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R368

The Village of Kiryas Joel

Draft Environmental Impact Statement for the Proposed Connection to the New York City Catskill Aqueduct

October 2003

NYS Environmental Conservation Law
Village of Kiryas Joel

SEQRA
Notice of Completion of Draft EIS
Notice of Hearing

Project # DWSRF 16906 Date: October 7, 2003

TO: Involved / Interested Agencies and Members of the Public

RE: Village of Kiryas Joel Water Supply Project

This notice is issued pursuant to Part 617 of the implementing regulations pertaining to Article 8 (State Environmental Quality Review) of the Environmental Conservation Law.

A Draft Environmental Impact Statement has been completed and accepted by the Board of Trustees of the Village of Kiryas Joel, as lead agency, and is available at Village Hall for the proposed action described below. Comments on the Draft EIS are requested and will be accepted by the contact person until November 24, 2003.

Please take notice, that a public SEQRA hearing will be held by the Board of Trustees concerning the action on November 14, 2003 at 10:30 am, at the Village Hall, 51 Forest Road, Monroe, NY 10950.

NAME OF ACTION: Catskill Aqueduct Connection

SEQR STATUS: Type 1 ____X_____ Positive Declaration – August 6, 2002

DESCRIPTION OF ACTION: Construction of a tap of the Catskill Aqueduct and a transmission main to transport water supplies to the Village of Kiryas Joel. The project will include a water treatment plant and pumping station.

LOCATION OF ACTION:

The water supply pipeline will extend from the NYC Catskill Aqueduct connection in New Windsor, NY along Riley Rd, State Rt.94, Clove Rd., County Rt. 27, State Rt 208, and State Rt. 17 to its termination in the Village of Kiryas Joel, Orange County, NY.

FOR FURTHER INFORMATION

CONTACT PERSON: Hon. Gedalye Szegedin, Village Clerk

ADDRESS: PO Box 566, Monroe, NY 10950

TELEPHONE NUMBER: (845) 783-8300

Draft Environmental Impact Statement

Village of Kiryas Joel

Proposed Connection to the New York City Catskill Aqueduct

Project Location:	Between Vails Gate and Kiryas Joel in Orange County, New York
Lead Agency:	Board of Trustees of the Village of Kiryas Joel Municipal Building 51 Forest Road, P.O. Box 566 Monroe, NY 10950
Lead Agency Consultant:	Camp Dresser & McKee Raritan Plaza I Raritan Center Edison, NJ 08818

Project contacts:

Mr. Gedalye Szegedin
Village Clerk
P.O. Box 566
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(845) 783-8300

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CDM
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Date of Acceptance by Lead Agency: October 7, 2003

Comment Period: ends November 24, 2003

Prepared for:
Village of Kiryas Joel

Prepared by:
Camp Dresser & McKee

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Background and Description of the Proposed Action

The residents of the Village of Kiryas Joel currently depend on groundwater wells for their entire supply of potable water. Although average per-capita consumption of water in Kiryas Joel is substantially lower than in Orange County and New York State as a whole, the Village has had difficulty providing enough groundwater for its growing population. According to the United States Census, the population of Kiryas Joel grew from 7,347 in 1990 to 13,138 in 2000, an annual growth rate of 5.9 percent.

The current average daily water demand in the Village is approximately 0.98 million gallons per day (mgd), based on operation reports from 2002. Peak daily water demand exceeds 1.3 mgd. NYSDEC has authorized Kiryas Joel to withdraw 1.0 mgd from nine wells in Kiryas Joel and 0.31 mgd from five wells in an unincorporated area of the Town of Monroe near Mountain Lakes, for a total of 1.31 mgd. Due to internal growth and the corresponding increase in water demand, wells in the Village have been heavily used, causing a net decrease in their output. Since the Village wells are no longer capable of producing the maximum permitted yield, Kiryas Joel's water system is unable to supply enough water on days of high demand. To overcome the supply deficit, the Village is occasionally forced to truck in additional water in preparation for religious holidays, when peaks of water demand often occur.

Kiryas Joel's current water shortfall is more acute during dry periods. A water-budget analysis showed that recharge to the bedrock aquifer underlying the Village is barely adequate during normal rainfall (1.03 mgd), and drops to approximately 0.41-0.70 mgd during drought conditions (LBG, 1995).

Because of the difficulties it has experienced in meeting its water supply needs using groundwater wells, Kiryas Joel contacted the New York City Department of Environmental Protection (NYCDEP) about acquiring water from the Catskill Aqueduct. State law originating in the Water Supply Act of 1905 requires the City of New York to furnish quantities of water (called "entitlement water") to various municipalities and water districts in certain counties north of the City in which City watershed areas and water supply facilities are located. Because Orange County is host to two of the City's aqueducts, municipalities and water districts in the County may apply to the City for entitlement water. Kiryas Joel filed an official request with NYCDEP in September 2000 for conceptual approval to establish a connection to the Catskill Aqueduct designed to withdraw up to 2.0 mgd of water. In a letter dated November 27, 2000, NYCDEP conceptually approved the proposed connection and withdrawal of water. The letter acknowledged the Village's estimate that Kiryas Joel would be entitled, pursuant to the NYC Administrative Code §24-360(e), to withdraw 1.1 mgd based on its population as measured by the 1990 Census. Based on the 2000 Census, Kiryas Joel would be entitled to withdraw approximately 1.9 mgd. NYCDEP must still grant final approval of the proposed connection to the Catskill Aqueduct.

The Village of Kiryas Joel proposes to connect to the Catskill Aqueduct near Riley Road in the Vails Gate section of the Town of New Windsor. The Vails Gate location is proposed because it is just upstream of the point where the aqueduct descends more than 1,000 feet to cross under the Hudson River.

Water would be withdrawn from the Catskill Aqueduct using a vacuum priming system, and the water would be conveyed to a pump station. The water would be pumped through a 13-mile pipeline that would follow State Route 94, County Route 27, State Route 208, and State Route 17. The pipeline would end at a new water treatment facility at the site of the existing water treatment facility on Berdichev Road in the Village of Kiryas Joel. After treatment, the aqueduct water would be fed into the Village's water distribution system.

Significant Beneficial and Adverse Impacts

Groundwater Resources

After completion of the proposed Aqueduct connection, the Village of Kiryas Joel's dependence on groundwater would decrease, with the existing wells functioning primarily as a backup system. The decrease in daily withdrawal would reduce stress on the aquifer.

Surface Water Resources

The major stream crossing for the preferred route would be Moodna Creek near the intersection of Route 27 and Orrs Mills Road in Salisbury Mills. Due to the depth of the creek bed below the roadway, the pipeline would be affixed to the bridge rather than buried under the creek. Therefore, there would be no permanent impacts to Moodna Creek or its floodplain at this crossing. Additional stream crossings, including Perry Creek and other minor tributaries, would require the pipeline to be affixed to bridges or culverts or buried under streams as conditions dictate. Any impacts to the flow or water quality of the streams at these locations would be temporary and construction-related. The proper construction mitigation measures would be employed to minimize such impacts. Pipeline stream crossings would be designed to have no impact on the maximum flow of water under a bridge or through a culvert.

Wetlands

NYSDEC wetland maps and National Wetlands Inventory maps show regulated freshwater wetlands adjacent to the proposed pipeline route. Field investigation indicates that wetland delineation may be needed to clearly define the limits of wetlands at County Route 27 and Mountain Lodge Road and at Exit 130 of State Route 17. Placement of the pipeline within the shoulder or roadway itself may be required at these locations to avoid wetland disturbance.

Air Quality

The Aqueduct connection project would generate minor, local, short-term increases in fugitive dust from exposed soil and use of operating machinery. Dust generation would be temporary and limited to areas of active construction.

Induced Growth

Growth in Kiryas Joel is primarily internal and results from two principal factors: large family size and young women remaining in the Village to have families of their own. Both of these growth factors are responses to the obligations of Hasidic religious practice rather than to external conditions such as the amount of potable water available. An increase in the water supply would not induce significant additional growth.

Economics

The proposed Aqueduct connection would generate jobs during construction. Construction of the proposed pipeline would have minor temporary impacts on businesses along the pipeline route. The number of businesses involved is small. Implementation of the proposed Aqueduct connection would increase the cost of water in Kiryas Joel, because the existing groundwater pumping system would be maintained as backup to the Aqueduct connection.

Traffic

Traffic impacts would be concentrated along the pipeline corridor. A minor impact to residents, businesses, emergency vehicles, school buses and public transit is anticipated. With appropriate pre-construction design and planning, conditions during pipeline construction would not be hazardous to pipeline workers and the traveling public and there would be no noticeable increase in congestion or access time to community facilities and residential/commercial areas, increased traffic accidents, or an increase in other safety related issues.

Use of alternating one-way traffic in the vicinity of pipe installation is anticipated. It is likely that construction contract requirements would include restrictions on construction activity during the morning and afternoon rush hours. Access to residential and business driveways would be maintained at all times during construction. Regular contact with local governments, government agencies, emergency services, utility companies, television and radio to inform them of project status would help to minimize impacts.

Noise

Noise generated by the proposed project would come primarily from the construction phase. Long-term operations noise would come from two sources: the pump station and the water treatment plant.

Construction noise impacts generally occur only during typical daytime working hours of 7:00 a.m. to 5:00 p.m., and would be highest during the clearing and trenching phases of construction. The noisiest equipment would likely be earthmoving equipment, such as dozers, graders, loaders and other heavy-duty diesel equipment. Noise levels decrease by 6 dBA for every doubling of distance. It is anticipated that the daytime L_{max} noise levels would not exceed 80 dBA at 150 feet away and the daytime L_{eq} noise level would not exceed 75 dBA at 150 feet away. Nighttime and weekend work would be avoided to the maximum extent possible.

The major long-term noise-generating piece of stationary equipment associated with the aqueduct connection component of the project is the pumping station to be located on the west side of Riley Road at the New Windsor Water Treatment Plant. The maximum sound level from the pump station would be specified as 60 dBA at the property boundary (the nearest property boundary to the pump station is expected to be approximately 50 feet from the pump station). At the residence nearest the pump station, more than 300 feet from the site property line, the pumping station noise would be inaudible.

An increase of 3-to-6 dBA in the immediate vicinity of the new water treatment facility in Kiryas Joel is projected. This is considered a minor to moderate increase.

Energy
Approximately 4,900 kWh of electrical energy per day would be required to pump 2 mgd of water out the top of the Catskill Aqueduct, over to the proposed pumping station in Vails Gate, and from the pumping station through the proposed 13-mile pipeline to Kiryas Joel. Although significant, this is a small amount of electrical power in comparison to the total amount consumed in the region.

The proposed 24-inch pipeline diameter was chosen primarily because less electrical energy would be required to pump 2 mgd of water through a 24-inch pipeline than through a 12-inch or 18-inch pipeline. After implementation of the Aqueduct connection, most pumping from Kiryas Joel's groundwater wells would cease, and most energy consumption associated with the pumping would therefore cease. This would partially offset the energy consumed by the proposed Aqueduct connection.

Alternatives Considered

A range of reasonable alternatives to the proposed action have been evaluated, including the following:

- Continuing to drill additional groundwater wells rather than connecting to the Catskill Aqueduct
- Routing the proposed pipeline along the New York State Thruway and/or State Route 32
- Construction of the pump station on land owned by New York City adjacent to the Catskill Aqueduct
- Reduction of the proposed 24-inch diameter of the pipeline to 18 inches or 12 inches

The alternative of continued reliance on Kiryas Joel's existing groundwater wells, the no-action alternative, has also been evaluated. Other alternatives have been evaluated previously, including obtaining water from neighboring communities and pumping water from the Hudson River. None of the examined alternatives would perform as

well as the proposed project in meeting the Village's objective: to provide its residents with a reliable, high-quality source of potable water while minimizing environmental impact and conflict with other communities.

Project Schedule

Environmental review of the proposed Catskill Aqueduct connection is expected to be complete by the end of 2003. It is projected that project design and permitting would occur during 2004 and construction during 2005-2006.

Regulatory Requirements and Permits

The following is a preliminary list of permits and approvals expected to be required for the proposed action.

US Army Corps of Engineers – Wetlands disturbance and stream crossing

NYSDEC – Freshwater wetlands, Protection of Waters, State Pollutant Discharge Elimination System (SPDES) General Permit for Construction Activities, Clean Water Act Section 401 Water Quality Certificate, State Historic Preservation Act (SHPA)

NYS Department of Transportation – Road opening permit

NYS Department of Health – Water distribution permit, plan review

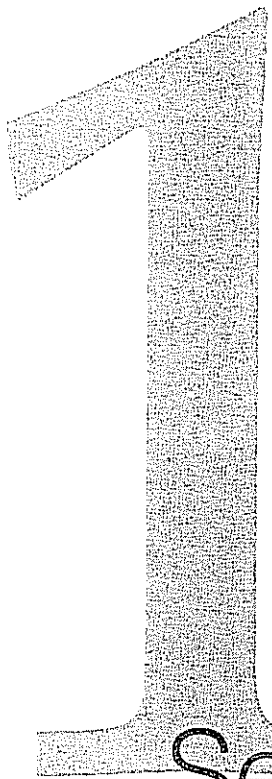
NYS Thruway Authority – Permit required to work in roadway easement

NYS Environmental Facilities Corporation – Approval of funding request

NYCDEP – Final approval for connection to the New York City water supply system, Revocable Permit for use of New York City land

NYC Water Board – Water supply agreement

Orange County Department of Health – Water distribution permit, plan review.



Section One

Section 1
Need, Purpose and Description of the Proposed Action

1.1 Introduction

The Village of Kiryas Joel, with the concurrence of the involved agencies, is the lead agency for implementation of a connection between the Village and New York City's Catskill Aqueduct. On July 2, 2002 the Board of Trustees of the Village of Kiryas Joel circulated a Notice of Establishment of Lead Agency to potentially involved agencies associated with this proposed action. The notice was accompanied by a full Environmental Assessment Form (EAF) as required by the State Environmental Quality Review Act (SEQRA). The Board stated its intention, if approved as lead agency, to issue a Positive Declaration for the proposed action, a Type I action under SEQRA. When a Positive Declaration is issued for a proposed Type I action, an Environmental Impact Statement (EIS) must be prepared and evaluated before an action may be directly undertaken by the lead agency itself and/or any necessary permits are issued for the proposed action by any other involved agency. Among other elements, the EIS must include a description of the proposed action and an explanation of the need for and purpose of the proposed action.

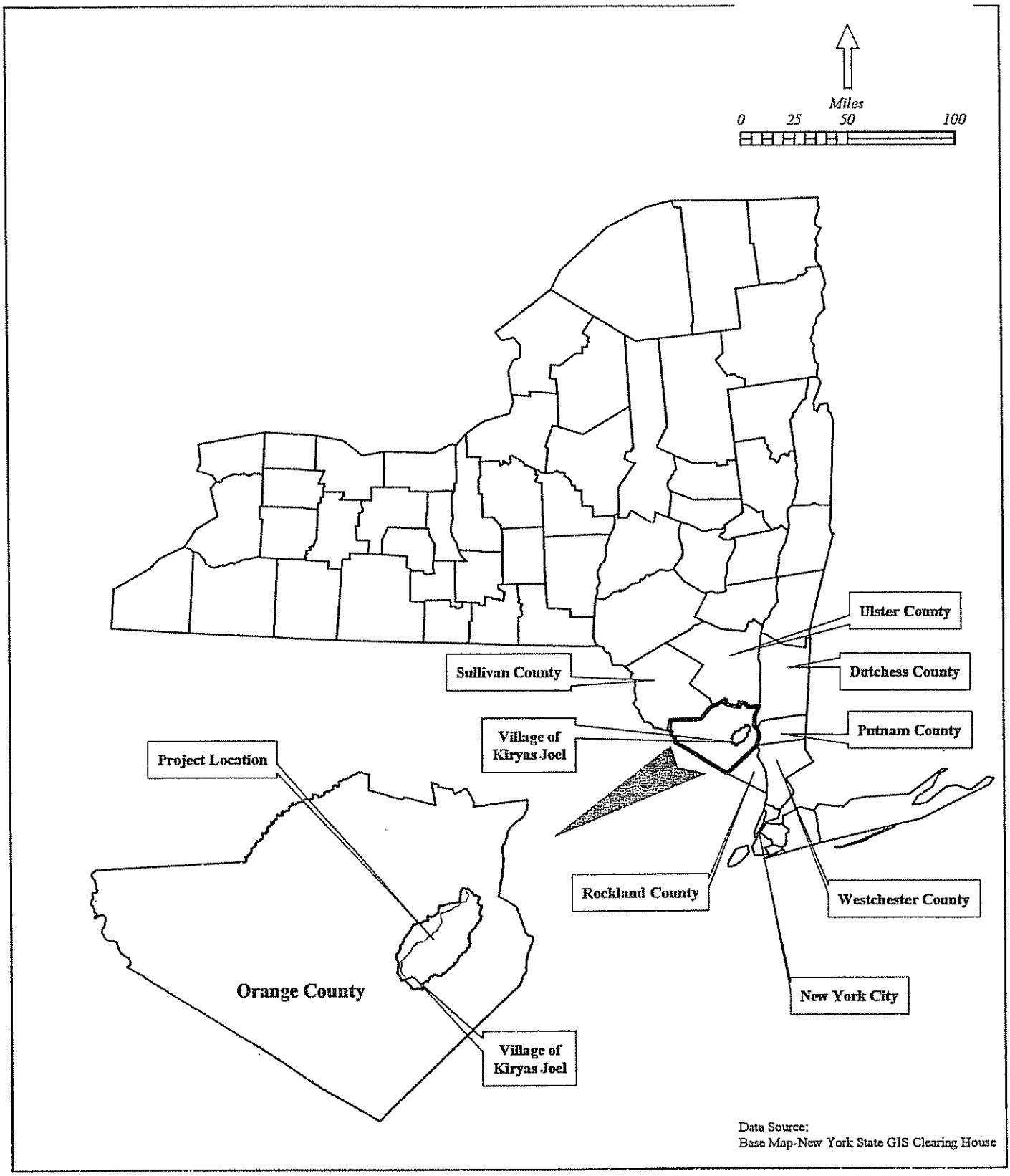
1.2 Need for the Proposed Action

The Village of Kiryas Joel needs to connect to New York City's Catskill Aqueduct because the Village's existing groundwater-dependent potable water system cannot be relied upon to meet current and future demands.

1.2.1 Growth of Kiryas Joel and the Demand for Water

The Village of Kiryas Joel is an incorporated village in the Town of Monroe, Orange County, New York, approximately 45 miles north of New York City (see Figure 1-1). Village residents depend on groundwater wells for their entire supply of potable water. Although average per-capita consumption of water in Kiryas Joel is substantially lower than in Orange County and New York State as a whole, the Village has had difficulty providing enough groundwater for its growing population. According to the United States Census, the population of Kiryas Joel grew from 7,347 in 1990 to 13,138 in 2000, an annual growth rate of 5.9 percent.

The current average daily water demand in the Village is approximately 0.98 million gallons per day (mgd), based on operation reports from 2002. Peak daily water demand exceeds 1.3 mgd. Peak water consumption is not attributed to those demands associated with a typical suburban community's water usage, such as car washing and lawn watering. As a result of the community's religious practices, peak flows are generally caused by preparation for holiday periods and the Sabbath. High demands have occurred during the temporary influx of population for holidays, and



Legend

Study Area

County Boundary

Figure 1-1

Location Map

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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also on the anniversary of the death of Grand Rabbi Joel Teitelbaum, founder of Kiryas Joel. Peak daily demands typically occur 50 to 75 days per year.

Hasidic families are large in accordance with the obligations of their religious practice. The lack of essential services, such as drinking water, has not slowed population growth in Kiryas Joel. Young women graduating from school in Kiryas Joel marry at age 18 and remain in the Village. The marriage rate is increasing as the young Village population matures. Whether or not the proposed aqueduct connection is implemented, Kiryas Joel will continue to grow at a substantial rate. The growth of Kiryas Joel has created a need for additional water supply and treatment within the Village, and the need will grow larger as time passes.

1.2.2 Previous Work to Expand Water Supply

Kiryas Joel's existing water supply system consists of deep extraction wells drilled into the rock formation underlying the community. The Village currently has nine active wells in the Village and five on a parcel south of the Village known as the Brenner property. The Village's water supply infrastructure also includes four storage tanks, approximately 11 miles of transmission mains, and two filtration plants.

To meet the demand of its growing population for potable water, the Village of Kiryas Joel has been actively planning and implementing comprehensive improvements to its water supply infrastructure. The following are projects completed to date.

- Preparation of a computerized water distribution system model that enables the Village to perform real-time analysis of a variety of water supply and demand scenarios.
- Development of five new groundwater wells on the Brenner property, a 70-acre parcel in the Town of Monroe, adjacent to the Village's southern boundary.
- Installation of a new elevated water storage tank.
- Planning of improvements to the Village's existing water treatment facilities.
- Planning for additional treatment capacity for new groundwater supplies as required.
- Implementation of comprehensive water conservation measures.

1.2.3 Groundwater Supply Issues

The existing Kiryas Joel water supply system includes 14 active groundwater production wells and two water treatment plants. Kiryas Joel is authorized to withdraw up to 1.0 mgd from the 9 wells in the Village and up to 0.31 mgd from the 5 wells on the Brenner property, a total of 1.31 mgd. The nine wells in the Village do not produce as much as 1.0 mgd, however, so the Village is currently not able to meet the maximum daily water demand of 1.3 mgd. The Village wells are heavily used,

and their yield has fallen. The Village must truck in additional water in preparation for religious holidays, when maximum water demand is likely to occur.

Kiryas Joel's current water shortfall is more acute during dry periods. A water-budget analysis showed that recharge to the bedrock aquifer underlying the Village is barely adequate during normal rainfall (1.03 mgd), and drops to approximately 0.41-0.70 mgd during drought conditions (LBG, 1995). Table 1-1 shows average daily water production for the years 1996 through 2002. Water consumption is not significantly different from water production. Production and consumption have increased since 2000. The Village expects continued growth in water demand, and believes it would be difficult to meet the demand with the current groundwater-dependent system.

Table 1-1
Water Production

Year	Average daily production (gallons)	Average daily production in peak month (gallons)
1996	765,800	854,600 (August)
1997	820,600	894,700 (August)
1998	852,500	933,500 (July)
1999	847,700	939,900 (December)
2000	800,200	857,100 (April)
2001	904,500	1,071,600 (August)
2002	981,300	1,081,500 (July)

To increase its water production capacity, Kiryas Joel has installed groundwater production wells on an undeveloped 70-acre parcel known as the Brenner property, south of the Village near Mountain Lakes in an unincorporated section of the Town of Monroe. Kiryas Joel has also drilled test wells south of Mountain Lakes. Additional testing is continuing in an area known as Parcel 5 within the Village, and on the Brenner property. Despite these efforts, the Village's water supply system is only marginally capable of meeting the current demand of approximately 0.98 mgd. Under the frequent peak demands, the water supply is inadequate.

Other municipalities in the vicinity of Kiryas Joel are experiencing growth, and none of them is willing to make arrangements to supply water to the Village.

1.2.4 Need for a More Reliable Long-Term Potable Water Source

The Village of Kiryas Joel's existing water supply system is minimally adequate for its present population, and the Village will need increasing amounts of potable water as it continues to grow. As the rate of groundwater withdrawal in the vicinity of Kiryas Joel grows larger in comparison to the groundwater recharge rate, it will become increasingly difficult for a groundwater-dependent system to maintain an adequate water supply for a growing community.

Maintaining an adequate supply of potable groundwater is especially difficult during periods of low rainfall. Kiryas Joel and its neighbors experienced one such dry period during 1998 and 1999. The drought caused a water supply shortage in the Village and Kiryas Joel had to truck in water to get through the drought.

To increase the reliability of its potable water supply and to counter the perception that it is drawing water away from other people's wells, Kiryas Joel needs to gain access to a substantial source of surface water. The Catskill Aqueduct is the best available source of surface water.

1.3 Purpose of the Proposed Action

The purpose of the proposed action is to provide a reliable and adequate supply of high-quality potable water for the Village of Kiryas Joel. Specifically, the proposed project has the following objectives:

- Establish a long-term, consistent, high-quality water supply for a growing community
- Reduce the dependence of the community on groundwater as its source of potable water
- Establish a potable water supply that avoids conflict with surrounding communities
- Reduce vulnerability to drought by broadening the area from which water can be drawn
- Avoid or minimize adverse impacts to the environment, the Village, and surrounding communities

1.4 Description of the Proposed Action

Because of the difficulties it has experienced in meeting its water supply needs using groundwater wells, the Village contacted the New York City Department of Environmental Protection (NYCDEP) about acquiring water from the Catskill Aqueduct. State law originating in the Water Supply Act of 1905 requires the City of New York to furnish quantities of water (called "entitlement water") to various municipalities and water districts in certain counties north of the City in which City watershed areas and water supply facilities are located. Because Orange County is host to two of the City's aqueducts, municipalities and water districts in the County may apply to the City for entitlement water. Kiryas Joel filed an official request with NYCDEP in September 2000 for conceptual approval to establish a connection to the Catskill Aqueduct designed to withdraw up to 2.0 mgd of water. In a letter dated November 27, 2000, NYCDEP conceptually approved the proposed connection and withdrawal of water. The letter acknowledged the Village's estimate that Kiryas Joel would be entitled, pursuant to the NYC Administrative Code §24-360(e), to withdraw 1.1 mgd based on its population as measured by the 1990 Census. Based on the 2000

Census, Kiryas Joel would be entitled to withdraw approximately 1.9 mgd. NYCDEP must still grant final approval of the proposed connection to the Catskill Aqueduct.

The Village of Kiryas Joel proposes to connect to the Catskill Aqueduct near Riley Road in the Vails Gate section of the Town of New Windsor. The Vails Gate location is proposed because it is just upstream of the point where the aqueduct descends more than 1,000 feet to cross under the Hudson River.

Water would be withdrawn from the Catskill Aqueduct using a vacuum priming system, and the water would be conveyed to a pump station. The untreated water would be pumped through a 13-mile pipeline that would follow State Route 94, County Route 27, State Route 208, and State Route 17, as shown in Figure 1-2. The pipeline would end at a new water treatment facility at the site of the existing water treatment facility on Berdichev Road in the Village of Kiryas Joel. After treatment, the aqueduct water would be fed into the Village's water distribution system.

1.4.1 Catskill Aqueduct Connection and Pumping Station

The Catskill Aqueduct connection would be similar in design to the Town of New Windsor's connection. A pipe would enter the Catskill Aqueduct from the top, as required by NYCDEP, and extend vertically to the bottom of the aqueduct. Because the Catskill Aqueduct is not under pressure at the proposed point of connection, there is normally an air space above the water flowing in the aqueduct. To withdraw water out the top of the aqueduct, it would therefore be necessary to install a vacuum priming system. The vacuum priming system would be located close to the aqueduct connection point.

The vacuum priming system would deliver water to the pump station wet well. Once a siphon is established, the water would continue to flow to the wet well. The water would be sprayed into the wet well from above while air is blown upward from below. This counter-current flow of air would aid in removing air from the water prior to pumping.

The pumping station would be sized to convey 2.0 MGD through the pipeline to the Village of Kiryas Joel. The design of the pump station (wet well, pumps and controls) would account for the significant changes in elevation along the proposed pipeline route.

The proposed location for the vacuum priming station and pump station is in the vicinity of the New Windsor water treatment plant on Riley Road in the Vails Gate section of the Town of New Windsor. Kiryas Joel's connection to the Catskill Aqueduct would be upstream of the Town of New Windsor's connection. The general proposed location for the pump station is shown in Figure 1-2. A specific pump station site would be selected during the preliminary design phase of the project, which would follow the environmental review and funding phases. Site selection criteria would include availability, accessibility, location relative to the

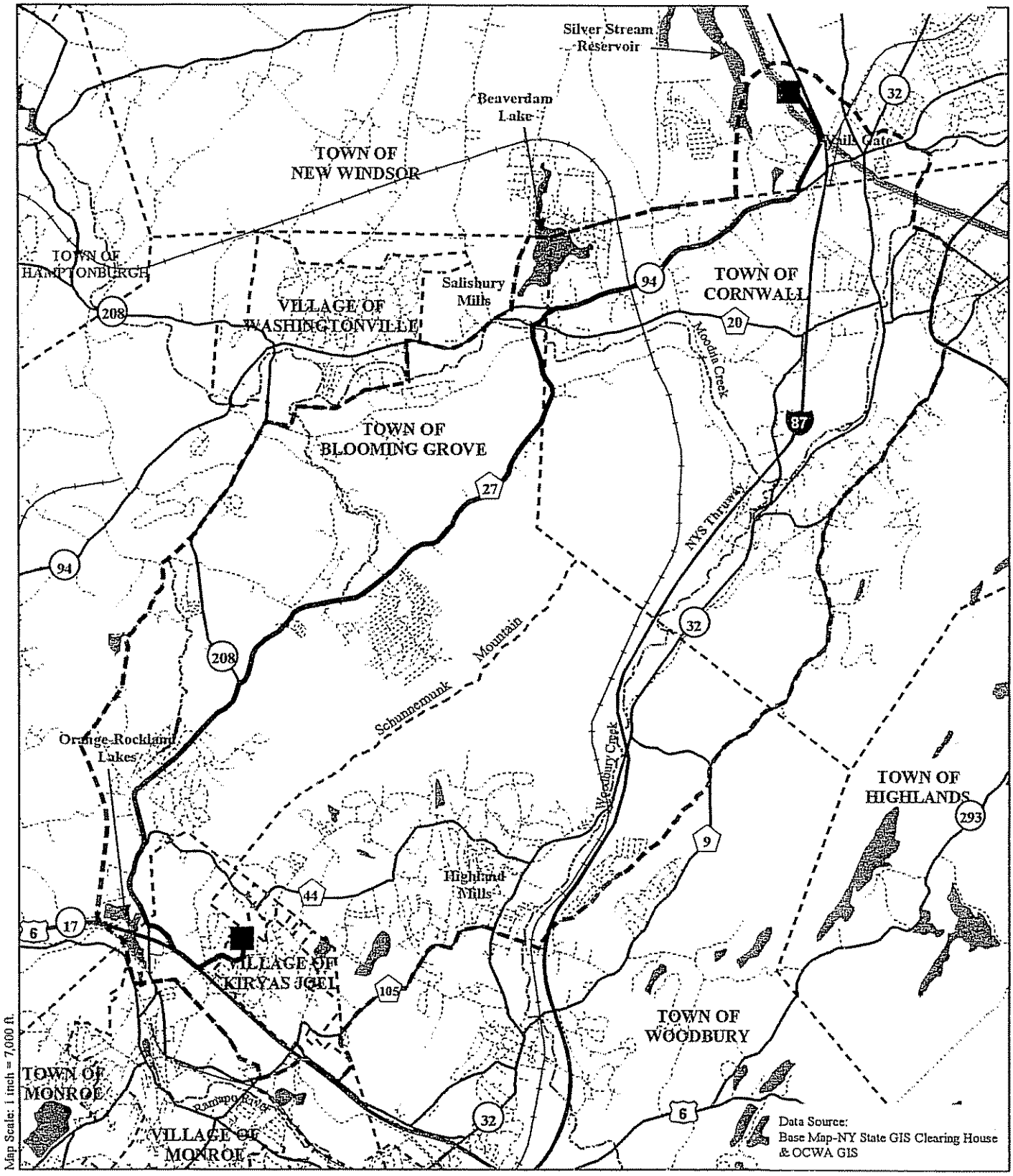

Figure 1-2

Proposed Project

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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Aqueduct connection point and the pipeline route, and suitability for construction of a small building.

1.4.2 Pipeline

The proposed pipeline route is shown in Figure 1-2. The pipeline would be a 24-inch ductile-iron force main. The pipeline would generally be placed in a trench approximately 4 feet wide and a minimum of 4.5 feet deep, within the rights-of-way of the public roads along the proposed route. The trench would be backfilled and the surface restored to approximately its original condition after installation of each section of the pipeline.

The pipeline would receive Catskill Aqueduct water through the vacuum primer and pump station pumps. The aqueduct water would be stripped of entrained or supersaturated air prior to entering the pipeline.

The bottom of the Catskill Aqueduct at the proposed point of connection is approximately 420 feet above mean sea level (amsl). The proposed location for the water treatment plant on Berdichev Road in Kiryas Joel is approximately 730 feet amsl. Along the proposed pipeline route, the minimum elevation is approximately 300 feet amsl on Riley Road near State Route 94, and the maximum elevation is approximately 750 feet amsl on Schunnemunk Road in the Village of Kiryas Joel. The change in grade from the low point to the high point is therefore approximately 450 feet.

The 13-mile length of the proposed pipeline and the grade changes along the route present significant hydraulic considerations that would have to be addressed in the design of the aqueduct connection project. The most significant design issue is water hammer. Water hammer occurs when a surge of high pressure within a pipeline collides with any solid barrier in the pipeline, such as the pipeline wall, a pump, or a valve. Water hammer can damage a pipeline and associated equipment. It can be caused by restoration of power after a power failure. Water hammer can also occur when an air pocket develops at a high point in a pipeline, restricting the flow of water, then suddenly breaks up, causing a surge of water flow and pressure. Power failure contributes to this type of water hammer by increasing the rate at which air enters the pipeline. Devices for controlling water hammer are available and would be evaluated thoroughly during pipeline design.

The proposed pipeline would begin at the proposed pump station near Riley Road in the Vails Gate section of the Town of New Windsor. The pipeline would run south along Riley Road for approximately 1.1 miles, then west on State Route 94 approximately 2.5 miles to Salisbury Mills. The pipeline would then follow Clove Road for a short distance from Route 94 to the northern end of County Route 27. Here the pipeline would cross a major stream, Moodna Creek. After crossing Moodna Creek the pipeline would run south and then southwest along Route 27 for approximately 5 miles to State Route 208. The pipeline would cross several minor streams that intersect Route 27. The pipeline would run along Route 208 for

approximately 2.5 miles, first heading southwest and then south to the exit ramp from westbound State Route 17 to northbound Route 208. The pipeline would then follow the exit ramp to Route 17, then proceed along Route 17 southeast to Wieder Boulevard. The pipeline would turn north along Wieder Boulevard, then east along Schunnemunk Road, crossing into the Village of Kiryas Joel. At Berdichev Road the pipeline would turn north and proceed to the existing water treatment facility.

1.4.3 Water Treatment Facility at Kiryas Joel

The water conveyed from the Catskill Aqueduct to the Village of Kiryas Joel via the proposed pipeline would require treatment prior to entering the potable water distribution system. Water from the Catskill Aqueduct, which derives primarily from surface runoff, requires different treatment than the groundwater treated at the two existing water treatment facilities in Kiryas Joel. In addition, the volume of aqueduct water would be greater than the volume handled by either of the existing facilities. A new water treatment plant would therefore be required. The proposed site for the new water treatment plant is on a lot adjacent to the existing water treatment plant on Berdichev Road in the Village. The new water treatment plant would be sized to treat an average daily flow of approximately 2.0 mgd.

A direct filtration plant similar to the New Windsor water treatment plant is proposed. The facility would consist of two-stage flocculation followed by dual-media filters. The dual-media filters would be anthracite and sand. An inline static mixer would probably be used to introduce a chemical coagulant (probably polyaluminum chloride) prior to flocculation. Polyaluminum chlorides are typically effective coagulants in both warm and cold water. The New Windsor water treatment plant switched to this coagulant after experiencing problems with aluminum sulfate during the cold-water months.

1.5 Project Schedule

Environmental review of the proposed Catskill Aqueduct connection is expected to be complete by the end of 2003. It is projected that design and permitting of the project would occur during 2004 and construction during 2005 and 2006.

1.6 Regulatory Requirements and Permits

The proposed action must comply with many requirements of regulatory agencies. These include requirements for environmental review of the proposed action under the State Environmental Quality Review Act (SEQRA), as well as for acquisition of permits and approvals required for the project.

This draft EIS is part of the State Environmental Quality Review Act (SEQRA) process. It has been submitted to the Village of Kiryas Joel, the designated lead agency for the proposed Catskill Aqueduct connection, pursuant to SEQRA and regulations of the New York State Department of Environmental Conservation (NYSDEC). The SEQRA regulations are contained in Part 617 of Title 6 of the New York Compilation of Rules and Regulations (6 NYCRR Part 617).

The SEQRA process includes eight basic steps:

1. Initial review
2. Determination of lead agency
3. Determination of environmental significance
4. Preparation and submission of a draft environmental impact statement (DEIS)
5. Public hearing and comment on the DEIS
6. Preparation and submission of a final environmental impact statement (FEIS)
7. Environmental findings by the lead agency
8. Final decision by the lead agency to adopt the environmental findings and proceed to design and permitting of the project

The following is a preliminary list of permits and approvals expected to be required for the proposed action.

US Army Corps of Engineers – Wetlands disturbance and stream crossing

NYSDEC – Freshwater wetlands, Protection of Waters, State Pollutant Discharge Elimination System (SPDES) General Permit for Construction Activities, Clean Water Act Section 401 Water Quality Certificate, State Historic Preservation Act (SHPA)

NYS Department of Transportation – Road opening permit

NYS Department of Health – Water distribution permit, plan review

NYS Thruway Authority – Permit required to work in roadway easement

NYS Environmental Facilities Corporation – Approval of funding request

NYCDEP – Final approval for connection to the New York City water supply system, Revocable Permit for use of New York City land

NYC Water Board – Water supply agreement

Orange County Department of Health – Water distribution permit, plan review

2 Section Two

Section 2
Environmental Setting, Direct Impacts and Mitigation

This section presents an overall summary of the existing physical, ecological, cultural, historical, and socioeconomic conditions within the project study area. The project study area is the area most likely to be affected by the construction of the proposed 13-mile pipeline. The existing conditions have been described using methods relevant to both local and regional environmental analysis.

The project study area for the proposed Catskill Aqueduct connection is shown in Figure 2-1. Figure 2-1 also shows the proposed route of the 13 miles of 24-inch transmission main and the proposed sites of the pumping station and the water treatment plant. The project study area extends north to the Vails Gate section of the Town of New Windsor, New York, where the water supply pipeline would connect to New York City's Catskill Aqueduct and where a new pump station would be constructed. The preferred connection site is on the west side of Riley Road in Vails Gate. This is the closest feasible location for the connection, because soon after leaving Vails Gate the Aqueduct descends deep underground, crosses under the Hudson River, and remains on the east side of the Hudson.

The proposed site for the pump station is in the vicinity of the New Windsor water treatment facility on Riley Road. A specific site would be selected during preliminary design. The preferred route for the proposed pipeline follows Riley Road south to State Route 94. Along Route 94 the pipeline would pass through Salisbury Mills where it would turn south along County Route 27 to State Route 208, follow the Route 17/208 exit ramp onto State Route 17, then follow Schunnemunk Road and Berdichev Road to an existing water treatment facility site in the Village of Kiryas Joel. A new water treatment plant would be constructed to treat the Catskill Aqueduct water.

2.1 Groundwater Resources

2.1.1 Existing Conditions

2.1.1.1 General Conditions

Groundwater in Orange County is pumped from bedrock aquifers as well as unconsolidated sand and gravel aquifers (Figure 2-2). Sand and gravel aquifers are more common, but most large municipal water supply wells are drilled into bedrock aquifers (LBG, 1995). Most of the bedrock aquifers are overlain by glacial till or other low-permeability confining material. The following bedrock aquifer rock types are found in the project area (LBG, 1995):

Undifferentiated Hamilton Group (Dh) – shale, siltstone and sandstone. In eastern Orange County, this unit consists of sandstone, conglomerate, shale and greywacke

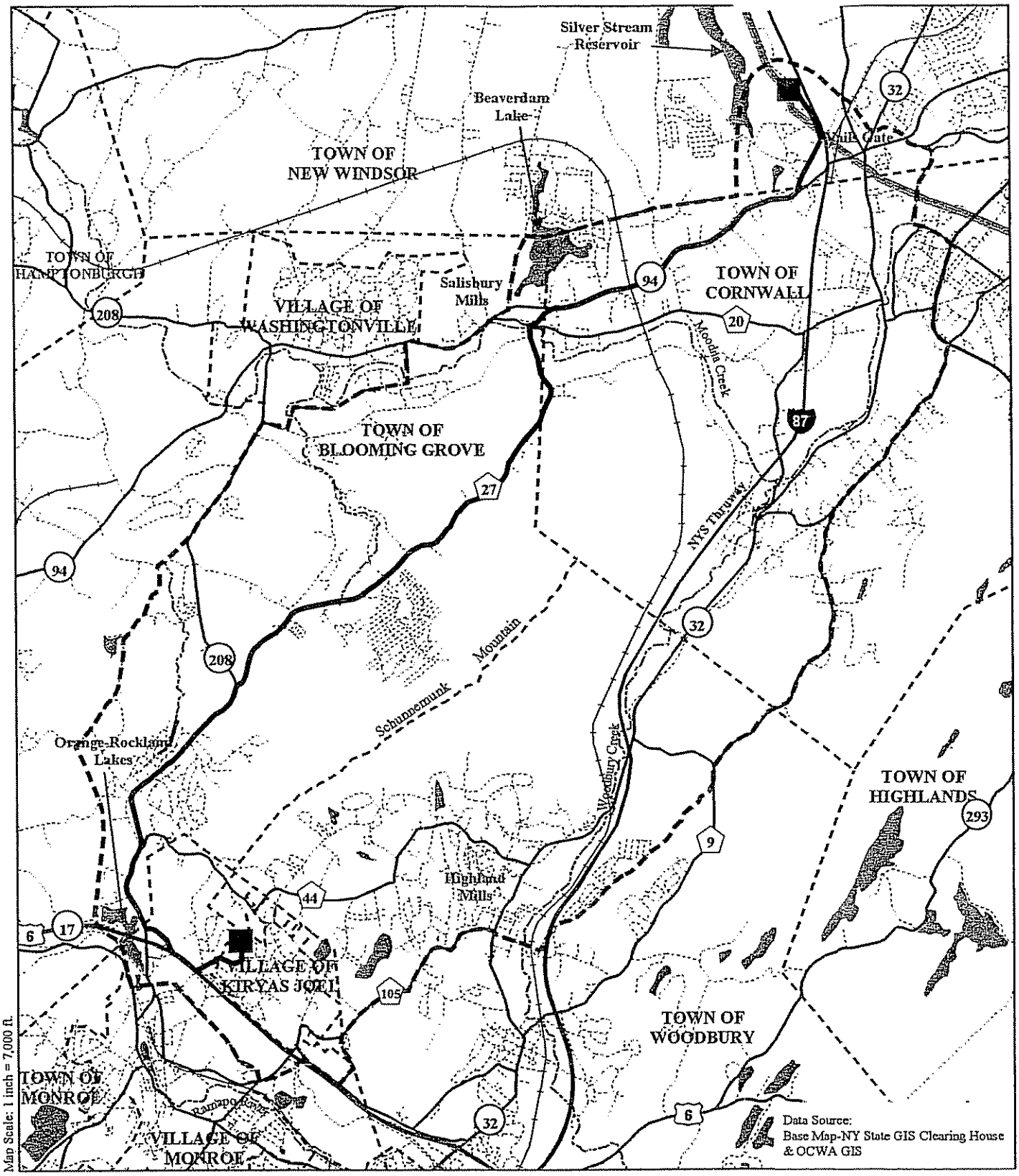

Figure 2-1

Study Area

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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formations. It is a productive aquifer and underlies areas of relatively dense urban development (such as the Village of Kiryas Joel). The rocks in this unit are brittle,

leading to the formation of numerous fractures and joints. This secondary permeability can be low to high.

Undifferentiated Lower Devonian and Silurian rocks (Ds). In Orange County, this unit comprises sandstone, conglomerate, shale, siltstone, and graywacke. Fractures, joints, etc. in the rock have created low to high secondary permeability.

Martinsburg Formation (On) – shale, siltstone, sandstone and graywacke. This unit, made up of several members, contains water in fractures, joints, bedding planes and other secondary openings. This secondary permeability is generally low to moderate.

Wappinger Group (OEw) – limestone, dolomite and shale. This unit, made up of several carbonate rock formations, is relatively brittle and subject to fracturing. Limestone and dolomite are also relatively soluble, causing fractures to open further as water flows through them. This secondary permeability can be low to high.

Undifferentiated gneiss (mu); undifferentiated gneiss and granite, granitic gneiss (mgu). These units are Precambrian metamorphic rocks, including gneiss, granite, amphibolite and calcsilicate rocks. Joints, fractures and weathering due to tectonic and metamorphic activity have created enough porosity and permeability to allow water storage and transmission in amounts sufficient to sustain water supply wells. This secondary permeability is generally low to moderate in granite and gneiss.

Refer to Section 2.4.1.2 for more information regarding these bedrock units.

The sand and gravel aquifers were formed mainly as a result of glacial action (LBG, 1995). They are both confined (overlain by low-permeability material such as till) and unconfined (water-table aquifers). The yield of an aquifer, whether it is bedrock or unconsolidated, is dependent upon several factors: the volume of openings within the aquifer (porosity or fractures), the interconnectedness of those openings (permeability), and the rate of recharge of surface water back into the aquifer.

2.1.1.2 Groundwater Supply

Village of Kiryas Joel

The Village of Kiryas Joel is supplied by water from nine production wells within the Village as well as five wells on an undeveloped 70-acre parcel known as the Brenner property, located south of the Village near Mountain Lakes in an unincorporated section of the Town of Monroe. The water from these wells is treated at two water treatment plants. These wells are marginally able to supply enough water to meet the average daily water demand, producing an average of 0.98 mgd in 2002. The allotted yield of these wells is 1.31 mgd, 1.0 mgd for the Village wells plus 0.308 mgd for the Brenner property wells. Despite the permitted yield, the wells are not able to produce sufficient water to meet the maximum daily water demand of 1.3 mgd. Heavy use of

the wells has caused damage to the wells over time and/or low groundwater levels. Historically, the Village has resorted to trucking in additional water in preparation for religious holidays, when the maximum daily demand often occurs. A water-budget analysis showed that recharge to the bedrock aquifer is barely adequate during normal rainfall (1.03 mgd), and drops to approximately 0.41-0.70 mgd during drought conditions (LBG, 1995).

In an attempt to develop new water sources, test wells have been drilled south of Mountain Lakes. Additional testing is continuing in an area known as Parcel 5 within the Village, and on the Brenner property. Despite these efforts, the water supply is barely adequate to meet average daily demand and is inadequate to meet peak demands.

Other municipalities in the vicinity of Kiryas Joel are experiencing strong growth, and none of them is willing to make arrangements to supply water to the Village.

Town of Blooming Grove

The Town of Blooming Grove has six municipal water districts (Nos. 1-6) and several private water suppliers. Each water district obtains water from one or more wells, as do the private water suppliers. The approximate total daily demand for the town is 0.3 mgd; peak daily demand in each of the water districts ranges from 0.02 to 0.20 mgd (see Table 2-1). Several of the water districts can't consistently satisfy the average daily demand with all wells in operation, nor are they able to supply the average daily demand with largest well out of service as required by the NYSDOH (Farr, personal communication).

Town of Cornwall

The Town of Cornwall has four main water supply systems, plus several small community water systems. The four main systems are the Firthcliffe Heights Water District, a community system owned by Star Expansion Company, the Village of Cornwall-On-Hudson main system, and the Village of Cornwall-On-Hudson mountain system. The Firthcliffe Heights Water District purchases water from the Town of New Windsor Catskill Aqueduct connection. The Star Expansion Company system obtains water from four wells and the major user is the Star Factory. The Village of Cornwall-On-Hudson's systems have an approximate average daily demand of 1.2 mgd and peak daily demand of 1.6 mgd, and are supplied by two surface water sources and two wells (Bergus, personal communication; MH&E, 1994). These systems supply water to 95 percent of the Village and 70 percent of the Town of Cornwall. The mountain system serves locations above an elevation of 400 feet.

Refer to Figure 2-2 for the locations of municipal wells in the project area. Other municipalities in the study area rely on surface water; these are described in Section 2.2.

Table 2-1

Recent Water Usage of Communities Near the Proposed Kiryas Joel Water Transmission Pipeline

Community	Water District	Average Water Use *mgd*	Average Water Use Period	Peak Water Use *mgd*	Peak Water Use Date
Kiryas Joel	--	0.98	2002	1.30	NA[1]
New Windsor	--	2.43	Jan 01-Dec 01	3.97	Jul 01
Village of Cornwall	--	1.194	Aug 01-Jul 02	1.577	Mar 02
Blooming Grove	1	0.10	Oct 01-Sep 02	0.12	Dec 01
	2	0.01	Oct 01-Sep 02	0.02	NA
	3	0.01	Jan 02-Dec 02	0.02	NA
	4	0.04	Oct 01-Sep 02	0.06	Jan 02
	5	0.02	Oct 01-Sep 02	0.04	Jun 02
	6	0.11	Oct 01-Sep 02	0.21	Aug 02
Woodbury	6	0.02	Oct 01-Sep 02	0.04	Feb 02
	Consolidated	0.92	Oct 01-Sep 02	1.44	May 02
Town of Monroe	1[2]	0.02	Jan 02-Dec 02	0.03	May 01
	2	0.01	Jan 01-Dec 01	0.02	Jun 01
	7[2]	0.00	Jan 01-Dec 01	0.01	May 01
	8[2]	0.03	Jan 01-Dec 01	0.06	NA
	10[2]	0.00	Jan 01-Dec 01	0.01	Dec 01
Village of Monroe		1.00	Oct 01-Sep 02	1.45	Aug 02

[1] Date not available

[2] Water supplied from Village of Monroe

Source: Orange County Department of Health (L. Bergus, personal communication)

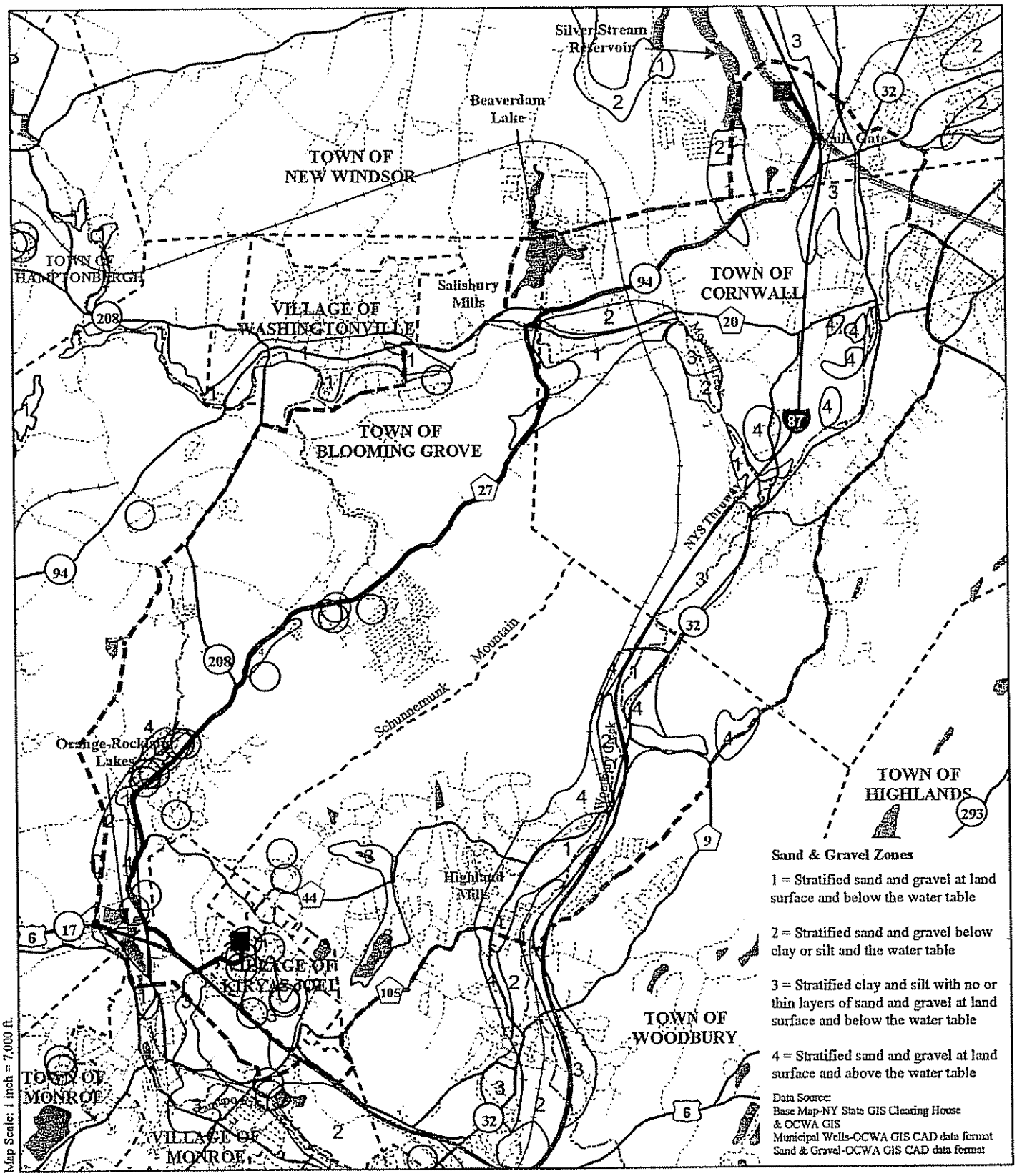

Figure 2-2

Municipal Wells with Sand & Gravel Zones

Village of Kiryas Joel Catskill Aqueduct Connection EIS

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2.1.2 Impacts and Mitigation

As the majority of the proposed pipeline would be constructed in existing roadways, very little additional impervious surface would be added that would inhibit groundwater recharge. Minor amounts of impervious surface would be constructed at the proposed connection point to the NYC Catskill Aqueduct, pump station location, or at the proposed site for the water treatment plant. However, there would be no permanent negative impacts to groundwater resources as a result of these relatively small areas of cover. After the proposed pipeline goes on line, the Village's dependence on groundwater would decrease, with the existing wells functioning primarily as a backup system. The decrease in daily withdrawal would reduce stress on the aquifer and on the surrounding communities that also depend on the aquifer for water.

