
Drill Rig Compressor	2	400	1.00	12	270	2,592,000	9.200	26.29	1.300	3.71				
Truck, 330 HP	1	330	1.00	12	5	19,800	9.200	0.20	1.300	0.03				
Concrete Mixer	1	8	1.00	12	270	25,920	9.200	0.26	1.300	0.04				
Dozer, 200 HP	1	200	1.00	2	36	14,400	9.200	0.15	1.300	0.02				
Total Emissions							NOx Total	31.83	VOC Total	4.50				
Horsepower Hours														
hp-hr = # of engines*hp*LF*hrs/day*days of operation														
Load Factors														
Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile. For this worst case estimate, LF is held at 1 for all equipment. Typical is 0.4 to 0.6														
Emission Factors														
NOx Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr														
VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr														
Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)														
Emissions (tons) = Emissions (g) * (1 ton/907200 g)														
Note: Duration of project is 10 months.														

Actual Work Days of Construction

Assumptions:

Project construction period is 10 months. Over 1 construction seasons
Project construction occurs 7 days per week.
There are 10 holidays in a calendar year.
There are 30 weather days (no work) in a year.

Actual work days = construction duration (days) - weekend days off - holidays off - weather days off.

Specify	Calculated	Specify	Specify
Duration	Weekend days off	Holidays	Weather days
660	0	0	0

Actual work days = 270

ATTACHMENT D

DRAFT PUBLIC NOTICE



Public Notice

U.S. Army Corps
Of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

Date: September 20, 2008

Comment Period Closes: October 20, 2008

Planning Branch, Engineering/Planning Division

HOP BROOK LAKE SEEPAGE REMEDIATION
WATERBURY AND NAUGATUCK, CONNECTICUT

Interested parties are hereby notified that the U.S. Army Corps of Engineers has prepared an Environmental Assessment for a proposed dam repair project in Middlebury, Connecticut. Comments are requested within 30 days of the date of this notice.

Project Description:

Hop Brook Dam has experienced seepage problems during high pool events in 1984 and 1986. After the 1986 high pool event, project personnel observed a depression on the downstream embankment slope and remedial repairs were undertaken in 1988 to try to control the foundation seepage problems at the dam. The 1988 remedial repairs consisted of sand injection and installation of a toe drain to establish adequate filter zones in the seepage areas and prevent the continued movement of embankment material. Fifteen piezometers were also installed at the dam to monitor seepage through the embankment and foundation. Further analysis shows measures are needed to reduce seepage. Failure of the dam due to continued seepage would result in loss of life and severe economic and environmental impacts.

Hop Brook Lake is located in western Connecticut in the lower Naugatuck River Watershed of the Housatonic River Basin (see Attached Location Map). The dam is located on Hop Brook, 1.4 miles above its confluence with the Naugatuck River, 3 miles southwest of Waterbury, Connecticut in New Haven County.

The recommended alternative would construct a 700-foot-long grout curtain along the existing foundation cut-off alignment. This has a surface expression of a chevron shape that runs from the crest at the right end down to Elevation 315 ft. (five feet above the normal pool elevation), underneath the service tower bridge, and up the upstream face to the crest at the left end. The grout curtain would consist of 3 lines, 5 feet apart, with primary holes drilled 10 feet apart, to a depth of 65 feet below the top-of-rock. Secondary holes would be drilled at 5 feet intervals. The outer two lines would consist of vertical holes, with the central line holes inclined 15 degrees. Inclined drilling would be incorporated to construct the curtain around the conduit. Grout would be a Type III Portland cement-based grout. A computerized control system [e.g. Intelligrout (TM)] would be utilized for aiding in grout placement. There would likely be no need to lower Hop Brook Lake or alter flood control protocols during construction. Because grout could seep through fissures in bedrock and reach Hop Brook water quality will be closely monitored during construction. If any grout reaches the brook immediate measures would be taken to reduce and contain the seepage.

