2.5. HISTORIC AND ARCHAEOLOGICAL RESOURCES

2.5.1. Existing Conditions

A historic and archaeological resource analysis evaluates the ways a project's proposed construction activities might physically alter a historic resource, where proposed activities may be close enough to a historic resource to potentially cause accidental damage, and where subsurface disturbance may adversely affect archaeological resources. Resources encompass buildings, structures, sites, and objects of historical, aesthetic, cultural and archaeological importance. In an archaeological analysis, data must be gathered from the surrounding area to predict the likelihood of resources existing in the project study area. Historic and archaeological resource analyses are typically conducted in three phases. A Phase I Archaeological Survey involves background investigation, site inspection and limited sub-surface investigations to determine if a site has possible historical and archaeological potential, with Phase IA focusing on the background investigation through a document search and Phase IB focusing on site investigation. A Phase II Site Examination involves a more extensive sub-surface investigation of any site with historical and archaeological potential and supplemental background investigation beyond that done for a Phase I Site Examination. Finally, A Phase III Data Recovery Plan (DRP) includes excavation to recover the sites' historical and archaeological potential.

2.5.1.1. Historic Resources.

In 1914, the City of New York identified the location for the Dam and the Reservoir in order to augment the City's water supply needs. The Schoharie Reservoir - Gilboa Dam project was started in 1919 and completed on July 24, 1926 with water first flowing over the Dam spillway on October 20, 1927. The Dam was constructed as a Stair-Stepped gravity cyclopean concrete and stone masonry spillway with a rolled Earthfill Embankment. The total length of the Dam, from the stone wall on top of the right (east) spillway abutment to where the embankment ties into the left (west) slope is 2,090 feet. Based on current surveys, the crest of the spillway section is at Elevation 1,130 feet National Geodetic Vertical Datum (NGVD), the crest length is 1,326 feet, and its width is 15 feet. The Spillway crest is uniform and controls the normal water surface of the Reservoir. When the water surface level in the Reservoir exceeds Elevation 1,130 feet, flow occurs over the entire Spillway crest, cascading down a maximum of nine steps on the downstream face. The original mortared stone masonry steps were 8.5 to 20 feet wide and 6 to 20 feet high. The vertical distance from the crest to the downstream toe of the gravity section varies from 30 to 155 feet. Please refer to Section 1.4.1.3 Project Description for further Dam details.

The Earthfill Embankment, consisting of homogeneous soil fill, is separated from the spillway portion by the West Training Wall, constructed of cyclopean concrete and faced with cut bluestone blocks. The bluestone was quarried from two sites in close proximity to the Dam: Stevens Mountain and Riverside Quarry. Bluestone is a common building material of that era and continues to be used. For instance, there is a quarry on the Virginia/West Virginia border that still provides bluestone for masonry use. The bluestone quarries near the Dam were unique in that fossilized trees were found by a local pastor in the area in the 1800s and many more were found during the Dam work at the quarry locations and as part of the foundation excavation.

2.5.1.2. Archaeological Resources.

The potential for archaeological resources in the project area is high given portions of the proposed work is located within the boundaries of the historic Town of Gilboa (historic Town) which was settled early in the nineteenth century. This proposed project encompasses a number of clustered residences, as well as the northern outskirts of the historic Town, which contained more widely dispersed residences associated with farms and some rural industries. In addition, parts of the project area served as a staging area during the original Dam construction from 1919 to 1927. Research indicates that most landowners sold their properties to New York City around 1919. This was followed by a period when some standing buildings served as boarding houses for skilled and managerial workers associated with the Dam's construction. Records show that several labor camps existed in the area. After completion of the Dam, any remaining structures were burned and demolished.

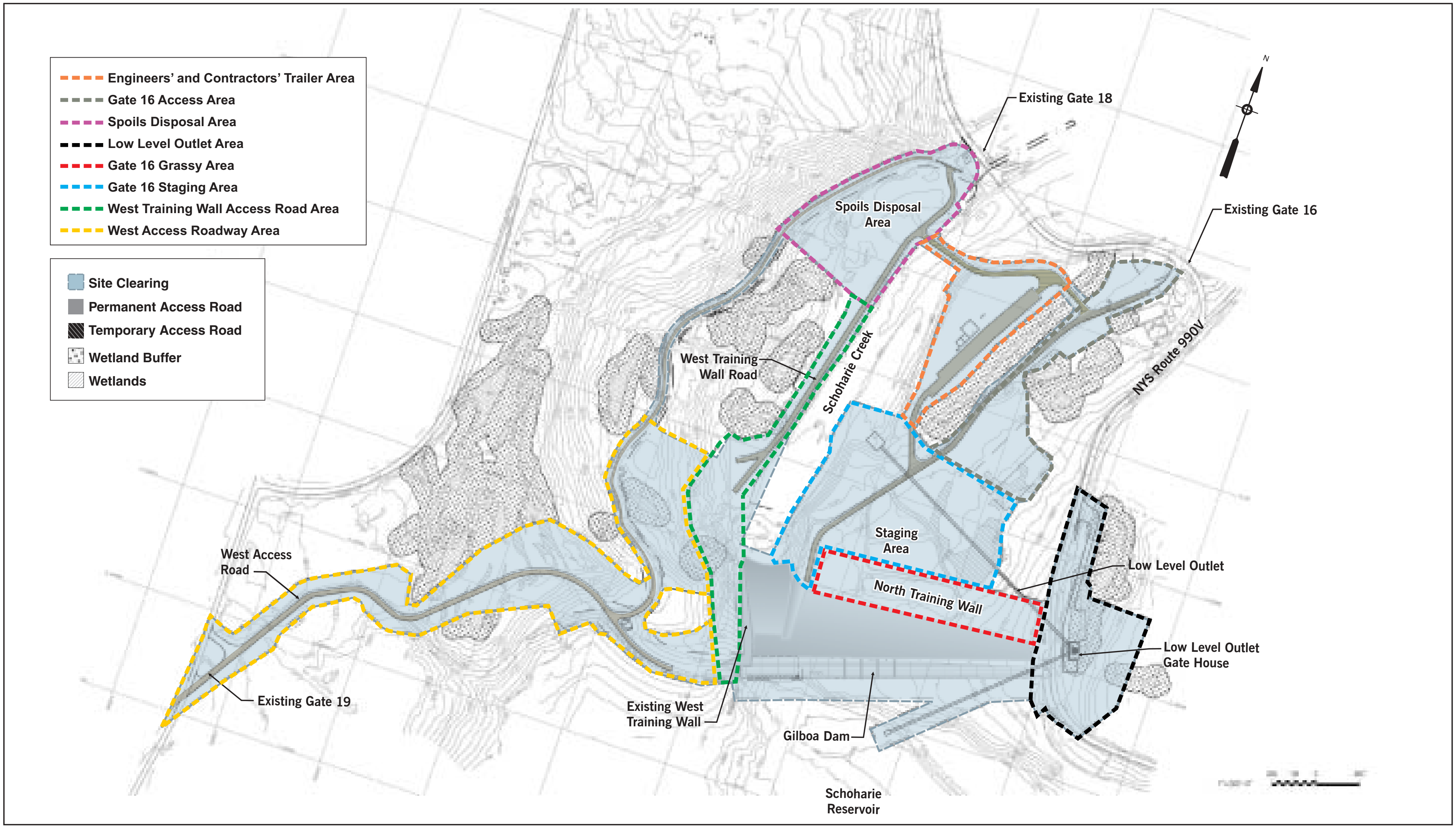
As a result of research potential that exists in the area, the NYCDEP has conducted various investigations, in accordance with NYSOPRHP procedures, to identify and determine the significance of any archaeological resources identified within areas that may potentially be disturbed as a result of the proposed project. Three general themes were used to interpret the archaeological results and determine the significance of sites examined. These three themes included nineteenth century development of the historic Town, worker housing during Dam construction, and demolition of historic Town structures after Dam construction. This work is described in the following sections.

2.5.1.3. Site Examinations.

In early 2005 the NYCDEP initiated a project to remove and properly dispose of approximately 5,000 cubic yards of dredged accumulated sediments from the Shandaken Tunnel Intake in the Reservoir which was subject to a separate environmental assessment (CEQR No. 04DEP217U). The Shandaken Tunnel Intake is located on the western shore of the Reservoir about three miles south of the Dam. The dredge material disposal area is located immediately downstream (north) of the Dam on a terrace east of Schoharie Creek in the northern portion of the Gate 16. The entire Gate 16 Area encompasses the proposed project's Engineers' and Contractors' Trailer Area, Gate 16 Access Area, Gate 16 Grassy Area, and Gate 16 Staging Area(see Figure 2.5-1). There were no identified cultural resources issues at the Shandaken Tunnel Intake work area. However, the Gate 16 temporary disposal site is located within the boundaries of the historic Town, which was settled early in the nineteenth century. As a result, the NYCDEP prepared and submitted to the NYSOPRHP a Phase I Archaeological Survey of the proposed Gate 16 disposal site in March of 2005. This Survey revealed that the Gate 16 disposal site contained several features including two (2) stone foundations, one (1) stone-lined shaft feature, a loading platform, and two (2) sets of four (4) concrete pillars that supported towers during the construction of the Dam. After its review, which was conducted in accordance with Section 106 of the National Historic Preservation Act and relevant implementing regulations, NYSOPRHP recommended that a Phase II Site Examination be completed on the two stone foundations and the shaft feature since they were found to be potentially eligible for listing on the National Register of Historic Places (National Register) as part of the historic Town. However, the loading platform and two sets of four pillars were interpreted to be from structures constructed by the Board of Water Supply for the administration of the Dam in the second and third decades of the 20th century. These features were determined not to be eligible for listing on the National Register as they lack associated features other than the Dam itself. Therefore, it was recommended that no further investigation be conducted and no evaluation be completed for the loading platform and pillars. Based on the Phase II investigations in the northern portion of the Gate 16 area, archeologists identified three areas of potential artifact concentrations and designated three sites: J.Reed Site, Gilboa 1 Site, and Gilboa 2 Site (see Figure 2.5.3).

While conducting investigations at the northern portion of the Gate 16 area, it was determined that the Gate 16 Grassy Area would also be used for sediment disposal (Figure 2.5-1). The Gate 16 Grassy Area is a narrow strip approximately 50 to 65 feet wide and 1120 feet long. It is gently sloping for approximately 785 feet, west to east, where it becomes very steeply sloping (Grassy Area see Figure 2.5-2). The deposition of sediments proposed for this location would bury and effectively seal off the current surface of the project area. A Phase IB survey was recommended. Excavation in the area revealed only a small portion of intact soils, while other subsurface investigations indicated a vast majority of the original soil and associated resources were removed during the original Dam construction and replaced by fill materials. Therefore, no further work was recommended for the Gate 16 Grassy Area.

It was further determined that other areas beyond the Gate 16 Grassy and northern Gate 16 areas designated for sediment disposal, may be impacted as the result of the proposed Dam reconstruction. These areas included portions of land on the east side of the Dam, the LLO Area (6.88 acres), Spoils Disposal Area (6.42 acres), West Training Wall Access Road Area (4.59 acres), and West Access Road Area (9.18 acres) (Figure 2.5.1). A Phase IB examination was completed and identified research potential in the area. It was recommended that a Phase II study be completed in these areas that may be disturbed by Dam reconstruction activities to determine if resources eligible for the National Register were present and could potentially be impacted as a result of the proposed Dam reconstruction activities. However, the Riverside Quarry Site was determined to have research potential restricted to palaeobotany and geology, and therefore was not recommended for Phase II study.



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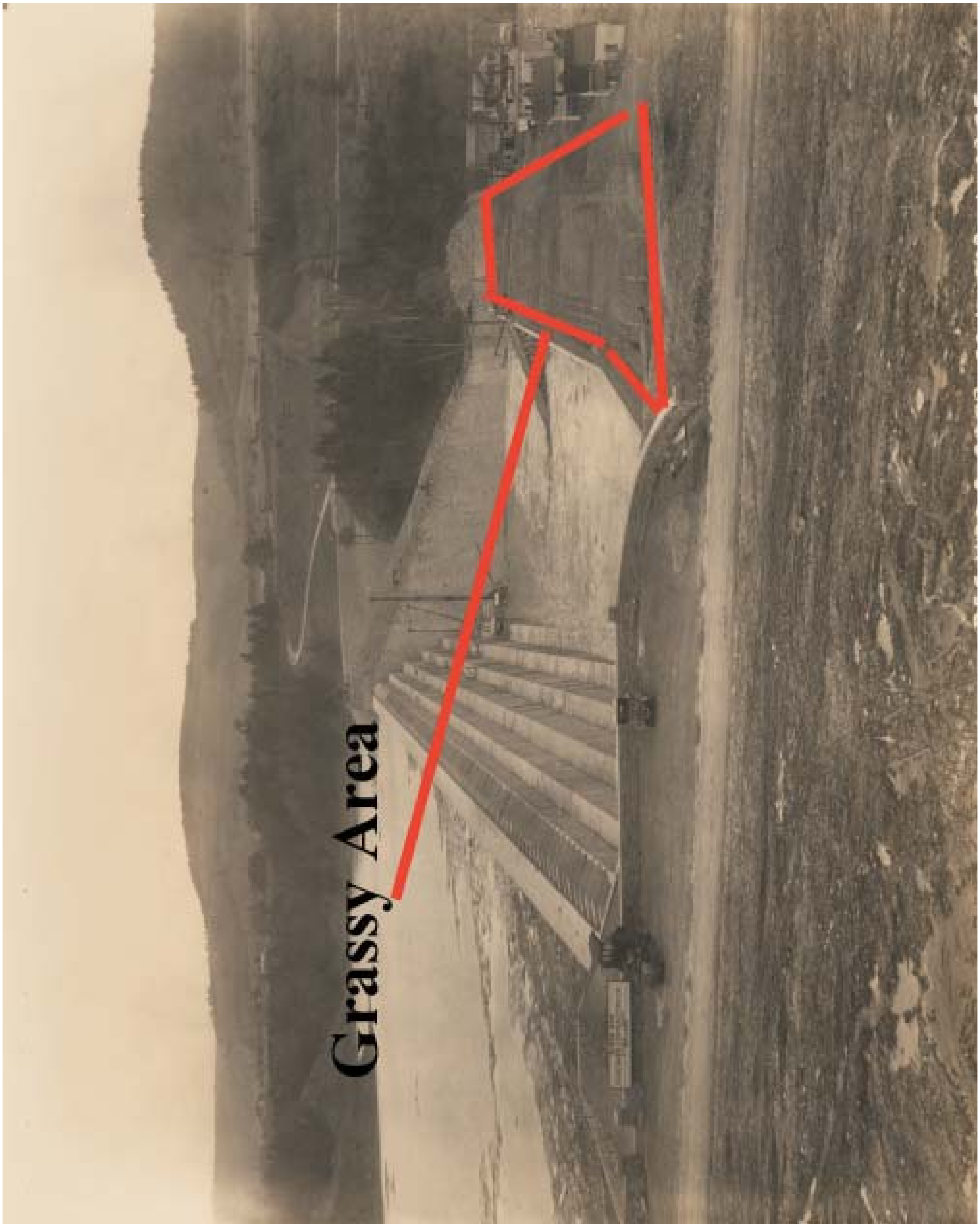
Historic and Archaeological Areas of Investigation

Figure 2.5-1



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Historic Photo of Grassy Area

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Figure 2.5-2

These Phase II Site Examinations identified nine potential historic and prehistoric sites within the project area: Gilboa 3, Gilboa 4, Gilboa 5, Buckingham, Mackey 1, Mackey 2, J. Cronk 1, J. Cronk 2 and Vroman Sites (see Figure 2.5-3), in addition to the three identified in the Gate 16 area. No prehistoric sites were identified. A summary of all twelve Phase II Site Examinations is as follows:

Gilboa 1 – Eligible for the National Register; foundation remains present. Data recovery recommended or avoidance of impacts.

Gilboa 2 – Not eligible for the National Register. No data recovery recommended, low research potential. No impact avoidance necessary.

J. Reed – Eligible for the National Register; foundation remains present. Data recovery recommended or avoidance of impacts.

Gilboa 3 Site – Not eligible for the National Register. No data recovery recommended, low research potential. No impact avoidance necessary.

Gilboa 4 Site – Eligible for the National Register; contributes to research on the nineteenth century development of rural fringes around the Village. Data recovery recommended or avoidance of impacts.

Gilboa 5 Site (South Locus) - Eligible for the National Register; contributes to research on the nineteenth century development of rural fringes around the Village. No data recovery recommended since sufficient recovery took place during Phase II sampling.

Gilboa 5 Site (North Locus) - Not eligible for the National Register. The materials consisted of trash likely associated with the laborers who built the Dam. It is possible that one of the labor camps could have occupied this land. It is also possible that the residence housed Dam workers. Although not eligible for the National Register, data recovery or avoidance of impacts was recommended.

Mackey 1 Site – Not eligible for the National Register. No data recovery recommended, low research potential. No impact avoidance necessary.

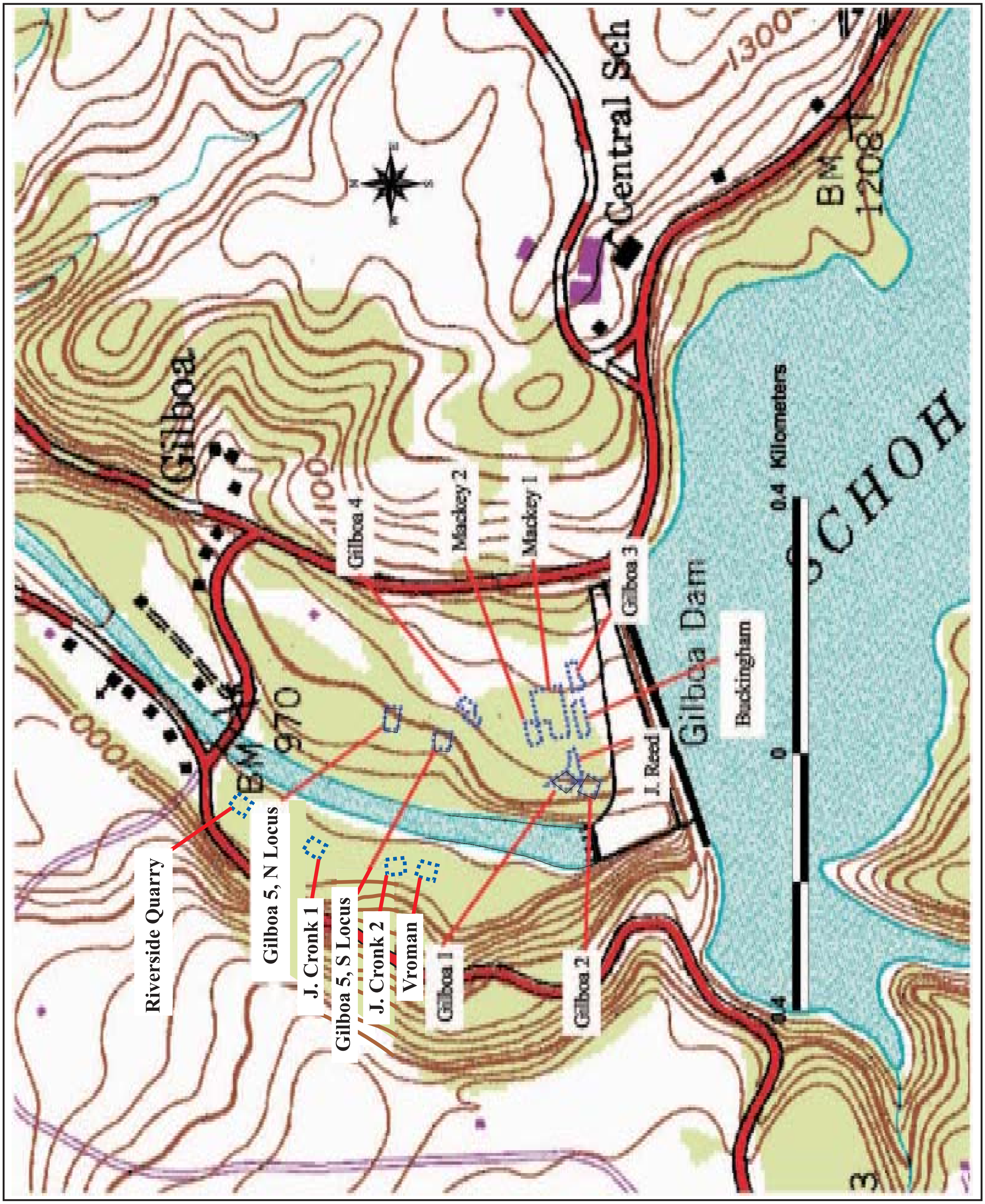
Mackey 2 Site – Not eligible for the National Register. No data recovery recommended, low research potential. No impact avoidance necessary.

Buckingham Site – Not eligible for the National Register. No data recovery recommended, low research potential. No impact avoidance necessary. This site was originally called the Bartholomew site, but historic records give a clearer spelling of the landowner's name. The site had connections to the nineteenth century village, in particular a family of blacksmiths. There was also a clear association with the last era of Gilboa i.e., final demolition of the structures through burning and razing. This process also caused disturbances to the site and limited its research potential.

J. Cronk 1 Site – Eligible for the National Register; contributes to research on the nineteenth century development of rural fringes around the Village. Diversified assemblage associated with former occupants as well as foundation remains and two possible stone walls. Data recovery recommended or avoidance of impacts.

J. Cronk 2 Site – Eligible for the National Register; contributes to research on the nineteenth century development of rural fringes around the Village. Diversified assemblage associated with former occupants. Data recovery recommended or avoidance of impacts.

Vroman Site – Eligible for the National Register; contributes to research on the nineteenth century development of rural fringes around the Village. Diversified assemblage of artifacts related to architecture, specifically widow glass and nails. Data recovery recommended or avoidance of impacts.



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Location of Identified Gilboa Dam Examined Sites

Figure 2.5-3

Seven of these sites, J. Reed, Gilboa 1, Gilboa 4, Gilboa 5 (North Locus), J. Cronk 1, J. Cronk 2 and Vroman were determined to be potentially eligible for the National Register and were recommended for data recovery if impacts could not be avoided (see Figure 2.5.3). These seven sites potentially could contain materials that would contribute to research on the nineteenth century upper historic Town and to worker contexts related to the early twentieth century construction of the Dam.

Since it was subsequently determined impacts could not be avoided to these seven sites, Phase III DRPs were required. Work associated with these DRPs has been completed for the J.Reed, Gilboa 1, Gilboa 4 and Gilboa 5 (North Locus) sites and will be completed for the remaining sites prior to the commencement of reconstruction activities.

Field excavations at the J. Reed, Gilboa 1, Gilboa 4 and Gilboa 5 Sites identified multi-component historic sites with periods representing the nineteenth-century occupation of the Village and the use of the land during the construction of the Dam during the 1920s. The north locus of the Gilboa 5 Site recovered information primarily related to the work camps of the construction laborers for the Dam in the 1920s. The DRP for these four areas was subsequently accepted by NYSOPRHP in May 2007. A summary of the examinations at J. Reed, Gilboa 1, Gilboa 4 and Gilboa 5 is as follows:

J. Reed Site:
Description - The site covers approximately 2,712 square feet and is contained entirely within the project limits.

Field Work - Field crews excavated 29 3-foot by 3-foot units of earth and 3 Features during data recovery. Features identified included two stone foundations and a dark stain in one of the soil units.

Summary of Artifacts - The functional diversity suggested a high potential to yield information to date the site and address economic class issues. The preliminary assessment confirms the results of the site examination, with significant quantities of creamware, pearlware, and redware in the assemblage. Additionally, there were a significant number of kaolin pipe fragments found throughout the site, but a particular concentration was noted in the second feature, a suspected root cellar. Overall, some 10,000 additional artifacts were recovered.

Gilboa 1:
Description - The site covers approximately 7,610 square feet within the project boundaries and is contained entirely within the project limits.

Field Work - Field crews excavated 31 3.3-foot by 3.3-foot units of earth and small pits at 5 meter intervals surrounding one feature. This feature was uncovered during excavation, which consisted of a 10.5 meter x 5.57 meter ashlar (square stone) foundation. This feature is a stone foundation that possibly served as a steam power plant. Overall some 10,000 additional artifacts were recovered.

Summary of Artifacts - Artifacts from this section of the site are consistent with material associated with the construction of the Dam during the 1920s, including a 1924 dime, rubber, and plumbing fitting, associated with the stone foundation mentioned above.

Gilboa 4:
Description - The site covers approximately 2,335 square feet and is contained entirely within the project limits.

Field Work - Field crews excavated 23 3.3-foot by 3.3-foot units of earth and uncovered portions of a stone walkway. The site is associated with a fieldstone residential foundation and two fieldstone wells. No significant artifact concentrations were found in association with these features. Overall some 5,000 additional artifacts were recovered.

Summary of Artifacts - Three units of earth at the northeast section of the site contained a layer of culturally sterile rock fill over a compact soil stratigraphy similar to the rest of the site. It appears that this section had a layer of rock fill deposited over the nineteenth century occupational layers, probably during the construction of the Dam. Two units of earth at the extreme northern end of the site had fill composed of large rocks. These rocks were large enough to hinder excavation. The general stratigraphy for the site appears to be intact with occasional intrusions related to the initial construction of the Dam during the 1920s.

Gilboa 5 (Northern Locus):
Description - The Northern Locus of the site covers approximately 8,729.5 square feet and is contained entirely within the project limits.

Field Work - The Northern Locus yielded over 3,500 historic artifacts and 181 faunal remains from 18 small pits and 4 3.3-foot by 3.3-foot units of earth. The majority of these artifacts came from a cluster in the center of the locus identified during the Phase II site examination as a historic trash dump. The majority of the units excavated during the data recovery were positioned in this cluster to gain the most data as possible. Three 3.3-foot by 3.3-foot units were placed along the assumed perimeter of the trash dump to identify the boundary of the trash dump. The other units consisted of four 6.5-foot by 3-foot units excavated at the center of the cluster of artifacts. Overall, some 5,000 additional artifacts were recovered.

Summary of Artifacts - The three perimeter units had a shallow deposition of cultural material. There were few artifacts in two of the three perimeter units having mostly nails, glass, and ceramics. The third perimeter unit had a charcoal lens, possibly associated with the trash dump. Most of the artifacts from this unit came from the charcoal lens and included bottle glass, metal objects, personal items (belt buckle, pencil lead, and shoe pieces), bottle caps and other material culture. The excavations of the artifact cluster identified a high concentration of artifacts consisting mostly of metal, glass, leather items, and burned wood and paper. The small pits excavated reached a sterile gravel layer related to glacial outwash without encountering any other cultural occupations.

The DRPs at the J. Reed, Gilboa 1, Gilboa 4, Gilboa 5 (north locus) sites was extensive and supports Phase II predictions of integrity and research potential. The excavations recovered a sufficient sample of material culture from intact areas of each site for site interpretation. This coverage has produced a diverse sample of artifacts and features to address the major research questions proposed in the DRPs. The results of the DRPs will be combined with information from the Site Examinations into a draft report proposed for October 2008. Shortly after the draft, a final report will be produced and will present interpretations of the analytical results based on the data recovered by excavation. These interpretations will contribute to the development of understanding the complex social and economic relationships that characterize rural settlements in nineteenth to early twentieth century America.

Because the remaining three sites recommended for Phase III DRP, J. Cronk I, J. Cronk II, and Vroman are in areas that could be impacted by the reconstruction activities of the Dam, a DRP is being developed as requested by NYSOPRHP. Phase II investigations showed that all three sites had little to no disturbance and excellent integrity. These sites also produced diverse artifact assemblages that indicated high research potential. Therefore it is recommended that all three sites be recognized as eligible for the National Register.

Paleontological Resources

The Riverside Quarry Site is a former quarry used during the construction of the Dam between 1919 and 1927 (Figure 2.5-3). Fossilized tree stumps were uncovered in the early 1920s, during construction of New York City's Schoharie Reservoir by the Hugh Nawn Contracting Company, the Contractor for the Reservoir. The fossils, some of the only survivors of their type in the World, are remnants of Earth's earliest forests. The Gilboa area has been of intense interest to paleobotanists since the 1850s. In 1852 Samuel Lockwood, a town of Gilboa resident and an ordained minister recorded and amassed an extensive collection of fossils from the Gilboa area. The fossil finds were very similar to the fossil plants in the Devonian Old Red Sandstone deposits of Britain and were the first documented discovery of fossilized trees in North America. Plant fossils continued to be found around Gilboa and catalogued through the 1870s. In the 1920s, during the Dam construction, large upright tree stumps from a fossil forest were uncovered, some of which are on display adjacent to the Dam site, at the New York Power Authority Blenheim-Gilboa Visitor's Center in Schoharie County, and at the New York State Museum (NYS Museum). An early researcher, Winifred Goldring of the NYS Museum, named them *Eospermatopteris*. New finds have helped to determine that *Eospermatopteris* belongs to the *Cladoxylopsida*, a class of big vascular plants with spectacular morphology for their time.[1] Based on the quarry's historic role in the

[1] The Gilboa Fossils by Linda VanAller Hernick, NYS Museum

identification of the oldest known tree species, and its source of many specimens of this plant fossil, the quarry is potentially eligible for the National Register.

The NYCDEP conducted preliminary coordination with State agencies (NYSOPRHP and the NYS Museum) and local paleontologists, which included a site visit where the proposed project site was walked and fossils were observed. The outdoor exhibit of fossil tree stumps at Gilboa on NYS Route 990V was visited as part of this coordination effort with State agencies. The outdoor exhibit displays the forest tree stumps that are of the Late Middle Devonian (about 380-360 million years old), rooted and still in life position, discovered in the 1870s from the Gilboa region. The Devonian Period was an interval of dramatic change in the history of life on Earth. Much of the evidence for what is known about the terrestrial life during this period in North America has come from some extraordinary fossil discoveries made over the past 150 years. The abundance and often superb preservation from the Gilboa region have made this area one of the most important Devonian fossil localities in the world.

During the site visit with the State agencies and paleontologists, various measures for protecting these valuable resources were discussed. At the same time, based on the proposed work, the State agencies concluded that the initial limited clearing of the site would provide an excellent opportunity to observe, study, and further catalogue the details of this unique and valuable resource. Based on this, the State agencies have requested access to the site after the initial clearing and prior to the filling of the Riverside Quarry Site.

A Memorandum of Agreement (MOA) is being negotiated between NYCDEP and NYSOPRHP which would stipulate measures to protect archaeological and/or historic materials associated with the proposed Gilboa Dam reconstruction project. Specifics on the various protective measures that would be implemented are outlined in 2.5.2 below.

2.5.2. Temporary Reconstruction Impacts

Any reconstruction related activities that would be near or within a designated sensitive area that has not undergone the required recovery activities would be avoided by implementing preventive measures to protect historic and archaeological resources. These sites would be avoided by placing a fence 25 feet from the identified boundaries, and further protecting the site from runoff and erosion from sediment piles by erecting appropriate screening material. At this time, this process would only involve the new sites identified in 2007 during the final Phase II investigations until Phase III DRPs are completed: J. Cronk 1, J. Cronk 2, the Vroman Site, and the Riverside Quarry Site. All other sites previously recommended for data recovery have been excavated and results of the DRPs will be combined with information from previous phases into a final report.

As noted above, a MOA is being negotiated between NYCDEP and NYSOPRHP which would stipulate measures to protect historic materials associated with the Gilboa Dam reconstruction project. At present, the MOA states that implementation of the proposed project would include onsite monitoring for historic resources during the clearing and grubbing phases of the proposed project. The purpose of this would be to monitor the site for the presence of any additional historical or archaeological artifacts and ensure their proper recovery. Further, during reconstruction, the NYCDEP would recover and retain excavated bluestone facing from the Dam's Spillway for potential use in the proposed onsite berm. The NYCDEP would also investigate the feasibility of using recovered bluestone facing within the Scenic Public Overlook Area to the Reservoir. With the potential presence of fossils at the Riverside Quarry Site, NYCDEP would provide site access for local and state certified paleontologists subsequent to the initial clearing of the Riverside Quarry Site and other associated sites by Schoharie Creek. To assist in that endeavor, NYCDEP would provide sufficient notification to these individuals for site access.

Based on the various measures outlined above, including the completed DRP and installation of protective fencing or additional Phase III DRPs, it is not anticipated that there would be any potential for impacts to the historic and archaeological or paleontological resources located onsite during reconstruction activities for the proposed project.

2.5.3. Potential Project Impacts

There are no anticipated project related impacts to onsite historical and archaeological resources or paleontological that would occur once temporary reconstruction activities are completed and standard Reservoir operations are in place. As noted above, disruption to any sensitive area that did not have the necessary data recovery would be avoided and adequately protected during the reconstruction phase.

2.6. NATURAL RESOURCES

2.6.1. Introduction

Natural resource parameters such as upland vegetation; wetlands, waterways, and floodplains; fish and benthic invertebrates; birds; herptiles; mammals; and endangered, threatened, or rare plant and animal species were assessed at the Dam study area to determine the potential effects resulting from the proposed reconstruction of the Dam. The methodologies used to assess baseline conditions for these parameters are detailed at the end of this document.

2.6.2. Existing Conditions

The overall project study area consists of approximately 120 acres of City-owned property. The property, purchased by the City in the early 1900s, is managed by the NYCDEP and abuts the Reservoir. The proposed Dam reconstruction project area is bounded on the south by the existing Dam; on the east by NYS Route 990V; on the north by NYS Route 990V in the location of the NYCDEP Police Precinct and the Town of Gilboa municipal building; and on the west by the gravel access road connecting NYS Route 990V to the west Earthfill Embankment of the existing Dam (Figure 2.6-1). The portion of the project area located between Schoharie Creek (Creek) and NYS Route 990V is generally known as Gate 16; this area would contain the majority of the temporary reconstruction staging. Additional areas to be affected by the proposed project include a 38-acre parcel to the west of the Earthfill Embankment of the Dam that would be the site of a new West Access Road and an approximately 10-acre parcel to the east of NYS Route 990V which would be used as staging area for the reconstruction of the new LLO (Figure 2.6-1). A sizable area immediately west of the Plunge Pool is subject to landslides and may need to be stabilized in the future. This Landslide Prone Area contains hemlock-northern hardwood forest and two small shallow emergent/shrub swamp wetlands. Any landslide stabilization efforts required in the future will be covered under a separate environmental review. The Reservoir is known to provide habitat for the following fish species: alewife, carp, pumpkin seed, walleye, brown bullhead, cisco, rock bass, white and yellow perch, brown trout, large mouth bass, spottail shiner, emerald shiner, white sucker, bluegill, bluntnose minnow, golden shiner, brook trout, and spotfin shiner (Baudanza, personal communication, 2004).

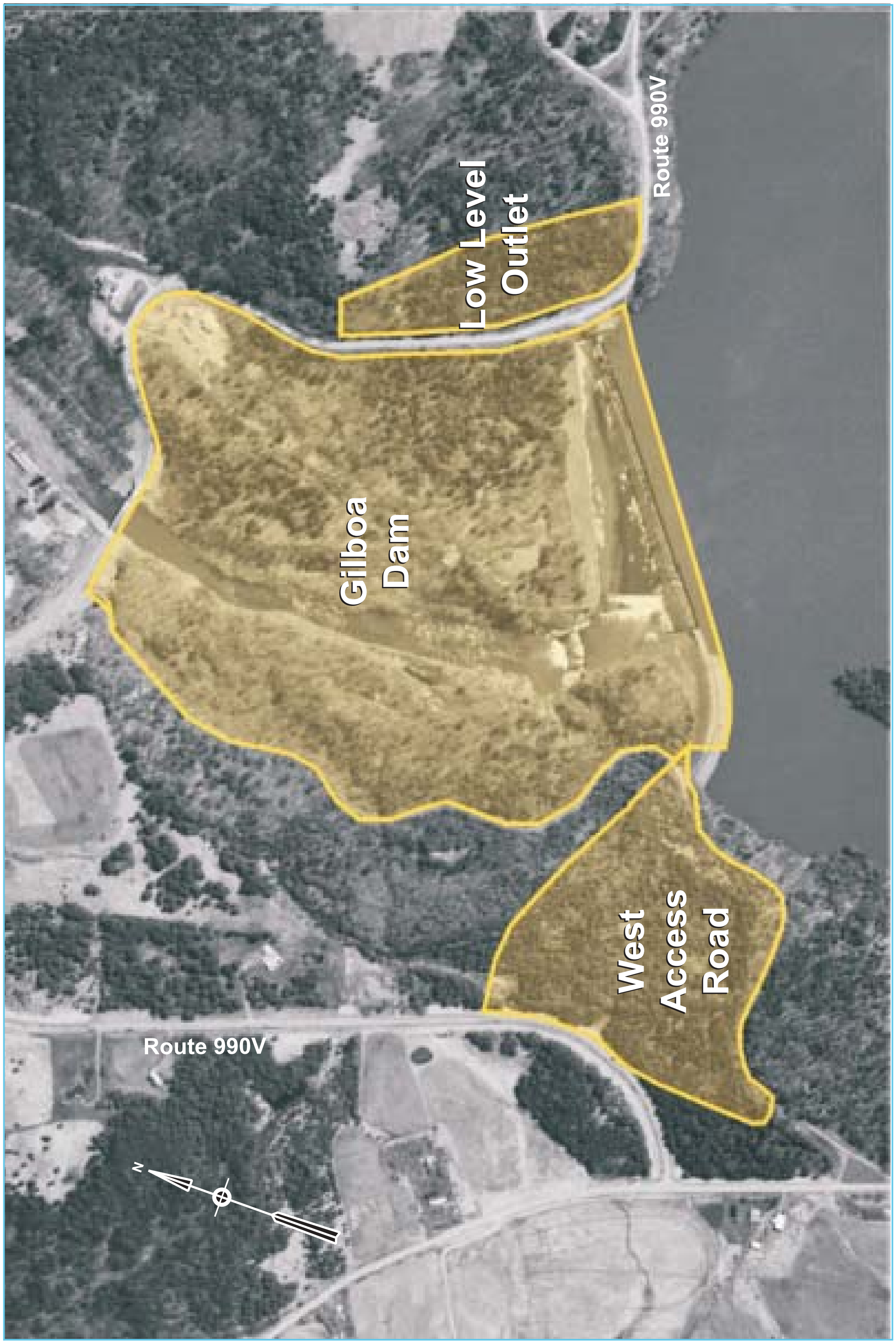
Woodland communities, including a mix of mature and successional forested communities, primarily characterize the proposed project area. The Creek flows through the central portion of the site in a northerly direction. A floodplain forest community exists on the east bank of the Creek. Several wetland communities exist onsite including shrub swamp wetlands, shallow emergent marshes, and vernal pool habitats.