2.2 Surface Water Resources

2.2.1 Catskill Aqueduct System

2.2.1.1 Existing Conditions

The Catskill System delivers water from the Catskill region 120 miles to New York City. The original system was completed in 1915 and included the construction of Ashokan Reservoir and the Catskill Aqueduct, which empties into Kensico Reservoir. The aqueduct is 92 miles long between Ashokan Reservoir and Kensico Reservoir and is gravity-driven. Flow changes made at Ashokan Reservoir require approximately 36 hours to take effect at Kensico Reservoir (H&S/CDM, 1996). Additional work, including the construction of Schoharie Reservoir and the Shandaken Tunnel, was completed in 1928 (NYCDEP, 2002). The Catskill System's watersheds cover 570 square miles and supply roughly 40 percent of New York City's 1.3 billion gallons of water per day (CWCWC, 2003). The water in the Catskill System is derived from the Esopus Creek and Schoharie Creek drainages. The majority of the system's water is stored in Ashokan Reservoir prior to entering the aqueduct, and the remainder is stored in Schoharie Reservoir upstream (H&S/CDM, 1996). The capacity of the Catskill Aqueduct upstream of Kensico Reservoir is approximately 610 mgd. Normally, the aqueduct supplies the base flow of New York City's supply, with the Delaware Aqueduct providing the remainder (H&S/CDM, 2001). The estimated safe yield, or amount of water that can safely be drawn from the system during the worst period of the drought of record, is 470 mgd. The minimum flow required to provide the required water depth in the aqueduct to serve upstate communities is 300 mgd (H&S/CDM, 1996).

Town of New Windsor

The Town of New Windsor's Consolidated Water District relies on the Catskill Aqueduct as a sole source of water during non-emergency situations. In an emergency, New Windsor can receive water from the Town of Newburgh and the City of Newburgh water systems. The average daily demand (2001) is 2.43 mgd; the maximum daily demand in 2001 was 3.97 mgd (Bergus, personal communication).

2.2.1.2 Impacts and Mitigation

The proposed pipeline would be designed to withdraw 2 million gallons of water per day from the Catskill Aqueduct, based upon the current Village population and the host community entitlement formula, and subject to NYCDEP approval. The connection system would be built and installed in accordance with NYCDEP requirements. Because the proposed withdrawal would be a small percentage of the average flow in the Catskill Aqueduct (roughly 600 mgd), no impacts would occur to the Aqueduct or the New York City water supply as a result of the project.

2.2.2 Local Water Supply Reservoirs

2.2.2.1 Existing Conditions

Mombasha Lake provides the water supply for the Village of Monroe. The lake has a surface area of 340 acres, and an estimated safe yield of approximately 1.4 million gallons per day (mgd). The average daily water demand is 1 mgd, and the maximum daily demand is 1.4 mgd (Bergus, personal communication). In addition to supplying the Village, an average of 0.1 mgd from Mombasha Lake goes to supply the Town of Monroe. The Village is permitted to withdraw 1.5 mgd from Mombasha Lake (LBG, undated).

2.2.2.2 Impacts and Mitigation

The proposed connection point to the NYC Catskill Aqueduct, pump station location, proposed pipeline route, and the proposed site for the water treatment plant would all be located 1.5 miles or more north of Mombasha Lake; therefore, there would be no impacts to the lake or its function as a water supply reservoir as a result of this project.

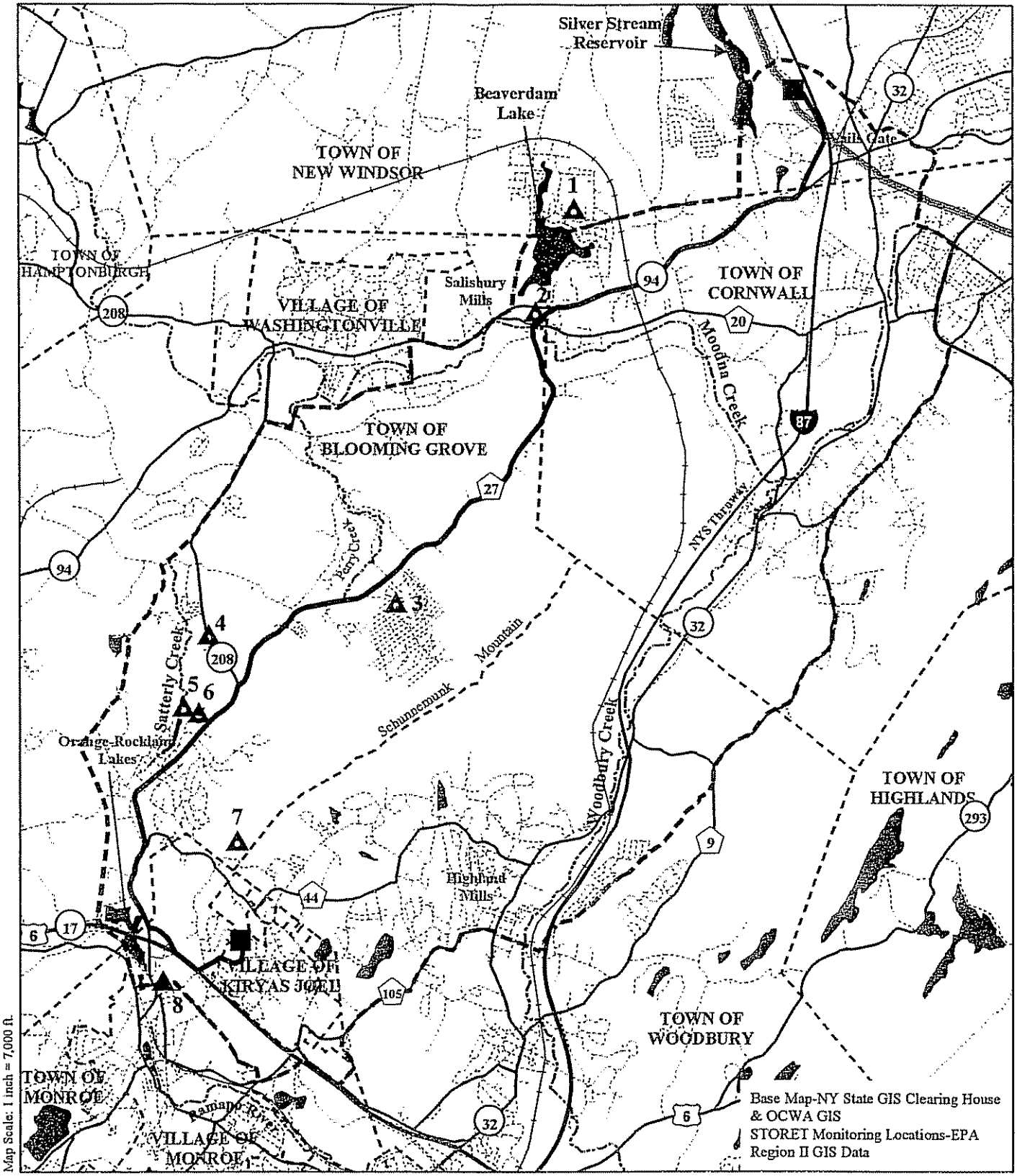
2.2.3 Streams and Floodplains

2.2.3.1 Existing Conditions

The major stream along the preferred route is Moodna Creek, which flows to the Hudson River. Various tributaries to this stream exist within the project area (Figure 2-3).

Moodna Creek flows in an easterly direction across the northern portion of the study area, through Blooming Grove Township, Cornwall Township, and New Windsor Township. Much of Moodna Creek is listed as a Class C waterbody, with a section through Cornwall Township listed as Class B trout waters. The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival (6 NYCRR Chapter X §701.7-701.8).

Perry Creek flows from Schunnemunk Mountain northwest to its confluence with Moodna Creek in Blooming Grove; it is listed as a Class C waterbody. Satterly Creek



Legend

- Proposed Pipeline Route
- Hydrologic Features
- Municipal Boundary
- Study Area
- Railroads
- Streams
- Streets
- Major Highways
- STORET Monitoring Location
- Proposed Pump Station or Treatment Plant
- Catskill Aqueduct

7,000 Feet 0

CDM

Figure 2-3

Surface Water Features with Water Quality Monitoring Locations

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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flows south to north and also empties into Moodna Creek; it is also listed as a Class C waterbody, with the reach just prior to its confluence designated as trout waters.

Floodplains designated by the Federal Emergency Management Agency (FEMA) exist along Moodna Creek, Perry Creek, and Satterly Creek (Figure 2-4).

2.2.3.2 Impacts and Mitigation

The major stream crossing for the preferred route would be Moodna Creek near the intersection of Route 27 and Orrs Mills Road in Salisbury Mills. Due to the depth of the creek bed below the roadway, the pipeline would be affixed to the bridge rather than buried under the creek. Therefore, there would be no permanent impacts to Moodna Creek or its floodplain at this crossing. Further stream crossings, including Perry Creek and other minor tributaries, would require the pipeline to be affixed to bridges or culverts or buried under streams as conditions dictate. Any impacts to the flow or water quality of the streams at these locations would be temporary and construction-related. Proper construction mitigation measures would be employed to minimize such impacts. Pipeline stream crossings would be designed to have no impact on the maximum flow of water under a bridge or through a culvert.

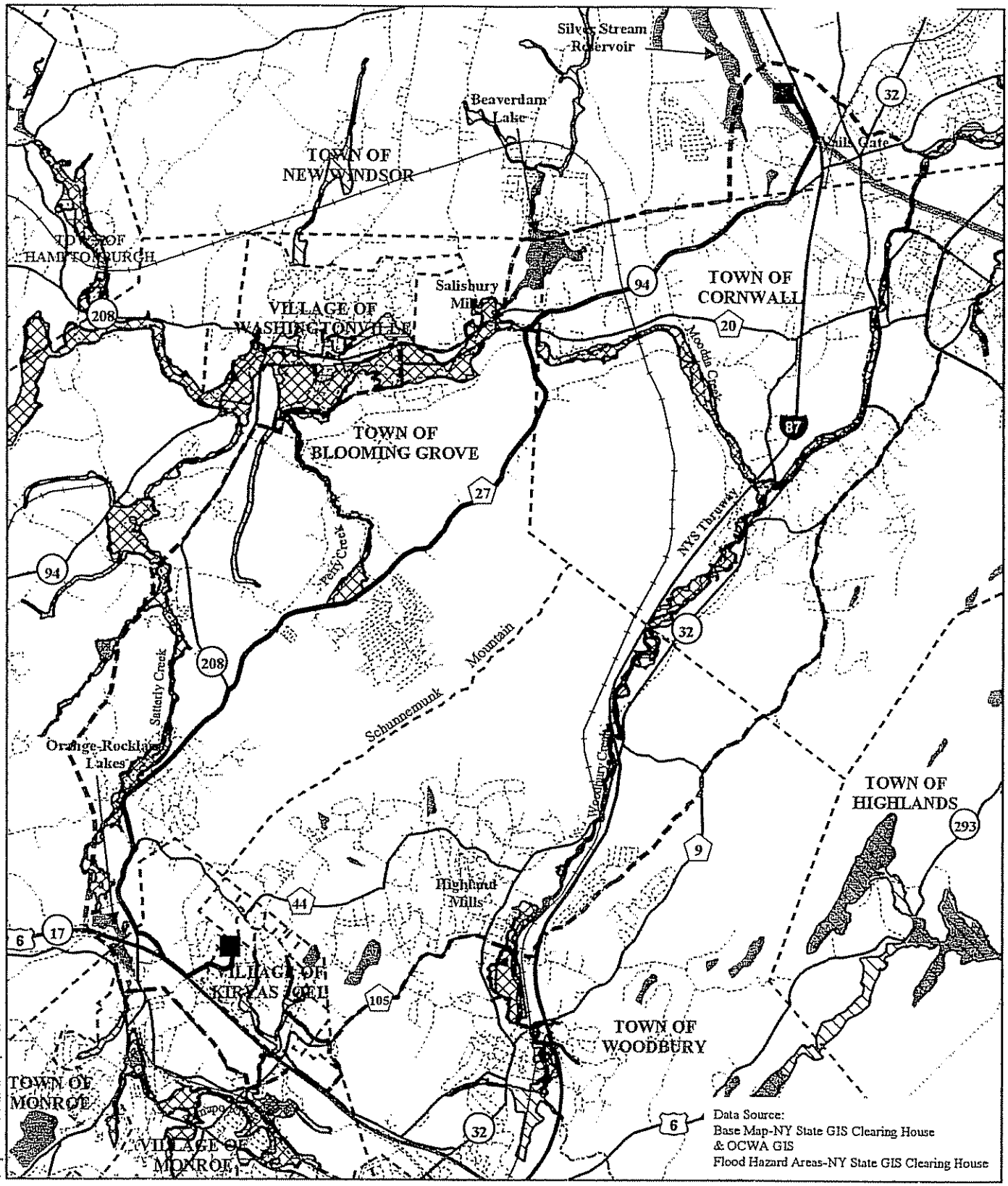
2.2.4 Ponds and Lakes

2.2.4.1 *Existing Conditions*

Several lakes and ponds are adjacent to the preferred route. Silver Stream Reservoir/Brown's Pond is approximately 1 mile west of Riley Road and is a Class A waterbody. The best usages of Class A waters are as a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. Beaverdam Lake is located approximately 2000 feet north of Salisbury Mills and is a Class A waterbody. A pond at former Camp Lenni-Len-A-Pe is just west of Route 27. Smaller ponds are also located along Route 27 south of Mountain Lodge and at Blaggs Clove. Merriewold Lake, several ponds near Bull Mine, and Orange-Rockland Lakes are located adjacent to Route 208 on the project route.

2.2.4.2 Impacts and Mitigation

As the majority of the proposed pipeline would be constructed in existing roadways, it would not cross any of the ponds in the project area and no impacts to lakes and ponds are anticipated. Construction at the proposed connection point to the NYC Catskill Aqueduct, pump station location, or at the proposed site for the water treatment plant similarly would not occur adjacent to any lakes or ponds. Any potential construction impacts (e.g., soil erosion) would be monitored in the field, and steps taken to prevent such temporary impacts to the extent possible. The appropriate erosion and sediment control approvals would be obtained prior to construction of the pipeline.



Map Scale: 1 inch = 7,000 ft.

Legend

- Proposed Pipeline Route
- Railroads
- Hydrologic Features
- Streams
- Municipal Boundary
- FEMA Zone A
- Study Area
- FEMA Zone AE
- Streets
- FEMA Zone X500
- Major Highways
- Proposed Pump Station or Treatment Plant
- Catskill Aqueduct

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CDM

Figure 2-4

FEMA Flood Hazard Areas

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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2.3 Ecological Resources

2.3.1 Wetlands

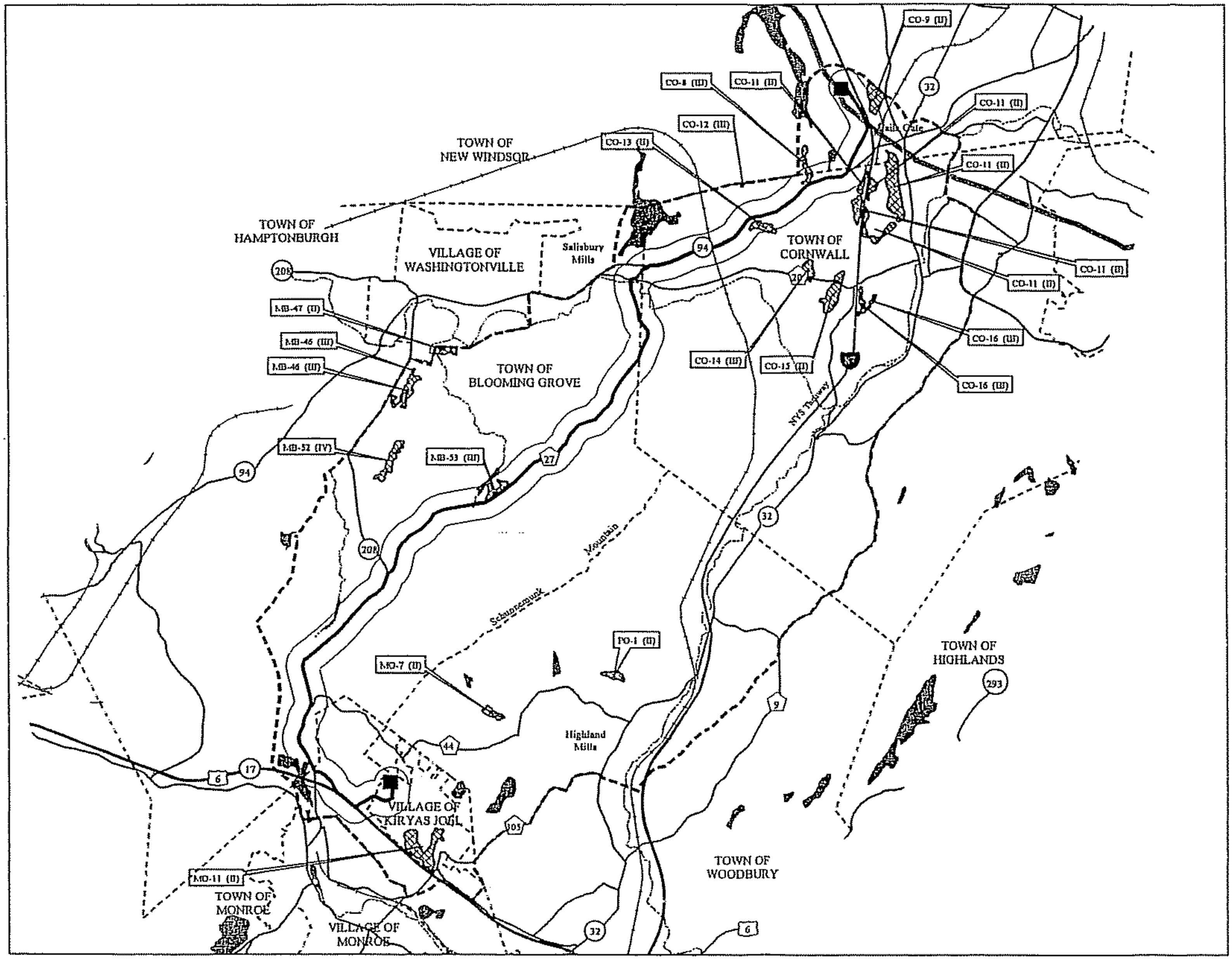
2.3.1.1 Existing Conditions

Executive Order 11990, Protection of Wetlands, defines wetlands as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds." Also included as wetlands are: estuarine areas, tidal overflows, and shallow lakes and ponds (with emergent vegetation).

Permitting of any action required in federally regulated wetlands would be reviewed by the US Army Corps of Engineers (USACE). Actions within state regulated wetlands are permitted through the NYSDEC.

A review of New York State Department of Environmental Conservation (NYSDEC) mapped wetlands within the project study area was conducted. Figure 2-5 shows the NYSDEC mapped wetlands as contained in the OCWA GIS and Cornell University databases. As can be seen, no NYSDEC regulated wetlands exist at the aqueduct connection and pump station location or the water treatment plant site. There are several NYS freshwater wetlands along the proposed pipeline corridor and within the project study area (see Figure 2-5.) Figure 2-5 shows the NYSDEC identification code for each wetland. The Roman numerals in parentheses indicate the wetland class. The regulatory definitions of the wetland classes are provided in Appendix A.

A review of the 1990 United States Department of the Interior - Fish and Wildlife Service National Wetlands Inventory (NWI) confirmed that there are no designated national wetlands in the vicinity of the aqueduct connection and pump station location or the water treatment plant site. There are NWI areas along the pipeline route as shown on Figure 2-6. The NYSDEC mapped wetlands and those under federal jurisdiction overlap in some locations. Jurisdiction of these wetlands would be determined during design, as part of the permitting process. There are several NWI wetland pockets found within the designated project study area. These NWI wetlands are also shown on Figure 2-7. The key to the identified NWI wetlands is listed on Table 2-2. The table also contains a brief description of each wetland classification.



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Projection: Transverse Mercator
Coordinate System: State Plane (NY East)
Datum: NAD 27
Map Scale: 1 inch = 6,000 ft.

Legend

- Hydrologic Features
- Major Highways
- Proposed Pipeline Route
- Railroads
- Streams
- Study Area
- Municipal Boundary
- Wetlands
- Catskill Aqueduct
- Proposed Pump Station or Treatment Plant

MO-11 (II) Quadrangle Abbreviation-NYSDEC Wetland Number (Wetland Class)

Quadrangle Abbreviations:
CO - Cornwall
MB - Maybrook
MO - Monroe
PO - Popolopen Lake

Data Source:
Base Map-NY State GIS Clearing House & OCWA GIS
Wetlands-Distributed by Cornell University

Figure 2-5

NYSDEC Wetlands (Within Study Area)

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Village of Kiryas Joel Catskill Aqueduct Connection EIS

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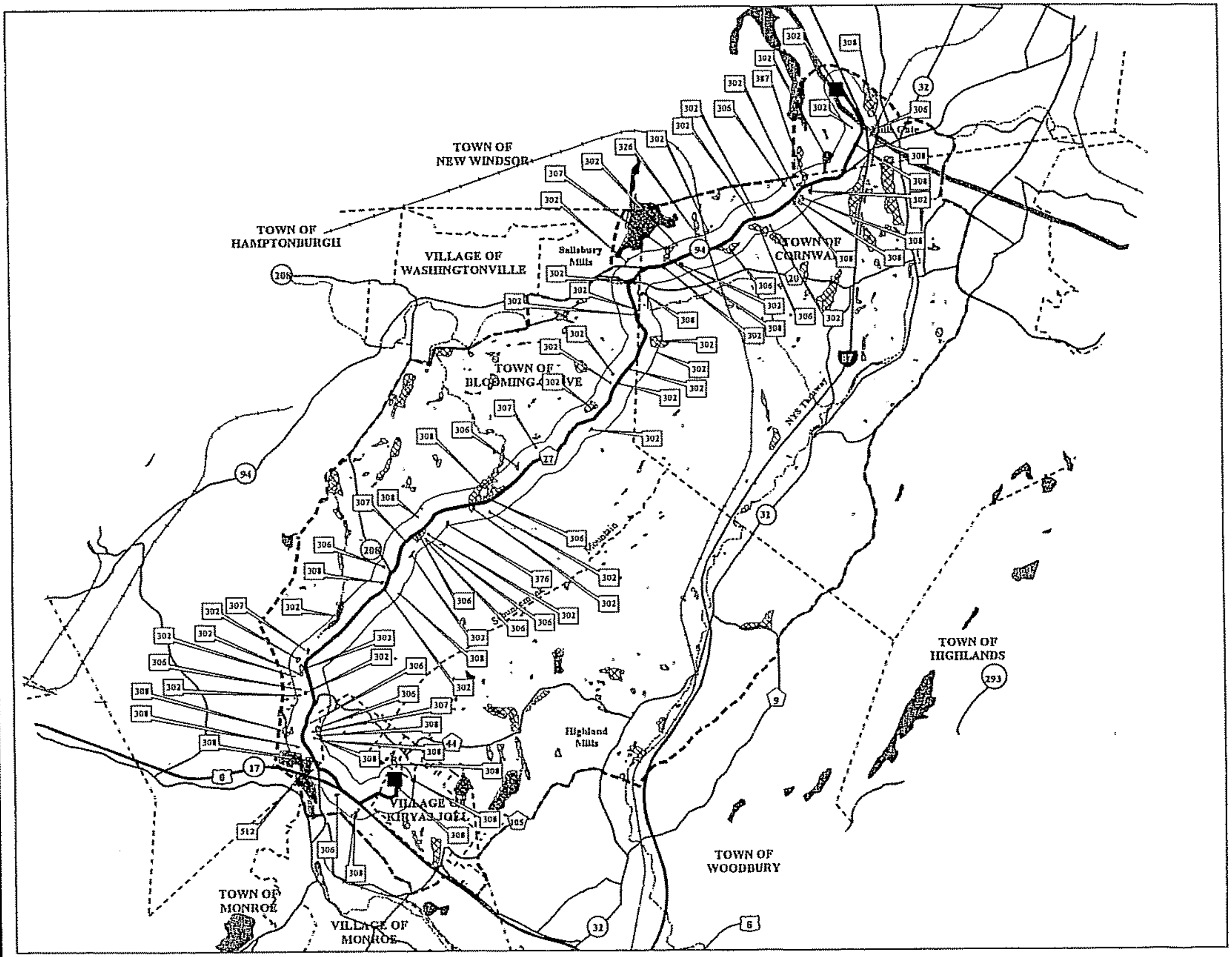

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Projection: Transverse Mercator
Coordinate System: State Plane (NY East)
Datum: NAD 27
Map Scale: 1 inch = 6,000 ft.

Legend

NWI Codes/Descriptions
222 = Riverine, Lower Perennial, Unconsolidated Bottom
231 = Riverine, Upper Perennial, Rock
236 = Riverine, Upper Perennial, Unconsolidated Shore
302 = Palustrine, Unconsolidated Bottom
304 = Palustrine, Emergent
306 = Palustrine, Unconsolidated Shore
307 = Palustrine, Scrub-Shrub
308 = Palustrine, Forested
309 = Palustrine, Intermittent, Open Water/Unknown Bottom
326 = Palustrine, Intermittent, Unconsolidated Bottom/Emergent
367 = Palustrine, Emergent/Scrub-Shrub
368 = Palustrine, Emergent/Forested
376 = Palustrine, Scrub-Shrub/Forested/Emergent
386 = Palustrine, Forested/Emergent
387 = Palustrine, Forested/Scrub-Shrub
512 = Lacustrine, Limnetic, Unconsolidated Bottom
522 = Lacustrine, Littoral, Unconsolidated Bottom
525 = Lacustrine, Littoral, Unconsolidated Shore

Hydrologic Features
Major Highways
Proposed Pipeline Route
Railroads
Streams
Study Area
Municipal Boundary
Wetlands (1990-National Wetland Inventory)
Catskill Aqueduct
Proposed Pump Station or Treatment Plant

Data Source:
Base Map-NY State GIS Clearing House & OCWA GIS
Wetlands-Redistributed by OCWA & Created by
USFWS National Wetland Inventory Mapping

Figure 2-6

USFWS National Wetland Inventory Mapping

CDM

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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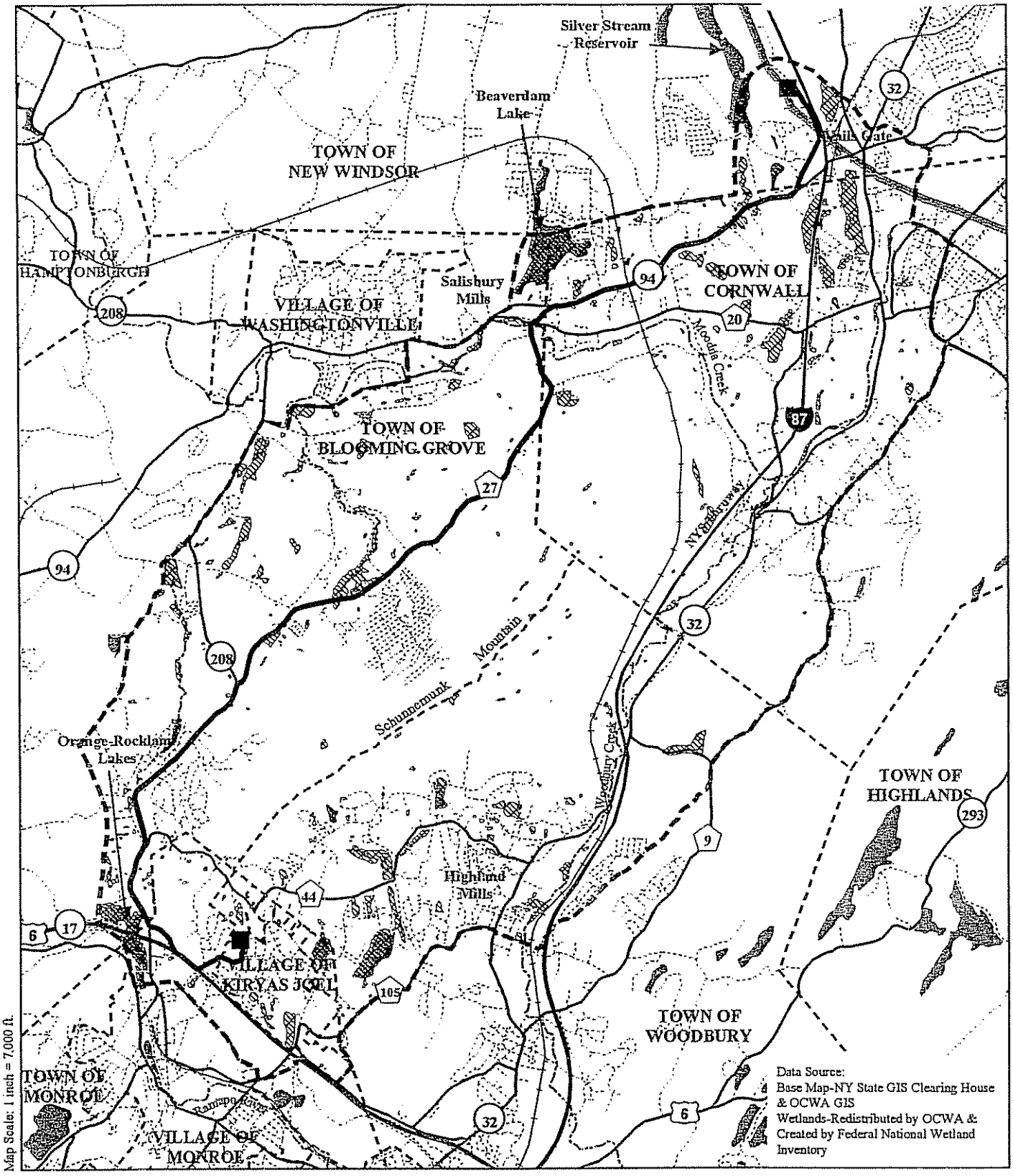


Figure 2-7

USFWS National Wetland Inventory Mapping (Within Study Area)

Village of Kiryas Joel Catskill Aqueduct Connection EIS

TABLE 2-2

NWI WETLAND CLASSIFICATIONS

Classification	Description
PFO/SS	Palustrine, Forested/Scrub/Shrub – Non-tidal wetland, dominated by woody vegetation
PUB	Palustrine, Unconsolidated Bottom – Non-tidal wetland, with less than 30% of substrate covered by vegetation
PEM	Palustrine, Emergent – Non-tidal wetland dominated by erect rooted, herbaceous vegetation
PFO	Palustrine, Forested – Non-tidal wetland dominated by trees
L1UB	Lacustrine, Limnetic, Unconsolidated Bottom - deepwater habitat in lakes with less than 30% of substrate covered by vegetation

Note: Wetland and deep water habitat classification system is based on the hierarchy developed by Cowardin et al., 1979 and presented in "Classification of Wetlands and Deepwater Habitats of the United States."

Federal and State mapping are based on infrared and topographic photography with limited field delineation. Some mapping was conducted 10+ years ago. As such, the areas identified on these wetland maps should be used as an indicator of the potential presence of wetlands and wetland habitat. Also, because of the gross scale at which the maps are produced, field delineation is needed to define the true wetland boundary.

In July 2003, a field survey of the mapped wetland areas was conducted. The field survey was conducted to generally confirm the presence of mapped wetlands as shown on the NWI maps as well as those mapped by the NYSDEC. In some locations the wetland areas were shown on both the NWI maps and on the NYSDEC freshwater wetland maps. The issue of jurisdiction would be resolved during design and permitting. The focus of this analysis was to identify potential areas of impact so that the design could be focused to avoid the potential for such impacts.

The presence of wetlands was confirmed by the existence of wetland vegetation and hydrology. This information would be used to assist in the placement of the pipeline along its route avoiding impact to the wetlands to the maximum extent practical. The pipeline could be placed in the roadway itself, the soft shoulder or within 10 feet of the shoulder. In conducting the field survey, an area approximately 75 feet from the roadway edge was examined, where appropriate. In areas where there were steep slopes, for example, the field survey was focused on the roadway and shoulder itself.

The field survey showed that the majority of the wetland areas that appear on the NWI maps were visually identified in the field. A few wetland areas appear to have been reduced in size or eliminated due to development and to a lesser degree, natural factors. Wetland areas were predominantly found along stream corridors or associated with lakes/ponds. A large wetland (Palustrine forest) area was noted on the northwest side of Route 27 at Mountain Lodge Road (Maybrook quad – PFOIE/PEMIE) This wetland appears to extend to within several feet of the existing road shoulder and extends to the south side of the road as well.

An existing mapped wetland along the exit ramp to State Route 17 (exit 130 – Route 208) appears larger than depicted on the NWI map (Monroe, NY quad – PFOIE). Roadway storm runoff is channeled to this area.

As the pipeline route roadways do not contain storm drains, small culverts and natural topography are used to channel runoff to the outside of the shoulder. In some locations wetland vegetation was observed. These areas were mostly small in size and concentrated where stormwater tends to pond.

2.3.1.2 Impacts and Mitigation

No federal or state regulated freshwater wetlands exist in the area of the proposed connection to the NYC Aqueduct, the pump station or the new water treatment plant; therefore, no impact would occur and no mitigation would be required.

NYSDEC wetland maps and NWI maps show regulated freshwater wetlands exist adjacent to the proposed pipeline route. Field investigations show that there is a stretch along Route 27 at Mountain Lodge Road where wetland delineation may be needed to clearly define the limits of the wetland at this location and to avoid construction related impacts within the wetlands. Placement of the pipeline within the shoulder or roadway itself may be required at this section of the roadway. Delineation is also recommended in the area at exit 130 of State Route 17, as the NWI maps and field investigation show wetlands at this location.

The pipeline alignment would be designed to avoid to the greatest extent practical the placement of the pipeline in or adjacent to regulated wetland areas. As excavation activities associated with pipeline installation could result in a temporary impact to wetlands adjacent to the roadway, permitting of these activities would be coordinated with the various permitting authorities. At a minimum the contractor would be required to exercise extreme care in these areas. The soils excavated would be carefully stockpiled and replaced. Revegetation would also be required. Areas known to be wetlands would be precluded from use by the contractor as a construction staging area. Industry methods to control and prevent construction runoff from entering the wetlands would be used.

Proper construction techniques would be employed to limit to the extent practical any temporary impact to the freshwater wetlands along the pipeline corridor No permanent wetland impacts (permanent fill) are anticipated.

2.3.2 Endangered and Threatened Species

2.3.2.1 Existing Conditions

Listings of federally listed and proposed endangered, threatened, and candidate species within New York state can be viewed online at the US Department of the Interior, US Fish & Wildlife Services, Ecological Services website. The following species have been designated either as endangered or threatened whose distribution falls within Orange County, NY.

Bog Turtle – *Clemmys muhlenbergii* – T
Bald Eagle – *Haliaeetus leucocephalus* – T
Indiana Bat – *Myotis sodalis* – E
Eastern Cougar – *Felis concolor couguar* – E
Small Whorled Pogonia – *Isotria medeoloides* – T

These species are not known to occur in the area of the connection to the NYC Aqueduct, pump station location, along the pipeline route or at the site of the new treatment plant.

In addition, no habitat in the project study area is currently designated or proposed "critical habitat" in accordance with the provisions of the Endangered Species Act. Therefore, it is assumed that except for occasional transient individuals, no Federal or State listed or proposed endangered or threatened species are known to exist within the project study area.

2.3.2.2 Impacts and Mitigation

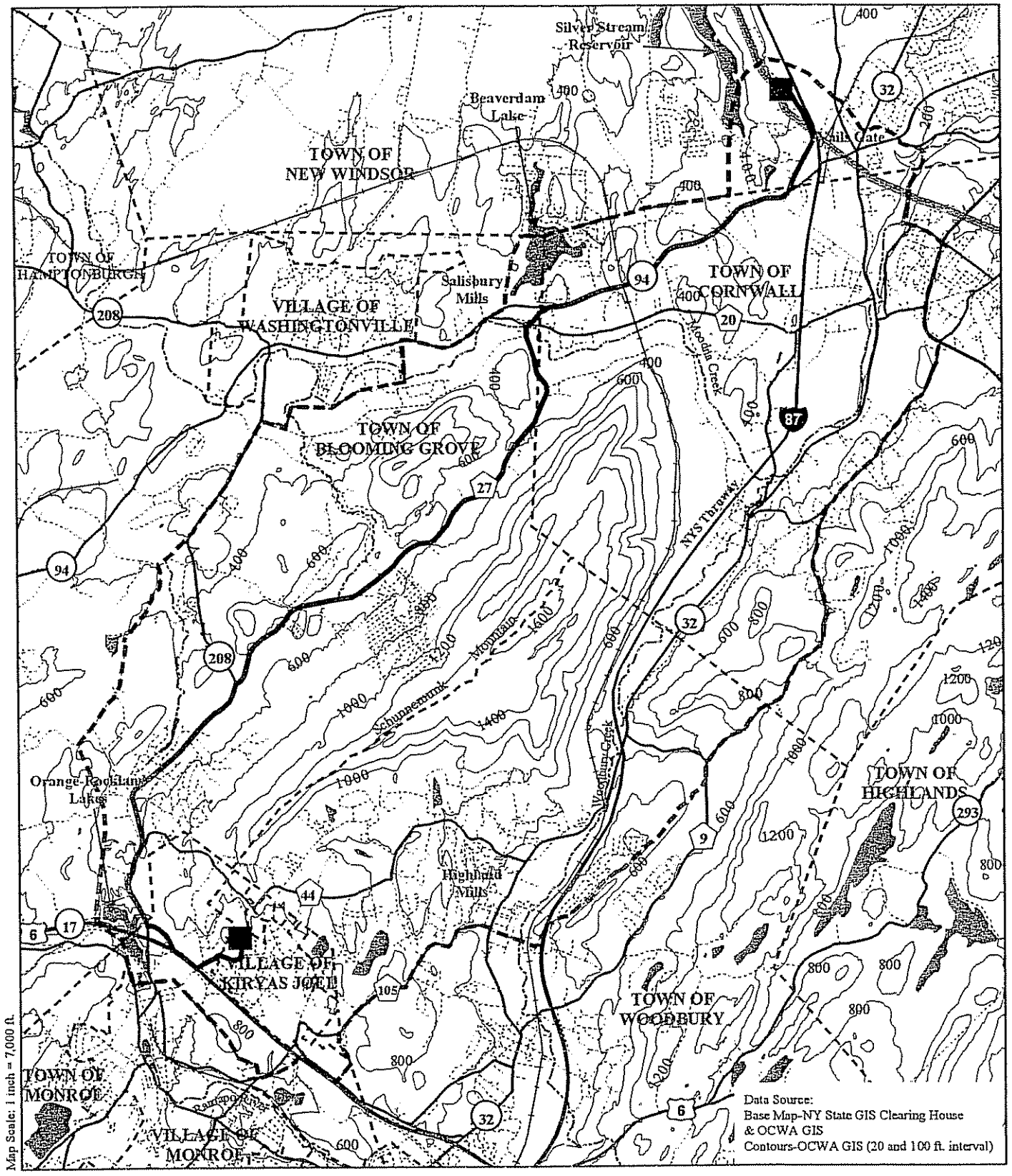
As there have been no known sightings of threatened or endangered species in the area of the proposed connection point to the NYC Catskill Aqueduct, pump station location, along the proposed pipeline route, or at the proposed site for the water treatment plant, no impact to these species would occur with the implementation of the proposed project. No mitigation is required.

2.4 Topography, Geology and Soils

2.4.1 Existing Conditions

2.4.1.1 Topography

Topography in the project study area varies from gently rolling to hilly to steep and mountainous. Figure 2-8 illustrates the general topography of the study area. The area topography reflects the underlying folded and faulted sedimentary and metamorphic rocks, and features rivers and streams, rolling hills, boulders, and protruding rock outcrops. Overall elevations range from 80 feet above mean sea level (amsl) on the west side of Moodna Creek southeast of Vails Gate, to 1,664 feet amsl at



Legend

- Proposed Pipeline Route
- Hydrologic Features
- Municipal Boundary
- Study Area
- Contours
- Railroads
- Streams
- Streets
- Major Highways
- Catskill Aqueduct
- Proposed Pump Station or Treatment Plant

Feet

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CDM

Figure 2-8

Topography

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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the peak of Schunnemunk Mountain. Although Schunnemunk Mountain is the dominant topographical feature of the study area, it has little impact on the proposed pipeline, which skirts it to the west.

Elevations along the proposed pipeline route generally range from a low of 300 feet amsl in Vails Gate to a high of approximately 750 feet amsl near the pipeline terminus in the Village of Kiryas Joel.

Generally, the topographical slope in the study area ranges from flat to 25 percent. Slopes along the proposed pipeline route are toward the low end of this range. Slope percentage is defined as the vertical distance divided by the horizontal distance multiplied by 100; therefore, a 25-percent slope is an elevation change of 25 feet in 100 feet of horizontal distance.

A more localized description of the preferred pipeline route and the proposed sites for the Aqueduct connection, pump station and water treatment plant are given below.

Site of the Proposed Aqueduct Connection and Pump Station
The proposed area for the Aqueduct connection is in the northwestern corner of the Vails Gate section of the Town of New Windsor, New York, west of the NYS Thruway and east of Silver Stream Reservoir. The proposed area generally slopes down to the Thruway.

Proposed Water Treatment Facility Site
The area of the site proposed for the new water treatment facility in Kiryas Joel is hilly. The elevation of the proposed site is approximately 750 feet amsl. To the south, the land slopes down to Forest Road Lake at approximately 630 feet amsl. To the north, the land slopes steadily up to the top of Schunnemunk Mountain, which is approximately 1,320 feet amsl at the southern end. To the east and west of the proposed site, elevations rise to 800 or 820 feet.

Proposed Pipeline Route
The proposed route for the transmission pipeline would follow State Route 94 to County Route 27 to State Route 208 to State Route 17, and then follow local roads into the Village of Kiryas Joel. This pathway travels around Schunnemunk Mountain to the west. The proposed pipeline route consists of relatively level lands that gradually increase in elevation as the route approaches the Village of Kiryas Joel. Elevation ranges more than 400-feet along the entire length of the route. Topography is relatively flat to gently rolling.

The proposed Aqueduct connection point is approximately 380 feet amsl. From the connection point, the proposed pipeline route descends to a low point of approximately 300 feet amsl where the Catskill Aqueduct passes under Riley Road. Along State Route 94 the elevation rises to approximately 400 feet amsl, then descends to 300 feet in Salisbury Mills where the transmission main would cross over Moodna Creek.

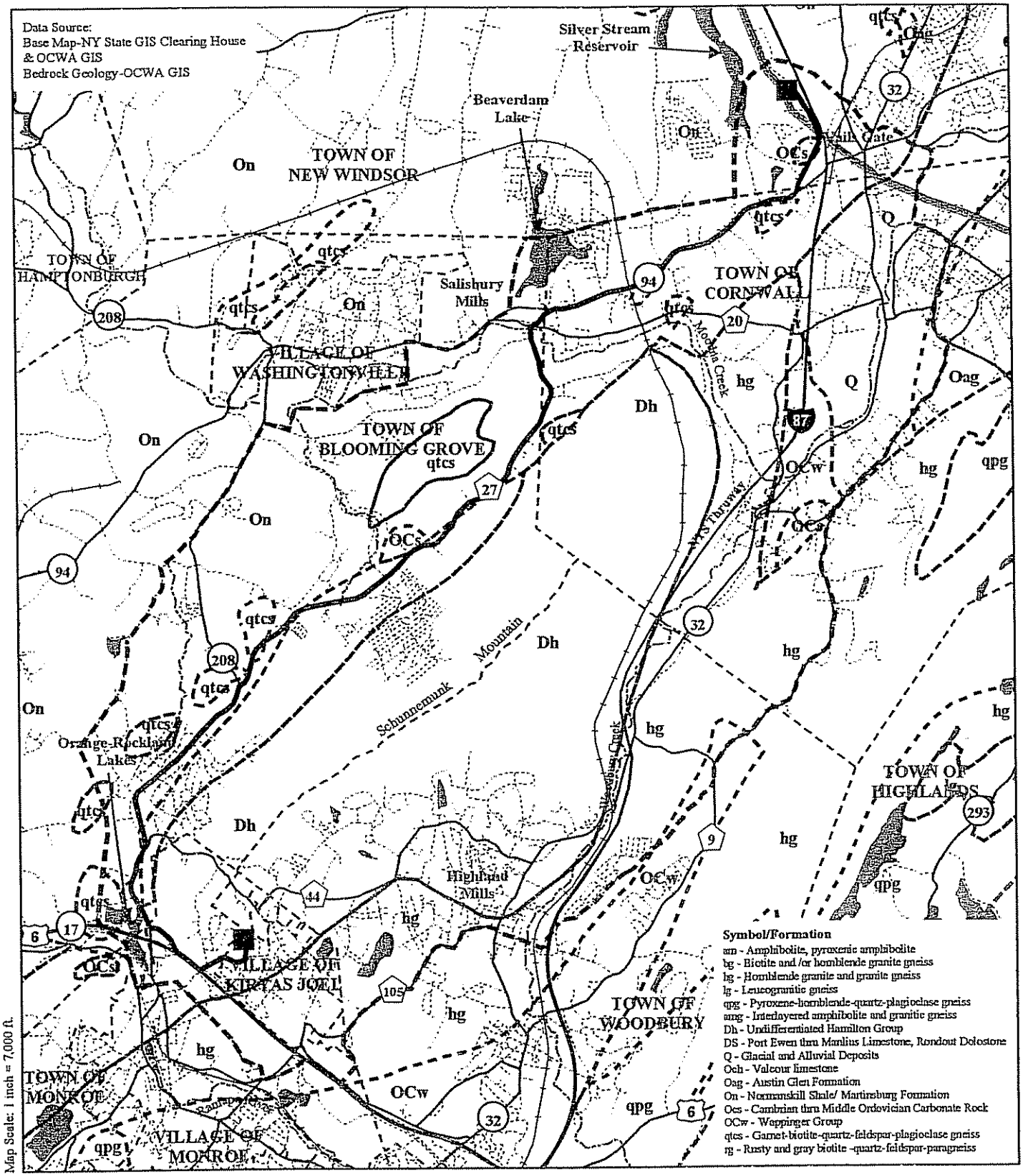
Proceeding south from Moodna Creek on County Route 27 (Clove Road), the elevation rises quickly to 350 feet amsl and remains at approximately 350 feet for the first mile, then rises to approximately 500 feet. A second creek crossing is required over Perry Creek before passing through Mountain Lodge. At 550 feet amsl Route 27 connects with Route 208. Continuing on Route 208, the pipeline route descends to 480 feet amsl near the southern end of Merriewold Lake, then rises to 600 feet at the Route 208/Route 17 interchange. Following the ramp connecting westbound 17 to northbound 208, the pipeline would rise to 680 feet amsl. Turning into the Village of Kiryas Joel on Schunnemunk Road, the pipeline would rise to 750 feet amsl, then return to 680 feet before rising again to approximately 750 feet amsl at the proposed treatment plant site.

2.4.1.2 Geology

Divided among three physiographic provinces--the New England Province, the Valley and Ridge Province, and the Appalachian Plateau Province--Orange County is underlain with igneous, metamorphic and sedimentary bedrock. Most of the County is underlain by sedimentary bedrock with the exception of the southeastern portion. The majority of the study area is within the New England Province, regionally known as the Hudson Highlands. It is largely federal- or state-owned and utilized as parkland or military land. Mostly composed of gneiss and granular--type crystalline bedrock, elevations rise from sea level to 1,400 feet. Bordering the New England Province to the west is the Valley and Ridge Province. Consisting of a layered sedimentary foundation, it exhibits rolling hills and valleys and is used predominantly for agricultural purposes. Northwest Orange County is defined as the Appalachian Plateau and is rugged and forested. Minimally populated and only slightly developed, the Appalachian Plateau Province is located at the foothills of the Catskill Mountains. Elevated flat lands underlain by layered sedimentary bedrock units characterize this physiographic feature.

Figure 2-9 illustrates the bedrock and surficial geology of the study area. Table 2-3 identifies the characteristics associated with the bedrock symbol units of Figure 2-9.

Three main formations/groups make up the project study area: the Undifferentiated Hamilton Group (Dh), the Undifferentiated Lower Devonian and Silurian Rocks (Ds), and the Martinsburg Formation (On). Also intermixed are Wappinger Group (Ocw) formations, as well as Metamorphic Bedrock and Undifferentiated Gneiss and Granite (am, bg, lg, qpg, amg). A large portion of the study area is made up of Undifferentiated Hornblende Gneiss (hg)



Map Scale: 1 inch = 7,000 ft.

Legend

- Proposed Pipeline Route
- Railroads
- Hydrologic Features
- Streams
- Municipal Boundary
- Streets
- Study Area
- Major Highways
- Bedrock Geology
- Proposed Pump Station or Treatment Plant
- Catskill Aqueduct

7,000 Feet 0

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Figure 2-9

Bedrock and Surficial Geology

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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TABLE 2-3

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Bedrock Geology		
Group	**Symbol**	**Formation**
Metamorphic Rocks of Uncertain Origin - Southeastern New York	am	Amphibolite, pyroxenic amphibolite
Metamorphic Rocks of Uncertain Origin - Southeastern New York	bg	Biotite and /or hornblende granite gneiss
	hg	Hornblende granite and granite gneiss
	lg	Leucogranitic gneiss
	qpg	Pyroxene-hornblende-quartz-plagioclase gneiss
Undivided and Mixed Gneisses - Southeastern New York	amg	Interlayered amphibolite and granitic, charnockitic, syenitic gneiss
Hamilton Group	Dh	Undifferentiated Hamilton Group
Undifferentiated Lower Devonian and Silurian Rocks	DS	Port Ewen thru Manlius Limestone, Rondout Dolostone
Glacial and Alluvial Deposits	Q	
Chazy Group	Och	Valcour limestone
Lorraine & Trenton & Black River Groups and Metamorphic Equivalents	Oag	Austin Glen Formation
	On	Normanskill Shale/ Martinsburg Formation
Vermont Valley Sequence and Metamorphic Equivalents	Ocs	Cambrian thru Middle Ordovician Carbonate Rock
	OCw	Wappinger Group
Metamorphic Rocks of Sedimentary Origin - Southeastern New York	qtcs	Garnet-biotite-quartz-feldspar-plagioclase gneiss
	rg	Rusty and gray biotite -quartz-feldspar-paragneiss

Source: New York State Museum, New York Geologic Survey (undated)

Source: Ground-Water Resources of Orange County, New York; Orange County Water Authority, Goshen, New York (LBG, 1995)

The westernmost section of the study area is predominantly Martinsburg Formation. Earlier named the Normanskill shale, this dark gray shale underlies most of central Orange County and consists of Penn Argyl Shale, Ramseyburg Member, and Bushkill Member of the Trenton Group (rocks of the Trenton Group were deposited during the Trentonian stage of the middle Late Ordovician period, approximately 448 to 458 million years ago). Formed by complex folding and thrust faulting of Cambrian and Ordovician sedimentary rocks, the Martinsburg Formation is generally resistant to weathering and likely exhibits low permeability. Main constituents of this formation are calcareous shale, greywacke and sandstone, and siltstone. Intermixed with the Martinsburg bedrock are metamorphic rocks of sedimentary origin (qtcs). Garnet, biotite, quartz, feldspar and plagioclase gneiss occur along a bedrock fault that acts as the eastern boundary separating the Martinsburg Formation from the Undifferentiated Lower Devonian and Silurian Rock Formations as well as rocks of the Undifferentiated Hamilton Group (DS), hornblende gneiss (hg) and northern glacial and alluvial deposits (Q). The foundation of the preferred pipeline route exists in this area, almost in its entirety. A small portion of the pipeline route passes through Undifferentiated Lower Devonian and Silurian rock (Ds) and an area

following the exit ramp of the State Highway 17/Route 208 interchange into the Village of Kiryas Joel passes through Hamilton Group Formations (Dh).