U.S. Army Corps of Engineers -Hop Brook Seepage Repair Public Notice

Environmental Benefits and Adverse Impacts:

A draft Environmental Assessment and Finding of No Significant Impact have been prepared for this project and are available for review (see below). A preliminary determination has been made that an Environmental Impact Statement is not required under the provisions of the National Environmental Policy Act.

Endangered Species: No impacts to state or federally threatened or endangered species are expected. Measures will be taken to minimize risk to the Eastern Hognose snake, a species of special concern in Connecticut.

Cultural Resources: No impacts.

Federal Consistency with Coastal Zone Management: The proposed activities are outside the coastal zone and not under review under the State of Massachusetts' federally approved Coastal Zone Management Program.

Clean Water Act: There will be no discharge of fill material into water of the United States. Specifications will require measures to protect water quality from possible incidental discharges during construction.

Compliance: This recommended plan is in compliance with all applicable Federal environmental laws and regulations (see Attachment A).

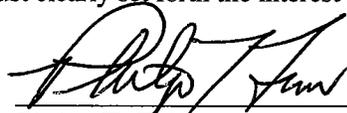
Coordination: The proposed work is being coordinated with the following Federal and State agencies:

Federal	State of Connecticut
U. S. Fish and Wildlife Service Environmental Protection Agency Region 1	CT Department of Environmental Protection CT Historical Commission CT Bureau of Natural Resources

Availability of the Draft Decision Document and Environmental Assessment: Copies of the reports are available at several locations (see Attachment B) and on the internet at www.nae.usace.army.mil (click on "Projects" and follow links). Additional information and copies of the reports on compact disc (CD) may be obtained from the Engineering/Planning Division of the U.S. Army Corps of Engineers, Mr. Mike Penko, Environmental Manager (978-318-8139; michael.penko@usace.army.mil.).

Public Comments: Comments on the draft decision document and Environmental Assessment are invited from all concerned parties and should be directed to the District Engineer at 696 Virginia Road, Concord, MA 01742, ATTN: Engineering/Planning Division (Ms. Jen Flanagan, 978-318-8015), within 30 days of this notice. Any person who has an interest, which may be affected, by the proposed project may request a public hearing. The request must be submitted in writing to me within 30 days of the date of this notice and must clearly set forth the interest and the manner in which the interest may be affected.

31 August 08
Date


Philip T. Feir
Colonel, Corps of Engineers
District Engineer

Attachments

Attachment A

PERTINENT FEDERAL LAWS, REGULATIONS AND DIRECTIVES

American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Archaeological Resources Protection Act of 1979, as amended, 16 U.S.C. 470 et seq.

Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972), 33 U.S.C. 1251 et seq.

Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-1

Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94-265

National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq. This amends the Reservoir Salvage Act of 1960 (16 U.S.C. 469).

Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Executive Order 11988, Floodplain Management, May 24, 1977 amended by Executive Order 12148, July 20, 1979

Executive Order 11990, Protection of Wetlands, May 24, 1977

Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971 (36 FR 8921, May 15, 1971).

Executive Order 13007, Accommodations of Sacred Sites, May 24, 1996.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994.

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, April 21, 1997.