2.6.2.1. Terrestrial Vegetation

Vegetation consists of the plant life or total plant cover found in a specific area, whether indigenous or introduced by humans. The proposed project area is located within the Appalachian Plateaus Physiographic Province of New York. The Appalachian Plateaus is a large natural region lying west of the Hudson lowlands and south of the Mohawk River valley and the Lake Ontario-Lake Erie plains. The Appalachian Plateau is underlain with nearly horizontal rock strata, and all of it was covered by a glacier as recently as 10,000 to 12,000 years ago. Ice and the force of rivers have dissected or cut into the bedrock, giving the whole region a rugged, hilly aspect. The Appalachian Plateau is highest in the eastern part of the state, where it forms the Catskill Mountains. The Appalachian Plateaus region contains a diverse mixture of major terrestrial plant habitats, including freshwater marshes, bogs, swamps and floodplains, upland valleys and slopes, upland ridges, and rock outcrops. Table 2.6-1 presents a list of habitat communities and their associated dominant vegetation found in the proposed project area.

Past disturbances of the proposed project area associated with the original village farming or Dam construction activities have created a mosaic of vegetative communities within its boundaries. The project area is dominated by cultural and successional forest communities such as successional southern hardwoods, successional northern hardwoods, and conifer plantations. These forest communities have wetlands and areas of mowed lawn interspersed throughout. The cultural and successional forest communities of the project area are not of high value from a native flora or plant community perspective. Higher quality forested communities lie immediately to the east of the Creek and along the western edge of the project area.

Vegetation surveys of the Dam study area were conducted in September 2005; May, June, July, August, and November 2006; and January 2007. No threatened or endangered plant species were found during the vegetation surveys. The ecological communities found onsite were classified according to the New York State Natural Heritage Program's (NYSNHP) Ecological Communities of New York State, Second Edition (Reschke, et. al., 2002). Thirteen primary vegetative communities were identified on the site. The upland communities consist of a successional southern hardwood forest, successional northern hardwood forest, hemlock-northern hardwood forest, floodplain forest, conifer plantation, successional southern hardwood/conifer plantation, successional northern hardwood/conifer plantation, successional red cedar woodland/conifer plantation, and mowed lawn. The wetland communities consist of a red maple hardwood swamp, shrub swamp, shallow emergent marsh, and vernal pool habitat. The approximate locations of these ecological communities in the study area are shown in Figure 2.6-2. The onsite wetlands can be described in terms of the United States Fish and Wildlife Service's (USFWS) wetland classification system as well and include palustrine forested wetlands (PFO1), palustrine shrub-scrub wetlands (PSS1), and palustrine emergent wetlands (PEM). The NYSNHP also provides global and state element ranks for each community type. These element ranks carry no regulatory weight but are believed to accurately reflect the relative rarity of the community type. The area covered by each of the ecological communities delineated in the proposed project area is given in Table 2.6-2. The mean density of trees with a diameter at breast height equal to or greater than 4 inches and the estimated number of trees within each upland forested community is given in Table 2.6-2.



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Gilboa Dam Natural Resource Study Areas

Figure 2.6-1

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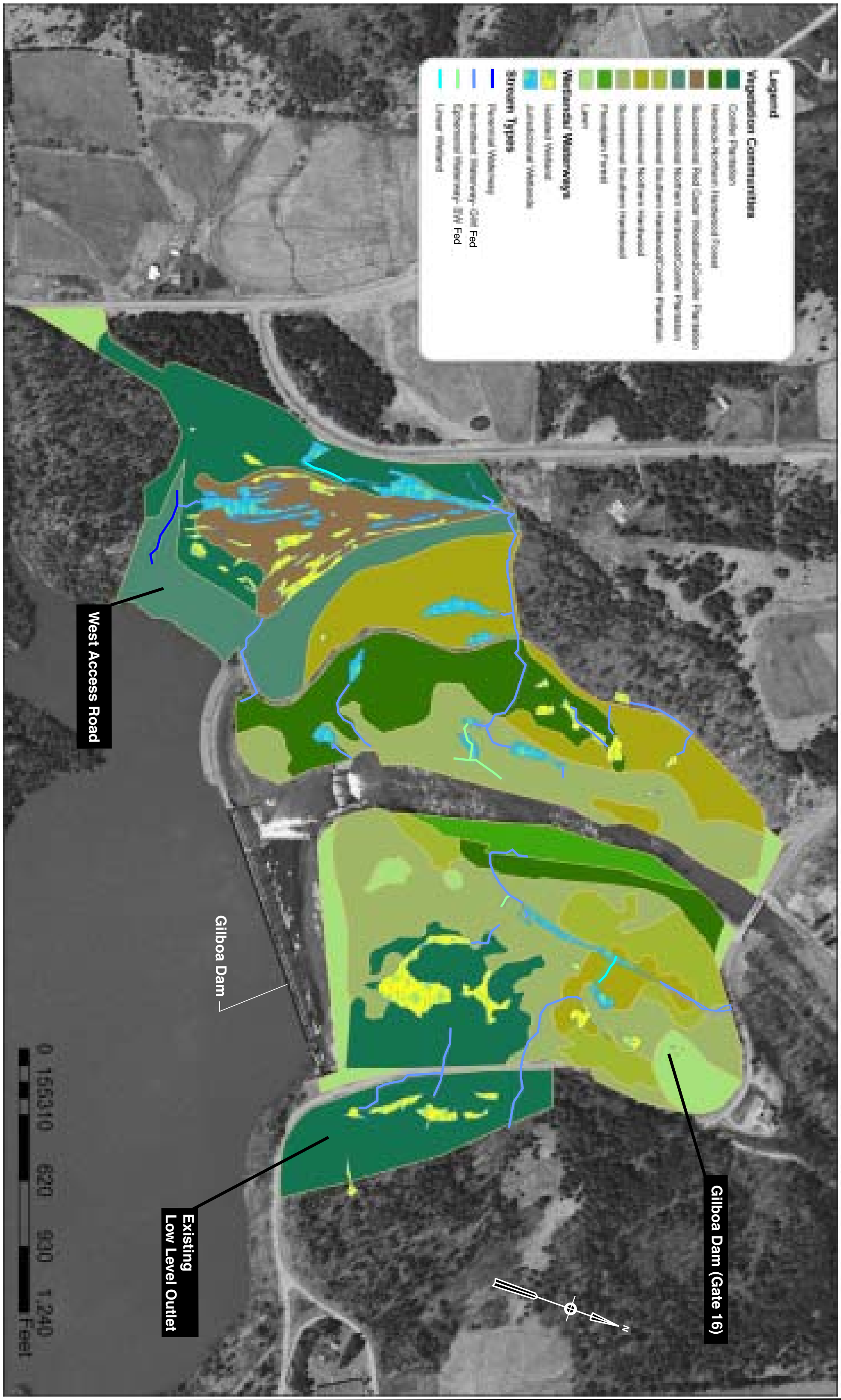


Gilboa Dam Natural Resource Existing Conditions

Figure 2.6-2

TABLE 2.6-1. DOMINANT VEGETATION IN THE GILBOA DAM STUDY AREA

Ecological Community	Stratum	Common Name	Scientific Name
Successional Southern Hardwood Forest	Tree	White ash	*Fraxinus americana*
		Black locust	*Robinia pseudo-acacia*
		Black cherry	*Prunus serotina*
		Box-elder	*Acer negundo*
		Sugar Maple	*Acer saccharum*
		Shagbark Hickory	*Carya ovata*
		Norway Spruce	*Picea abies*
		White Pine	*Pinus strobus*
	Shrub	Morrow's honeysuckle	*Lonicera morrowii*
		Black raspberry	*Rubus occidentalis*
		Blackberry	*Rubus allegheniensis*
		Gray dogwood	*Cornus racemosa*
	Vine	Virginia Creeper	*Parthenocissus quinquefolia*
		Fox Grape	*Vitus labrusca*
	Herbaceous	Hemp nettle	*Galeopsis tetrahit*
		Dames rocket	*Hesperis matronalis*
		Canada goldenrod	*Solidago Canadensis*
		Jewelweed	*Impatiens capensis*
		White snakeroot	*Eupatorium rugosum*
Successional Northern Hardwood Forest	Tree	White ash	*Fraxinus americana*
		Sugar Maple	*Acer saccharum*
		White Pine	*Pinus strobus*
		Quaking aspen	*Populus tremuloides*
		Black locust	*Robinia pseudo-acacia*
	Shrub	Morrow's honeysuckle	*Lonicera morrowii*
		Black raspberry	*Rubus occidentalis*
		Blackberry	*Rubus allegheniensis*
		Silky dogwood	*Cornus amomum*
	Vine	Poison ivy	*Toxicodendron radicans*
		Fox Grape	*Vitus labrusca*
		Virginia creeper	*Parthenocissus quinquefolia*
	Herbaceous	Dames rocket	*Hesperis matronalis*
		Canada goldenrod	*Solidago Canadensis*
		Sedge	*Carex sprengelii*
		White snakeroot	*Eupatorium rugosum*
		Herb robert	Geranium robertianum
		Hemp nettle	*Galeopsis tetrahit*

TABLE 2.6-1. DOMINANT VEGETATION IN THE GILBOA DAM STUDY AREA

Ecological Community	Stratum	Common Name	Scientific Name
Hemlock-Northern Hardwood Forest	Tree	Eastern Hemlock	*Tsuga candensis*
		White ash	*Fraxinus americana*
		Sugar maple	*Acer saccharum*
		Basswood	*Tilia americana*
		White pine	*Pinus strobus*
	Shrub	Maple-leaved viburnum	*Viburnum acerfolium*
		Round-leaved dogwood	*Cornus rugosa*
		Common barberry	*Berberis vulgaris*
		Morrow's honeysuckle	*Lonicera morrowii*
	Vine	Poison ivy	*Toxicodendron radicans*
		Fox Grape	*Vitus labrusca*
	Herbaceous	White wood aster	*Aster divaricatus*
		Bottle brush grass	*Elymus hystrix*
		Hemp nettle	*Galeopsis tetrahit*
		Sedge	*Carex sprengelii*
		Wreath goldenrod	*Solidago caesia*
Conifer Plantation	Tree	Norway spruce	*Picea abies*
		Red pine	*Pinus resinosa*
		Scotch pine	*Pinus sylvestris*
		White ash	*Fraxinus americana*
	Shrub	Morrow's honeysuckle	*Lonicera morrowii*
		Black raspberry	*Rubus occidentalis*
		Gray dogwood	*Cornus racemosa*
	Vine	Poison ivy	*Toxicodendron radicans*
		Fox Grape	*Vitus labrusca*
		Virginia creeper	*Parthenocissus quinquefolia*
	Herbaceous	Pennsylvania sedge	*Carex pensylvanica*
		Sensitive fern	*Onoclea sensibilis*
		Wire grass	*Poa compressa*
		Canada goldenrod	*Solidago Canadensis*
Successional Red Cedar Woodland/Conifer Plantation	Tree	Northern Red Cedar	*Juniperus virginiana*
		Norway Spruce	*Picea abies*
		White Pine	*Pinus strobus*
	Shrub	Blackberry	*Rubus allegheniensis*
	Herbaceous	Dames rocket	*Hesperis matronalis*
		Bedstraw	*Galium sp.*
		Cinquefoil	*Potentilla sp.*

TABLE 2.6-1. DOMINANT VEGETATION IN THE GILBOA DAM STUDY AREA

Ecological Community	Stratum	Common Name	Scientific Name
Floodplain Forest	Tree	Sycamore	*Platanus occidentalis*
		White ash	*Fraxinus americana*
		Slippery elm	*Ulmus rubra*
		Black birch	*Betula lenta*
		Quaking aspen	*Populus tremuloides*
		Black locust	*Robinia pseudoacacia*
	Shrub	Morrow's honeysuckle	*Lonicera morrowii*
		Black raspberry	*Rubus occidentalis*
		Gray dogwood	*Cornus racemosa*
		Thimbleberry	*Rubus odoratus*
	Vine	Poison ivy	*Toxicodendron radicans*
		Fox Grape	*Vitus labrusca*
		Virginia creeper	*Parthenocissus quinquefolia*
	Herbaceous	Bottle brush grass	*Elymus hystrix*
		Indian hemp	*Apocynum cannabinum*
		Hog peanut	Amphicarpa bracteolata
		Tall goldenrod	Solidago altissima
		White snakeroot	*Eupatorium rugosum*
Shallow Emergent Marsh	Herbaceous	Reed Canary Grass	*Phalaris arundinacea*
		Black bulrush	*Scirpus atrovirens*
		Boneset	*Eupatorium perfoliatum*
		Broad leaved cattail	*Typha latifolia*
		Soft stem bulrush	*Scirpus validus*
		Little duckweed	*Lemna minor*
		Watercress	*Nastutium officianale*
		Jewelweed	*Impatiens capensis*
		Sensitive fern	*Onoclea sensibilis*
		Lurid sedge	*Carex lurida*
		Late goldenrod	*Solidageo gigantean*
		Common horsetail	*Equisetum arvense*
		Hollow joe-pye weed	*Eupatoriadelphus fistulosus*
		Arrow-leaved tearthumb	*Polygonum sagittatum*
		Calico aster	*Aster lateriflorus*
		Rice cutgrass	*Leersia oryzoides*

TABLE 2.6-1. DOMINANT VEGETATION IN THE GILBOA DAM STUDY AREA

Ecological Community	Stratum	Common Name	Scientific Name
Shrub Swamp Wetland	Shrub	Speckled alder	*Alnus rugosa*
		Silky dogwood	*Cornus amomum*
		Gray dogwood	*Cornus racemosa*
		Witch hazel	*Hamamelis virginiana*
	Herbaceous	Jewelweed	*Impatiens capensis*
		Common Reed	*Phragmites australis*
		Broad-leaf cattail	*Typha latifolia*
		Black bulrush	*Scirpus atrovirens*
		Reed Canary Grass	*Phalaris arundincea*
		Sensitive fern	*Onoclea sensibilis*
		Arrow-leaved tearthumb	*Polygonum sagittatum*
		Soft rush	*Juncus effusus*
		New England aster	*Aster novae-angliae*
		Purple stemmed aster	*Aster puniceus*
Red Maple-Hardwood Swamp	Tree	Red maple	*Acer rubrum*
		Slippery elm	*Ulmus rubra*
		Sycamore	*Platanus occidentalis*
		Cottonwood	*Populus deltoides*
	Herb	Common horsetail	*Equisetum arvense*
		Jewelweed	*Impatiens capensis*
		Fowl manna grass	*Glyceria striata*
		Virginia wild rye	*Elymus virginicus*
		Crooked stem aster	*Aster prenanthoides*

Notes: Based on ecological surveys conducted within the Gilboa Dam study area in September 2005; and May, June, July, August, and November 2006; and January and May 2007.

TABLE 2.6-2. AREA OF ECOLOGICAL COMMUNITIES IN THE GILBOA DAM STUDY AREAS AND ESTIMATED NUMBER OF TREES IN FORESTED COMMUNITIES

Ecological Community*	Area (acres)	Mean Tree** Density (#/acre)	Estimated No. of Trees
Successional Southern Hardwood	30.3	229	6,939
Successional Northern Harwood	16.9	199	3,363
Hemlock-Northern Hardwood	14.2	233	3,309
Conifer Plantation	29.2	236	6,891
Successional Southern Hardwood/Conifer Plantation	7.0	172	1,204
Successional Northern Hardwood/Conifer Plantation	10.2	235	2,397
Successional Red Cedar Woodland/Conifer Plantation	7.3	339	2,475
Floodplain Forest	3.4	154	524
Mowed Lawn	6.0	--	--
Shallow Emergent Marsh	2.6	--	--
Shrub Swamp	1.7	--	--
Shallow Emergent Marsh/Shrub Swamp	3.8	--	--
Red Maple Hardwood Swamp	0.4	--	--
Vernal Pool	0.3	--	--

Notes: *As per Reschke, 2002; ** trees with a diameter at breast height of 4 inches or greater.

<u>Terrestrial Community Description - Successional Southern Hardwoods (SSH)</u>

As described by Reschke, this community type is a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees of this community include any of the following: American elm (*Ulmus Americana*), slippery elm (*U. rubra*), white ash (*Fraxinus americana*), red maple (*Acer rubrum*), box elder (*A. negundo*), silver maple (*A. saccharinum*), sassafras (*Sassafras albidum*), gray birch *Betula populifolia*), hawthorns (*Crataegus sp.*), eastern red cedar (*Juniperus virginiana*), and choke cherry (*Prunus virginiana*). Certain introduced species are commonly found as well: black locust (*Robinia pseudo-acacia*), tree-of-heaven (*Ailanthus altissima*), and buckthorn (*Rhamnus cathartica*). Any of these species may be dominant or co-dominant. This community is found primarily in the southern half of New York State, south of the Adirondacks. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State).

This community occurs mostly on the flatter sections of the project area above the Schoharie River in what had been the Village of Gilboa or where there has been fill deposited. In these areas, old cisterns were found and thick carpets of blue grass (*Poa* sp.) occurred that may be remnants of lawn. Garden species such as live forever (*Sedum purpureum*) were found occasionally in the plots. On the west side of the Creek, SSH is common on the low areas that appear to have been quarries at one time and in areas where old roads have caused some slumping of the steep slopes above. In some plots, introduced plantation species, such as Norway spruce (*Picea abies*), are seeding in. The SSH communities are dominated by two species, black locust and white ash. The understory of this community type consists of saplings of the aforementioned trees, Morrow's honeysuckle (*Lonicera morrowii*), black raspberry (*Rubus occidentalis*), gray dogwood (*Cornus racemosa*), and blackberry (*R. allegheniensis*). Common ground cover species include: dames rocket (*Hesperis matronalis*), hemp nettle (*Galeopsis tetrahit*), Canada goldenrod *(Solidago Canadensis*), white snakeroot (*Eupatorium rugosum*), and Virginia creeper (*Parthenocissus quinquefolia*). The study area contains 30.3 acres of the SSH community type with an average tree density of approximately 229 trees per acre. Therefore, approximately 6,939 trees could be located within this forest community type.

Terrestrial Community Description – Successional Northern Hardwoods (SNH)

As described by Reschke, this community type is a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees of this community include any of the following: quaking aspen (*Populus tremuloides*), big-toothed aspen (*P. grandidentata*), balsam poplar (*P. balsamifera*), paper birch (*Betula papyrifera*) or grey birch, pin cherry (*Prunus pensylvanica*), black cherry *(P. serotina*), red maple, white pine (*Pinus strobus*) with lesser amounts of white ash, green ash (*Fraxinus pensylvanica*), and American elm. Northern indicators include aspens, birches, and pin cherry. This community is found throughout upstate New York north of the Coastal Lowlands ecozone. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State).

The SNH community type occurs on both sides of the Creek. The SNH community was dominated by white ash and sugar maple. On the west side of the Creek, the SNH community is a younger forest and much weedier than the adjacent Hemlock-Northern Hardwood forest community indicating past disturbance. Invasive exotics are common to abundant in the SNH communities but there are quite a few native species as well. Dominant trees include white ash, quaking aspen, white pine and black locust. The shrub and herb layers are dominated by Morrow's honeysuckle, dame's rocket, and some black locust in the sapling stage. The study area contains 16.9 acres of the SNH community type with an average tree density of approximately 199 trees per acre. Therefore, approximately 3,363 trees could be located within this forest community type.

Terrestrial Community Description – Hemlock-Northern Hardwood Forest (HNHF)

As described by Reschke this community is a mixed forest that typically occurs on middle to lower slopes of ravines; on cool, mid-elevation slopes; and on moist, well-drained sites at the margins of swamps. In any one stand, eastern hemlock (*Tsuga canadensis*) is codominant with any one to three of the following: American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), red maple, black cherry, white pine, yellow birch (*Betula alleghenensis*), black birch (*B. lenta*), red oak (*Quercus rubra*), and basswood (*Tilia americana*). This community occurs throughout New York State. The NYSNHP has given this community a global element rank of G4 (apparently secure globally) and a state element rank of S4 (apparently secure in New York State).

The H-NHF community occurs on steep slopes on the east and west side of the Creek. Several species comprise the canopy in the H-NHF community with eastern hemlock, sugar maple, and white ash usually dominant or common. Also occurring are white pine, paper birch, yellow birch, American beech and basswood. The abundance of sugar maple and eastern hemlock along with yellow and paper birch and basswood are all good indicators of this community type. The steep slopes on the west side of the Creek are the least disturbed by prior activity. Importantly, many of the tree species are found in multiple layers from the ground to the super-canopy. The existence of the same species in multiple structural layers indicates the community type is self-maintaining (Whittaker1975) and therefore appears to be the climax community for that portion of the site. The H-NHF community of the project study area also contains a rich shrub and herbaceous flora with maple-leaved viburnum (*Viburnum acerfolium*), round-leaved dogwood (*Cornus rugosa*), white wood aster (*Aster divaricatus*), bottle brush grass (*Elymus hystrix*), and wreath goldenrod (*Solidago caesia*) as the dominant species. Most of the same non-native/invasive species that occur on the flats and low slopes of the study area also occur on the steep slopes covered by the H-NHF, but here they are in quite low abundance. The study area contains 14.2 acres of the H-NHF community type with an average tree density of approximately 233 trees per acre. Therefore, approximately 3,309 trees could be located within this forest community type.

Terrestrial Community Description – Conifer Plantation (CP)

As described by Reschke, this community type consists of a stand of softwoods planted for the cultivation and harvest of timber products or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping. This is a broadly defined community found throughout New York State. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State).

The slopes to the east and west of NYS Route 990V just north of the Dam, as well as the area west of the Earthfill Embankment, are dominated by this cultural community type. The CP community is a mix of Norway spruce (*Picea abies*), white pine, red pine (*Pinus resinosa*) and Scotch pine (*P. sylvestris*) with a minor component of hardwoods. Although the conifers in this community may not be harvested for commercial reasons, it seems likely that they were originally planted either as ornamentals by the villagers or as erosion control on land that may have been pasture at one time. It is clear that the Norway spruce and possibly the others are reproducing. Although there are some native species such as white ash, exotics like the conifers and black locust are common to abundant throughout the community polygon. The understory of this community type consists of saplings of the aforementioned trees, Morrow's honeysuckle, black raspberry, gray dogwood, and blackberry. Common ground cover species include: Pennsylvania sedge (Carex pensylvanica), wire grass (*Poa compressa*), Canada goldenrod, and Virginia creeper. The study area contains 29.2 acres of the CP community type with an average tree density of approximately 236 trees per acre. Therefore, approximately 6,891 trees could be located within this forest community type.

Terrestrial Community Description – Successional Southern Hardwoods/Conifer Plantation (SSH/CP)

Some of the former Village and fill areas have this mixed community type that reflects past land use. This mixed type was included because of the abundance of species like black locust and other early successional species and because of a nearly equal abundance of species such as Norway spruce, Scot's pine and red pine. Although red pine is native to New York, it was likely planted here along with the other conifers. It is possible that some of the white pines were planted too. Spruce and other conifers become more abundant upslope. The study area contains 7.0 acres of the SSH/CP community type with an average tree density of approximately 172 trees per acre. Therefore, approximately 1,204 trees could be located within this forest community type.

Terrestrial Community Description – Successional Northern Hardwoods/Conifer Plantation (SNH/CP)

This mixed community type also reflects past land use. This mixed type was included because of the abundance of species like white ash and quaking aspen and other early successional species and because of a nearly equal abundance of species such as white pine and red pine. Although red pine is native to New York, it was likely planted here along with the other conifers. It is possible that some of the white pines were planted too. The study area contains 10.2 acres of the SNH/CP community type with an average tree density of approximately 235 trees per acre. Therefore, approximately 2,397 trees could be located within this forest community type.

Terrestrial Community Description – Successional Red Cedar Woodland/Conifer Plantation (SRCW/CP)

As described by Reschke, the successional red cedar woodland community type commonly occurs on abandoned agricultural fields and pastures usually at elevations under 1,000 feet. The dominant tree is eastern red cedar with lesser amounts of successional hardwoods such as gray birch and buckthorn. This community is found throughout New York State. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State).

This mixed community type occurs in the West Access Road study area and was delineated because of the abundance of white pine and Norway spruce associated with northern red cedar (*Juniperus virginiana*). Components of the Successional Northern Hardwoods community are also scattered within this mapped polygon but are not large enough to map as individual communities. The study area contains 7.3 acres of the SNH/CP community type with an average tree density of approximately 339 trees per acre. Therefore, approximately 2,475 trees could be located within this forest community type.

Terrestrial Community Description – Floodplain Forest (FF)

As described in Reschke, this community consists of a hardwood forest that occurs on mineral soils on low terraces of river floodplains and river deltas. These sites are characterized by their flood regime: low areas are annually flooded in the spring and high areas are flooded irregularly. Some sites may be quite dry by late summer while other sites may be flooded with heavy precipitation associated with tropical storms. This is a broadly defined community that is quite variable and may be very diverse. Floodplain forests occur throughout New York State north of the Coastal Lowlands ecozone. The NYSNHP has given this community a global element rank of G3 (either rare and local throughout its range, or found locally in a restricted range, or vulnerable to extinction throughout its range due to other factors) and G4 (apparently secure globally) and a state element rank of S2 (demonstrably vulnerable in New York State) and S3 (limited acreage or miles of stream in New York State).

The area immediately to the east of the Creek has been classified as Floodplain Forest. The abundance of sycamores (*Platanus occidentalis*), and slippery elm along with mature cottonwoods (*Populus deltoides*) and ironwood (*Carpinus caroliniana*) are all good indicators of the type. Given this area's elevation above the Creek, it probably floods on a regular basis in the spring or during Dam releases. The understory of this community type consists of saplings of the aforementioned trees, Morrow's honeysuckle, black raspberry, gray dogwood, and blackberry. Common ground cover species include: bottle brush grass, Indian hemp (*Apocynum cannabinum*), hog peanut (*Amphicarpa bracteolate*), tall goldenrod (*Solidago altissima*), and Virginia creeper. The study area contains 3.4 acres of the FF community type with an average tree density of approximately 154 trees per acre. Therefore, approximately 524 trees could be located within this forest community type.

<u>Terrestrial Community Description – Mowed Lawn</u>

This community type occurs on land in which the groundcover is dominated by clipped grasses and there is less than 50 percent cover of shrubs and 30 percent cover of trees. There are 6.0 acres of this community type within the study area the largest parcels of which occur along the Dam Spillway and at the NYCDEP Police Precinct. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State).

2.6.2.2. Wetlands and Waterways

Wetlands are areas where soil saturation is the dominant factor in determining the nature of soil development and the types of plants and animal communities capable of being supported. Wetlands are transitional areas between upland and aquatic systems, and are important biological habitats of ecological and socioeconomic value. Wetlands moderate extremes in water flow, aid in the natural purification of water, and are areas of groundwater recharge.

Wetland surveys within the study area were conducted in September 2005; May, June, and November 2006; and January and May 2007. Some of the wetlands found are associated with the Creek, the main waterway within the study area. Some wetlands are also found at higher elevations and are isolated, having no apparent surface hydrological connection with the Creek. No NYSDEC mapped wetlands are found within the study area. No palustrine wetlands are mapped by the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) within the project study area. Topography within the project study area surrounding the Dam consists of steep slopes bordering a fairly level floodplain with an elevation range between 950 and 1,150 feet above mean sea level. Below is a description of the wetland communities found onsite. In total, the study area contains approximately 8.8 acres of non-contiguous wetlands (Table 2.6-2). Some of these wetlands have been determined to be regulated by the United States Army Corps of Engineers (USACOE) based on comments received from USACOE at a site visit conducted on November 21, 2006. Additional wetlands delineated after the November site visit would need to be inspected by USACOE to confirm their regulatory status. The approximate location of the wetland communities in the study area and their potential regulatory status are shown in Figures 2.6-3, 2.6-4, and 2.6-5. Refer to Table 2.6-1 for a list of the vegetative species identified within the wetland communities located within the Dam study area.

The Creek, downstream of the Dam, is a Class B waterway and runs in a south-north direction through the center of the study area. The Creek is identified as a perennial stream by the U.S. Geological Survey. Perennial streams have permanent running water. NWI lists the Creek as a riverine, lower perennial, unconsolidated shore, temporarily flooded wetland (R2USA) and identifies the Reservoir as a lacustrine, limnetic, unconsolidated bottom, permanent, diked/impounded wetland (L1UBHh). There are two unnamed perennial and numerous intermittent, which flow when the groundwater table is elevated, typically during the spring and summer, and ephemeral streams, which are primarily fled by stormwater and thus flow only during and after rainfalls,located throughout the study area. The Creek and the unnamed perennial streams have a total length of 4,610 feet in length. Seventeen intermittent streams totaling 5,385 feet in length, and one ephemeral stream totaling 70 feet in length were identified and mapped within the study area. The locations of these waterways are given in Figures 2.6-3, 2.6-4, and 2.6-5.

<u>Palustrine Community Description – Shallow Emergent Marsh (SEM)</u>
As described by Reschke, this community consists of marsh meadow that occurs on mineral soil or deep muck soils (rather than true peat) that are permanently saturated and seasonally flooded. A wide variety of herbaceous plants can be found in this community type. This community type must have less than 50 percent cover of peat and tussock forming sedges and less than 50 percent shrub cover. This type of wetland is found throughout New York State. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State). The USFWS classification for these wetlands is Palustrine Emergent Marsh (PEM) Wetland.

Many of the SEM wetlands occur within depressions created by previous disturbance associated with the construction of the existing Dam and receive hydrology from surface runoff and groundwater discharge. Sensitive fern (*Onoclea sensibilis*), jewelweed (*Impatiens capensis*), broad-leaf cattail (*Typha latifolia*), goldenrods (*Solidago* sp.) and sedges (*Carex* sp.) were the dominant vegetation. There are 23 SEM wetlands in the study area totaling approximately 2.6 acres. The individual SEM wetlands are small ranging in size from 0.01 to 0.41 acres. The dominant wetland function of the SEM wetlands in the study area is providing wildlife habitat. Additional functions the SEM wetlands provide include groundwater discharge, floodflow alteration, sediment/toxicant retention, nutrient removal, and production export.

Palustrine Community Description - Shrub Swamp Wetland (SS)

As described by Reschke, this community consists of inland wetlands dominated by tall shrubs that occur along the shores of a lake or river, in a wet depression or valley not associated with a lake, or as a transition zone between a marsh, fen, or bog and a swamp or upland community. The substrate is usually mineral soil or muck. This is a very broadly defined community type and is very common and quite variable. Characteristic shrubs that are common include meadow-sweet (*Spirea alba*), steeple-bush (*S. tomentosa*), gray dogwood, swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corybosum*), maleberry (*Lyonia ligustrina*), smooth alder (*Alnus serrulata*), spicebush (*Lindera benzoin*), willow (*Salix sp*.), and arrowwood viburnum (*Viburnum dentatum*). This type of wetland is found throughout New York State. The NYSNHP has given this community a global element rank of G5 (demonstrably secure globally) and a state element rank of S5 (demonstrably secure in New York State). The USFWS classification for these wetlands is Palustrine Shrub-Scrub (PSS1) Wetland.

Many of the SS wetlands also occur within depressions created by previous disturbance associated with the construction of the existing Dam. The dominant shrubs include gray dogwood and silky dogwood (*Cornus amomum*). Jewelweed, common reed (*Phragmites australis*), broad-leaf cattail, sensitive fern, wool grass (*Phalris arundinacea*), soft rush (*Juncus effusus*), and arrow-leaved tearthumb (*Polygonum sagittatum*) were the dominant herbaceous vegetation. There are 19 SS wetlands in the study area totaling approximately 1.7 acres. The individual SS wetlands are small ranging in size from 0.02 to 0.60 acres. The dominant wetland hydrology of the SS wetlands is overland flow. The dominant wetland function of the SS wetlands in the study area is providing wildlife habitat.

Palustrine Community Description – Shallow Emergent Marsh/Shrub Swamp (SEM/SS)

This community type contains a mix of the previous two wetland community types. The largest wetland in the study area is a SEM/SS wetland located to the north of the Dam Spillway. Located within a slope depression, the wetland receives hydrology from surface runoff and groundwater discharge. The dominant shrubs in the SEM/SS wetlands include gray dogwood and silky dogwood. Common herbaceous vegetation includes broad-leaf cattail, sensitive fern, jewelweed, green bulrush (*Scirpus atrovirens*), arrow-leaved tearthumb, swamp aster (*Aster puniceus*), moss (*Thuidium* spp.) and sedges (*Carex* spp.). This is the dominant wetland community type within the study area with 10 SEM/SS wetlands totaling approximately 3.8 acres. The individual SEM/SS wetlands range in size from 0.05 to 1.33 acres. The dominant wetland hydrology of the SEM/SS wetlands is overland flow and groundwater discharge. The dominant wetland functions of the SEM/SS wetlands in the study area are providing wildlife habitat and floodflow alteration. Additional functions the SEM/SS wetlands provide include groundwater discharge and sediment/toxicant retention.

Palustrine Community Description - Red Maple Hardwood Swamp Wetland (RMHS)

As described by Reschke, this community consists of a hardwood swamp that occurs in poorly drained depressions, usually on inorganic soils. This is a broadly defined community with many regional variants. In any one stand, red maple is either the only canopy dominant, or is co-dominant with one or more hardwoods including ashes, elms, yellow birch, and swamp white oak (*Quercus bicolor*). Other trees with low percent cover include butternut (*Juglans cinerea*), bitternut hickory (*Carya cordiformis*), black gum (*Nyssa sylvatica*), ironwood, and white pine. This type of forested wetland is found throughout New York State. The NYSNHP has given this community a global element rank of G3 (either rare and local throughout its range, or found locally in a restricted range, or vulnerable to extinction throughout its range due to other factors) and G4 (apparently secure globally) and a state element rank of S2 (demonstrably vulnerable in New York State). The USFWS classification for these wetlands is also Palustrine Forested (PFO1) Wetland.