The central portion of the project study area (principally Schunnemunk Mountain) is Undifferentiated Hamilton Group (Dh). A narrow strip of Undifferentiated Lower Devonian and Silurian Rocks borders the Hamilton Group in the west, separating it from the Martinsburg Formation. To the east hornblende gneiss (hg) and rocks of the Wappinger Group Formation (Ocw) border the Hamilton Group (Dh). Included in the Undifferentiated Hamilton Group are the Schunnemunk Formation, Bellvale Formation, and Cornwall Shale. This particular portion of Orange County is mostly underlain with rocks of the Schunnemunk Formation, sandstone and conglomerates. The Village of Kiryas Joel is underlain predominantly with Undifferentiated Hamilton Group. This unit is characteristically coarse grained and exhibits low to moderate permeability. Generally, the bedrock units are brittle and give way to multiple fractures resulting in high yielding water capacity.

Between the Martinsburg Formation (On) and the Undifferentiated Hamilton Group (Dh) is an area of Undifferentiated Lower Devonian and Silurian Rocks (DS) that includes bedrock units of sandstone, conglomerates, shale, siltstone and greywacke. This geologic composition is unique to the area of Schunnemunk Mountain working as the foundation along the east and west valleys that surround the mountain. The Lower Devonian and Silurian Rocks (DS) are multi-textured groups and also found to produce high yielding groundwater wells.

East of the Undifferentiated Hamilton Group (Dh) the foundation is dominated by hornblende gneiss (hg). Pink-gray in color, it is a massive fine to medium grained rock composed mostly of quartz and 10 to 20 percent hornblende crystals. Also in the easternmost sector of the project study area is Wappinger Group (OCw) bedrock. Wappinger Group formations are dark gray to gray-black limestone dolomite units. In Orange County, the Wappinger Group includes the Balmville, Rockdale, Halcyon Lake Dolostone, Briarcliffe Dolostone, Pine Plains Dolostone, and Stissing Formation. Inter-layered with limestone, shale and dolomite, the Wappinger Group Formation is similar to carbonate units in that both are brittle and prone to bedrock fractures. Dolomite and limestone are soluble, therefore fractures in Wappinger Formations tend to grow more rapidly through dissolution. The hornblende gneiss underlying most of Interstate 87 and Route 32 are metamorphic rocks of uncertain origin. Characteristically, hornblende gneiss is dark and medium grained and highly resistant to weathering and erosion, producing more rugged terrain.

2.4.1.3 Soils

The Soil Survey of Orange County, New York, was published in 1981 by the United States Department of Agriculture (USDA) Soil Conservation Service (now known as the Natural Resources Conservation Service [NRCS]) in cooperation with the Cornell University Agricultural Experiment Station. According to the Soil Survey, Orange County comprises 9 different soil units and 44 soil series, and is founded upon 6 geologic surficial deposits. Each soil series includes one or more soil types.

Figure 2-10, consisting of three sheets, shows the soil phases along the proposed pipeline route.

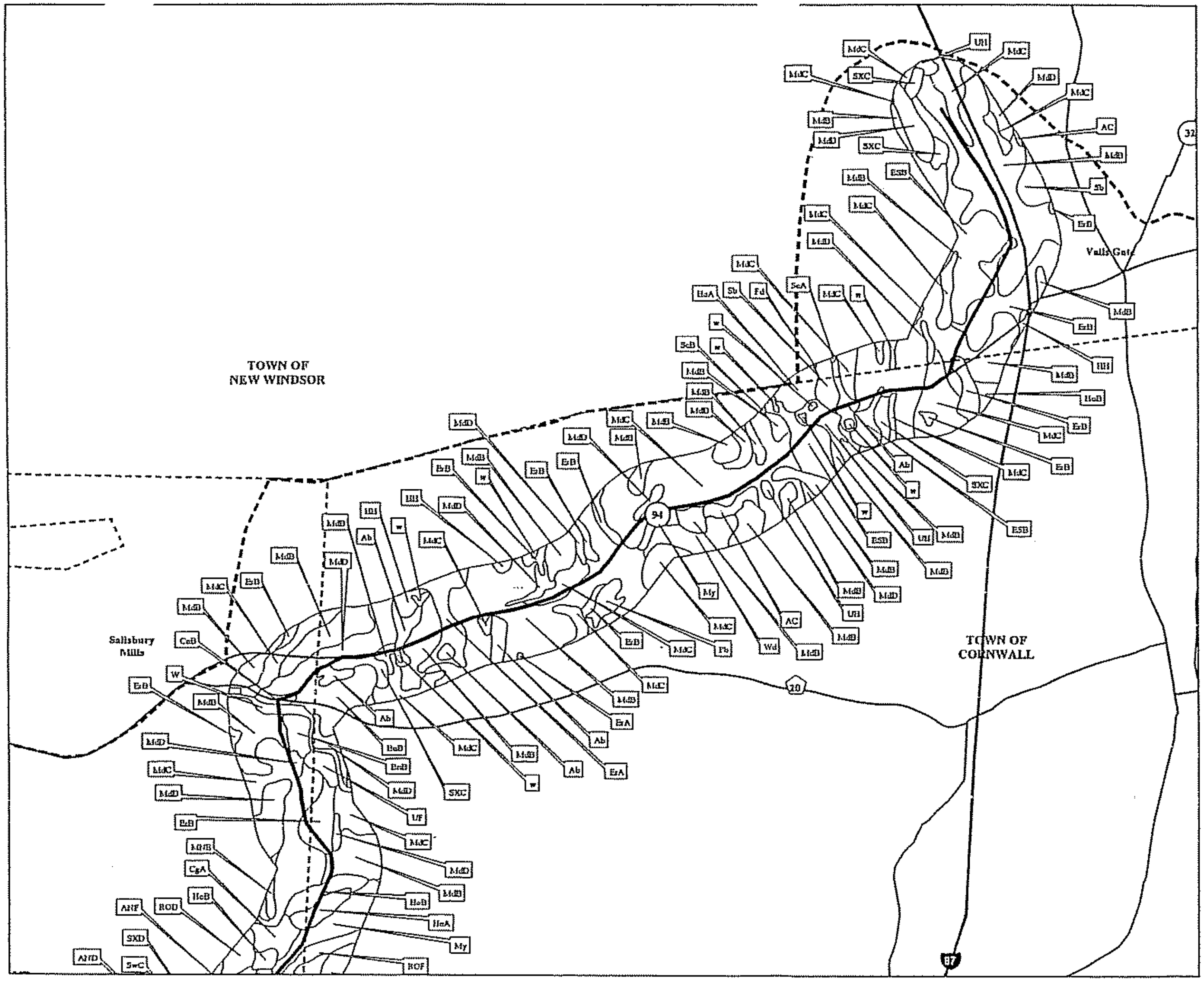
The dominant soil series of the project study area is the Mardin-Erie series. Derived from shale, slate and sandstone, the Mardin-Erie series soils formed from glacial till deposits. Slopes typically range from 3 to 15 percent although some areas may reach 35 percent. The general landscape comprises hilltops, hillsides, and broad divides. The Mardin-Erie series makes up nearly 45 percent of the Orange County land area. The unit is composed of 50 percent Mardin soils, 15 percent Erie soils and 35 percent "other." Drainage and erosion control management systems are the main requirements for optimum land use. Seasonal wetness and slow water movement, particularly through the fragipan, are the main limitations of land use.

Table 2-4 summarizes the major characteristics of the individual soil phases found throughout the project study area. Contained in the table are general descriptions of soil characteristics for the individual soil units, as well as limitations and hazards associated with each unit as defined by their physical qualities.

Proposed Catskill Aqueduct Connection Site
The origin of the water supply pipeline would be located in Vails Gate in the Town of New Windsor. The two soils most common in Orange County, the Mardin and Erie, are dominant in New Windsor. The area of the proposed connection comprises Erie extremely stony soils (ESB). Surrounding the area of the connection site are Mardin series soils (MdC, MdB) to the west, and Erie soil (ESB) to the southeast.

Village of Kiryas Joel and Proposed Water Treatment Facility Site
A new treatment facility in the Village of Kiryas Joel would house the water treatment facility receiving the water from the proposed pipeline. The Village soil is made up predominantly of Mardin and Erie gravelly silt loams (MdB, MdC, ErA, ErB) with slopes ranging from 0 to 15 percent, although a small area in the center of the Village has slopes greater than 15 percent (MdD). Also found scattered across the Village are combinations of Swartswood and Mardin very stony soils (SXC), as well as Alden (Ab) and Wayland (Wa) silt loams, and smoothed Udorthents (UH). The area of the proposed site for the new water treatment facility has MdB and MdC soils giving way to SXC as the elevation of Berdichev Road rises to the north.

Proposed Pipeline Route
The proposed pipeline route follows Riley Road to State Route 94, Route 94 to County Route 27, Route 27 to State Route 208, Route 208 to State Route 17, Schunnemunk Road into the Village of Kiryas Joel, and Berdichev Road to the site of an existing Village water treatment facility. The 13-mile pipeline route is composed of multiple soil types varying in texture, permeability, and drainage.



Feet
2,000 0

Projection: Transverse Mercator
Coordinate System: State Plane (NY East)
Datum: NAD 27
Map Scale: 1 inch = 2,000 ft.

Legend

Soil Type/Description
AC = silts, clays and very fine sands that pond, nearly level (hydric)
AHC = silts influenced by bedrock, nearly level to sloping
AHD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
AHF = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Ab = silts, clays and very fine sands that pond, nearly level (hydric)
BnB = medium sands and silts with bedrock and surface stones, nearly level to sloping
BnC = medium sands and silts with bedrock and surface stones, nearly level to sloping
Ca = silts, clays and very fine sands that pond, nearly level (hydric)
CgA = course silts and loam with a firm fragipan, nearly level to sloping
ChA = well to excessively well drained sands and gravels, nearly level to sloping
ChB = well to excessively well drained sands and gravels, nearly level o sloping
ESB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
ErA = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
ErB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
Fd = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
HH = waterbodies and marshland (hydric)
HLC = silts influenced by bedrock, nearly level to sloping
Ha = silts, clays and very fine sands that pond, nearly level (hydric)
HoA = well to excessively well drained sands and gravels, nearly level to sloping
HoB = well to excessively well drained sands and gravels, nearly level to sloping
HoC = well to excessively well drained sands and gravels, nearly level to sloping
HoD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
MOE = sands, silts and clay that are dominated by very steep slopes (over 25 percent)
Ma = silts, clays and very fine sands that pond, nearly level (hydric)
MdB = course silts and loam with a firm fragipan, nearly level to sloping
MdC = course silts and loam with a firm fragipan, nearly level to sloping
MdD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
My = very fine sands and silts that flood, nearly level
NaD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Pb = organic material, nearly level (hydric)
Pg = well to excessively well drained sands and gravels, nearly level to sloping
RMC = silts influenced by bedrock, nearly level to sloping
RMD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
ROC = silts influenced by bedrock, nearly level to sloping
ROD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
ROF = sands, silts and clay that are dominated by very steep slopes (over 25 percent)
RSB = silts influenced by bedrock, nearly level to sloping
RSD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Ra = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
RhA = well to excessively well drained sands and gravels, nearly level to sloping
RhB = well to excessively well drained sands and gravels, nearly level to sloping
SXC = medium sands and silts with bedrock and surface stones, nearly level to sloping
SXD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Sb = silts, clays and very fine sands that pond, nearly level (hydric)
ScA = heavy silts and clays, nearly level to gently sloping
ScB = heavy silts and clays, nearly level to gently sloping
SwB = course silts and loam with a firm fragipan, nearly level to sloping
SwC = course silts and loam with a firm fragipan, nearly level to sloping
SwD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
UF = very fine sands and silts that flood, nearly level
UH = well to excessively well drained sands and gravels, nearly level to sloping
UnB = well drained, very fine sands and silts, nearly level to gently sloping
W = waterbodies and marshland (hydric)
Wd = very fine sands and silts that flood, nearly level
WsC = course silts and loam with a firm fragipan, nearly level to sloping
w = waterbodies and marshland (hydric)

Proposed Pipeline Route
Municipal Boundary
Study Area
Major Highways

Data Source:
Base Map-NY State GIS Clearing House
& OCWA GIS
Soils-OCWA GIS

Figure 2-10
Sheet 1 of 3

Soils

CDM

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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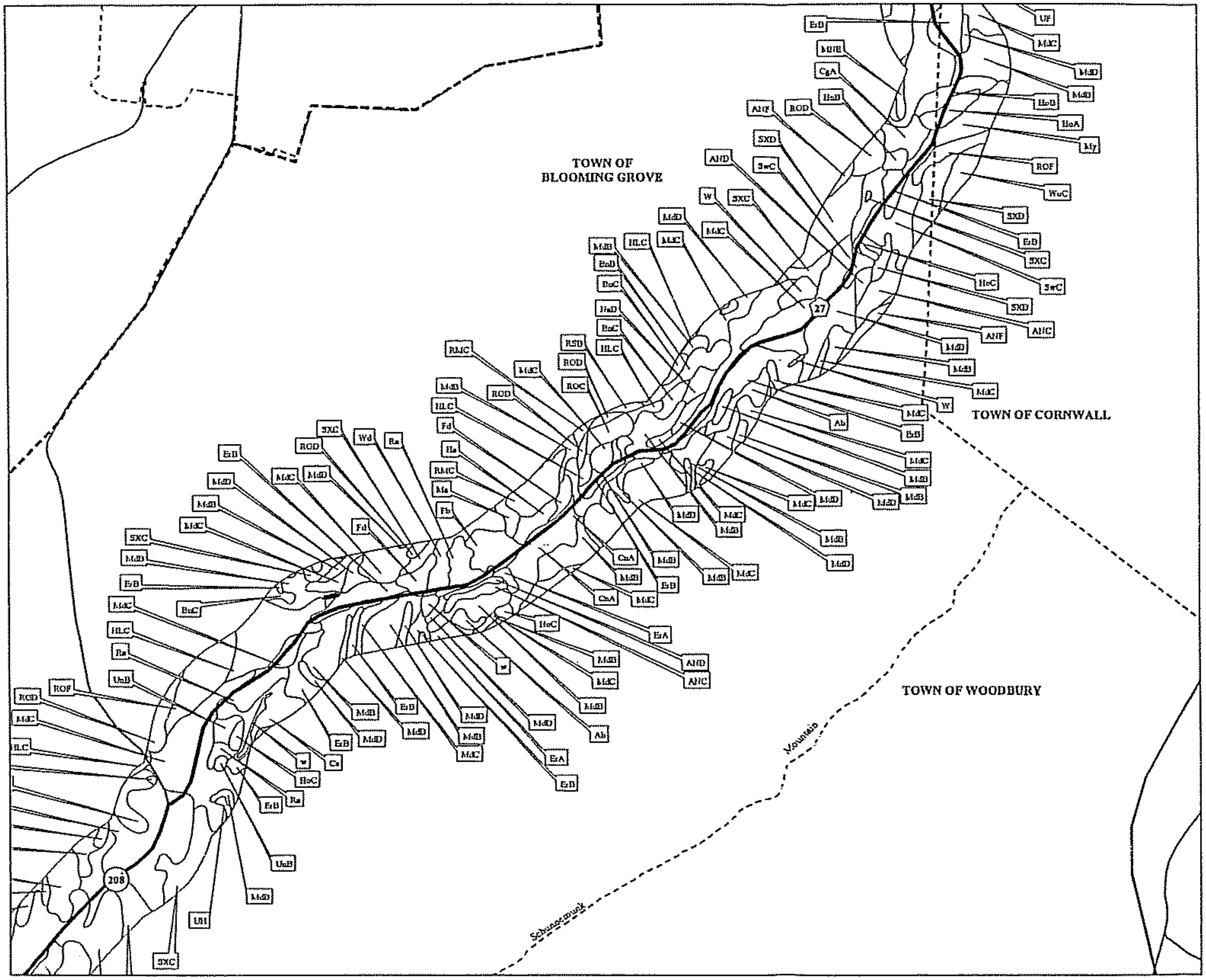

Feet
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Projection: Transverse Mercator
Coordinate System: State Plane (NY East)
Datum: NAD 27
Map Scale: 1 inch = 2,000 ft.

Legend

Soil Type/Description
AC = silts, clays and very fine sands that pond, nearly level (hydric)
AHC = silts influenced by bedrock, nearly level to sloping
AHD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
AHF = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Ab = silts, clays and very fine sands that pond, nearly level (hydric)
BoB = medium sands and silts with bedrock and surface stones, nearly level to sloping
BoC = medium sands and silts with bedrock and surface stones, nearly level to sloping
Ca = silts, clays and very fine sands that pond, nearly level (hydric)
CgA = coarse silts and loam with a firm fragipan, nearly level to sloping
CnA = well to excessively well drained sands and gravels, nearly level to sloping
CnB = well to excessively well drained sands and gravels, nearly level o sloping
ESB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
ErA = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
ErB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
Fd = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
HH = waterbodies and marshland (hydric)
HLC = silts influenced by bedrock, nearly level to sloping
Ha = silts, clays and very fine sands that pond, nearly level (hydric)
HoA = well to excessively well drained sands and gravels, nearly level to sloping
HoB = well to excessively well drained sands and gravels, nearly level to sloping
HoC = well to excessively well drained sands and gravels, nearly level to sloping
HoD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
MHE = sands, silts and clay that are dominated by very steep slopes (over 25 percent)
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MdB = coarse silts and loam with a firm fragipan, nearly level to sloping
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MdD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
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UnB = well drained, very fine sands and silts, nearly level to gently sloping
W = waterbodies and marshland (hydric)
Wd = very fine sands and silts that flood, nearly level
WuC = coarse silts and loam with a firm fragipan, nearly level to sloping
w = waterbodies and marshland (hydric)

Proposed Pipeline Route
Municipal Boundary
Study Area
Major Highways

Data Source:
Base Map-NY State GIS Clearing House
& OCWA GIS
Soils-OCWA GIS

Figure 2-10
Sheet 2 of 3
Soils

CDM
Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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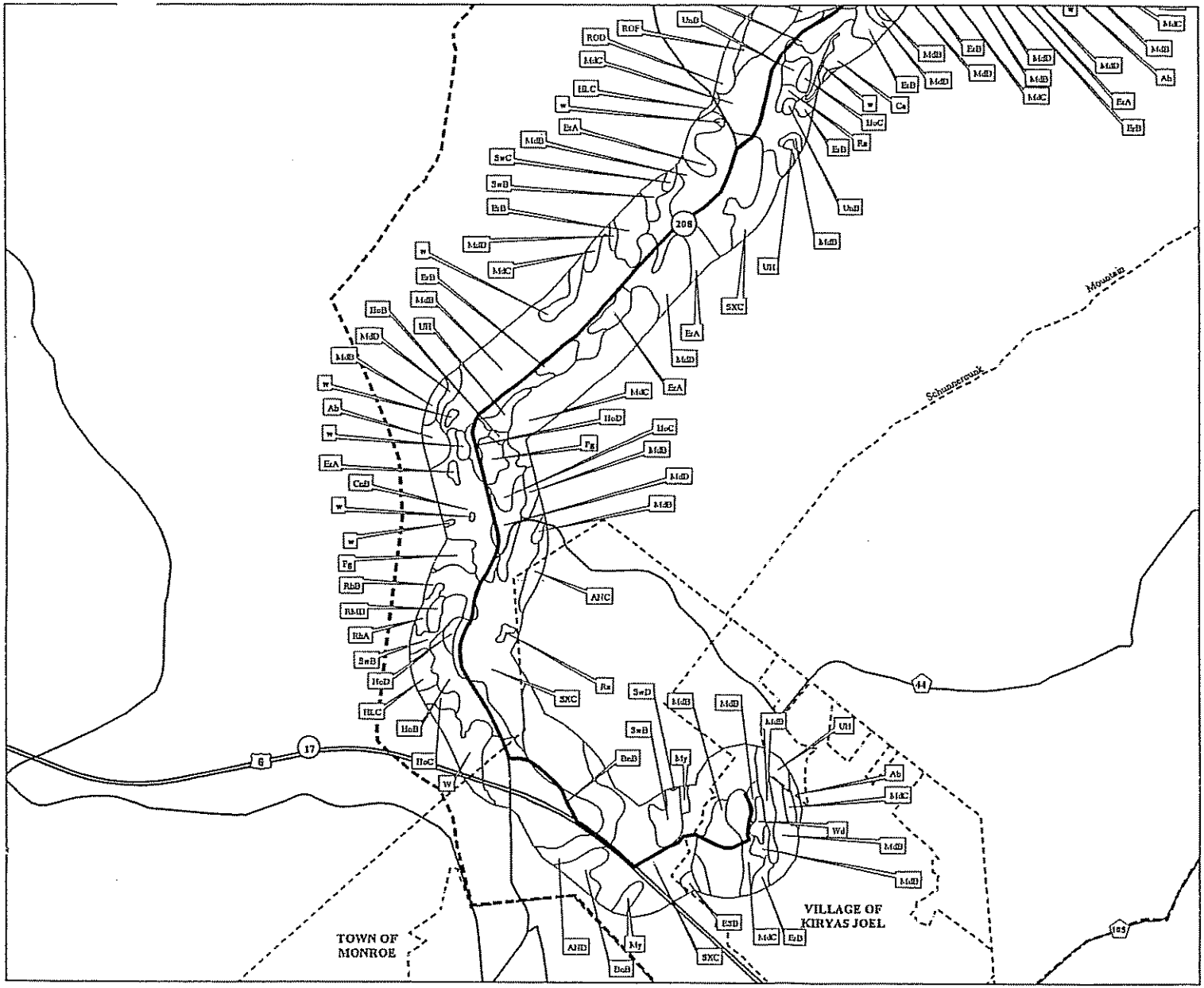

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Projection: Transverse Mercator
Coordinate System: State Plane (NY East)
Datum: NAD 27
Map Scale: 1 inch = 2,000 ft.

Legend

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BnC = medium sands and silts with bedrock and surface stones, nearly level to sloping
Ca = silts, clays and very fine sands that pond, nearly level (hydric)
CgA = coarse silts and loams with a firm fragipan, nearly level to sloping
CnA = well to excessively well drained sands and gravels, nearly level to sloping
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ESB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
EsA = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
EsB = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
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HeB = well to excessively well drained sands and gravels, nearly level to sloping
HeC = well to excessively well drained sands and gravels, nearly level to sloping
HeD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
HVE = sands, silts and clay that are dominated by very steep slopes (over 25 percent)
Ma = silts, clays and very fine sands that pond, nearly level (hydric)
MdB = coarse silts and loams with a firm fragipan, nearly level to sloping
MdC = coarse silts and loams with a firm fragipan, nearly level to sloping
MdD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
My = very fine sands and silts that flood, nearly level
NsD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Pb = organic material, nearly level (hydric)
Pg = well to excessively well drained sands and gravels, nearly level to sloping
RHC = silts influenced by bedrock, nearly level to sloping
RHD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
ROC = silts influenced by bedrock, nearly level to sloping
ROD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
ROF = sands, silts and clay that are dominated by very steep slopes (over 25 percent)
RSB = silts influenced by bedrock, nearly level to sloping
RSD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Rs = silts, clays and very fine sands that are wet (hydric or hydric inclusions) nearly level to sloping
RtA = well to excessively well drained sands and gravels, nearly level to sloping
RtB = well to excessively well drained sands and gravels, nearly level to sloping
SXC = medium sands and silts with bedrock and surface stones, nearly level to sloping
SXD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
Sh = silts, clays and very fine sands that pond, nearly level (hydric)
ScA = heavy silts and clays, nearly level to gently sloping
ScB = heavy silts and clays, nearly level to gently sloping
SwB = coarse silts and loams with a firm fragipan, nearly level to sloping
SwC = coarse silts and loams with a firm fragipan, nearly level to sloping
SwD = sands and silts that are influenced by steep slopes, moderately steep to steep (over 15 percent)
UF = very fine sands and silts that flood, nearly level
UtI = well to excessively well drained sands and gravels, nearly level to sloping
UuB = well drained, very fine sands and silts, nearly level to gently sloping
W = waterbodies and marshland (hydric)
Wd = very fine sands and silts that flood, nearly level
WsC = coarse silts and loams with a firm fragipan, nearly level to sloping
w = waterbodies and marshland (hydric)

Proposed Pipeline Route
Municipal Boundary
Study Area
Major Highways

Data Source:
Base Map-NY State GIS Clearing House
& OCWA GIS
Soils-OCWA GIS

Figure 2-10
Sheet 3 of 3

Soils

CDM

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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R423

Table 2-4
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Erosion Hazard	Water Table			Permeability		Drainage	Depth to Bedrock (In)	Development Limitation		
					Depth (Ft)	Type	Months	Depth (In)	In/hr			Shallow Excavations	Dwellings without basements	Local Roads and Streets
Alden	Alden silt loam	Ab	Nearly Level	Slight	0-0.5	Perched	Nov - Jun	0-9 9-60	0.6-2.0 0.2-0.6	Wetness, percs slowly, poor outlets	> 60	Severe: Wetness Large Stones	Severe: Wetness	Severe: Wetness Frost Action
	Alden extremely stony soil	AC	1/ 8% to 15%	Slight	0-0.5	Perched	Nov - Jun	0-9 9-60	0.6-2.0 0.2-0.6	Large stones, percs slowly, poor outlets	> 60			
Arnot-Lordstown	Arnot-Lordstown complex, sloping	ANC	1/ 8% to 15%	Slight	1.0-1.5 >6.0	Perched	Apr - May	0-15 Arnot 15 Arnot 0-37 Lordstown	0.6-2.0 --- 0.6-2.0	Not Needed	10-20' 20-40'	Severe: Depth to Rock Small Stones Slope Hazard	Moderate - Severe: Slope Depth to Bedrock Frost Action	Severe: Slope Depth to Bedrock
	Arnot-Lordstown complex,moderately steep	AND	1/ 15% to 25%	Slight	1.0-1.5 >6.0	Perched	Apr - May	0-15 Arnot 15 Arnot 0-37 Lordstown	0.6-2.0 --- 0.6-2.0	Not Needed	10-20' 20-40'		Severe: Slope Depth to bedrock	
	Arnot-Lordstown complex, very steep	ANF	1/ +25%	Moderate	varies	Perched	Apr - May	0-15 Arnot 15 Arnot 0-37 Lordstown	0.6-2.0 --- 0.6-2.0	Not Needed	10-20' 20-40'			
Bath-Nassau	Bath-Nassau shaly silt loams	BnB	3% to 8%	Slight	2.0-4.0 >6.0	Perched	Nov - Mar	0-29 Bath 29-53 Bath 53 Bath 0-18 Nassau 18 Nassau	0.6-2.0 <0.2 --- 0.6-2.0 ---	Not Needed	48-60'	Moderate: Depth to Rock Small Stones Slope Hazard	Moderate - Severe: Frost Action Depth to Bedrock	Moderate - Severe: Frost Action Depth to Bedrock
	Bath-Nassau shaly silt loams	BnC	8% to 15%	Slight	2.0-4.0 >6.0	Perched	Nov - Mar	0-29 Bath 29-53 Bath 53 Bath 0-18 Nassau 18 Nassau	0.6-2.0 <0.2 --- 0.6-2.0 ---	Not Needed	48-60'		Moderate - Severe: Slope Frost Action Depth to Bedrock	Moderate - Severe: Slope Frost Action Depth to Bedrock
Canandaigua	Canandaigua silt loam	Ca	Nearly Level	Slight	0-0.5	Apparent	Nov - Jun	0-8 35-60	0.2-2.0 2.0-6.0	Cutbanks cave, poor outlets, wetness	>60	Severe: Wetness Cutbanks cave	Severe: Wetness Frost Action	Severe: Frost Action Wetness
Castile	Castile gravelly silt loam	CgA	0% to 3%	Slight	1.5-2.0	Apparent	Mar - May	0-9 9-50 50-60	0.6-6.0 .0-6.0 >6.0	Cutbanks cave	>60	Severe: Wetness Cutbanks cave	Severe: Frost Action	Severe: Frost Action
	Castile gravelly silt loam	CgB	3% to 8%	Slight	1.5-2.0	Apparent	Mar - May	0-9 9-50 50-60	0.6-6.0 2.0-6.0 >6.0	Cutbanks cave	>60			

Table 2-4 (cont.)
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Erosion Hazard	Water Table			Permeability		Drainage	Depth to Bedrock (In)	Development Limitation		
					Depth (Ft)	Type	Months	Depth (In)	In/hr			Shallow Excavations	Dwellings without basements	Local Roads and Streets
Chenango	Chenango gravelly silt loam	CnA	0% to 3%	Slight	>6.0	-----	----	0-28 28-60	0.6-6.0 6.0-20.0	Not Needed	>60	Severe: Small Stones Cutbanks cave	Miderate: Frost Action	Moderate: Slope Frost Action
	Chenango gravelly silt loam	CnB	3% to 8%	Slight	>6.0	-----	----	0-28 28-60	0.6-6.0 6.0-20.0	Not Needed	>60			
	Chenango gravelly silt loam	CnC	8% to 15%	Slight	>6.0	-----	----	0-28 28-60	0.6-6.0 6.0-20.0	Not Needed	>60			
--	Dumps	Du	------	------				------	------	------				
Erie	Erie gravelly silt loam	ErA	0% to 3%	Slight	0.5-1.5	Perched	Dec - May	0-18 18-70	0.6-2.0 <0.2	Percs slowly	>60	Severe: Wetness	Severe: Wetness Frost Action	Severe: Frost Action
	Erie gravelly silt loam	ErB	3% to 8%	Slight	0.5-1.5	Perched	Dec - May	0-18 18-70	0.6-2.0 <0.2	Percs slowly	>60			
	Erie extremely stony soils, gently sloping	ESB	1/ 3% to 8%	Slight	0.5-1.5	Perched	Dec - May	0-18 18-70	0.6-2.0 <0.2	Percs slowly, large stones	>60	Severe: Wetness Large Stones	severe: Wetness Large Stones Frost Action	Severe: Frost Action
Fredon	Fredon loam	Fd	Nearly Level	Slight	0-1.5	Apparent	Oct - Jun	0-6 6-24 24-60	0.6-2.0 0.2-2.0 2.0-20	Poor outlet	>60	Severe: Wetness	Severe: Wetness Frost Action	Severe: wetness Frost Action
Halsey	Halsey silt loam	Ha	Nearly Level	Slight	0-0.5	Apparent	Sep - Jun	0-6 6-22 22-60	0.6-2.0 0.2-2.0 2.0-20	Wetness, poor outlets	>60	Severe: Wetness	Severe: Wetness Frost Action	Severe: Wetness Frost Action
Histic Humaquepts	Histic Humaquepts, ponded	HH	1/ +25%	Slight	-----	---	----	----	----	---	---	---	---	---
Hollis	Hollis soils, sloping	HLC	1/ 8% to 15%	Slight	>6.0	-----	----	0-14 14	0.6-6.0 ----	Not Needed	10-20	Severe: Depth to Rock Slope Hazard	Severe: Slope Depth to Bedrock	Severe: Slope Depth to Bedrock
	Hollis soils, moderately steep	HLD	1/ 15% to 25%	Slight	>6.0	-----	----	0-14 14	0.6-6.0 ----	Not Needed	>60			
Hoosic	Hoosic gravelly sandy loam	HoA	0% to 3%	Slight	>6.0	-----	----	0-6 6-22 22-60	2.0-6.0 2.0-20 >20	Not Needed	>60	Severe: Small Stones	Slight	Slight
	Hoosic gravelly sandy loam	HoB	3% to 8%	Slight	>6.0	-----	----	0-6 6-22 22-60	2.0-6.0 2.0-20 >20	Not Needed	>60	Severe: Small Stones	Slight	Slight
	Hoosic gravelly sandy loam	HoC	8% to 15%	Slight	>6.0	-----	----	0-6 6-22 22-60	2.0-6.0 2.0-20 >20	Not Needed	>60	Severe: Small Stones	Moderate: Slope	Moderate: Slope
	Hoosic gravelly sandy loam	HoD	15% to 25%	Slight	>6.0	----	------	0-6 6-22 22-60	2.0-6.0 2.0-20 >20	Not Needed	>60	Severe: Small Stones Slope Hazard	Severe: Slope	Severe: Slope

Table 2-4 (cont.)
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Erosion Hazard	Water Table			Permeability		Drainage	Depth to Bedrock (In)	Development Limitation		
					Depth (Ft)	Type	Months	Depth (In)	In/hr			Shallow Excavations	Dwellings without basements	Local Roads and Streets
Madalin	Madalin silt loam	Ma	Nearly Level	Slight	0-0.5	Apparent	Dec - May	0-10 10-38 38-60	0.2-0.6 0.06-0.2 <0.2	Wetness, percs slowly, poor outlets	>60	Severe: Wetness	Severe: Wetness	Severe: Wetness Low Strength
Mardin	Mardin gravelly silt loam	MdB	3% to 8%	Slight	1.5-2.0	Perched	Mar - May	0-20 20-60	0.6-2.0 <0.2	Percs slowly	>60	Severe: Wetness	Severe: Wetness	Moderate: Frost Action
	Mardin gravelly silt loam	MdC	8% to 15%	Slight	1.5-2.0	Perched	Mar - May	0-20 20-60	0.6-2.0 <0.2	Slope, percs slowly	>60	Severe: Wetness	Moderate: Frost Action Wetness	Moderate: Slope Frost Action
	Mardin gravelly silt loam	MdD	15% to 25%	Slight	1.5-2.0	Perched	Mar - May	0-20 20-60	0.6-2.0 <0.2	Slope, percs slowly	>60	Severe: Wetness Slope Hazard	Severe: Slope	Severe: Slope
	Mardin soils, steep	MNE	1/ +25%	Slight	1.5-2.0	Perched	Mar - May	0-20 20-60	0.6-2.0 <0.2	Slope, percs slowly	>60	Severe: Wetness Slope Hazard	Severe: Slope	Severe: Slope
Middlebury	Middlebury silt loam	My	Nearly Level	Slight	0.5-2.0	Apparent	Feb - Apr	0-42 42-60	0.6-2.0 >6.0	Floods, poor outlets	>60	Severe: Floods Wetness Cutbanks cave	Severe: Floods Frost Action	Severe: Frost Action Floods
Nassau	Nassau shaly silt loam	NaD	15% to 25%	Slight	>6.0	----	------	0-18 18	0.6-2.0 ------	Not Needed	10-20	Severe: Slope Depth to Rock	Severe: Slope Depth to Bedrock	Severe: Slope Depth to Bedrock
Otisville	Otisville gravelly sandy loam	OtB	0% to 8%	Slight	>6.0	----	------	0-28 28-60	6.0-20.0 >6.0	Not Needed	>60	Severe: Cutbanks cave Small Stones	Slight	Slight
	Otisville gravelly sandy loam	OtC	8% to 15%	Slight	>6.0	----	------	0-28 28-60	6.0-20.0 >6.0	Not Needed	>60		Moderate: Slope	Moderate: Slope
	Otisville gravelly sandy loam	OtD	15% to 25%	Slight	>6.0	----	----	0-28 28-60	6.0-20.0 >6.0	Not Needed	>60		Severe: Slope	Severe: Slope
Otisville and Hoosic	Otisville and Hoosic soils, steep	OVE	1/ +25%	Slight	>6.0	----	------	0-28 Otisville 28-60 Otisville 0-6 Hoosic 6-22 Hoosic 22-60 Hoosic	6.0-20.0 >6.0 2.0-6.0 2.0-20 >6.0	Not Needed	>60	Severe: Cutbanks cave, Small Stones, Slope Hazard	Severe: Slope	Severe: Slope
Palms	Palms muck, ponded	Pb	----	Slight	0-1.0	Apparent	Nov - May	0-25 25-60	0.2-0.6 0.2-2.0	Floods, frost action, excess humus	>60	Severe: Wetness, Floods, Excess humus	Severe: Wetness Low Strength Floods	Severe: Wetness Low Strength Floods
--	Pits, gravel	Pg	------	------				------	------	------				

Table 2-4 (cont.)
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Erosion Hazard	Water Table			Permeability		Drainage	Depth to Bedrock (In)	Development Limitation		
					Depth (Ft)	Type	Months	Depth (In)	In/hr			Shallow Excavations	Dwellings without basements	Local Roads and Streets
Raynham	Raynham silt loam	Ra	------	Slight	0.5-2.0	Apparent	Nov - Jun	0-8 8-26 26-60	0.6-2.0 0.2-2.0 0.06-.20	Percs slowly	>60	Severe: Wetness	Severe: Frost Action Wetness	Severe: Frost Action Wetness
Rhinebeck	Rhinebeck silt loam	RbA	0% to 3%	Slight	0.5-1.5	Perched	Jan - May	0-11 11-60	0.2-6.0 0.06-0.2	Percs slowly	>60	Severe: Wetness	Severe: Wetness	Severe: Low Strength
	Rhinebeck silt loam	RbB	3% to 8%	Slight	0.5-1.5	Perched	Jan - May	0-11 11-60	0.2-6.0 0.06-0.2	Percs slowly	>60			
Riverhead	Riverhead sandy loam	RhA	0% to 3%	Slight	>6.0	------	------	0-30 30-60	2.0-6.0 >20	Not Needed	>60	Severe: Cutbanks cave	Moderate: Frost Action	Moderate: Frost Action
	Riverhead sandy loam	RhB	3% to 8%	Slight	>6.0	------	------	0-30 30-60	2.0-6.0 >20	Not Needed	>60		Moderate: Frost Action	Moderate: Frost Action
	Riverhead sandy loam	RhC	8% to 15%	Slight	>6.0	------	------	0-30 30-60	2.0-6.0 >20	Not Needed	>60		Moderate: Slope Frost Action	Moderate: Slope Frost Action
	Riverhead sandy loam	RhD	15% to 25%	Slight	>6.0	------	------	0-30 30-60	2.0-6.0 >20	Not Needed	>60		Severe: Slope	Severe: Slope
Rock outcrop-Nassau complex	Rock outcrop-Nassau complex, undulating	RSB	1/ 3% to 8%	Slight	>6.0	------	------	0-18	0.6-2.0 ------	Not Needed	10-20	Severe: Depth to Rock	Severe: Depth to Bedrock	Severe: Depth to Bedrock
Scarboro	Scarboro mucky sandy loam	Sb		Slight	0-1.0	Apparent	Jan - Dec	0-60	>6.0	Cutbanks cave, Wetness	>60	Severe: Wetness	Severe: Wetness	Severe: Wetness
Scio	Scio silt loam	ScA	0% to 3%	Slight	1.5-2.0	Apparent	Mar - May	0-35 35-60	0.6-2.0 2.0-20.0	Cutbanks cave	>60	Severe: Wetness	Severe: Frost Action	Severe: Frost Action
	Scio silt loam	ScB	3% to 8%	Slight	1.5-2.0	Apparent	Mar -May	0-35 35-60	0.6-2.0 2.0-20.0	Cutbanks cave	>60			
Suncook	Suncook sandy loam	Su		Slight	3.0-6.0	Apparent	Jan -Apr	0-60	>6.0	Not Needed	>60	Severe: Floods Cutbanks cave	Severe: Floods	Severe: Floods
Swartswood and Mardin	Swartswood and Mardin very stony soils, sloping	SXC	1/ 8% to 15%	Slight	1.5-4.0	Perched	Nov - May	0-31 Swartswood 31-70 Swartswood 0-20 Mardin 20-60 Mardin	0.6-2.0 0.06-0.6 0.6-2.0 <0.2	Slope, large stones, rooting depth	>60	Moderate: Slope Hazard Wetness	Moderate: Slope Frost Action Large Stones Wetness	Moderate: Slope Frost Action
	Swartswood and Mardin very stony soils, moderately steep	SXD	1/ 15% to 25%	Slight	1.5-4.0	Perched	Nov - May	0-31 Swartswood 31-70 Swartswood 0-20 Mardin 20-60 Mardin	0.6-2.0 0.06-0.6 0.6-2.0 <0.2	Slope, large stones, rooting depth	>60	Severe: Slope	Severe: Slope	Severe: Slope
	Swartswood and Mardin very stony soils, very stony	SXF	1/ +25%	Moderate	1.5-4.0	Perched	Nov -May	0-31 Swartswood 31-70 Swartswood 0-20 Mardin 20-60 Mardin	0.6-2.0 0.06-0.6 0.6-2.0 <0.2	Slope, large stones, rooting depth	>60	Severe: Slope Hazard	Severe: Slope	Severe: Slope

Table 2-4 (cont.)
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Erosion Hazard	Water Table			Permeability		Drainage	Depth to Bedrock (In)	Development Limitation		
					Depth (Ft)	Type	Months	Depth (In)	In/hr			Shallow Excavations	Dwellings without Basements	Local Roads and Streets
Tioga	Tioga silt loam	Tg	Nearly Level	Slight	3.0-6.0	Apparent	Feb - Apr	0-40 40-60	0.6-6.0 0.6-20	Not Needed	>60	Severe: Floods	Severe: Floods	Severe: Floods
Udorthents	Udorthents, smoothed	UH	1/ +25%	Slight	----	----	----	-----	----	----	----	----	----	----
Unadilla	Unadilla silt loam	UnB	0% to 8%	Slight	>6.0	-----	-----	0-44 44-60	0.6-2.0 2.0-20.0	Erodes easily, piping	>60	Slight	Severe: Frost Action	Severe: Frost Action
	Unadilla silt loam	UnC	8% to 15%		>6.0	-----	-----	0-44 44-60	0.6-2.0 2.0-20.0	Erodes easily, piping	>60	Moderate: Slope Hazard	Severe: Frost Action	Severe: frost Action
–	Urban Land	Ur	-------	------				-------	-------	-------				
Wallkill	Wallkill silt loam	Wa	Nearly Level	Moderate	0-0.5	Apparent	Sep -Jun	0-18 18-60	0.6-2.0 2.0-20	Not Needed	>60	Severe: Wetness Floods	Severe: Floods Wetness Low Strength	Severe: Floods Wetness Low Strength
Wayland	Wayland silt loam	Wd	Nearly Level	Moderate	0-0.5	Apparent	Nov - Jun	0-9 9-60	0.2-2.0 0.06-0.2	Not Needed	>60	Severe: Wetness Floods	Severe: Floods Wetness Frost Action	Severe: Floods Wetness Frost Action

Notes:

1/ The composition of these units is more variable than that of other units in the surey area but has been controlled well enough to be interpreted for the expected uses of the soils

* Indicate hard bedrock which may require blasting or special equipment for excavation.

Soil types contained within "Project Area" extend approximately 250 feet on either side of highway lines and include all soil types found in Vails Gate and the Village of Kiryas Joel.

Source: Soil Survey of Orange County, New York, USDA, 1981.

The point where Riley Road and Route 94 intersect has fairly poor drainage due to large stones and a perched water table. The soils present along Route 94 are predominantly Mardin series B or C (MdB, MdC, occasionally MdD). Also intermixed are patches of Alden hydric silt loams (Ab), smoothed Udorthents (UH) and Erie extremely stony soils (ESB). Near the intersection of Jackson Avenue, Swartswood and Mardin (SXC) complex soil and Wayland silt loams (Wd) are present.

Soil types along Route 27 are generally the same as along Route 94. Where Route 27 crosses Moodna Creek, the soil is mostly Mardin series (MdB) and Tioga (Tg). The composition continues as mostly Mardin series but varies where Route 27 passes Otter Kill Road and continues south. Other soil types include Hoosic Series soils (HoB, HoA) and Swartswood and Mardin combination soils (SXC). The soil composition remains consistent as Mardin Series soils (MdC, MdD, MdB) until reaching Mountain Lodge where the composition becomes more variable. In addition to Mardin Series and Erie Series soils, Fredon Loam (Fd), Chenango gravelly silt loam (CnA), ponded palms muck (Pb), and Raynham silt loam (Ra) also make up portions of the soil.

The soils along Route 208 vary between Mardin Series and Erie series (MdB, MdC, MdD, ErA, ErB) for the majority of the route, with Hoosic soils (HoD) and Udorthent soil (UH) featured in a few areas. After Route 208 passes County Route 44, the soil types are Chenango gravelly silt loam (CnB), Riverhead sandy loam (RhB), Swartswood and Mardin complex soils (SXC), and Hoosic gravelly sandy loam (HoB). Along the ramp connecting northbound Route 208 with eastbound Route 17, the soils are Bath-Nassau shaly silt loams (BnB) and Arnot - Lordstown complex soils (AND). Following Route 17 and Schunnemunk Road east into Kiryas Joel, the proposed pipeline would pass through AND and SXC soils, then return to Mardin Series soils at the proposed site of the new water treatment plant.

2.4.1.4 Limitations

As described in the Soil Survey of Orange County, New York and in Table 2-4, the native soils of Orange County and more specifically of the project study area have physical qualities that could impose limitations during construction. The columns headed "Development Limitations" describe the degree of limitation and the root of the restriction. Degrees range from slight to moderate to severe. In situations where the limitation is only slight the soils are regarded as favorable to the activity and any restrictions are easily managed. Moderate limitation indicates soil features are not favorable to the activity in question and would require some special planning, design, and/or maintenance to overcome or reduce the unfavorable features. Soils described as having severe limitations to development are extremely unfavorable with respect to the activity. The degree of limitation is based on the soil qualities and other soil characteristics discussed below. Special planning, design, management, increased construction costs and increased maintenance are generally required to successfully overcome the soil limitations.

Flooding

Soils described as having construction limitations due to flooding are generally located along or around existing water bodies. These soils are temporarily inundated after the overflow of streams and rivers, from runoff of adjacent slopes, and tides. They are typical of areas with soils that have slow infiltration rates or moderate to fine texture. Hydrologic soil groups have been used to describe soils' tendency to absorb runoff from precipitation. The four hydrologic groups are A, B, C, and D. Group A has a high infiltration rate, B a moderate infiltration rate, C soils have slow infiltration rates and commonly have a layer that impedes the downward movement of water, and D soils have a very slow infiltration rate, consist mainly of clays that are present in the pan or near the surface, have a high water table, and are shallow. These qualities increase moisture and flooding hazards during construction. Special methods may be required during construction in areas classified as Group C or Group D.

Steep Slopes

Soils having slopes of 15 percent or greater pose a higher risk for erosion and increased hazards associated with soil stability. These soils may require pre-construction planning and special means to support adjacent soils during excavation and pipe installation. Mitigative measures in accordance with *New York State Department of Environmental Conservation Erosion and Sediment Control Guidelines* would also be implemented in these higher risk areas.

Frost Action Hazards

Increased hazards influenced by frost are caused by the upward or lateral expansion of soil due to the formation of segregated ice lenses and the loss of stability from thawing. Soils that are silty or highly structured clay soils are more prone to have a frost action hazard, as are those soils with high water tables in winter. These soils may require special construction methods or inflict time restrictions during the construction phase.

Depth to Bedrock

The majority of the soils in the study area have a depth to bedrock of greater than 5 feet and are fairly soft; however, there are several soils that are only 10 to 20 inches or 20 to 40 inches above bedrock and much harder than the surrounding soils. The Arnot-Lordstown complex soils (ANC, AND, ANF), Bath-Nassau complex soils (BnB, BnC), Rock Outcrop Nassau complex soils (RSB) and Hollis sloping soils (HLC, HLD) may require blasting or more intricate means of rock excavation. Alternative methods such as diverting the pipeline around immovable rock, using large excavators to rip and pull the rock from the foundation, or hammering the area to free the rock and make it more workable may be considered. In the event that blasting is the only means possible to remove the rock, the activity would take place under the guidance of the site engineer and under state and local protocol.

Blasting

The proposed pipeline route is restricted almost entirely to previously disturbed earth, much of which is currently paved roadways or shoulders; however, as stated previously there is potential for contact with bedrock or large boulders that may require blasting. Blasting would be used as a last resort means of earth removal and limited to the smallest area necessary. Potential areas would be identified through soil borings conducted as part of the detailed design and confirmed at the time of excavation. Blasting details are required in the Erosion and Sediment Control Plan, which would be prepared during final design.

2.4.2 Impacts

2.4.2.1 Construction

Geology and soils in the project corridor would be impacted only temporarily during the construction of the Kiryas Joel Catskill Aqueduct Pipeline Project, with the exception of excavation necessary to accommodate the connection site and pump station in Vails Gate and the new Water Treatment Plant in the Village of Kiryas Joel. Geologic formations underlying the project corridor from origin to terminus are adequate to support the proposed facilities. Depth to bedrock is greater than five feet in most areas and encountering rock is not expected, therefore blasting is not anticipated. If blasting should be required it would be conducted in compliance with New York State requirements in 12 NYCRR Part 39. The proposed route of the transmission main is located predominantly in existing roadways reducing the potential of permanent impact. The installation of the water supply pipeline would be in accordance with the *New York State Department of Transportation Requirements for the Design and Construction of Underground Utility Installations Within the State Highway Right-of–Way*. Upon completion of the project, the land surface would be returned to pre-construction conditions.

An adverse impact expected as a result of construction is soil erosion. Construction activities increase the amount of soils exposed to wind and water. With increased exposure soils may be wind blown or mixed with flowing waters that could potentially lead to sediment build-up in nearby surface waters. To minimize adverse impacts, mitigative measures would be set in place in addition to strictly enforced soil erosion guidelines in compliance with *New York State Standards and Specifications for Erosion and Sediment Control*. Because soil disturbance would be greater than 1 acre, a New York State SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-02-01) would be required. The application for Permit GP-02-01 includes developing a Stormwater Pollution Prevention Plan (SWPPP) and submitting a Notice of Intent (NOI) prior to beginning construction activities.

The total amount of previously undisturbed land to be disturbed would be minimized to the maximum extent practical.

2.4.2.2 Long-Term

The proposed project would not have a long-term impact on existing geology, soils or topography. There would be no changes to any unique geologic features, nor are

there significant geologic hazards associated with the project. The soils along the proposed pipeline route have already been disturbed by road construction, and soils along the Catskill Aqueduct were disturbed by construction of the Aqueduct. Construction of the proposed pipeline would not have a significant additional impact. Soils at the proposed sites of the pump station and the water treatment facility have been previously disturbed.

2.4.3 Mitigation

In accordance with *New York State Department of Environmental Conservation Erosion and Sediment Control Guidelines*, actions would be implemented during construction of the Aqueduct connection project to reduce sediment runoff:

- Seeding immediately after the slope is graded with an appropriate ground cover in a manner
- Placement of mulch, jute mesh or wood chips immediately after soil disturbance has occurred.
- Seeding of slopes simultaneously with road construction
- Placement of temporary and permanent vegetative covers for the stabilization of soils.
- Placement of temporary stabilization on exposed soil beds.
- Placement of gabion baskets, rip-rap, log cribbing, or vegetation at the bed and banks of all on an off-site streams that may be impacted by construction activities, land clearing, excavation, or grading.
- Construction of temporary sediment basins to prevent runoff from any land disturbing activity that may have the potential to be discharged off-site or into storm drains or watercourses.
- Installation of sediment barriers such as silt fences or hay bales around the perimeter of the active work area for sediment control
- Installation of drainage diversions to prevent surface runoff that is relatively clean from flowing through areas of construction activity
- Ensuring that the cut face of earth excavations and fills is no steeper than the safe angle of repose for the materials encountered and flat enough to allow for proper maintenance.
- Ditches should be stabilized immediately with rock riprap or other acceptable non-erodible liner for soil stabilization.

- Making provisions to safely conduct surface water to storm drains or suitable watercourses and prevent surface runoff from damaging cut faces and fill slopes.
- All soils or debris deposited on public thoroughfare from machinery or activity should be cleaned and maintained immediately to prevent them from entering catch basins, storm sewers or combined sewers.
- All erosion and sediment control details should be maintained and any repairs necessary made to ensure continued stabilization.

These measures would be finalized during project design and completion of a SWPPP as required by SPDES Permit GP-02-01.

Blasting
Although not expected to be required, these measures would be incorporated if blasting is found to be needed.

- Blasting would be done in accordance with Part 39, Title 12 of the New York Code of Rules and Regulations and local regulations.
- Blasting would be conducted by an insured and licensed blasting contractor. Prior to blasting the contractor would obtain a permit from the Village or Town where the activity would take place as well as be informed of local blasting procedures.
- Blasting operations would be limited to regular construction hours between 8:00 a.m. and 4:00 p.m., excluding weekends and holidays.
- Prior to blasting, site inspections would be conducted at all off-site structures located within 500 feet of the excavation area when requested or authorized by the owner.
- Monitoring would include detailed logs and photographs of the activity, seismographic data, explosive materials used and field conditions.

2.5 Air Quality

2.5.1 Existing Conditions

The NYSDEC monitors air quality in the state and publishes regional air quality reports annually. As a result of the Clean Air Act, New York State is required to execute a State Implementation Plan (SIP) for the purpose of providing a structured and regulated means of meeting air quality standards. The New York State SIP adopted ambient air quality standards from a list of critical pollutants established by the United States Environmental Protection Agency (USEPA); these pollutants are carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, lead, and particulate matter. Exposure to these pollutants is associated with increased respiratory symptoms, as well as lung and heart disease. In 1990 the USEPA amended the Clean Air Act and established updated ambient air quality standards to include primary

and secondary standards to protect human health and environmental quality. Compliance with the federal standards is required under the Clean Air Act.