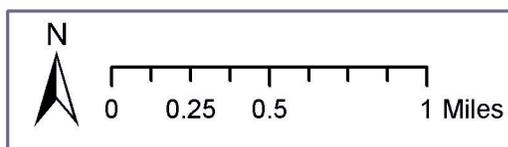
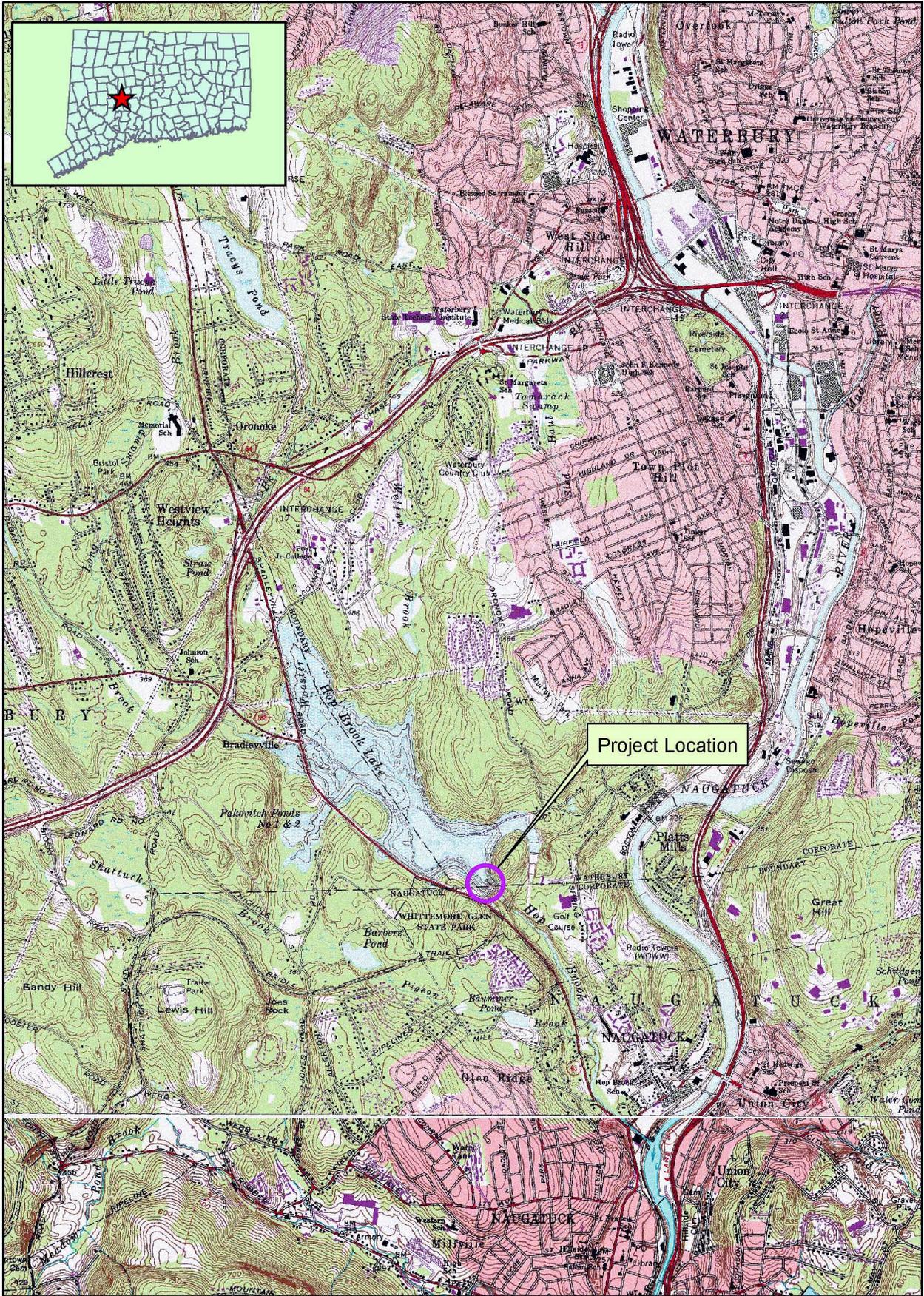
White House Memorandum, Government-to-Government Relations with Indian Tribes, April 29, 1994.

Attachment B

Copies of the draft Environmental Assessment are available for viewing at the following locations:

Silas Bronson Library 267 Grand Street, Waterbury, CT 06702 Phone: 203-574-8225

Howard Whittemore Library 243 Church Street Naugatuck, CT 06770 Phone: 203-729-4591
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Hop Brook Lake
Seepage Remediation Project
Location Map