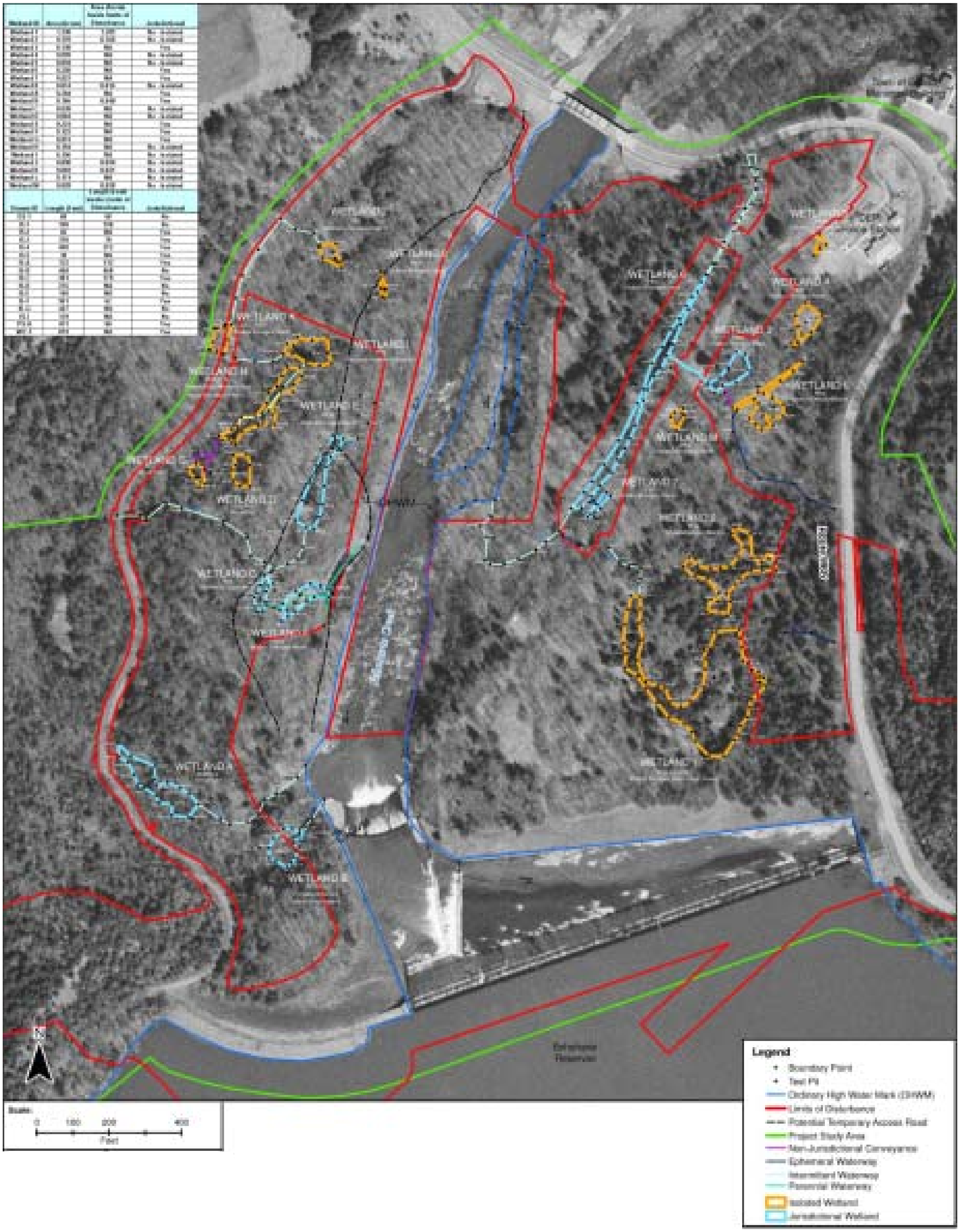
Several small RMHS wetlands were identified within the floodplain along the west side of the Creek. Hydrology in these wetlands was a mix of surface runoff and periodic flooding with minimal groundwater influence. Dominant trees in this community type included ash and slippery elm with red maple present. The understory of the RMHS wetlands contained common horsetail (*Equisetum arvense*), jewelweed, fowl manna grass (*Glyceria striata*), Virginia wild rye (*Elymus virginicus*), and crooked stem aster (*Aster prenanthoides*). There are four RMHS wetlands in the study area totaling approximately 0.4 acres. The individual RMHS wetlands are small ranging in size from 0.05 to 0.16 acres. The dominant wetland function of the RMHS wetlands in the study area is providing floodflow alteration.

<u>Palustrine Community Description – Vernal Pool (VP)</u>

As described by Reschke, vernal pools are aquatic communities of intermittently to ephemerally ponded, small, shallow depressions typically within an upland forest. Vernal pools are typically flooded in spring or after a heavy rainfall, but are usually dry during the summer. The substrate of vernal pools is typically dense leaf litter over hydric soils. Vernal pools typically occur in confined basins without an outlet. This community includes a diverse group of invertebrates and amphibians that depend upon temporary pools as breeding habitat. Plants are predominantly hydrophytic. Floating and submerged plants may be common but emergent plants should be sparse. Characteristic vascular plants may include manna grass (Glyceria sp.), spikerush (Eleocharis acicularis), water purslane (Ludwigia palustris), duckweed (Lemna minor), and water hemlock (Cicuta maculata).

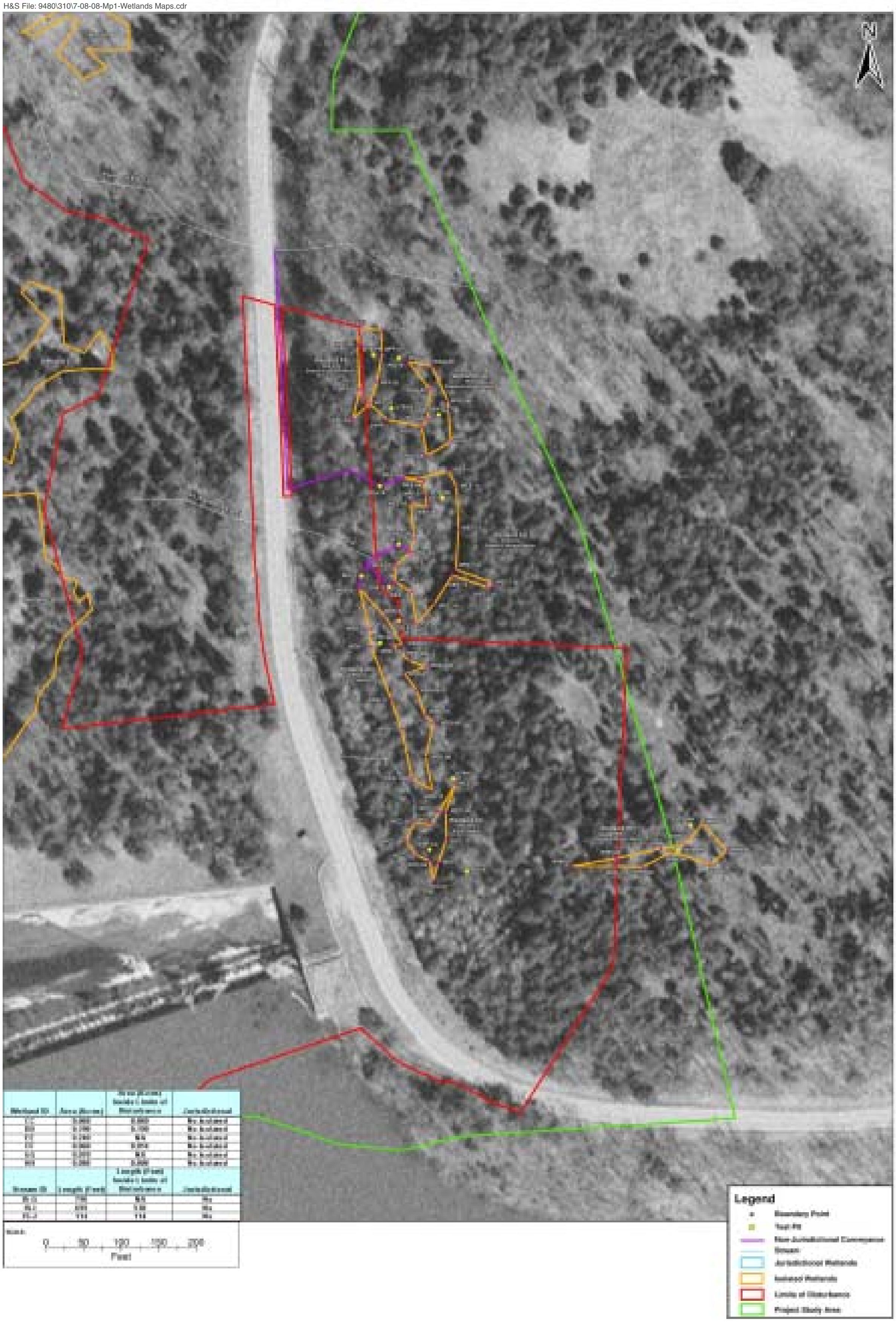
Several small VP communities were identified along the west side of the Creek. Hydrology in these communities is governed primarily by sheet flow. The herbaceous community in the VPs is sparse with American bugleweed (*Lycopus americanus*) dominant in some locations, and sensitive fern, Virginia wild rye, Virginia knotweed (*Polygonum virginianum*), and sedges common throughout. Slippery elm dominates both the shrub and canopy layers and ash are common in the canopy along the perimeter of the VPs. There are four VP communities in the study area totaling approximately 0.3 acres. The individual VP communities are small ranging in size from 0.04 to 0.14 acres. The dominant function of the VP communities in the study area is providing wildlife habitat. Additional functions provided include floodflow alteration, sediment/toxicant retention, and nutrient removal.

H&S File: 9480\310\7-08-08-Mp1-Wetlands Maps.cdr



Wetlands and Waterways in the Gilboa Dam Study Area

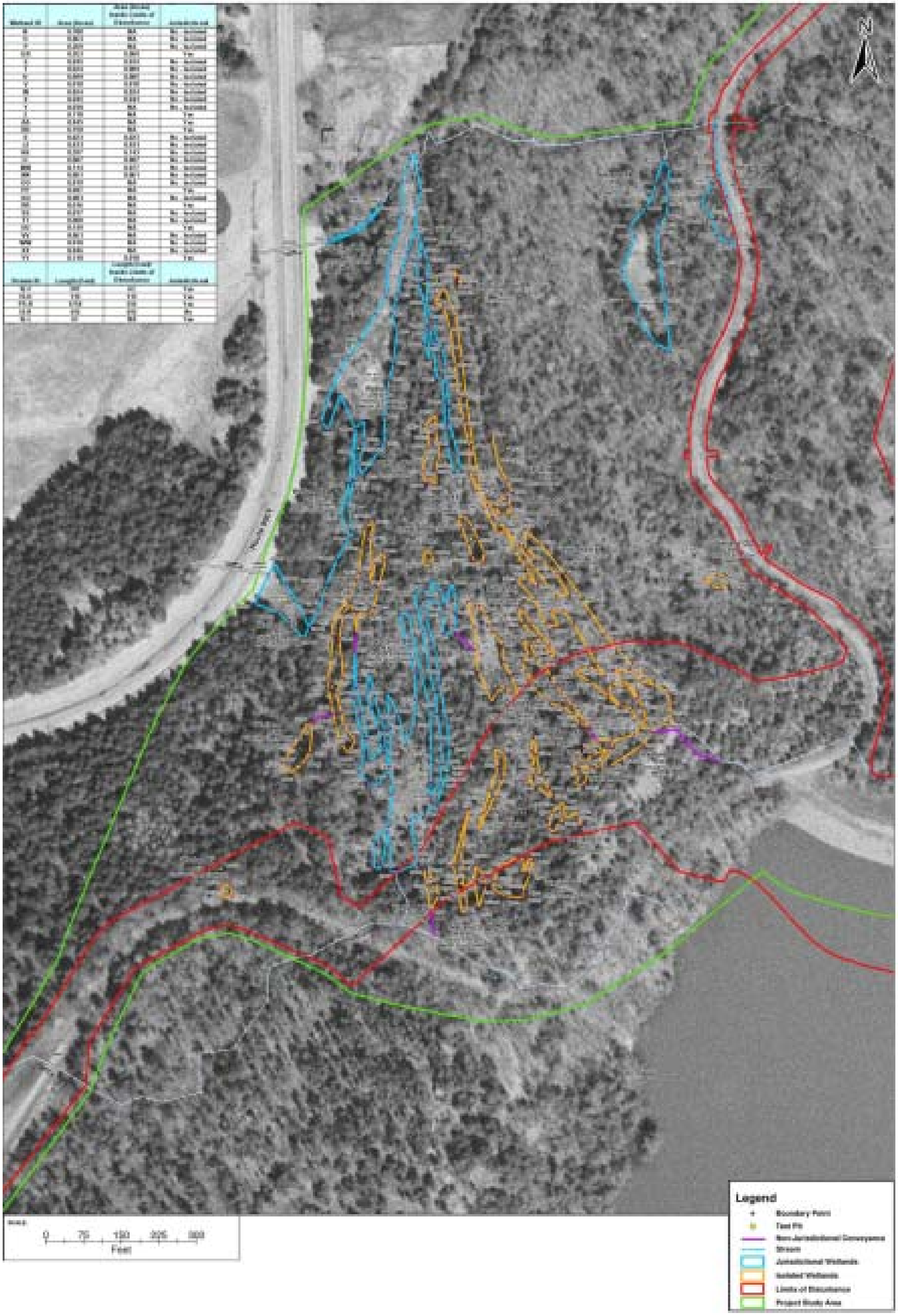
Figure 2.6-3



Wetlands and Waterways in the Low Level Outlet Study Area

Figure 2.6-4

H&S File: 9480\310\7-08-08-Mp1-Wetlands Maps.cdr



Wetlands and Waterways in the West Access Road Study Area

Figure 2.6-5

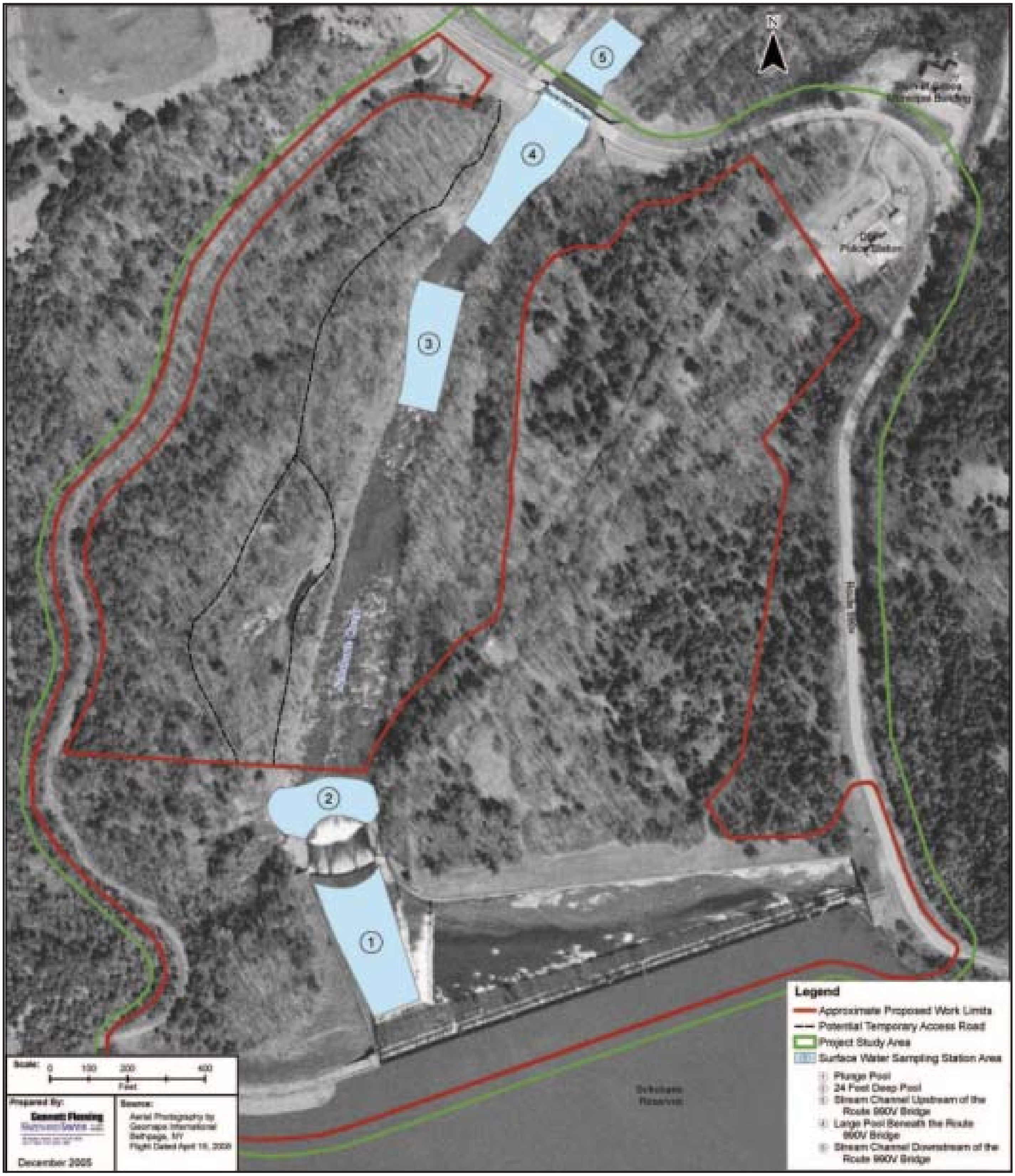
2.6.2.3. Fish and Benthic Macroinvertebrates

An inventory of the natural resources associated with surface water present in the Dam reconstruction project area was conducted in October 2005. This survey focused on the fish, benthic macroinvertebrates, and mussels present in the reach of the Creek from the Plunge Pool immediately downstream of the Dam to 0.5 mile downstream of the NYS Route 990V Bridge. All survey methodology was consistent with the U.S. Environmental Protection Agency's Rapid Bioassessment Protocols Levels II and III (USEPA 1999), The American Fisheries Society's *Fisheries Techniques* (Murphy and Willis, eds. 1996), and the American Fisheries Society's *A Guide to Sampling Freshwater Mussel Populations* (Strayer and Smith 2003).

Water flow in the Creek downstream of the Dam is largely controlled by spillage over the Dam. When no water is spilled due to little or no precipitation, stream flow is reduced severely. Typically, this occurs in late summer through early fall and discharge measured at the U.S. Geological Survey gage (No. 01350101), which is located just upstream of the NYS Route 990V Bridge, can be less than several cubic feet per second. During these low streamflow periods, surface water in the survey reach is limited to several relatively large pools and a 5 to 30 feet wide shallow stream connecting small pools upstream and downstream of the NYS Route 990V Bridge.

Five water quality sampling stations were established: the Plunge Pool immediately downstream of the Dam, a 24-foot deep pool downstream of the Plunge Pool, the stream channel upstream of the NYS Route 990V Bridge, a large pool beneath the NYS Route 990V Bridge, and the stream channel downstream of the NYS Route 990V Bridge (Figure 2.6-6). The survey was conducted during a period of low streamflow. Please see Methodology section for further explanation on sampling location descriptions.

Selected physicochemical water quality parameters, which are indicators for the presence of a healthy aquatic habitat with the ability to support fish and benthic macroinvertebrates, were measured at each sampling station using field instrumentation. The parameters measured included temperature, dissolved oxygen, pH, and specific conductance (Table 2.6-3). All measurements were made just below the water surface, including in the Plunge Pool, the 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge. The field measurements made indicated that water quality was similar among all of the sample stations, although the stream channel station located upstream of the NYS Route 990V Bridge was warmer and better-oxygenated than the others. Nevertheless, all of the stations were well-oxygenated with dissolved oxygen concentrations ranging from 8.9 milligram per liter (mg/l) to 13.2 mg/l and no water quality problems at any station were evident in the data. In comparison, the NYSDEC water quality standard for dissolved oxygen in the portion of Schoharie Creek located within the project study area (Class B, non-trout waters) is never less than 4.0 mg/l. In addition, the water at all stations was clear except along the shoreline of the 24 feet deep pool downstream of the Plunge Pool where turbidity was observed. This turbidity is due to severe erosion along the west shoreline of the Creek in this location.



H&S File: 9480\310\Mp1-Surface Water Sample.cdr 7-09-08

Surface Water Quality Sampling Stations

CAT 211

Engineering Design Services and Design During Construction for the Reconstruction of Catskill Watershed Dams and Associated Facilities

Figure 2.6-6

Gannett Fleming HAZEN AND SAWYER Environmental Engineers & Scientists

A Joint Venture

Table 2.6-3 Physiochemical measurements made in Schoharie Creek Downstream of the Gilboa Dam in 2005.

Parameter	Sampling Location					NYSDEC Water Quality Standard[1]
	Plunge Pool	24' Deep Pool	Channel Upstream of 990V Bridge	Pool beneath 990V Bridge	Channel Downstream of 990V Bridge	
Date	17 October	17 October	18 October	18 October	18 October	--
Water Temp (°C)	12.2	12.8	14.2	12.2	12.5	NA[2]
Dissolved O_2 (mg/l)	8.9	9.0	13.2	10.2	9.8	Never < 4.0
pH (Standard Units)	7.7	7.1	7.8	7.8	7.8	>6.0 and <9.5
Specific Conductance (μmhos/cm)[3]	157	198	322	371	377	NA[2]

1 For Class B, non-trout waters which is the classification for Schoharie Creek in the project study area.
2 Not Applicable, no water quality standards exist.
3 mhos is the SI unit of conductance equivalent to 1 ampere per volt.

A total of 705 fish of 14 species were captured at the five stations. The dominant species of fish included smallmouth bass, white sucker, cutlips minnow, rock bass, and longnose dace. No fish listed as threatened or endangered by NYSDEC were captured. Twelve of the 14 species identified were native species. The non-native species included common carp and brown trout. Only two pioneering species, those that predominate in unstable habitats and are among the first to reinvade streams following dry periods, were identified: white sucker and longnose dace.

Most of the fish, including many young-of-the-year smallmouth bass, were captured at the channel stations. The brown trout and walleye were restricted to the Plunge Pool and the 24 feet deep pool, which apparently provide safe haven for these larger sportfish. However, the thin condition of the four brown trout captured in the 24 feet deep pool suggest a potentially insufficient macroinvertebrate food resource at this location.

Based on the presence of young-of-the-year fish in the catch, rock bass and smallmouth bass appear to reproduce in the study reach. Brown trout and walleye likely move into the survey reach from the Reservoirs located upstream and downstream.

A diverse mixture of macroinvertebrates were collected at the five sampling stations. Included in the total of 43 taxa collected were 16 EPT taxa, the mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) that generally are considered intolerant of water pollution and habitat degradation.

More total macroinvertebrate taxa and more EPT taxa were collected at the two stream channel stations than in the large pools. Only 49 macroinvertebrates were collected in the entire sample in the 24 feet deep pool, whereas the other samples contained sufficient numbers to justify the 200-specimen subsample methodology employed in sample processing. It should be noted that this is more likely a function of water depth than a reflection of any specific set of water quality parameters. Also, computed Hilsenhoff Biotic Index values indicated overall greater intolerance of water pollution and habitat degradation in the macroinvertebrate communities at the stream channel stations. The presence of EPT taxa along with the computed HBI values are indicative of good water quality within the Creek capable of supporting a diverse assemblage of macroinvertebrates and a lack of organic enrichment.

No live mussels, nor any empty or “spent” shells that would indicate the possible presence of live mussels, were found in a total of 5 man-hours of survey. These results are not unexpected because the extremely coarse nature of the stream substrate (i.e., almost entirely boulders and bedrock with some cobbles) and the nearly intermittent stream flow regime constrict mussel communities.

Given the low light and dissolved oxygen constraints common in deep water habitats, the aquatic benthic organisms most likely to reside within the area cited for the LLO intake pipe (approximate depth of 100 feet) would include invertebrates of the family Chironomidae, some oilgochaetes (worms), and Sph aeracea (fingernail clams) (Ward, 1992; Strayer, personal communication, 2005). This describes the potential for existing macroinvertebrate on the Reservoir bottom. Chironomids are very common in freshwater environments and typically account for most of the macroinvertebrates species found within freshwater aquatic habitats (Peckarsky et. al., 1990). Fingernail clams are commonly occurring small (3-20 mm) bivalves that live abundantly in standing waters and exhibit tolerances to low temperature and low dissolved oxygen environments common in deep lakes (Peckarsky et. al., 1990; Strayer, personal communication, 2005).

2.6.2.4. Reptiles and Amphibians

Herptile (reptiles and amphibians) inventory surveys of the Dam reconstruction project study area were conducted 19 through 23 September 2005, 2 through 4 May 2006, 6 through 8 June 2006, 15 June 2006, and 19 through 2 June 2006. Herptiles of the project study area were inventoried by eight methods: time-constrained searches, pitfall traps, basking turtle traps, incidental observation, nighttime call surveys, timed dip-net sweeps, egg-mass surveys, and PVC artificial habitats. Prior to the field inventory the New York State Amphibian and Reptile Atlas was consulted to determine the known distribution of herptile species in the project study area (NYSDEC 2005a). Information on protected herptile species was also obtained from the New York Natural Heritage Program (NYSDEC 2005b).

Eighteen (18) herptile species were recorded from the project study area during the 2005 and 2006 inventories (Table 2.6-4). This species record includes nine salamander, five frog, one toad, two snake, and one turtle species. Most species were recorded during the time-constrained searches and the most commonly encountered species were redback salamanders (*Plethodon cinereus*) in terrestrial settings and green frogs (*Rana clamitans*) in aquatic settings. American toads (*Bufo americanus*) were the only species captured in pitfall traps and no turtles were captured in the basking traps. Spring peepers (*Pseudacris crucifer*) were the most commonly identified species during the nighttime call surveys and wood frog (*Rana sylvatica*) were the most abundant species captured with the timed dip-net sweeps. Northern gray treefrogs (*Hyla chrysoscelis*) were heard vocalizing on several occasions but were not found using the PVC artificial habitats. The state-listed Species of Special Concern, Jefferson salamander (*Amybstoma jeffersonianum*), was recorded from several locations throughout the project study area.

All species documented in the project study area have been previously reported from Schoharie County and the most common species were those that were expected. Historical reports indicate that 32 herptile species are known from Schoharie County (NYSDEC 2005). The 2005 and 2006 inventory of the project study area recorded 18 herptile species, which is approximately 56 percent of the herptile fauna known to inhabit Schoharie County.

Two protected species were recorded from several locations throughout the project study area. Jefferson salamanders (*Ambystoma jeffersonianum*) were observed as eggs, larvae, and adults and blue-spotted salamanders (*A. laterale*) were observed as eggs. Jefferson and blue-spotted salamanders are listed as Species of Special Concern in New York State.

The New York State Natural Heritage Program has records of timber rattlesnake (*Crotalus horridus*), a state threatened species, occurring within or near the project area. The NYSDEC has record of a known timber rattlesnake hibernaculum (over-wintering den) within two miles of the project study area. A survey for timber rattlesnake (*Crotalus horridus*) critical habitat within the Dam reconstruction project study area was conducted with NYCDEP biologists from September 19 through 23 September 2005 and 16 June 2006. In addition, on December 3, 2004 NYCDEP biologists conducted a habitat survey for timber rattlesnakes at the proposed dredge material disposal area (Gate 16) for the Shandaken Tunnel Dredging and Dewatering project.

The timber rattlesnake is a relatively wide ranging species. In some cases a male will travel as far as 7.2 km (4.5 mi) during their summer migration, foraging for food and searching for a mate. In northeastern New York the mean maximum migratory distance from the den was 4.07 km (2.5 mi) for males and for non-gravid females was 2.05 km (1.3 mi).

The life of the timber rattlesnake, in northern climates, is focused around communal hibernation dens (hibernaculum). These dens are usually located near rock ledges or talus slopes. Every year the Timber Rattlesnakes return to the same den to hibernate. Until the recent development of radio telemetric sampling, it was thought that rattlesnakes preferred open rocky habitat since this is where rattlesnakes are typically seen. However, with the aid of radio telemetry, it was determined that the habitat used most frequently by male and non-gravid (not pregnant) female timber rattlesnakes is heavily wooded (NYCDEP, 2004). Water features are also considered an important habitat feature during the summer months. From radio telemetric studies done in the lower Hudson Valley and observations near Lake George, timber rattlesnakes seem to have an affinity for visiting ponds, lakes, and streams, and for foraging in wetlands.

The fall 2005 survey for timber rattlesnake critical habitat was a reconnaissance-type survey designed to identify potential critical habitat areas for further investigation in the spring of 2006 (spring survey). The fall 2005 survey occurred at about the time that the species would be congregating at the hibernaculum. Critical habitat for timber rattlesnakes was not confirmed in the project study area but habitats were identified that required further investigation. The spring 2006 survey focused on areas identified as snake basking areas (rocky areas with open canopies allowing for ample sunlight).

No timber rattlesnakes were observed during the spring 2006 survey. In addition, no timber rattlesnakes were observed during the numerous surveys of wetland and forested habitats in the project study area. Eastern garter snakes (*Thamnophis sirtalis*) were the only snake species observed during the spring 2006 survey.

TABLE 2.6-4. KNOWN HERPTILES OF SCHOHARIE COUNTY, NEW YORK (SOURCE: NYSDEC 2005A)	
COMMON NAME	**SCIENTIFIC NAME**
Eastern American Toad	***Bufo americanus***
Northern Spring Peeper	***Pseudacris crucifer***
Gray Treefrog	***Hyla chrysoscelis***
Bullfrog	*Rana catesbeiana*
Green Frog	***Rana clamitans***
Wood Frog	***Rana sylvatica***
Leopard Frog	*Rana pipiens*
Pickerel Frog	***Rana palustris***
Jefferson Salamander	***Amybstoma jeffersonianum***
Blue-Spotted Salamander	***Ambystoma laterale***
Spotted Salamander	***Amystoma maculatum***
Red-spotted Newt	***Notophthalmus viridescens***
Northern Dusky Salamander	***Desmognathus fuscus***
Mountain Dusky Salamander	***Desmognathus ochrophaeus***
Redback Salamander	***Plethodon cinereus***
Slimy Salamander	***Plethodon glutinosis***
Spring Salamander	*Gyrinophilus porphyriticus*
Two-Lined Salamander	***Eurycea bislineata***
Northern Water Snake	***Nerodia sipedon***
Northern Brown Snake	*Storeria dekayi*
Northern Redbelly Snake	*Storeria occipitomaculata*
Common (or Eastern) Garter Snake	***Thamnophis sirtalis***
Northern Ringneck Snake	*Diadophis punctatus*
Northern Black Racer	*Coluber constrictor*
Smooth Green Snake	*Opheodrys vernalis*
Eastern Milk Snake	*Lampropeltis triangulum*
Northern Copperhead	*Agkistrodon contortrix*
Common Snapping Turtle	***Chelydra serpentina***
Wood Turtle	*Clemys insculpta*
Eastern Box Turtle	*Terrapene carolina*
Red-eared Slider	*Trachemys scripta*
Painted Turtle	*Chrysemys picta*

Note: Species in **Bold** were recorded during 2005 and 2006 herpetile surveys conducted within the Gilboa Dam study area

2.6.2.5. Avifuana

Avian surveys within the proposed project area were conducted 10 through 12 October 2005, 10 and 11 January 2006, and 24 through 26 May 2006. Birds of the project study area were inventoried by three methods: Avian Survey Transect (AST); Targeted Search (TS); and incidental observation. Prior to the field inventory the New York Breeding Bird Atlas, the National Audubon Society Christmas Bird Count, bird reports on eBird, and the most up-to-date published range maps (Sibley 2003) were reviewed to determine bird species likely to occur in the project study area.

Ninety-three (93) avian species were recorded from the project study area during the fall 2005 inventory. Of these 93 species, 67 percent were confirmed utilizing the habitats of the project study area while 18 percent were observed flying over the project study area and 16 percent were observed on or primarily associated with the Reservoir only. The American robin (*Turdus migratorius*) was the most commonly encountered species (with exception to Reservoir associated species) during both the AST and TS surveys.

Thirty (30) avian species were recorded from the project study area during the winter 2006 inventory. Of these 30 species, 73 percent were confirmed utilizing the habitats of the project study area while 27 percent were observed flying over the project study area. The American crow (*Corvus brachyrhynchos*) was the most commonly encountered species with the black-capped chickadee (*Poecile atricapillus*) a close second. Because many of the crows were in local transit over the project study area, we consider the black-capped chickadee to be the most numerous wintering and resident species that uses habitats within the project study area.

Ninety-one (91) avian species were recorded from the project study area during the spring 2006 inventory. Of these 91 species, 82 percent were confirmed utilizing the habitats of the project study area while 8 percent were observed flying over the project study area and 10 percent were observed on or primarily associated with the Reservoir only. The red-eyed vireo (*Vireo olivaceous*) was the most commonly encountered species. The Reservoir-associated brant, *Branta bernida*, was also recorded in large numbers, however, it should be noted that seasonal (temporary) migratory stop-overs of Brant are infrequently recorded at other NYC reservoirs.

Based on field observations (126 species recorded) as well as additional outside information, it is estimated that eighty-one (81) avian species breed at the site, fifty-two (52) avian species winter at the site, and one hundred ninety-six (196) avian species are transients through the site (Table 2.6-5). All together, it is estimated that two hundred eleven (211) avian species use the site through the course of the year. This avian diversity appears to be typical of the region.

Nine protected species, as listed by the NYSDEC, were identified within the project study area. These species included: the endangered peregrine falcon (*Falco peregrinus*); the threatened pied-billed grebe (*Polilymbus podiceps*), northern harrier (*Circus cyaneus*), and bald eagle (*Haliaeetus leucocephalus)*; and the Species of Special Concern common loon (*Gavia immer*), osprey (*Pandion haliaetus*), sharp-shinned hawk (*Accipiter striatus*), red-shouldered hawk (*Buteo lineatus*), and Bicknell's thrush (*Catharus bicknelli*). The bald eagle and red shouldered hawk are the only known resident species with protective status. However, no bald eagle or red-shouldered hawk nests were observed in the immediate study area. The remaining protected avian species are most likely migrants.