New York State regional monitoring data is available, and although no NYSDEC ambient air quality monitoring stations exist within the project study area, data from nearby stations can be utilized to characterize the study area air quality. The NYSDEC 2001 Annual Air Quality Report, the most recent report available, contains air quality data for the monitoring stations nearest to the study area. Table 2-5 lists ambient air monitoring data in comparison with the State and Federal Ambient Air Quality Standards. Since the monitoring stations are strategically located to characterize NYSDEC Region 3 ambient air quality, the use of the 2001 Ambient Air Quality Report provides reasonable measures of air quality for the project study area.

The project study area is located within the confines of the Level-II air quality boundaries for Orange County, NY as defined in Parts 293 of the NYCRR Ambient Air Quality Standards Classification System. According to the NYSDEC 2001 Annual Air Quality Report, the ambient air quality stations in Region 3 that are nearest to the project study area encompassing all essential ambient air pollutants are spread through three counties and located at: Valley Central HS, Wallkill, Scotchtown, Newburgh (Orange County, NY), Mount Ninham (Putnam County, NY), and Belleayre Mountain (Ulster County, NY). The criteria pollutants monitored at each station include total suspended particulates and lead at the Wallkill locations, inhalable particulates, sulfur dioxide and ozone at Belleayre Mountain, inhalable particulates at the Newburgh location, lead at the Scotchtown location, sulfur dioxide and ozone at the Mt. Ninham monitoring station, and a third record of ozone at Valley Central High School. The recorded pollutant data show that the monitoring locations characteristic of NYSDEC Region 3 and characteristic of the project study area meet the designated State and Federal ambient air quality standards for all parameters with the exception of ozone. Hourly ozone averages were recorded to be 0.090 ppm, 0.89 ppm, and 0.084 ppm, slightly exceeding State and Federal standards of 0.08ppm. Recorded averages were taken from three different monitoring sites the months of May, June and July. During this time of year ozone levels are typically the highest with increased ground ozone concentrations as a result of travel and automotive exhaust as well as increased atmospheric ozone as a result of UV intensity.

Table 2-5
Existing Ambient Air Quality
New York State Department of Environmental Conservation, Region 3, Hudson Valley

Pollutant	Monitoring Station	Sampling Frequency	Averaging Period	Concentrations	New York Ambient Air Quality Standards	Federal Air Quality Standards	
						Primary	Secondary
Total Suspended Particulates (TSP)	Wallkill [1] (based on 1988 data)	Manual	12-Month	33.0 ug/m^3*	(55 ug/m^3)	******	******
		Manual	24-hour	103 ug/m^3*****	250 ug/m^3	260 ug/m^3	150 ug/m^3
Inhalable Particulates (PM10)	Belleayre Mountain	Continuous	12-month	10 ug/m^3****	50 ug/m^3	50ug/m^3	50ug/m^3
		Continuous	24-hour	35ug/m^3*****	150 ug/m^3	150 ug/m^3	150 ug/m^3
(<2.5 Microns)	Newburgh (F)	Manual	12-month	11.6 g/m^3*	15 g/m^3	15 g/m^3	15 g/m^3
Lead	Wallkill[1]	Manual	3-month	0.09 ug/m^3**	*******	1.5 ug/m^3	1.5 ug/m^3
	Wallkill[2]	Manual	3-month	0.15 ug/m^3**	*******	1.5 ug/m^3	1.5 ug/m^3
	Scotchtown	Manual	3-month	0.03 ug/m^3**	*******	1.5 ug/m^3	1.5 ug/m^3
Sulfur Dioxide (SO_2)	Mt. Ninham	Continuous	3-hour	0.0321 ppm***	0.50 ppm	0.50ppm	0.50 ppm
		Continuous	24-hour	0.0145 ppm*****	0.14 ppm	0.14ppm	0.14 ppm
		Continuous	12-month	0.0026 ppm****	0.03 ppm	0.030 ppm	0.030 ppm
	Belleayre Mountain	Continuous	3-hour	0.019 ppm***	0.5 ppm	*****	0.50 ppm
		Continuous	24-hour	0.0093 ppm*****	0.14 ppm	0.14 ppm	0.14 ppm
		Continuous	12-month	0.0019 ppm****	0.03 ppm	0.030 ppm	0.030 ppm
Ozone	Valley Central	Continuous	1-hour	0.090 ppm***	0.08 ppm	0.08 ppm	0.08 ppm
	Mt. Ninham	Continuous	1-hour	0.089 ppm***	0.08 ppm	0.08 ppm	0.08 ppm
	Belleayre Mountain	Continuous	1-hour	0.084 ppm***	0.08 ppm	0.08 ppm	0.08 ppm
Carbon Monoxide (CO)^			1-hour		9ppm	9 ppm	9 ppm
			8-hour		35 ppm	35 ppm	35 ppm
Nitrogen Oxides (NO^2)+			12-month		100ug/m^3	100ug/m^3	100ug/m^3

Monitoring Stations	
Belleayre Mountain	Belleayre Cross-Country Ski Area
Mt. Ninham	NYSDEC Field Headquarters - Gypsy Trail Road
Newburgh	
Scotchtown	24 Industrial Avenue
Valley Central HS	Valley Central High School - 1175 Route 17K
Walkill [1]	RSR Plant, Ballard Room
Walkill [2]	Wakefern Food Processing Center

Notes:

Sampling Frequencies:
Manual - Every 6 days, 61 samples/year
Continuous - Continuous, 1 hour averages, 24

(F) Federal Reference Method

( ) 50% of the value of the 30 day average concentrations shall not exceed limit

(+) All monitoring stations are located out of Project Study Area vicinity

(++) TSP standards have been superseded by the PM10 Standard; TSP measurements may still serve as surrogates to PM10 measurements in the determination of compliance status

* Annual geometric mean
** Quarterly Values, Highest Values
*** Hourly Average, Highest Value
**** Annual Arithmetic Mean
***** 24 hour Concentrations, Maximum Value

Data source:
NYSDEC Region 3, Hudson Valley, Air Quality Data for Calendar Year 2001, July 2002
2001 Annual New York State Air Quality Report Ambient Air Monitoring System, July 2002
Source of Fedral Air Quality Standards: USEPA-NAAQS
Source of New York Ambient Air Quality Standards : 6 NYCRR Part 257

2.5.2 Impacts

2.5.2.1 Construction

The Aqueduct connection project would generate minor, local, short-term increases in fugitive dust from exposed soil and use of operating machinery. Construction operations requiring blasting (if required), jack hammering, saw cutting, or equipment moving could be sources of airborne particle generation. Dust conditions would be temporary and limited to areas of active construction.

Minor impacts may occur from exhaust emissions from construction equipment. Any potential impact would be less significant than that of fugitive dusts. To minimize impacts, proper tuning and machine maintenance should be conducted throughout the length of the project to control emissions.

2.5.2.2 Long Term

No long-term air quality impacts are expected. Upon the completion of the water supply connection and the demobilization of construction equipment, air quality would return to pre-construction conditions. The water treatment plant would not be a source of air pollution; however, there would be a standby generator for use during power outages.

2.5.3 Mitigation

To minimize levels of dust generated during construction, the following mitigative measures similar to those listed under Section 2.4.3 would be applied:

- All open abrasive blasting operations would use complete containment measures to prevent particle release.
- The area disturbed at any one time would be minimized.
- Mulch or temporary covers would be used on exposed soil surfaces to prevent particles from becoming windborne.
- The movement of operating machinery and trucks would be limited over exposed soil surfaces.
- Trucks carrying soil or debris would be conveyed in vehicles with properly working covers and/or materials would be thoroughly wet down before loading and before departure.
- Operating machinery and construction truck tires and bodies would be washed to remove excess soils and dusts.
- Operating machinery and construction trucks not in use would not be left idling. Machines and trucks would operate only when in use to reduce exhaust.

- All soils or debris deposited on public thoroughfare from machinery or activity would be cleaned and maintained immediately.

2.6 Agricultural Resources

2.6.1 Existing Conditions

The Village of Kiryas Joel contains no land in agricultural use, and there is no agricultural land near the site for the proposed Aqueduct connection and pumping station in New Windsor. Outside Kiryas Joel and New Windsor, the study area contains substantial areas of agricultural land. The largest concentration of farmland is in Cornwall below the northern end of Schunnemunk Mountain. There is also a significant amount of farmland along State Route 208 and County Route 27 in Blooming Grove. The proposed pipeline route passes farmland on State Route 94 in Cornwall and on Route 27.

2.6.2 Impacts

Because there is no agricultural land at the potential sites for the proposed pumping station in New Windsor or the proposed water treatment facility in Kiryas Joel, construction of these facilities would have no impact on agricultural resources. Because the pipeline would be constructed in the rights-of-way of existing roads, the pipeline would not have an impact on agricultural resources.

2.6.3 Mitigation

Because the proposed project would not have an impact on agricultural resources, no mitigation is needed.

2.7 Historic Architectural and Archaeological Resources

As implementation of the proposed action would require subsurface disturbance, which may impact archaeological resources, if present, an archaeological assessment has been prepared for this project. The assessment is summarized below and presented in its entirety in Appendix B.

The Stage 1A report prepared by Historical Perspectives, Inc. examined the proposed project pipeline routing as well as the alternative routes under consideration. The report: 1) identifies the Areas of Potential Effect (APE) for the proposed pipeline route corridors, 2) identifies areas of potential archaeological sensitivity within the APE that may be affected by the proposed project, 3) assesses potential project effects on any such resources, and 4) provides recommendations for further consideration where necessary.

2.7.1 Study Parameters

The proposed water transmission pipeline would pass through areas that may contain archaeological resources, and thus the permitting authorities must consider the cultural resource impacts of the proposed construction in accordance with the State Historic Preservation Act (SHPA). In particular, in the overall project study area three

areas of potential impact can be identified as (1) the State Route 94 corridor, (2) the Mountainville area, and (3) the hamlet of Highland Mills. An archaeological assessment was prepared to identify any documented or potential significant archaeological resources within areas that may be affected by the project. The potential effects of the proposed action on archaeological resources were then analyzed, and further evaluation measures, if necessary, recommended. Note that the Mountainville area and the hamlet of Highland Mills are not along the proposed pipeline route.

The study, therefore, was conducted to address two major questions: What is the likelihood that potential precontact and historic archaeological resources of significance exist within the APEs; and what is the likelihood that such resources have survived later disturbances? Sufficient information was gathered to compare, both horizontally and vertically, the precontact era past, the historical past, and the subsurface disturbance record.

The APEs were defined as the areas that may experience subsurface disturbance (via construction) that could affect archaeological resources, if present. Effects could result from cut-and-cover construction, excavations, and any other ground disturbing activity that would extend from the existing grade down into potentially sensitive strata.

The potential for disturbing archaeologically sensitive areas by excavation or compaction was used as the criterion to determine the potential for adverse effects and the need for additional archaeological evaluations.

A physical survey of the proposed pipeline corridor, including the proposed aqueduct connection location and treatment plant site, and alternative corridors, including an alternative treatment plant site (as discussed in Section 3 3), was undertaken in June 2003, and documentary photographs were taken. The following summarizes the results of the physical survey. Areas sensitive for historic or precontact era resources along the proposed pipeline route are listed below. Additional information including photographs of these areas can be found in Appendix B. See Figure 2-11.

- Intersection of Route 94 and Mount Airy Road: remains of a historic structure
- Village of Bethlehem: church and cemetery
- Route 94 and South Jackson Avenue: floodplain ideal for Native American settlement
- Clove Road and Route 27 intersection: Salisbury Mills (sensitive locale)
- Route 208: historic foundation on west side of the road and historic structure converted for modern use

2.7.2 Study Results

Native American settlements or villages tended to be located near critical resources, such as water, flat or gently sloped fertile lands, or vantage points on the landscape. Other settlement factors might include the presence of special resources, such as raw materials like chert for stone tool making, or Native American trails. Smaller, special-purpose sites such as workshops may be found near these specific resources.

Site file searches indicate Native American occupation in the region possibly dating back to 3,500 BC (see Appendix A-2, SHPO A071-03-000240). Previously discovered sites by and large consist of stone tools and stone tool production debris; however, a later Woodland period rock shelter site along the proposed western route yielded faunal remains, carbon and ceramics as well as stone artifacts (see Appendix A-2, SHPO A07101.000095).

However, the likelihood of finding intact precontact archaeological sites within the proposed project route (or the alternative pipeline routes and treatment plant location) is low, given the amount of historic and modern-era disturbance that has occurred. Evidence shows that the landscape has been farmed consistently beginning with the earliest land patents in the 1700s and increasing greatly during the 19th century (See Appendix B-1; Simeon 180?; Sidney 1851; Lathrop 1903). Plowing fields tends to scatter Native American sites, taking artifacts out of context and diminishing, though not revoking, their significance (See Appendix B-2; SHPO A071-03-000240). Further disturbance would have occurred through the process of road construction. The proposed pipeline route follows roads that are for the most part historic themselves. The initial construction, continued use, and modern reconstruction of these roads over several centuries have also served to significantly disturb the precontact landscape.

The Stage 1A reconnaissance and previously identified sites indicate that there are areas within the project study area that could possibly still hold Native American resources. These areas tend to be located outside of developed areas on open, flat ground.

Five previously known precontact sites were identified in the site file searches that abut the proposed pipeline routing (see Appendix B). These are the following:

USN# 07115.0000706, Vantage One Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road.

USN# 07115.0000707, Vantage Two Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road.

SHPO A071-03-000240: A large area was surveyed in Cornwall along the south side of Route 94 and the east side of the railroad, south of Bethlehem. This site spans the

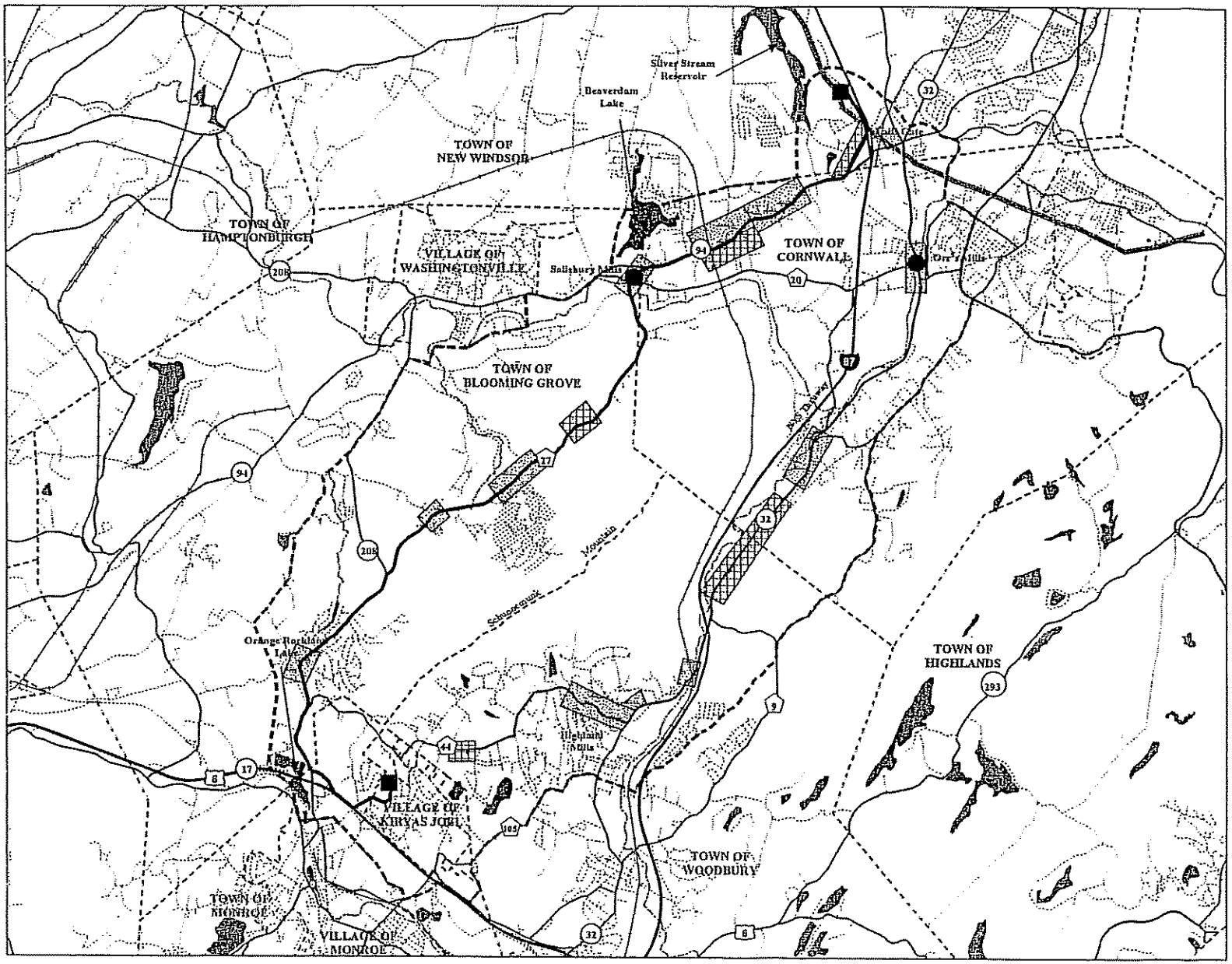


Figure 2-11

Areas of Potential Archaeological Sensitivity

CDM

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

R440

Middle Archaic through the Transitional Period (3,500-500 BC). Stone tools and debris were dispersed in the plow zone within this site.

SHPO A07101.000095 (NYSM 8652, Survey #171): The Snail Rockshelter is located in Blooming Grove, west of Clove Road and north of Felter Hill Road. This later Woodland Period site yielded ceramics, stone tools and debris, charcoal and bone. This rocky, intermittently steep area is characterized by occasional veins of chert, a raw material used for making stone tools. The study area for the previous survey abutted the road (BTK Associates, Inc. 1995); however, the rock shelter is located north of the project route.

NYSM 8543: Precontact-era stray find located in Monroe, on the south side of Route 17. A single stone tool (uniface scraper) and lithic debitage (stone tool production debris) were recovered. The location of this find abuts the project area.

Many historic era structures would have fronted onto the same roads as the proposed pipeline route, as is borne out in cartographic and site file research (see Appendix B). As road locations may have changed, it is possible that some early historic sites are located under current roadbeds. It is not possible to determine, to any great degree of accuracy, the amount by which roads have changed their courses through time. However, given the rural nature of Orange County, most structures, be they houses or commercial, appear to have been set back slightly from the road, leaving room for a front yard and space between the structure and the roadway (or railroad or stream). It is clear, then, that the proposed routes pass through or along multiple front yards on either side.

Twenty-three historic sites were found in the site file search that fall along the proposed pipeline corridor (see Appendix B for a description). These sites are generally located to the north beginning with the Bethlehem Presbyterian Church and Cemetery and found intermittently along State Route 94, County Route 27 and ending at the H.W. Bull Barn Apartments in Blooming Grove on State Route 208. This final historic site falls just outside of the project study area.

Impacts to potential archaeological resources have already been considerable. As previously mentioned, evidence shows that the landscape has been farmed consistently beginning with the earliest land patents in the 1700s and increasing greatly during the 19th century.

Further disturbance would have occurred through the process of road construction. However, the longevity of many roads from the historic through the modern era indicates that the roadbeds themselves would have seen little historical development, including Routes 94 and Clove Road, and several roads leading into Kiryas Joel. The initial construction, continued use, and modern reconstruction of these roads over several centuries have served to significantly disturb the landscape beneath, as well as prohibit historic development.

2.7.3 Study Recommendations

For the pipeline to be installed, extensive subsurface impacts would only occur in the narrow construction corridor and only within the existing roadbed. This type of in-road construction may affect historic resources in locations where historic roads have changed course over time. The crossing of a natural river/stream in direct proximity to an historic mill could affect remaining buried industrial components of the mill complex. Since mills were often adjacent to early roads and junctions to roads it is possible that there are some mill features within the extant roads. The recommendation of the Stage 1A Archaeological Assessment is that limited monitoring of excavated areas be conducted only within those zones specifically sensitive for historic mills. (See Figure 2-11.)

During the final engineering of the pipeline itself, the engineering team would work with a field archaeologist to establish areas for equipment storage, temporary offices or worker parking so as to avoid areas sensitive for precontact or historic resources to the maximum extent practical. A lot-by-lot reconnaissance inspection of only the sensitive zones would be conducted to precisely establish disturbed and non-disturbed areas along the route. This approach has been used successfully on other projects along roadways to minimize unnecessary mitigation. The 'sensitive areas' are located on Figure 2-11. For contractor staging areas that may fall within these sensitive areas, the introduction of a horizon (geo-filter or exotic soils) would serve to prevent accidental below-grade intrusions during contractor use. This material would be removed at the end of the contractor's use.

The engineering design team and the contractor working with an archaeologist would ensure that as many potentially sensitive areas as possible are avoided during the installation of the proposed pipeline. Given the widespread historic and potential precontact occupation, the strategy presented would avert damaging known and unknown archaeological sites without the need to hand test the entire length of the pipeline route.

2.8 Socioeconomics

2.8.1 Existing Conditions

2.8.1.1 Population

The project study area includes parts of five towns, all in Orange County: Blooming Grove, Cornwall, Monroe, New Windsor, and Woodbury. The U.S. Census also compiles data for the Village of Kiryas Joel within the Town of Monroe and for two "hamlets" in the study area: Vails Gate, within the Town of New Windsor, and Highland Mills, within the Town of Woodbury. Table 2-6 shows census data for these locations and for Orange County as a whole.

Table 2-6
Population and Housing

Demographic parameter	Town of Monroe		Town of Woodbury		Town of Cornwall	Town of New Windsor		Town of Blooming Grove	Orange County
	Village of Kiryas Joel	Balance of town	Highland Mills CDP	Balance of town		Vails Gate CDP	Balance of town		
Population in 1990	7,437	15,598	2,576	5,660	11,270	3,014	19,923	16,673	307,647
Population in 2000	13,138	18,269	3,468	5,992	12,307	3,319	19,547	17,351	341,367
Change from 1990 to 2000	77%	17%	35%	6%	9%	10%	-2%	4%	11%
Median age[1]	15	23	36	36	38	38	37	36	35
Households with a member over 65 years of age	6%	20%	14%	18%	25%	29%	24%	19%	22%
Households with a member under 18 years of age	81%	46%	50%	49%	39%	31%	40%	47%	42%
Average household size	5.7	3.0	2.9	3.1	2.7	2.3	2.8	3.0	3.0
Racial composition									
White	99%	92%	87%	92%	95%	72%	87%	90%	84%
Black/African American	0.2%	1.9%	5.1%	1.9%	1.3%	12%	5.9%	3.8%	8.1%
Asian	0.02%	2.3%	2.7%	2.5%	1.3%	4.2%	1.3%	1.4%	1.5%
Other[2]	0.8%	3.8%	5.0%	3.7%	2.7%	12%	6.0%	4.5%	6.7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Hispanic or Latino[2]	0.9%	7.8%	9.1%	7.3%	5.1%	19.3%	9.7%	9.0%	11.6%
Percentage of single-family detached housing units	5%	72%	52%	80%	70%	29%	66%	75%	62%
Percentage of housing units in structures of 5 or more units	52%	11%	4%	6%	12%	43%	10%	9%	28%
Percentage of occupied housing units that are rented	69%	20%	12%	21%	29%	56%	24%	19%	33%
Median contract rent[1]	$661	$708	$592	$762	$647	$692	$671	$673	$631
Median value of owner-occupied housing units[1]	$159,000	$168,500	$163,900	$176,300	$163,800	$122,600	$134,400	$161,200	$141,500
Median household income[1]	$15,138	$50,889	$80,581	$79,087	$59,537	$39,851	$51,113	$66,040	$52,058
Per-capita income	$4,355	$25,353	$30,257	$27,587	$28,509	$22,967	$22,779	$25,097	$21,597
Percent below poverty level	62.2%	5.4%	3.0%	3.5%	5.0%	10.4%	5.1%	3.9%	10.5%

CDP = census designated place

[1]For "balance of town" in Monroe, Woodbury and New Windsor, the listed values are actually medians for the towns as a whole rather than for just the portions outside the designated village or census designated place.

[2]In the US Census, Hispanic/Latino is a nonracial category. The majority of Hispanics and Latinos in Orange County identify themselves as white, but many identify themselves as "other," and they account for the majority of this racial category.

Source: 2000 Census except 1990 population, which is from the 1990 Census.

The Village of Kiryas Joel has notable demographic characteristics. The population of the Village grew 5.9 percent per year from 1990 to 2000. The second fastest growing part of the study area for which the Census compiles data, the hamlet of Highland Mills, grew 3.0 percent per year during the same period. The population of Orange County as a whole grew 1.0 percent per year.

The median age in Kiryas Joel is 15, less than half the county median. In most sections of the study area, the median age is slightly higher than the county median. The average household size in Kiryas Joel is 5.7, almost twice the county average of 3.0. Eighty-one percent of the households in Kiryas Joel have a member under 18 years of age, almost double the percentage for the county as a whole.

Only 6 percent of the households in Kiryas Joel include a member over 65 years of age. The Village was founded in 1977 and has been populated mainly by young couples and their children. Many members of the generation of Hasidic Jews who would now be over 65 years of age were killed during the Holocaust.

Racially, the population of Kiryas Joel is 99-percent white. Less than 1 percent of Village residents identify themselves as Hispanic or Latino. Within the study area, the hamlet of Vails Gate has the highest percentage of minority group members. Vails Gate is 12 percent black or African American, 4 percent Asian, and 19 percent Hispanic/Latino. All of these percentages are above the Orange County average.

The Orange County Department of Planning has posted population projections on its web site for the each town and incorporated village in the county except Kiryas Joel. Primarily because of the short history of Kiryas Joel, which did not exist prior to 1977, the Department of Planning does not believe it can make population projections for Kiryas Joel that have a reasonable likelihood of proving valid.

Table 2-7 shows the county projections for the five towns that overlap the primary study area. The study area towns are projected to grow at a faster rate than the county as a whole.

The population of Kiryas Joel increased by 13.5 percent per year from 1980 to 1990 and 5.9 percent per year from 1990 to 2000. Currently, growth in Kiryas Joel is primarily internal and results from two principal factors: large family size and young women remaining in the Village to have families of their own. Both of these growth factors are responses to the obligations of Hasidic religious practice. Young women graduating from school in Kiryas Joel marry at age 18, and the marriage rate is increasing as the young Village population matures. The population of Kiryas Joel will continue to grow.

Table 2-7
Population Projections

Political subdivision	2000 Census	Projected annual growth rate	Projections			
			2010	2015	2020	2025
Town of Blooming Grove	17,351	2.58%	22,376	25,410	28,855	32,768
Town of Cornwall	12,307	1.26%	13,943	14,841	15,797	16,814
Town of Monroe (including Kiryas Joel)	31,407	3.26%	43,300	50,842	59,697	70,095
Town of New Windsor	22,866	2.79%	30,099	34,534	39,621	45,458
Town of Woodbury	9,460	2.00%	11,529	12,727	14,049	15,509
Orange County	341,367	1.24%	386,215	410,802	436,954	464,772

Source: Orange County Department of Planning

2.8.1.2 Housing

In comparison to Orange County as a whole, Kiryas Joel has a low percentage of single-family detached housing units, a high percentage of housing units in buildings with five or more units, and a high percentage of rented units. In this respect, Vails Gate is the section of the study area most similar to Kiryas Joel.

The median rent and median value of owner-occupied housing in Kiryas Joel are typical of the study area and the county. Median household income and per-capita income are very low in the Village, however, and 62 percent of Village residents live in households that are below the federally designated poverty level. Vails Gate has a poverty rate close to the county rate of 10.5 percent, and the other sections of the study area have poverty rates well below the county average. Highland Mills and the rest of the Town of Woodbury have the highest median household incomes in the study area.

2.8.1.3 Employment

Table 2-8 shows the distribution of employed residents of the study area among general types of occupations. Kiryas Joel has a low percentage in sales and office occupations and a relatively high percentage in production, transportation, and material moving occupations. The towns of Woodbury and Cornwall have relatively high percentages in management, professional, and related occupations. Approximately 20 percent of employed residents of Kiryas Joel are in education, training and library occupations, a subset of management, professional, and related occupations. This is almost double the percentage in any other municipality in the study area.

2.8.1.4 Community Services

Schools

The Village of Kiryas Joel contains eight schools serving grades prekindergarten through 12. Only one of the eight schools is in the vicinity of the proposed project: the UTA Masivta rabbinical college, on Berdichev Road near the western end of the Village. Dormitories and a dining hall for this school are directly across Berdichev Road from an existing Village water treatment facility. This facility is the proposed site for the new water treatment facility that would be constructed as part of the proposed project. The proposed water transmission pipeline would follow Berdichev Road from Schunnemunk Road to the treatment facility.

The school system of Kiryas Joel is predominantly private, but education for children with special needs is provided through the Kiryas Joel Union Free School District, a public school district.

Outside Kiryas Joel, the study area contains only two schools, with a third under construction. The Thevenet Montessori School is on County Route 105 opposite Roselawn Road, near the southwestern corner of Highland Mills in the Town of Woodbury. Round Hill Elementary School, part of the Washingtonville Central

Table 2-8
Occupations of Employed Residents

Type of occupation	Town of Monroe		Town of Woodbury		Town of Cornwall	Town of New Windsor		Town of Blooming Grove	Orange County
	Village of Kiryas Joel	Balance of town	Highland Mills CDP	Balance of Town		Vails Gate CDP	Balance of town		
Management, professional, and related occupations	36.0%	37.1%	42.4%	45.6%	43.4%	31.8%	32.8%	34.5%	33.2%
Sales and office occupations	6.5%	15.7%	14.7%	12.0%	13.6%	19.1%	15.9%	16.5%	16.5%
Service occupations	31.5%	30.3%	27.8%	27.7%	25.3%	27.3%	30.5%	28.5%	27.6%
Farming, fishing, and forestry	0.3%	0.1%	0.0%	0.6%	0.2%	0.0%	0.1%	0.0%	0.4%
Construction, extraction, and maintenance	7.3%	8.5%	9.1%	8.2%	10.1%	11.5%	10.7%	11.1%	10.2%
Production, transportation, and material moving	18.3%	8.3%	6.0%	5.9%	7.4%	10.3%	10.0%	9.4%	12.1%

Source: 2000 Census

School District, is on Round Hill Road just east of State Route 208 in the Town of Blooming Grove. The Round Hill school is approximately 0.8 miles from the proposed pipeline route.

The new Cornwall Central High School is under construction off the south side of State Route 94 southwest of Vails Gate, approximately half a mile west of the NYS Thruway. The school is set back from Route 94 approximately 1,000 feet.

Fire Protection

The Village of Kiryas Joel has a volunteer fire department that provides first response to fires in the Village. A new emergency service center and firehouse is under construction on Mountain Avenue. The Village contracts with the Mombasha Fire Company (the Village of Monroe fire department) for additional service. The Mombasha Fire Company has a station at the intersection of Gilbert Street, Main Street and State Route 208, just outside the study area at the northern end of the Village of Monroe.

The study area contains five additional fire stations:

- The South Blooming Grove Independence Fire Company facility on Duelk Avenue just off State Route 208 in the Town of Blooming Grove. This fire company serves the southwestern part of the study area, offering emergency medical services in addition to fire protection. The fire station is behind a bank branch that faces Route 208. The proposed pipeline route follows Route 208 through the area.

- Two stations of the Vails Gate Fire Department on State Route 94 in Vails Gate, Town of New Windsor, east of State Route 32. These stations serve the northeastern corner of the study area.

- The Salisbury Mills Fire Department station on Orrs Mills Road (County Route 20) in Salisbury Mills, just west of the T-intersection of Orrs Mills Road and County Route 27. The proposed pipeline route would approach this intersection from the east and turn south on Route 27, and so would not pass the fire station. The Salisbury Mills Fire Department serves the north central part of the study area, offering emergency medical services in addition to fire protection.

- The station of the Mountain Lodge Park Volunteer Fire Department in the Mountain Lodge Park residential development off the southeast side of Route 27.

The northwestern part of the study area is served by the Monell Engine Company of the Washingtonville Fire District. The company is stationed on East Main Street (State Route 94) in the Village of Washingtonville, outside the study area.

A portion of the northeastern part of the study area is served by Storm King Fire Engine Company #2 on Hudson Street in Cornwall on Hudson, Town of Cornwall, just east of Duncan Avenue.

The southeastern part of the study area is served by the Highland Mills Fire Company of the Woodbury Fire District. The company has a new facility on State Route 32 in Highland Mills, just south of County Route 105 and downtown Highland Mills.

All fire departments in Orange County operate under the Orange County Fire Mutual Aid Plan and can be dispatched through the County 911 Communications Center.

Police Protection

The Village of Kiryas Joel has a constable, but police protection is provided by the New York State Police from their Monroe station on Dunderberg Road at the southeastern corner of the village.

The Woodbury Police Department has its headquarters on State Route 32 between Highland Mills and Central Valley, inside the study area but not on the portion of Route 32 being considered as a pipeline route. The Cornwall Police Department is stationed on Main Street in the northeastern section of the town, east of the study area and just west of the Village of Cornwall on Hudson. Vails Gate is in the jurisdiction of the New Windsor Police Department, stationed on Union Avenue just east of State Route 300, approximately 0.8 miles north of Vails Gate.

Within the Town of Blooming Grove, the Village of Washingtonville has its own police department with headquarters on State Route 94 just east of State Route 208. The Blooming Grove Police Department has its headquarters in the Blooming Grove Government Center at the intersection of Route 94 and Horton Road, west of the study area.

Emergency Medical Services

Emergency medical services in Kiryas Joel are provided by the Kiryas Joel Volunteer Emergency Medical Service, based on Forest Road near the center of the village. The New York State Department of Health has authorized the Kiryas Joel EMS to offer paramedic services in addition to the basic life support offered by all ambulance services in Orange County.

Woodbury Community Ambulance on Route 32 between Highland Mills and Central Valley serves the southeastern part of the study area. Two fire companies in the study area, the South Blooming Grove Independence Fire Company and the Salisbury Mills Fire Department, also provide emergency medical services (see "Fire Protection" above).

The Blooming Grove Volunteer Ambulance Corps, based in Washingtonville, serves the northwestern part of the study area. The northeastern part of the study area is served by two ambulance services: the New Windsor Volunteer Ambulance Corps on Union Avenue just east of Route 32, approximately 0.8 miles north of Vails Gate, and the Cornwall Volunteer Ambulance Corps at Clinton and Hasbrouck streets in Cornwall, approximately 1 mile east of Route 32.

2.8.1.5 Business Activity

There are no business establishments in the vicinity of the proposed Aqueduct connection and pump station or the proposed water treatment plant. The proposed pipeline route is largely rural and suburban-residential, with relatively few business establishments. Business activity is concentrated in Vails Gate and Salisbury Mills, on Route 208 north of County Route 44, and to some degree on Route 27 at Mountain Lodge Park. The property of the Lake Anne Country Club fronts on Route 27 near Route 208, but activity at the club occurs well back from the road.

2.8.1.6 Cost of Water in Kiryas Joel

The current cost of potable water in Kiryas Joel is $2.75 per thousand gallons. This means a typical household in Kiryas Joel spends approximately 2.5 percent of its income on potable water.

2.8.2 Impacts

Hasidic families are large in accordance with the obligations of their religious practice. The lack of essential services, such as drinking water, has not slowed population growth in Kiryas Joel. Whether or not the proposed aqueduct connection is implemented, Kiryas Joel will continue to grow. Therefore, the proposed aqueduct connection would not have a significant impact on the population of Kiryas Joel or on the housing the village population requires.

Disruption of the UTA Masivta rabbinical college would be minimal. It is a residential school with minimal vehicular traffic. Construction of the pipeline and treatment plant would occur on the opposite side of the street from the school, and would therefore not conflict with school functions. Construction would not occur during hours when the students were sleeping in the dormitories across the street. The classroom buildings are farther from the construction area than the dormitories.

Construction of the proposed pipeline would have minor temporary impacts on businesses along the pipeline route, on school bus service, and on emergency vehicles. The number of businesses involved is small. For a full discussion of traffic-related impacts, see Section 2.11.2.

The proposed aqueduct connection would generate jobs during construction. After construction is complete, the proposed project would have no impact on employment.

Implementation of the proposed Aqueduct connection would increase the cost of the Kiryas Joel water supply system, because the existing groundwater pumping system would be maintained as backup to the Aqueduct connection.

2.8.3 Mitigation

The potential impacts of the proposed project to businesses, school bus service, and emergency services are related to traffic. For a discussion of mitigation measures for traffic-related impacts, see Section 2.11.3.

Implementation of a connection to the Catskill Aqueduct would reduce the need to develop new groundwater wells to serve Kiryas Joel. This would mitigate the impact of the proposed project on the cost of water in Kiryas Joel.

2.9 Land Use

2.9.1 Existing Conditions

2.9.1.1 Existing Land Use

Figure 2-12 gives a general picture of land use in the study area. Because the land use mapping shown in the figure is based on interpretation of photographs taken from satellites, it is only generally accurate. It does not show the correct land use for each individual parcel of land.

Land use in the vicinity of the proposed Aqueduct connection and pump station is a mix of low-density residential, upland forest, the West Windsor water treatment facility, and the Catskill Aqueduct.

The principal land uses along the proposed pipeline route are low-density residential, upland forest, and agricultural. Residential use is concentrated in five areas: Vails Gate, Salisbury Mills, Mountain Lodge Park on County Route 27, on State Route 208 northwest of Kiryas Joel, and on both sides of the Kiryas Joel border at the southwest corner of the Village. The limited commercial use along the proposed pipeline route is concentrated in these same areas, with the exception of the southwest corner of Kiryas Joel. Agricultural use is concentrated between Vails Gate and Salisbury Mills and between Salisbury Mills and the Mountain Lodge Park.

In Kiryas Joel, the proposed pipeline route passes multi-family dwellings on the south side of Schunnemunk Road. The proposed site of the new water treatment plant on Berdichev Road is already in use as a water treatment facility. The UTA Masivta rabbinical college is across Berdichev Road to the west and residential buildings line the top of a steep slope to the east.

2.9.1.2 Land Use Planning

The Orange County Department of Planning has designated "priority growth areas," which include the "Urban Area" of the county. The Urban Area includes the established municipal centers and surrounding or connecting areas where public infrastructure such as major roads and centralized water and sewer services are available or could be efficiently extended to accommodate growth. The Orange County Comprehensive Plan of January 2003 states that higher density residential development and complementary civic, commercial and industrial development are preferred in the Urban Area. The following elements of the project study area are in the designated Urban Area:

- The Village of Kiryas Joel
- The hamlet of Highland Mills in the Town of Woodbury
- The County Route 44 and County Route 105 corridors between Kiryas Joel and Highland Mills

- The NYS Route 208 corridor
- The portion of the County Route 27 corridor between NYS Route 208 and the northern end of Mountain Lodge Park
- The eastern half of the Town of New Windsor, including Vails Gate and the proposed locations for the Aqueduct connection and the pumping station
- The NYS Route 94 corridor between Vails Gate and Washingtonville

Most of the land in Orange County is outside the designated Urban Area and is referred to as the Rural Area. The Orange County Comprehensive Plan states that the Rural Area concept supports maintenance of a mix or agriculture, forestry, and natural areas along with lower intensity residential and commercial uses. The proposed pipeline route would pass through the Rural Area on County Route 27 from the southern edge of Salisbury Mills to the northern end of Mountain Lodge Park.

2.9.2 Impacts

Construction of a connection to the Catskill Aqueduct and a pump station near the New Windsor water treatment facility would be consistent with existing land use. Construction of a new water treatment facility at the site of the existing Kiryas Joel water treatment facility on Berdichev Road would also be consistent with existing land use. Construction of the proposed pipeline in the rights-of-way of existing public roads would have no impact on existing land use.

Improvement of the water supply infrastructure in the Village of Kiryas Joel is consistent with the Orange County Comprehensive Plan, which identifies the Village as a priority growth area.

2.9.3 Mitigation

Because the proposed project would have no significant land use impacts, no mitigation is needed.

2.10 Transportation and Traffic

The following first describes the existing road conditions and then discusses potential construction related transportation and traffic impacts of the proposed project. It addresses whether construction of the project would result in the alteration of surface transportation patterns or otherwise divide or disrupt established communities or orderly, planned development. Such disruption is not considered to be significant unless there is a noticeable increase in congestion or access time to community facilities, recreation areas, or places of residence or business or other disruption that cannot be prevented or minimized. It also addresses the project's effect on existing transportation systems by determining whether there would be an alteration of present patterns of movement of people and/or goods or whether the proposed action would result in major traffic problems.

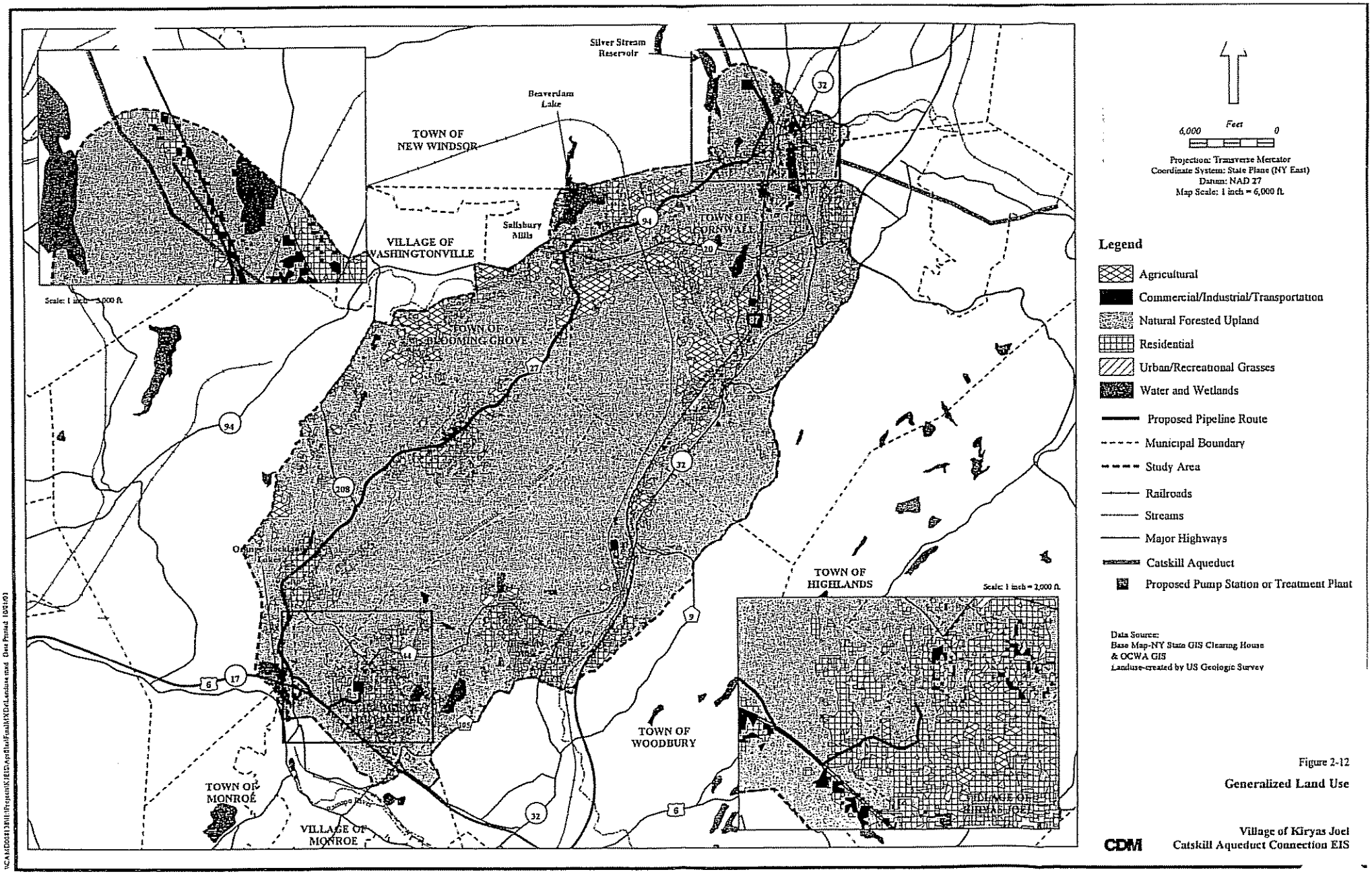


Figure 2-12

Generalized Land Use

CDM

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

R453

2.10.1 Existing Conditions

The proposed aqueduct connection and pump station location for the Village of Kiryas Joel connection to the Catskill Aqueduct is west of Riley Road in the Vails Gate section of the Town of New Windsor, New York. From this location, the proposed pipeline corridor utilizes Riley Road, State Route 94, Clove Road, County Route 27, State Route 208, U.S. Route 6/State Route 17 westbound off-ramp to Seven Springs Road/Schunnemunk Road, terminating at a new water treatment plant site in the Village (see Figure 2-1).

2.10.1.1 Existing Highway System

The highway system in Orange County serves travel by personal vehicle, taxi, freight movements by truck, and transit movement by bus. Travel by individual vehicle is the dominant transportation mode. The 2020 Vision-Orange County Transportation Plan estimates that over 90 percent of the current daily travel is made by private vehicles on the highway system. Defining a trip as a one-way movement, it is estimated that over 1.1 million vehicle trips per day are currently made in Orange County. The majority of the highway mileage is the responsibility of local municipal governments.

The existing highway system for the proposed pipeline corridor is described below.

2.10.1.2 Riley Road

Riley Road is a north-south, two-lane local road that intersects State Route 207 to the north and State Route 94 to the south. The posted speed limit is 30 mph. The intersection with State Route 94 is 3-way with no turn lanes and it is controlled with a stop sign on Riley Road. No traffic counts are available, but observations of traffic indicate that traffic volume is light.

2.10.1.3 State Route 94

The functional classification of State Route 94 is Urban Principal Arterial-Other. It is an east-west, two-lane highway that intersects with U.S. Route 9W to the northeast and the New Jersey state line to the southwest. Intersecting roads within the corridor are controlled with stop signs. The intersection with County Route 27 is 3-way with no turn lanes and it is controlled with a stop sign on County Route 27. The posted speed limit is 40 mph. The 2001 Average Annual Daily Traffic (AADT) is estimated by the New York State Department of Transportation to be 7,900 between the intersection with County Road 20 (Salisbury Mills) and the intersection with State Routes 32 and 300 in Vails Gate.

2.10.1.4 Clove Road

Clove Road is a north-south, two-lane local road that intersects State Route 94 to the north and County Routes 20 and 27 in Salisbury Mills to the south. The posted speed limit is 30 mph. The intersection with State Route 94 is 3-way with no turn lanes, and it is controlled with a stop sign on Clove Road. The intersection with County Routes 20 and 27 is essentially 4-way with County Route 27 offset slightly to the west. It is controlled with stop signs on Clove Road north of County Route 20 and on County

Route 27. No traffic counts are available, but observations of traffic indicate that traffic volume is light.

2.10.1.5 County Route 27

County Route 27 is a north-south, two-lane road that intersects State Route 94 to the north and State Route 208 to the south. The posted speed limit is 45 mph. Increased truck traffic is present on this road because trucks enter and exit from the Callahan & Nannini Quarry. Intersecting roads within are controlled with stop signs. The intersection with State Route 208 is 3-way and it is controlled with a traffic signal. The 2001 Average Annual Daily Traffic (AADT) is estimated by the Orange County Department of Public Works to be 3,237 at 300 feet south of the intersection with Otterkill Road.

2.10.1.6 State Route 208

The functional classification of State Route 208 is both an Urban Minor Arterial and a Rural Minor Arterial. It is a north-south, predominantly two-lane highway that intersects State Route 299 in Ulster County to the north and State Route 17M to the south. Some sections within the corridor are posted for a 45 mph speed limit and some sections are posted for a 55 mph speed limit. Intersecting roads within the corridor are controlled by both traffic signals and stop signs. The intersection with the U.S. Route 6/State Route 17 westbound off-ramp is 4-way and it is controlled with a traffic signal. The 2001 Average Annual Daily Traffic (AADT) is estimated by the New York State Department of Transportation to be 16,500 between the intersection with U.S. Route 6/State Route 17 and the intersection with County Road 27.

2.10.1.7 Seven Springs Road/Schunnemunk Road

Seven Springs Road/Schunnemunk Road is a two-lane local road that travels both north-south and east-west. Intersecting roads are controlled primarily with stop signs with some intersections controlled with yield signs. No traffic counts were available for this road but traffic was observed to be light.

2.10.1.8 Other Modes of Transportation

Public transit encompasses a variety of modes in Orange County: high-speed rail, commuter rail, light rail, intercity and local bus services, van pools, and other demand-responsive services. There are 6 regional bus companies, 3 local bus companies, 9 Dial-A-Bus operations, 1 trolley bus operation and 1 commuter rail service. In the vicinity of the project Kiryas Joel Bus operates a local service with a fixed route that provides service in the village and to destinations in Monroe and Woodbury. KJ Shuttle service connects Kiryas Joel and Rockland County. Short Line operates a commuter service with an express fixed route traveling between Newburgh, Vails Gate, Woodbury and New York City. Monroe Bus Company also provides service between Kiryas Joel and New York City.

Bicycle/pedestrian travel in Orange County is accommodated by shared use of roadways, 3 miles of on-road bike facility, 6.3 miles of multi-use trail, recreational

trails, and sidewalks. Because facilities are limited, sharing highway space with motorists is the only option for non-motorists in most parts of the County.

2.10.2 Impacts

2.10.2.1 Construction Impacts

The exact location of the pipeline in the existing roadways has not yet been determined. The location would be set during detailed design. It is anticipated that the pipeline would be placed in one of the following locations:

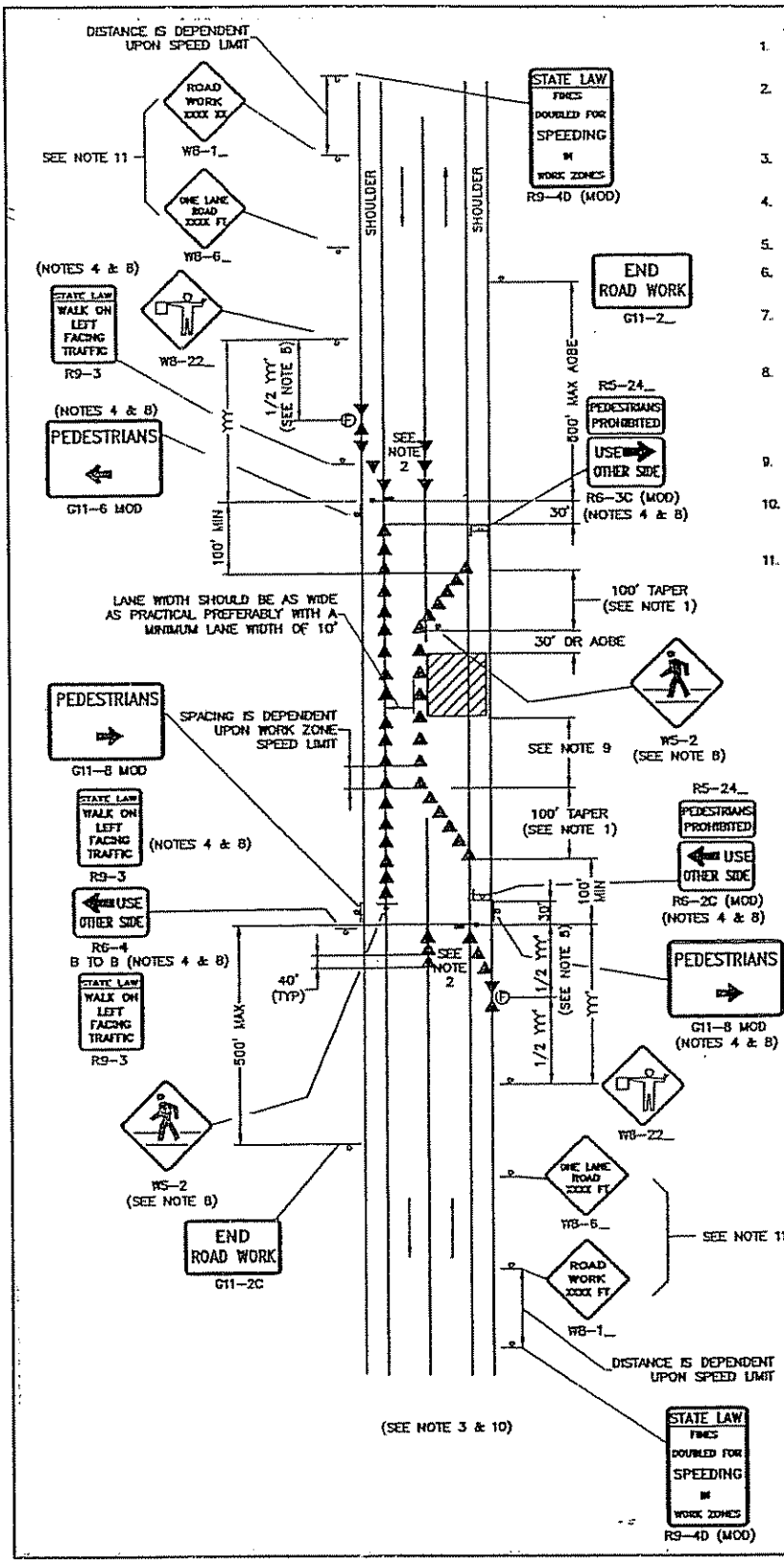
1. In the highway right-of-way, but outside the limits of the roadway.
2. In the shoulder of the roadway.
3. In one or two of the roadway travel lanes.
4. A combination of two or all three of the above location scenarios.

The four location scenarios noted above have the potential to produce somewhat different impacts. For all of the scenarios except the first it is anticipated that the pipeline would be installed utilizing alternating one-way traffic in the immediate vicinity of the pipeline installation. This method uses short-term single lane closures that shift along the roadway as the pipeline installation progresses. Traffic would be controlled by appropriate signage along with flag persons following the New York State Department of Transportation Manual of Uniform Traffic Control Devices. Refer to Figures 2-13 and 2-14 for the anticipated maintenance and protection of traffic schemes. The need for short-term single lane closures is not anticipated if the pipeline is located outside the limits of the roadway, although temporary closing of the roadway shoulder could still be required.

Where the pipeline crosses streams or areas of lower elevation, where a bridge or culvert currently exist, the pipeline could either be supported on the bridge or culvert or it could be placed below ground, under the stream or under the area of lower elevation. It is anticipated that the same method of traffic control noted above would be utilized at these particular locations. The crossing at Moodna Creek would be coordinated with the Orange County Department of Public Works.

Along the proposed pipeline route, one pipeline crossing at a railway structure would be required. The structure carries the railway over Route 94. This crossing would be coordinated with Metro-North Railroad and the New York State Department of Transportation.

Construction of the aqueduct connection and pump station west of Riley Road in Vails Gate would occur well off the highway and therefore would not require traffic control on Riley Road or any other nearby highway. Traffic volumes would increase slightly for a short time in the morning and in the evening when workers are traveling to and from the site. There would also be an occasional truck traveling to and from



NOTES:

1. A MINIMUM OF 6 CHANNELIZING DEVICES SHALL BE SPACED EQUALLY OVER THE LENGTH OF THE TAPER.
2. AS SHOWN, 3 CONES ALONG THE CENTER LINE & 3 CONES ON THE RIGHT ALONG THE EDGE OF PAVEMENT AND NOT ON THE SIDEWALK SHALL PRECEDE THE FLAGGER IN THE DIRECTION FROM WHICH THAT FLAGGER IS CONTROLLING TRAFFIC.
3. FLAGGERS SHALL STOP TRAFFIC IN BOTH DIRECTIONS TO ALLOW PEDESTRIANS TO SAFELY CROSS THE ROAD.
4. THIS POSTING SHALL BE REPEATED AT ALL ROADWAYS INTERSECTING THE ACTIVITY AREA.
5. FOR 30 MPH SPEEDS, THIS DISTANCE SHALL BE 200'.
6. THE FLAG TREE SHALL BE PLACED AT THE EDGE OF SHOULDER. TWO CONES SHALL BE PLACED AT THE BASE.
7. W5-1 SIGNS SHALL BE POSTED IN ALL NON-URBAN AREAS OR ANY OTHER AREAS IN WHICH PEDESTRIANS MIGHT NOT BE EXPECTED, AS DETERMINED BY THE ENGINEER.
8. THESE SIGNS SHALL BE POSTED DURING ALL HOURS THE PEDESTRIAN TRAFFIC CONTROL PLAN IS IN PLACE. W5-2 SIGNS MAY BE DELETED, AS DETERMINED BY THE ENGINEER, WHERE THE TEMPORARY PEDESTRIAN CROSSING IS AT A ROADWAY INTERSECTION.
9. THIS DISTANCE SHOULD BE THE STOPPING SIGHT DISTANCE (SSD) APPROPRIATE FOR THE SPEED OF THE APPROACHING TRAFFIC.
10. THE DETAIL SHOWN IS FOR A HIGHWAY SECTION WITH SHOULDERS. FOR A CURB SECTION, THE INSIDE EDGE OF SHOULDER REPRESENTS THE FACE OF CURB.
11. * FOR APPROACH SPEEDS OF 35 MPH OR LESS THE DISTANCE LEGENDS FOR THE W8-1 AND W8-6 SIGNS SHOULD BE "1500 FT" AND "1000 FT" RESPECTIVELY.
    * FOR APPROACH SPEEDS OVER 35 MPH THE DISTANCE LEGENDS SHOULD BE "1/2 MILE" AND "1500 FT" RESPECTIVELY. ADDITIONAL SIGNS MAY BE NEEDED IF LONG QUEUES ARE EXPECTED FOR HIGH SPEED HIGHWAYS.
    * FOR VILLAGE AND CITY STREETS THE DISTANCE LEGEND "AHEAD" OR OTHER SPECIFIC DISTANCE LEGENDS MAY BE USED WHEN THE ABOVE NOTED DISTANCE VALUES ARE INAPPROPRIATE FOR THE LOCATION. (E: LOW SPEED URBAN LOCATION).
    * IN ALL CASES SIGNING IS TYPICAL FOR BOTH DIRECTIONS OF TRAVEL.

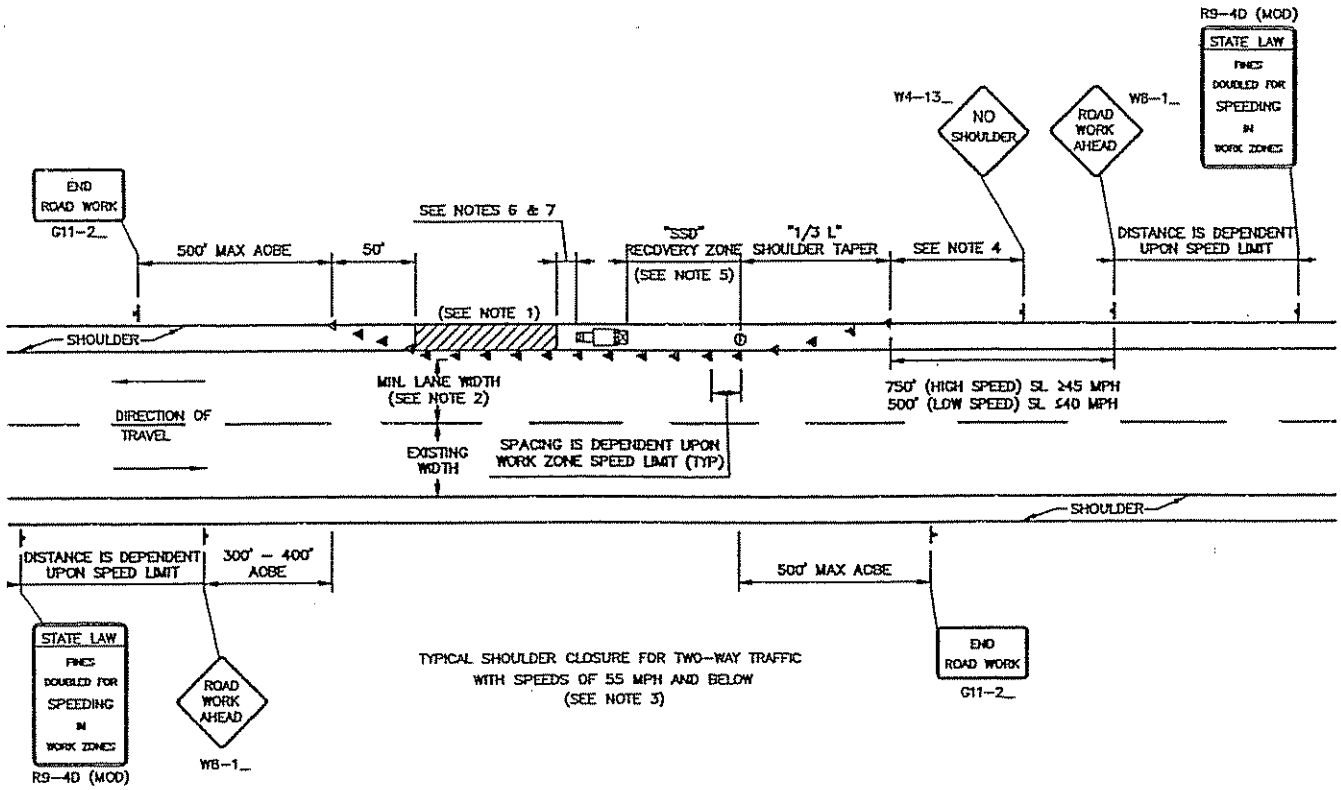
LEGEND

- CHANNELIZING DEVICE
- WORK AREA
- SIGN (NYS MUTCD)
- FLAGGER
- FLAG TREE (NOTE 6)
- TYPE III CONSTRUCTION BARRICADE

Maintenance and Protection of Traffic
Typical Lane Reduction with Flaggers
One Lane - Two Way Traffic

Figure 2-13

CDM



TYPICAL SHOULDER CLOSURE FOR TWO-WAY TRAFFIC WITH SPEEDS OF 55 MPH AND BELOW (SEE NOTE 3)

NOTES:

1. WHERE THE NO SHOULDER CONDITION EXISTS FOR A DISTANCE OF 1000' OR LONGER, A W9-2_ AUXILIARY SIGN SHOULD BE ADDED, OF W4-13_ "NO SHOULDER" SIGNS POSTED EVERY 1000'. A "NO SHOULDER" SIGN SHALL BE POSTED AT INTERSECTING ROADS, JUST BEYOND THE INTERSECTION AND SUPPLEMENTED WITH A W9-2_ SIGN, IF NOT ALREADY POSTED EVERY 1000'.
2. LANE WIDTH SHOULD BE AS WIDE AS PRACTICAL PREFERABLY WITH A MINIMUM LANE WIDTH OF 10'. WHEN THE MINIMUM LANE WIDTH, DUE TO THE SHOULDER CLOSURE CAN NOT BE MAINTAINED, A LANE CLOSURE SHALL BE USED FOR M&PT.
3. SIGN SIZE, LETTER DESIGNATION TO BE DETERMINED BY DESIGN IN CONFORMANCE WITH THE MUTCD, SECTION 201.2.
4. SEE POSTING CATEGORY III OF MUTCD FOR POSITIONING OF "NO SHOULDER" SIGN W4-13.
5. THIS DISTANCE SHOULD BE THE STOPPING SIGHT DISTANCE (SSD) APPROPRIATE FOR THE SPEED OF APPROACHING TRAFFIC, WHEN NO IMPACT ATTENUATOR IS USED, THE DISTANCE FROM THE END OF THE SHOULDER TAPER TO THE WORK AREA SHOULD BE THE SSD.
6. SHADOW VEHICLE WITH TRUCK MOUNTED IMPACT ATTENUATOR (TMIA) ARE AN ADDITIONAL OPTION.
7. THIS DISTANCE SHALL BE 100' FOR OPERATING SPEEDS AND SPEED LIMITS LESS THAN 45 MPH, AND 125' FOR SPEEDS BETWEEN 45 MPH AND 55 MPH.

LEGEND

	WORK AREA
	SIGN (NYS MUTCD)
	SHADOW VEHICLE WITH IMPACT ATTENUATOR
	FLASHING ARROW BOARD
	CHANNELIZING DEVICE
	FLAG TREE

Maintenance and Protection of Traffic
Typical Shoulder Closures with Speeds of 55 MPH and Below

Figure 2-14

the site delivering supplies and/or equipment. The greatest increase in traffic from construction of the aqueduct connection and pump station is anticipated to occur on Riley Road. Similarly, construction of the new water treatment plant would likely contribute to increases in traffic volume during morning and evening hours, and would cause truck traffic near the construction site.

The duration of project construction is anticipated to be 18 months. Depending on the weather, construction could continue or be shut down during the winter.

Traffic impacts would be concentrated along the pipeline corridor. A minor impact to residents, businesses, emergency vehicles, school buses and public transit is anticipated. The traveling public would experience slight delays and slight increases in travel time when traveling through the area where pipeline construction is taking place. Although the pipeline design is conceptual at this time, the need to detour traffic around the pipeline construction is not anticipated. Bicycle/pedestrian traffic can continue to share the roadway with vehicles.

Impacts may be slightly more significant in "tighter" village or village-like locations along the proposed corridor such as in Salisbury Mills and Kiryas Joel. At these locations a greater number of structures and sidewalks along with a higher concentration of utilities could somewhat limit the operation of construction equipment and also limit the exact location of the pipeline. There could be a need to move the equipment more frequently and result in a greater number of occurrences where traffic is slightly delayed to allow the equipment to move.

2.10.2.2 Long-term Impacts

The only long-term impact on traffic would occur from an occasional maintenance vehicle and/or truck hauling supplies and equipment to and from the pumping station or water treatment plant. In addition, plant operators would commute to and from the water treatment plant every day.

2.10.3 Mitigation

Site-specific measures to accommodate construction and minimize impacts to traffic and the transportation system would be developed during detailed design. As noted above, the use of alternating one-way traffic in the vicinity of pipe installation is anticipated. Traffic control would follow the New York State DOT manual of uniform traffic control devices (See Figures 2-13 and 2-14).

Coordination with local governments, agencies, organizations, emergency services, utility companies, television and radio, and Metro-North Railroad would help to minimize impacts. Regularly scheduled contact with the above to inform them of project status and on-going activities during construction is essential. Approval of construction permit applications is anticipated to be obtained from New York State, and, potentially, from the County, the local municipalities, and Metro-North Railroad. Project particulars would be provided in the permit applications. These entities would

become further informed on the project as a result of their review of these applications. Additional project coordination would therefore result.

It is currently anticipated that the pipeline, aqueduct connection, pump station, and water treatment plant would be constructed between the hours of sunrise to sunset. It is likely that construction contract requirements would include restrictions in the morning and afternoon during normal commute hours. For example, during a recent project on State Route 94 west of Vails Gate, the contractor was required to maintain two lanes of traffic Monday through Friday between the hours of 7 to 9 a.m. and 4 to 6 p.m. Similar restrictions are anticipated for the proposed project. Adjustments would also be made as necessary to comply with any local noise ordinances. Although at this time it does not appear that it would be necessary, consideration would be given to utilizing nighttime construction to help minimize impacts. Adjustments in the construction schedule to accommodate local special events would also be considered. The need for either long-term or short-term detours around project construction is not anticipated but would be evaluated further during design.

During detailed design, consideration would be given to the use of advance signing including the use of variable message boards to inform the traveling public on the status of construction. Local residents would be notified of the project. Some of these residents would find and utilize alternate routes to avoid construction. This would help to minimize any congestion and delays that could occur.

The increase in traffic volume from construction worker and equipment/supply traffic would be minimal. Access to residential and business driveways would be maintained at all times during construction. Construction workers would park off the roadway during construction of the elements of the project so that the vision of motorists is not hindered and so that construction does not interfere with motorists entering and exiting driveways to residences and businesses.

As discussed above, impacts that occur would be concentrated along the pipeline corridor. A very minor impact to residents, businesses, emergency vehicles, school buses and public transit is anticipated. With appropriate pre-construction design and planning, conditions during pipeline construction would not be hazardous to pipeline workers and the traveling public and there would be no significant increase in congestion or access time to community facilities and residential/commercial areas, increased traffic accidents, or an increase in other safety related issues.

No permanent highway improvements are recommended for this project.

2.11 Noise

2.11.1 Noise Fundamentals

Noise is often and most simply defined as unwanted sound. The magnitude of air pressure fluctuations produced by sound is referred to as the sound level and is measured in decibels (dB). The decibel scale, using a logarithmic function, compresses the very large range of audible pressures into a meaningful scale: 0dB

corresponds to the faintest audible sound; levels in excess of 140 dB produce pain in humans. Because human hearing sensitivity varies with the frequency of sound, a filter, called the A-weighting filter, which simulates this frequency sensitivity in human hearing, is used in measuring and reporting environmental noise levels. A-weighted sound levels are abbreviated as "dBA". Figure 2-15 shows typical A-weighted sound levels for various sources.

Since the decibel scale is logarithmic, changes in sound energy are not proportional. A 26-percent change in the energy level changes the sound level by just one decibel. The most sensitive human ear would not detect this change, except in an acoustical laboratory. A doubling of the energy level results in a 3 dB increase, which would be barely perceptible to most people. A tripling in energy level results in a clearly noticeable change of 5 dB in the sound level. A change of ten times in the energy level results in a 10dB change in the sound level. For most people a 10 dB increase in sound level is perceived as a doubling of the apparent loudness.

This understanding forms the basis for the impact significance categorizations expressed in various guidelines for assessing noise impacts, including the NYSDEC noise guidelines, "Assessing and Mitigating Noise Impacts (NYSDEC, 2001). The criteria are based on predicted increases in ambient sound levels caused by a proposed project. Human perception of sound is such that a total ambient noise level increase of 0 to 3 dBA is perceived as a "minor", insignificant project noise impact; with no appreciable effect on receptors, an increase of 3 dBA to 10 dBA is perceived as a "moderate" project noise impact, whose significance depends upon the existing ambient level and the proximity and sensitivity of noise receptors; and an increase of 10 dBA or more is perceived as a "significant" project noise impact that deserves consideration of avoidance and mitigation in most cases. See the discussion in Section 2.12.2 on applicable regulatory guidance.

The primary noise descriptor used in this report is the energy equivalent sound level (Leq). The Leq is a single value average of the energy content of a time-varying sound level for any time period. The Leq is suitable for representing the time-varying noise levels associated with land uses and activities along highways and roads such as would occur with the proposed project.

Noise levels occurring at night (after 10:00 p.m.) generally produce greater annoyance than do the same levels occurring during the day. It is generally agreed that community perception of nighttime noise levels is 10 dBA higher. That is, a given level of environmental noise during the day would appear to be approximately 10 dBA louder at night, at least in terms of community annoyance. This is largely because nighttime environmental ambient levels in most areas are approximately 10 dBA lower than daytime noise levels. However, project construction is not proposed to occur at night. The only long-term nighttime project noise sources are the proposed pump station and water treatment facility.

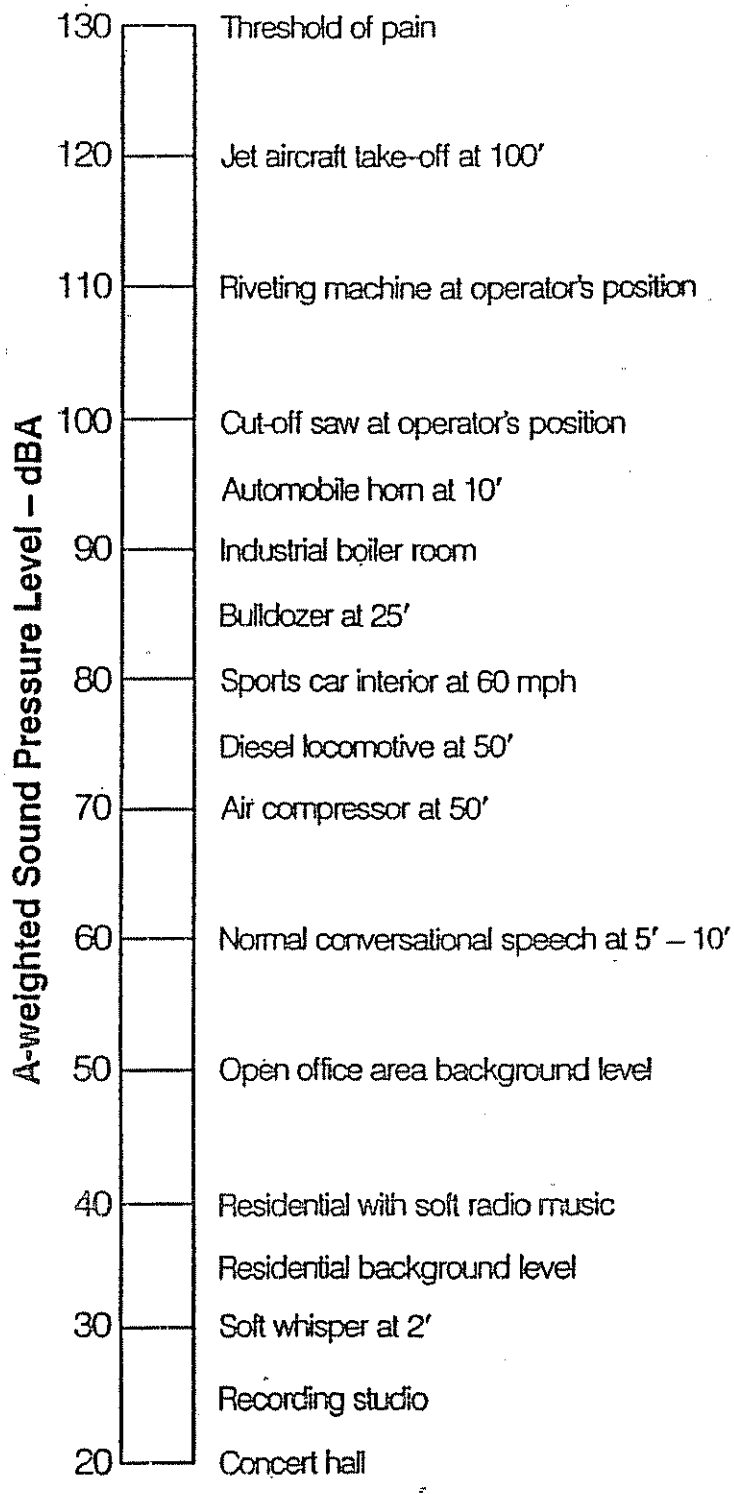


Figure 2-15

A-Weighted Sound Pressure Levels Associated with Common Sounds

2.11.2 Applicable Guidance and Regulations

2.11.2.1 Local

Town of Monroe and Town of Woodbury

The towns of Monroe and Woodbury noise ordinances (Chapter 334 & 208, Noise, respectively) prohibit "loud, unreasonable, or unusual noises which disturb the peace and quiet of any neighborhood or which cause discomfort or annoyance to any reasonable person of normal sensitivities residing in the area." However, the ordinances do not establish a numerical sound level standard against which to judge a particular operation.

In the case of the Town of Monroe ordinance, the hours for erection, excavation, demolition, alteration or building repair are limited by the ordinance to 7:00 a.m. to 9:00 p.m., on weekdays and 9:00 a.m. to 9:00 p.m. on Saturday and Sunday.

Town of New Windsor

The Town of New Windsor noise regulations (Chapter 48, Town Code) establish a maximum daytime (8:00 a.m. to 9:00 p.m.) sound level of 65 dBA for stationary sources (such as machinery, motors, pumps, fans) in a residential zoning district (80 dBA in non-residential zoning districts) measured at a point not nearer than the property line of the subject property nearest the source of the noise. The maximum sound level applies to intermittent, impulsive, sporadic or continuous noise. However, construction activities from 7:00 a.m. to 7:00 p.m. are exempted from these limitations.

Town of Cornwall

The Town of Cornwall noise regulations establish maximum permissible sound-pressure levels at specified points of measurement for noise radiated continuously from a facility between 7:00 p.m. and 7:00 a.m. as follows:

Octave Band (cycles per second)	Sound-Pressure Level (decibels)
20-75	67
75-100	66
150-300	61
300-600	54
600-1,200	47
1,200-2,400	39
2,400-4,800	29
4,800-10,000	20

If the noise is not smooth and continuous and/or is not radiated between 7:00 p.m. and 7:00 a.m., the following corrections to the above table are to be made (only one correction is applied):

Daytime operation only – Plus 5 decibels

Noise source operates less than 20% of any one-hour period – Plus 5 decibels

Noise source operates less than 5% of any one-hour period – Plus 10 decibels

Impulsive noise – Minus 5 decibels

Periodic noise – Minus 5 decibels

Town of Blooming Grove

The Town of Blooming Grove noise ordinance, Chapter 158, declares it unlawful to perform outside construction work or operate construction type devices between 9:00 p.m. of one day and 7:00 a.m. of the next day in such a manner that a reasonable person of normal sensitivity residing in the area is caused discomfort of annoyance.

The maximum permitted sound-pressure level from any activity at or beyond any lot line is governed by an octave band table as follows:

Octave Band (cycles per second)	Sound-Pressure Level (decibels)
0-74	66
75-149	58
150-299	55
300-599	50
600-1,199	45
1,200-2,399	42
2,400-4,799	38
4,800-20,000	35

Where the lot lies within 200 feet of a residence district, the maximum permitted decibel level at any point on and beyond the district boundary shall be reduced by six decibels from the maximum permitted level set forth in the above table. Said six-decibel reduction shall also apply to any sound emitted between 9:00 p.m. and 7:00 a.m. and all day Sunday.

2.11.2.2 State

State of New York Department of Environmental Conservation

The NYSDEC has promulgated guidelines for assessing and mitigating the noise impacts of projects in a document entitled "Assessing and Mitigating Noise Impacts". This policy is intended to provide direction to the staff of the NYSDEC in evaluating sound levels and characteristics generated from proposed or existing facilities. The guidance also serves to identify when noise levels may cause a significant

environmental impact and gives methods for noise impact assessment, avoidance and reduction measures.

According to the guidance document, the goal for any permitted operation should be to minimize increases in sound pressure level (SPL) above ambient levels at the chosen point of sound reception. Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential depending on existing SPLs and the character of surrounding land use and receptors. SPL increases approaching 10 dB result in a perceived doubling of SPL. The perceived doubling of the SPL results from the fact that SPLs are measured on a logarithmic scale. An increase of 10 dB(A) or more deserves consideration of avoidance and mitigation measures in most cases. The above thresholds as indicators of impact potential should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances one encounters.

In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor.

With respect to construction noise, the guidance document presents noise measurements from common equipment used in construction and recommends use of this information in a first level of analysis to help determine whether or not noise is an issue and whether actual measurements should be made to confirm the levels.

New York State Department of Transportation/Federal Highway Administration
Another widely used set of criteria is the USDOT Federal Highway Administration noise abatement criteria for land-based activities. These criteria relate hourly Leq noise levels to various land uses such as parks, schools and residences. The criteria are shown in Table 2-9. NYSDOT noise analysis policy is consistent with and in substantial conformance with these FHWA procedures and policies.

According to these criteria, noise impacts occur when traffic noise levels approach or exceed the criteria or when there is a substantial increase in the noise levels over ambient conditions. The definitions of "approach" and "substantial increase" may be specified by the individual states. The "approach" is 1dB in New York State; therefore, a residential property is considered affected when the traffic noise level equals a 1-hour Leq of 66 dBA or more. "Substantial increase" refers to the net increase in traffic noise levels from existing to that predicted for the design year at the same location. The New York State Department of Transportation (NYSDOT) defines substantial increase as 6dB (1 hour Leq) or more.

With respect to construction noise, FHWA Technical Advisory T6160.2, "Analysis of Highway Construction Noise," outlines acceptable procedures for analysis of highway construction noise. In general, construction noise impact would not occur at Leq levels under 80dBA.

Table 2-9 **R466**
FHWA Noise Abatement Criteria

Activity Category	$L_{eq}(1hr)^1$ (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Note: [1] No single hourly average L_{eq} in a 24-hour day can exceed this value.
Source: *23 CFR Part 772.*

2.11.3 Current Sound Levels

To characterize current ambient sound levels in the vicinity of the proposed project, weekday (June 3, 2003) environmental sound level monitoring was conducted at the following five locations. Because no construction is anticipated on weekends or at night, weekend and nighttime sound level monitoring was not necessary. Weekend and nighttime sound levels are typically several decibels lower, on average than weekday sound levels. The five monitoring locations, which are shown in Figure 2-16, were as follows:

Location No. 1 – Approximately 50 feet west of Riley Road and 115 feet north of Dean Hill Road

Location No. 2 - Approximately 50 feet north of Route 94 and 200 feet east of Stony Acres Trail

Location No. 3 - Approximately 25 feet south of Clove Road and 800 feet southwest of Route 94

Location No. 4 - Approximately 50 feet east of Route 27 and 65 feet north of Mountain Lodge Road

Location No. 5 - Approximately 50 feet west of Route 208 and 50 feet north of Stonegate Drive

The above locations were chosen to monitor baseline sound levels at receptors along the five roads where the proposed pipeline would be constructed. These baseline

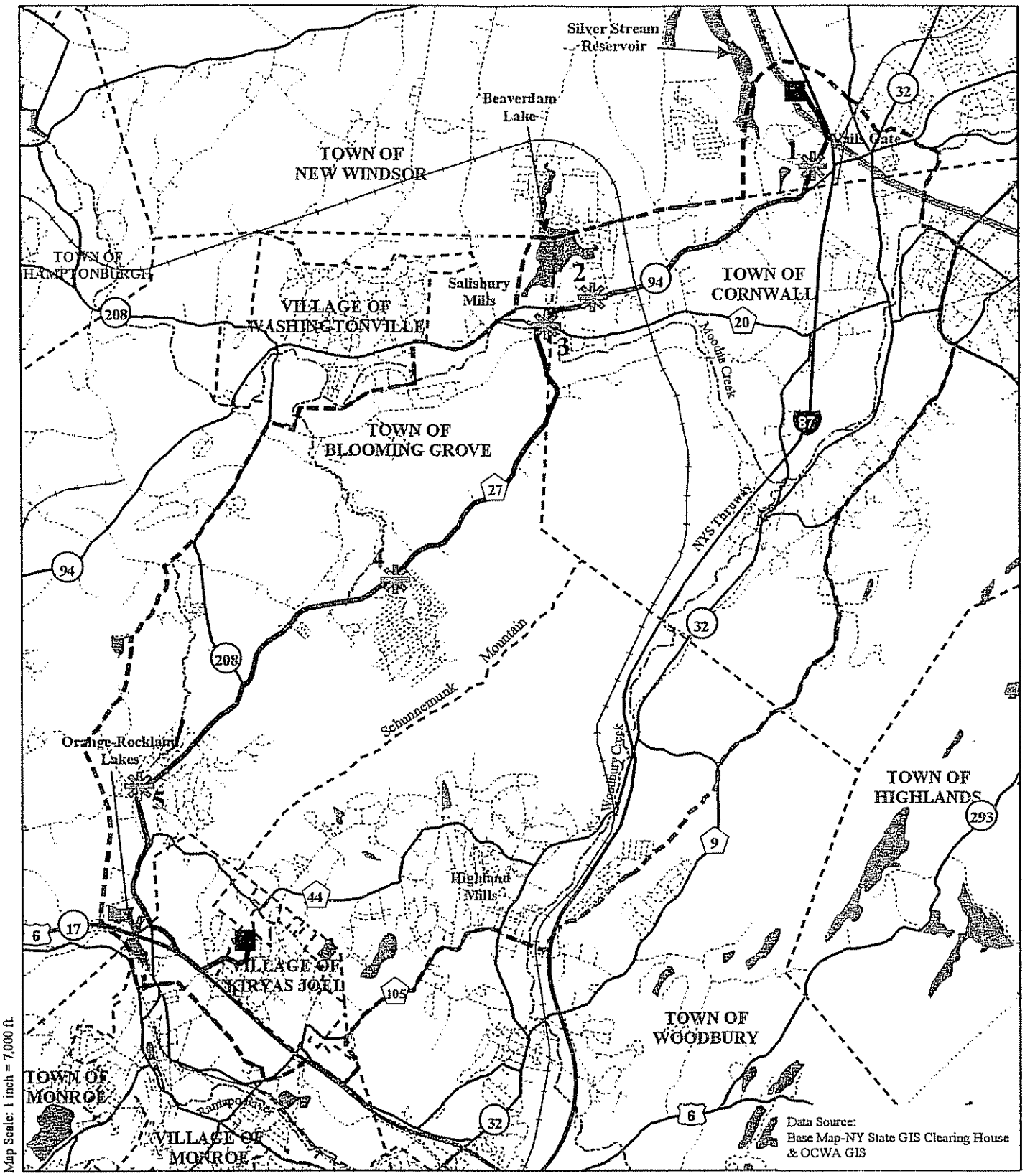


Figure 2-16

Noise Monitoring Locations

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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levels have been used to: 1) assess the potential noise impact of the proposed project and 2) document compliance with applicable regulations and ordinances.

The sound level monitoring covered three distinct 15 to 20 minute periods between approximately 8:00 a.m. and 5:00 p.m. at each of the monitoring locations (except Clove Road where one mid-day measurement was made) to define representative existing ambient sound levels during the day. The three periods were as follows: 1) 7:00 to 10:15 a.m.; 2) 11:15 a.m. to 1:50 p.m. (midday); 3) 3:30 to 5:05 p.m. All five locations were monitored on a weekday.

Sound level measurements recorded the energy equivalent, A-weighted sound level (Leq) and the L10, 50, 90, maximum and minimum sound level at each location for each time period. Measurements were made with a Quest Model 1900 (type 1) integrating sound level meter, using measurement procedures conforming to ANSI and ASTM standards.

Table 2-10 shows the lowest and highest measured weekday Leq sound levels measured at the noise monitoring locations. The measured weekday Leq sound levels ranged from a low of 57 dBA at location No. 1 to a high of 64 dBA at location No. 5. Most measured values were in the 60 to 64 dBA range, with highway traffic noise the dominant variable.

Table 2-10
Lowest and Highest Measured Weekday
Leq Sound Levels
7:50 a.m. to 5:05 p.m.
June 3, 2003

Location	Leq in dBA			
	Lowest Measured		Highest Measured	
No.				
1 - Riley Road & Dean Hill Road	57	(11:15 - 11:35 a.m.)	59	(3:30 - 3:45 p.m.)
2 - Route 94	62	(8:45 - 9:00 a.m.)	63	(1:00 - 1:20 p.m.)
3 - Clove Road	58	(1:30 - 1:50 p.m.)	58	(1:30 - 1:50 p.m.)
4 - Route 27	60	(9:20 - 9:35 a.m.)	62	(4:20 - 4:40 + 3:55 - 4:15)
5 - Route 208	63	(10:00 - 10:15 a.m. + 4:50 - 5:05 p.m.)	64	(12:30 - 12:45 p.m.)

The lowest and highest sound levels measured were 36 dBA and 80 dBA, respectively.

Appendix C contains the monitoring data for all of the sites.

2.11.4 Impacts of the Proposed Project

Noise generated by the proposed project would come primarily from the construction phase. Long-term operations noise would come from two sources: the pump station and the water treatment plant.

2.11.4.1 Construction Impacts

Construction noise impacts were evaluated in accordance with FHWA Technical Advisory Memorandum, *Analysis of Highway Construction Noise*, T6160.2, March 13, 1984.

Highway construction activities include both mobile and stationary equipment. Mobile equipment such as dozers, loaders, graders, and haul trucks operate in cycles in which a period of full power is followed by a period of reduced power. Stationary equipment falls into two categories: 1) equipment that operates at a fixed power, such as pumps, compressors and generators; and 2) impact equipment such as pile drivers, jack hammers and pavement breakers. The first group generates a constant background noise level whereas the second group generates a much higher noise level, but over a very short time period (FHWA, *Special Report Highway Construction Noise: Measurement, Prediction and Mitigation*, 1987). Table 2-11 presents typical maximum noise levels (L_{max}) measured at 50 feet from construction equipment. Maximum noise levels range from 70 dBA for generators to 90 dBA for a mounted impact hammer at 50 feet away.

Pipeline construction is completed in the following phases:

- Mobilization
- Clearing and grubbing
- Trenching
- Pipe Installation
- Backfilling
- Paving and cleanup

Each construction phase would generate short-term noise impacts for noise sensitive land uses adjacent to the proposed pipeline construction activity. In general construction noise impacts occur only during typical daytime working hours of 7:00 a.m. to 5:00 p.m., and would be highest during the clearing and trenching phases of construction. The noisiest equipment would likely be earthmoving equipment, such as dozers, graders, loaders and other heavy-duty diesel equipment. Noise levels decrease by 6 dBA for every doubling of distance. It is anticipated that the daytime L_{max} noise levels would not exceed 80 dBA at 150 feet away and the daytime L_{eq} noise level would not exceed 75 dBA at 150 feet away.

Table 2-11
Typical Construction Equipment Noise Levels

Equipment Category	L_{max} Level (dBA)
Backhoe	80
Chain Saw	85
Compactor	80
Compressors	80
Concrete Mix Truck	85
Concrete Pump	82
Concrete Saw	90
Crane (Mobile or Stationary)	85
Dozer	85
Front End Loader	80
Generator (25 kVA or less)	70
Generator (25 kVA or more)	82
Gradall	85
Grader	85
Jackhammer	85
Mounted Impact Hammer	90
Paver	85
Pneumatic Tools	85
Pumping Equipment	77
Scraper	85
Tractor	84
Vibrator (rollers)	80
All Other Equipment with Engines Larger than 5 HP	85

Source: Noise Control Engineering Journal, Construction Noise Control Program and Mitigation Strategy at the Central Artery Project, Sep-Oct 2000.

2.11.4.2 Long-Term Impacts

The major long-term noise-generating piece of stationary equipment associated with the aqueduct connection component of the project is the pumping station to be located on the west side of Riley Road in the vicinity of the New Windsor Water Treatment Plant. The maximum sound level from the pump station would be specified as 60 dBA at the property boundary (the nearest property boundary to the pump station is expected to be approximately 50 feet from the pump station). This is in compliance with the Town of New Windsor noise code, which sets a 60dBA maximum.

Because typical daytime sound levels along Riley Road are 57 to 59 dBA, the maximum daytime potential sound level increase at the property line is 4dBA, a moderate increase. At night, the maximum potential increase at the property line is 8dBA, also a moderate increase, according to the NYSDEC guidelines. However, the nearest residence to the pump station is over 300 feet from the site property line. At this distance, the pumping station noise would be inaudible.

The new water treatment facility in Kiryas Joel would be adjacent to an existing water treatment facility. The new facility would generate sounds similar to those at the existing facility, but the new facility would probably generate somewhat more noise

because it would have a greater capacity. An increase of 3-to-6 dBA in the immediate vicinity of the new treatment facility is projected. This is considered a minor to moderate increase.

2.11.5 Mitigation

To minimize noise levels during construction, construction equipment would be appropriately muffled with mufflers in good operating condition. In addition, nighttime and weekend construction hours would be avoided to the maximum extent possible. The contractor would be required to comply with construction hour/noise level limitations in the noise ordinances of the municipalities through which the project passes in order to minimize the additional noise associated with construction equipment.

2.12 Aesthetics

2.12.1 Existing Conditions

Much of the Village of Kiryas Joel is already densely developed. Although many trees remain, especially in steeply sloping areas, the village is developing an urban appearance.

The area proposed for the pumping station in New Windsor is largely wooded, with open areas of short-cut grass at the New Windsor water treatment plant and over the Catskill Aqueduct. A buffer of trees and other vegetation separates the aqueduct and the treatment plant from a residential area to the north, a development under construction to the west, and the NYS Thruway to the east, except where a power line easement provides a brief view of part of the treatment plant property from the Thruway.

Outside Kiryas Joel and Vails Gate, much of the study area still has a rural appearance, but substantial portions of the study area are developing a suburban aesthetic. The largely undeveloped area along County Route 27 south of Salisbury Mills is particularly scenic. This area features views to the east and southeast across open fields to Schunnemunk Mountain.

2.12.2 Impacts

Existing vegetation would screen the Aqueduct connection from residences to the south. The new pump station at the New Windsor water treatment facility would be a small, low building. It would be visually compatible with the existing buildings at the facility.

Construction of a new treatment facility at the existing Kiryas Joel water treatment facility site on Berdichev Road would not have a significant aesthetic impact. The area is already substantially developed and the new facility would be visually compatible with the existing plant.

The proposed transmission pipeline would be underground and therefore out of sight, except at points where it would be attached to bridges over streams. At these points the pipeline would not generally be visible from the bridges themselves, but would be visible from upstream and/or downstream. None of the bridges have special aesthetic qualities that would be significantly damaged by the presence of a pipeline.

The pipeline would be installed within the rights-of-way of existing roads, in most cases in the shoulder of the roadway. Very few trees would be removed to make way for the pipeline.

During construction of the pipeline, the construction operation would have temporary aesthetic impacts along the pipeline route.

2.12.3 Mitigation

The pump station at the New Windsor water treatment facility and the new water treatment facility at the existing Berdichev Road water treatment facility in Kiryas Joel would be designed to be visually compatible with the existing structures on the sites.

At stream crossings where the transmission pipeline would be attached to a bridge, the pipeline would be painted to blend visually with the bridge. As no significant impact to the aesthetics of the area would result from project implementation, no additional mitigation is required.

2.13 Utilities

2.13.1 Existing Conditions

2.13.1.1 Water

Relatively isolated homes and small businesses in the study area get potable water from small individual wells. Areas of concentrated population are served by public and private water systems including those listed in Table 2-12 on the following page.

All water systems listed in the table pump water from groundwater wells except the New Windsor Consolidated Water District, which has a connection to New York City's Catskill Aqueduct. The connection is near Riley Road, which roughly parallels the NYS Thruway northwest of Vails Gate. The New Windsor Consolidated Water District operates a water treatment plant and pump station on Riley Road near the aqueduct connection.

Wells operated by the Kiryas Joel Water Department produced approximately 0.98 million gallons per day (mgd) of water in 2002. Approximately half of the water from the Kiryas Joel wells requires only chlorine disinfection prior to entering the potable water distribution system. The other half receives more extensive treatment including flocculation/clarification, green sand filtration for iron and manganese removal, and disinfection using sodium hypochlorite. This level of treatment is performed at the

water treatment facility on Berdichev Road, the proposed site for the new treatment facility to treat water from the proposed Catskill Aqueduct connection.

Table 2-12
Water and Sanitary Sewer Systems in the Study Area

Water System	Area Served	Sanitary Sewer System
Village of Kiryas Joel	Entire Village	Village of Kiryas Joel and Orange County Sewer District #1
Town of Woodbury Consolidated Water District	Primarily Highland Mills and Central Valley	Woodbury Sewer District #1
Blooming Grove Water District #1	Worley Heights development off NYS Route 208	Blooming Grove Sewer District #1 and #2
Blooming Grove Water District #5	Mountain View Estates, outside southeast corner of Washingtonville	Individual Septic Systems
Blooming Grove Water District #6	Merriewold Lake development off NYS Route 208	Blooming Grove Sewer District #1 and #2
Mountain Lodge Park (private)	Mountain Lodge Park development off Route 27 in Blooming Grove	Glenwood Sewer District (partial)
Lake Anne Water Corporation (private)	Lake Anne Country Club	Lake Anne Waste Disposal Corp.
Firthcliffe Heights Water District	Both sides of NYS Route 32 in Cornwall at New Windsor border	Cornwall Sewer District
Town of New Windsor Consolidated Water District	Eastern half of town, including Vails Gate	New Windsor sewer districts

R474

2.13.1.2 Wastewater

Sanitary sewer systems in the study area are listed in Table 2-12. The Village of Kiryas Joel operates a sewage treatment facility east of Bakertown Road in the eastern part of the Village. An expansion of facility capacity from 0.5 mgd to 0.97 mgd will be complete by the fall of 2003. The facility discharges to a tributary of the Ramapo River.

In addition to having its own wastewater treatment facility, Kiryas Joel is part of Orange County Sewer District No. 1, which also includes the Village of Harriman, the Village of Monroe, and a portion of the rest of the Town of Monroe. Orange County Sewer District No. 1 discharges to the Harriman Wastewater Treatment Plant (WWTP) in Harriman.In addition to maintaining their individual sanitary sewer systems, the towns of Blooming Grove, Monroe, Woodbury and Chester, as well as the Village of Chester, have formed the Moodna Basin Southern Region (MBSR) Joint Sewerage Board. The sanitary sewer systems within the MBSR also discharge to the Harriman Wastewater Treatment Plant

The Harriman WWTP was built in 1974 as a 2.0 mgd conventional, suspended growth, activated sludge facility. In 1987 the average design flow of the plant was expanded from 2.0 mgd to 4.0 mgd. The plant is currently permitted to operate at 4.5 mgd. Flow is currently split between the original treatment process and a newer oxidation ditch treatment system. Flow from both systems is directed to final polishing filters and a chlorine contact tank where chlorine gas and sulfur dioxide gas are added for disinfection and dechlorination. Plant effluent is discharged to the Ramapo River. Sludge from the facility is dewatered using belt filter presses and composted.

Approved developments in the service area of the Harriman plant are expected to generate an additional 1.5 mgd of wastewater flow. A design for expansion of the plant to 6.0 mgd has been completed and work on the expansion has begun.

As a member of Orange County Sewer District No. 1, the Village of Kiryas Joel is entitled to discharge all of its wastewater to the Harriman WWTP, as long as capacity is available. The Kiryas Joel treatment facility was built during a period when the Harriman plant was operating at capacity and NYSDEC had imposed a moratorium on new discharges to the Harriman facility, such as discharges from newly constructed buildings. The sanitary sewer system in Kiryas Joel is designed such that all wastewater from the Village flows to the Harriman plant unless part or all of it is diverted to the Kiryas Joel facility.

Initially, Kiryas Joel did not need the entire capacity of its wastewater treatment facility. The Village leased 0.35 mgd of capacity to Orange County, and the County made this capacity available to other communities. The 4-year lease expires in November 2004.

2.13.1.3 Electricity

Electrical service is available throughout the study area. Orange and Rockland Utilities, Inc. provides electrical service in the Town of Monroe, including the Village of Kiryas Joel, and in the Town of Blooming Grove, the Town of Woodbury, and in an adjoining portion of southern and southwestern Cornwall. Central Hudson Gas and Electric Corporation provides electrical service in the rest of the Town of Cornwall and in the Town of New Windsor.

2.13.1.4 Natural Gas

Natural gas service is available in some of the more densely populated communities in the study area. Orange and Rockland Utilities, Inc. provides gas service in the Village of Kiryas Joel. An Orange and Rockland gas main along NYS Route 208 serves the developments north of County Route 44 and extends to the Village of Washingtonville. New York State Electric and Gas Corporation provides gas service in Highland Mills in the Town of Woodbury, and has a gas main that extends north along NYS Route 32. Central Hudson Gas and Electric Corporation provides gas service in Vails Gate.

2.13.1.5 Telephone

Frontier provides telephone service throughout the study area.

2.13.2 Impacts

2.13.2.1 Water

Implementation of the proposed Catskill Aqueduct connection would reduce the amount of groundwater withdrawn from the wells operated by the Kiryas Joel Water Department. This would reduce the potential for Kiryas Joel's wells to compete with private wells for the same groundwater.

State law originating in the Water Supply Act of 1905 requires the City of New York to furnish quantities of water (called "entitlement water") to various municipalities and water districts in certain counties north of the City in which City watershed areas and water supply facilities are located. Because Orange County is host to two of the City's aqueducts, municipalities and water districts in the County may apply to the City for entitlement water. Kiryas Joel filed an official request with NYCDEP in September 2000 for conceptual approval to establish a connection to the Catskill Aqueduct designed to withdraw up to 2.0 mgd of water. NYCDEP has conceptually approved the proposed connection and withdrawal of water, noting that Kiryas Joel would be entitled to withdraw 1.1 mgd based on its population as measured by the 1990 Census. Based on the 2000 Census, Kiryas Joel would be entitled to withdraw approximately 1.9 mgd.

2.13.2.2 Wastewater

Wastewater volume generally increases as water use increases, especially in places like Kiryas Joel where water uses that do not generate wastewater, such as lawn watering, are relatively insignificant. As water use in the Village of Kiryas Joel

increases, the volume of wastewater discharged from the village will increase. This will occur regardless of whether the increased volume of water comes from groundwater wells or from a connection to the Catskill Aqueduct. Because the Aqueduct is a more reliable water source, the proposed Aqueduct connection would make it more likely that the volume of wastewater discharged from Kiryas Joel would continue to increase. The current expansion of both the Harriman WWTP and Kiryas Joel's own wastewater treatment facility would accommodate a large increase in wastewater discharges from Kiryas Joel.

2.13.2.3 Electric, Gas and Telephone Service

The proposed Aqueduct connection project would not have a significant impact on electric and gas utilities. The amount of electricity used by the pumping station in New Windsor and the water treatment plant in Kiryas Joel would not be significant in comparison to the total capacity of the Central Hudson Gas and Electric Corporation and Orange and Rockland Utilities, Inc.

The need to relocate aboveground utility lines and poles during construction of the proposed pipeline is not anticipated. Underground utilities in the path of the pipeline would be identified during the surveying phase of the project, after issuance of construction permits. Typically, the pipeline would deviate slightly from its course to go under subgrade utility pipes and conduits. The utility companies would be notified and proper procedures would be followed to protect the utility lines from damage during construction. Backfilling of the pipeline trench would be performed in a way that would provide adequate long-term support to any temporarily exposed utility lines.

2.13.3 Mitigation

No mitigation measures are proposed beyond the standard excavation and construction procedures used to prevent impacts to utilities.

2.14 Energy

2.14.1 Existing Conditions

Energy consumption in the project study area is typical of a mixed land use environment. No unusual or unique energy consumption exists in the study area.

2.14.2 Impacts

Approximately 4,900 kWh of electrical energy per day would be required to pump 2 mgd of water from the Catskill Aqueduct to the proposed pumping station in Vails Gate, and from the pumping station through the proposed 13-mile pipeline to Kiryas Joel. This is approximately the amount of electrical energy used by 300 typical residential customers in the service area of the Central Hudson Gas and Electric Corporation. Although not insignificant, this is a small amount of electrical power in comparison to the total amount consumed in the region. For example, Orange County had approximately 115,000 households in 2000, and projections prepared by

the Orange County Department of Planning indicate that the County is expected to add more than 1,500 households per year through 2025.

2.14.3 Mitigation

The proposed 24-inch pipeline diameter was chosen partly because less electrical energy would be required to pump 2 mgd of water through a 24-inch pipeline than through a 12-inch or 18-inch pipeline.

After implementation of the Aqueduct connection, pumping from Kiryas Joel's groundwater wells would decrease, and energy consumption associated with the pumping would therefore decrease. This would partially offset the energy consumed by the proposed Aqueduct connection.

2.15 Solid Waste Management

2.15.1 Existing Conditions

Orange County has three solid waste transfer stations: the New Hampton Transfer Station, formerly the Orange County Landfill, the Newburgh Transfer Station, and the Port Jervis Transfer Station. Located on Route 17K and Orr Avenue in Newburgh the Newburgh Transfer Station is nearest to the project study area while the New Hampton Transfer Station is the second closest, located on Route 17M in Goshen. The Port Jervis Transfer Station is located in western Orange County. The transfer stations operate Monday through Friday during the day and on Saturday morning. Some of the waste received at the transfer stations is separated for recycling. Most of the waste is hauled to the Alliance Landfill in Taylor, Pennsylvania. Waste is hauled on a daily basis with trucks utilizing Interstate 84 as the main hauling route to the landfill.

2.15.2 Impacts

The waste generated during construction would be temporary and consist of construction and demolition (C&D) debris from road excavation and from the construction of the water treatment plant and pump station. Components of C&D debris typically include concrete, asphalt, wood, metals, gypsum wallboard, and roofing. The Orange County waste management facilities accept C&D debris for a fee of $75.00 per ton.

Local waste haulers would be affected temporarily during the construction of the water supply pipeline. The pipeline would be constructed in the right-of-way of existing roads, which could temporarily impact haulers on days of pick up in the areas of construction. Impacts would be minimal and expected to only increase the time of route completion.

Construction waste is not expected to adversely affect the Orange County Waste Management Facilities. Waste generated during construction can be disposed of at any one of the three Orange County Transfer Stations, where each facility has sufficient capacity to accommodate the waste generated during construction. The transport of waste from the transfer stations to the Alliance Landfill in Taylor,

Pennsylvania would also be unaffected as trucks utilize Route 84 that lies north of the project area.

The pipeline, pump station and water treatment plant would have no long-term impact on solid waste management. Wastes generated from these facilities would be minimal, mainly consisting of approximately one truckload of sludge per month from the water treatment plant.

2.15.3 Mitigation

Dumpsters and a stockyard would be used for storage and as a temporary disposal site for C&D wastes until disposal is necessary. The reuse and recycling of C&D waste materials would be encouraged throughout the life of the project in efforts to minimize waste generation and the potential for C&D materials to enter into the Orange County waste stream. C&D generated after final recovery would be disposed of in accordance with 6 NYCRR Part 360.