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Common Loon	***Gavia immer***			x (r)
Pied-billed Grebe	***Polilymbus podiceps***			x (r)
Horned Grebe	*Podiceps auritus*			x (r)
Red-necked Grebe	*Podiceps grisegena*			x (r)
Double-crested Cormorant	***Phalacrocorax auritus***			x (r)
American Bittern	*Botaurus lentiginosus*			x
Great Blue Heron	***Ardea herodias***			x (r)
Great Egret	*Casmerodius albus*			x (r)
Green Heron	***Butorides striatus***	x		x
Black-crowned Night-Heron	***Nycticorax nycticorax***			x (r)
Turkey Vulture	***Cathartes aura***	x		x
Snow Goose	***Chen caerulescens***			x (r)
Brant	***Branta bernicla***			x (r)
Canada Goose	***Branta canadensis***	x (r)	x (r)	x (r)
Wood Duck	***Aix sponsa***	x		x
Gadwall	*Anas strepera*			x (r)
American Wigeon	*Anas americana*			x (r)
American Black Duck	***Anas rubripes***		x (r)	x (r)
Mallard	***Anas platrhynchos***	x (r)	x (r)	x (r)
Blue-winged Teal	*Anas discors*			x (r)
Northern Shoveler	*Anas clypeata*			x (r)
Northern Pintail	*Anas acuta*			x (r)
Green-winged Teal	***Anas crecca***			x (r)
Canvasback	*Aythya valisineria*			x (r)
Redhead	*Aythya Americana*			x (r)
Ring-necked Duck	***Aythya collaris***			x (r)
Greater Scaup	*Aythya marila*			x (r)
Lesser Scaup	*Aythya affinis*			x (r)
Surf Scoter	*Melanitta perspicillata*			x (r)
White-winged Scoter	***Melanitta deglandi***			x (r)
Black Scoter	*Melanitta nigra*			x (r)
Long-tailed Duck	*Clangula hyemalis*			x (r)
Bufflehead	*Bucephala albeola*			x (r)
Common Goldeneye	*Bucephala clangula*		x (r)	x (r)
Hooded Merganser	*Lophodytes cucullatus*	?	x (r)	x (r)
Common Merganser	***Mergus merganser***	x	x (r)	x (r)
Red-breasted Merganser	*Mergus serrator*			x (r)

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Ruddy Duck	*Oxyura jamaicensis*			x (r)
Osprey	***Pandion haliaetus***			x (r)
Bald Eagle	***Haliaeetus leucocephalus***	x (r)	x (r)	x (r)
Northern Harrier	***Circus cyaneus***			x (o)
Sharp-shinned Hawk	***Accipiter striatus***	?	x	x
Cooper's Hawk	*Accipiter cooperii*	?	x	x
Northern Goshawk	*Accipiter gentilis*		x	x
Red-shouldered Hawk	***Buteo lineatus***		x	x
Broad-winged Hawk	*Buteo platypterus*	?		x
Red-tailed Hawk	***Buteo jamaicensis***	x	x	x
Rough-legged Hawk	*Buteo lagopus*			x (o)
Golden Eagle	*Aquila chrysaetos*			x (o)
American Kestrel	*Falco sparverius*		x (o)	x (o)
Merlin	*Falco columbarius*			x (o)
Peregrine Falcon	***Falco peregrinus***			x (r)
Ruffed Grouse	***Bonasa umbellus***	x	x	
Wild Turkey	***Meleagris gallapavo***	x	x	
American Coot	*Fulica americana*			x (r)
Black-bellied Plover	*Pluvialis squatarola*			x (r)
Killdeer	***Charadrius vociferus***	x (r)		x (r)
Semipalmated Plover	*Charadrius semipalmatus*			x (r)
Greater Yellowlegs	***Tringa melanoleuca***			x (r)
Lesser Yellowlegs	*Tringa flavipes*			x (r)
Solitary Sandpiper	*Tringa solitaria*			x (r)
Spotted Sandpiper	***Actitis macularia***			x (r)
Dunlin	*Calidris alpine*			x (r)
Pectoral Sandpiper	*Calidris melanotos*			x (r)
Semipalmated Sandpiper	*Calidris pusilla*			x (r)
Least Sandpiper	*Calidris minutilla*			x (r)
Wilson's Snipe	*Capella gallinago*			x (r)
American Woodcock	***Philohela minor***	?		x
Bonaparte's Gull	*Larus philadelphia*			x (r)
Ring-billed Gull	***Larus delawarensis***			x (r)
Herring Gull	***Larus argentatus***		x (r)	x (r)
Great Black-backed Gull	*Larus marinus*		x (r)	x (r)
Common Tern	*Sterna hirundo*			x (r)
Black Tern	*Chlidonias niger*			x (r)
Rock Pigeon	***Columba livia***	x	x	
Mourning Dove	***Zenaida macroura***	x	x	x
Black-billed Cuckoo	***Coccyzus erythropthalmus***	x		x
Yellow-billed Cuckoo	*Coccyzus americanus*			x

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Barn Owl	*Tyto alba*			x
Eastern Screech-Owl	***Otus asio***	x	x	
Great Horned Owl	***Bubo virginianus***	x	x	
Barred Owl	***Strix varia***	x	x	
Long-eared Owl	*Asio otus*		x	x
Northern Saw-whet Owl	*Aegolius acadicus*		x	x
Common Nighthawk	***Chordeiles minor***			x
Chimney Swift	***Chaetura pelagica***	x		x
Ruby-throated Hummingbird	***Archilochus colubris***	x		x
Belted Kingfisher	***Megaceryle alcyon***	x	x	x
Red-headed Woodpecker	*Melanerpes erythrocephalus*			x
Red-bellied Woodpecker	***Melanerpes carolinus***	x		x
Yellow-bellied Sapsucker	***Sphyrapicus varius***	x		x
Downy Woodpecker	***Picoides pubescens***	x	x	
Hairy Woodpecker	***Picoides villosus***	x	x	
Northern Flicker	***Colaptes auratus***	x	x	x
Pileated Woodpecker	***Dryocopus pileatus***	x	x	
Olive-sided Flycatcher	*Nuttallornis borealis*			x
Eastern Wood-Pewee	*Contopus virens*			x
Yellow-bellied Flycatcher	***Empidonax flaviventris***			x
Alder Flycatcher	*Empidonax alnorum*			x
Willow Flycatcher	*Empidonax traillii*			x
Least Flycatcher	***Empidonax minimus***	x		x
Eastern Phoebe	***Sayornis phoebe***	x		x
GreatCrested Flycatcher	***Myiarchus crinitus***	x		x
Eastern Kingbird	***Tyrannus tyrannus***	x		x
Yellow-throated Vireo	***Vireo flavifrons***	x		x
Blue-headed Vireo	***Vireo solitarius***	x		x
Warbling Vireo	***Vireo gilvus***	x		x
Philadelphia Vireo	*Vireo philadelphicus*			x
Red-eyed Vireo	***Vireo olivaceus***	x		x
Blue Jay	***Cyanocitta cristata***	x	x	x
American Crow	***Corvus brachyrhynchos***	x	x	x
Common Raven	***Corvus corax***	x	x	
Horned Lark	*Eremophila alpestris*			x (o)
Purple Martin	*Progne subis*			x (o)
Tree Swallow	***Iridoprocne bicolor***	x		x
Northern Rough-winged Swallow	***Stelgidopteryx ruficollis***	x		x
Bank Swallow	*Riparia riparia*			x (o)
Cliff Swallow	*Petrochelidon pyrrhonota*			x

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Barn Swallow	***Hirundo rustica***			x
Black-capped Chickadee	***Parus atricapillus***	x	x	
Tufted Titmouse	***Parus bicolor***	x	x	
Red-breasted Nuthatch	***Sitta canadensis***	x	x	x
White-breasted Nuthatch	***Sitta carolinensis***	x	x	x
Brown Creeper	***Certhia familiaris***	x	x	x
Carolina Wren	***Thryothorus ludovicianus***	x	x	
House Wren	***Troglodytes aedon***	x		x
Winter Wren	***Troglodytes troglodytes***			x
Marsh Wren	*Cistothorus palustris*			x
Golden-crowned Kinglet	***Regulus satrapa***		x	x
Ruby-crowned Kinglet	***Regulus calendula***			x
Blue-gray Gnatcatcher	***Polioptila caerulea***	x		x
Eastern Bluebird	*Sialia sialis*			x
Veery	***Catharus fuscescens***	x		x
Gray-cheeked Thrush	***Catharus minimus***			x
Bicknell's Thrush	***Catharus bicknelli***			x
Swainson's Thrush	***Catharus ustulatus***			x
Hermit Thrush	***Catharus guttatus***	x		x
Wood Thrush	***Hylocichla mustelina***	x		x
American Robin	***Turdus migratorius***	x		x
Gray Catbird	***Dumetella carolinensis***	x		x
Brown Thrasher	*Toxostoma rufum*			x
European Starling	***Sturnus vulgaris***	x	x	x
American Pipit	***Anthus spinoletta***			x (o)
Cedar Waxwing	***Bombycilla cedrorum***	x	x	x
Blue-winged Warbler	*Vermivora pinus*			x
Golden-winged Warbler	*Vermivora chrysoptera*			x
Tennessee Warbler	*Vermivora peregrina*			x
Orange-crowned Warbler	*Vermivora celata*			x
Nashville Warbler	***Vermivora ruficapilla***	x		x
Northern Parula	***Parula americana***	x		x
Yellow Warbler	***Dendroica petechia***	x		x
Chestnut-sided Warbler	***Dendroica pensylvanica***	x		x
Magnolia Warbler	***Dendroica magnolia***	x		x
Cape May Warbler	***Dendroica tigrina***			x
Black-throated Blue Warbler	***Dendroica caerulescens***			x
Yellow-rumped Warbler	***Dendroica coronata***	x		x
Black-throated Green Warbler	***Dendroica virens***	x		x
Blackburnian Warbler	***Dendroica fusca***	x		x

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Pine Warbler	***Dendroica pinus***	x		x
Prairie Warbler	*Dendroica discolor*			x
Palm Warbler	***Dendroica palmarum***			x
Bay-breasted Warbler	*Dendroica castanea*			x
Blackpoll Warbler	***Dendroica striata***			x
Cerulean Warbler	*Dendroica cerulea*			x
Black-and-white Warbler	***Mniotilta varia***	x		x
American Redstart	***Setophaga ruticilla***	x		x
Ovenbird	***Seiurus aurocapillus***	x		x
Northern Waterthrush	*Seiurus noveboracensis*			x
Louisiana Waterthrush	*Seiurus motacilla*			x
Connecticut Warbler	*Oporornis agilis*			x
Mourning Warbler	*Oporornis philadelphia*			x
Common Yellowthroat	***Geothlypis trichas***	x		x
Hooded Warbler	***Wilsonia citrina***			x
Wilson's Warbler	*Wilsonia pusilla*			x
Canada Warbler	***Wilsonia canadensis***			x
Scarlet Tanager	***Piranga olivacea***	x		x
Eastern Towhee	***Pipilo erythrophthalmus***	x		x
American Tree Sparrow	*Spizella arborea*		x	x
Chipping Sparrow	***Spizella passerina***	x		x
Field Sparrow	*Spizella pusilla*			x
Vesper Sparrow	*Pooecetes gramineus*			x (o)
Savannah Sparrow	*Passerculus sandwichensis*			x (o)
Grasshopper Sparrow	*Ammodramus savannarum*			x (o)
Fox Sparrow	*Passerella iliaca*			x
Song Sparrow	***Melospiza melodia***	x	x	x
Lincoln's Sparrow	***Melospiza lincolnii***			x
Swamp Sparrow	***Melospiza georgiana***			x
White-throated Sparrow	***Zonotrichia albicollis***		x	x
White-crowned Sparrow	*Zonotrichia leucophrys*			x
Dark-eyed Junco	***Junco hyemalis***	x	x	x
Lapland Longspur	*Calcarius lapponicus*		?	x (o)
Snow Bunting	***Plectrophenax nivalis***		x (o)	x (o)
Northern Cardinal	***Cardinalis cardinalis***	x	x	
Rose-breasted Grosbeak	***Pheucticus ludovicianus***	x		x
Indigo Bunting	***Passerina cyanea***	x		x
Bobolink	***Dolichonyx oryzivorus***			x (o)
Red-winged Blackbird	***Agelaius phoeniceus***			x
Eastern Meadowlark	*Sturnella magna*			x (o)
Rusty Blackbird	*Euphagus carolinus*			x

TABLE 2.6-5. AVIAN SPECIES OBSERVED OR ANTICIPATED TO OCCUR AT THE GILBOA DAM STUDY AREAS

COMMON NAME	SCIENTIFIC NAME	BREEDING	WINTERING	TRANSIENT
Common Grackle	***Quiscalus quiscula***	x	x	x
Brown-headed Cowbird	***Molothrus ater***	x	x	x
Baltimore Oriole	***Icterus galbula***	x		x
Purple Finch	***Carpodacus purpureus***	x	x	x
House Finch	***Carpodacus mexicanus***	x	x	x
Red Crossbill	*Loxia curvirostra*			x
White-winged Crossbill	*Loxia leucoptera*			x
Common Redpoll	*Carduelis flammea*		x	x
Pine Siskin	***Carduelis pinus***		x	x
American Goldfinch	***Carduelis tristis***	x	x	x
Evening Grosbeak	*Hesperiphona vespertina*		x	x
House Sparrow	*Passer domesticus*	?	?	
TOTALS		81 (4)	52 (15)	196

x=expected in project area (**bold** = observed); r = primarily using reservoir; o = primarily flying over; ?=possible in project study area.

Notes: Based on ecological surveys conducted within the Gilboa Dam study area in October 2005 and January and May 2006. Surveys consisted of four Avian Survey Transects representative of habitats present within the project study area. Species not directly using the project study area (i.e. birds primarily associated with the Reservoir or observed flying over in migration or local transit) were also recorded. The NYSDEC New York Breeding Bird Atlas Program, National Audubon Society Christmas Bird Count, bird reports on eBird, and recently published range maps (Sibley 2003) were also consulted.

2.6.2.6. Mammals

An inventory of the mammals (excluding bats) of the Dam reconstruction project study area was conducted from 19 through 23 September 2005, 2 through 4 May 2006, and 20 through 22 June 2006. Mammals of the project study area were inventoried by five methods: live trapping, pitfall trapping, track and scat identification, incidental observation, and spotlight survey. Prior to the field inventory the list of New York State Mammals was consulted to determine a potential list of species in the project study area (NYSDEC 2005a). Information on protected mammal species was also obtained (NYSDEC 2005b).

Twenty-six (26) mammalian species were recorded from the project study area during the fall 2005 inventory (Table 2.6-6). This includes eleven rodent, seven carnivore, two insectivore, one artiodactyl (hoofed mammals with even-numbered toes, i.e., deer, etc.), and one marsupial species. Seven mammalian species were captured with the live traps and only one mammalian species was captured using the pitfall traps. Overall trapping success was thirteen percent (32 of 247) for the live traps and 1 percent (1 of 80) for the pitfall traps. Mice (*Peromyscus* sp.) were the most commonly captured small mammal. No protected species were identified in the project study area.

TABLE 2.6-6. TERRESTRIAL AND AQUATIC MAMMALS OF NEW YORK STATE

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
Virginia Opossum	***Didelphis virginiana***	**Eastern Chipmunk**	***Tamias striatus***
Masked Shrew	***Sorex cinereus***	**Woodchuck**	***Marmota monax***
Water Shrew	*Sorex palustris*	**Gray Squirrel**	***Sciurus carolinensis***
Smoky Shrew	*Sorex fumeus*	Fox Squirrel	*Sciurus niger*
Long-tailed Shrew	*Sorex dispar*	**Red Squirrel**	***Tamiasciurus hudsonicus***
Pygmy Shrew	*Sorex hoyi*	**S. Flying Squirrel**	***Glaucomys volans***
N. Short-tailed Shrew	***Blarina brevicauda***	**N. Flying Squirrel**	***Glaucomys sabrinus***
Least Shrew	*Cryptotis parva*	**Beaver**	***Castor canadensis***
Hairy-tailed Mole	*Parascalops breweri*	**Deer Mouse**	***Peromyscus maniculatus***
Eastern Mole	*Scalopus aquaticus*	**White-footed Mouse**	***Peromyscus leucopus***
Star-nosed Mole	*Condylura cristata*	Alleghany Woodrat	*Neotoma magister*
Coyote	***Canis latrans***	**Southern Red-backed Vole (Boreal Redback Vole)**	***Clethrionomys gapperi***
Red Fox	*Vulpes vulpes*	Meadow Vole	*Microtus pennsylvanicus*
Gray Fox	***Urocyon cinereoargenteus***	Rock Vole	*Microtus chrotorrhinus*
Black Bear	***Ursus americanus***	**Pine (Woodland) Vole**	***Pitymys (Microtus) pinetorum***
Raccoon	***Procyon lotor***	**Muskrat**	***Ondatra zibethicus***
Marten	*Martes americana*	S. Bog Lemming	*Synaptomys cooperi*
Fisher	*Martes pennanti*	Black Rat	*Rattus rattus*
Ermine	***Mustela erminea***	Norway Rat	*Rattus norvegicus*
Long-tailed Weasel	*Mustela frenata*	House Mouse	*Mus musculus*
Mink	***Mustela vison***	**Meadow Jumping Mouse**	***Zapus hudsonius***
Striped Skunk	***Mephitis mephitis***	**Woodland Jumping Mouse**	***Napaeozapus insignis***
River Otter	*Lontra canadensis*	**Porcupine**	***Erethizon dorsatum***
Bobcat	*Lynx rufus*	Eastern Cottontail	*Sylvilagus floridanus*
White-tailed Deer	***Odocoileus virginianus***	New England Cottontail	*Sylvilagus transitionalis*
Moose	*Alces alces*	Varying Hare	*Lepus americanus*

Species in **Bold** were recorded during mammal surveys conducted within the Gilboa Dam study area**.** Flying squirrel and mice were identified to genus only.

Notes: Based on ecological surveys conducted within the Gilboa Dam study area in September 2005 and May, June 2006. The New York State Department of Environmental Conservation checklist of amphibians, reptiles, birds, and mammals of New York State, including their legal status, 5th Revision, was also consulted.

2.6.2.7. Bats

A summer mist-net bat survey of the Dam reconstruction project study area was conducted from 19 through 23 June 2006. Collections were performed under the conditions of a New York State Fish and Wildlife License (No. 652) and all captured bats were released to the wild unharmed. The methods used to conduct the bat survey followed the mist-netting guidelines in the *Agency Draft Indiana Bat (Myotis sodalis) Revised Recovery Plan* (USFWS 1999). Mist-net surveys for bats were performed for a total of sixteen net-nights near the Dam, at feeding habitats, and along flyway corridors in the project study area. Based on current knowledge of the project site, it was anticipated that up to five locations would be sampled to characterize the bat population and adequately quantify project potential impacts. The five mist-net locations were selected based on the foraging habits of bats (i.e., locations near water where flying insects are plentiful, and within a tree canopy that has a ceiling and narrow sides that funnel the foraging bats into the mist-nets).

Prior to the field survey, the list of New York State Mammals was consulted to determine a potential list of bats in the project study area (NYSDEC 2005a). One bat species, the Indiana bat (*Myotis sodalis*), is protected in New York State (NYCDEC 2005b, NYNHP 2003). In 2004, the NYSDEC conducted a bat survey of the Dam access shaft and this data was used to supplement data collection efforts for the proposed project. In addition, published range maps (Barbour and Davis 1969, Merritt 1987, NatureServe 2006) were reviewed to determine which bat species may utilize the project study area.

Five bat species, including one State-listed Species of Special Concern the eastern small-footed bat (*Myotis leibii*, nine individuals), were recorded in the project study area during the June 2006 survey (Table 2.6-7). The eastern small-footed bat is listed as a Species of Special Concern in New York State (NYSDEC 2005b) and is considered by some to be one of the rarest bats in the eastern United States (Wilson and Ruff 1999). No federally or state-listed threatened or endangered species were captured during the June 2006 survey.

The NYCDEP and NYSDEC conducted a hibernating bat survey inside the Gate Chamber of the Dam on December 3, 2004. The results of the joint bat survey are presented in Table 2.6-8.

TABLE 2.6-7. KNOWN BATS OF SCHOHARIE COUNTY, NEW YORK (SOURCES: NATURESERVE 2006, MERRITT 1987)

COMMON NAME	SCIENTIFIC NAME
Big Brown Bat	***Eptesicus fuscus***
Silver-haired Bat	*Lasionycteris noctivagans*
Red Bat	***Lasiurus borealis***
Hoary Bat	*Lasiurus cinereus*
Eastern Small-footed Bat	***Myotis leibii***
Little Brown Bat	*Myotis lucifugus*
Northern Long-eared Bat	***Myotis keenii septentrionalis***
Eastern Pipistrelle	***Pipistrellus subflavus***

Species in **Bold** were recorded during a bat survey conducted within the Gilboa Dam study area.
Notes: Based on ecological surveys conducted within the Gilboa Dam study area in June 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer and the Guide to the Mammals of Pennsylvania, University of Pittsburgh Press, Carnegie Museum of Natural History, Pittsburgh, PA. were also consulted.

TABLE 2.6-8. RESULTS OF NYCDEP/NYSDEC HIBERNATING BAT SURVEY CONDUCTED WITHIN THE GATE CHAMBER OF GILBOA DAM ON DECEMBER 3, 2004

Common Name	Scientific Name	No. of Bats	Male/Female	Regulatory Status
Northern Long-Eared Bat	*Myotis evotis*	3	2/1	None
Big Brown Bat	*Eptesicus fuscus*	72	15/4	None
Small-Footed Bat	*Myotis sublutus*	8	4/4	SC, G3, S2
Little Brown Myotis	*Myotis lucifugus*	3	3/0	None
Eastern pipistrel	*Pipistrellus subflavus*	2	2/0	None
Unknown Bat species	*Unknown*	11	Unknown	Unknown

Notes: SC = Species of Special Concern (NYSDEC), G = Global Rank (NY Natural Heritage Program), S = State Rank (NY Natural Heritage Program)

2.6.3. Future Without the Project

The Future Without the Project considers the anticipated Reconstruction Peak Year and the first full year of operation for the proposed facility. The anticipated Reconstruction Peak Year of reconstruction is based on the peak number of workers.

In the Future Without the Project, the natural resources in and around the proposed project area would change over time through the process of forest succession. This would occur within the successional forest communities most significantly in the next several decades, producing a forest type with a more vertically stratified vegetative composition with well-defined herbaceous, shrub/understory and canopy layers. Increased habitat complexity through the process of forest succession may also increase the diversity of forest-dependent wildlife frequenting the site. Those species which currently exist onsite and rely on forested conditions would benefit. The mature hemlock-northern hardwood forest, floodplain forest, and red maple swamp wetland areas of the site would change the least in the coming decades. However, the potential exists for species change with the differential regeneration of existing or associate plant community species and potential invasion of opportunistic and wind-disseminated vegetation that may occur after tree death or damage via natural occurrences (windthrow, etc.). The structure and function of the more mature upland and wetland forest types would change little in the Future Without the Project.

The amount and extent of existing wetlands are not anticipated to change significantly in the Future Without the Project as the surface and groundwater hydrology of the project site is expected to remain unchanged. Ecological succession within the emergent and shrub wetlands can be anticipated with these wetland habitat types developing more vertically stratified vegetative composition with well-defined herbaceous, shrub/understory and canopy layers.

Water quality within the Creek and its tributaries is not anticipated to improve or worsen significantly in the Future Without the Project. It is anticipated that the current condition of the Creek and its tributaries would continue to support the aquatic faunal population that currently exists, consisting predominantly of insects, amphibians and fish tolerant of the existing water quality. However, it should be noted that recent climate modeling indicates that increases in greenhouse gas emissions could result in a significant increase in the number of days with heavy precipitation (days with greater than 0.40 inches of rain) in areas above 40 degrees north latitude (Tebaldi, 2006; Miller, 2006). Increased turbidity levels from these higher intensity storms could lead to a deterioration in water quality within the Creek and its tributaries.

2.6.4. Temporary Reconstruction Impacts

The proposed reconstruction of the Dam and its appurtenances would result in temporary adverse impacts to some natural resources. The majority of the natural resources affected by the proposed project would be a direct result of the site clearing required for reconstruction related activities. A proposed Natural Resources Restoration Plan has been developed that provides the opportunity for replacing impacted natural resources in space available after reconstruction activity has been completed (see Section 2.6.6, Natural Resources Restoration Plan).

The potential reconstruction impacts have been assessed by comparing the Future With the Project conditions against the Future Without the Project conditions for the predicted maximum area that would be affected by the proposed facility, including building footprints, roads and lay down and staging areas. Refer to Figure 2.6-7 for a depiction of the reconstruction impacts to natural resources at the project site associated with the proposed reconstruction of the Dam.

The configuration of the Dam project site was designed to minimize impacts to natural resources to the greatest extent possible. Staging and lay down areas have been located in successional communities and the impacts to existing wetlands have been limited to the maximum extent practicable. The area to the east of the Creek designated for staging and reconstruction trailers is a mix of successional southern and northern hardwood forest and conifer plantation. Two areas of isolated wetlands, consisting of shallow emergent marsh and shrub swamp wetlands are located within the staging area as well. Southern and northern successional forest and conifer plantation communities to the west of the Creek would be impacted for a spoils disposal area and reconstruction of access roadways to the Dam. In addition, the analysis of temporary reconstruction impacts includes an area to the east of NYS Route 990V consisting of a conifer plantation community with small isolated wetlands that could be impacted under one alternative being considered for reconstruction of the LLO.

2.6.4.1. Terrestrial Vegetation

The proposed reconstruction of the Dam would require the clearing of 60.1 acres of upland terrestrial habitat for the development of reconstruction staging and lay down areas, and access road reconstruction. Of the land cleared during reconstruction activities, 6.6 acres would be utilized for new access roadways, buildings, parking, and stormwater detention basin(s). These disturbances would constitute a permanent loss of the existing onsite vegetation. The 60.1 acres to be cleared would include approximately 20.3 acres of successional southern hardwood forest, 5.3 acres of successional northern hardwood forest, 14.0 acres of conifer plantation, 4.5 acres of successional southern hardwood/conifer plantation, 6.4 acres of successional northern hardwood/conifer plantation, 0.8 acres of successional red cedar woodland/conifer plantation, 3.1 acres of hemlock-northern hardwood forest, 1.1 acres of floodplain forest, and 4.6 acres of lawn (Table 2.6-9). Based upon mean tree densities calculated for each forest community type, an estimated 12,450 trees with a diameter at breast height of 4 inches or greater would be lost due to the clearing for reconstruction related activities (Table 2.6-10). In addition, the understory, shrub, and herbaceous vegetation associated with these community cover types would be lost.

Ninety-three percent of the project related impacts to vegetation occur within vegetative communities with characteristics of disturbances in the recent past such as successional forests, conifer plantation or lawn that are typically dominated by invasive or non-native species (Table 2.6-10). The dominant tree species within these communities include black locust, white ash, sugar maple, and Norway spruce. The shrub layer in these communities is dominated by the non-native Morrow’s honeysuckle and the herbaceous layer is dominated by the non-native Dame’s rocket and hemp nettle. The remaining seven percent of project related impacts to vegetation occur within higher ecological value communities such as hemlock-northern hardwood and floodplain forests (Table 2.6-9). Impacts to these communities are necessary for reconstruction related activities associated with the proposed West Training Wall, LLO outfall structure and temporary internal bridge crossing of the Creek. The impacts to these higher value communities have been minimized to the maximum extent practicable.

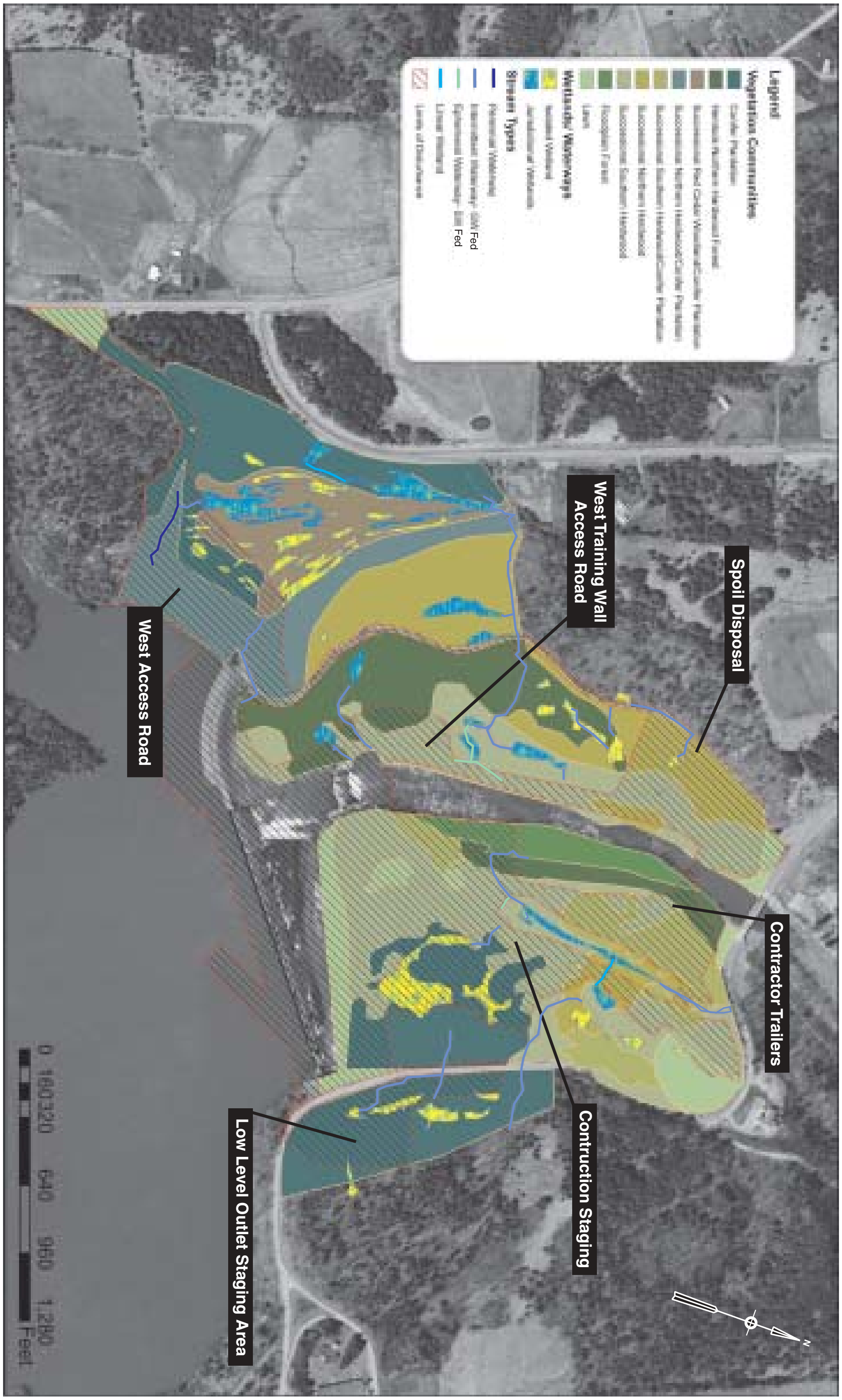
In general, the vegetative species and communities found on the project site are common in the region and do not constitute rare or exemplary stands of native vegetation and no threatened or endangered plant species were found during the vegetation surveys. The NYSNHP has listed the floodplain forest community as vulnerable within New York State. The loss of trees, vegetation, and wildlife habitat that is anticipated with the proposed reconstruction of the Dam would be an adverse impact. However, this impact would be temporary in nature as the proposed Natural Resources Restoration Plan would replace the lower value ecological communities often dominated by invasive, non-native species that are currently onsite with higher value communities dominated by native species for a net loss of 6.6 acres.

The proposed Natural Resources Restoration Plan consists of approximately 51 acres of high quality upland and 5 acres of wetland habitats that includes vernal pools in upland forest habitats, installation of bat roosting and maternity boxes, and installation of large rock clusters for basking habitat (see Section 2.6.6, Natural Resources Restoration Plan).

2.6.4.2. Wetlands and Waterways

The overall development of the site has been designed to minimize disturbances to onsite wetland and stream features. However, due to the orientation of the Creek stream corridor traversing the central portion of the project site and the required components of the proposed reconstruction project, impacts to wetlands are unavoidable. Anticipated impacts include the removal of existing vegetation and the grading and filling of several wetland areas within the site for the development of reconstruction staging and lay down areas, access road reconstruction, and a spoil disposal area. Figure 2.6-6 shows the wetlands that would be impacted as a result of the proposed facility.

The estimated disturbance of wetlands associated with the proposed project would be approximately 2.6 acres (Table 2.6-11). This wetland encroachment includes the filling of 1.7 acres of isolated shallow emergent marsh and shrub swamp wetlands to the east of the Creek in the reconstruction staging area north of the Dam's Side Channel. To the west of the Creek, 0.04 acres of shallow emergent marsh and shrub swamp that drain to the Creek would be filled in the West Training Wall access road.



Gilboa Dam Natural Resource Impact Areas

Figure 2.6-7

A small isolated shallow emergent marsh (0.01 acres) and red maple hardwood swamp wetland (0.05 acres) in the spoil disposal area would be filled as well. Reconstruction of the West Access Road would require the disturbance of shallow emergent marsh and shrub swamp wetlands 0.49 acres of which are isolated and 0.02 acres of which drain to the Creek. The reconstruction staging area for the LLO shaft to the east of NYS Route 990V would impact 0.27 acres of isolated shallow emergent and shrub swamp wetlands. These impacts would be temporary as the Natural Resources Restoration Plan includes the creation of 5.0 acres of freshwater wetlands.

The proposed reconstruction of the Dam would also impact waterways located within the project area. Approximately 325 linear feet of perennial stream, 1,625 linear feet of intermittent stream and 70 linear feet of ephemeral stream would be directly impacted as a result of the proposed project. These impacts will affect fish and benthic aquatic organisms which are natural resources recognized by the NYSDEC and U.S. Army Crops of Engineers.

The direct impacts to perennial stream would occur within the Creek. The extension of the West Training Wall and lining of the Scour Hole immediately downstream of the Plunge Pool would impact approximately 300 linear feet of the Creek. The extension of the West Training Wall would result in the placement of approximately 975 cubic yards of fill below the ordinary high water mark of the Creek and would represent a permanent loss of Creek habitat. However, this would greatly improve the water quality within the Creek by eliminating the current turbidity problems resulting from the severe erosion along the west shoreline of the Creek in this location. The lining of the Scour Hole would result in the placement of approximately 6,800 cubic yards of fill below the ordinary high water mark of the Creek. This fill would decrease the water depth within the Scour Hole by about two-thirds and create a stable non-erosive stream bottom. The proposed temporary internal bridge across the Creek would impact approximately 25 linear feet of the Creek. The temporary internal bridge would be located to the south of the existing NYS Route 990V Bridge and would allow unrestricted access to the spoils disposal area on the west side of the Creek. The temporary internal bridge would require the installation of three bridge piers directly within the bed of the Creek resulting in a temporary disturbance to the Creek. The portion of each pier below ordinary high water would consist of four (4) 5-foot diameter caissons drilled into the bed of the stream. If bedrock is encountered below the Creek bed, a continuous concrete spread footing would be constructed to support each pier. Fill below the ordinary high water associated with the temporary internal bridge piers would be approximately 80 cubic yards. Following reconstruction activities, the temporary internal bridge would be removed and the affected portion of the Creek channel would be re-engineered to create the natural stream morphology that existed prior to the disturbance.

The direct impacts to the intermittent and ephemeral streams would be the result of fill within the reconstruction and staging areas. The direct impacts to waterways within the reconstruction and staging areas have been minimized to the maximum extent practicable through the use of bottomless arch culverts and span bridges where possible. The implementation and use of rigorous Best Management Practices (BMPs) and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that adheres to strict NYCDEP and NYSDEC guidelines would also minimize the impacts to waterways not directly impacted by reconstruction activities.

TABLE 2.6-9. RECONSTRUCTION IMPACTS TO TERRESTRIAL ECOLOGICAL COMMUNITIES IN THE GILBOA DAM STUDY AREAS AND ESTIMATED TREE LOSS

Ecological Community*	Area Disturbed Within Project Area (acres)	Mean Tree** Density (#/acre)	Estimated No. of Trees Lost
Successional Southern Hardwood	20.3	229	4,649
Successional Northern Harwood	5.3	199	1,055
Hemlock-Northern Hardwood	3.1	233	722
Conifer Plantation	14.0	236	3,304
Successional Southern Hardwood/Conifer Plantation	4.5	172	774
Successional Northern Hardwood/Conifer Plantation	6.4	235	1,504
Successional Red Cedar Woodland/Conifer Plantation	0.8	339	271
Floodplain Forest	1.1	154	169
Lawn	4.6	--	--
TOTAL	**60.1**	**--**	**12,448**

Notes: *As per Reschke, 2002; ** trees with a diameter at breast height of 4 inches or greater

TABLE 2.6-10. RECONSTRUCTION IMPACTS TO TERRESTRIAL ECOLOGICAL COMMUNITIES IN THE GILBOA DAM STUDY AREAS AS PERCENT OF AREA DISTURBED AND THEIR HABITAT CHARACTERISTICS

Ecological Community	Area (acres)	Percent of Disturbed Area	Habitat Characteristic
Successional Southern Hardwood	20.3	33.7	Recent disturbance, invasive species
Successional Northern Harwood	5.3	8.8	Recent disturbance, invasive species
Hemlock-Northern Hardwood	3.1	5.2	Climax community, native species
Conifer Plantation	14.0	23.3	Recent disturbance, invasive species
Successional Southern Hardwood/Conifer Plantation	4.5	7.5	Recent disturbance, invasive species
Successional Northern Hardwood/Conifer Plantation	6.4	10.7	Recent disturbance, invasive species
Successional Red Cedar Woodland/Conifer Plantation	0.8	1.3	Recent disturbance, invasive species
Floodplain Forest	1.1	1.8	Limited occurrence in NYS
Lawn	4.6	7.7	Recent disturbance, invasive species
TOTAL	**60.1**	**100**	

TABLE 2.6-11. RECONSTRUCTION IMPACTS TO WETLANDS IN THE GILBOA DAM STUDY AREA

Wetland Type	Area (acres)
Shallow Emergent Marsh	0.5
Shrub Swamp	0.6
Shallow Emergent Marsh/Shrub Swamp	1.4
Red Maple Hardwood Swamp	0.1
TOTAL	**2.6**

The potential for impacts to wetlands and waterways on the project site has been minimized to the greatest extent possible while still providing adequate reconstruction access and staging areas to complete the required components of the proposed project. A project limiting fence, consisting of Jersey barriers topped with a four foot high chain link fence, installed prior to reconstruction would prevent unauthorized wetland encroachments during the reconstruction and operational phases of the project. Sufficient spacing between the Jersey barriers would be provided to allow wildlife movement into and out of existing wetland areas. Eight (8) temporary stormwater sediment traps and one (1) temporary stormwater detention basin would be utilized during reconstruction activities and two (2) permanent stormwater detention basins would be utilized within the project site after completion of reconstruction activities. The temporary and permanent stormwater detention measures would be designed to improve stormwater quality, attenuate the storm water flows to the Creek, and maintain drainage conditions similar to the existing conditions. Table 2.6-13 presents a summary of the projected cumulative impacts to vegetation.

Table 2.6-12 – SUMMARY OF IMPACTS TO VEGETATION

Habitat Type	Area Disturbed (acres)	Area Restored (acres)	Net Gain/ Loss of Onsite Vegetation (acres)
Terrestrial	60.1	51.1	-9.0
Wetland	2.6	5.0	+2.4
Total	62.7	56.1	-6.6

The loss of wetland habitat and potential disturbance to waterways that are anticipated with the proposed reconstruction of the Dam would be temporary in nature as the proposed Natural Resources Restoration Plan would incorporate a large, contiguous onsite wetland system consisting of a mix of shallow emergent, shrub swamp, and forested wetland habitats. The proposed Natural Resources Restoration Plan consists of approximately 56 acres of high quality upland and wetland habitats of disturbed areas (see Table 2.6-14 and Section 2.6.6, Natural Resources Restoration Plan).

Table 2.6-13 IMPACTS TO WETLANDS AND WATERWAYS

Wetland Waterway Type	Disturbance to USACOE Regulated (Water of the U.S.)	Disturbance to NYSDEC Regulated	Amount Created/ Restored	Net Gain/ Loss
Perennial Stream	325 linear feet	325 linear feet	325 linear feet	0
Intermittent Stream	705 linear feet	1,625 linear feet	1,625 linear feet	0
Ephemeral Stream	0 linear feet	70 linear feet	70 linear feet	0

Notes: There will be a total of 2.6 acres of wetlands disturbed as a result of the proposed project (0.06 acres are jurisdictional to the U.S. Army Corps of Engineers and 2.54 acres are isolated, non-jurisdictional). There are no NYSDEC regulated fresh water wetlands within the proposed project site. The net gain of freshwater wetlands is the result of grading and planting associated with the Natural Resources Restoration Plan.

There are currently six options being considered for the placement of the new LLO for the Reservoir (see Section 1.5.1.2.2, Project Description). Options 2A and 2B result in the greatest impacts to natural resources and consist of constructing a new intake tower within the Reservoir on the south side of the Dam. A tunnel from the intake tower to the Plunge Pool would either penetrate the Dam (Option 2A) or be routed through the Dam's foundation (Option 2B). Option 2A and 2B would also require the excavation of a 200 linear foot channel upstream of the intake tower to reach Reservoir depths sufficient to facilitate emergency drawdowns.