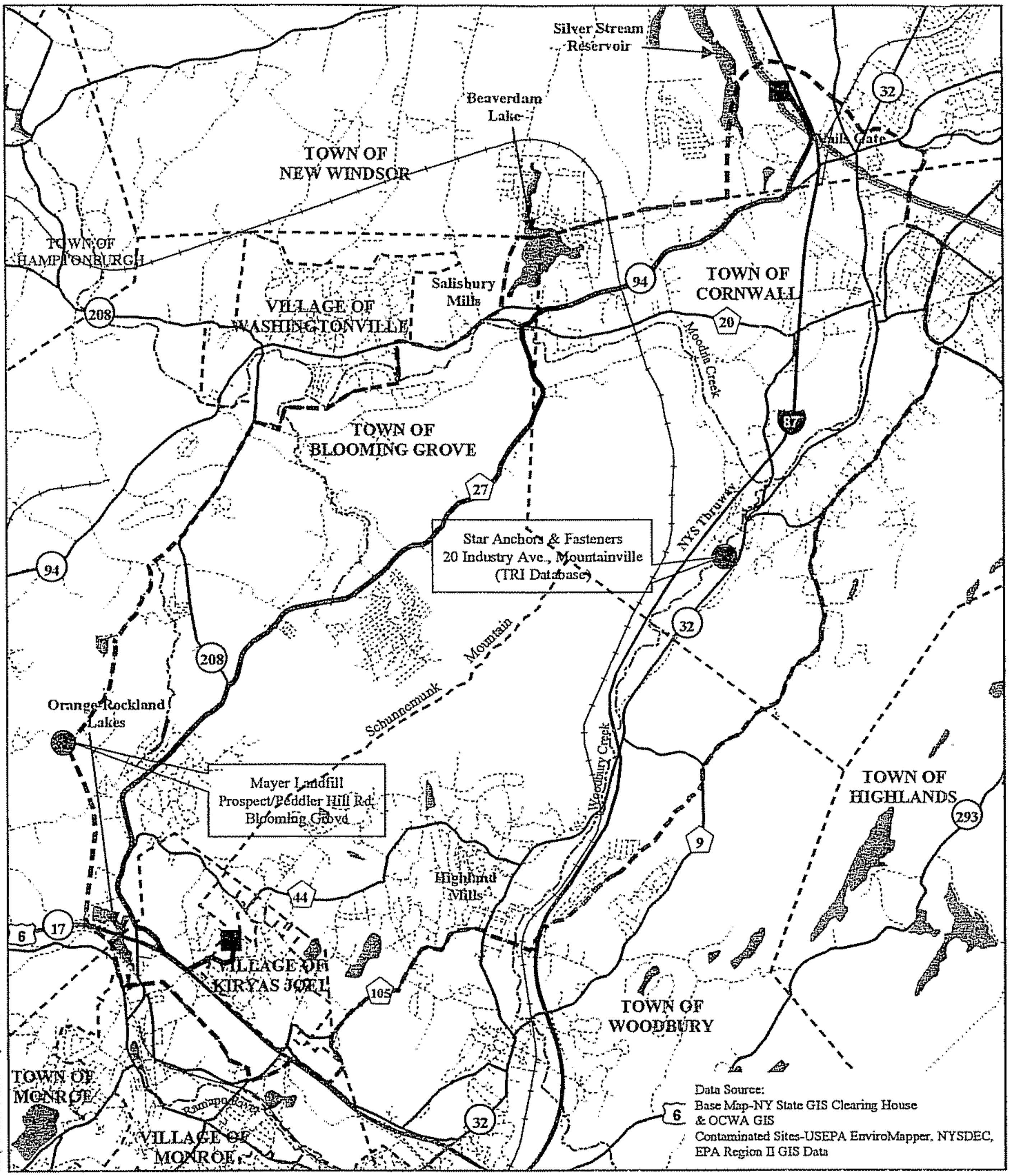
2.16 Hazardous Materials

2.16.1 Existing Conditions

The project study area contains two hazardous waste sites, as listed on the EPA Toxic Release Inventory (TRI) or Comprehensive Environmental Response, Cleanup and Liability Information System (CERCLIS) database. These sites are currently under remediation. Figure 2-17 shows the locations of the sites, and brief descriptions of the sites are provided below. Information was received from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites in New York State (Volume 3, April 2002), the USEPA Toxics Release Inventory, the CERCLIS Hazardous Waste Database and the USEPA Enviromapper database.

Site Name: Mayer Landfill
Location: Prospect and Peddler Hill Roads, Blooming Grove

Identified in 1987, the Mayer Landfill is an inactive hazardous waste disposal site as defined by the NYSDEC. Located at Prospect and Peddler Hill Roads in Blooming Grove, and operating from 1964 to 1972, the Mayer Landfill once accepted residential, commercial, industrial demolition and agricultural refuse. In 1987 Reichold Chemicals Inc. informed New York State through a "Right to Know" survey questionnaire that during the active period of the landfill their research and development centers disposed of various hazardous wastes including solvents, anhydrides, esters, amines, epoxides and glycols. NYSDEC conducted a Phase 1 site assessment and confirmed the presence of hazardous materials. A Phase 2 assessment was conducted and completed in 1991. Contamination levels were found in the landfill and in groundwater at concentrations giving the site a low priority level. In March of 1999 a remedial investigation/feasibility study (RI/FS) was initiated and in 2001 the RI/FS was finalized. The lead agency, NYSDEC, is in the development stages of a remedial design plan to propose to the public for the remediation of the site. Onsite sampling continues while a remedy is developed. Nearby groundwater samples currently do not exceed contaminant levels; however,



Legend

- Proposed Pipeline Route
- Hydrologic Features
- Municipal Boundary
- Study Area
- Known Contaminated Site
- Proposed Pump Station or Treatment Plant
- Railroads
- Streams
- Streets
- Major Highways
- Catskill Aqueduct

Feet
7,000 0

Map Scale: 1 inch = 7,000 ft.

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Figure 2-17

Known Contaminated Sites

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

individuals that enter the site may still be exposed to low levels of semivolatile organic compounds in the soil.

Site Name: Star Anchors & Fasteners
Location: 20 Industry Avenue, Mountainville

Star Anchors & Fasteners is located on Industry Avenue in Mountainville, NY and is actively managed under the Resource Conservation and Recovery Act (RCRA). Located between the New York State Thruway and State Route 32, Star Anchors & Fasteners is also known as Star Expansion Company, Star Mountainville, Star Industries, Mountainville Properties, and Star Newco. In 1997 a significant amount of cleanup was done but the site was not fully remediated. Currently the site is under financial stress and is near abandonment. Known to still contain volatile organic compounds (VOCs) and oils in addition to impacted bedrock, this site is currently under consideration to be re-listed as an EPA Superfund Site. Onsite groundwater contamination is documented, and offsite groundwater contamination is possible. In the fall of 2002, testing of 14 offsite bedrock wells did not detect contamination. EPA considers this site a high-priority corrective action site. Since January 2002 the site has not met the standards for having groundwater contamination or human exposure under control (EPA's goal is for 95 percent of high-priority corrective action sites facilities to have human exposures under control by the end of 2005, and for 70 percent of the facilities to have groundwater contamination under control by 2005.).

2.16.2 Impacts

No hazardous materials impacts are expected as a result of the Kiryas Joel Catskill Aqueduct Water Supply Connection. The sites described above are located within the project study area and included in this report for information and reference purposes. Theses sites are not located on soils that would be disturbed during construction and therefore, there are no anticipated adverse effects.

The proposed water treatment facility in Kiryas Joel would probably use polyaluminum chloride as a coagulant and sodium hypochlorite as a disinfectant. These chemicals would be stored in liquid form in small tanks. Polyaluminum chloride in solution with water gives off hydrochloric acid gas, and sodium hypochlorite has the potential to give off chlorine gas. Because of the small quantities involved, even a sudden and complete tank failure would be unlikely to cause significant health problems in the time it would take to evacuate the affected area.

2.16.3 Mitigation

All water treatment chemicals would be stored in accordance with applicable regulations and safety standards. No other mitigative actions are needed, as there are no other potential long or short-term adverse hazardous materials effects resulting from the project.

2.17 Cumulative Impact

No projects similar to the proposed Aqueduct connection are planned within the area that would be affected by the proposed project. The Village of Kiryas Joel does not

plan to make any major improvements to the existing Berdichev Road water treatment facility during 2005 and 2006, when the proposed new water treatment plant at the same location is expected to be built.

The Town of New Windsor is seeking approval to expand the capacity of its water treatment facility, and it is possible that work on the treatment facility would take place at the same time as work on the proposed pump station at the same location and on the proposed Aqueduct connection nearby. This could cause cumulative noise and air quality impacts (primarily fugitive dust) during construction. These cumulative impacts would be minor and temporary.

Orange County has not planned any major road or bridge improvement projects on County Route 27 in 2005 or 2006, when the proposed pipeline is expected to be built. Similarly, the New York State Department of Transportation has not planned any major road or bridge improvement projects during 2005 or 2006 on the segments of State Route 94, State Route 208, and State Route 17 along which the proposed pipeline would be constructed.

Repaving, considered a minor road improvement, is not scheduled as far in advance as major improvements. Repaving may occur on the affected segments of the county and state roads during 2005 and 2006. Construction of the proposed pipeline would have to be coordinated with any repaving projects to prevent cumulative traffic impacts.

Section Three

Section 3
Alternatives Evaluation

The State Environmental Quality Review (SEQR) regulations require that an environmental impact statement describe and evaluate the proposed action and reasonable alternatives to the proposed action, including the alternative of taking no action (6 NYCRR 617.9(b)(5)). This section evaluates the proposed action—connection to New York City's Catskill Aqueduct, a pump station, approximately 13 miles of transmission pipeline, and a new water treatment plant —in comparison to reasonable alternatives to the proposed action.

Section 3.1 below evaluates the no-action alternative, Section 3.2 evaluates the alternative of the Village relying on water from the drilling of additional groundwater wells, Section 3.3 evaluates two alternate pipeline transmission routes, Section 3.4 evaluates one alternate pumping station location, and Section 3.5 evaluates an alternate pipeline diameter. Those alternatives that were previously eliminated during the planning process are discussed in Section 3.6. Section 3.7 contains a comparison of the proposed action to the reasonable alternatives identified and evaluated in this section.

3.1 No-Action Alternative

The no-action alternative is defined as the continuation of existing conditions. For the Village of Kiryas Joel, that would mean the Village would continue to supply its growing population with potable water solely from its existing permitted groundwater wells. The existing Kiryas Joel water supply system includes 14 active groundwater production wells. Kiryas Joel is permitted to withdraw up to 1.0 mgd from 9 wells in the Village and up to 0.31 mgd from 5 wells on a tract near Mountain Lakes called the Brenner property, a total of 1.31 mgd. The nine wells in the Village do not produce as much as 1.0 mgd, however. The Village wells are heavily used and their yield has fallen. Even with conservation measures in place, the Village is currently not able to meet the maximum daily water demand of 1.3 mgd. The Village must truck in additional water in preparation for religious holidays, when maximum water demand is likely to occur.

Kiryas Joel's current water shortfall is more acute during dry periods. A water-budget analysis showed that recharge to the bedrock aquifer underlying the Village is barely adequate during normal rainfall (1.03 mgd), and drops to approximately 0.41-0.70 mgd during drought conditions (LBG, 1995).

Insufficient potable water is not considered a reasonable alternative to the proposed action. Additional water sources are needed. Additional groundwater sources (wells) are discussed in section 3.2 below.

As stated in section 1.3, the purpose of the proposed action is to provide a reliable and adequate supply of potable water for the residents and businesses of Kiryas Joel. The

no-action alternative does not meet the objectives stated. The objectives include the establishment of a long-term, consistent water supply for the growing community, reduced dependence on groundwater as their sole potable water source, reduced vulnerability to drought conditions, and avoidance of adverse impacts to the environment and the neighboring communities.

As the no-action alternative does not meet the purpose or the objectives as stated in Section 1.3 of this document, it is rejected from further consideration.

3.2 Drilling of Additional Groundwater Supply Wells in or Near the Village

Municipalities in the southeastern part of Orange County provide potable water to their residents and businesses through the use of groundwater wells that extract water from a fractured bedrock aquifer system. NYSDEC has instituted limits on pumping rates on wells located within a specific recharge area to allow for recovery within this fractured bedrock system and to reduce the likelihood of wells affecting the productivity of nearby wells. As discussed in Section 3.1 above, the Village of Kiryas Joel is currently permitted to withdraw 1.0 mgd of water from wells within the Village and 0.31 mgd from wells outside the Village. The total authorization of 1.31 mgd is approximately equal to the current maximum daily water demand in Kiryas Joel. As the Village continues to grow, the current permitted groundwater allocation will become increasingly inadequate.

The authorized withdrawal rate for the wells within Kiryas Joel, 1.0 mgd, is approximately equal to the estimated sustainable yield of the aquifer underlying the Village (see Section 2.1.1.2). It is therefore unlikely that the authorized withdrawal rate will be increased. To increase its groundwater pumping significantly, Kiryas Joel would have to drill more wells outside the Village.

The surrounding municipalities and private homeowners all draw some or all of their potable water from groundwater wells. Balancing the potable water needs of the various communities has not always been successful. Communities have accused one another of excessive pumping, limiting the availability of water for their residents. Neighboring homeowners have claimed that the low productivity of their private wells was caused by municipal wells in Kiryas Joel. Continued dependence by area communities on the same groundwater source would continue to stress this area resource. For the Village, additional groundwater sources would provide only short-term relief for the chronic water supply deficiency.

The Village's current groundwater exploration program includes the search for viable groundwater sources outside of the Village's jurisdictional limits, and outside the recharge area of its current permitted wells (other than the Brenner Property wells). Specific parcels were identified based on a preliminary hydrogeologic review conducted by LBG in 1999. As a result of this review, drilling has occurred on two of the identified parcels. As of September 2003, three test wells had been drilled, each with limited production capability, on a 20-acre parcel outside the Village's boundary

along the Ramapo River. A sand and gravel well in this location is anticipated to produce approximately 20 gallons per minute. Five to seven wells would be needed to make this a viable water production location. If the installation of production wells at the 20 acre parcel is successful, it is anticipated these wells would not fall under the Village's 1 mgd permitted allowance. These wells would help to bridge the gap between the current demands of the Village's residents and businesses for potable water and the available supply. The Village has also drilled two additional test wells on the Brenner Property. As of the writing of this DEIS, the safe yield of these wells had not yet been determined.

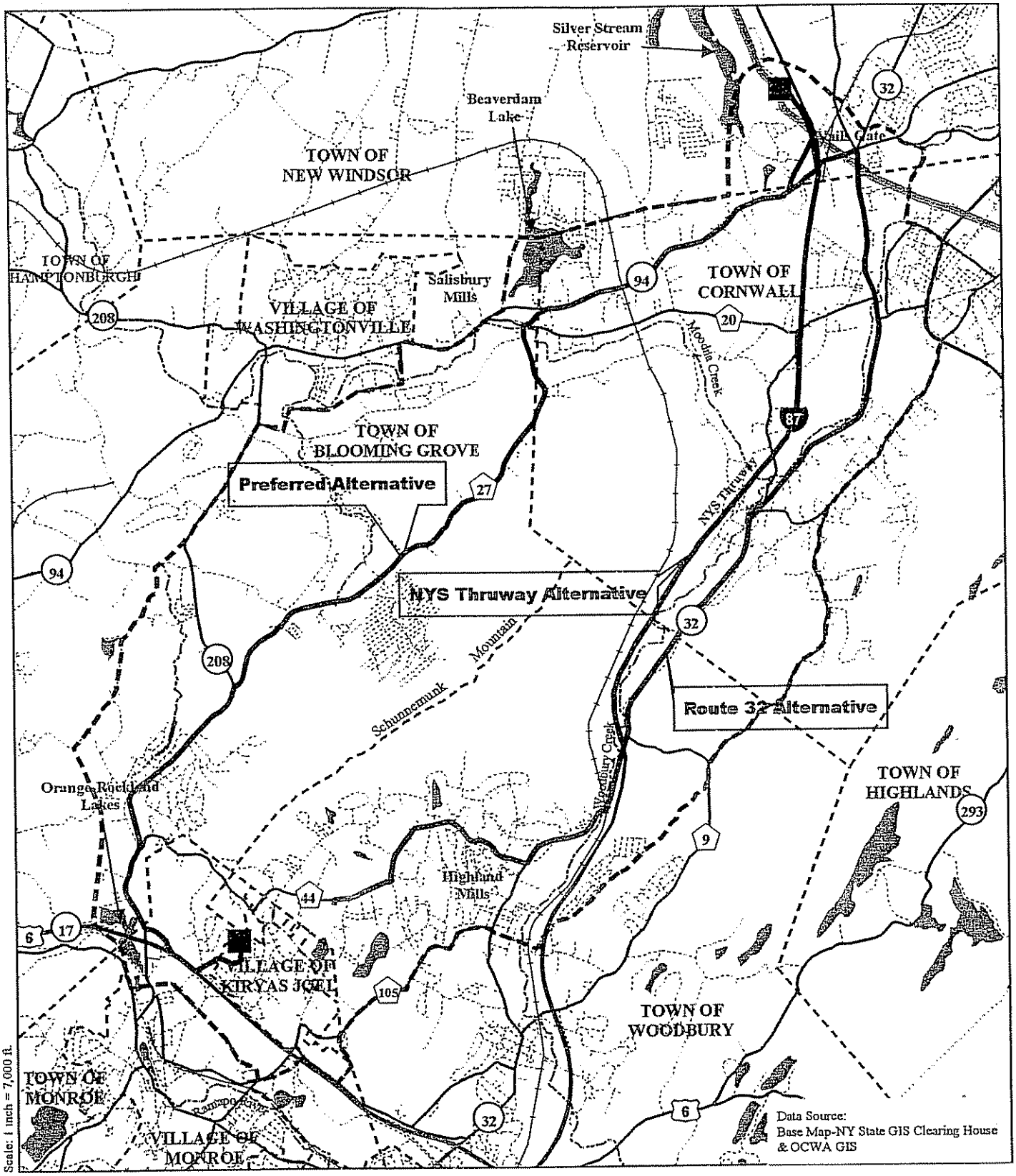
The Village's average daily potable water demand is expected to exceed the present supply by the year 2005. Providing a reliable water supply for this community is the primary purpose of the proposed action. Reliance solely on available groundwater sources would result in continued competition for this limited resource by the area's municipalities. Wells further and further from the village would be needed with no guarantee that their yields would meet the potable water needs of the Village. Also there would be no guarantee that these new wells would not result in an impact to other community and private wells. Therefore, this alternative is not considered to be a viable alternative to the proposed action, as it does not meet the purpose or objectives as stated in Section 1.3 of this document.

Although groundwater supply wells do not meet the objectives as stated in Section 1.3 of this document, under the proposed action, existing and future groundwater wells would be required to provide a back-up water source if the Aqueduct flow were interrupted (e.g., for maintenance).

3.3 Alternative Pipeline Routings

The preferred pipeline route and the two alternative pipeline routes are shown on Figure 3-1. The preferred pipeline routing is evaluated in Section 2 of this document. sections 3.3.1 and 3.3.2 identify reasonable alternative routes under consideration and then describe the potential impacts associated with the implementation of the specific route. The two alternative routes terminate at the same location. The alternate pipeline terminus, as under the proposed action, would be the location of a new water treatment plant. The water treatment plant location is shown on Figure 3-1.

Both alternative pipeline routes terminate at an undeveloped parcel on the south side of Seven Springs Road just west of Bakertown Road. Under these alternative routings, a new treatment plant would be constructed at this location to treat NYC Catskill Aqueduct water prior to its conveyance and release to the Village's distribution system. An additional pipeline, approximately 1 mile in length, would be required to convey the treated water from the treatment plant to the Village's distribution system.



Legend

- Alternative Route
- Hydrologic Features
- Municipal Boundary
- Study Area
- Proposed Pump Station or Treatment Plant
- Railroads
- Streams
- Streets
- Major Highways
- Catskill Aqueduct

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Figure 3-1

Alternative Pipeline Routes

Village of Kiryas Joel
Catskill Aqueduct Connection EIS

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The alternate treatment plant site is currently vegetated. The new treatment plant would require approximately 1 acre of the 30-acre site to be developed, thereby removing the existing vegetation and associated habitat. No wetlands or known historic resources would be impacted with the construction of the treatment plant. The surrounding land uses are either residential or undeveloped lots. Construction of a water treatment plant would occur over an approximate 18-to-24-month period. Traffic may be temporarily disrupted along Seven Springs Road to allow for the construction of the pipeline and to bring building supplies and equipment to the site. The line of sight is not good in this section of the roadway and care would be required to provide safe site access for construction related vehicles without impacting existing roadway traffic.

The treatment plant could be set back from the road to limit its visibility from the closest neighbors directly across the street. The noise and traffic generated during construction would be temporary. The treatment plant itself would not generate noise or odors that would be detected offsite. One to two operators for an 8-hour shift would be required daily to operate the new plant. Chemical delivery would be the same as under the proposed action: approximately one truckload of chlorine every other week, and one truckload of coagulant per month. No more than one truckload of sludge would be removed from the plant each month. This would not significantly impact traffic in the area of the treatment plant.

The potential impacts of the proposed action are summarized and compared to those associated with the two reasonable alternative routings in Table 3-1, and discussed in Section 3.3.3. The potential impacts are presented as 'disadvantages' associated with a particular routing. Engineering as well as environmental parameters are considered.

3.3.1 NYS Route 32/County Route 44

Under this alternative pipeline routing, the aqueduct connection would occur as under the proposed action, near the New Windsor water treatment plant. The overall raw water pipeline length would be approximately 12.5 miles. The pipeline would proceed south along Riley Road, turning east on NYS Route 94 to Vails Gate. According to NYSDOT, the 2001 Average Annual Daily Traffic counts estimate the vehicular movements at the State Route 32 and State Route 94 intersection to be 18,000. The pipeline would then proceed south along NYS Route 32 for approximately 8 miles, turn west along County Route 44 for approximately 2.5 miles and terminate at a new water treatment facility on an undeveloped site on the south side of Seven Springs Road just west of Bakertown Road. Once treated, the water would exit the facility and travel, via a newly constructed pipeline, an additional mile to the Village's existing water distribution system.

As under the proposed action, the pipeline under this scenario would be installed within the roadway easement or right-of way. In areas where the roadway easement is too narrow, where existing utilities make it impossible to accommodate the

Table 3-1
Comparison of Alternative Pipeline Routes

Route	Advantages	Disadvantages
Routes 94/27/208	▪ Pipeline would terminate at existing WTP site and connect directly to Village's distribution system ▪ Avoids Vails Gate intersection ▪ Routes 94 and 27 are less traveled than Route 32. ▪ Least change in topography	▪ Temporary impact to Riley Road ▪ Limited shoulder; pipeline would need to be installed in roadway ▪ Salisbury Mills bridge (Moodna Creek crossing)
Routes 32/44	▪ Sizeable shoulder allowing for easy pipe installation	▪ Longest pipeline length ▪ WTP site is undeveloped lot ▪ Additional 1 mile of pipeline required to connect to existing distribution system ▪ Temporary impact to Vails Gate 5-point intersection ▪ Temporary impact to Riley Road ▪ Limited road detours for existing traffic ▪ Greatest change in topography ▪ 5 NYS protected stream crossings ▪ Orrs Mill bridge (Moodna Creek crossing)
Routes 87/32/44	▪ Shortest pipeline length ▪ Avoids Vails Gate intersection ▪ Limited impact to Riley Road	▪ Must show Thruway Authority no other route is viable ▪ WTP site is undeveloped lot ▪ Additional 1 mile of pipeline required to connect to existing distribution system ▪ 6 bridge crossings: Rt 94, Hollman Rd, Moodna Creek, Taylor Rd, Woodbury Creek tributary, Woodbury Creek

proposed transmission pipeline, or where bedrock outcrops exist, the pipeline would be placed in the roadway itself.

In Orrs Mill the pipeline would cross the Moodna Creek either by being suspended from the bridge itself or laid across the bottom of the Creek. Once the pipeline has crossed beneath the NYS Thruway, it would need to cross Woodbury Creek once and a tributary once. Along County Route 44, the pipeline would cross the same tributary twice more. This alternative pipeline routing would result in a total of five crossings of protected streams.

Based on the Stage 1 cultural resources survey conducted by HPI, State Route 32 was found to have a high density of recognized historic sites. A total of 12 sites were found to abut this route. A total of eight precontact era sites were identified in the area around the routing, although none abut it directly. The floodplains along Woodbury Creek on either side of State Route 32 south of Mountainville would be ideal for Native American settlement. As this route follows a natural water course it is sensitive for precontact resources.

3.3.2 NYS Route 87/NYS Route 32/County Route 44

As for the proposed action and the previously described alternative pipeline routing, the aqueduct connection point would be near the New Windsor water treatment plant. The pipeline would then proceed south on Riley Road for less than 1 mile to an existing maintenance access road to the NYS Thruway (Interstate 87). The pipeline would be placed in the roadway easement of the Thruway, continuing south for an approximate 6- mile distance. Just south of Trout Brook Road the pipeline would continue onto NYS Route 32. As in the previous alternative routing, the pipeline would then proceed along NYS Route 32, then west onto County Route 44. The pipeline would terminate at an undeveloped site on the south side of Seven Springs Road just west of Bakertown Road. Under this alternative routing, the raw water pipeline would be approximately 11 miles in length. Once the raw water was treated at a new filtration plant at this location, the water would be piped, via a newly constructed pipeline, for an additional 1 mile to the Village's existing distribution system.

As under the proposed action, the pipeline under this scenario would be installed within the roadway easement or right-of way. For roadways other than the NYS Thruway, in areas where the roadway easement is narrow, existing utilities make it impossible to accommodate the proposed transmission pipeline, or bedrock outcrops exist, the pipeline would be placed in the roadway itself. The 6 miles of pipeline that would be within the NYS Thruway easement would be the subject to review by the NYS Thruway Authority. The pipeline placement (design) would need to comply with Federal Highway regulations and also be subject to the review of NYSDOT. In addition to pipeline placement in relationship to the roadway, an analysis of viable alternate routings would be required. The project proposer, here the Village, would need to demonstrate that no other viable routings exist, making the use of the NYS Thruway easement the only feasible alternative.

With the NYS Thruway Authority evaluating the addition of a new north and south bound lane in the area between exits 16 and 17, the placement of the pipeline would need to fall 30 feet from this proposed additional lane. Sections of the Thruway have significant bedrock outcrops, requiring blasting to install the pipeline. This alternative route is the most likely of three routes evaluated to require blasting as part of the construction activities. The Thruway also has the highest vehicular volumes of the three routes evaluated.

Few residential units are in close proximity to the NYS Thruway along the 6-mile length. Residences are in close proximity to the roadway along Riley Road; construction related impacts, specifically noise and traffic disruption, would occur over the less than 1-mile the pipeline would traverse along Riley Road until it would reach the NYS Thruway access point.

Six bridge crossings would be required along the 6-mile length of the NYS Thruway. Three of these crossings involve state protected streams (Moodna Creek, Woodbury Creek). Once the pipeline has made its way to NYS Route 32, it would need to cross Woodbury Creek once and a tributary once again. Along County Route 44, the pipeline would again cross the same tributary twice more.

The Stage 1 cultural resources survey conducted by HPI showed the areas of most sensitivity for either precontact or historic resources along this routing to be the southern section of the routing, specifically State Route 32. The NYS Thruway overlays a railroad line constructed at the beginning of the 20th century that was in part large tracts. The Thruway construction caused significant disturbance to the landscape. Cartographic evidence shows few homesteads in the vicinity of the Thruway throughout the 18th and 19th centuries. These factors significantly reduce the potential for precontact or historic resources to be present along this segment of the routing.

3.3.3 Comparison of Alternative Pipeline Routes to the Proposed Action

The following provides a comparison of the proposed pipeline route, as evaluated in Section 2.0 of this document, and the two alternative pipeline routings described and evaluated above. The advantages and disadvantages of the three pipeline routings are summarized in Table 3-1. Engineering and environmental parameters were included in the evaluation of the three pipeline routes.

The three pipelines are similar in overall length, 11 to 13 miles in length from their connection to the NYC Catskill Aqueduct to the new water filtration plant location. Both the proposed pipeline routing and the NYS Thruway routing avoid the congested Vails Gate 5-way intersection. Both the proposed routing and Route 32/44 routing would result in similar construction related impacts along Riley Road. Routes 94/27/208 are less traveled than Route 32/44. Route 32 travelers would be most inconvenienced during construction, as detour roads are limited along this corridor.

The proposed routing is the least likely to require blasting. From field inspections of the three routings the proposed routing showed shale outcrops to be friable in most places with no significant rock outcrops. Rock outcrops were most visible along the NYS Thruway. Steep slopes were prominent along some portions of Route 32. Although Route 32/44 has the most consistent shoulder allowing for easier pipe installation, County Road 44 had the most complicated horizontal and vertical alignment resulting in higher construction costs over that of the proposed routing.

With the proposed additional north and southbound lanes to consider along the NYS Thruway, this would add considerably to the need for blasting and increased construction cost as the pipeline would need to be 30 feet outside this new planned lane. Extensive reviews would be required by the Thruway Authority and the NYS Department of Transportation (NYSDOT), adding to the permitting time and possibly the construction duration.

In addition, for the pipeline to be placed in the easement of the NYS Thruway, the Village would need to demonstrate that no other feasible routings exist. Approval of this routing by NYS Thruway Authority and NYSDOT is therefore doubtful, as two other routings have been discussed in this document as potentially viable.

The Route 32/44 routing would result in 5 NYS protected stream crossings. The Thruway/Route 32/44 routing would result in 3 NYS protected stream crossings, as under the proposed action. Crossing the Moodna Creek would be the greatest along Route 32, Orrs Mill, adding to the construction costs. Crossings would require a Protection of Waters permit from NYSDEC. Wetlands are commonly associated with these stream crossings. Delineation would be required prior to finalizing the pipeline design for all three routes to avoid these resources and their associated buffer areas.

The Stage 1 cultural resource survey concluded that no single route avoids all historic resources. The potential pipeline routing along the NYS Thruway is the least likely to have precontact era resources because of past disturbance (i.e. roadway construction) and it does not follow a waterway. Many historic structures are located along Route 32. As this route does not precisely follow the original road, therefore the modern road may in fact pass over earlier structures that once fronted on the old road. Route 32 follows natural streams and contains many areas suited for precontact era habitation or use. Undisturbed areas may be sensitive for precontact resources.

The proposed pipeline routing more closely follows the historic roadways and the area generally supports a lower population density. More recorded historic sites fall along this routing than either of the alternatives evaluated. Also more precontact archaeological resources have been recovered from areas around this routing This is due in part to the rural natural of area as compared to the two eastern pipeline routings evaluated.

Regardless of the routing, extensive subsurface impacts would only occur in the construction narrow corridor within existing roadbeds. These construction activities

are not expected to affect archaeological resources except as noted. Crossing of a natural river/stream in direct proximity to an historic mill could affect remaining buried industrial components of the mill complex. It is therefore recommended (regardless of the routing) that limited monitoring of excavations be conducted only within those zones specifically sensitive for historic mills.

Under the proposed action, the raw water from the NYC Catskill Aqueduct would be treated at the current site of the Village's treatment plant on Berdichev Drive. A new filtration plant would be constructed adjacent to the existing plant to treat the raw water transported by pipeline to this site. The treated water would then enter the Village's distribution system at this location. The existing plant would remain on stand-by and be used to treat groundwater when the back-up supply wells were in use.

Neither the Route 32/44 routing nor the Thruway/Route 32/44 routing allow for the direct connection to the Village's water distribution system. The proposed water treatment plant site for these two alternate routings is currently an undeveloped vegetated lot about 1-mile from the Village's distribution system. This site does not contain wetlands based on a review of the NWI and NYSDEC mapping. The Stage 1 historical resources study conducted for this project noted there are no known precontact or historic resources recorded at or in the area of this parcel.

3.4 Alternative Pumping Station Site

The alternate pump station site is NY City-owned land adjacent to the Catskill Aqueduct. This site is currently wooded. Access is provided via a maintained earthen road. The road is used by local landowners whose homes occupy adjoining parcels. The road is initially paved from Riley Road for approximately 500 feet. A child-care center is located at the terminus of the paved road. The earthen road that begins at this point is narrow, sufficient for a single vehicle. The earthen road is steep in some spots. Construction vehicles accessing the paved and unpaved access road would directly impact those homes and businesses along its length. The unimproved portion of the road may need to be widened resulting in the loss of trees and other vegetation. The pump station at this location would require less than an acre of land for its construction. The structure would be fenced for security. The water conveyance pipeline would then need to be placed within this earthen road and proceed to Riley Road, adding to the construction related impacts. The construction related impacts at this alternate site are greater (more disruptive) than those under the proposed action. Existing roadways would need to be widened, vegetation would be lost and other roadway users would be impacted. In addition, to locate the pump station at this site the Village would need to apply to NYCDEP. The stated purpose of this land is for NYC water supply. Although the land requirement would be minimal, NYCDEP could require the Village to show that no other suitable site is available.

The proposed action includes the pumping station in the vicinity of the New Windsor treatment plant and pump station. As the New Windsor treatment plant site is dedicated to water treatment and pumping activities the proposed action would be a

continuation of its current use. Impacts at this site would be limited to construction. This location is not in direct line of sight to any residential units. In summary, locating the pump station on NYC land would not result in a reduction in environmental impact or construction cost over the proposed action. In addition, the City might not grant permission to locate the pump station on its land.

3.5 Alternative Diameter Raw Water Transmission Pipeline

Under the proposed action the raw water transmission pipeline is 24 inches in diameter. To determine the appropriate pipeline diameter for this proposed project several factors were taken into consideration including: expected life of the pipeline, the Village's water requirements for a minimum 20-year planning period, construction cost, and operational cost. The proposed project, if implemented, would be expected to provide raw water to the Village for an extended period of time. Infrastructure, including water supply pipelines, is expected to be in service for a minimum of 50 years and often closer to 100 years. At the Village's present rate of growth and assuming their current rate of potable water consumption, 2.0 mgd would meet the Village's needs for approximately 10 years. As such the pipeline diameter has been sized to convey a minimum of 2.0 mgd. Although a transmission pipeline diameter of 18 inches would be capable of conveying the 2.0 mgd, other design factors were considered. Pipeline diameters less than 18-inches (i.e. 12-inch diameter) were determined not to be feasible due to the high headloss and therefore were eliminated from further consideration.

The cost of installing a smaller diameter pipe would be comparable to that as under the proposed action. Trench size and duration of construction would be the same if the pipe diameter were 24 inches or 18 inches. An estimated cost savings for the 18-inch pipe is in the order of just over $1 million. This is just 4% of the estimated construction cost of $25 million.

In addition to the cost of the material and the construction related cost and duration, the operational efficiency of the pipeline was considered. Included in the operational efficiency is the energy cost associated with pumping the raw water the 13-mile distance. Energy costs increase with increased friction. Increased friction results in a greater energy demand needed to pump the volume of water through the pipeline. Based on an energy efficiency calculation, the 24-inch pipeline functioned as well as the 18-inch pipeline with the assumed 2.0 mgd. The water flowing through a 24-inch diameter pipe would experience less headloss than that of an 18-inch diameter pipe. The reduced headloss translates into lower operating and associated power cost. Annual cost savings would be approximately 10% over the 18-inch diameter pipe.

From an engineering perspective, it is reasonable and appropriate to design a pipeline that is expected to be in service for a minimum of 50 years and may indeed be in service for 100-years.

The length of the pipeline would be the same regardless of its diameter. The trench needed to install the pipeline would also be approximately the same for a pipe that is 18 or 24 inches in diameter, resulting in a similar area of disturbance. The smaller diameter pipe would not result in either a significant reduction in capital cost or a significant reduction in construction duration while having greater annual energy costs for pumping. As such no reduction in environmental impacts with the construction of a smaller diameter pipeline would be expected.

In summary, the engineering rationale presented above supports the action as proposed. Also, there are no environmental benefits associated with the implementation of a smaller diameter pipeline. Therefore the alternative of a smaller diameter pipeline is eliminated from further consideration.

3.6 Alternatives Previously Eliminated from Consideration

The Village examined a series of options that might enable it to provide a consistent reliable potable water source to its residents. The first being the continued reliance upon groundwater wells for its long-term water needs. As discussed in Section 3.2 above, with pumping limits in-place and the continued local competition for groundwater, the continued reliance upon groundwater for its potable water needs has eliminated this alternative from consideration.

The Village had also explored making arrangements with neighboring communities to supplement their water supply needs. Neighboring communities have been unwilling to commit to providing the Village with a steady (or emergency) water supply. This alternative has been determined not to be feasible and has been eliminated from consideration.

Also evaluated was the use of Hudson River water as a potable water source. After a preliminary evaluation this alternative was deemed to be prohibitive given the river's poor water quality (brackish) requiring costly treatment and generating a large quantity of wastewater that would also require treatment prior to discharge. The use of Hudson River water as a source of drinking water for the Village has therefore been eliminated from further consideration.

The alternatives discussed in this subsection do not meet the purpose of the proposed action, providing a reliable and adequate supply of potable water for the residents and businesses of the Village of Kiryas. Therefore, these alternatives are not considered to be reasonable alternatives to the proposed action.

3.7 Comparison of Reasonable Alternatives to the Proposed Action

Connecting to the NYC Catskill Aqueduct would provide the Village with a reliable high quality potable water source (meeting the purpose as stated in Section 1.3 of this document), and would not impact the neighboring communities' potable water sources. Implementation of the no-action alternative, continued use of the Village's

current water supply wells, would not provide for a reliable potable water source. As stated above, the current water supply wells do not have sufficient permitted capacity to provide the Village's growing population with potable water. As such, this alternative does not meet the purpose of the proposed action and is eliminated from further consideration.

Although drilling of additional supply wells may be possible with the groundwater source in this area of Orange County being a fractured bedrock system the supply is strictly regulated. Pumping rates have been established by the permitting agencies to prevent overpumping of the fractures and allow for consistent recharge. The southeastern portion of Orange County has had a history of water supply issues resulting in neighboring communities accusing each other of overpumping their supply wells. Further reliance on this fragile resource would not provide the Village with a reliable potable water source for its growing population. This alternative does not meet the purpose of the proposed action as stated in Section 1.3, and has therefore been eliminated from further consideration as a reliable source of drinking water for the Village.

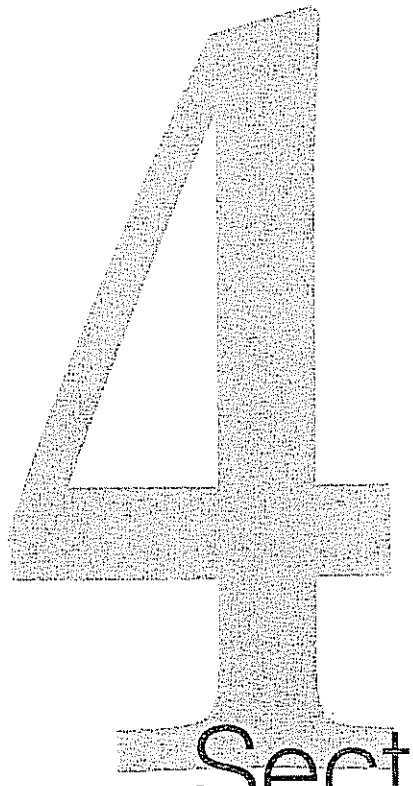
The two alternate pipeline routes both pass through the congested 5-way intersection in Vails Gate. Under the proposed action, this intersection would be avoided. The alternate routes also terminate at a vacant lot approximately 1 mile from the Village's water distribution system. Design constraints associated with the NYS Thruway would add to the construction cost and duration of the project, and the need to demonstrate to the approving agencies that there is no other feasible routing would increase the difficulty of permitting and implementing this project.

Construction along State Route 32 could result in local traffic impacts (delays for local travelers) as there are limited alternate routings possible along this corridor. The topographic changes along the eastern routes are more significant than along the proposed routing, a factor that adds to the construction cost of the project and the operation costs. As discussed above, there are no cost savings (capital or operation) associated with the two alternate routes, no engineering requirement showing either route to be superior to the proposed routing and no environmental benefit as compared to the proposed routing. Therefore, these routes are not preferable to the proposed routing.

The alternate pump station location is on NYC-owned land adjacent to the Catskill Aqueduct. In order to construct the pump station, approval would be required by NYCDEP. Existing vegetation would be removed and local homes and businesses would be impacted during construction. Under the proposed action the pump station would be constructed near the Town of New Windsor's water treatment plant. Although minor traffic-related impacts (delays when construction vehicles enter or leave the site) to residents along Riley Road could occur, the road to the alternate site is unimproved, narrow and shared by the NYCDEP and local residents in the area to access their homes. Construction of the pump station on NYC-owned land does not represent an environmental benefit over the proposed location. Disruption to

homeowners who utilize the unimproved road and the lack of a clear rationale for the pump station to be located at this alternate parcel, make this alternative less feasible than the location under the proposed action. As discussed above a smaller diameter pipeline, was rejected due to engineering factors, namely increased headloss and increased operational cost associated with smaller diameter pipes. In addition, no environmental benefit would be realized by installing a smaller diameter pipe. The trench size and the construction duration would be the same as under the proposed action. Therefore this alternative is not preferable to the proposed action.

In conclusion, the proposed action best meets the objectives of the project, 1) to provide the residents and businesses of the Village of Kiryas Joel with a reliable potable water supply, 2) engineering feasibility, and 3) minimize the potential for environment impact, as compared to the reasonable alternatives evaluated above.



Section Four

Section 4
Unavoidable Adverse Environmental Effects

The proposed connection to the Catskill Aqueduct would have no adverse impact on many of the environmental elements addressed in Section 2. For many of the impacts that would be anticipated during and after implementation of the project, Section 2 recommends or describes a mitigation that would eliminate or reduce the effect. Certain adverse environmental effects are unavoidable, however. Regardless of mitigation efforts, and even if the best design and operating procedures were used, these effects would be likely to occur.

This section extracts a short list of unavoidable adverse effects from the comprehensive impact assessment in Section 2. The unavoidable adverse consequences of the project do not pose a significant threat to public health and safety or the environment.

4.1 Soils

Soils at the proposed sites of the pump station and the water treatment facility, which may not have been significantly disturbed in the past, would be disturbed during construction of the new facilities.

4.2 Air Quality

The proposed Aqueduct connection project would generate minor, local, short-term increases in fugitive dust from exposed soil and use of operating machinery. Dust generation would be temporary and limited to areas of active construction.

4.3 Streams and Floodplains

At minor stream crossings, including Perry Creek and other tributaries, it might be necessary to bury the proposed pipeline under the stream. During construction, this would have an impact on the stream bed and the quality of the water. No long-term impact is anticipated.

4.4 Community Services

Construction of the proposed pipeline would have minor temporary impacts on school bus service and on emergency vehicles.

4.5 Economics

Construction of the proposed pipeline would have minor temporary impacts on businesses along the pipeline route. The number of businesses involved is small. Implementation of the proposed Aqueduct connection would increase the cost of the

Kiryas Joel water supply system, because the existing groundwater pumping system would be maintained as backup to the Aqueduct connection.

4.6 Traffic

Minor traffic impacts would occur during construction of the proposed pipeline.

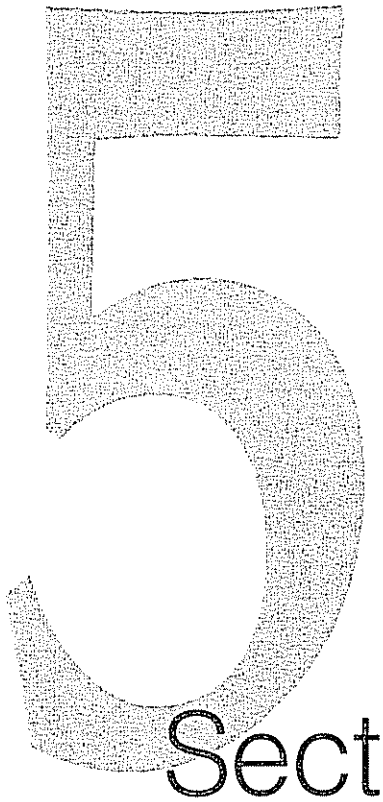
4.7 Noise

Minor noise impacts would occur during construction of the proposed pipeline. Noise impacts would generally occur between 7 a.m. and 5 p.m., Monday through Friday, and would be greatest during the clearing and trenching phases of construction. The noisiest equipment would likely be earthmoving equipment, such as dozers, graders, loaders and other heavy-duty diesel equipment. It is anticipated that the daytime L_{max} noise levels would not exceed 80 dBA at 150 feet away and the daytime L_{eq} noise level would not exceed 75 dBA at 150 feet away.

The proposed pumping station at the New Windsor water treatment plant would generate noise at a maximum of 60 dBA at the property boundary. At the residence nearest the pump station, more than 300 feet from the site property line, the pumping station noise would be inaudible. An increase of 3-to-6 dBA in the immediate vicinity of the new water treatment facility in Kiryas Joel is projected. This is considered a minor to moderate increase.

4.8 Energy

The energy consumed in pumping water through the proposed pipeline would be substantially offset by the energy savings realized by reducing operation of the Village's groundwater wells. Nonetheless, implementation of the proposed Aqueduct connection would increase the amount of energy consumed in providing potable water to the Village of Kiryas Joel.



Section Five

Section 5
Irreversible and Irretrievable Commitments of Resources

Construction of the proposed aqueduct connection would involve the commitment of natural and manmade resources. According to the State Environmental Quality Review Act,

"The extent to which the project may cause a loss of environmental resources, both in the immediate future and the long term, should be briefly identified. Resources to be considered include natural and man-made resources that are consumed, converted or made unavailable for future uses. The extent to which the proposal involves trade-offs between short-term environmental gains and long-term losses, and the extent to which the proposed action forecloses future options, should also be addressed."

This section reviews the resources that would be committed during construction and operation of the project: that is, land, water, construction materials, human work hours, and energy. The life expectancy of the proposed facilities is 50 years or more.

5.1 Land

Land is one of the resources to be committed by development of the proposed facility. Although not totally irreversible, a long-term commitment of about 1 acre would be required for construction of the pumping station and water treatment facilities. The pumping station and water treatment facility sites are currently occupied by treatment plants, and their expanded use as such is appropriate. Both sites would continue to be committed to an industrial use for the life of the project.

5.2 Water

Water usage during the proposed construction would be limited to such uses as dust control, pipe pressure tests, human consumption, and sanitary purposes. The irreversible and irretrievable commitment of water during the construction phase is expected to be minimal, as would any concurrent deterioration of water quality. Water usage during project operations would consist of the water consumed by the users of the Village of Kiryas Joel water system.

5.3 Energy

During operation of the project, energy would be needed primarily for the pumping station and operation of the water treatment plant. The increased consumption in energy relative to current energy consumption in the project study area would be small. During construction and operation, an irretrievable commitment of fuel will be used for construction vehicles and equipment and facility operations. This is a necessary and unavoidable commitment given the present state-of-the-art in equipment technology.

5.4 Materials

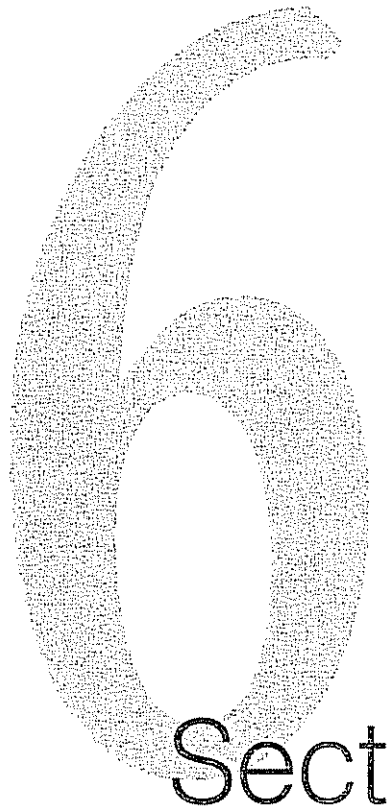
Construction of the proposed facilities would involve the irreversible and irretrievable commitment of such construction materials as: steel, wood, concrete, asphalt, plastic, glass, natural and synthetic fiber and paint. Operation of the proposed facilities would not require additional commitments of resources, except as may be necessary for normal maintenance and repairs.

5.5 Labor

Human labor would also be an irreversible and irretrievable resource commitment during both construction and operation of the proposed project.

5.6 Conclusion

The resources that would be irreversibly and irretrievably committed represent a reasonable and not unusual expenditure for this type of project.



Section Six

Section 6
Growth-Inducing Aspects

A project induces growth if it creates conditions that cause growth to occur that would not occur without the project. The proposed connection to the Catskill Aqueduct would induce growth if it caused growth to occur in Kiryas Joel that would not occur without the project, or if it caused growth to occur in other communities that would not occur without the project.

The proposed Aqueduct connection would create few if any permanent jobs outside of the Village of Kiryas Joel, and would therefore not induce people to move into the project area to seek employment or to live closer to their employment. As proposed, the Aqueduct connection would supply water to the Village only, and would therefore not induce growth in other communities by expanding the water supply. If other communities were to connect to the proposed pipeline at some time in the future, inducement of growth in those communities would become an issue at that time. Inducement of growth in other communities is not an issue at this time, however.

Growth in Kiryas Joel is primarily internal and results from two principal factors: large family size and young women remaining in the Village to have families of their own. Both of these growth factors are responses to the obligations of Hasidic religious practice rather than to external conditions such as the amount of potable water available. Young women graduating from school in Kiryas Joel marry at age 18, and the marriage rate is increasing as the young Village population matures. Whether or not the proposed aqueduct connection is implemented, Kiryas Joel will continue to grow. An increase in the water supply would not induce significant additional growth.

Section Seven

Section 7
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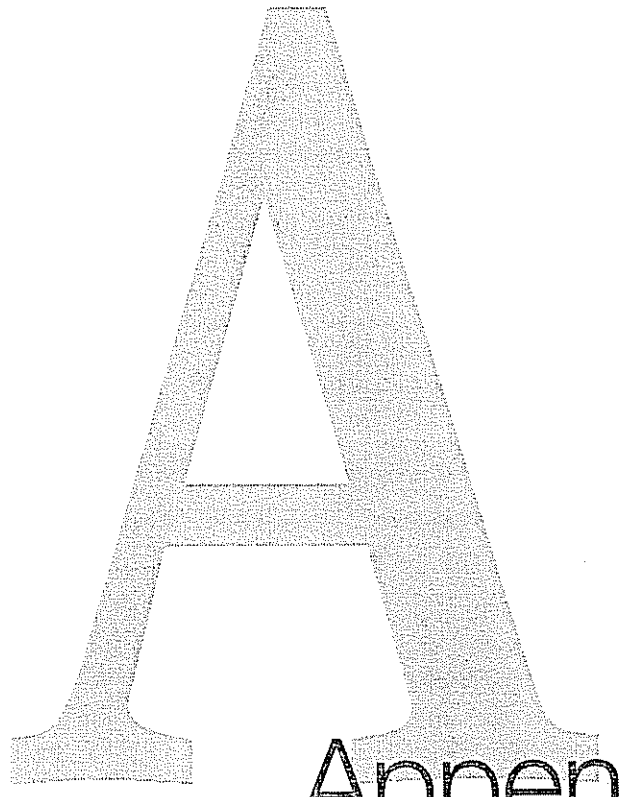

Appendix A

Appendix A

NYSDEC Wetland Class Definitions

NYSDEC Wetland Class Definitions

Class I Wetlands

A wetland shall be a Class I wetland if it has any of the following seven enumerated characteristics:

- **Ecological associations** - it is a classic kettlehole bog (664.6(b)(2));
- **Special features** - it is resident habitat of an endangered or threatened animal species (664.6(c)(2) and (4)); it contains an endangered or threatened plant species (664.6(c)(4)); it supports an animal species in abundance or diversity unusual for the state or for the major region of the state in which it is found (664.6(c)(1) and (6));
- **Hydrological and pollution control features** - it is tributary to a body of water which could subject a substantially developed area to significant damage from flooding or from additional flooding should the wetland be modified, filled, or drained (664.6(d)(1)); it is adjacent or contiguous to a reservoir or other body of water that is used primarily for public water supply, or it is hydraulically connected to an aquifer which is used for public water supply (664.6(d)(2),(3), and (4));
- **Other** - it contains four or more of the enumerated Class II characteristics.

Class II Wetlands

A wetland shall be a Class II wetland if it has any of the following seventeen enumerated characteristics:

- **Covertype** - it is an emergent marsh in which purple loosestrife and/or reed (phragmites) constitutes less than two-thirds of the covertype (664.6(a)(2));
- **Ecological association** - it contains two or more wetland structural groups (664.6(b)(1)); it is contiguous to a tidal wetland (664.6(b)(3)); it is associated with permanent open water outside the wetland (664.6(b)(4)); it is adjacent or contiguous to streams classified C(t) or higher under article 15 of the environmental conservation law (664.6(b)(5));
- **Special features** - it is traditional migration habitat of an endangered or threatened animal species (664.6(c)(3) and (4)); it is resident habitat of an animal species vulnerable in the state (664.6(c)(2) and (5)); it contains a plant species vulnerable in the state (664.6(c)(5)); it supports an animal species in abundance or diversity unusual for the county in which it is found (664.6(c)(7)); it has demonstrable archaeological or paleontological significance as a wetland (664.6(c)(8)); it contains, is part of, owes its existence to, or is

ecologically associated with, an unusual geological feature which is an excellent representation of its type (664.6(c)(9));

- **Hydrological and pollution control features** - it is tributary to a body of water which could subject a lightly developed area, an area used for growing crops for harvest, or an area planned for development by a local planning authority, to significant damage from flooding or from additional flooding should the wetland be modified, filled, or drained (664.6(d)(1)); - it is hydraulically connected to an aquifer which has been identified by a govern-ment agency as a potentially useful water supply (664.6(d)(4)); it acts in a tertiary treatment capacity for a sewage disposal system (664.6(d)(3));

- **Distribution and location** - it is within an urbanized area (664.6 (e) (1)); it is one of the three largest wetlands within a city, town, or New York City borough (664.6(e)(3)); or it is within a publicly owned recreation area (664.6(e)(4))

Class III Wetlands

A wetland shall be a Class III wetland if it has any of the following fifteen enumerated characteristics:

- **Covertypes** - it is an emergent marsh in which purple loosestrife and/or reed (phragmites) constitutes two-thirds or more of the covertype (664.6(a)(2)); it is a deciduous swamp (664.6(a)(3)); it is a shrub swamp (664.6(a)(5)); it consists of floating and/or submergent vegetation (664.6(a)(6)); it consists of wetland open water (664.6(a)(7));

- **Ecological associations** - it contains an island with an area or height above the wetland adequate to provide one or more of the benefits described in section 664.6(b)(6);

- **Special features** - it has a total alkalinity of at least 50 parts per million (664.6(c)(10)); it is adjacent to fertile upland (664.6(c)(ll)); it is resident habitat of an animal species vulnerable in the major region of the state in which it is found, or it is traditional migration habitat of an animal species vulnerable in the state or in the major region of the state in which it is found (664.6(c)(1),(2),(3), and (5)); it contains a plant species vulnerable in the major region of the state in which it is found (664.6(c)(1) and (5));

- **Hydrological and pollution control features** - it is part of a surface water system with permanent open water and it receives significant pollution of a type amenable to amelioration by wetlands (664.6(d)(3));

- **Distribution and location** - it is visible from an interstate highway, a parkway, a designated scenic highway, or a passenger railroad and serves a valuable aesthetic or open space function (664.6(e)(2)); it is one of the three largest

wetlands of the same covertype within a town (664.6(e)(3)); it is in a town in which wetland acreage is less than one percent of the total acreage (664.6(e)(3)); or it is on publicly owned land that is open to the public (664.6(e)(5)).

Class IV Wetlands

A wetland shall be a Class IV wetland if it does not have any of the characteristics listed as criteria for Class I, II or III wetlands. Class IV wetlands will include wet meadows (664.6(a)(1) and coniferous swamps (664.6(a)(4)) which lack other characteristics justifying a higher classification.

Source: 6 NYCRR Part 664 Freshwater Wetlands Maps and Classification

Appendix B

Appendix B

Stage IA Archaeological Assessment

R516

Stage 1A Archaeological Assessment

Catskill Aqueduct Connection

Village of Kiryas Joel

Orange County, New York

Stage 1A Archaeological Assessment
Proposed Catskill Aqueduct Connection
Village of Kiryas Joel, Orange County, New York

August 2003

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Photo 15: Looking north at historic foundations north of Fairway Drive and west of Route 208. These foundations sit right off the west shoulder of Route 208.

Photo 16: Looking west down Route 17 from the Schunnemunk Road Overpass. Westbound traffic is on the right.

Photo 17: Looking northwest up Berdichev Drive, Village of Kiryas Joel. The Water Department of the Village of Kiryas Joel is on the right.

Photo 18: Looking east along Route 44 from the intersection of Route 44 and Milval Lane. The northern edge of Parcel 2 is on the right.

EXECUTIVE SUMMARY

The proposed Catskill Aqueduct Connection Project will provide a new source of drinking water for the Village of Kiryas Joel, Orange County, New York (Figures 1 and 2). The new pipeline will connect the existing Aqueduct in New Windsor, also in Orange County, with a new water treatment plant (WTP) to be constructed on either the site of the Village's existing WTP on Berdichey Drive or on a site on Seven Springs Road (County Road 44) (Figure 3). This Stage 1A Archaeological Assessment has been undertaken to determine the project's potential effects on archaeological resources within each of three possible water conveyance corridors as well as the proposed site of the new WTP (Figure 3).

Orange County is still rural in many aspects, reflecting its rich historic and precontact past Historic hamlets and villages, including mill towns located along rivers, are found throughout the County. Each of the three proposed water conveyance routes follows historic roads for considerable lengths (see Photos, Figures). The lack of modern disturbance in certain resource-rich areas along these routes makes the discovery of both historic and precontact resources more likely.

Both the possible eastern (Route A) and western (Route C) corridors roughly follow historic roads, and as such, might impact historic sites, including old mills. Research found that the current State Roads or Routes do not precisely follow the original routes; hence the modern roads may in fact pass over earlier structures that once fronted these roads. The areas surrounding these historic roads experienced considerable development during the 19th century. The density of historic occupation in some areas might indicate the potential survival of historic resources. In particular, historic mills were often adjacent to the early roads and junctions of roads and it is very possible that there are some mill features beneath the extant roads. Known mills were located at two stream crossings at Orrs Mills in Cornwall and Salisbury Mills in Blooming Grove, within the corridors of the eastern and western routes, respectively. The eastern route along State Road 32 follows natural streams and contains many areas suited for precontact era habitation or use. Undisturbed areas may thus be sensitive for precontact resources. Although Parcel 2, the site of the proposed new WTP, was not found to have hosted significant historic resources, the site might be sensitive for precontact archaeological resources based on its location and topographic characteristics.

Out of the three possible water conveyance corridors, research indicates that the central corridor (Route B), which follows Interstate 87, might have the least impact on potential historic or precontact resources. This is due primarily to the fact that over three-quarters of this route follows a major highway, the construction of which caused serious disturbance. Only one section of the proposed central corridor, south of Interstate 87, passes by historic structures as detailed in Appendices 1 and 2. Even though this segment passes these resources, the total potential impacts are considerably less than those identified along the other two routes.

It is recommended that once an alternative route is chosen specific boundaries and/or selected monitoring zones, located within the archaeologically sensitive areas, be established for study. This strategy would include working with the design management team to avoid

some potentially sensitive areas. Given the widespread degree of historic and precontact occupation, this strategy is suggested as the best possible means to avert damaging archaeological sites. This would also help limit the location where field testing would be required along the selected route.

Once the final route is selected, a lot by lot intensive reconnaissance inspection of the sensitive zones would be conducted to precisely establish the level of disturbance and degree of sensitivity within each zone. This would allow sensitive areas to be more precisely located or large portions of the route eliminated due to obvious disturbance. In particular, limited monitoring of excavations for the pipeline installation would be conducted within those zones specifically sensitive for historic mills. The crossing of natural streams in direct proximity to a historic mill could affect remaining, buried industrial components of the mill complex. Visual and physical barriers (e.g., rolled, plastic fencing) would be erected to delineate sensitive stretches of the existing road shoulder and right-of-way. For potentially sensitive areas that cannot be absolutely avoided but are not likely to suffer subsurface impacts, such as staging areas, putting down a geo-filter on the existing grade or depositing a few inches of topsoil over it to form a distinct horizon, could help prevent accidental impacts to potential resource. Further, the recommended construction management program would include the stipulation that storage areas established for the construction project would not be reused after the project is completed and that all spoils deposits must be removed at the end of the project.

1.0 INTRODUCTION

The proposed Catskill Aqueduct Connection Project will provide a new source of drinking water for the Village of Kiryas Joel, Orange County, New York (Figures 1 and 2). The new pipeline will connect the existing Aqueduct in New Windsor, also in Orange County, with a new water treatment plant (WTP) to be constructed on either the site of the Village's existing WTP on Berdichey Drive or on a site on Seven Springs Road (County Road 44) (Figure 3). The potential environmental effects of the proposed project are to be assessed in an *Environmental Impact Statement* (EIS) prepared for the project, and will include this Stage 1A Archaeological Assessment of the project's potential effects on archaeological resources.

Three pipeline route corridors (identified in this report as Routes A, B, and C) have been evaluated for conveyance of Catskill Aqueduct water to the Village (Figure 2). Each of the proposed pipelines would require subsurface disturbance, which may impact archaeological resources, if present. Therefore, an archaeological assessment has been prepared for this project and is presented here in this document.

This Stage 1A report 1) identifies the Areas of Potential Effect (APE) for the proposed pipeline route corridors, 2) identifies areas of potential archaeological sensitivity within the APE that may be affected by the Connection Project, 3) assesses potential project effects on any such resources, and 4) provides recommendations for further consideration where necessary

1.1 Regulatory Setting: Applicable Regulations, Policies and Guidelines

The proposed water transmission mains go through areas that may contain archaeological resources, and thus the permitting authorities must consider the cultural resource impacts of the proposed construction in accordance with the State Historic Preservation Act (SHPA). In particular, three areas of potential impact can be identified immediately as (1) the State Route 94 corridor, (2) the Mountainville area, and (3) the hamlet of Highland Mills. As part of applying for NYS Department of Environmental Conservation (DEC) permits and as part of the proposer's Draft Environmental Impact Statement (Draft EIS), these locations and other possible impacted areas must be reviewed by a professional archaeologist under a Phase 1-A and possibly a Phase 1-B Field Investigation. To comply with these requirements, this archaeological assessment was prepared to identify any documented or potential significant archaeological resources within areas that may be affected by the project. The potential effects of the proposed action on archaeological resources are then analyzed, and further evaluation measures, if necessary, recommended.

1.2 Project Identification

The Catskill Aqueduct Connection Project will connect the existing Aqueduct in New Windsor with either the existing WTP location on Berdichey Drive in the Village of Kiryas Joel or with a new WTP to be constructed on Seven Springs Road (County Road 44) (Figure 2). This will be accomplished via the construction of a new water conveyance that will follow one of three possible routes along a number of main roads in central Orange County.

Potentially, therefore, this project will impact between 11 and 13 miles of County roads as well as a 30-acre parcel of land that is being considered as the location for a new WTP (Figure 2). Each of the three possible pipeline route corridors, as well as the potential site of the new WTP, are the subjects of this study.

1.3 Study Approach

The first task for this Stage 1A archaeological assessment was to define the Areas of Potential Effect (APE) for the proposed Connection Project. The Areas of Potential Effect are the areas where each of the three possible pipeline routes and the potential new WTP would disturb potential archaeological resources, if present. Once the APE was defined, the scope of work was designed to accomplish a number of tasks:

** The first task was to review files at the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) for information on state-identified sensitive areas and to review files at the New York State Museum (NYSM) to determine if precontact materials have previously been reported in the vicinity of, or within, the project area.

** The second task was to place the three alternative corridors in a broader historical context. Research was conducted at various institutions, such as the New York Public Library and the Columbia University Libraries. Local and regional histories were reviewed in order to understand the types of archaeological resources that may have been deposited within the project area. A cartographic analysis of the three routes through time was performed to help determine more precisely those areas of possible archaeological sensitivity. This overview of all three routes and the proposed new WTP site identifies "red flag" loci that could be critical factors in the review process and/or construction.

** The third task was to establish what portions of the three corridors are unlikely to produce archaeological materials due to steep slopes, shallow topsoil, extreme landscape manipulation, standing water, etc. An infield survey of the APEs and a photographic record of the current conditions were also completed, and anomalies and areas of obvious ground disturbance were noted.

** The fourth task was to meet the 1994 standards adopted by the OPRHP vis-à-vis an in-depth, lot-specific survey of discrete sections of the preferred installation corridor. A critical question addressed in this survey concerns the likelihood that historic homelot resources might fall within the corridor route.

This study, therefore, was designed to address two major questions. What is the likelihood that potential precontact and historic archaeological resources of significance exist within the APEs; and, what is the likelihood that such resources have survived later disturbances? Sufficient information was gathered to compare, both horizontally and vertically, the precontact era past, the historical past, and the subsurface disturbance record.

1.4 Area of Potential Effect

The Areas of Potential Effect (APE) were defined as the areas that may experience subsurface project construction, which could affect potential archaeological resources. Potential effects could result from cut-and-cover construction, excavations, and any other ground disturbing activity, which would extend from the existing grade down into potentially sensitive strata. The APEs for the three pipeline corridors and the one alternative WTP site are described below (see Figures 2 and 3).

The areas that will be potentially impacted by this project fall entirely within the towns of New Windsor, Cornwall, Woodbury, Monroe and Blooming Grove. In the case of the three pipeline route corridors, while the exact placement for each stretch of pipeline has not been determined, they would be installed either in the roadway right of way or in the road itself. The pipeline trenches themselves would be only 6 feet deep by 4 feet wide. However, at-grade construction disturbance (e.g., parking of heavy equipment, spoils deposits, temporary trailer installation, etc.) could extend up to 100 feet on either side of the trench. For this report, therefore, the 100-foot strips of land on either side of each route were considered Areas of Potential Effect, meaning they were studied in person and evaluated for precontact and historic activity. For identification purposes only, the three proposed routes have been arbitrarily labeled from east to west as Routes A, B and C. The same research was prepared for the potential site of a new WTP (Parcel 2). Specifically, these are the APEs described in this report.

1.4.1 Route A (The Eastern Route)

In Route A, the water conveyance would begin at the Catskill Aqueduct in New Windsor, proceed south along Riley Road to State Route 94, turn east to Vails Gate, turn south on State Route 32, turn west on County Road 44 in Highland Mills, and terminate at the potential WTP just west of Bakertown Road (see Parcel 2). The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route.

1.4.2 Route B (The Central-Eastern Route)

In Route B, the water conveyance would begin at the Catskill Aqueduct in New Windsor, proceed south along Riley Road to a paved access point onto the New York State Thruway (Interstate 87), proceed south on Interstate 87 until it intersects with State Route 32, proceed south on Route 32, turn west on County Road 44, and terminate at the potential WTP site just west of Bakertown Road (see Parcel 2). The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route.

1.4.3 Route C (The Western Route)

In Route C, water conveyance would begin at the Catskill Aqueduct in New Windsor, proceed south along Riley Road to State Route 94, turn west to Clove Road at Salisbury Mills (County Road 27), turn south on County Road 27 to State Route 208, turn south on State Route 208 to State Route 17, follow the Exit 130 north ramp to the trunk of State Route

17, follow State Route 17 to Shunnemunk Road, turn northeast on Shunnemunk Road to Berdichev Drive, turn northwest on Berdichev Drive to Kiryas Joel's Village existing WTP location. The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route.

1.4.4 Additional WTP site, Parcel 2, Site 13-1-49

Under Routes A and B a new WTP will be constructed on a parcel on Seven Springs Road (County Road 44). Specifically, one acre of land will be needed to house the plant itself. The plot of land (Site 13-1-49) is located just west of the intersection of Seven Springs Road and Bakertown Road. Conservatively, until the exact location of the WTP is established, the APE considered here includes all 30 acres of the undeveloped land in Parcel 2 (Figure 2).

1.5 Impact Evaluation Factors

The potential for disturbing archaeologically sensitive areas by excavation or compaction was used as the criterion to determine potential adverse effects and the need for additional archaeological evaluations.

2.0 ARCHAEOLOGICAL RESOURCE EVALUATION

This study addresses the archaeological potential for each of the three possible routes and the site of the new WTP that may experience subsurface impacts during the proposed Catskill Aqueduct Connection Project.

2.1 Environmental Setting

Prior to human occupation of the Northeast United States the project region experienced heavy glacial activity during the Pleistocene Epoch. Massive ice sheets reached their maximum advance during the last glacial period of the Pleistocene (i.e., the Wisconsin Period) between 18,000 and 16,000 years ago and most of Southern New York was covered in glacial ice at this time. After this period, as the glaciers began to retreat north, immense quantities of glacial gravel were deposited along the margins of the melting ice in the project region. By 13,000 years ago, flora and fauna were reestablished in the project region as temperatures began to rise in the path of the retreating ice. At this time a number of glacial lakes formed in the region, and many of these eventually filled with sediments or became swamps. Current studies indicate that this type of recently deglaciated environment was ideal for Native American populations, who settled the Northeast sometime around 12,000 years ago. An overview of the Native American precontact cultural chronology and its corresponding projectile point typology appears in the following section.

Much of Orange County is quite rugged and mountainous, with the Hudson Highlands to the east along the Hudson River and the Shawangunk Mountains to the west. The Hudson Highlands, which extend along the Hudson River from New York City to Newburgh, prevented early major trade or easy communication routes between the City and the interior,

early settlements of New York State. The excellent natural harbor at Newburgh and the break through the Shawangunk Mountains at the same latitude created an ideal location for early inland settlement in Orange County.

2.1.1 Climate

The climate of Orange County is moderate. Summers are warm with occasional hot periods and winters are cold. The temperature averages from 29 degrees to 84 degrees Fahrenheit with colder temperatures in the more mountainous regions (USDA 1981:3).

2.1.2 Vegetation

Large forested areas are located in the southeastern and southwestern parts of Orange County where the terrain is very steep. The oak forest zones in these areas have been cut several times and consist mostly of scrub oaks and pitch pine that tend to survive on the thinner rocky soils typical of abandoned farmlands. Much of the forest land is scrubby and overgrown with brush.

The other major zone in the forested areas of Orange County is comprised primarily of oak-northern hardwood. This transitional zone is intermixed on moister, deeper soils, but the slope is more often responsible for the alternating stands of each. Southern slopes are often oak or mixed with hickory while northern slopes resemble forests of regions further to the north. Other trees include red cedar, white oak, hawthorn and locust (Thompson 1966:93-95, in Hartgen 1989)

Abandoned farmland in the county has typically reverted directly to forest rather than being converted to pasture before the final abandonment, which is the most current practice. White pine does not pioneer well into abandoned pasture but will quickly seed into abandoned farmland. Therefore, the appearance of white pine often indicates early abandoned farmland.

The central portion of Orange County had nearly equal proportions of forest and farmland in 1965 (Thompson 1966:99, in Hartgen 1989). However, abandoned marginal farmland is becoming reforested. By 1974, farmland constituted only 28% of the land used in Orange County (USDA 1981:1).

2.1.3 Geology and Soils

Orange County includes portions of the Hudson-Mohawk Lowland. The Shawangunk Mountains lie in the west as does a portion of the Catskill Mountains. The Ramapo Mountains and Hudson Highlands, which occupy the eastern third of the county, border the project area to the east. Rolling plains and a series of smaller mountains, including Bellvale, Warwick and Schunnemunk Mountains, characterize the central portion of the county. The last of these (Schunnemunk Mountain) falls squarely in the middle of the project area in the southeastern portion of the county. Elevations range from sea level at the Hudson River to 1,664 feet at the top of Schunnemunk Mountain.

The bedrock geology of Orange County is complex, especially on the county's eastern and western borders. The central portion of the county that contains the project area is the least variable. It is underlain by the Trenton Group of shale (especially Snake Hill shale, which is the principle member of this group in the area). Glacial till has been deposited over 86% of the county by glacial action. The soils that formed in this glacial till include Mardin-Erie, Swartswood-Alden, Pittsfiled-Farmington, Nassau-Bath-Rock Outcrop, Arnot-Swartswood-Hollis and Hollis-Rock Outcrop (USDA 1981:4-9).

2.1.4 Waterways, Ponds and Lakes

Eastern Orange County is drained by the Hudson River, which forms the natural eastern boundary of the county, and a number of its tributaries. Moordenar's (also called Moodna) Creek, for example, enters the Hudson across from Pallopell Island. The Otterkill is a principal branch of Moordenar's Creek. Moordenar's Creek, as well as its branches and tributaries, was at one time called Murderer's Creek. The Otterkill is located in the Salisbury Mills section. Newburgh Creek also empties into the Hudson between Newburgh and New Windsor. The Wallkill River, which rises in New Jersey, flows north through the center of Orange County. Warwick, Pochuck and Rutgers' Creeks are branches of the Wallkill. Ramapo and Sterling Creeks, which feed into the Passaic River in New Jersey to the south, rise in Orange County and pass through Monroe and Tuxedo towns. The Delaware River and its tributaries flow along the western edge of Orange County.

A large collection of ponds and lakes are found in Orange County. Chadwick Lake, Orange Lake, Lake Washington and the Silver Stream Reservoir are in the northeastern part of the county. Beaver Dam Lake and Popolopen Lake are in the eastern portion of the county. To the south are Glenmere Lake, Wickham Lake, Mombasha Lake, Sterling Lake, Tuxedo Lake and Greenwood Lake. Tomahawk Lake is in central Orange County. Further details on these waterways, ponds and lakes are provided in the following sections as they relate more directly to the project area.

2.2 Contextual Overview

In order to fully understand the use of the project area through time it is necessary to develop the historical contexts for the APE. As defined by the National Park Service, "historic contexts provide a framework for the identification, evaluation, designation, and treatment of cultural resources associated with particular themes and time periods. Historic context based planning permits recognition of individual properties as parts of larger systems. Historic contexts also help managers and others evaluate properties within their proper levels of significance. As such, they provide both a systematized basis for comparison and a comprehensive frame of reference. In so doing, historic contexts provide cultural resource managers with a guide for rational decision making" (Grumet 1990). The following discussions establish a contextual framework for the precontact and historical eras as they relate overall to the project area.

2.2.1 Precontact Context

For this report, the word 'precontact' is used to describe the period prior to European exploration and settlement of the New World. As they do elsewhere in the United States, archaeologists and historians in southern New York gain their knowledge and understanding of precontact Native America from three sources: ethnographic reports, Native American artifact collections, and archaeological investigations.

Based on their knowledge of extant archaeological data in particular, researchers active in southern New York State have established regional models of precontact life, subsistence, and settlement patterns. These models, while provisional, provide archaeologists with a baseline for understanding potential resources from area to area in the New York region. This contextual understanding is necessary for interpreting archaeological resources and assessing precontact land and resource utilization. The outline presented here, which is based on years of archaeological research, summarizes the precontact era of the immediate region. Clearly, as research in the area continues in the years to come, regional histories, chronologies and theoretical issues will become more refined.

Paleo-Indian Period (12,000-9,500 Years Before Present)

Between 14,000 and 12,000 years ago the Northeast was dominated by common spruce and generally characterized as open woodland. This changed roughly 10,000 years ago when different species of pine came to dominate the region (Gaudreau 1988:240). Pollen analysis shows that the southeastern region of New York State was comprised of a mixed coniferous-hardwood forest following deglaciation (Salwen 1975:43). The post-glacial environment supported a diverse array of mega-fauna including mammoth, giant ground sloth, horse, and giant beaver, and these were consistently hunted during the precontact period for subsistence. The Paleo-Indian period represents the earliest documented human occupation in the Northeast, dating approximately between 12,000 to 9,500 years B.P. (before present).

In the Northeast, few remnants of these peoples have been recovered from habitation sites. Artifacts attributed to this period from sites in the Hudson River Valley and throughout the Northeast include fluted projectile points that are diagnostic of the well known Clovis-type and processing tools such as scrapers, gravers, and drills. Often these were made from varieties of chert that originated in eastern New York, and jasper from Pennsylvania and New Jersey. Lithics such as these recovered at a distance from their sources suggest well-defined or extensive travel or trade networks in operation at that time. Research in the Northeast has lead to the assumption that small bands of hunters nomadically roamed large territories, relying predominantly on post-Pleistocene mega-fauna. Alternative hypotheses based on research in eastern New York suggest that Paleo-Indians inhabiting the area utilized a wide array of resources and had a restricted territory in which they operated (Eisenberg 1978:139). The Dutchess Quarry cave site in Florida, Orange County, for example, produced Paleo-Indian artifacts mixed with a number of faunal remains including caribou, deer, and elk, supporting this hypothesis (Funk 1976:206). On-going research in the region will further develop and refine these types of theoretical models of Paleo-Indian Period subsistence and settlement.

While there are also many unanswered practical questions regarding the particularities of the settlement and subsistence systems of Paleo-Indians, there are a few general observations that can be made. For example, sites that have been identified tend to be located in three specific geographic locales: on lowland waterside camps near coniferous swamps or larger rivers; on upland bluffs in areas where deciduous trees dominated; and on ridge tops also dominated by deciduous trees (Eisenberg 1978:138). Throughout the Northeast, it is more common to locate isolated 'spot finds' of diagnostic artifacts than whole habitation sites. For instance, spot finds have occurred along the Hudson River and its tributaries (Funk 1976:205). The paucity of recovered habitation sites may be due to post-glacial changes in topography resulting from site inundation, or historic and modern activities where habitation sites once existed.

Interestingly, more mastodon remains have been recovered from Orange County then from any other county in the United States (Johnson 1981:3). Commonly, mastodon remains can be found in glacial outwashes, because the poorly drained nature of these outwashes restricts oxygen flow and allows for better faunal preservation. An east to west break in the Hudson Highlands and the Shawangunk Mountains may have acted as an open corridor for precontact people to follow megafauna to the Hudson River through Orange County. It should be noted, of course, that while Native American hunters did hunt mastodon, the mere existence of the remains of this type of megafauna does not guarantee the presence of Paleo-Indians.

Archaic Period (9,500-3,000 Years B.P.)

The Archaic period, spanning approximately 6,500 years, has been subdivided into the Early, Middle, Late, and Terminal periods. The Early Archaic (9,500-7,000 years B.P.) experienced some fluctuations in the climate, but these eventually gave way to a gradual warming trend that allowed new types of natural resources to become established. As a result of these environmental changes, it appears that Native American dependency on big game gave way to a mixed economy that included hunting, fishing, and gathering. This diversification of the Native American economy and its use of a more stabilized resource base may have facilitated population growth in this period. Artifacts of the period include bifurcate-base points, which are often found along major drainages. Few sites of this period have been found in the areas of southern New York and southern New England. One site that has been documented from this period is the New Hampton Site in Goshen, which lies in the Wallkill River Valley nine miles west of Kiryas Joel.

Middle Archaic cultures thrived from roughly 7,000 to 5,500 years ago. The climate continued to warm in this period, which allowed new flora and fauna to become established. Dincauze and Mulholland (1977) suggest that seasonal movements based on the exploitation of specialized resources became well established at this time, which may have encouraged territoriality. Tool kits expanded in response to diverse resource utilization, and artifacts include Neville and Stark projectile points. Neville-like points have been recovered from both the Sylvan Lake Rockshelter in Dutchess County and the Muddy Brook Rockshelter in Putnam County (Funk 1976:168; Tompkins and DiMaria 1979:58).

From approximately 5,500 to 4,000 years B.P. Late Archaic cultures flourished across the Northeast as warming trends continued to promote new resource-rich environments. Point types diagnostic of this period include small stemmed points such as Lamokas and Taconics, as well as Squibnocket and Brewerton Points. The Lower Hudson Valley experienced increased habitation, which can be seen in a rise in the number of Late Archaic shell middens recorded along the banks of the Hudson River (Brennan 1974:87). Sites from this period include rockshelters, open woodland camps, and areas located on high bluffs along the Hudson River. Many sites from this period have been discovered in the Lower Hudson River Valley and the Hudson Highlands area.

The dominant subsistence pattern in the Late Archaic may have been one of centrally based wandering focused on the exploitation of seasonal resources. The wide range of site types and a greater diversity in site locations represent a high degree of cultural complexity. More Late Archaic sites have been reported than for either of the two previous periods. The increase in the number of sites may reflect either an increase in the population brought on by the stabilizing environment, or a bias in site visibility. By the Late Archaic period, sea and river levels were roughly the same as they are today, and sites of this period would have less of a chance of being inundated. In addition, archaeologists in the Northeast have assumed that small stemmed quartz points attributed to this period actually represent an underlying cultural tradition that persisted through later periods (McBride 1984:133). Sites that are attributed to this period based solely on projectile point typologies, therefore, may actually be misidentified.

Three cultural traditions persisted in the Northeast United States during the Terminal Archaic period (4,000-3,000 years B.P.). These include (1) the Laurentian tradition, which is represented by the Vergennes phase and the Vosberg complex, (2) the small stemmed tradition, and (3) the Susquehanna tradition, which is represented by the Snook Kill and Orient phases (Funk 1976:250). Although Funk defines these three separate traditions as persisting in the Hudson River Valley, Snow (1980:237) reassesses the distribution of Terminal Archaic points and suggests, first, that the Susquehanna tradition dominated the first half of the period (and is marked by Snook Kill, Perkiomen and Susquehanna Broad points), and, second, that the Orient complex dominated the latter half of the period (and is characterized by the Orient Fishtail Point). The precise sequence of Terminal Archaic traditions, complexes, and phases is a continued source of debate. Regardless, Funk states that Laurentian manifestations are relatively weak in the Bear Mountain region, while narrow stemmed points are heavily represented (Funk 1976:183). A Brewerton point and a Genessee point recovered from the United States Military Academy Reservation at West Point (USMA Site 58) places a Laurentian Tradition presence in the Lower Hudson Valley area (Public Archaeology Lab, Inc. 1991:12).

Whether these distinct Terminal Archaic traditions (i.e., Laurentian, small stemmed, and Susquehanna) represent the migration of new people into the area or the spread of new technologically ideas has yet to be determined. Similarly, although it has yet to be described in great detail, it can be assumed that each tradition had different settlement patterns that reflected the differential utilization of specific resource niches. Some general patterns, however, have been outlined. For example, Terminal Archaic people ground and polished

soapstone into bowls and other items. Funk (1976:266) states that both Susquehanna and Orient points have a relatively low incidence in back-country rockshelters and that the majority of sites encountered in the region thus far existed along the Hudson River and its major tributaries. This pattern may be the result of the high site visibility of sites along major river drainages as opposed to the actual lack of sites in remote settings, since continued research from interior areas has produced sites of this period. For example, the Tiorati Rockshelter, which is east of the project area near Lake Tiorati in Bear Mountain State Park, yielded four Orient Fishtail points (Funk 1976:177). Orient Points have been radiocarbon-dated to approximately 4,000 to 2,800 years B.P. in the Hudson River Valley

Woodland Period (3,000-500 Years Before Present)

The Woodland period persisted in the Northeast from approximately 3,000 to 500 years ago. This period consists of three sub-periods (Early, Middle and Late). The first of these, the Early Woodland period, lasted from about 3,000 to 1,700 years ago and is represented by the Middlesex phase in eastern New York. This period is marked by the introduction of ceramic vessels into material culture assemblages. This early pottery, which was crude and undecorated and often tempered with steatite, is called Vinette 1. Examples of this pottery type are largely recovered from sites on major waterways and tributaries, although Vinette 1 pottery was also found at the Greycourt Rockshelter in Chester Township in Orange County.

A number of Early Woodland sites have been discovered during sand and gravel mining operations near lake and rivers, as sites tend to be located on well drained knolls adjacent to fresh water (Ritchie 1980:201). Fish runs in rivers would have provided stable and reliable food sources, and fish weirs are thought to have been utilized in the Hudson and smaller tributary rivers for the recovery of large quantities of anadramous fish (Brumbach 1986:35).

The Middle Woodland period, lasting from c. 1,700 to 1,000 years B.P., is marked by regional changes in lithic technology and ceramic styles. Jack's Reef Corner Notched, Jack's Reef Pentagonal and Fox Creek projectile points characterize Stone tool assemblages of this period. A significant amount of exotic lithic materials was utilized; perhaps indicating increased activity though regional trade networks. Subsistence and settlement patterns appear to have been characterized by semi-permanent settlements with task-specific locations utilized for the purpose of exploiting target resources. Ritchie and Funk (1973:349) identify several settlement types for Middle Woodland cultures, including recurrently-occupied small and semi-permanent large camps, small temporary camps, cemeteries, burial mounds, and workshops.

During this period, maize was introduced from middle North America and horticultural practices were slowly adapted into the lifeways of local Indians. The nature and extent of maize use in the precontact era has been much debated by archaeologists working in the Northeast (Ceci 1979:72). Material items of this period include ornamental pendants, pins, and the bow and arrow. Ceramics became technologically more advanced as vessel walls became thinner and overall shape became more rounded. It is suggested that the change to ceramic vessels with rounded bottoms corresponds with the introduction of maize and was the result of a need to cook food for longer periods of time (Braun 1980:100) Ceramic

'netmarking' also became a popular mode of decoration in this period. In general, ornamentation of the collars and bodies of ceramic pots increased, suggesting that the potters were potentially concerned with expressing their cultural affiliations. Overall, the remains representative of this period recovered from eastern New York are limited in number, compared to those found further to the west in the Great Lakes region (Funk 1976:298). This may be a misrepresentation resulting from biased sampling and preservation rather than the actual lack of sites.

The Windsor tradition, which has related components found along the Hudson and Connecticut River drainages and the coast of Long Island Sound, was established in this period. In the Lower Hudson River Valley, the tradition is represented by the Windsor North Beach and Clearview phases (Snow 1978:63). The Fox Creek phase of the Middle Woodland period appears to have had its center of distribution in the New York coastal region and in the eastern New York drainages (Ritchie and Funk 1973:356). Settlement patterns reflect a more restricted wandering system, which would have excluded the presence of large base camps and semi-permanent villages.

During the Late Woodland period, 1,200 to 500 years ago, the climate was similar to that of today. The recorded settlement patterns indicate the use of diverse environmental settings including inland rockshelter sites, coastal and island sites, inland sites on major drainages, and campsites located near swamps and along streams. There is marked evidence of an overall increase in site size, abundance, and artifact frequencies. An annual subsistence round of seasonal movements between riverine, coastal, and inland wintering sites may have existed. The semi-permanent settlement pattern may have led to competition and defense of arable land, contributing to regional territoriality (Mulholland 1988:163).

Artifact types of this period include the Levanna triangular projectile point and Owasco-related ceramics. This Owasco-related phase is much smaller and a bit later than the great Owasco phase seen in central New York during the Middle Woodland period (Funk 1976:300). In the Bear Mountain region as a whole, Late Woodland materials are fairly abundant and appear to be more closely associated with the cultural material found in New York's coastal areas (Funk 1976:301). For example, a Levanna point from the Trophy Point Site places a Late Woodland occupation at the USMA Reservation at West Point (Public Archaeology Lab, Inc 1991:14).

Contact Period (500-300 Years Before Present)

The Contact Period, from 500 to 300 years B.P., is typified by the initial interactions between Native American groups and early Europeans. Native settlement patterns at the beginning of this period were essentially the same as those of the Late Woodland, consisting of seasonal hunting and gathering. In spring and fall, areas along streams were occupied to take advantage of fish runs. In the transition seasons upland and inland task-specific sites were occupied for short periods for hunting, trapping, and lithic procurement activities. Inland and upland wintering sites were utilized when smaller bands retreated from the valleys to hunt forest game (Cronon 1983:48).

Semi-permanent villages of Contact Period Native Americans were located near planted fields in the interior. Houses were oval or round, and were covered in bark or mats. Large pits were used for storing dried meat, fish, and corn, and it was common practice to burn fields to facilitate hunting, trapping, and planting. It was not uncommon for horticultural villages to move to new locations after ten or twenty years as soil fertility, firewood, and nearby game resources were depleted (Salwen 1975:57). Although early historical accounts suggest the presence of stockaded villages or forts in the Hudson River Valley and coastal New York, archaeological data indicate they were not present prior to the middle of the seventeenth century (Ritchie and Funk 1973:368).

The first contacts between Native Americans and Europeans occurred when early explorers began to trade with native population. The area that was to become Orange County was known at that time as "land of the Lenape." The people were of Algonkian descent and spoke various dialects of what has been referred to as the Delaware language (Kraft 1984:1). In 1524 Giovanni da Verrazzano encountered a ground of Native Americans in the Lower Hudson River region and described them as "curious, friendly, and accommodating" (Kraft 1991:207). By 1609 Henry Hudson had sailed up the Hudson River to expand the European trade network. As European materials were introduced, settlement and subsistence patterns changed drastically. Traditional tools were replaced by adopted European goods such as copper and iron. Shell beads and wampum were produced and furs were collected by Native Americans as a medium of exchange. Europeans were anxious to acquire furs from Native Americans, thus numerous trading posts were established along the Hudson River. Due to the fur trade, Native Americans slowly became economically dependent upon the Europeans, decreasing their status from traders to employees. As the fur supply decreased, poverty soon followed (Hauptman 1975:6).

Several rockshelter sites within Orange and Rockland Counties bear evidence of the first contacts between Native Americans and Europeans. The Ramapo Rockshelter yielded a total of 216 projectile points, together with two incised Indian pipe bowls, one European kaolin pipe, a triangular arrow point of brass, and a musket ball (Funk 1976:180). The White Rabbit Rockshelter, within Bear Mountain State Park, also contained many projectile points together with colonial period china, rum bottle glass, kaolin pipes, and musket shot (Funk 1976:182). However, the general paucity of European trade goods at Lower Hudson Valley Native American sites, as compared to Upper Valley sites, has not been adequately explained (Kraft 1991:214).

During this tumultuous period of European settlement, clan groups were often dispersed and replaced by non-local Indian groups. In the seventeenth century, the Ramapo region was occupied by Indians speaking a Munsee dialect of the Eastern Algonquian language who were probably Minisinks (Goddard 1978:73). In addition, there is reference to a tribe of Ramapaughs Indians who resided in the nearby Ramapo Pass (Cole 1884:262). In the 1690's there was also an influx of Shawanoe Indians from elsewhere (Ruttenber and Clark 1881:11). In the deed of a 1709 transaction for the Ramapock land tract (i.e., just east of Tuxedo), property was conveyed from 'Memerescum', who is described as the "sole Sachem of all the nations of Indians on the Ramapock River" (a sachem is a Native American leader, see Cole

1884:262). In any case, by the early eighteenth century, most Native American groups had dispersed from their precontact homelands (Heusser 1923:81).

Large-scale conflicts between Native Americans and European settlers did not break out in the Hudson Valley region until the 1638 arrival of Governor Willem Kieft, who maintained a hard-line policy against local Indians. This policy caused the death of 1000 Native Americans between 1640 and 1645 due to conflicts alone (Washburn 1978:98). In 1655 Native Americans attacked New Amsterdam, and the ensuing Esopus Wars, named so for the involvement of the Esopus Indians, lasted until 1664. As a result, Algonquian bands in the lower Hudson River Valley ultimately lost their independence and fell under Dutch control.

The subsequent breakdown of native socio-political organization during the seventeenth century was caused by intertribal stress, plagues, and the desire of newcomers to obtain land rights. The plagues of 1616-1620, introduced by Europeans, depopulated many groups, with population losses in southern New England and New York estimated between 70 and 90 percent (Snow 1980:34). The conflicts engendered by rapid colonial expansion, war, and epidemics caused many Native American groups either to leave the area or take up habitation in established communities (Brasser 1978:85). The local populations, although depleted, were still intact after 1670. In the following century, missionaries and officials encouraged the Indians to leave the area altogether (Hauptman 1978:247).

2.2.2 Historic Context

Early Settlement

While Henry Hudson did manage to sail to and anchor in Cornwall Bay in 1609, the Dutch were the first Europeans to settle in the vicinity of Orange County, and the area was controlled by Holland until the conquest by the British in 1664 (Ruttenber and Clark 1881:20). Immigration into Orange County was slow and erratic while the area was under Holland's control, but this changed dramatically once the English established dominion over the region (Eager 1846-7:45, 91, in Hartgen 1989). Orange County was established according to colony law in 1683 as one of the original counties of the Province of New York. The county name is derived from King William III of England who was a Prince of the House of Orange. At its inception Orange County contained the territory that is now Rockland County, which was established as an independent entity in 1798.

Around the year 1700 English as well as French Huguenot and Dutch settlers began to flow steadily into the area. For the next 75 years and the start of the Revolutionary War, the county was portioned into numerous land patents that effectively displaced many Native American. In fact, the 1700s saw active maneuvering and competition among European settlers over the allocation and purchase of Native American lands, and a flurry of these patents were transferred to notable persons holding official government positions (Ruttenber and Clark 1881:15).

The first patent issued in the area was the Minisink Patent in 1697, which covered most of the county, including the Shawangunk Mountains. Other portions of the counted included

the Chesecock Patent, issued in 1702, which included the southeast of the county, and the Wawayanda Patent, issued in 1703, covering the northwest portion (French 1860: 503). These early patents were quite large, and boundaries of these initial patents so vaguely defined that they were difficult to determine without seemingly infringing on others' lands. By the mid-1700s, the practice of granting large patents was abandoned and the rest of the county was patented in smaller tracts to settlers who physically occupied the granted tracts, although settlements along the frontiers of Orange County were frequently under attack by Native American groups during the French War of 1755 and later, during the Revolutionary War.

Revolutionary War

During the Revolutionary War both the British and Colonial armies appreciated the strategic location of Orange County at the northern reaches of the Hudson Highlands, which extend along the Hudson River from New York City to Newburgh. In particular, the settlements of Newburgh and New Windsor were ideally located in relation to the end of the highland bluffs and natural inland transportation routes along valleys and waterways. For example, the Highland fortifications at Forts Clinton and Montgomery, which were captured by the British in October 1777, were the object of much military attention. This British victory resulted in the construction by the Continental Army of a new improved defensive settlement at West Point to maintain control of the Hudson River corridor. In the spring of 1779 when George Washington was on the defensive, the Continental Army was concentrated in the Highlands and in Smith's Cove, with Washington's Army Headquarters located in New Windsor (Ruttenber and Clark 1881:259). When the Treaty of Paris was signed in the spring of 1783 marking the end of the war, the Continental Army was officially disbanded from New Windsor. In the end, Washington had established his longest residency during the Revolutionary War in the area around Newburgh, and it was from here that he established the Order of the Purple Heart. In 1850 Washington's Headquarters became the first Registered National Historic Landmark in the United States.

19th Century Development

Improved sloop design for river transport made Newburgh a central node in the movement of goods from central New York State down to New York City (Ruttenber and Clark 1881:111). The 1800s also brought more settlers and prosperity to Orange County, which was evidenced in the construction of a new network of roads and turnpikes for transporting goods to and from the inland areas. The Orange Turnpike in Monroe, for example, which was built in 1800 and is now known as State Route 19, was one of the area's first turnpikes. The Newburgh Turnpike, which was begun in 1801, was over 60 miles long and offered Newburgh expanded access to inland markets (Ruttenber and Clark 1881:112). Part of this turnpike, which connects Montgomery to Coldenham to Newburgh, is known as State Route 17K and falls north of the project area. The New Windsor-Blooming Grove Turnpike was undertaken in the same year, and this route falls along one of the project's proposed routes (i.e., along State Route 94). It is discussed in more detail in a later section. A number of other turnpikes were developed in Orange County during the early 1800s (Eager 1846-7, in Hartgen 1989), and the benefits of this network of routes fell largely to Newburgh, which

eventually replaced New Windsor as the commercial center of the region and the primary point of connection between western New York State and New York City (Ruttenber and Clark 1881:115).

The period of canal construction west of Orange County in the 1820s adversely affected the economic relationships towns like Newburgh and New Windsor held with the western areas of New York State as goods were transferred more directly from producers to consumers in the City (Ruttenber and Clark 1881:16). Some of the major canal projects included the Erie Canal begun in 1825 and the Delaware and Hudson Canals begun in 1828, and at one point the people of Orange appealed to the state government for aid. By the mid 1800s railroads began to compete with the canals for control of these transportation routes (Ruttenber and Clark 1881:123), meaning the people of Orange fell further out of the New York exchange economies. A number of these routes crossed the project area and will be discussed in more detail below. Examples of some of the railroads that were developed at this time include the Hudson and Delaware Railroad Company that was established in 1830 to run through Orange County from Newburgh to the Delaware River. The New York, Lake Erie and Western Railroads were also formed at this time, with the Newburgh branch of the New York and Erie Railroad opening in 1850.

While the canals and railroads operated simultaneously for a period of time, eventually the seasonal problems associated with the canal system highlighted the advantages of the railroads. In fact, by the 1850s the locations of the railroads in Orange County were a primary factor in the prosperity or decline of businesses and villages. Newburgh, for example, which had unsuccessfully sought to become the terminus of the New York and Erie Railroad, lost out to Jersey City in the regional trade and transportation economy (Thompson 1966, in Hartgen 1989).

After 1900 the development of the common automobile affected the physical and cultural landscape of Orange County in a number of profound ways. In particular, the turnpike and road system was further developed and new federal and sate highway constructions programs were undertaken. The New York State Thruway (Interstate Highway 87), which was opened in 1955, was one of the first such highways developed in New York State. This Thruway followed an already well-established route and provided the impetus for the construction of similar interstate highways. For example, Interstate 84 was constructed after 1963, connecting Connecticut and New Jersey through northern Orange County.

Agriculture and Industry in Orange County

Since even the earliest historic period the economy throughout Orange County was based on agriculture and animal husbandry. Wheat was the principal crop and an active livestock economy included cattle, sheep and poultry as well as milk and butter. These products were regularly sent to New York City along the Hudson River, which was a natural corridor for moving trade goods.

Each of the improvements described above in statewide networks of transportation, however, had indirect and negative effects on the agricultural life of Orange County. The completion

of the Erie Canal, for instance, opened up vast new agricultural areas in western New York, where high quality grain was produced. As competition in agricultural markets intensified across the state, Orange County farmers were forced to specialize in order to remain competitive. By the 1860s the area had become well known for the quality of its dairy products and milk, cheese and butter had become the most important local industry. The advent of the railroads also caused problems for Orange County farmers, and more and more farms fell out of use by 1900. The steeper, thinner soils on poorly drained upland areas were abandoned first, as were gravelly sandy lowlands. Many of these farms reverted to woodlots or brush and, more recently, to areas of suburban and urban development.

While agriculture and the management of livestock have always been the primary industries in Orange County, early sawmills and gristmills were scattered throughout the region along a number of the more substantial streams. A number of foundries were built in historic times, as were brick making yards and tanneries. Textiles and clothing industries were also common along the Hudson Rivers in 1800s. Newburgh was once the center of an important gunpowder industry that provided the country with ammunitions until the late 19th century. Industries that appeared in the 20th century in Orange County included metal, paper and chemical. More recently a number of high-tech companies have found their way to Orange County, especially to Middletown (USDA 1981:1).

Towns of Orange County

For each town in Orange County that falls within the project area, a brief discussion of its organization, natural features, history, and composite villages are discussed. Information is summarized from previous surveys, old maps and historic documents (Burr 1829; French 1860; Beers 1875; Lathrop 1903; HAA 1989; see Figures 4-18). Villages that fall within the area of the proposed pipelines are discussed in further detail.

The town of New Windsor, located at the north of Orange County, is the starting point for all three proposed pipelines. The town of Cornwall encompasses the two eastern proposed pipelines while the western pipeline would run through Blooming Grove and terminate within the borders of the town of Monroe. The town of Woodbury did not yet exist in the early 1800s (Figure 4).

New Windsor

New Windsor, which borders the Hudson River, was formed in 1788. Largely rolling and hilly, the first settlers of New Windsor were emigrants from Ireland, including the Col. Charles Clinton, Grandfather of DeWitt Clinton (French 1860: 510). The main drainage, Murderers Creek (later called the Moodna Creek), empties into the Hudson at the southeast corner.

The village of Vail's Gate, located just below Mortonville, was a major junction for the Newburgh and Woodbury branches of the Erie Railroad, which passed west and east of the Schunnemunk Mountains, respectfully (Figures 5 and 11; Lathrop 1903). The Vail's Gate P.O. was the location of several hotels, a Presbyterian Church and cemetery. Revolutionary

War headquarters for General Knox were located at Vail's Gate (Lathrop 1903: Plate 8), as was the historic Edmonston House, dating to 1755, former medical facility and headquarters for Generals St. Clair and Gates.

Cornwall

Cornwall was originally part of a tract of land purchased by Governor Dongan from Native Americans in 1685. Established in 1764, Cornwall was at first called "New Cornwall", composed of Cornwall and Monroe, as well as modern day Woodbury (Figures 12-15 and 18; French 1860: 505; Ruttenber and Clark 1881: 753). Monroe later separated in 1799. Highland peaks and ridges with narrow, steep and rocky valley streams largely shape the landscape of Cornwall. The Schunnemunk Mountains bound this town to the west. The main streams are Murderers (Moodna) Creek, emptying into the Hudson, and Otter Kill, which forms the main tributary, flowing through broad valleys in the north of the town. Woodbury Creek heads south from the southernmost bend in Murderers Creek. Several small bodies of water are found along the mountains. The Hudson River forms its eastern border, upon which are located the village of Cornwall, West Point and Fort Montgomery.

The village of Bethlehem in the northwest of the township was reported to have established a church by 1730 and twelve dwellings (Ibid.). The village of Orr's Mills would later become a railroad stop along the New York railroad line (Figures 6, 7 and 12). The Erie railroad heading south from Vail's Gate in New Windsor passed by the village of Mountainville, heading south (Figures 8 and 13). Both Orr's Mills and Mountainville had active mills on Woodbury Creek. Salisbury Mills was part of Blooming Grove, but its Post Office lay within the boundaries of Cornwall (HAA 1989: 17). Other hamlets within Cornwall included Ketchamtown in the west and Townsville in the north. Townsville was located along Murderer's Creek while Ketchamtown was located where Otter Kill joined with Murderer's Creek (Sidney 1851).

Blooming Grove

Blooming Grove, once the western portion of Cornwall, was officially organized in 1779 (Figures 16 and 17). The Schunnemunk Mountains divided Blooming Grove from Monroe to the south and Cornwall to the east, while rolling hills in the north and west were largely cleared and converted to farmlands. Bog meadows in the south of Blooming Grove were drained and converted into some of the most valuable agricultural lands. Otter Kill, part of Murderers Creek, was the major drainage, flowing from northwest Blooming Grove into the town of Cornwall.

The village of Salisbury Mills, near the eastern edge of Blooming Grove, attracted one of the earliest known settlers, Vincent Mathews, due to the substantial waterfall along Otter Kill. Mathews purchased the Rip Van Dam Patent in 1721 and established a gristmill on the creek that was converted to a paper mill and back to a gristmill (Burr 1829; Ruttenber and Clark 1881: 630-1). Later settlers in the 1700s included Edward Blagg and Johannes Hey. A section of land was named Blagg's Clove after these early settlers (Figure 4; Burr 1829).

Salisbury Mills was located on a public road about three miles south of the larger town of Washingtonville (Figures 9, 10 and 16). Apart from Mathews' gristmill, another important mill was owned by Henry Ramsdell (Lathrop 1903: Plate 19). Other businesses located at Salisbury Mills during the historic era included a leather manufacturer, a wagon and carriage shop, a blacksmith, a post office and two general stores. The Newburgh branch of the Erie Railroad passed through Salisbury as well (Beers 1875: Plate 112; Lathrop 1903: Plate 19). Additionally, this village was the site of a Methodist Church, a Presbyterian Church and Public School No. 7 (Ibid.)

Monroe

Monroe, originally part of Cornwall, was initially organized as one large land patent called Chesecocks (French 1860: 507). Later it became known as Southfield, and finally, Monroe in 1808 (Figure 18). In 1845 Monroe accumulated a part of what had previously been known as Chester. Monroe is largely mountainous, bounded by the Schunnemunk Mountains to the north. Woodbury Creek is its main drainage in the north.

Monroe was known for its agriculture, dairy products, forest products, and several mills. Several small villages located within the project area included Woodbury Falls or Woodbury Clove, a hamlet located on Woodbury Creek, and Highlands Mills, which developed around extensive mills once located on the creek (French 1860: 508). Lower Smith Clove, one mile south of Highland Mills, was yet another hamlet. These small villages, once part of Monroe, are currently located in the town of Woodbury. Monroe Village, just south of the project area, was a station on the New York, Erie and Western Railways, with several businesses, including two mills (Ruttenber and Clark 1881: 763-4).

2.3 Existing Conditions

A physical survey, including taking documentary photographs, of each of the corridors and areas being considered for the Catskill Aqueduct Connection Project was undertaken in June 2003 (see Photos 1-18). The potential project areas fall entirely within the towns of New Windsor, Cornwall, Woodbury, Monroe and Blooming Grove. The existing conditions of each of the potential impacted areas are described below.

The Town of New Windsor Water Supply Aqueduct Station, the starting point of each possible pipeline route, is located along Riley Road, west of Interstate 87 (Photo 1). Heading northeast along Route 94, a commemorative plaque marks the Edmonston House, a historic landmark dating to 1755, which is located along the proposed Route A (Photo 2; see Section 1.4, Figure 2). The intersection of Route 94 and Route 32 at Vail's Gate Junction is a heavily trafficked zone, with much evident disturbance to the original landscape (Photo 3).

South of Vail's Gate, Route 32 (Route A) crosses the Moodna Creek at the historic village of Orrs Mills (Photo 4) A historic plaque dating Orrs Mills to 1776 is located on the east shoulder of Route 32 immediately north of the intersection of Orrs Mill Road and Route 32. The actual historic mill was located on the east side of Route 32, north of the bridge spanning Moodna Creek.