Reconstruction of the intake tower, tunnel, and inlet channel for Options 2A and 2B of the LLO would take place under water within the Reservoir. Reconstruction of the intake tower and tunnel would require the dredging of approximately 4,300 cubic yards of sediment from the Reservoir and the removal of approximately 400 cubic yards of bedrock. The bedrock would be removed using hydraulic splitting or mechanical removal techniques. A coffer dam would be installed within the Reservoir around the intake tower work site and removal of soil and bedrock would be accomplished with a high capacity crane. Reconstruction of the inlet tower and tunnel would result in the placement of approximately 5,270 cubic yards of fill within the Reservoir. The channel upstream of the intake tower would require the excavation of approximately 1,400 cubic yards of Reservoir sediments.

It is anticipated that temporary adverse impacts to Reservoir waters resulting from reconstruction activities associated with Option 2A and 2B for the LLO would occur. Turbidity levels in the immediate vicinity of the reconstruction activities could become temporarily elevated and there is the potential for accidental releases of fuel or hydraulic fluids from reconstruction barges that could potentially impact aquatic habitat and organisms. These impacts would be temporary in nature and minimized to the maximum extent practicable through the use of BMPs. Double turbidity curtains would be deployed under either option to contain and minimize turbidity levels within the Reservoir and floating booms would be deployed around the dredge barge to contain accidental releases of fuel or oil.

Temporary adverse impacts to the Reservoir waters resulting from the placement of riprap at the Earthfill Embankment and West Training Wall could occur as turbidity levels in the immediate vicinity of the reconstruction activities could become temporarily elevated. As with impacts from construction of the LLO, reconstruction activities in the area of the Earthfill Embankment and West Training Wall could potentially impact aquatic habitat and organisms. These impacts, if they were to occur, would be temporary in nature and minimized to the maximum extent practicable through the use of BMPs. Double turbidity curtains would be deployed around the area where the riprap would be placed to contain and minimize turbidity levels within the Reservoir. The turbidity curtains would extend from the surface to the bottom of the Reservoir. In addition, the riprap would be processed (e.g., washed) prior to placement within the Reservoir to reduce the amount of fine grained material entering the Reservoir.

2.6.4.3. Fish and Benthic Macroinvertebrates

As outlined above in the existing conditions, examination of the Creek revealed a diverse mixture of fish and macroinvertebrate species. Several of the macroinvertebrate species are generally considered intolerant of water pollution and habitat degradation. No fish listed as threatened or endangered by the NYSDEC were found. Water quality measurements taken in the field further indicate the waters of the Creek are well oxygenated and no water quality problems were evident at any of the stations sampled.

Short-term reconstruction related impacts to local fish and benthic macroinvertebrate communities within the Creek may occur. Reconstruction activities related to the lining of the Scour Hole immediately downstream of the Plunge Pool and extension of the West Training Wall could temporarily impact resident fish by altering cover habitat. Increasing in sediment loads to the Creek could temporarily impact benthic marcoinvertebrate habitat. Implementation of rigorous reconstruction related BMPs would minimize these potential impacts. Implementation of the SWPPP that adheres to strict NYCDEP and NYSDEC guidelines would also minimize the impacts to fish and benthic macroinvertebrate communities in the Creek. The completion of these reconstruction activities would permanently benefit fish and macroinvertebrates within the Creek by eliminating the turbidity caused by the erosion of fine sediments in this area of the Creek that is occurring under existing conditions. However, no adverse impacts to regional populations are anticipated. The affected portion of Creek channel would be restored upon completion of the reconstruction activities.

Reconstruction associated with Options 2A and 2B for the LLO would take place under water within the Reservoir. Dredging for LLO Options would take place at depths of approximately 100 feet below the water surface. At these depths the benthic community of the Reservoir would likely be composed of just a few species as taxonomic richness generally declines with increasing depth. For example, a study of Oneida Lake in Oswego County, New York, concluded that lake benthic taxonomic richness declined to less than four species at depths approaching 20 feet (Ward, 1992). It is anticipated that the dredging operation for both options would result in adverse impact to benthic organisms within the immediate reconstruction area. However, no adverse impacts to the surrounding benthic community are anticipated. These impacts would be temporary in nature as benthic organisms would repopulate the disturbed area over time once reconstruction activities have been completed.

It is anticipated that the reconstruction activities associated with the placement of riprap fill on the Reservoir side of the Earthfill Embankment would also result in an adverse impact to benthic organisms within the immediate reconstruction area. These impacts would be temporary in nature as benthic organisms would repopulate the disturbed area over time once reconstruction activities have been completed.

The potential impacts to fish species in the Reservoir related to reconstruction for Options 2A and 2B of the LLO and the placement of riprap fill on the Reservoir side of the Earthfill Embankment include their temporary displacement from the proposed work areas and temporary increases in turbidity within the water column within the dredging area. The installation of the double turbidity curtains around the work areas is not anticipated to impact fish species as the activity associated with their deployment would likely encourage the movement of any fish in the vicinity away from the curtains prior to closure. Therefore, it is unlikely that fish would be trapped or killed. To minimize fish entrapment and potential mortality, a combination of acoustic and light systems would be utilized to scare fish from the project area prior to deployment of the silt curtains. No adverse impacts to the overall fish population within the Reservoir are anticipated.

2.6.4.4. Reptiles and Amphibians

The forested and wetland areas of the Dam proposed project contain suitable herpetile habitat due to the availability of water, high density of leaf litter, and high percent of canopy cover (see Section 2.6.2, Existing Conditions). Loss of hemlock-northern hardwood forest, successional northern and southern hardwood forest, floodplain forest, shallow emergent and shrub swamp wetlands associated with the proposed reconstruction of the Dam (see Table 2.6-10 and Table 2.6-11) would decrease the leaf litter and habitat available for herpetile shelter on the project site.

The loss of the forest and wetland habitat associated with the proposed reconstruction of the Dam would displace some of the local herptile community (salamanders and frogs) and represents a potential adverse impact. However, no long-term adverse impacts to regional herptile populations are anticipated. The wetlands, upland forest, and running water throughout the remainder of the project site could provide habitat to support viable communities of herpetile species. Several of the onsite wetlands identified as important herptile habitat for the blue-spotted and Jefferson salamanders, NYSDEC listed Species of Special Concern, would not be impacted by reconstruction activities. The potential adverse impact to local herptile population would be temporary in nature as the proposed onsite restoration of approximately 56 acres of forested and wetland habitat would replace habitat criteria needed for the local herptile community lost due to reconstruction activities (see Section 2.6.2, Existing Conditions,).

No impacts are anticipated for the timber rattlesnake, a NYSDEC listed threatened species, as none were observed onsite during the herptile surveys. The NYSDEC has a record of a known timber rattlesnake hibernaculum (over-wintering den) within two miles of the project study area which would not be impacted by the proposed project. While timber rattlesnake foraging and basking habitat exist on the project site, the timber rattlesnake is mobile enough to avoid these areas during reconstruction activities. Ample foraging and basking habitat exists outside the project area. In addition, the proposed Natural Resources Restoration Plan would incorporate reconstruction of snake basking areas (rocky areas with open canopies allowing for ample sunlight) to replace those habitats lost during the reconstruction of the Dam.

2.6.4.5. Avifauna

No long-term adverse impacts to the avifauna of the project site are anticipated to occur from the proposed reconstruction of the Dam. Any potential impacts are anticipated to be short-term and related to the reconstruction phases of the project. The avifauna observed onsite consists of species that are common in similar habitats in the region. Seven of the nine protected species identified (see Section 2.6.2, Existing Conditions) are likely migrants and would not be impacted by the proposed project. The bald eagle and red shouldered hawk are the only known resident species with protective status. However, no bald eagle or red-shouldered hawk nests were observed in the immediate study area. As New York State's Bald Eagle population continues to expand, the potential exists for a new pair of eagles to utilize the shoreline areas adjacent to the Dam or for the existing pair to relocate. New eagle territories for nesting pairs and relocation of existing pairs is a common occurrence on the New York City Reservoirs (NYSDEC). In the event of this change during the reconstruction phase and depending on the selected location of the eagles, short-term adverse impacts might be anticipated. The modification of existing vegetative communities resulting from the proposed project could potentially impact birds that breed within and around the project area. However, none of the vegetative communities on the project site serve as critical breeding or nesting areas for any of the species identified during the field surveys. It is anticipated that the vegetative communities that would remain onsite during reconstruction as well as in the surrounding area would continue to provide adequate habitat for breeding species of birds that may use the project site.

Recent concern has been raised regarding the potential impact of development and forest fragmentation in the northeastern United States upon neotropical migrant bird species. Although some of the species observed onsite are neotropical migrants, the temporary disturbance of the site should not negatively affect these species. Most of the issues about these species relate to the effects of fragmentation of larger contiguous woodlands and are, therefore, not of concern on the proposed Dam project site which is located in rural Schoharie County, New York where ample undeveloped land exists. Project impacts could result from lighting at the reconstruction site and noise from trucks during the day. Light exiting the site would be minimized through the use of deflectors and proper alignment and the light wavelength of the lamps used would be designed to minimize impacts to nocturnal avian species as well as night flying moths and other insects.

All of the migrant species observed during the field surveys are common and anticipated in the region. Observations during the spring and fall of migrating bird populations do not indicate that the proposed Gilboa project site is significant in this respect. As a result, no adverse impacts to migrating birds that may utilize the site are anticipated during reconstruction operations. It is anticipated that the vegetative communities that would remain onsite during reconstruction as well as in the surrounding area would continue to provide adequate habitat for migrating passerines that may use the project site. The proposed onsite restoration of approximately 56 acres of forested and wetland habitat would replace perching habitat and a food source for migratory passerines (see Section 2.6.2, Existing Conditions).

2.6.4.6. Mammals

The proposed Dam project site is inhabited by a variety of small mammals and is also utilized by deer and black bear (see Section 2.6.2, Existing Conditions). The proposed project would require the clearing of forested, wetland, and open habitat. The change to these resources would decrease the amount of food and shelter for many species such as gray squirrel, chipmunk, woodchuck, coyote, gray fox, and white-tailed deer. Some species requiring forested habitat would probably relocate outside of the project area where similar forest habitat exists. However, most of the species found on the site can utilize both forested and open habitats. Reconstruction noise and activity would also likely cause local wildlife to move to unutilized portions of the project site and beyond. The temporary loss of the forested, wetland, and open habitats associated with the reconstruction of the Dam would displace some of the local wildlife population and represents a potential adverse impact. However, no long-term adverse impacts to regional wildlife populations are anticipated. The local wildlife community could also experience a decrease in diversity due to the loss of habitat. The potential adverse impact to the local wildlife population would be temporary in nature as the proposed onsite restoration of approximately 56 acres of forested and wetland habitat would replace habitat criteria needed for the local mammal community lost due to reconstruction activities (see Section 2.6.6, Natural Resources Restoration Plan).

The local mammal fauna, including white-tailed deer, are very common and very adaptable and readily habituate to human presence. Edge species (Virginia opossum, raccoon, striped skunk, woodchuck, coyote, and gray fox) would utilize cleared areas and benefit from them. Regional extirpation would not occur as a result of the proposed facility because the lost habitat is common in a regional context. Reconstruction lighting around the Dam and access roads during reconstruction may affect some nocturnal or reclusive animals. Light exiting the project site during reconstruction would be minimized through the use of deflectors and proper alignment.

2.6.4.7. Bats

The five bat species recorded from the project site include the eastern small-footed bat, a NYSDEC listed Species of Special Concern. The proposed reconstruction of the Dam could displace some of the local bat community representing a potential adverse impact. However, no long-term adverse impacts to regional bat populations are anticipated. Any potential impacts are anticipated to be short-term and related to the reconstruction phases of the project. The existing Dam shaft is a known hibernaculum, roosting, and potential maternity site for bats. The planned modifications to the Dam shaft would be seasonally coordinated to minimize impacts to the local bat population. The modification of existing vegetative communities would reduce foraging opportunities for the bats, however, similar vegetative community exist within close proximity to the project site. The potential adverse impact to the local bat population would be temporary in nature as the proposed onsite restoration of approximately 56 acres of forested and wetland habitat would replace foraging habitat for bats lost due to reconstruction activities (see Section 2.6.6, Natural Resources Restoration Plan). In addition, the proposed Natural Resources Restoration Plan would incorporate construction of bat roosting and maternity boxes to replace those habitats lost during the reconstruction of the Dam. Project impacts could result from lighting at the reconstruction site. Light exiting the site would be minimized through the use of deflectors and proper alignment and the light wavelength of the lamps used would be designed to minimize impacts to nocturnal species such as bats.

2.6.4.8. Conclusion

It is anticipated that the area that would be disturbed during the proposed reconstruction of the Dam would alter the natural resources on the project site temporarily. Adverse impacts to existing habitat, wetlands, and trees would probably displace local wildlife from the project site. Reductions in local wildlife diversity can be anticipated as well. However, these impacts would be temporary in nature as the proposed Natural Resources Restoration Plan would replace the vegetative communities disturbed during the reconstruction phase of the project and allow for the re-establishment of the temporarily displaced wildlife populations. Project related impacts to natural resources are not anticipated to have serious consequences in a regional context. The availability of large parcels of undeveloped land in Schoharie, Greene and Delaware Counties for resident and migratory wildlife in the region demonstrates that the temporary disturbance of the project site would not result in an adverse impact on overall species populations of wildlife or the regional ecology.

2.6.5. Potential Project Impacts

Of the land cleared during reconstruction activities, 6.6 acres would be utilized for new access roadways, buildings, parking, and stormwater detention basin(s). These disturbances would constitute a permanent loss of the existing onsite vegetation. The vast majority (ninety-three percent or 55.9 acres) of the project related impacts to vegetation occur within vegetative communities with characteristics of disturbances in the recent past (e.g., successional forests, conifer plantation, lawn). The dominant tree species within these communities include black locust, white ash, sugar maple, and Norway spruce. The shrub layer in these communities is dominated by the non-native Morrow’s honeysuckle and the herbaceous layer is dominated by the non-native Dame’s rocket and hemp nettle. The remaining project related impact areas (seven percent or 4.2 acres) occur within higher ecological value communities (e.g., hemlock-northern hardwood and floodplain forests). Impacts to these communities are necessary for reconstruction related activities associated with the West Training Wall, LLO outfall structure and temporary internal bridge crossing of the Creek. The impacts to these higher value communities have been minimized to the maximum extent practicable.

In general, the vegetative species and communities found on the project site are common in the region and do not constitute rare or exemplary stands of native vegetation. However, the NYSNHP has listed the floodplain forest community as vulnerable within New York State. Ten temporary and two permanent stormwater detention basins would be located within the project site in order to improve stormwater quality, attenuate the stormwater flows to the Creek, and maintain drainage conditions similar to the existing conditions. Loss of shrub swamp and floodplain forest wetlands and their associated stormwater attenuation functions would be replaced with the proposed onsite restoration of these important habitats. The loss of 6.6 acres of trees and wildlife habitat that would occur for new access roadways, buildings, parking, and stormwater detention basin(s) would be a permanent impact. However, the Natural Resources Restoration Plan would replace lower value ecological communities, often dominated by invasive, non-native species currently existing onsite, with higher value communities dominated by native species. The Natural Resources Restoration Plan would consist of approximately 56 acres of high quality forested and wetland habitats and create other wildlife functional values such as vernal pools in upland forest habitats, installation of bat roosting and maternity boxes, and installation of large rock clusters for basking habitat.

The potential for impacts to wetlands and waterways on the project site has been minimized to the greatest extent possible. Two (2) permanent stormwater detention basins would be utilized within the project site after completion of reconstruction activities. These stormwater detention measures would be designed to improve stormwater quality, attenuate the stormwater flows to the Creek, and maintain drainage conditions similar to the existing conditions. There would be a loss of approximately 0.06 acres of wetland habitat resulting from permanent structures such as new access roadways, buildings, and parking. However, the Natural Resources Restoration Plan would incorporate a large, contiguous onsite wetland system consisting of a mix of shallow emergent, shrub swamp, and forested wetland habitats. This wetland system would provide a diversity of benefits to water quality, wildlife and other ecological functions. The proposed Natural Resources Restoration Plan would consist of approximately 5 acres of high quality wetland habitats.

Initiation of snowpack-based reservoir management to provide enhanced flood attenuation at the Reservoir would result in a lowering of Reservoir water levels nominally up to 5 feet, or more, depending upon the amount of snowpack within the watershed. Under this program NYCDEP anticipates establishing general operating guidelines that would maintain the crest gates in a fully lowered position once sufficient snowpack is present in the Schoharie watershed and inflate the crest gates to a fully raised position at the start of the refill period. This position will be maintained at least until the end of the refill period so that maximum storage at Schoharie Reservoir can be obtained for water supply before drawdown occurs. The exact dates and durations of the refill period would be determined based on climatological modeling and projections.

The discharge to the Creek due to lowering of Reservoir water levels could potentially impact flora and fauna that occupy the edge of the Reservoir. However, the water levels maintained in the Reservoir for snowpack-based reservoir management would be within the normal range of water levels typically occurring in the Reservoir throughout the year, hence no long-term impacts to flora and fauna are anticipated.
The initial drawdown of water within the Reservoir at the beginning of the winter would be at a slow enough rate to prevent aquatic organisms from becoming stranded and maintain slope stability. The lower water levels in the winter months, during Reservoir drawdown, would occur when vegetation is dormant. Therefore, no impacts to vegetation would occur during this period. During the springtime, when the vegetation requires higher water levels for the critical growing season, the Reservoir would be in the refill period, thus providing adequate inundation for the vegetation. During the summer months the Reservoir is typically at or below elevation 1125.0 under normal conditions and therefore, maintaining the crest gates in a lowered condition would not impact existing inundation along the shoreline. During the fall, the vegetation would experience intermittent inundation that is typically provided as a result of fall storms. The inconsistent inundation during the fall season would not impact the growing patterns of the vegetation located along the shoreline as they are approaching dormancy. The lowering of the water level within the Reservoir is not expected to cause slope instability along the exposed shoreline of the Reservoir or increase turbidity levels within the

Reservoir. Therefore, no adverse impacts from snowpack-based reservoir management at the Reservoir are anticipated.

In addition, the anticipated flow rates associated with LLO usage for snowpack-based reservoir management would be similar in duration and magnitude to a typical spillway discharge due to a frequent, small intensity storm. Based on this, no changes to the morphology or habitat are anticipated in the downstream sections of Schoharie Creek. Therefore, no adverse impacts to downstream aquatic organisms, vegetation, or the Creek bed are anticipated from the operation of the LLO.

The inlet structure for the LLO would be located at a depth of greater than 100 feet. At this depth, oxygen levels are typically low enough for a significant portion of the year to preclude fish from inhabiting bottom waters of the Reservoir. During winter months, however, the bottom waters of the Reservoir are slightly warmer than surface waters and may contain enough oxygen to attract fish to this zone of the Reservoir. To minimize the potential entrainment of fish during operation of the LLO during winter months, acoustic and/or other appropriate deterrent systems would be utilized to drive fish from the vicinity of the inlet structure for the LLO.

2.6.6. Natural Resources Restoration Plan

As per CEQR guidelines, avoidance and minimization of impacts to natural resources were employed early on in the design phase of the proposed project. As such, the impacts to the mature hemlock-northern hardwood and floodplain forests and wetlands that occur on the project site have been minimized to the maximum extent practicable. In addition, restoration of the temporary impacts to natural resources would be undertaken. The restoration of temporarily disturbed areas would be completed in a phased approach. Restoration activities will begin once work within a particular area has been completed. It is anticipated that restoration activities will begin in the West Access Road area and be followed by the West Training Wall, Spoils Disposal, Construction Staging, and Low Level Outlet areas.

2.6.6.1. Reforestation

It is the objective of NYCDEP to provide a more diverse and functional ecosystem for habitat that would be lost at the Dam project site. Forest habitat lost due to reconstruction activities would be replaced in kind through reforestation efforts that would include the re-planting of approximately 51 acres of canopy, sub-canopy and herbaceous layers. The proposed Natural Resources Restoration Plan would replace the lower value ecological communities often dominated by invasive, non-native species that are currently onsite with higher value communities consisting of native species. Several state and local sources on plant communities and species indigenous to the Catskill region were consulted during the development of the proposed Natural Resources Restoration Plan for the Dam reconstruction project (Bierhorst, 1995; Kudish, 2000; Reschke, 2002). The proposed Natural Resources Restoration Plan would include plant communities indigenous to the area and of a size that would provide for long-term success of the reforestation efforts. An appropriate ecological mixture of trees and shrubs would be chosen that would replicate and improve the type of forest habitat lost by re-introducing ecologically important indigenous species while avoiding those species prone to disease and pests. The proposed reforestation plan would be designed to produce a forest type with a vertically stratified vegetative composition with well-defined herbaceous, shrub/understory and canopy layers. The upland ecological communities that would be created as part of the proposed Natural Resources Restoration Plan are given in Table 2.6-14. Figure 2.6-8 shows the approximate location of the restored upland ecological communities. A list of potential plant species that could be utilized within the canopy, understory, shrub, and herbaceous layers of each of these ecological communities can be found in Appendix A. The growth and development of the reforested areas would increase habitat complexity, by selecting from an appropriate mix of indigenous plant material and designing the site to be restored to encourage a diverse habitat for wildlife. The Natural Resources Restoration Plan would provide an overall benefit to local and regional wildlife populations by supplying increased foraging and cover opportunities.

2.6.6.2. Wetland Restoration

NYCDEP would replace the wetlands to be disturbed under the proposed project through the creation of approximately 5 acres of new wetlands that provide the same functions and values as the disturbed areas. The wetlands on the proposed project area provide stormwater attenuation, water quality improvement, and wildlife habitat. The proposed Natural Resources Restoration Plan would create a large, contiguous onsite wetland system of shallow emergent, shrub swamp, and forested wetland habitats. This wetland system would provide a diversity of benefits to water quality wildlife and other ecological functions. This would restore the functionality of the impacted wetlands within the same water body and watershed which is critical to minimizing wetland related impacts associated with the proposed project. The created wetlands would improve vegetative habitat diversity and provide increased habitat value for aquatic fauna and herptiles. The wetland communities that would be created as part of the Natural Resources Restoration Plan are given in Table 2.6-15 and their approximate locations are shown in Figure 2.6-8.

2.6.6.3. Tree Removal and Protection

Prior to any reconstruction activities (such as clearing, grading, or excavation) tree protection fencing would be installed. A minimum of six-feet-tall fencing would be installed at the edge of twice the dripline distance of the trees to provide protection. Signs would be attached to the fence stating that inside the fencing is a tree protection zone, which is not to be disturbed unless prior approval has been obtained from NYCDEP. No application of chemicals, trenching, grading, root/branch pruning, or other activity would occur within the tree protection zone without the supervision of an onsite arborist approved by NYCDEP. The fencing would not be removed until all reconstruction activities are completed. The tree protection fence would be used in conjunction with silt fences and hay bales to prevent damage from erosion or the transport of reconstruction debris.

2.6.6.4. Conclusion

It is anticipated that the area that would be disturbed during the proposed reconstruction of the Dam would alter the natural resources on the project site temporarily. Adverse impacts to existing habitat, wetlands, and trees would potentially temporarily displace local wildlife from the site. The availability of large parcels of undeveloped land in Schoharie, Greene and Delaware Counties for resident and migratory wildlife in the region would provide habitat to offset the temporary disturbance of the project site.

Reductions in local wildlife diversity can be anticipated as well. However, these impacts would be temporary in nature as the proposed Natural Resources Restoration Plan would replace the vegetative communities disturbed during the reconstruction phase of the project and allow for the re-establishment of the temporarily displaced wildlife populations. There are no project related impacts to natural resources that are anticipated to have serious consequences.

TABLE 2.6-14. TARGETED ECOLOGICAL COMMUNITIES AND APPROXIMATE ACREAGES OF THE NATURAL RESOURCES RESTORATION PLAN FOR THE GILBOA DAM RESTORATION PROJECT

Community Designations (Reschke 2002)	Acres
Upland	
Native Wildflower Meadow +	4.0
Appalachian Oak-Pine Forest (with vernal pools) ^	10.5
Maple-Basswood Mesic Forest (with vernal pools) ^	11.0
Pine-Northern Hardwood Forest (with vernal pools) *	24.5
Floodplain Forest *	1.0
Wetland	
Shallow Emergent Marsh *	1.5
Shrub Swamp *	1.5
Red Maple Hardwood Swamp (with vernal pools) *	2.0
TOTAL	**56.0**

Notes: + Similar community type exists onsite (e.g. mowed lawn, both provide open habitat);
^ Replaces successional hardwood forests;
* Community already exists onsite

Gilboa Dam
Conceptual Natural Resources Restoration Plan

Figure 2.6-8

2.6.7. METHODOLOGY

2.6.7.1. Terrestrial Vegetation

Vegetation surveys of the Dam, West Access Road, and LLO study areas were conducted in September 2005; May, June, July, August, and November 2006; and May 2007. The methodology employed during the vegetation surveys are described below.

Plots

A total of forty-three (43) 75-foot diameter (0.10-acre) plots were located based on preliminary placement on aerial maps of the project study area. As an initial step, the project study area was divided into a grid pattern and the vegetation plots were laid out to provide adequate spatial coverage to define the vegetation communities within the proposed work limits after a review of the limited existing vegetation data in the southern portion of the Gate 16 area that was collected for the Shandaken Tunnel Intake Dredging Project. Additional plot and transect locations were located outside the proposed work limits in order to characterize the surrounding vegetative communities with an eye towards developing a restoration plan for the area to be cleared and grubbed based on these community types. Stereoscopic review and interpretation of aerial photography and delineation of vegetation community polygons were performed to adjust the plot locations so that all vegetation community types within the project study area were sampled and characterized. In addition, field biologists used professional judgment to further adjust location of plots in the field to best match community polygons and develop representative data sets for each community type.

The center point of each plot was identified and a baseline was laid out to 37.5 foot radius to define the circular plot limits. The plot was divided into four quarters based on the four cardinal compass directions to develop tree dominance data using the Point-Centered Quarters (PCQ) method (Mueller-Dombois and Ellenberg 1974). The distance and diameter-breast height (dbh) were measured for the closest tree over 4" dbh in each quarter. All trees over 4-inches dbh were then measured (with the 4 PCQ trees also included). Once tree dbh data were completed, all vascular plant species in the plot were identified and recorded according to the various structural layers (trees in 3 layers, shrubs in 3 layers, herbaceous, vines and moss layer). Each species in each layer was assigned a cover value based on its estimated percent cover in the plot. Heights and overall cover were estimated for each layer. Mosses were only noted as occurring and their percent cover estimated. For analysis, the 0.1 acre plot tree dbh data were converted to basal area and combined with density data to determine Importance Values. The Importance Values were used to generate ordinations using Detrended Correspondence Analysis in PC-ORD (McCune and Mefford 1999).

Timed Meander Surveys

Timed Meander Survey (TMS) transects were located in the field in a similar fashion as the 0.1 acre plots. A total of twenty-one (21) timed meander surveys were conducted. The purposes of the TMS' were to encounter as many species as possible and to ensure that all the forest communities were evaluated and inventoried. The TMS lines were also used to search for rare, threatened, or endangered species. Stereoscopic review and interpretation of aerial photography and delineation of vegetation community polygons were performed to adjust the TMS locations so that all vegetation community types within the project study area were sampled and characterized. In addition, field biologists used professional judgment to further adjust location of the TMS' in the field to best match community polygons and develop representative data sets for each community type. The TMS methodology presented in the Natural Resources Work Plan indicated that plant species would be recorded for a period of time until 30 minutes elapsed without finding any additional species. Based on the number of proposed TMS' within the project study area and the dominance of Southern Successional Hardwood Forest species, the methods were slightly modified to accomplish the purposes of the TMS and to maximize efficiency. All Reschke forest community types were surveyed with the modified TMS methodology. The surveys were conducted along random routes for 30 minutes each. During that time all plant species were recorded and any that were not known but had flowering or fruiting material were collected for later identification. Survey routes covered one or more forest types and small wetland communities. Where possible, the wetlands were distinguished on the field forms. All species were recorded when known or keyed out later and then added to the lists. Some specimens could only be identified to genus and a few could not be identified at all. Plant nomenclature follows Gleason and Cronquist (1991).

Plot Ordinations

A Detrended Correspondence Analysis (DCA) was conducted using tree "Importance Values" (IV). The DCA groups plots and species to indicate how plots are responding to species as variables. PC-ORD, a multivariate statistics computer software package was used to perform the DCA (McCune and Mefford 1999).

Several plot ordinations were tried using "raw" IV data for all species with each plot's data and then removing the rare species, white oak (*Quercus alba*) and red maple (*Acer rubrum*). There were large variations among and between species' total IVs using the "raw" data. Finally, to reduce the risk of one or a few species overwhelming the analysis, data were log-transformed. Because there were a large number of zeros in the data set, a 1 was added to every species IV before transforming. Community types (Reschke 2002) were assigned to each plot based on the ordination results and then compared to shrub and herb data from each plot.

Belt Transects

One of the preliminary locations of a 0.1 acre circular plot was along a cliff face adjacent to the east shore of the Creek. A 0.1-acre circular plot was not possible in this location so two 6-foot x 100-foot long belt transects parallel to the long edge of the cliff face were sampled. A tape measure was extended to 6 feet to measure the width of the belt as the survey was conducted by walking along the cliff face and recording species and cover values. The two belt transects were reinvestigated during the 2006 survey for spring herbaceous species that might not have been identified in the fall 2005 survey.

Point-Centered Quarters Transects

Point-Centered Quarter transects were established at sixteen (16) locations in the project study area using a Geographical Information System (GIS). Transects were placed to assess the different Reschke forest habitats of the project study area. Sample points were established along each transect at 50-foot intervals using the GIS. The latitude and longitude of each sample point was determined with the GIS and navigated to in the field using a Global Positioning System (GPS). Each point was divided into four quarters based on the four cardinal compass directions to develop tree dominance data using the

Point-Centered Quarters (PCQ) method (Mueller-Dombois and Ellenberg 1974). The distance and diameter-breast height (dbh) were measured for the closest tree over 4-inches dbh in each quarter. PCQ metrics were run on the data so that species dominance, density, importance and similar metrics could be determined for each of the four forest community types analyzed (Mitchell 2006).

GPS Mapping

A Trimble™ ProXR® Global Positioning System (GPS) with sub-meter horizontal position precision (Trimble 1997) was used to map the location of plots, TMS', belt transects, and to locate the PCQ sample points. The GPS data were collected as real-time differentially corrected data. The data were transferred onto site mapping using the U.S. State Plane 1983, New York east coordinate system.

Community Mapping

Once the ordinations of the plot data were completed, the plot data were used to delineate forest community polygons on a base map composed of a digital 2004 panchromatic black and white image. The image was printed with the plot locations overlaid and then stereo pairs of 1996 photography was used to interpret and delineate the Reschke forest communities. The communities were delineated on the photos and then transferred to the base map. The plot data were used to guide the interpretation and Reschke forest community polygon development.

2.6.7.2. Wetlands and Waterways

A desktop review of existing information and mapping of the project area was conducted. The U.S. Geological Survey (USGS) 7.5-minute quadrangle map (Gilboa, NY), U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping, NYSDEC Freshwater Wetland Mapping, the Schoharie County NY Soil Survey and aerial mapping were reviewed to determine if wetlands existed, or may exist, onsite prior to beginning field investigations.

The project study area was investigated for palustrine wetland indicators of vegetative composition, soil development and hydrology. Wetland field investigations were conducted in September 2005, May and June 2006, and May 2007 in accordance with methods outlined in the *U.S. Army Corps of Engineers (USCOE) Wetlands Delineation Manual* (Environmental Laboratory, 1987). Due to the size and characteristics of the project study area, the Routine-Onsite Determination method was used.

Vegetation was identified using *A Field Guide to Trees and Shrubs* (Petrides, 1986), *Newcomb's Wildflower Guide* (Newcomb, 1977), *Illustrated Guide to Trees and Shrubs* (Grave, 1956), *Flora of West Virginia* (Strausbaugh, P.D. and E.L. Core, 1977) and *Grasses: An Identification Guide* (Brown, 1979). Plant species were assigned an indicator status [e.g., Upland (UPL), Facultative Upland (FACU), Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) based on the USFWS's *National List of Plant Species that Occur in Wetlands: 1988 National Summary* (Reed, 1988). Soils were characterized by evaluating the upper horizons of the soil profile. Soil pits were dug using a "sharpshooter" spade with a 14-inch blade. Soil horizons were evaluated using normal field protocols for determining texture and nomenclature. The *Munsell Soil Color Charts* (Macbeth Division of Kollmorgen Instruments Corporation, 1994) were used to determine the colors of horizons and redoximorphic features. Reducing condition determinations in soils were performed in the field using presence/absence of mottles, low chroma colors and presence of concretions.

Hydrologic characteristics were evaluated based on the presence/absence of primary and secondary wetland hydrology indicators such as inundation, saturation, drainage patterns, buttressed tree roots, water marks, drift lines, and water-stained leaves. Weather conditions 24 hours prior to fieldwork were also noted to identify the potential for extremely wet or dry weather that might have effects on hydrologic indicators within suspected wetlands. Wetland data and boundary points were marked using pink wetland flagging and located using a Trimble ™ ProXR⊇Global Positioning System (GPS). The Trimble ™ ProXR⊇ is capable of attaining sub-meter accuracy (Trimble, 1997). The GPS data were then transferred onto relevant site mapping using the U.S. State Plane 1983, New York East coordinate system.

Wetland function and value assessments were performed at each delineated wetland using the methods outlined in *The Highway Methodology Workbook Supplement, Wetland Functions and Values: A Descriptive Approach*, USCOE New England Division (NEDEP-360-1-30a 1995). Several qualitative methods are available to determine wetland functions and values (Tiner, 2003; Bartoldus et al., 1994; USACE, 1995). These methods are generally similar in that they identify similar wetland functions (e.g. nutrient removal, wildlife habitat, etc.), yet they are often grossly different in that some use remote data while others use site specific data. The relatively new USFWS method for the Northeastern United States (Tiner, 2003) takes into account landscape position, landform, and waterflow path, but is designed for planning purposes at a regional or watershed scale and is done without the input of site specific data. Hence, functional opportunities are not taken into account. The Evaluation for Planned Wetlands method uses site specific data but is designed to determine whether a man-made wetland has been adequately designed to achieve defined function goals (Bartoldus et al., 1994). The USACE New England method (USACE, 1995), on the other hand, is designed for use with both remote and site specific data, and can be used to assess both natural and man-made wetlands. For this reason, the New England method was used to determine wetland functions and values for this project. Wetland functions were evaluated and recorded using the standard wetland function-value evaluation form.

Wetland habitat and vegetation communities were classified using *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979) and *Ecological Communities of New York State* (Reschke, C. 1990).

Field investigations for waterways were performed in conjunction with the wetland field investigation and included the field verification of mapped watercourses and the identification and delineation of streams, springs, and seeps that were not shown on existing mapping. Waterways were identified by the presence of bed and banks and/or ordinary high water marks. The flow regime of each identified waterway was characterized based upon field indicators of hydrologic, floral, and faunal character at the time of the investigation. All previously unmapped waterways were identified and located using GPS. Color photographs were taken of all relevant features (wetlands and waterways) to document site conditions during the time of the investigations.

2.6.7.3. *Fish and Benthic Macroinvertebrates*

An inventory of the natural resources associated with surface water present in the Dam reconstruction project area was conducted on 17 and 18 October 2005. This inventory (or survey) focused on the fish, benthic macroinvertebrates, and mussels present in the reach of the Creek from the Plunge Pool to 0.5 mile downstream of the NYS Route 990V Bridge (see Figure 2.6-6). All survey methodology was consistent with the U.S. Environmental Protection Agency's Rapid Bioassessment Protocols Levels II and III (USEPA 1999), The American Fisheries Society's *Fisheries Techniques* (Murphy and Willis, eds. 1996), and the American Fisheries Society's *A Guide to Sampling Freshwater Mussel Populations* (Strayer and Smith 2003).

Description of Survey Reach and Sampling Locations

Water flow in the Creek downstream of the Dam largely is controlled by spillage over the Dam. When no water is spilled due to little or no precipitation, stream flow is reduced severely. Typically, this occurs in late summer through early fall and discharge measured at the U.S. Geological Survey gage (No. 01350101), which is located just upstream of the NYS Route 990V Bridge, can be less than several cubic feet per second. During these low streamflow periods, surface water in the survey reach is limited to several relatively large pools and a 5 to 30 feet wide shallow stream connecting small pools upstream and downstream of the NYS Route 990V Bridge.

The survey was conducted during several days of low streamflow. Five sample stations were established:

1. The Plunge Pool
2. The 24-foot deep pool located immediately downstream of the Plunge Pool
3. The flowing water connecting small pools in the stream channel upstream of the NYS Route 990V Bridge
4. The large pool beneath the NYS Route 990V Bridge
5. The flowing water connecting small pools in the stream channel downstream of the NYS Route 990V Bridge.

Fish

The fish present at each station were sampled using electrofishing gear. A small boat-mounted electrofisher[1] was used in the relatively deep water of the Plunge Pool, the 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge. A small float-mounted electrofisher was employed in the shallow water of the stream channel upstream and downstream of the NYS Route 990V Bridge. All of the electrofishing was conducted during daylight hours.

Gill nets were set on the bottom in the three pool stations in order to capture fish in the deeper water (in excess of 6 feet) that was outside the range of the electrofisher. The following gill net panels were deployed:

[1] An electrofisher imparts a mild electric current to the water that temporarily stuns fish that can then be collected for identification and measurement

Plunge pool
- two 1.5-inch mesh, 6 feet x 120 feet panels
- one 3-inch mesh, 6 feet x 60 feet panel

24-foot deep pool
- one 1.5-inch mesh, 6 feet x 120 feet panel
- one 3-inch mesh, 6 feet x 60 feet panel

Large pool beneath the NYS Route 990V Bridge
- two 1.5-inch mesh, 6 feet x 120 feet panels
- one 3-inch mesh, 6 feet x 60 feet panel

The gill nets were deployed for approximately four hours mid-day in the Plunge Pool and the 24-foot deep pool and for three hours in the morning in the large pool beneath the NYS Route 990V Bridge.

The fish captured by electrofishing or in the gill nets were identified and their total length was measured. In addition, they were examined for physical condition, abnormalities, wounds, and external parasites.

All fish were returned alive to the water with several exceptions. Two brown trout captured in the 24-foot deep pool were sacrificed for examination of their stomach contents. Secondly, several fantail darter were preserved for laboratory confirmation of identification.

As part of the fish survey, selected physicochemical water quality parameters were measured at each sampling station using field instrumentation. The parameters measured included temperature, dissolved oxygen, pH, and specific conductance. All measurements were made just below the water surface, including in the Plunge Pool, the 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge.

Macroinvertebrates

A sample of macroinvertebrates was collected at each station using a D-frame dipnet (12 inches wide and 10 inches high, net mesh = 0.595 millimeters). In each instance, the collector disturbed the bottom by kicking loose substrate where it could be found and captured the dislodged macroinvertebrates and small quantities of sand/gravel with the kicknet. This process was repeated at several locations within each station and the kicknet contents were combined into a single composite sample for each station.

Sample collection in the Plunge Pool, 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge was restricted to wadeable water around the perimeter of these locations. Sampling in the deeper waters was impractical because the coarse, rocky nature of the substrate prevented use of mechanical grabs commonly used to sample the soft-bottom sediment (silt, sand, etc.) that is most often found in such environments.

The macroinvertebrate samples were preserved in the field with 70 percent isopropanol. A 200-specimen subsample was sorted from each sample in the laboratory and identified to genus level, in most cases, under magnification using a dissection microscope.

Mussels

Each sample station was visually searched for live mussels and any empty or "spent" shells that would indicate the possible presence of live mussels. This was accomplished by wading, where possible, the shallow water around the perimeter of the Plunge Pool, the 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge. Where wading was not possible because of relatively steep slope or slippery conditions, the shallow water was viewed from the adjacent shoreline. Survey in the deeper water of these pools was not possible without use of SCUBA and such an effort was not warranted in this level of survey. The stream sample stations located upstream and downstream of the NYS Route 990V Bridge were waded.

In addition to the wetted area at each station, the adjacent dry stream channel also was searched for any stranded live mussels or spent shells. Particular attention was paid to any middens, accumulations of shells discarded by predatory wildlife, which would indicate the presence of live mussels nearby.

Data Interpretation

The data obtained in the fish and macroinvertebrate sample efforts were compiled and metrics useful in interpretation of the data were computed. These metrics are recommended for such use in USEPA (1999) and/or are used by the Stream Biomonitoring Unit, Division of Water, New York State Department of Environmental Conservation (NYSDEC) (Bode, *et. al*. 2002). They are discussed in the next section of this report and listed on the relevant data tables.

2.6.7.4. Reptiles and Amphibians.

A herptile (amphibians and reptiles) inventory of the Dam reconstruction project study area was conducted 19 through 23 September 2005, 2 through 4 May 2006, 6 through 8 June 2006, 15 June 2006, and 19 through 2 June 2006. In some instances, herptile inventory work took place concurrent with other natural resources studies. Herptile inventory work was conducted during both daytime and nighttime hours. Collections were performed under the conditions of a New York State Fish and Wildlife License (No. 652) and all captured herptiles were released to the wild unharmed. Color photographs were taken of selected specimens to document the species presence in the project study area.

Herptiles of the project study area were inventoried by eight methods:

1. Time-constrained searches
2. Pitfall traps
3. Basking turtle traps
4. Incidental observation
5. Nighttime call surveys
6. Timed dip-net sweeps
7. Egg-mass surveys
8. PVC pipe artificial habitats

Time-constrained searches are a commonly used herptile inventory method in New York State (Ducey et al. 2005) that involves the non-systematic searching of a given habitat by turning over natural cover objects (rocks, logs, etc.) for a set time period (Corn and Bury

1990). Time-constrained searches were conducted in the various habitats of the project study area. This included time-constrained searches of uplands (5.5 person-hours), wetlands (3.3 person-hours), streams/seeps (2.5 person-hours), and the river corridor (1.5 person-hours). The number of individuals for each species was kept as a tally during each timed-search so that a relative abundance could be calculated (no. of each species/person-hours).

Straight-line pitfall trap arrays were constructed at four locations in the project study area to sample herptiles (Corn 1994). Herptile pitfall trapping was done in conjunction with small mammal pitfall trapping. Each pitfall trap array consisted of five (5) 2.64-liter plastic buckets buried flush at ground level and separated by 0.254 m x 3 m aluminum flashing. The aluminum flashing was partially buried so that at least 0.150 m was above ground surface. Pitfall traps were checked at a minimum of once every 24 hours and all captured specimens were identified to species and released.

Basking turtle traps were placed at two locations in the project study area and checked twice daily. Basking turtle traps are designed to capture species that bask in open water. Upon arrival at the site in September 2005 it was determined that habitat for basking turtle species was not abundant within the project study area but the traps were placed in an effort to confirm that basking turtles were not present. Basking turtle traps were not re-installed in 2006.

Incidental observation was a herptile inventory method used during each trip to the site. Incidental observations are herptile identifications while onsite performing other work or while traversing from one herptile sampling location to another. Species observed through incidental observations were recorded and photographed when possible.

Nighttime call surveys (NAAMP 2005) were conducted during the May and June 2006 inventories to increase the number of anuran species (frogs and toads) recorded from the project study area and to identify breeding habitat for particular species. Nighttime call surveys consisted of remaining stationary at one location for a set period of time (minimum time of ten minutes) and recording each species of anuran heard vocalizing from that location.

Timed dip-net sweeps (Shaffer et al. 1994) were performed during the May and June 2006 surveys in wetlands with vernal pool habitat. All individuals collected during timed dip-net sweeps were identified to species, photographed (when applicable), and returned to the pool from which they were captured.

Egg mass surveys (Crouch and Patton 2000) were conducted during the May 2006 survey in those wetlands with vernal pool habitat and were performed to identify the various Ambystomatid salamander species of the project study area. Egg mass surveys were also conducted. Egg mass surveys involved the species identification of egg-masses, count for each species, and representative photographic documentation.

Polyvinyl chloride (PVC) pipes were installed as artificial habitat at selected locations in the project study area to document the presence of treefrogs (Moulton et al. 1996). One schedule 40 PVC pipe (0.63 cm inside diameter, approximately 100 cm length) was installed, such that approximately 70 cm of the pipe remained exposed above the ground, at a selected location in wetlands during the May 2006 survey. These tubes were checked for the presence of nesting northern gray treefrogs (*Hyla chrysoscelis*) during the June 2006 surveys.

Prior to the field inventory the New York State Amphibian and Reptile Atlas was consulted to determine the known distribution of herptile species in the project study area (NYSDEC 2005a, NYSDEC 2005b). Additional published sources were reviewed to determine species that may range into the project study area (Conant and Collins 1991, Ernst et al. 1994, Hulse et al. 2001, and Petranka 1998). Identification of State-protected species was verified through coordination with NYSDEC herpetologist, Mr. Al Breisch.

2.6.7.5. Avifauna

Bird (avian) inventories of the Dam reconstruction project area were conducted 10 through 12 October 2005, 10 and 11 January 2006, and 24 through 26 May 2006. Birds of the project study area were inventoried by three methods:

Avian Survey Transect (AST)
Targeted Search (TS)
Incidental observation

Inventorying birds along an established Avian Survey Transect (AST) is a commonly used bird inventory method (Bibby et al. 1992). The AST method, rather than the point count method, was used due to the relatively small size of the project area. Four (4) ASTs, representative of habitats present at the project study area, were used to inventory bird populations within the project study area. ASTs were walked at a steady, slow pace of about 0.6 mile per hour. A short portion of AST-3 was covered at twice that speed to achieve comparable coverage given the required backtracking. All individual birds seen or heard were recorded in field notebooks. All observations on ASTs were passive; no audio playback, imitations, "pishing", or other means were used to attract birds. Those species not directly using the project study area (i.e. birds primarily associated with the Reservoir or observed flying over in migration or local transit) were noted separately. The AST method provides repeatable data on species presence as well as an index of relative abundance. Weather conditions were recorded during each AST survey. A team of two avian biologists spent 178 minutes (about 3 hours) conducting each set of AST surveys.

During the October 2005 inventory, one set of ASTs was conducted, beginning with AST-2 (walked north to south), then AST1 (west to east), then AST-3 (south to north) and finally AST-4 (north to south). During the January and May 2006 inventories, two sets of ASTs were conducted on consecutive mornings. The first set was conducted as in October and the second set was conducted in reverse order, beginning at the south end of AST-4 and ending at the east end of AST-1. Due to emergency Dam reinforcement work underway in January 2006, it was necessary to modify AST-1 in order to complete the survey. Instead of walking in the open area at the base of the Dam, avian biologists walked about 100 feet to the north within the woods. While the actual shift of the transect probably had little impact on the results, noise from jackhammer activity made it very difficult to hear and, no doubt, resulted in fewer birds on the transects. This noise was somewhat of a problem virtually throughout the project area but probably had an impact only on AST-1. AST-1 was similarly modified during the May 2006 inventory. Noise disturbance was again a problem in May though only during the second survey of AST-1.

Prior to conducting the fall 2005 avian survey, a thorough search of the area was performed. The purpose of this search was both to locate birds and to investigate habitat types within the site in order to confirm that the three (ASTs) proposed in the Scope of Work adequately sampled these habitat types. Based upon search results, several minor modifications were made to two transects and a fourth transect was added. The east end of AST-1 was extended about 200 feet to include a vista of the Reservoir. The south end of AST-3 was extended about 200 feet to include a clearer view of the Spillway and Dam. A leg of about 100 feet was extended off of AST-3 just below the Dam to access a steep gorge with a grove of hemlocks. The latter habitat is unique in the study site and was not adequately sampled by the ASTs originally proposed in the Scope of Work. A new transect (AST-4) was added in the floodplain zone along the west side of the Creek. It roughly parallels the Creek about 150 feet from the shoreline and extends about 0.3 mile to the south, terminating at a small wetland. This extensive floodplain habitat was not adequately sampled by existing ASTs.

The Targeted Search (TS) is a commonly used bird inventory method that aims to document the presence of a particular species or groups (e.g., owls) of birds in an area (Bibby et al. 1992). Both nocturnal and diurnal (nighttime and daytime) TSs were conducted. The TS inventory method was used primarily to document species presumed to occur in the project study area that were not recorded by the AST method. In some cases, audio playback was used to elicit responses from target species. The TS method provides information on species presence only, though most species found during TS investigations and not on the ASTs are assumed to be relatively uncommon or inconspicuous in the project study area during the survey period.

Incidental observation was the final bird inventory method used during the fall, winter, and spring inventories. Incidental observation includes the identification of avian species while not conducting a systematic search. For example, bird species identified during the projects other technical studies or while in transit from one systematic surveying location to another, were identified through this method. On 10 January 2006, Chris Nadereski of the New York City DEP was at the site and collected numerous bird observations. His findings were incorporated into the targeted search and incidental observations data from the January 2006 visit. Incidental observation provides information on species presence only, though most species found incidentally and not on the ASTs are assumed to be relatively uncommon or inconspicuous in the project study area during the survey period.

Point counts, one of the most commonly used bird inventory methods (Blondell and Frochet 1981), were not used because of the relatively small size of the project area. To avoid duplicate counting, point counts should typically be located at least 1/2-mile apart (Bibby et al. 1992). At this spacing, they would not accommodate enough point count locations to provide meaningful data. The AST method, on the other hand, allows the surveyor to maintain continuous audible or visual contact with birds, reducing the risk of duplicate counting and allowing a larger sample in a smaller area.

Prior to the field inventory, the New York Breeding Bird Atlas (Andrle and Carroll 1988 and the New York State Department of Environmental Conservation website), the

National Audubon Society Christmas Bird Count (Butcher 1990, Butcher and McCulloch 1990), bird sightings on eBird (www.ebird.org), and the most up-to-date published range maps (Sibley 2003) were reviewed to determine bird species likely to occur in the project study area.

2.6.7.6. Mammals

An inventory of the mammals (excluding bats) of the Dam reconstruction project study area was conducted in September 2005 and May and June. A separate bat survey was conducted in June 2006 (see Bat Survey Technical Memorandum). The 2005 and 2006 mammal inventory was conducted during both daytime and nighttime hours. Collections were performed ethically (ASMACUC 1998) and under the conditions of a New York State Fish and Wildlife License (No. 652). All captured mammals were released to the wild unharmed with two exceptions: one shrew inadvertently died in a trap; and one shrew and five mice (Peromyscus sp). were sacrificed for a separate NYCDEP study [Mr. Chris Nadareski – under conditions of his permit]. Color photographs were taken of selected specimens to document the species presence in the project study area.

Mammals of the project study area were inventoried by four methods:

1. Live trapping
2. Pitfall trapping
3. Track and scat identification
4. Incidental observation
5. Spotlight Survey

Live trapping is a commonly used method to inventory small mammal assemblages (Jones et al. 1996). Up to twenty-nine (29) Sherman® folding aluminum live traps (3.0 x 3.5 x 9.0 inches) were baited with rolled oats and peanut butter or chicken and placed in the various habitats of the project study area each night live trapping occurred. The live traps were positioned along 11 transects, representing the various habitats of the project study area, using the best-site placement technique to maximize capture success (Powell and Proulx 2003). The best-site placement technique allows the researcher to place the trap where he/she expects to capture small mammals (near downed logs, rocks, etc.). This technique was used because it generally results in more captures than the technique of placing traps a set distance apart along transects. Live traps were checked at a minimum of once every 24 hours and all captured specimens were identified to species and released. Live trapping was conducted in September 2005, and in May and June 2006, and success was recorded as the number of captures per trap-night (total of 247 trap-nights).

Live trapping is known to under-represent both the shrew (Kirkland and Sheppard 1994) and arboreal (Loeb et al. 1999) small populations of eastern forests. For this reason, straight-line pitfall trap arrays were constructed at four locations in the project study area to inventory small mammals (Bury and Corn 1987). Small mammal pitfall trapping was done in conjunction with herptile pitfall trapping. Each pitfall trap array consisted of five (5) 2.50 quart plastic buckets buried flush at ground level and separated by aluminum flashing (0.8 x 9.0 feet). The aluminum flashing was partially buried so that at least 0.5 feet was above ground surface. Pitfall traps were checked at a minimum of once every 24 hours and all captured specimens were identified to species and released. Pitfall trapping was conducted in September 2005, and in May and June 2006, and success was recorded as the number of captures per trap-night (total of 80 trap-nights).

Specimens captured through the live trapping and pitfall trapping techniques described above were identified to species using a regionally specific field guide (Merritt 1987). White-footed mice (*Peromyscus leucopus*) and deer mice (*P. maniculatus*) were recorded collectively as *Peromyscus* sp. since the two species have overlapping ranges and are difficult to distinguish in the field (Wilson and Ruff 1999). Larger mammals of the project study area were also identified by signs like track and scat identification. Regionally specific field guides were used to identify mammal species from tracks and scat (Merritt 1987, Halfpenny 1986).

Incidental observation was another mammal inventory method used during the 2005 and 2006 inventory. Incidental observations are mammal identifications while onsite performing other work or while traversing from one mammal sampling location to another. Species observed through incidental observations were recorded and photographed when possible.

During the May and June 2006 surveys a spotlight survey of the project study area was conducted. The spotlight survey was conducted during nighttime hours along existing roadways of the project study area. The spotlight survey was conducted on foot with a rechargeable spotlight.

Prior to the field inventory, the list of New York State Mammals was consulted to determine a potential list of mammalian species in the project study area (NYSDEC 2005a, NYSDEC 2005b).

2.6.7.7. Bats

A summer mist-net bat survey of the Dam reconstruction project study area was conducted from 19 through 23 June 2006. Collections followed ethical standards (ASMACUC 1998) and were conducted under the conditions of a New York State Fish and Wildlife License (No. 652). Mist-net surveys for bats were performed for a total of sixteen net-nights near the Dam, at feeding habitats, and along flyway corridors in the project study area. Based on current knowledge of the project site, it was anticipated that up to five locations would be sampled to characterize the bat population and adequately quantify project potential impacts. The five mist net locations were selected based on the foraging habits of bats (i.e., locations near water where flying insects are plentiful, and within a tree canopy that has a ceiling and narrow sides that funnel the foraging bats into the mist nets).

The methods used to conduct the bat survey followed the mist-netting guidelines in the *Agency Draft Indiana Bat (Myotis sodalis) Revised Recovery Plan* (USFWS 1999). It was not anticipated that Indiana bats would be captured, but the protocol for their capture was a logical template for the site inventory. The recovery plan indicates that there should be one net site per kilometer (0.6 mile) of stream and two net sites per square kilometer (247 acres) of forested habitat. Each net site requires at least three net nights (one net set up for one night = one net night) unless bats are caught sooner. If bats are caught on the first or second night, a minimum of two nights of netting is required. A minimum of two net locations is required at each site (at least 30 meters apart, especially in linear habitat such as a stream corridor). Following these guidelines a minimum total effort of six survey nights was determined necessary to adequately inventory the project study area.

Prior to the field survey, data was collected from existing sources, including the NYSDEC, so that a list of expected species could be generated. For example, in 2004 the NYSDEC conducted a bat survey of the access shaft and this data was used to supplement data collection efforts for the proposed project. In addition, published range maps (Barbour and Davis 1969, Merritt 1987, NatureServe 2006) were reviewed to determine what bat species may utilize the project study area. Bat species were identified and confirmed using *Bats of America* (Barbour and Davis 1969), *The Smithsonian Book of North American Mammals* (Wilson and Ruff 1999) and *Guide to the Mammals of Pennsylvania* (Merritt 1987).

2.7. WATER RESOURCES

2.7.1. Introduction

Water resources (surface water and groundwater) were assessed for the project study area to determine the potential effects resulting from the proposed reconstruction of the Dam. The methodologies used to assess baseline conditions for these parameters are detailed at the end of this section.

2.7.2. Existing Conditions

2.7.2.1. Surface Waters

The Schoharie Creek (the Creek), downstream of the Dam, is a Class B waterway and runs in a south-north direction through the center of the study area. The Creek is identified as a perennial stream by the U.S. Geological Survey (USGS). Perennial streams have permanent running water. The U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) lists the Creek as a riverine, lower perennial, unconsolidated shore, temporarily flooded wetland (R2USA). There are two unnamed perennial and numerous intermittent and ephemeral streams located throughout the study area. The Creek and the unnamed perennial streams have a total length of 4,610 feet in length within the study area (Section 2.6, Natural Resources, Figure 2.6.2). Seventeen intermittent streams totaling 5,385 feet in length, and one ephemeral stream totaling 70 feet in length were identified and mapped within the study area. The locations and flow regimes of these waterways are provided in Section 2.6, Natural Resources. The intermittent streams are primarily fed by groundwater. Intermittent streams flow when the groundwater table is elevated, typically during spring and winter. The ephemeral streams are primarily fed by stormwater and thus flow only during and after rainfalls large enough to trigger overland flow.

An inventory of the natural resources associated with surface water present in the proposed project area was conducted in October 2005. This survey focused on the fish, benthic macroinvertebrates, and mussels present in the reach of the Creek from the Plunge Pool immediately downstream of the Dam to 0.5 mile downstream of the NYS Route 990V Bridge (see Section 2.6, Natural Resources).

Water flow in the Creek downstream of the Dam is largely controlled by spillage over the Dam. When no water is spilled due to little or no precipitation, stream flow is reduced severely. Typically, this occurs in late summer through early fall and discharge measured at the USGS gage (No. 01350101), which is located just upstream of the NYS Route 990V Bridge, can be less than several cubic feet per second. During these low streamflow periods, surface water in the survey reach is limited to several relatively large pools and a 5 to 30 feet wide shallow stream connecting small pools upstream and downstream of the NYS Route 990V Bridge.

Selected physicochemical water quality parameters were measured within the survey reach using field instrumentation to demonstrate the presence of a healthy and functioning aquatic environment. The parameters measured included temperature, dissolved oxygen, pH, and specific conductance. All measurements were made just below the water surface, including in the Plunge Pool, the 24-foot deep pool, and the large pool beneath the NYS Route 990V Bridge. The field measurements made indicated that water quality was similar among all of the sample stations, although the stream channel station located upstream of the NYS Route 990V Bridge was warmer and better-oxygenated than the others. Nevertheless, all of the stations were well-oxygenated with dissolved oxygen concentrations ranging from 8.9 milligram per liter (mg/l) to 13.2 mg/l and no water quality problems were evident in the data. In comparison, the state water minimum daily average dissolved oxygen standard for Class B waterways range from 7.0 mg/l for waterways that support trout spawning to 5.0 mg/l for nontrout waterways (see Table 2.7-1).

Table 2.7-1 Physiochemical measurements made in Schoharie Creek Downstream of the Gilboa Dam in 2005.

Parameter	Sampling Location					NYSDEC Water Quality Standard[2]
	Plunge Pool[1]	24' Deep Pool	Channel Upstream of 990V Bridge	Pool beneath 990V Bridge	Channel Downstream of 990V Bridge	
Date	17 October	17 October	18 October	18 October	18 October	--
Water Temp (°C)	12.2	12.8	14.2	12.2	12.5	NA[3]
Dissolved O_2 (mg/l)	8.9	9.0	13.2	10.2	9.8	Never < 4.0
pH (Standard Units)	7.7	7.1	7.8	7.8	7.8	>6.0 and <9.5
Specific Conductance (µmhos/cm)[4]	157	198	322	371	377	NA[3]

[1] The locations of water quality sampling sites are presented in Figure 2.6-6, Natural Resources.
[2] For Class B, non-trout waters which is the classification for Schoharie Creek in the project study area.
[3] Not Applicable, no water quality standards exist.
[4] mhos is the SI unit of conductance equivalent to 1 ampere per volt.

The Dam impounds approximately 17.6 billion gallons at full capacity to form the Reservoir. The total tributary watershed area of the Reservoir is approximately 314 square miles. The Reservoir has a very high drainage area to storage area ratio, which results in frequent water surface elevation changes with limited storage capacity; this is often referred to as a "flashy" reservoir system. The NWI identify the Reservoir as a lacustrine, limnetic, unconsolidated bottom, permanent, diked/impounded wetland (L1UBHh).

2.7.2.2. Groundwater

The USGS New York Water Science Center Strategic Science Plan, 2005-2010 (USGS 2005) states that aquifers in New York consist of: 1) discontinuous, unconsolidated glacial stratified-drift deposits composed of sand and gravel; 2) unconsolidated coastal-plain deposits on Long Island; and 3) sandstone and carbonate bedrock. Other types of bedrock and glacial till cover large areas of the state but are generally low yielding and typically only serve rural residents relying on private wells. Surface water is the primary source of drinking water supply in New York State and serves about two-thirds of the State's nearly 19 million residents. Groundwater is the source of supply for the remaining third, about half of whom live on Long Island.

The USGS operates several groundwater monitoring wells in New York State where they monitor real-time groundwater levels. This information is available on the USGS of New York website (http://ny.water.usgs.gov/); however, there are no real-time groundwater sites located in Schoharie County. The Hamilton and Gilboa Formations underly the project study area (Berdan 1950). Though not specific to the project study area, Berdan (1950) recognized that there are several small springs associated with these formations with an average yield of approximately 13 gallons per minute.

Geotechnical studies presented in the Joint Venture Geotechnical Memorandum (Gannett Fleming and Hazen & Sawyer 2005), indicate that groundwater occurs in bedrock joints and bedding planes of the Hamilton and Gilboa Formations underlying the project study area. The geotechnical studies also indicated that groundwater expressions were observed along the rock outcrops located along the downstream end of the Spillway. Several minor seeps were noted along joint surfaces within the rock bluff on the east side of the Creek; however, no seeps were observed on rock bluff along the west side of the Creek. The absence of seeps on the west side of the Creek suggests the rock beds dip to the west, thereby preventing groundwater from flowing to the surface. Water seepage and moss growth was noted on the south side of some of the more open easterly-trending joints, suggesting groundwater flow also has a northerly component. The westerly bedrock dip inferred from the seepage pattern is consistent with published information on engineering geology aspects of the Dam, which states that "on the east bank, the bedrock was stripped to form the overflow channel, the water flowing down the dip slope of the bed parallel to the face of the Dam and discharging into the gorge" (Fluhr and Terenzio 1989).

Wetland field investigations conducted in September 2005 and May and June 2006 revealed several wetland communities supported or influenced by groundwater discharge zones consisting of springs and seeps. Other wetland communities observed were supported by saturated zones of either seasonally perched groundwater or the shallow occurrence of groundwater near the surface. When groundwater discharge was not observed, other observations (i.e. presence of indicator species like watercress) was used to assume a groundwater influence.

2.7.3. Future Without the Project

The Future Without the Project considers the anticipated Reconstruction Peak Year and the first full year of operation for the proposed project. The anticipated Reconstruction Peak Year is based on when the peak number of workers would occupy the project site.

In the Future Without the Project, the water resources at the proposed project study area would change little over time. The amount and extent of existing wetlands are not anticipated to change significantly in the Future Without the Project as the surface and groundwater hydrology of the project site is expected to remain unchanged. Water quality within the Creek and its tributaries and the Reservoir is not anticipated to improve or worsen appreciably in the Future Without the Project. It is anticipated that the current condition of the Creek and Reservoir would continue to support the aquatic floral and faunal population that currently exist. It should be noted that recent climate modeling indicates that increases in greenhouse gas emissions could result in a significant increase in the number of days with heavy precipitation (days with greater than 0.40 inches of rain) in areas above 40 degrees north latitude (Tebaldi, 2006; Miller, 2006). Increased turbidity levels from these higher intensity storms created from additional runoff could lead to deterioration in water quality within the Creek and its tributaries.

2.7.4. Temporary Reconstruction Impacts

The proposed reconstruction of the Dam would result in temporary adverse impacts to some water resources. The majority of the water resources affected by the proposed project would be a direct result of the site clearing required for reconstruction related activities. The Natural Resources Restoration Plan replaces and restores impacted water resources after reconstruction activities have been completed (see Section 2.6.6, Natural Resources Restoration Plan).

The potential reconstruction impacts have been assessed by comparing the Future With the Project conditions against the Future Without the Project conditions for the predicted maximum area that would be affected by reconstruction activities associated with the proposed project, including building footprints, roads and lay down and staging areas (see Figure 2.7-1). See Figure 2.6-6 in Section 2.6.6, Natural Resources Restoration Plan for a depiction of the reconstruction impacts to natural resources at the project site associated with the proposed reconstruction of the Dam.

2.7.4.1. Surface Waters

The overall development of the site has been designed to minimize disturbances to the Reservoir and onsite wetland and stream features from direct reconstruction activities and reconstruction associated stormwater runoff.

Reservoir

There are currently six options being considered for the placement of the new Low Level Outlet for the Reservoir (see Section 1.0, Project Description). Options 2A and 2B result in the greatest impacts to water resources and consist of constructing a new intake tower within the Reservoir on the south side of the Dam. A tunnel from the intake tower to the Plunge Pool would either penetrate the Dam (Option 2A) or be routed through the Dam's foundation (Option 2B). Options 2A and 2B would also require the excavation of a 200 linear foot channel upstream of the intake tower to reach Reservoir depths sufficient to facilitate emergency drawdowns.

Reconstruction of the intake tower, tunnel, and inlet channel for Options 2A and 2B of the LLO would take place under water within the Reservoir. Reconstruction of the intake tower and tunnel would require the dredging of approximately 4,300 cubic yards of sediment from the Reservoir and the removal of approximately 400 cubic yards of bedrock. The bedrock would be removed using hydraulic splitting or mechanical removal techniques. A coffer dam would be installed within the Reservoir around the intake tower work site and removal of soil and bedrock would be accomplished with a high capacity crane. Reconstruction of the inlet tower and tunnel would result in the placement of approximately 5,270 cubic yards of fill within the Reservoir. The channel upstream of the intake tower would require the excavation of approximately 1,400 cubic yards of Reservoir sediments.

It is anticipated that temporary adverse impacts to Reservoir waters resulting from reconstruction activities associated with Options 2A and 2B for the LLO would occur. Under this option, turbidity levels in the immediate vicinity of the reconstruction activities could become temporarily elevated and there is the potential for accidental releases of fuel or hydraulic fluids from reconstruction barges. These impacts, if they were to occur, would be temporary in nature and minimized to the maximum extent practicable through the use of BMPs. Double turbidity curtains would be deployed under either Option to contain and minimize turbidity levels within the Reservoir. The turbidity curtains would extend from the surface to the bottom of the Reservoir. Floating booms would be deployed around the dredge barge to contain accidental releases of fuel or lubricating fluids. A spill prevention plan would be developed as part of the reconstruction specification document that would detail spill prevention equipment to be used, notification requirements should an accidental spill occur, and spill remediation measures.

Additional fill within the Reservoir would include approximately 43,000 cubic yards of riprap placed on the Reservoir side of the Earthfill Embankment (where the embankment wraps around the end of the masonry Spillway) and on the Reservoir side of the West Training Wall. This fill would increase the stability of the Earthfill Embankment and the West Training Wall during emergency drawdowns where the Reservoir pool is fully and rapidly lowered. Because of the location of the fill, and the likelihood that the Reservoir would not be fully drawn down during reconstruction, much of this fill material would be placed in wet conditions.

Temporary adverse impacts to Reservoir waters resulting from the placement of riprap at the Earthfill Embankment and West Training Wall could occur as turbidity levels in the immediate vicinity of the reconstruction activities could become temporarily elevated. These impacts, if they were to occur, would be temporary in nature and minimized to the maximum extent practicable through the use of BMPs. Double turbidity curtains would be deployed around the area where the riprap would be placed to contain and minimize turbidity levels within the Reservoir. The turbidity curtains would extend from the surface to the bottom of the Reservoir. In addition, the riprap would be processed (e.g., washed) prior to placement within the Reservoir to reduce the amount of fine grained material entering the Reservoir.

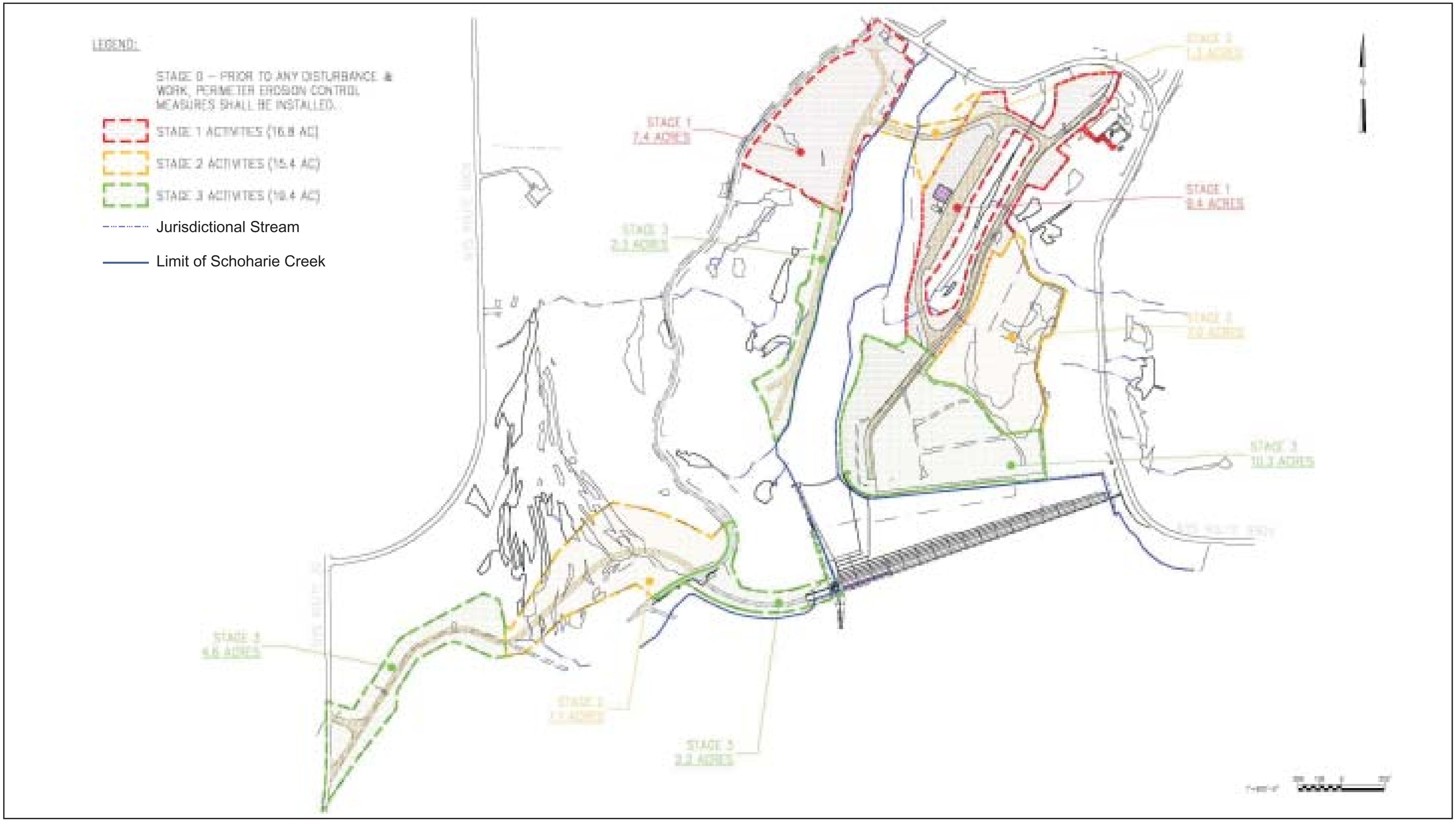
Wetlands

Impacts to wetlands are unavoidable due to the orientation of the Creek stream corridor traversing within the project area. Anticipated impacts include the removal of existing vegetation and the grading and filling of several wetland areas within the site for the development of reconstruction staging and lay down areas, access road reconstruction, and a spoils disposal area. Figure 2.6-6 in Section 2.6, Natural Resources shows approximately 2.6 acres of wetlands that would be impacted as a result of the proposed project.

Streams

The proposed reconstruction of the Dam would also temporarily impact waterways located within the project area. Approximately 325 linear feet of perennial stream, 1,625 linear feet of intermittent stream and 70 linear feet of ephemeral stream would be directly impacted as a result of the proposed reconstruction project.

The direct impacts to perennial streams would occur within the Creek. The extension of the West Training Wall and relining of the Scour Hole immediately downstream of the Plunge Pool would impact approximately 300 linear feet of the Creek. The extension of the West Training Wall, or other retaining wall options being considered, would result in the placement of approximately 975 cubic yards of fill below the ordinary high water mark of the Creek and would represent a permanent loss of Creek habitat. However, this would greatly improve the water quality within the Creek by eliminating the current turbidity problems resulting from the severe erosion along the west shoreline of the Creek in this location. The relining of the Scour Hole would result in the placement of approximately 6,800 cubic yards of fill below the ordinary high water mark of the Creek. This fill would decrease the water depth within the Scour Hole by about two-thirds and create a stable non-erosive stream bottom. Should a temporary internal bridge across the Creek be constructed to remove Dam debris to the spoils disposal area the temporary bridge would impact approximately 25 linear feet of the Creek. The temporary internal bridge would be located to the south of the existing NYS Route 990V Bridge and would allow unrestricted access to the spoils disposal area on the west side of the Creek. The temporary internal bridge, if built, would require the installation of three bridge piers directly within the bed of the Creek resulting in a temporary disturbance to the Creek.



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Staging for Site Preparation
Gilboa Dam and Associated Facilities

Figure 2.7-1

The portion of each pier below ordinary high water would consist of four (4) 5-foot diameter caissons drilled into the bed of the stream. If bedrock is encountered below the Creek bed, a continuous concrete spread footing would be constructed to support each pier. Fill below the ordinary high water associated with the temporary internal bridge piers would be approximately 80 cubic yards. Following Dam reconstruction activities, the temporary internal bridge would be removed and the affected portion of the Creek channel would be re-engineered to create the natural stream morphology that existed prior to the temporary disturbance.

The direct impacts to the intermittent and ephemeral streams would be the result of fill within the reconstruction and staging areas. The direct impacts to waterways within the reconstruction and staging areas would be minimized to the maximum extent practicable through the use of bottomless arch culverts and span bridges where possible. The implementation and use of rigorous construction Best Management Practices (BMPs) and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that adheres to strict NYCDEP and NYSDEC guidelines would also minimize the impacts to waterways not directly impacted by reconstruction activities (Section 2.7.5.2., Stormwater Management During Reconstruction).

The potential for impacts to waterways on the proposed project area has been minimized to the greatest extent possible while still providing adequate reconstruction access and staging areas to complete the required components of the proposed project. The management of onsite stormwater would include utilizing eight temporary stormwater sediment traps and one temporary stormwater detention basin during reconstruction activities and two permanent stormwater detention basins within the project site after completion of reconstruction activities (see Section 2.7.5.2, Stormwater Management During Reconstruction for detailed discussion of stormwater management controls). The temporary and permanent stormwater detention basins would be designed to improve stormwater quality, attenuate the storm water flows to the Creek, and maintain drainage conditions similar to the Existing Year. The potential disturbance to waterways that are anticipated with the proposed reconstruction of the Dam would be temporary in nature as the Natural Resources Restoration Plan would restore any impacted waterways to conditions that existed prior to disturbance. The proposed Natural Resources Restoration Plan would consist of approximately 56 acres of high quality upland and wetland habitats (see Section 2.6.6, Natural Resources Restoration Plan).

2.7.4.2. Stormwater Management Control During Reconstruction

The following Section provides a description of the stormwater management measures that would be implemented during reconstruction. It also describes the overall sequence of reconstruction for the reconstruction of the Dam and associated facilities. The Stormwater Pollution Prevention Plan (SWPPP) for this project incorporates measures required by NYCDEP and NYSDEC as well as satisfying all requirements of the NYSDEC SPDES General Permit for Stormwater Discharges associated with Construction Activities. Structural soil erosion and sediment control practices and stabilization techniques have been included in the project design to prevent onsite erosion and to maintain water quality of downstream and surrounding water bodies. The various components of the SWPPP are summarized below.

Reconstruction Sequencing
The proposed project would be implemented in five phases. Phase One of the proposed project would consist of the installation of crest gates in the existing notch. Phase Two work consists of preparation of the project site for heavy reconstruction. The major activities performed in this phase would include clearing and grading of the Contractor staging areas, improvements of site access roads including the West Access Road, preparation of spoils disposal area, and installation of the temporary internal bridge. Phase Three consists of major Dam reconstruction activities to improve Dam and Reservoir safety, as well as the installation of the Low Level Outlet (LLO). The major activities performed in the phase would include reconstruction of the Dam including Spillway, Side Channel and Plunge Pool reconstruction, extension and reinforcement of the West Training Wall, refurbishment of the Upper Gate Chamber, reinforcement of the Earthfill Embankment and the installation of the LLO. Phase Four would consist of the rehabilitation of the Shandaken Tunnel Intake Facility. Please refer to Section 1.0, Project Description for a detailed description of work to be performed in Phases One through Four. The Fifth and final phase of work would consist of site restoration activities to address and/or mitigate any lasting environmental effects of the Dam reconstruction as well as the restoration of the Scenic Public Overlook Area. Please refer to the Natural Resources Restoration Plan in Section 2.6, Natural Resources for a description of work to be performed in Phase Five.

Surface Water Quality Control During Reconstruction
The principal concern for impacts on surface water quality during reconstruction is turbidity, which may come from several sources, including sediment from groundwater and dewatering effluents, large unprotected excavations, and stockpiled soils. All of these sources are addressed below with respect to the potential for impacts and the types of mitigation measures that could be implemented to protect surface water quality.

The stormwater collected during reconstruction will be discharged to the Creek, which is classified as a fourth order stream based on the NYSDEC stream order identification guideline developed by Schueler T of Center for Watershed Protection, Ellicott City, Maryland. Per *New York State Stormwater Management Design Manual (August 2003)*, discharges to fourth order streams do not require stormwater “quantity” controls; therefore, discharges to the Creek from the Dam project site will not require stormwater “quantity” control based on the Chapter 4 of the Design Manual, *Unified Stormwater Sizing Criteria*. In addition, should the requirements change, the Contractor would be required to follow all guidelines in the latest edition of this manual.

Dewatering Operations
If dewatering operations are needed for the project, the Contractor would be required to send pumped-out residual water through settling devices, such as sediment tanks, prior to discharge to avoid surface water impacts. These devices would allow the suspended solids to settle out prior to discharge downstream.

Erosion and Sedimentation Measures

The potential for soil erosion during reconstruction is increased when the soil is cleared of its vegetation, excavated, and stockpiled, thereby exposing loose soil to the direct impacts of rainwater and wind. During reconstruction, sediment and erosion control measures and stormwater management practices would be employed to divert and manage runoff in and around the reconstruction areas. The impacts of runoff on the excavation and grading would be controlled by minimizing erosion, and preventing sedimentation of the Creek and adjacent wetlands and streams. All erosion and sediment control measures have been designed in accordance with the *New York State Standards and Specifications for Erosion and Sediment Control, August 2005.* However, the Contractor would be required to implement these measures in accordance with the latest edition of these standards and specifications at the time of implementation.

To minimize and reduce the potential short and long-term erosion impacts on the project area surface water resources, a detailed erosion and sedimentation control plan has been developed for the reconstruction and covers all activities conducted at the project site. Clearing and disturbance limits would clearly be defined onsite using a combination of temporary reconstruction limit fence, reinforced silt fence, and concrete jersey barriers. No vegetation or soil outside these limits would be disturbed. Also, stockpiling of excavated material would require temporary seeding or the establishment of a temporary vegetative cover on disturbed areas or soil stockpile areas by seeding with appropriate, rapidly growing annual plants. These measures provide protection to exposed soils during reconstruction until permanent vegetation or other erosion control measures can be established.

In addition, control of erosion and sedimentation during reconstruction would be achieved by using temporary diversion swales and/or earth dikes to convey storm flow away from the reconstruction area to a series of sediment traps and filters, prior to discharge downstream. The stormwater would pass through sediment traps, which provide detention time for the majority of eroded soil particles that may be carried in the flow.

The Contractor's lay down/storage/concrete batch plant areas and temporary office complex area would be cleared and a twelve-inch deep gravel base mat will be installed and maintained. The Contractor's lay down/storage/concrete batch plant area would be used for several purposes, including material storage and reconstruction vehicle parking. Truck wash/decontamination stations would be provided to remove soil or other material from all vehicles leaving the work area. Each station would be equipped with an oil/water separator unit and discharge to a sediment basin.

Structural Soil Erosion and Sediment Control Practices

The following is a list and brief description of temporary erosion and sedimentation control features proposed to be adopted during the reconstruction process. The locations of erosion and sedimentat control features are shown in Figure 2.7-2.

Temporary Sediment Trap. A temporary sediment trap is a settling area created by excavating and constructing an earthen embankment with a stone outlet. The trap's purpose is to intercept and detain sediment-laden runoff from disturbed areas, generally less than fifteen acres, allowing the majority of the sediment to settle out, thus protecting drainage ways and adjacent properties.

Temporary Sediment Basin. A temporary sediment basin consists of a barrier or dam constructed across a drainage way or at other suitable locations to intercept sediment laden runoff and to trap and retain the sediment.

Sediment Filter. Sediment filters are located at the outlets of sediment traps and basins to form a further barrier to filter flow. They are lined with trap rock and composed of reinforced silt fence walls, and outlet of broken straw bales inside a chicken wire meth.

Reinforced Silt Fence. A reinforced silt fence, a temporary barrier of geo-textile fabric or filter cloth and faced with straw bales, is used to intercept sediment-laden runoff (sheet-flow) from small drainage areas of disturbed soil. The reinforced silt fence reduces runoff velocity and affects deposition of sediment load.

Portable Sediment Tank. This device is a compartmented tank container through which sediment-laden water is pumped to trap and retain the sediment. This results in clean water being discharged to drainage ways downstream.

Stabilized Reconstruction Entrance. This measure consists of a stabilized pad of aggregate underlain with filter cloth. It is located at a point where traffic would be exiting a construction site onto a public right-of-way. The stabilized construction entrance serves to reduce the tracking of sediment onto public streets.

Temporary Diversion Swale. This is a temporary, excavated drainage way used to intercept and divert stormwater runoff to a sediment trap.

Sand Bags. Sand bags are made from a coarse, heavy woven synthetic non-biodegradable material. Stacked sand bags, placed on level ground, form the outlet to sediment traps.

Check Dam. These are small, temporary stone dams constructed across a drainage channel to reduce erosion and limit sediment transport by restricting the velocity of flow in the channel.

Earth Dike. An earth dike is a temporary berm or ridge of compacted soil, located in such a manner as to channel water to a desired location. It is used to direct sediment-laden runoff to a sediment trapping device, thereby reducing the potential for erosion and offsite sedimentation. A vegetated earthen berm would be provided around the temporary soil stockpile areas to supplement containment using concrete jersey barriers.

Concrete Jersey Barrier. Concrete jersey barriers would be provided onsite to surround the temporary soil stockpile areas for containment purposes. Additionally, the concrete jersey barriers would also be installed to provide a separation between the disturbed and undisturbed areas. The concrete jersey barriers would be keyed in six inches to prevent creeping.

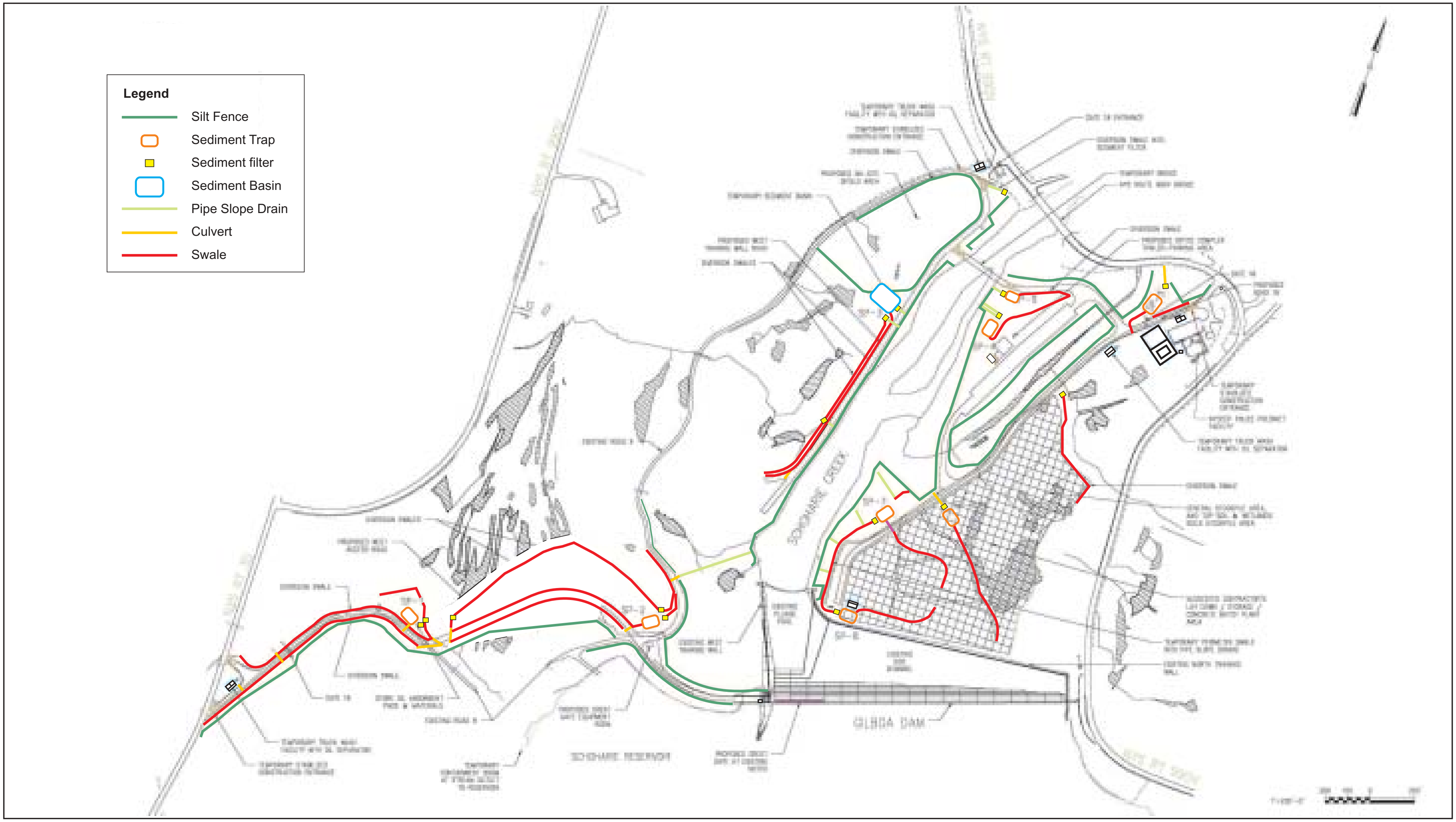
Vehicle Wash Station/Decontamination Station. A **v**ehicle wash station/decontamination station is used for removing soil or other potentially hazardous material (e.g., oil, paint chips or lead dust debris) from all vehicles and equipment leaving the site. Unless otherwise indicated on Contract Documents, one decontamination station would be provided for each site exit onto public roads and at Creek Crossings. Each station would include a high-pressure water truck wash for equipment and vehicles equipped with water recycling.

Catch Basin Inserts. A **c**atch basin insert is a woven polypropylene bag that is inserted into a catch basin or drop inlet to capture sediment. Sediment control devices are equipped with lifting loops or lugs to allow the devices to be removed, cleaned and reinserted back into catch basin or drop inlet.

Oil/Water Separator. An oil/water separator is a structural device designed to separate gross amounts of oil and suspended solids from the runoff entering from the vehicle wash facility on project site.

Containment Boom. Containment booms contain oils and other debris at the water body surface, so that the waste remains localized.

Pipe Slope Drain. A pipe slope drain is a temporary pipe installed from top to bottom of an existing slope, so that stormwater runoff can be conveyed without causing erosion on or below the slope. Pipe slope drains are used where sheet or concentrated stormwater flow may cause erosion as it moves down the face of slope.



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CAT 211 Engineering Design Services and Design During Construction for the Reconstruction of Catskill Watershed Dams and Associated Facilities

Overall Temporary Erosion Control Plan

Figure 2.7-2

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Stabilization Practices

Stabilization practices refer to the covering of exposed soils. This is one of the foremost preventive measures for minimizing sediment discharge by reducing the energy of flowing water over the ground surface. These practices allow for the increased infiltration of water into the ground surface and for the deposition of sediment prior to discharge to receiving waters.

Temporary Seeding and Erosion Control Blankets. Stabilization practices would be implemented as soon as practicable, but no more than fourteen days after reconstruction activities have temporarily or permanently ceased, or before an impending rain storm. Stabilization of exposed areas and stockpiled soils would consist of one or a combination of the following: temporary seeding, mulching, geo-textiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, and preservation of mature vegetation. The Contractor would record the dates when major grading activities occur, such as clearing and grubbing, excavation, embankment, and grading. It is also important and necessary to record when reconstruction activities temporarily or permanently cease on a portion of the site, and when stabilization practices are initiated. All stabilization practices would be subject to approval by the Engineer.

Dust Control. Visible dust generated by work operations and moving vehicles and equipment would be minimized by the application of water to the roadways and active work areas. Dust control would be implemented when soils are exposed, and before, during, and after work ceases. Methods of dust control must be in accordance with the Detailed Specification Sections 01356 Environmental Health and Safety Requirements. However, the use of chemicals, for dust control, including calcium chloride, would not be permitted.

Other Controls

In addition to managing stormwater runoff and erosion, other controls would be implemented to prevent accidental releases of fuels, lubricating fluids, or other hazardous materials. Containment equipment would be stored onsite, in case of accidental releases.

Decontamination Station. The Contractor is required to provide decontamination stations and equipment for removing soil or other potentially hazardous material from all vehicles and equipment leaving the work area. At least one decontamination station is required for each point of egress from the site and at the Creek crossing. The stations would include a high-pressure water wash area for equipment and vehicles. The station would be designed to contain all decontamination water, and to prevent its escape onto the surrounding ground surface. A secondary containment system, e.g., oil absorbent booms, would be used in case of system failure. The station would also be sloped to allow drainage to flow to one end of the station. The collection system consists of a sump area, from which the water is sent to an oil/water separator and ultimately to a sedimentation trap.

Spill Prevention and Containment. The SWPPP includes measures to be implemented to avoid accidental releases of oil or Other Hazardous Materials (OHMs) and contain spills should they occur during reconstruction. In order to prevent and mitigate impacts to resource areas from accidental spills or OHMs on the site, the following measures and procedures shall be implemented:

∉ No equipment storage, or refueling and maintenance of construction vehicles or equipment would be permitted within close proximity to the Reservoir, the Creek, streams, and the adjacent wetland areas. To minimize the possibility of leakage of hydraulic fluid, all hydraulic lines on all reconstruction equipment and vehicles would be inspected at the end of each workday. If any excessive wear or leakage is observed, the line would be repaired prior to further use.

∉ Spill containment equipment would be stored in equipment storage and refueling areas in an easily accessible manner for use in the cleanup of accidental releases of fuel or other hazardous materials. The Contractor would maintain a sufficient supply of oil absorbent pads, oil absorbent materials, containment booms, and appropriate fifty-five-gallon drums to contain potential fuel spills. All reportable spills of OHMs, as specified in the NYSDEC regulations governing notification of releases and threats of release of OHMs, would be reported to the NYSDEC. All remediation waste generated as the result of spills of OHM would be stored, handled, and disposed of in accordance with all applicable laws and regulations.

∉ One set of temporary containment booms would be installed at an existing stream outlet on the west side of the Reservoir for an extra protective measure against potential spills. Drainage runoff from the first segment of the Proposed West Access Road would flow into new roadside swales on either side. These swales would enter a temporary sediment trap and outflow would exit through a temporary sediment filter. Runoff would then channel through a new drainage structure and into an existing stream that follow the former Road 8 alignment, which eventually meets the Reservoir. At this point, the temporary containment boom would protect Reservoir waters in the event of any spill incidents. In addition, as an extra provision to protect the Reservoir in the event of any spillage on this first segment of the West Access Road, spare quantities of spill containment equipment would be stored near the first sediment trap (see Figure 2.7-2).

∉ Extra protection for both the Reservoir and the Creek will be provided during the installation of the Crest Gates System in the Spillway notch opening at the top of the Dam. During this work, cranes and other equipment are expected to be in close proximity to the sensitive water bodies; thus, added temporary containment booms, spill safeguard, and attention will be provided as directed by a qualified professional. Prior to any disturbance and site work activities for each Contract on the Dam project site and as the first order of work, temporary containment booms will be installed at the upstream side of the Spillway notch to protect the Reservoir. In addition, on the Side Channel and Plunge Pool areas, sand bags or approved equal items will be installed in an attempt to prevent any spills going downstream into the Creek as directed by qualified professional.

Inspections and Reporting. To ensure proper functioning of the soil erosion and sediment control measures described above, the Contractor would be required to conduct site inspections at least every seven days and within twenty-four hours after each rainfall event of at least one-half inches.

Records of the inspections and repairs shall be prepared and maintained onsite by the Contractor. The inspection reports shall contain at a minimum:

- Scope of the inspection;
- Names and qualifications of personnel conducting the inspection;
- Date of the inspection;
- Major observations relating to the implementation of the Sedimentation and Stormwater Control Plan (SSCP);
- Maintenance performed and actions taken; and
- Incidents of non-compliance.

If no incidents of non-compliance are found, the report would contain a certification that the facility is in compliance with the SWPPP and the permit. Each month, a summary report documenting site inspection activities shall be prepared by the Contractor and submitted to the Engineer. The report would outline the status of reconstruction and the erosion control measures in place, and identify any erosion control maintenance completed or outstanding. Inspection reports would be maintained in a log book at the site.

2.7.4.3. Groundwater

Although groundwater flow, storage, and level are locally affected by site conditions, such as the Reservoir pool level, groundwater at the site is chiefly controlled by regional topography and aquifer characteristics (e.g., bedrock lithology and structure). Therefore, activities associated with the reconstruction of the Dam would potentially result in only localized and/or temporary impacts to the site groundwater.

Reconstruction of the West Access Road would likely result in a permanent but localized lowering of the groundwater level within the limits of the roadway. Borings along the new West Access Road alignment indicate that groundwater in the area of the new roadway may exist within the overburden soils at depths up to 10 feet below the ground surface. This is consistent with the presence of numerous wetlands to the north of the new West Access Road alignment. It is believed that these wetlands, and possibly also the groundwater levels, are fed by surface water runoff and are thus perched levels that are created by the relatively low permeability overburden materials. This conclusion is consistent with observations that there is relatively little seepage exiting along the slope immediately west of existing Road Eight. The grading plans for the new West Access Road require excavation as deep as 40 to 50 feet along the roadway alignment. Therefore, site groundwater would be intercepted by the excavation and would be locally lowered by the new roadway grades. The relatively low permeability of the overburden soil should limit the lateral extent of this lowering. Still, to address the potential seepage, outbreak control measures would be constructed at seepage locations as excavation proceeds along the West Access Road cut-slopes on an as needed basis. Seepage control measures would consist of one foot of overexcavation along the seepage area, laid with a separation geotextile and backfilled with one foot of gravel. This control measure would extend from the seepage point down the cut slope to the roadside swale, where the groundwater would be collected and conveyed to a stormwater BMP.

Other reconstruction activities that could potentially impact the groundwater levels include reconstruction dewatering measures for the LLO shafts and tunnels, and pumping from groundwater supply wells that would be used to provide water for reconstruction personnel and operations. Impacts of these dewatering operations are anticipated to be limited to temporary, localized depression of the groundwater level at the dewatering points or water supply wells. These localized depressions should be limited in size to a zone of influence around the specific locations. Normal groundwater levels at these locations are anticipated to be restored when reconstruction operations cease.

Reconstruction of the access shafts for the new LLO would likely be accomplished by drilling and blasting techniques, and structural reconstruction work inside the shafts would require temporary dewatering in the local area of the shafts to a significant depth below ground surface. Tunnels may be excavated by a tunnel boring machine or by blasting. Tunneling operations would likely require some local dewatering of the tunnel area during reconstruction, particularly near the active tunnel excavation face. Impacts to groundwater levels created by blasting for rock excavation at the LLO shaft and tunnels should not be significant provided controlled blasting techniques are utilized to minimize over-break, fracturing or loosening of adjacent unexcavated ground. It is likely that localized grouting would be required at the tunnel face to minimize groundwater infiltration during reconstruction of the tunnels regardless of the reconstruction techniques used to advance the tunnels. Only non-toxic grouts would be used. All LLO tunnels and shafts would be provided with permanent liners to limit the passage of groundwater into or out of the structures on a long-term basis.

Two water supply wells with a maximum capacity of 60 gpm would be installed to provide non-potable water for concrete batch plant operations, sanitary facilities, and for miscellaneous reconstruction activities. Typical ground water consumption for sanitary and miscellaneous activities would be approximately 5,000 gpd. During continuous batch plant operation approximate water usage from the wells could be up to 80,000 gpd. However the batch plant would not be in continuous operation over the period of reconstruction and therefore the maximum usage represents a worst-case scenario. Impacts from well operations are anticipated to be limited to temporary, localized depression of the groundwater level. These localized depressions should be limited in size to a zone of influence around the specific locations. Normal groundwater levels at these locations are anticipated to be restored when reconstruction operations cease.

The proposed project would also provide a sanitary holding tank for sanitary waste from the office trailer complex. Waste from these holding tanks would be pumped out and moved offsite on a bi-weekly basis. A sanitary holding tank or septic field would also be provided at the LLO Gate House. Discharges to groundwater from the septic field, if installed, would be localized and minimal; therefore no temporary impacts to groundwater are anticipated.

2.7.5. Potential Project Impacts

The potential for impacts to waterways on the project site has been minimized to the greatest extent possible while still providing adequate reconstruction access and staging areas to complete the required components of the proposed project. The direct impacts to waterways within the limit of disturbance would be minimized to the maximum extent practicable through the implementation and use of rigorous construction BMPs. Implementation of a SPPP that adheres to strict NYCDEP and NYSDEC guidelines would also minimize the impacts to these waterways. Stormwater detention basins would be located within the project site in order to improve stormwater quality, attenuate the stormwater flows to the Creek, and maintain drainage conditions similar to the existing conditions. The potential disturbance to waterways that are anticipated with the proposed reconstruction of the Dam would be temporary in nature as the proposed Natural Resources Restoration Plan would restore any impacted waterways to conditions that existed prior to disturbance. The proposed restoration plan would consist of approximately 56 acres of high quality upland and wetland habitats (see Section 2.6.6 Natural Resources Restoration Plan).

Initiation of snowpack-based reservoir management to provide enhanced flood attenuation at the Reservoir would result in a lowering of Reservoir water levels nominally up to 5 feet, or more, depending upon the amount of snowpack within the watershed. Under this program NYCDEP anticipates establishing general operating guidelines that would maintain the crest gates in a fully lowered position once sufficient snowpack is present in the Schoharie watershed and inflate the crest gates to a fully raised position at the start of the refill period. This position will be maintained at least until the end of the refill period so that maximum storage at Schoharie Reservoir can be obtained for water supply before drawdown occurs. The exact dates and durations of the refill period would be determined based on climatological modeling and projections.

When the Reservoir pool is lowered to elevation 1125.0 by water diversions to Ashokan Reservoir for public water supply and cold water releases for fisheries in the Esopus Creek, the gates would be deflated to a fully lowered position. The crest gate system would remain in this lowered position until being raised at the beginning of the following year's refill period. Initial drawdown of water within the Reservoir at the beginning of the winter would be at a slow enough rate to maintain slope stability and the associated water levels maintained in the Reservoir for snowpack-based reservoir management would be within the normal range of water levels typically occurring in the Reservoir throughout the year. Hence lowering of the water level within the Reservoir is not expected to cause slope instability along the exposed shoreline of the Reservoir or increase turbidity levels within the Reservoir. Therefore, no adverse impacts from snowpack-based reservoir management at the Reservoir are anticipated.

In addition, the LLO would be used as part of snowpack-based reservoir management to lower the Reservoir levels, thereby creating a void for capturing the snowpack-based runoff and providing enhanced flood attenuation downstream. The anticipated flow rates to Schoharie Creek associated with the LLO usage for snowpack-based reservoir management would be similar in duration and magnitude to a typical spillway discharge due to a frequent, small intensity storm. Based on this, no changes to the morphology or habitat are anticipated in downstream sections of Schoharie Creek.

2.7.5.1. Post Reconstruction Stormwater Management Control

The majority of treated stormwater runoff would be discharged to the Creek, which is classified as a fourth order stream. Therefore, in accordance with NYSDEC standards, an assessment of pre-and post-construction stormwater runoff quantity control would not be required for the majority of the site. The exception to this is discharge from the first segment of the Proposed West Access Road. This area discharges to a stream that discharges to the Reservoir; therefore an assessment of pre-and post-construction stormwater runoff quantity control would be conducted for this area. The overall post-construction stormwater management plan for the project would provide long-term control and treatment of stormwater runoff generated from additional impervious areas.

The key components of the permanent stormwater management plan are stormwater collection and water quality. The proposed stormwater management plan has been designed to safely convey and treat the additional stormwater runoff generated from the proposed access roads, in accordance with water quality guidelines specified by NYSDEC and the NYCDEP.

The proposed stormwater management plan would include a stormwater collection system designed to convey runoff from the 100-year 5-minute storm event and stormwater quality controls. In this case stormwater quality controls would be constructed wetlands, sized for the water quality volume required by the *NYS Stormwater Management Design Manual and NYCDEP Applicant's Guide to Stormwater Pollution Prevention Plans and Crossing, Piping or Diversion Permits, August 2002.* However, the Contractor would be required to implement stormwater quality controls in accordance with the latest edition of the State manual and NYCDEP guide.

Roadside swale systems have been designed to collect and convey stormwater runoff generated from the proposed permanent access roads. Roadside swales also serve as a pre-treatment system to capture sediment and other pollutants from stormwater runoff prior to discharging to the proposed constructed wetlands. The constructed wetlands would detain and treat stormwater runoff and discharge to the Creek through the outfall systems. The constructed wetland systems would be designed to promote the removal of sediments, nutrients, and bacteria from stormwater runoff and reduce downstream erosion. Outflow from the constructed wetlands system would be regulated by providing a low-flow orifice and a weir (Please refer to Section 2.6, Natural Resources, Figure 2.6-8).

2.8. AIR QUALITY

2.8.1. Introduction

This section summarizes the results of detailed air analyses carried out to evaluate the potential impacts of the proposed reconstruction activities at the Dam on existing local air quality. The proposed project is located on the Reservoir in the Town of Gilboa in southern Schoharie County, and is characterized as lightly populated and rural. The air quality assessment presented herein focuses on the temporary effects of air emissions associated with reconstruction activities of the Dam. Once the Dam reconstruction is completed, the only air emissions associated with the Dam would be from normal operation and maintenance which would not differ in any substantial way from its current operations.

The proposed project would be implemented in five phases which are further detailed in Section 1.5.9, Project Description. The anticipated reconstruction schedule provides for Phase One, which includes crest gates starting in winter 2008; Phase Two site preparation activities to begin in the summer of 2009; and for Phase Three, Dam reconstruction activities to begin in 2010 and be completed in 2014. Phase Four and Five would be conducted in parallel and completed by 2014. After reviewing the various possible construction alternatives for the proposed actions associated with each phase, a reasonable worst case scenario was identified to provide the basis for the air quality assessment. It was determined that Phase Three would result in the highest air emissions. The reasonable worst case scenario during Phase Three was developed and its potential effects on air quality are presented and discussed in this air analysis.

2.8.2. Air Quality Fundamentals

Maintaining air quality is important for maintaining a healthy lifestyle. The USEPA currently has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants to protect public health and welfare. These six compounds, carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM), Ozone (O_3), and lead (Pb) are regulated under the Clean Air Act. In addition, the NAAQS establish limits for particulate matter, particulate matter with aerodynamic diameter less than 10 µm called (PM_{10}), and particulate matter with aerodynamic diameter less than 2.5 µm ($PM_{2.5}$). Table 2.8-1 lists the existing ambient concentrations of these pollutants in the vicinity of the Dam reconstruction project and their respective NAAQS.

The air pollutants analyzed for potential changes from ambient levels related to Dam reconstruction activities were CO, SO_2, NO_2, PM_{10} and $PM_{2.5}$. Lead and ozone emissions related to reconstruction are anticipated to be negligible and therefore were not analyzed.

2.8.3. Existing Air Quality

The project site for proposed Dam reconstruction is located in southern Schoharie County and is characterized as lightly populated and rural. The County is an attainment area for particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), and sulfur dioxide (SO_2). Schoharie County is a nonattainment area for the eight-hour ozone standard. Therefore, nitrogen oxides (NOx), being a precursor of ozone, would be considered the pollutant of concern. There are no known activities or facilities located near the project area that would contribute substantially to air quality impacts, other than state highways and associated vehicular traffic. Table 2.8-1 shows the existing ambient air quality that is representative of the project area.

The existing ambient air quality levels shown in Table 2.8-1 represent the air monitoring concentrations for each pollutant averaged over the latest year of available data from NYSDEC air quality monitoring stations selected to be representative of the study area based on the land use information. It is important to note that these are not actual local ambient conditions or worst-case background conditions but conservatively representative air emissions based on standard monitoring locations. None of the background conditions exceed the standards.

The background air quality concentrations used for modeling and presented in Table 2.8-2 are the 5-year maximum concentrations for each pollutant measured at the same standard monitoring locations. These background air quality concentrations represent the worst-case scenario for the project area and are added to the modeling results to determine total air quality concentrations of each pollutant during the Peak Reconstruction Year.

It should be noted that $PM_{2.5}$ is absent from Table 2.8-2 since the air quality analysis required for $PM_{2.5}$ by NYCDEP's "Interim Guidance for $PM_{2.5}$ Analyses" considers impacts related to incremental increases in emissions not peak total emissions as presented in Table 2.8-2. The method for evaluating substantial impacts related to changes in $PM_{2.5}$ concentrations is discussed in the next section (Section 2.8.4, Methodology for Air Quality Analysis).

The two intersections as identified in Section 2.8.5.1. with the potential for the highest impacts from mobile sources associated with the proposed actions are NYS Route 990V/Gate 16 and NYS Route 30/NYS Route 145. Table 2.8-3 shows the existing maximum total CO and PM_{10} concentrations at the two analyzed intersections. The concentration given is a combination of the mobile air emissions from traffic at the modeled intersections and the background 5-year worst case concentration shown in Table 2.8-2. As shown in Table 2.8-3, the maximum total modeled concentrations at the two intersections as well as the concentrations for NO_2, SO_2, ozone, and lead, are in compliance with the NAAQS. *De minimis* criteria, also presented in the table, were used to evaluate potential project impacts for CO from mobile sources per the NYC CEQR

Technical Manual. These criteria set the minimum change in 8-hour average CO concentration that constitutes a significant environmental impact.

TABLE 2.8-1
CURRENT AMBIENT AIR QUALITY LEVELS AND AIR QUALITY STANDARDS

Pollutant, Averaging Period	**Monitor Location**	**Ambient Value**	**NAAQS**
NO2, Annual	Eisenhower Park, Nassau County	33.8 μg/m^3	100 μg/m^3
PM_{10}, 24-hour	Belleayre Mountain, Ulster County	37 μg/m^3	150 μg/m^3
$PM_{2.5}$, 24-hour	Albany Health Dept., Albany, NY	31 μg/m^3	35 μg/m^3
$PM_{2.5}$, Annual	Albany Health Dept., Albany, NY	9.2 μg/m^3	15 μg/m^3
CO, 1-hour	Loudonville Reservoir, Albany, NY	1.5 ppm	35 ppm
CO, 8-hour	Loudonville Reservoir, Albany, NY	1.0 ppm	9 ppm
SO2, 3-hour	Loudonville Reservoir, Albany, NY	49.8 μg/m^3	1,300 μg/m^3
SO2, 24-hour	Loudonville Reservoir, Albany, NY	36.7 μg/m^3	365 μg/m^3
SO2, Annual	Loudonville Reservoir, Albany, NY	13.1 μg/m^3	80 μg/m^3

Notes:
1) Based on the most representative NYSDEC air monitoring data for 2006 except for PM_{10}, which is based on data from 2004 (the PM_{10} monitor at Belleayre Mountain was shut down after 2004).
2) NAAQS = New York and National Ambient Air Quality Standards which are designed to protect the public health and welfare with a margin for safety.

TABLE 2.8-2
5-YEAR WORST CASE BACKGROUND AIR QUALITY CONCENTRATIONS FOR MODELING

Pollutant, Averaging Period	Air Pollutant Monitoring Location	Background Concentration
NO_2, Annual	Eisenhower Park, Nassau County	41 µg/m^3
PM_{10}, 24-hour	Belleayre Mountain, Ulster County	41 µg/m^3
CO, 1-hour	Loudonville Reservoir, Albany, NY	2.9 ppm
CO, 8-hour	Loudonville Reservoir, Albany, NY	1.5 ppm
SO_2, 3-hour	Loudonville Reservoir, Albany, NY	131 µg/m^3
SO_2, 24-hour	Loudonville Reservoir, Albany, NY	63 µg/m^3
SO_2, Annual	Loudonville Reservoir, Albany, NY	13 µg/m^3

Notes:
1) Based on the most representative NYSDEC air monitoring data for the five-year period 2002 – 2006 for all air pollutants except for PM_{10}, which is from data for the three-year period 2002 – 2004. The PM_{10} monitor at Belleayre Mountain was shut down after 2004.

TABLE 2.8-3
WORST CASE BACKGROUND CONCENTATIONS COMBINED WITH MOBILE EMISSIONS AT MODELED INTERSECTIONS

Intersection	**One-Hour[1] CO (ppm)**	**Eight-Hour[2] CO (ppm)**	**24-Hour[3] PM_{10} ($\mu g/m^3$)**	***de minimis* CO[4] (ppm)**
NYS Route 990V/Gate 16 (#5)	3.1	1.6	46.0	3.7
NYS Route 30/Route 145 (#11)	4.5	2.6	67.8	3.2
NAAQS:	**35**	**9**	**150**	

Notes:
1) The results represent the highest predicted one-hour CO concentration and include a one-hour background CO concentration of 2.9 ppm.
2) The results represent the highest predicted eight-hour CO concentration and include an eight-hour background CO concentration of 1.5 ppm.
3) The results represent the highest predicted 24-hour PM_{10} concentration over the five-year modeling period and include a 24-hour background PM_{10} concentration of 41 $\mu g/m^3$.
4) The *de minimis* CO criteria values were calculated as per Section 412 of the CEQR Manual (p. 3Q-41).

2.8.4. Methodology for Air Quality Analysis

The air quality assessment was prepared in accordance with guidance provided in the New York City Environmental Quality Review (CEQR) Technical Manual, and followed guidance provided in the latest version of the United States Environmental Protection Agency's (USEPA) "Guideline on Air Quality Models" (revised November 9, 2005) and NYCDEP's "Interim Guidance for $PM_{2.5}$ Analyses" (revised July 9, 2007). In accordance with the CEQR Technical Manual, ambient air quality impacts were assessed for CO, NO_2, SO_2, and PM (both PM_{10} and $PM_{2.5}$).

Throughout the analysis, predicted project impacts for criteria pollutants such as CO, PM_{10}, NO_2, and SO_2 were added to background concentrations to evaluate the total project impact per the CEQR Technical Manual. The background air quality data are based on the most recent, complete, 5-year monitoring period of 2002 through 2006, except for the PM_{10} data which are from the most recent complete three year period of 2002 through 2004. The background monitoring stations selected are the nearest background monitor stations to the project site, and are representative of the study area based on the land use information. Table 2.8-2 summarizes the background air quality. Total project impacts were then compared to the NAAQS over each averaging period for which a pollutant has a NAAQS. Substantial impacts result when concentrations of criteria pollutants exceed their associated NAAQS as a result of the proposed project.

According to *de minimis* criteria, significant impacts are defined as an increase of 0.5 parts per million (ppm) or more at a location where the 8-hour baseline concentration is equal to 8 ppm or between 8 to 9 ppm, or as an increase of more than half the difference between the baseline and 8-hour NAAQS concentrations where the existing concentrations are less than 8 ppm. For example, the *de minimis* CO criteria of 3.2 ppm, as shown in Table 2.8-3 was calculated for intersection NYS Route 30/NYS Route 145. This value is one-half of the difference between the maximum predicted 8-hour CO concentration for the Future Without the Project case (2.6 ppm) and the 8-hour NAAQS (9 ppm), i.e., **½ x (9 – 2.6) = 3.2 ppm.**

For $PM_{2.5}$, potential adverse impacts associated with the proposed project were defined as 24-hour average $PM_{2.5}$ incremental concentration changes greater than 5 $\mu g/m^3$ as described by the NYCDEP and NYSDEC "Interim Guidance for $PM_{2.5}$ Analyses." The guidance does allow for some incremental microscale 24-hour $PM_{2.5}$ impacts between 2 $\mu g/m^3$ and 5 $\mu g/m^3$, depending on the frequency, duration, and location of these concentrations. This interim guidance is relevant to this project because the 24-hour background $PM_{2.5}$ levels are close to the associated NAAQS (Table 2.8-1). $PM_{2.5}$ incremental concentration changes below 2 $\mu g/m^3$ are considered not to be an adverse air quality impact. In addition, impacts to annual $PM_{2.5}$ incremental concentrations must not exceed 0.3 $\mu g/m^3$ from stationary sources. The neighborhood scale annual $PM_{2.5}$ impacts, which is an average concentration over an area of one square kilometer, must not exceed 0.1 $\mu g/m^3$ in order to not be considered a substantial impact according to the guidance.

2.8.4.1. Mobile Sources

The proposed project would generate up to 120 employee trips and 20 delivery trucks per day. Microscale and neighborhood scale air quality analyses of motor vehicle mobile sources were performed for $PM_{2.5}$ and a microscale air quality analysis was performed for PM_{10}, $PM_{2.5}$, and CO.

The microscale analysis was performed for the Existing Year, No-Build Year, and Reconstruction Peak Year Condition for the weekday morning and weekday afternoon peak traffic periods. The neighborhood analysis was performed for the No-Build Year and Reconstruction Peak Year. (The Reconstruction Peak Year was chosen for analysis due to the fact that it is projected to be the year for peak demolition and hauling activities).

The USEPA CAL3QHC dispersion model was used to predict one-hour CO concentrations at the modeled intersections from both moving and idling vehicles. The CAL3QHCR dispersion model was used to predict 24-hour and annual $PM_{2.5}$ concentrations and 24-hour average PM_{10} concentrations at the modeled intersections, using hourly meteorological data from Albany, for the five-year period 2002 through 2006. The microscale analysis used receptors located at appropriate distance from each roadway approach, with a height of 1.8 meters. The neighbor receptors were the same receptors located at the appropriate distance farther from the roadways.

The emission factors for motor vehicles were determined with the USEPA mobile air emission model MOBILE6.2 for engine exhaust (moving and idling), brake wear, and tire wear. The microscale analysis of $PM_{2.5}$ includes exhaust, brake wear, tire wear, and fugitive emissions; while the neighborhood $PM_{2.5}$ analysis includes exhaust, brake wear, and tire wear emissions. The MOBILE6.2 emissions model was run using input files provided by the NYCDEP and the NYSDEC corresponding to the project area. Two types of trucks, 12 CY waste haul trucks with an estimated average weight of 25 tons and delivery trucks with an estimated average vehicle weight of 23 tons were modeled.

Fugitive particulate matter (PM_{10} and $PM_{2.5}$) emissions resulting from the re-suspension of loose material on the paved and unpaved road surfaces were calculated with USEPA's AP-42 document. The silt loading and silt content of the roadways are selected based on the classifications following guidance from the AP-42 document. A silt loading of 0.1 g/m^2 was used for all public roadways, since all of the modeled roads are considered to be principal or minor arterials. The unpaved silt content for onsite unpaved roadways was assumed to be 8.5 percent. Onsite paved road silt content was modeled as 0.4 g/m^2. Figure 2.8-1 shows the modeled roadways within the reconstruction site.

2.8.4.2. Stationary Sources

Based on reasonable worst case scenario the reconstruction activities and their associated equipment are divided into seven major areas as described in Table 2.8-4 and depicted in Figure 2.8-2. The emission and dispersion modeling methodology are summarized below.

TABLE 2.8-4
DESIGNATED RECONSTRUCTION ACTIVITES
FOR SEVEN AREAS

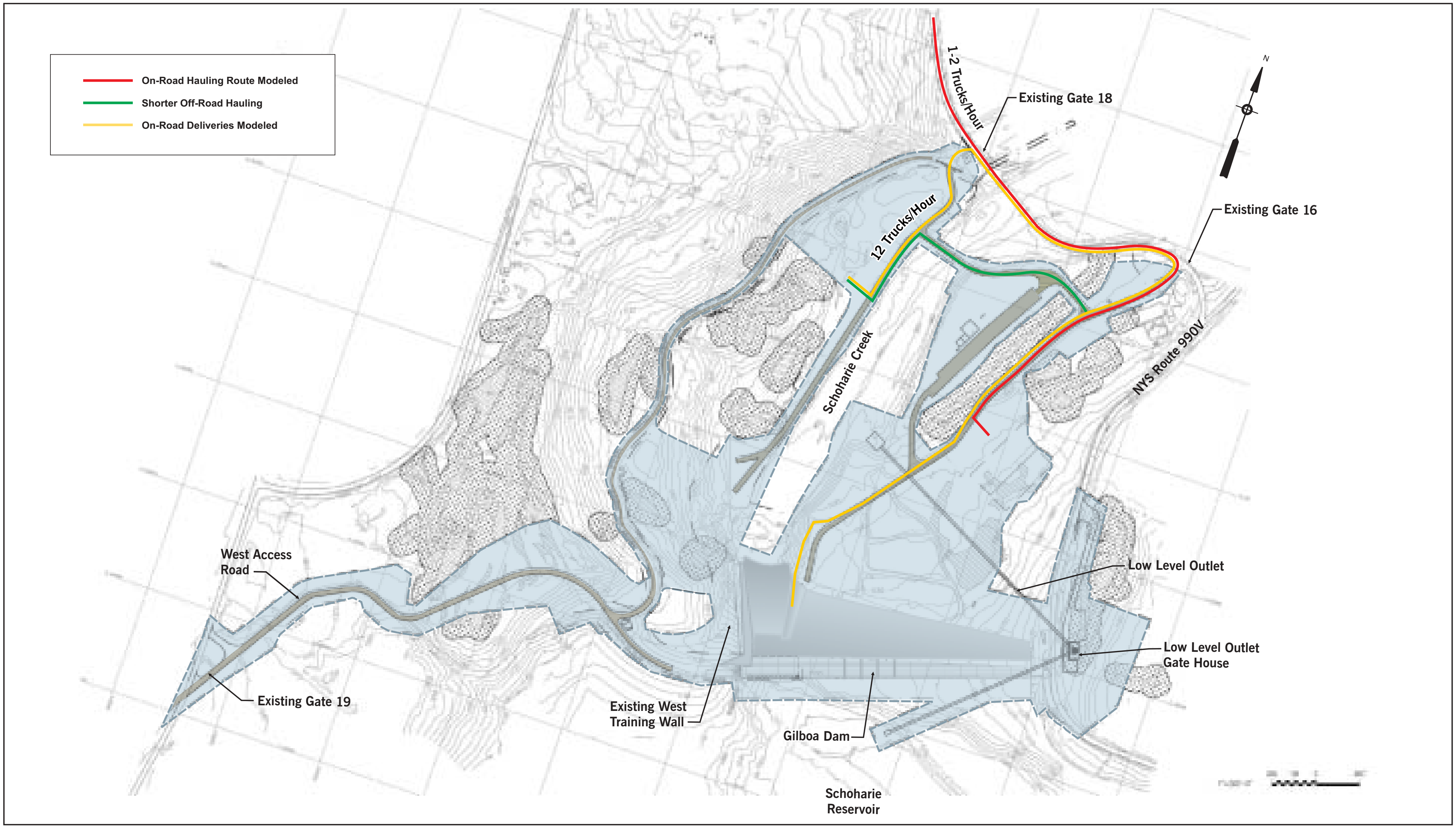
AREA	REASONABLE WORST CASE SCENARIO (PHASE THREE)
1	Demolition & concrete placement
2	Truck traffic
3	Material staging
4	Material staging
5	Concrete production
6	Demolition & concrete placement
7	Demolition & reconstruction

Dispersion Model

The AERMOD dispersion model (version 07026) was used to analyze the air quality impacts from the emission sources at the reconstruction site. All of the sources were modeled as area sources except employee traffic, which was modeled as a mobile source and the batch plant which was modeled as a volume source. The area sources were set up to represent the center portion of each area, where the predominant amount of activity would occur.

Meteorological Data

Five years of meteorological data, for the period 2002 through 2006, were prepared for the analysis with the AERMET processor. The hourly surface meteorological data and the twice-daily upper-air data used were taken from Albany International Airport.



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CAT 211 Engineering Design Services and Design During Construction for the Reconstruction of Catskill Watershed Dams and Associated Facilities

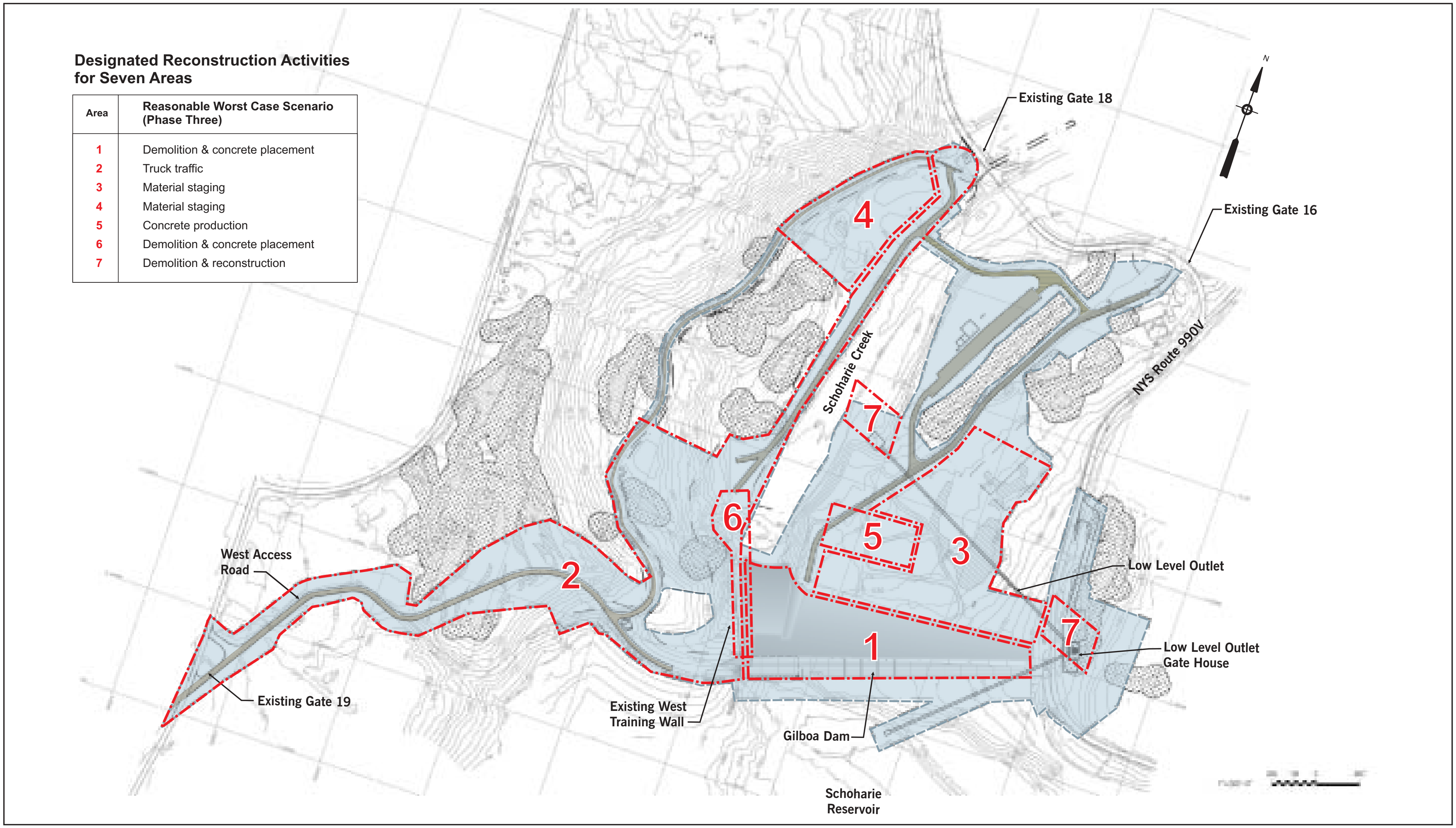
Gannett Fleming HAZEN AND SAWYER Environmental Engineers & Scientists
A Joint Venture

Truck Routes

Figure 2.8-1

Designated Reconstruction Activities for Seven Areas

Area	Reasonable Worst Case Scenario (Phase Three)
1	Demolition & concrete placement
2	Truck traffic
3	Material staging
4	Material staging
5	Concrete production
6	Demolition & concrete placement
7	Demolition & reconstruction



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Project Onsite Source Areas

Figure 2.8-2

Receptors

The modeling receptors were placed along the perimeter of the reconstruction area, with a spacing of 50 meters. Additional receptors were placed at 50 meter intervals in a grid extending outward from the property line for a short distance. The receptor grid for the neighborhood scale analysis is a 1 kilometer by 1 kilometer grid with 25 meter spacing centered at the point where the maximum annual impact is modeled to occur. Twenty-two discrete receptors were placed at specific locations that could be susceptible to air emission changes from the temporary reconstruction of the Dam. These discrete receptors include 16 residences, the Conesville School, the Conesville School District (CSD) Athletic Facilities, the Town Hall/Post Office, the Gilboa Museum, the Gilboa Highway Department, and the United Methodist Church. A total of 248 receptors were modeled, and are shown in Figure 2.8-3.

Emission Factors for Onsite Vehicles

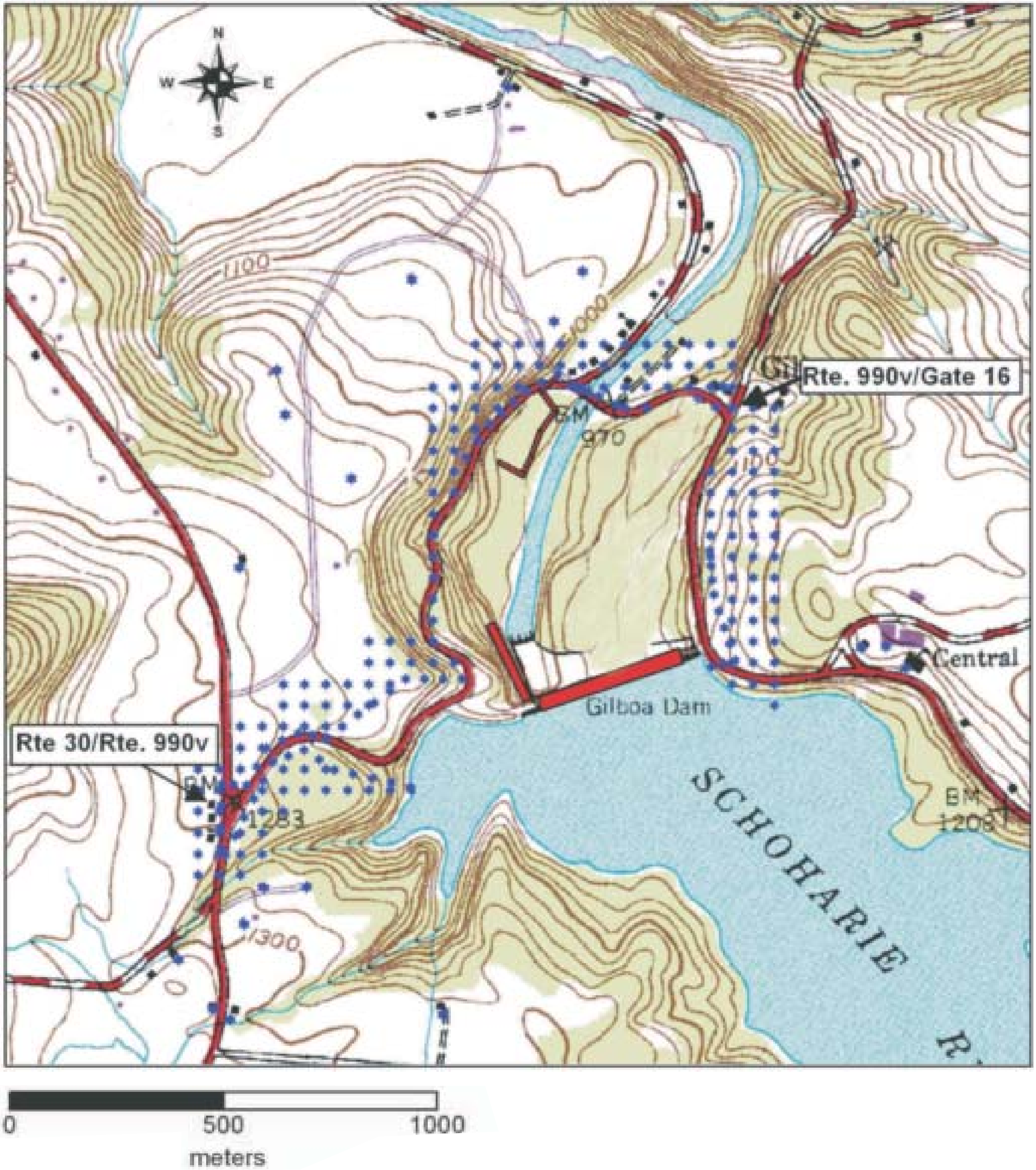
Emissions from vehicles traveling onsite are estimated using the same emission methodology as described in *Mobile Sources* above. A control efficiency of 50 percent was applied to the fugitive emissions to reflect the use of water spray for onsite paved and unpaved roadways to control fugitive dust emissions. All vehicles would be restricted to idling for no more than 5 minutes; with trucks assumed to idle for 5 minutes and employee vehicles assumed to idle for 1 minute. Employee vehicles are assumed to be light-duty gasoline vehicles. Emissions associated with travel for a total of 0.5 miles were divided between five ground-based volume sources; with employee vehicle idling emissions limited to the employee parking area and truck idling emissions limited to the staging area. Twenty daily trucks trips were added to appropriate area sources to represent potential emissions from delivery trucks.

Batch Plant

The batch plant, with an hourly capacity of 400 CY of concrete, would be equipped with a dust collector that would provide 99 percent control to the particulate emissions associated with transfer of sand, aggregate, and cement to the batch plant silos. The other sources of particulate matter from the batch plant, such as aggregate and sand delivery, storage, and transfer to the conveyor, were assumed to be uncontrolled. The plant's maximum output is limited to 600 yards of concrete per day. Section 11.12 of USEPA's AP-42 document was used to calculate the PM_{10} and $PM_{2.5}$ emissions from the batch plant.

Demolition of the Existing Dam Facade

The demolition activities would be limited to daytime hours. USEPA AP-42 Section 11.19.2 "Crushed Stone Processing and Pulverized Mineral Processing" was used to determine the emission rate from Dam demolition. A PM_{10} emission factor for uncontrolled tertiary rock crushing of 0.0024 lb PM_{10} per ton of material demolished was used.



H&S File: 9480\310\Mp1-Location Project Receptors.cdr 7-11-08

Location of Project Receptors

Figure 2.8-3

Handling of Waste and Aggregates
USEPA's AP-42 was used to estimate the $PM_{2.5}$ and PM_{10} emissions from the loading, dumping, and wind erosion of demolition waste materials and materials for the concrete batch plant.

Daily movement of concrete debris was estimated to be 1,275 tons/day and 192 tons/night. Daily combined aggregate and sand movements were estimated to be a maximum of 1,500 tons.

Propane Generators
Emission factors from USEPA's AP-42 were used to calculate the air pollution emission rates for the propane generators. Usage factors of 50 percent were applied to these sources.

Source Scaling Factors
The AERMOD model emission factor option was used to scale the sources according to the anticipated hours of use during reconstruction. Scaling factors range between zero and one. The scaling factor is set to one when a source would be operating at 100 percent and zero when the source would not be operating. These factors were varied by day of the week and season. Separate scaling factors of 0.167 and 0.666 were used to scale the employee vehicle emissions, with the smaller factor representing both the late night and morning shift change hours, and the larger factor representing the afternoon shift change hour.

Reasonable Worst Case Scenario
The conditions of the reasonable worst case scenario during Phase Three are summarized below.

The reasonable worst case scenario conditions include both traffic-related air emissions and air emissions from mobile and stationary sources. Although the reconstruction portion of the proposed project would extend over at least five years, most of the air emissions during reconstruction would be extremely intermittent. To capture the reasonable worst case scenario, many traffic related and reconstruction equipment activities were assumed to occur simultaneously (at normal usage rates). For example the reasonable worst case scenario assumes concurrent operation of all equipment anticipated to be involved in major Dam reconstruction activities: reconstruction of the Dam façade, spillway and side channel, work on the LLO structure, the West Training Wall, the Upper Gate Chamber and the Earthfill Embankment. It also assumes employee vehicles would be present at the maximum commitment number. These assumptions are extremely conservative and it is anticipated that for most of Phase Three, the actual air emission levels would be much less than the projected air emissions levels presented in this section. In addition, to minimize temporary increases in air emissions this analysis assumed that the Contractor would be required to demonstrate that Non-road vehicles meet Tier 2 emission standards and install diesel particulate filters with 85 percent control efficiency.

The Phase Three demolition portion of this proposed project would begin with workers arriving at 7 AM and demolition of the Dam façade would begin shortly thereafter. A hoe-ram or rock-drill would be used to chip the older, inferior material off of the top of the Dam and its façade. This material would be allowed to collect in the Side Channel. After a few hours, façade demolition debris that cascaded down the Dam into the Side Channel area would be reduced in size with jackhammers and loaded onto dump trucks for hauling to the spoils disposal area. The demolition and hauling activities would continue until between 3 PM and 5 PM, when the second shift would arrive to continue the cycle. At 10 PM, during the summer months and 8 PM during the winter months, the reconstruction project would shift to hauling and clean-up activities only. The hauling activities would end when the demolition materials are removed. The air quality modeling assumed that this activity would potentially continue until 3 AM. No reconstruction activity that would occur between 3 AM and 7 AM except concrete pouring, which would only occur on hot summer days if required.

As discussed in Section 1.5.10, Project Description, the preferred hauling alternative during Phase Three includes the installation of a temporary internal bridge however; the reasonable worst case scenario assumes that hauling trucks would use the NYS Route 990V Bridge to move the disposal materials from the existing Dam area to the spoils disposal area. This assumption is conservative since most of the temporary particulate emissions would come from fugitive dust and truck particulate emissions during the hauling of debris to the disposal area and the dust emissions would be highly localized. The primary area most influenced by dust emissions is the area immediately adjacent to the road (see Figure 2.8-2).

The reasonable worst case scenario for mobile sources includes a conservative vehicle volume which is anticipated to occur for only few months over the duration of Phase Three. This includes delivery trucks, conservatively estimated to be 20 trucks per day. Daily hauling of demolition debris was conservatively estimated at approximately 1,400 tons/day.

For all pollutants other than $PM_{2.5}$, the worst case hourly emissions were considered continuous during the maximum reconstruction schedule. While continuous operation of any piece of reconstruction equipment would be possible over an hour, many of the air quality averaging times required for analysis, and discussed herein, are over a 24-hour averaging period or over an entire year. This means that most of the temporary air emissions assumed in this analysis are significantly overestimated. The reasonable worst case $PM_{2.5}$ assumptions reflect that only a certain number of trucks or vehicles would travel around the site during any 24-hour period.

This is for the following reasons:

- The receptors where the 24-hour $PM_{2.5}$ concentrations could exceed 2 $\mu g/m^3$ are located near the project boundary or near the roadways and are not located near any residences or other sensitive receptors. In addition, the time the public would be anticipated to spend along the project boundary or near roadways where these concentrations may exist are likely to be short, and substantially below the 24-hour averaging period.

∉ The maximum contributor to $PM_{2.5}$ impacts would be the nighttime demolition waste hauling operations. These operations would occur on a limited number of days during Dam reconstruction. The modeling assumes that this activity occurs every day and therefore over-predicts the number of days the 24-hour average $PM_{2.5}$ concentrations could exceed 2 $\mu g/m^3$. It is likely that the maximum number of days with a 24-hour average $PM_{2.5}$ is 4.6 $\mu g/m^3$ at any receptor would be less than the 7 that are predicted with the conservative air quality dispersion modeling analysis.

∉ Since approximately 60 days over the two year Reconstruction Peak Year would see peak potential for dust, and not the 365 days modeled, it is anticipated that the seven days predicted to exceed the 2 $\mu g/m^3$ would actually be much less.

2.8.5. Temporary Reconstruction Air Results

The potential increase in air emissions generated by the reconstruction activities during the Reconstruction Peak Year was analyzed at the project's sensitive receptors in the Dam study area. As part of the stationary and mobile source analysis, the projected reconstruction air emissions are presented in this section.

2.8.5.1. Mobile Sources Air Quality Analysis

The microscale air quality analysis of roadway mobile sources was conducted for two intersections: NYS Route 990V/Gate 16 and NYS Route 30/NYS Route 145. The microscale roadway mobile source air quality analysis was performed for the pollutants CO, PM_{10}, and $PM_{2.5}$ for the Reconstruction Peak Year. The dispersion modeling results for 24-hour $PM_{2.5}$ demonstrate that the temporary impacts from the Dam reconstruction would not have an adverse air quality impact even though there are some instances where 24-hour average $PM_{2.5}$ concentration impacts are greater than 2 $\mu g/m^3$. Tables 2.8-5 through 2.8-7 summarize the maximum predicted impacts for each modeled air pollutant and averaging period. Based on the modeling results shown in Tables 2.8-5 to 2.8-7, mobile air quality concentrations from traffic associated with the proposed project would be very low and would present no overall adverse impacts.

The Reconstruction Peak Year impacts of 1.7 ppm and 2.7 ppm are less than the smallest calculated *de minimus* value of 3.2 ppm and therefore, no substantial impacts associated with roadway mobile sources of air emissions are anticipated. Temporary increases in particulate matter due to roadway mobile emissions are also well within the applicable regulatory limits.

TABLE 2.8-5
MAXIMUM PREDICTED MICROSCALE ONE-HOUR AND EIGHT-HOUR AVERAGE CARBON MONOXIDE CONCENTRATIONS PLUS BACKGROUND (ppm)

Intersection	Existing Year	No Build Year	Reconstruction Peak Year	Temporary Increase in Emissions
One-Hour Averages[1]				
NYS Route 990V/Gate 16	3.1	3.1	3.2	0.1
NYS Route 30/Route 145	4.5	4.5	4.6	0.1
NAAQS:	**35**	**35**	**35**	**-**
Eight-Hour Averages				
NYS Route 990V/Gate 16	1.6	1.6	1.7	0.1
NYS Route 30/Route 145	2.6	2.6	2.7	0.1
***De minimis* Criteria[2]**	**-**	**-**	**3.2**	**-**
NAAQS:	**9**	**9**	**9**	**9**

Notes:
1) The one-hour average results represent the highest predicted one-hour CO concentration and include a one-hour background CO concentration of 2.9 ppm in the Existing Year and Reconstruction Peak Year. The eight-hour average results represent the highest predicted eight-hour CO concentration and include an eight-hour background CO concentration of 1.5 ppm in the Existing Year and the Reconstruction Peak Year.
2) The *de minimis* criteria value shown is the smallest value calculated for either intersection, as per Section 412 of the CEQR Manual (p. 3Q-41).

TABLE 2.8-6
MAXIMUM PREDICTED MICROSCALE 24-HOUR AVERAGE
COARSE PARTICULATE (PM_{10}) CONCENTRATIONS
PLUS BACKGROUND (μg/m^3)

Intersection	Existing Year	No Build Year	Reconstruction Peak Year	Temporary Increase in Emissions
NYS Route 990V/Gate 16	46.0	46.2	53.7	7.5
NYS Route 30/Route 145	67.8	68.7	69.0	0.3
NAAQS:	**150**	**150**	**150**	**-**

Notes:
1) The results represent the highest predicted 24-hour PM_{10} concentration over the five-year modeling period and include a 24-hour background PM_{10} concentration of 41 μg/m^3 in the Existing Year and Reconstruction Peak Year.

TABLE 2.8-7
MAXIMUM PREDICTED MICROSCALE 24-HOUR AVERAGE
FINE PARTICULATE ($PM_{2.5}$) CONCENTRATIONS (μg/m^3)

Intersection	Existing Year	No Build Year	Reconstruction Peak Year	Temporary Increase in Emissions
NYS Route 990V/Gate 16	0.28	0.19	1.13	0.94
NYS Route 30/Route 145	1.33	0.70	0.71	0.01
INTERIM CRITERIA:	**2, up to 5**	**2, up to 5**	**2, up to 5**	**-**

Notes:
1) The 24-hour average values shown are the highest predicted values over the five-year modeling period and do not include a background concentration.
2) The interim criteria is 2 μg/m^3, but the interim guidance allows some microscale 24-hour $PM_{2.5}$ impacts between 2 μg/m^3 and 5 μg/m^3, depending on the frequency, duration, and location of these concentrations.

2.8.5.2. *Stationary Sources Air Quality Analysis*

Air quality impact analyses of onsite stationary sources were performed with the US EPA AERMOD model using five years of meteorological data (see Section 2.8.2, Air Quality Fundamentals for a description of the stationary source modeling). The stationary source air quality analysis was performed for the pollutants SO_2, CO, NO_2, PM_{10}, and $PM_{2.5}$. A neighborhood scale air quality analysis of annual average $PM_{2.5}$ was also performed for the stationary sources.

Table 2.8-8 summarizes the maximum predicted impacts for each modeled air pollutant and averaging period. Based on the modeling results shown in Table 2.8-8, air quality concentrations of SO_2, CO, NO_2, and PM_{10} from the stationary sources associated with this reconstruction project, and including background concentrations, would be in compliance with applicable air quality standards.

Table 2.8-8 also shows the 24-hour and annual average modeling results for $PM_{2.5}$ and the annual average neighborhood modeling results for $PM_{2.5}$. The results show that the maximum predicted annual $PM_{2.5}$ impacts would be in compliance with the interim annual $PM_{2.5}$ criteria of 0.3 $\mu g/m^3$ for stationary sources. No exceedances of the 2 $\mu g/m^3$ interim 24-hour $PM_{2.5}$ criteria are predicted at any of the 23 closest residential, municipal, or commercial locations to the project site.

The maximum predicted 24-hour average $PM_{2.5}$ concentration is 4.6 $\mu g/m^3$. The maximum predicted annual frequency of 24-hour average $PM_{2.5}$ concentrations greater than 2 $\mu g/m^3$ is 7 occurrences at any receptor and with a total of 59 occurrences over 31 different receptors. These receptors border or are in the immediate vicinity of the northern perimeter of the proposed project site.

Table 2.8-8 also summarizes the results of the annual average $PM_{2.5}$ neighborhood analysis. The results shown demonstrate that the project would comply with the 0.1 $\mu g/m^3$ annual average interim $PM_{2.5}$ criteria, as the sum of the annual average mobile and stationary source impacts are less than the 0.1 $\mu g/m^3$ criteria.

TABLE 2.8-8
MAXIMUM PREDICTED RECONSTUCTION CONCENTRATIONS WITH NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) AND $PM_{2.5}$ INTERIM CRITERIA

Pollutant	Averaging Time	Maximum Predicted Concentration (μg/m³)	Monitored Background Concentration (μg/m³)	Total Concentration (μg/m³)	NAAQS (μg/m³)
SO_2	3-hour	4.3	131	135.3	1,300
	24-hour	1.0	62.9	63.9	365
	Annual	0.1	13.1	13.2	80
CO	1-hour	0.4 ppm	2.9 ppm	3.3 ppm	35 ppm
	8-hour	0.1 ppm	1.5 ppm	1.6 ppm	9 ppm
NO_2	Annual	20.5	41.4	61.9	100
PM_{10}	24-hour	37.2	41	78.2	150

Notes:
1) The results shown are the highest predicted concentrations for short-term SO2, CO, and PM_{10} over the five-year modeling period. For all annual averages, the highest predicted annual concentration from the five-year period are shown. Background concentrations are included in all of the total concentrations.

Pollutant	Averaging Time	Overall Maximum Predicted Concentration (μg/m³)	Discrete Receptor Maximum Predicted Concentration (μg/m³)	Interim $PM_{2.5}$ Criteria (μg/m³)
$PM_{2.5}$	24-hour	4.6*	1.5	2 **
	Annual	0.28	0.12	0.3

Notes:
1) The overall maximum results shown are the highest predicted 24-hour and annual $PM_{2.5}$ concentrations, without background concentrations added, over the five-year modeling period, at all receptors. Discrete receptors consist of the 22 closest residential, municipal, and commercial locations near the project site.
* At any one receptor, for any modeled year, a maximum of 7 occurrences were predicted to have a 24-hour $PM_{2.5}$ concentration between 2 and 5 μg/m³.
** The interim criteria is 2 μg/m³, but the interim guidance allows some microscale 24-hour $PM_{2.5}$ impacts between 2 μg/m³ and 5 μg/m³, depending on the frequency, duration, and location of these concentrations.

TABLE 2.8-8 (continued)
MAXIMUM PREDICTED RECONSTUCTION CONCENTRATIONS WITH NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) AND $PM_{2.5}$ INTERIM CRITERIA
(Neighborhood Analysis $PM_{2.5}$ Results)

Pollutant	Averaging Time	Maximum Predicted Concentration From Stationary Sources (μg/m^3)	Maximum Predicted Concentration From Mobile Source (μg/m^3)	Maximum Total Predicted Concentration (μg/m^3)	Interim $PM_{2.5}$ Criteria (μg/m^3)
$PM_{2.5}$	Annual	0.059	0.02	0.079	0.1

2.8.6. Conclusions

The air quality dispersion modeling results presented in Tables 2.8-5 through 2.8-8 demonstrate that the temporary air quality impacts from the Dam reconstruction project would not cause or contribute to any short-term exceedances of the NAAQS or *de minimus* CO criteria at any locations surrounding the project site.

The modeling results indicate that there could be some days when the 24-hour $PM_{2.5}$ concentrations could exceed 2 $\sigma g/m^3$. The maximum predicted annual frequency of these values was 7 occurrences, at a receptor located on the north project perimeter along NYS Route 990V, between the two project gates. The other 30 receptors where maximum 24-hour $PM_{2.5}$ concentrations (neighborhood analysis) exceeded 2 $\sigma g/m^3$ had a maximum annual frequency between 1 and 5 occurrences, with the average being around 2 occurrences per year. These receptors were also located along and near the northern perimeter of the project site. All of the locations are at remote wooded locations or along open roadways, where the public would not be expected to have prolonged exposure; with prolonged exposure defined a continuous 24 hour period or longer.

It is important to note that the potential number of 24-hour periods when the 24-hour $PM_{2.5}$ concentrations could exceed 2 $\sigma g/m^3$ would likely be much less than the modeling predicts since the worst case would not regularly occur, and therefore the interim criteria would not be exceeded nearly as often as predicted in the modeling. These temporary increases in $PM_{2.5}$ are not significant because the area is currently not exceeding the NAAQS for $PM_{2.5,}$ the maximum number of times that the concentration exceeds the interim standard would be infrequent, and the locations of highest concentrations would not be significant since none of the highest concentrations were modeled to occur at a residential dwelling or a municipal building.

No annual exceedances of any NAAQS, *de minimis* CO criteria, or interim $PM_{2.5}$ criteria were predicted at any of the closest 22 sensitive receptor locations surrounding the project site. The results of the neighborhood $PM_{2.5}$ analysis (Table 2.8-8) show that the combined annual average mobile source and stationary source $PM_{2.5}$ impacts would be in compliance with the interim annual $PM_{2.5}$ criteria.

The air quality assessment presented herein focuses on the effects of the temporary air increase during reconstruction activities of the Dam. Once the Dam reconstruction is completed, the only air emissions associated with the Dam would be those associated with normal operation and maintenance which would not differ in any substantial way from current operations. Therefore, the temporary increase in air emissions from reconstruction activities would not have an adverse impact to air quality in the vicinity of the Dam.