Passing further south along Route 32, one approaches the village of Mountainville. Photo 5 was taken just north of Mountainville, opposite Rustic Ridge Road. Woodbury Creek is on the east side and a steep slope rises from the west side of Route 32. West of Mountainville, the Route 87 corridor (Route B) is marked by extensive grading and landscape disturbance (Photo 6). To the south of Mountainville, floodplains along either side of Route 32 appear to have experienced fewer disturbances (Photo 7). Contrary to the steep slopes or disturbed landscapes to the north, these plains would be valuable planting grounds during precontact and historic times.

The Highland Mills Methodist Church and Cemetery is located on the east side of the intersection of Route 32 and Route 44 (Ridge Road) (Photo 8). On the south side of Ridge Road just west of the intersection is a structure which may be the original parsonage associated with the church (Photo 9). Both Routes A and B follow this corridor.

Returning north to the New Windsor Water Supply, the following description follows Route C, which winds around Schunnemunk Mountain to the west (see Section 1.4; Figure 2). An abandoned historic structure was observed at the Intersection of Route 94 and Mount Airy Road, east of the village of Bethlehem (Photo 10). The village of Bethlehem itself is considered historic, including the Bethlehem church pictured here at the intersection of Route 94 and South Jackson Avenue (Photo 11). The church also has an associated cemetery. Additionally, the floodplains in this area are potentially sensitive for historic or precontact resources (Photo 12).

Salisbury Mills, a historic village that once was home to two mills, is located along Moodna Creek where Orrs Mills Road (Route 20) and Clove Road (Route 27) intersect (Photo 13). As a site of early historic settlement, this village is considered a particularly sensitive locale.

At the intersection of Route 208 and Fairway Drive, just north of Route 17, historic structures are evident that have been converted for modern use (Photo 14). There is also evidence for sub-surface remains of historic structures, such as the foundations evident off of the west shoulder of Route 208, just north of Fairway Drive (Photo 15)

Route 17 is a more recently constructed road that handles a fair amount of traffic (Photo 16). This corridor would have been highly disturbed during the construction of this route.

The proposed Route C terminates at the current Water Treatment Plant, located on Berdichev Drive within the village of Kiryas Joel (Photo 17). If this route is chosen, the new WTP would be built on the landscaped area of the existing plant. The proposed Routes A and B terminate at a location on Route 44, referred to as Parcel 2, the other possible site of the new WTP (Photo 18; see Section 1.4; Figure 2 and 3). Drainage ditches are evident along Route 44, possible evidence of disturbance.

2.3.1 Precontact Archaeological Potential

Native American settlements or villages tended to be located near critical resources, such as water, flat or gently sloping fertile lands, or vantage points on the landscape. Other settlement factors might include the presence of special resources, such as raw materials like chert for stone tool making, or Native American trails. Smaller, special purpose sites such as workshops may be found near these specific resources.

Site file searches indicate Native American occupation in the region possibly dating back to 3,500 BC (see Appendix 2, SHPO A071-03-000240). Previously discovered sites by and large consist of stone tools and stone tool production debris, however a later Woodland period rockshelter site along the western route yielded faunal remains, carbon and ceramics as well as stone artifacts (see Appendix 2, SHPO A07101.000095).

However, the likelihood of finding intact precontact archaeological sites within any of the three proposed project routes or Parcel 2 is unlikely, given the amount of historic and modern-era disturbance that has occurred. Evidence shows that the landscape has been farmed consistently beginning with the earliest land patents in the 1700s and increasing greatly during the 19th century (See Appendix 1; Simeon 180?; Sidney 1851; Lathrop 1903) Plowing fields tends to scatter the evidence of Native American sites, taking artifacts out of context and diminishing, though not revoking, their significance (See Appendix 2; SHPO A071-03-000240). Further disturbance would have occurred through the process of road construction. The proposed pipeline routes follow roads that are for the most part historic themselves. The initial construction, continued use, and modern construction of these roads over several centuries have also served to significantly disturb the precontact landscape.

The favorable topographic features observed during the reconnaissance survey and the presence previously identified sites indicates that there are areas that could possibly still hold Native American resources. These areas tend to be located outside of developed areas on open, flat ground and are described below:

Route A

Two previously known precontact sites were identified in the site file searches that could possibly be impacted by Route A (see Appendix 2). These are as follows:

USN# 07115.0000706, Vantage One Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road.

USN# 07115.0000707, Vantage Two Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road.

That the materials recovered were below the plow zone indicates that buried precontact resources may still be intact.

Additionally, reconnaissance shows floodplains along Woodbury Creek on either side of Route 32 south of Mountainville that would have been ideal for Native American settlement in the past. The well-drained soils close to a source of water would have been valued resources to early horticulturalists and could hold evidence of Native American habitation or use.

Route B

No previously known precontact sites were identified in the site file searches that would be impacted in any way by Route B (see Appendix 2). As Route B follows Interstate 87 from New Windsor into Cornwall, it bypasses the sites associated with Route A found along Riley Road.

Like Route A, the field reconnaissance found floodplains present along Woodbury Creek, on either side of Route 32 south of Mountainville, that would have been ideal for precontact settlement. The well-drained soils close to a source of water would have been valued resources to early horticulturalists and could hold evidence of Native American habitation or use.

Route C

Five previously known precontact sites were identified in the site file searches that abutted Route C (see Appendix 2). They include the following:

USN# 07115.0000706, Vantage One Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road. That the materials recovered were below the plow zone indicates that buried precontact resources may still be intact.

USN# 07115.0000707, Vantage Two Prehistoric Site: Native American artifacts were recovered below the plow zone in the Town of Windsor, along the west side of Riley Road. That the materials recovered were below the plow zone indicates that buried precontact resources may still be intact.

SHPO A071-03-000240: A large area was surveyed in Cornwall along the south side of Route 94 and the east side of the railroad, south of Bethlehem. This site spans the Middle Archaic through the Transitional Period (3,500-500 BC). Stone tools and debris was dispersed in the plow zone within this site.

SHPO A07101 000095 (NYSM 8652, Survey #171): The Snail Rockshelter is located in Blooming Grove, west of Clove Road and north of Felter Hill Road. This later Woodland Period site yielded ceramics, stone tools and debris, charcoal and bone. Occasional veins of chert, a raw material used for making stone tools, characterize this rocky, intermittently steep area. The study area for the previous survey abutted the road (BTK Associates, Inc. 1995); however, the rockshelter is located north of the project route

NYSM 8543: Precontact-era stray find located in Monroe, on the south side of Interstate 17. A single stone tool (uniface scraper) and lithic debitage (stone tool production debris) were recovered. The location of this find abuts the project area.

Additionally, reconnaissance along the proposed corridor identified floodplains along Route 94 in the area of the village of Bethlehem as holding potential for Native American resources. Well-drained soils near a source of water would have provided desirable habitation sites.

Parcel 2

No previously known precontact sites were identified in the site file searches that would be impacted by construction within Parcel 2 (see Appendix 2).

2.3.2 Historic Archaeological Potential

Many historic era structures would have fronted onto the same roads currently considered as potential pipeline routes, as is borne out in cartographic and site file research (see Appendices). As several road locations may have changed, it is possible that some early historic sites are located under current roadbeds.

As technology and speed limits have grown, many winding country roads have been straightened through time (see Figures 5-18). It is possible only in a general way to determine the precise amount by which roads have changed their courses through time, given the lack of precision of early maps and atlases. However, given the rural nature of Orange County, most structures, be they houses or commercial, appear to have been set back slightly from the road, leaving room for a front yard and space between the structure and the roadway (or railroad or stream). It is clear, then, that all of the proposed routes pass through or along front yards of multiple historic houses and farmsteads.

What follows are lists of historic sites found through Site File Searches of the NYCLPC, NYSOPRHP and NYSM that are described as lying adjacent to or abutting one of the proposed corridors (see Appendix 2 for complete list of sites within a one mile radius). Sites are listed generally from north to south along each proposed route. Note that some sites in the appendix do not have sufficient information to determine their precise location or content. Additionally, this is a comprehensive listing of known and recorded historic sites only. Unknown or poorly recorded sites may still exist, particularly undiscovered subsurface remains.

Route A

Twenty-four (24) historic sites were found in site file searches that fall along Route A.

USN# 07115.000098: Beach-Still House (Young Residence), located in New Windsor, NY 94 at Vail's Gate, west of I97. Consists of a stone structure, c. 1786. Aaron Burr and William Edmonston witnessed a 1790 deed to property.

Edmonston House: Vail's Gate, west of Temple Hill Road along State Route 94. National Registered Landmark, historic house dating to 1755, used as a medical facility and headquarters during the Revolutionary War.

Survey # 294, Historic Stone House: Cornwall, hamlet of Meadowbrook, south of State Route 94 at Mt. Airy Road. Two-story brick dwelling, dates prior to 1851. Just outside project area.

B. Woodruff House: Cornwall, West side of Route 32 near town of New Windsor Line; National Registered Landmark, historic house.

USN # 07103.000063: Orr's Mills, Abandoned Mill. Cornwall, NY32, east side, near Moodna Creek Bridge, down private drive. Eligible for National Register status, grist and flour mill, current structure dates to 1866. Built on foundation of former revolutionary-era mill. Just outside project area.

USN # 07103.000148: Parker Truss Bridge
Bin 1-02224-0, Owner NYS-DOT, DOT PIN 8460.36 95PR0040
Cornwall, NY32, Orrs Mill, over Moodna Creek (No information available.)

USN # 07103.000060: Moodna Mansion (Morizzo Residence), Cornwall, Orr's Mills Rd, north side, west side of Rte 32. Eligible for National Landmark status, wood frame structure, 1870. Land abuts project area.

USN # 07103.000059: Orr's Summerhouse (Incanno Residence). Cornwall, Orr's Mills Rd, at intersection Rte 32, west side, Moodna Creek to the east. Wood frame structure, wine cellar built into hill, remnants of mill structures surrounding. C. 1750, rebuilt 1872. Boat house turned into piano factory in early 20th century.

USN # 07103.0002246: William Orr House, Cornwall, Orr's Mill Rd. and NY32. Eligible for National Landmark status, no further information available.

NYSM 7700: Mountainville Camp, Cornwall, Mountainville, between State Route 32 and *Interstate 87. Camp, no info.*

Mountainville Grange Hall: Cornwall, State Route 32 at Star Entrance Road National Registered Landmark.

Elias Hand House: Cornwall, State Route 32 at Star Entrance Road. National Registered Landmark.

USN # 07120.000207: Revolutionary Encampment, Woodbury, NY32, East side of Woodbury Creek. No further information available.

SHPO A07120.000241: Woodbury, east side of County Road 44. Historic period well.

SHPO A07120.000209: Furnace Ruins, Woodbury Falls, east side of County Road 44

USN # 07120.000233: Woodbury, 612 NYS32 National Registered Landmark, no further information available.

USN # 07120.000232: Woodbury, 632 NYS32. National Registered Landmark, no further information available.

USN # 07120.000231: Woodbury, 635 NYS32. National Registered Landmark, no further information available.

USN # 07120.000230: Woodbury, 649 NYS32. National Registered Landmark, no further information available.

USN # 07120.000229: Woodbury, 653 NYS 32. National Registered Landmark, no further information available.

USN # 07120.000027: Seaman Homestead, Woodbury, Quaker Hill Road, Old Rte. 32. Wood frame house, 1826. Near project area.

USN # 07120.000025: J.P. Ford House, Woodbury, Quaker Rd., at intersection Rte. 32, south side. Wood frame house and guesthouse, c. 1810-20.

USN # 07120.000026: Leffert House, Woodbury, Quaker Rd., at intersection Rte. 32, north side. Wood frame house with barn, shed and well, c. 1780. Possibly used as tavern.

Route B

Six historic sites were found in site file searches that fall along Route B.

NYSM 7700: Mountainville Camp, Cornwall, Mountainville, between State Route 32 and Interstate 87. Camp, no further information.

USN # 07120.000027: Seaman Homestead, Woodbury, Quaker Hill Road, Old Rte. 32, Wood frame house, 1826. Near project area.

USN # 07120.000025: J.P. Ford House, Woodbury, Quaker Rd., at intersection Rte. 32, south side. Wood frame house and guesthouse, c. 1810-20.

USN # 07120.000026: Leffert House, Woodbury, Quaker Rd., at intersection Rte. 32, north side. Wood frame house with barn, shed and well, c. 1780. Possibly used as tavern.

SHPO A07120.000241: Woodbury, east side of County Road 44. Historic period well.

SHPO A07120.000209: Woodbury, east side of County Road 44. Furnace ruins at Woodbury Falls.

Route C

Twenty-three (23) historic sites were found in the site file search that fall along Route C.

USN # 07103.000002: Bethlehem Presbyterian Church and Cemetery. Cornwall, NY94, north side, west side of Jackson Ave., National Registered Landmark. Church and Cemetery. Original church built 1730, current structure built 1828. Structure faces road, cemetery located to the north and west of church. Washington is said to have attended services while headquartered at the Ellison House in New Windsor.

USN # 07103.000119: Bethlehem School House, Cornwall, NY94, National Registered Landmark, no further information available.

USN # 07103.000073: J. Denniston House (Costello Residence). Cornwall, NY94, south side, east of Mt. Airy Rd. Eligible for National Landmark status, stone structure, c. 1817. Built using salvaged timbers from the Temple of Virtue on the New Windsor Cantonment. In 1916, sold to Frances Hodgeson Burnett (author of *Little Lord Fauntleroy*, *The Little Princess* and *The Secret Garden*).

USN # 07103.000072: J.W. Denniston House (De Ronde Residence), Cornwall, NY94, south side, west of Meadowbrook RR crossing. Simulated variegated cut stone front (grout), 1864.

USN # 07103.000071: Smith-Moffat House (Sauer Residence), Cornwall, NY94, north side, east of Jackson Ave. Wood frame structure, stone fencing, c. 1750.

USN # 07103.000074: Thursten House (Makuen Residence), Cornwall, NY94, north side, between Jackson Ave. and Mt. Airy Rd. National Registered Landmark.

USN # 07103.000117: Farrell House, Cornwall, NY94, Meadowbrook. National Registered Landmark, Stone and stucco, 1825.

A. Walsh Stone House and Farm Complex: 1570 State Route 94, north side between Jackson Avenue and Shore Drive. National Registered Landmarks, including a mid-19th century two-story Greek Revival stone house.

USN # 07103.000114: Salisbury Railroad Trestle. Cornwall, Otterkill Rd., railroad over Otterkill Rd. National Registered Landmark.

USN # 07103.000019: Thursten House-Spring Valley Farm (Glen Oden Farms), Cornwall, Otterkill Rd., south side, at intersection Jackson Avenue. No further information available.

USN # 07103.000245: Building. Cornwall, 100 Otterkill Rd. Eligible for National Landmark status. No further information available.

NYSM 564: Moodna Creek North, Cornwall, Orrs Mill Road, north bank of creek below the trestle. No further information available.

NYSM 565, Salisbury Mills, Cornwall. Site of historic village. Project area passes through east end of village.

USN # 07101.000002: Salisbury Mill, Blooming Grove, Rte 27, east side, in bend of Otter Kill Creek, south of Salisbury Mills. Paper mill, early 18th/late 19th century.

USN # 07101.000014: Hope Chapel, Blooming Grove, Clove Rd, Salisbury Mills. See USN # 07101.000072, Presbyterian Chapel, below.

USN # 07101.000072: Presbyterian Chapel, also known as Hope Chapel, Blooming Grove, Clove Rd., Salisbury Mills (Rte. 27) west side, south of Orr's Mills Rd. Wood frame Gothic chapel, c. 1840.

USN # 07101.000073: S.W. Moffat-James Kirby House (Morgan Residence), Blooming Grove, Clove Rd, (Rte. 27), west side, north of Felter Hill Rd. Wood frame house, barn, well, railroad in rear. Dates to 1766.

USN # 07101.000093: Benjamin S. Tuthill House, Blooming Grove, Clove Rd., CR 27, west side, south of Camp Lenni-Len-A-Pe. No further information available

USN # 07101.000094: David C. Smith House, Blooming Grove, Clove Rd, CR 27, east side, north of Camp Lenni-Len-A-Pe. No further information available.

USN # 07101.000109: Crawford House, Blooming Grove, NYS208. Eligible for National Landmark status, no further information available.

USN # 07101.000066: H.W. Bull Barn Apartments, Blooming Grove, Rte 208, west side, at junction with Rte 44. Stone structure, incl. barn and house, 1852, currently used as apartments. Just outside project area.

Parcel 2

No historic sites were found in site file searches that fell within the area of Parcel 2.

2.4 Impact Assessment

Impacts to potential archaeological resources have already been considerable. As previously mentioned, evidence shows that the area has been farmed consistently beginning with the earliest land patents in the 1700s and increasing greatly during the 19th century (See Appendix 1; Simeon 180?; Sidney 1851, Lathrop 1903). Plowing fields tends to scatter

Native American sites, taking artifacts out of context and diminishing, though not revoking, their significance (See Appendix 2, e.g. SHPO A071-03-000240).

Further disturbance would have occurred through the process of road construction. However, the longevity of many roads from the historic through the modern era indicates that the roadbeds themselves would have seen little historical development, including Routes 94 and parts of 32, County Road 44, Clove Road, and several roads leading into Kiryas Joel. Some roads have altered their courses slightly through the course of the 20th century, notably including Route 32. Interstate 87 was a fairly latecomer, but followed largely in the path of the previous Erie Railroad line that ran along the east side of the Schunnemunk Mountains. The proposed pipeline routes largely follow these roads that are for the most part historic themselves (see Appendix 1; Simeon 180?; Sidney 1851; French, Wood and Beers 1859; Lathrop 1903). The initial construction, continued use, and modern reconstruction of these roads over several centuries have served to significantly disturb the landscape beneath, as well as prohibit historic development.

Summary

Natural landscape features have served to both encourage and prohibit habitation and other forms of land use within the project corridors from pre-contact through modern times. Critical resources such as fertile soils and access to water and transportation routes would have been largely responsible for patterns of occupation. The study of the pre-contact and historic occupation along three proposed water conveyance routes has demonstrated that these patterns were indeed present.

The investigation considered the corridors surrounding the entire length of each proposed route as well as the additional WTP site, Parcel 2 (Routes A and B terminate at Parcel 2 and Route C terminates at the site of the Village's existing WTP on Berdichey Road). This has been necessary in order to document the full potential for archaeological sensitivity within the project areas.

The occupation of many historically settled areas along the proposed project corridors has continued without the impacts of major re-development. Many state roads and highways still follow the paths of their 18th and 19th century predecessors. Always a rural hinterland, cartographic evidence demonstrates the 18th and 19th century development of Orange County farmsteads along these rural roads and the emergence of small mill towns around local streams and waterfalls (see Appendix 1). Reconnaissance of each proposed route confirms the persistence of rural villages and hamlets with historic resources. Finally, site file searches for identified pre-contact and historic sites in the region demonstrate the ubiquity of historic resources in the area, including many National Register Properties, some of which date to the Revolutionary era, as well as evidence for Native American sites in areas where predictive models would indicate habitation or use.

An assessment of each of the proposed routes is provided below.

Route A (State Route 32)

Although eight precontact era sites were identified in the area around Route A, none abutted the project corridor directly. The identified sites do not necessarily represent a full representation of Native American occupation of the region, as these tend to be reported as a matter of necessity during mitigation of specific areas or as chance finds. For example, the floodplains along Woodbury Creek on either side of Route 32 south of Mountainville would be ideal for Native American settlement (Figures 13 and 14). Further, although plowing had disturbed the area, mitigation at Woodbury Common revealed evidence for occupation (see Appendix 2, USN# 07120.00219). Unlike the other two proposed pipeline connection routes, the proposed Route A corridor follows a natural water course, which might have provided an ideal setting for precontact activities.

Site file research found that the location of proposed Route A has the highest density of recognized historic sites (see Appendix 2). A total of 40 historic sites were identified along or near this route, largely because it follows the historic-era road depicted on the earliest cartographic representations of Orange County (e.g. Burr 1829; see Appendix 1). Noted historic sites include the Edmonston House at Vail's Gate and Orr's Mill at State Route 32 and Orr's Mills Road (see Figures 5-7). According to cartographic resources, the historic hamlet of Mountainville largely lay to the east of the route, although a few structures might have been located along the route of the proposed corridor (Figure 13). Route 32 passes through a narrow valley on its way through Mountainville, which would not have provide a good location for precontact or historic sites. The Mountainville P.O. Station was located west of this route (Figure 8). Highland Mills is located south of this route's impact area (Figure 15).

Not all of the resources identified during the site file search are located directly within the project area. A total of 12 are described abutting the road. Because several of the registered sites do not provide a precise geographical location, the total possible historic sites along Route A may be as high as 24. Additionally, cartographic evidence indicates that numerous undocumented historic farmhouses and homesteads may still be standing. Further, unidentified resources might exist beneath the Route 32 roadbed, as the course of this road has changed over the past century.

Route B (Interstate 87 to State Route 32)

This route has considerably less potential for the presence of precontact or historic resources, largely because the section of this corridor that follows Interstate 87 does not overlay an historic-era road. Instead, the area of Interstate 87 was part of larger farm tracts until a railroad line was constructed around the beginning of the 20th century (Figures 4, 12-15). Further, the construction of Interstate 87 has caused considerable damage to the landscape along this route.

There have been six precontact era sites identified in the region of Route B, but none of these abut the project corridor. Research found that the portion of the proposed corridor that overlaps with Route A, along the southern section of Route 32 and heading west into Kiryas Joel, has the most potential for the presence of cultural resources.

Site file searches indicate a total of 36 historic era sites are located in the vicinity of this route. Only six however, are described as abutting the road and none are located along the section that follows Interstate 87. Cartographic evidence supports this, as few homesteads are shown in the vicinity of Interstate 87 throughout the 18th and 19th centuries (see Appendix 1).

Route C (Route 94/27/208)

Nine precontact sites have been previously identified in site file searches, five of which abut this proposed route. Further, the floodplains along Route 94 in the northern segment of this route have yielded precontact era artifacts in and under plow zones dating back to the Middle Archaic period (see Appendix 2).

Route C follows original roads connecting a number of small hamlets and mill towns. This would be the historic area referred to by the NYSDEC as the Route 94 corridor (Figures 11, 12, 16 and 17). Although fewer historic sites were identified during the site file search (a total of 28), 25 of these sites were found to abut the project area. This suggests that the current roads likely follow the same route as the historic ones. The fact that the Route C corridor follows more country roads than state routes may account for this. Research found that because the area west of the Schunnemunk Mountain appears to have supported lower population densities, it retained more of its historic character.

In addition to the presence of former homesteads and farmhouses, a wider range of historical resources is present along this route (see Appendix 2). For example, a still-active Presbyterian Church and cemetery (status unknown) is located in the small village of Bethlehem within the town of Cornwall (Figure 12). Several historic structures in the hamlet of Salisbury Mills, including another Presbyterian Chapel and the Salisbury Paper Mill are also present (Figures 9 and 10). Finally, an historic one-room schoolhouse is located at Round Hill Road and Clove Road.

Parcel 2

Cartographic research and the site file review found no identified historic or precontact era sites within this parcel. The presence of drainage ditches along the roadside indicates some degree of disturbance to the area. However, apart from historic era plowing, the extent of disturbance off of the road is unknown.

2.5 Recommendations

In sum, the recommendations are as follows:

Although no single route avoids all historic resources, Route B is the least likely of the three possible routes to cause impacts to historic sites, known or unknown. This is due to the fact that over three-quarters of this route follows Interstate 87, the construction of which has caused serious disturbance to a majority of this route. The remainder of Route B, however, passes by historic structures as detailed in Appendices 1 and 2. Although this segment of the route is shared with Route A, the total potential impacts are considerably less than the those that might be encountered along Route C.

Route B is also less likely to have precontact era resources in the area of Interstate 87. This is a result of past disturbance, specifically the construction of this modern thoroughfare. The route also does not follow a waterway, as does State Road 32. The portion of this route that does follow State Road 32 may contain precontact archaeological resources in undisturbed, habitable areas close to natural resources.

Route A follows local roads, including State Route 32. As a result, more historic structures are located along this route. Because the current State Route 32 does not precisely follow the original road, the modern thoroughfare may in fact pass over earlier structures that once fronted on the old road. Because this area experienced considerable development during the 19th century, there is a higher likelihood for the presence of historic resources due to the density of historic occupation. Additionally, Route A, as it follows natural streams, contains many areas suited for precontact era habitation or use. Undisturbed locales may thus be sensitive for precontact resources.

Route C, like Route A, also follows local roads. Because the location of this route was traditionally more rural, the population density was not as high as the areas east of Schunnemunk Mountain during the historic era (i.e. Routes A and B). As a result, this route appears to have seen fewer disturbances as a result of development. Further, more identified precontact and historic sites were present along this route than on Routes A or B.

Parcel 2 was not found to have any direct evidence for historic resources, but could still be sensitive for precontact archaeological resources.

Extensive subsurface impacts will only occur in the narrow water conveyance installation corridor, which, regardless of the alternative, will occur within an existing roadbed. This type of in-road construction may have potential impacts on historic resources in the locations where historic roads have changed course over time. Further, the crossing of a natural river/stream in direct proximity to a historic mill could affect remaining, buried industrial components of the mill complex at that crossing (e.g., dam, wing walls, wheel pit foundations, tailrace, etc.). Even early, simple mills incorporated a number of stone, timber, and earthen features and much landscape manipulation to impound water and ensure a consistent and powerful head. Since mills were often adjacent to the early roads and junctions of roads, it is very possible that there are some mill features within the extant roads. It is recommended that, after the selection of the water conveyance route, limited monitoring of excavations for the installation be conducted only within those zones specifically sensitive for historic mills (Figure 19).

The following recommendations refer to the construction support system that accompanies large-scale projects, including equipment laydown areas, temporary offices, temporary service roads, spoils storage, etc. Given the density of historic resources and length of individual corridors, Historical Perspectives, Inc. recommends a construction management program that avoids impacting specific areas of potential archaeological sensitivity that abut the selected water conveyance corridor. The discovery of roadside archaeological resources has recently become more prevalent on many DOT projects (McCann and Ewing 2002: 16). Once the final route is selected, field archaeologists should work in tandem with design crews to establish specific areas of sensitivity to be avoided (e.g., the frontage of historic farmstead lots that abut the extant road and church/cemetery parcels).

A lot by lot intensive reconnaissance inspection of the sensitive zones along the selected route would be conducted to precisely establish disturbed versus non-disturbed and sensitive versus non-sensitive boundaries within zones of sensitivity. This would allow sensitive areas to be more precisely located and/or portions of the proposed corridors eliminated due to obvious disturbance caused by intrusions such as culverts, catchbasins, prior road constructions, parking drives, etc. This approach has been used previously to minimize unnecessary mitigation. Visual and physical barriers (e.g., rolled, plastic fencing) would be erected to delineate sensitive stretches of the existing road shoulder and right-of-way. See the graphic illustration of these sensitive loci on each alternative corridor (Figure 19).

For the potentially sensitive areas that cannot be absolutely avoided but are not likely to suffer subsurface impacts, such as staging areas, either putting down a geo-filter on the existing grade or depositing a few inches of topsoil over it to form a distinct horizon could avoid accidental impacts to potential resource. This introduced horizon (geofilter or exotic soils) would serve to prevent accidental below-grade intrusions during storage and when the spoils and equipment are being hauled away (pers. comm. Bob Ewing, Environmental Bureau, DOT 7/8/03).

Further, the recommended construction management program would include the stipulation that storage areas established for the construction project would not be reused after the project is completed. All spoils deposits must be removed at the end of the project in order to prevent unanticipated alterations to the visual, often historic landscape (pers. comm. Bob Ewing, Environmental Bureau, DOT 7/8/03).

In sum, once an alternative route is chosen specific boundaries and/or selected archaeologists would establish monitoring zones, within the archaeologically sensitive areas. This strategy would include working with the design management team to ensure that as many potentially sensitive areas are avoided as possible. Given the widespread degree of historic and potential precontact occupation, this strategy is suggested as the best possible means to avert damaging archaeological sites, known and unknown, without the need to hand test the entire length of the selected route.

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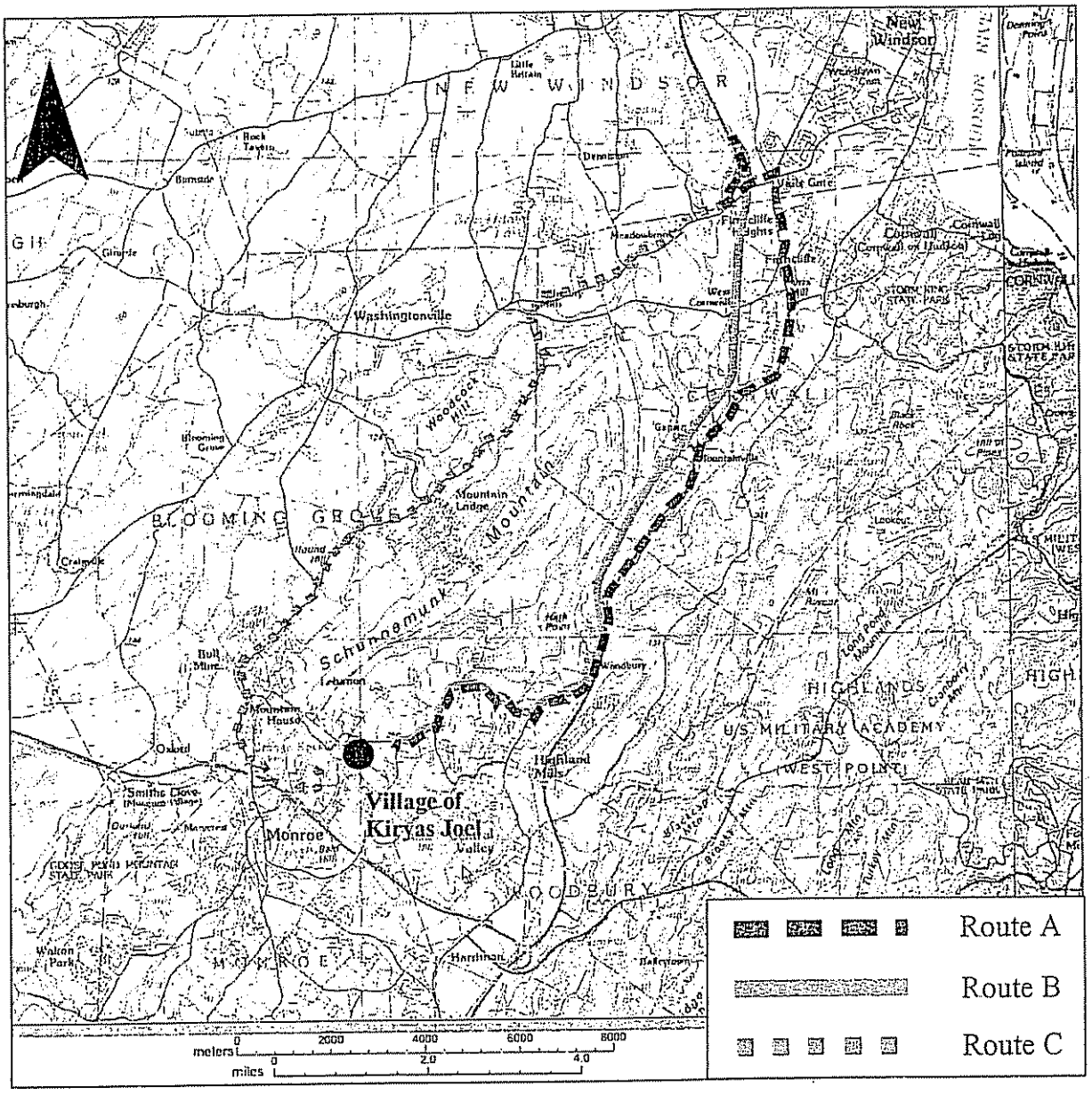


FIGURE 1

USGS Middletown NY, NJ Quadrangle.
United States Geological Survey 1986.

Proposed Catskill Aqueduct Connection Project Area, Orange County, New York.

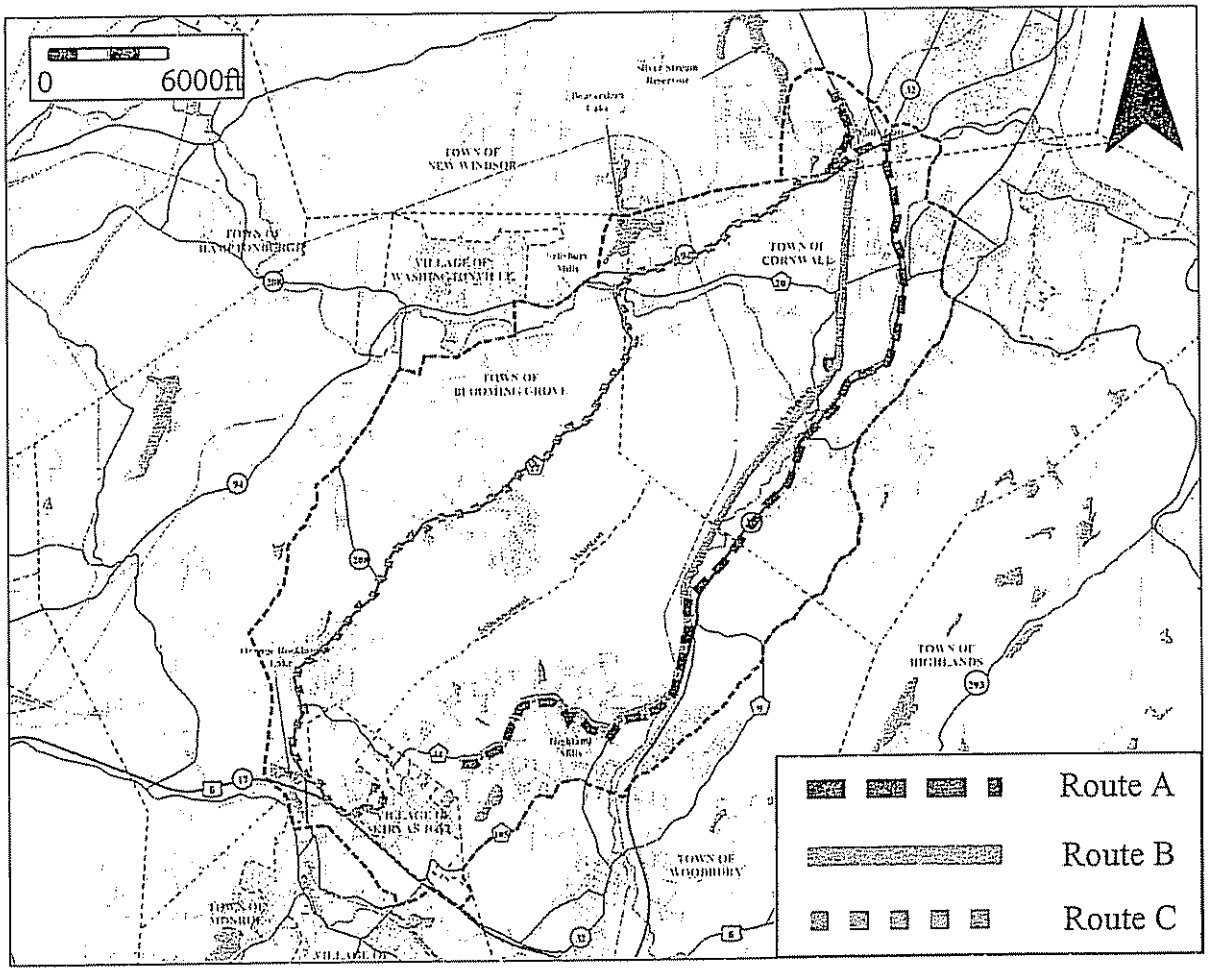


FIGURE 2

Three Proposed Routes for Proposed Catskill Aqueduct Connection, Kiryas Joel, Orange County, New York.
CDM 2003.

Orange County, New York.

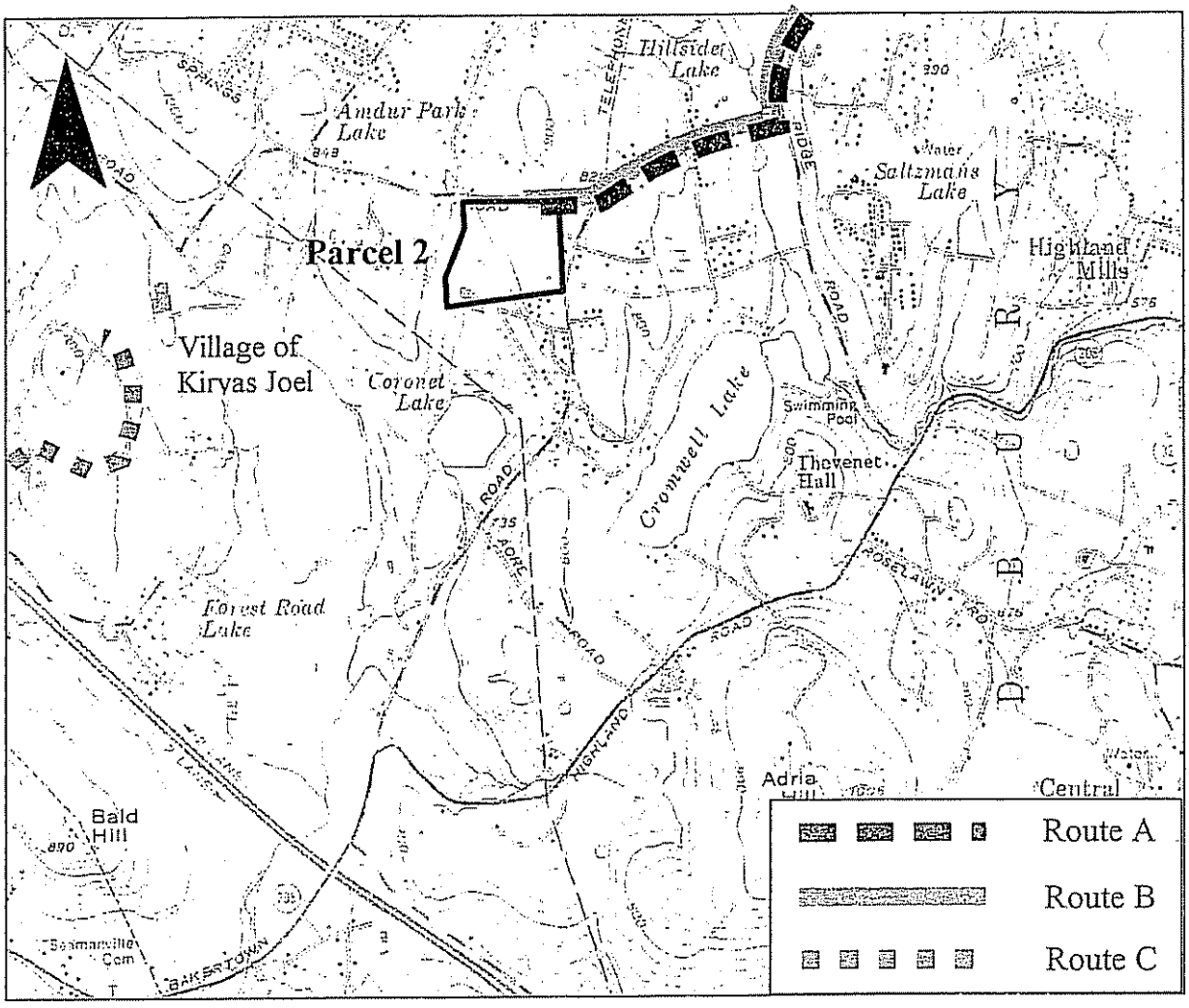


FIGURE 3

Project Area for Proposed Parcel 2, Village of Kiryas Joel.
Map Provided by CDM.

Proposed Catskill Aqueduct Connection, Village of Kiryas Joel, Orange County, New York.

No Scale Provided.

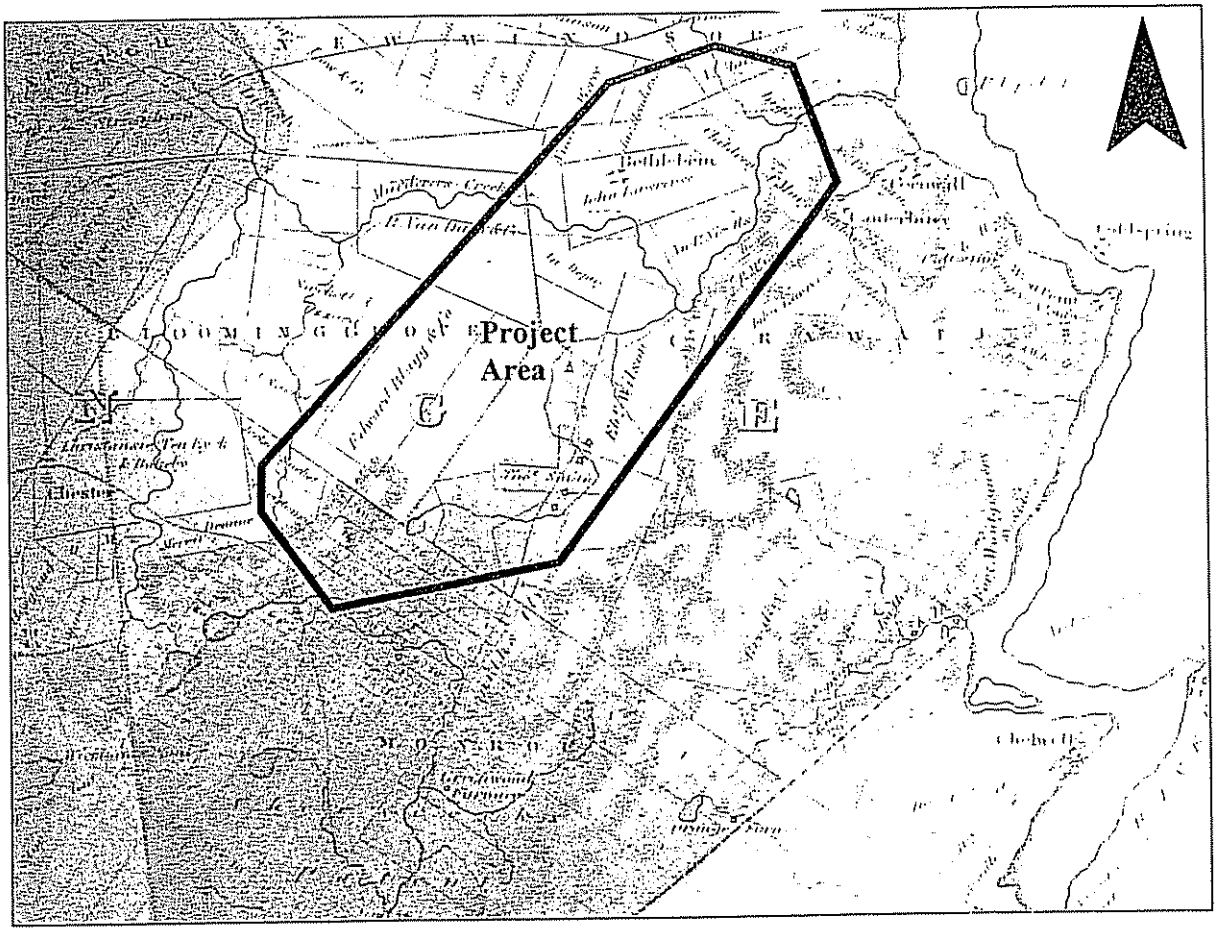


FIGURE 4

Map of the Counties of Orange and Rockland.
Burr 1829.

Project Area, Proposed Catskill Aqueduct Connection, Orange County, New York.

No Scale Available.

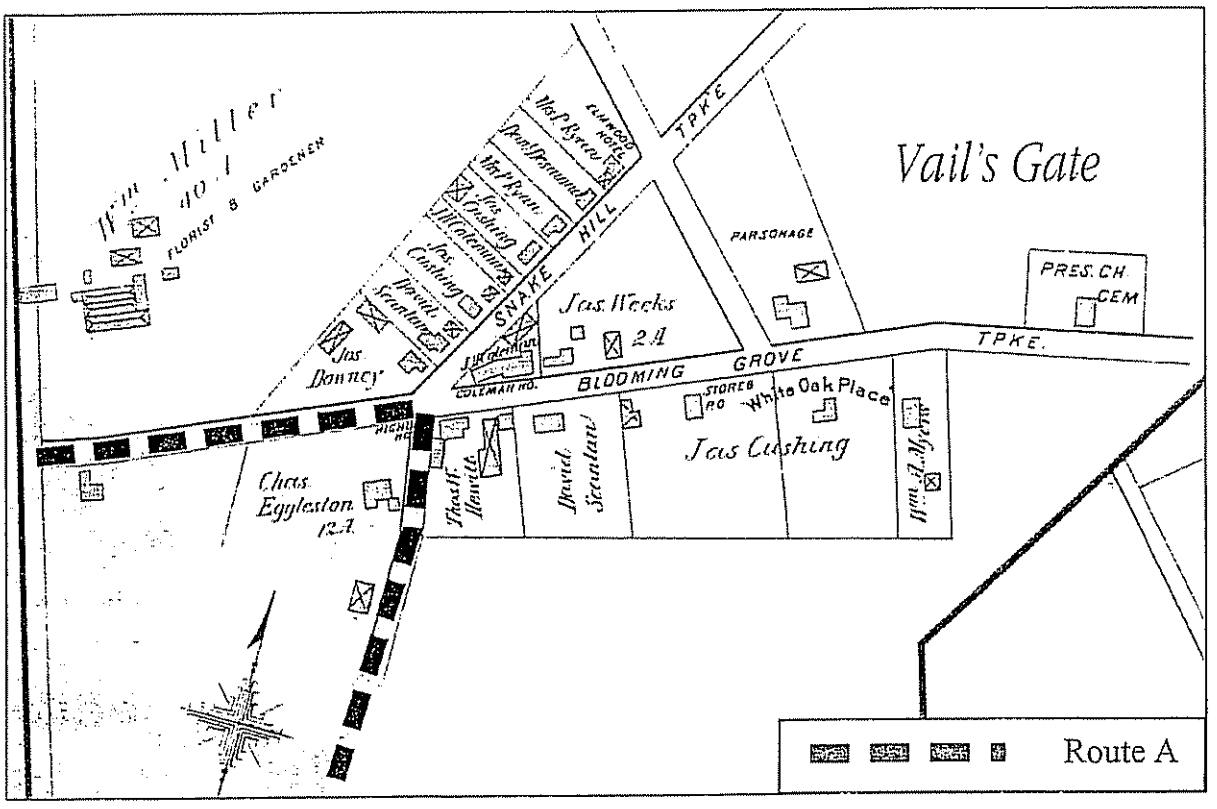


FIGURE 5

Atlas of Orange County, New York.
Lathrop 1903.

Route A, Vail's Gate, New Windsor, Orange County, New York.

No Scale Available.

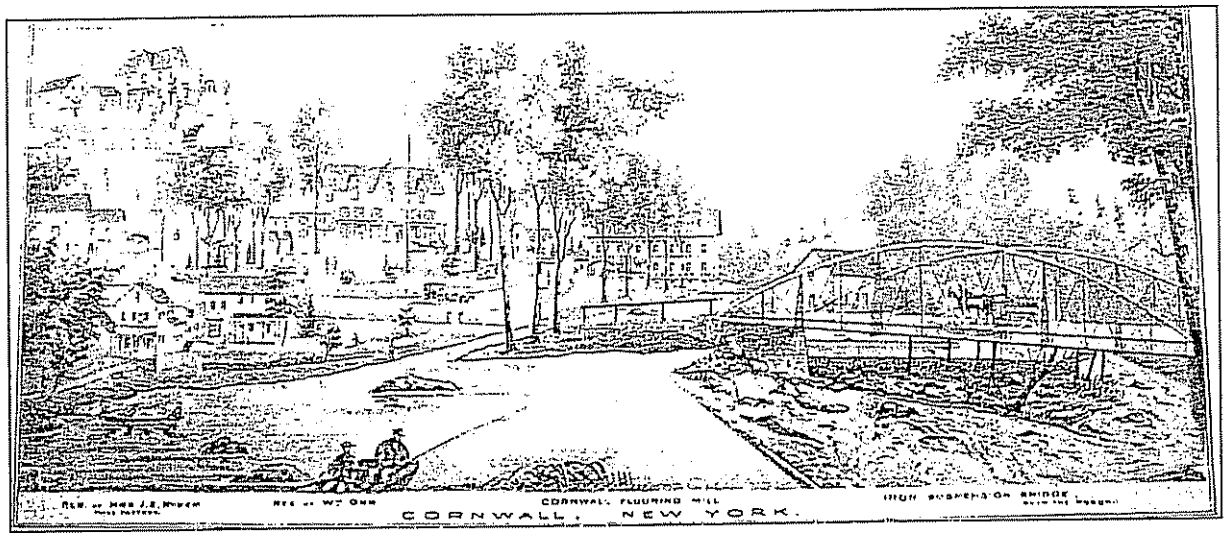


FIGURE 6

County Atlas of Orange, New York
Beers 1875.

Orr's Mills, Cornwall, Orange County, New York.

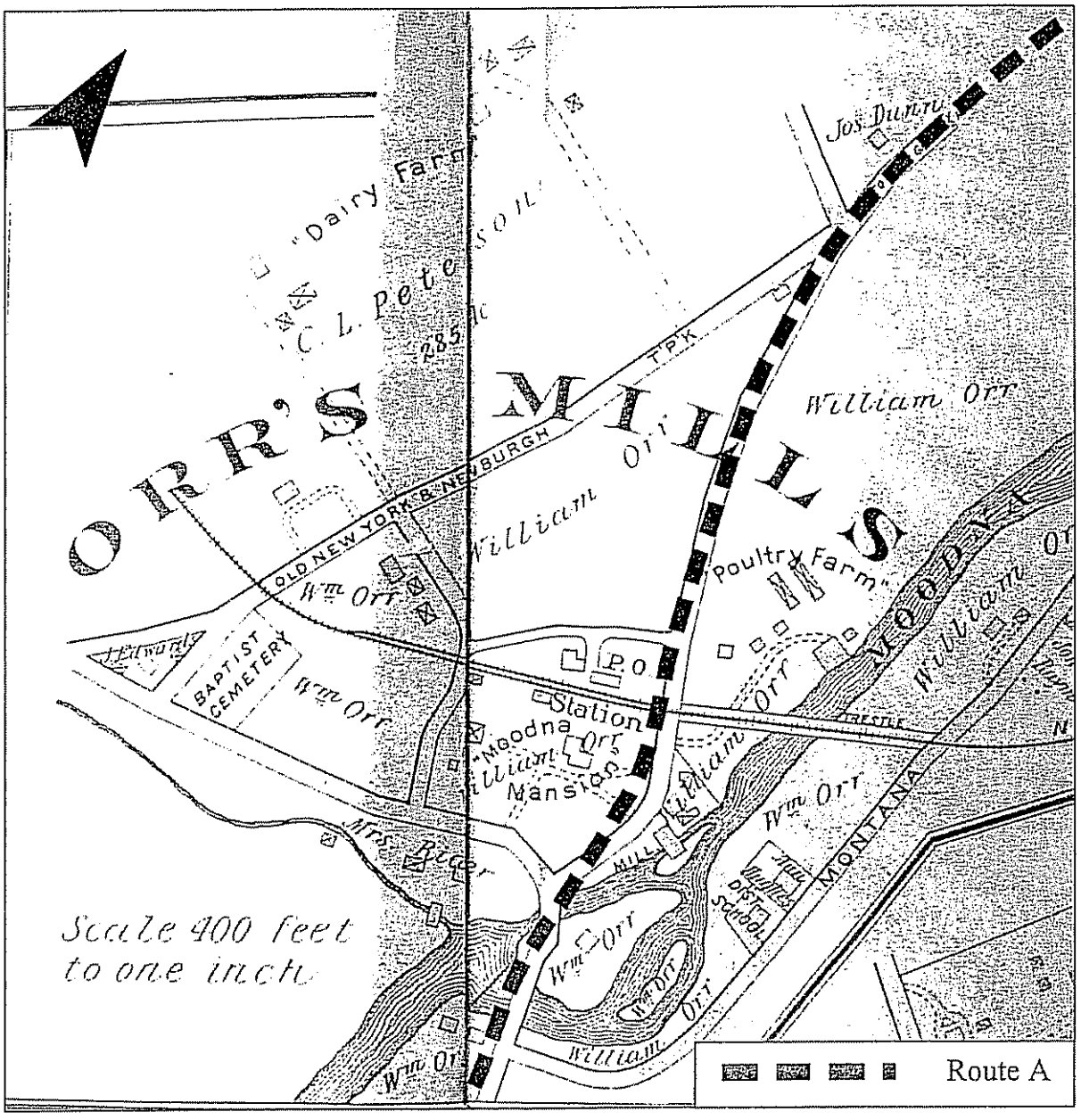


FIGURE 7

Atlas of Orange County, New York.
Lathrop 1903.

Route A, Orr's Mills, Cornwall, Orange County, New York.

No Scale Available.

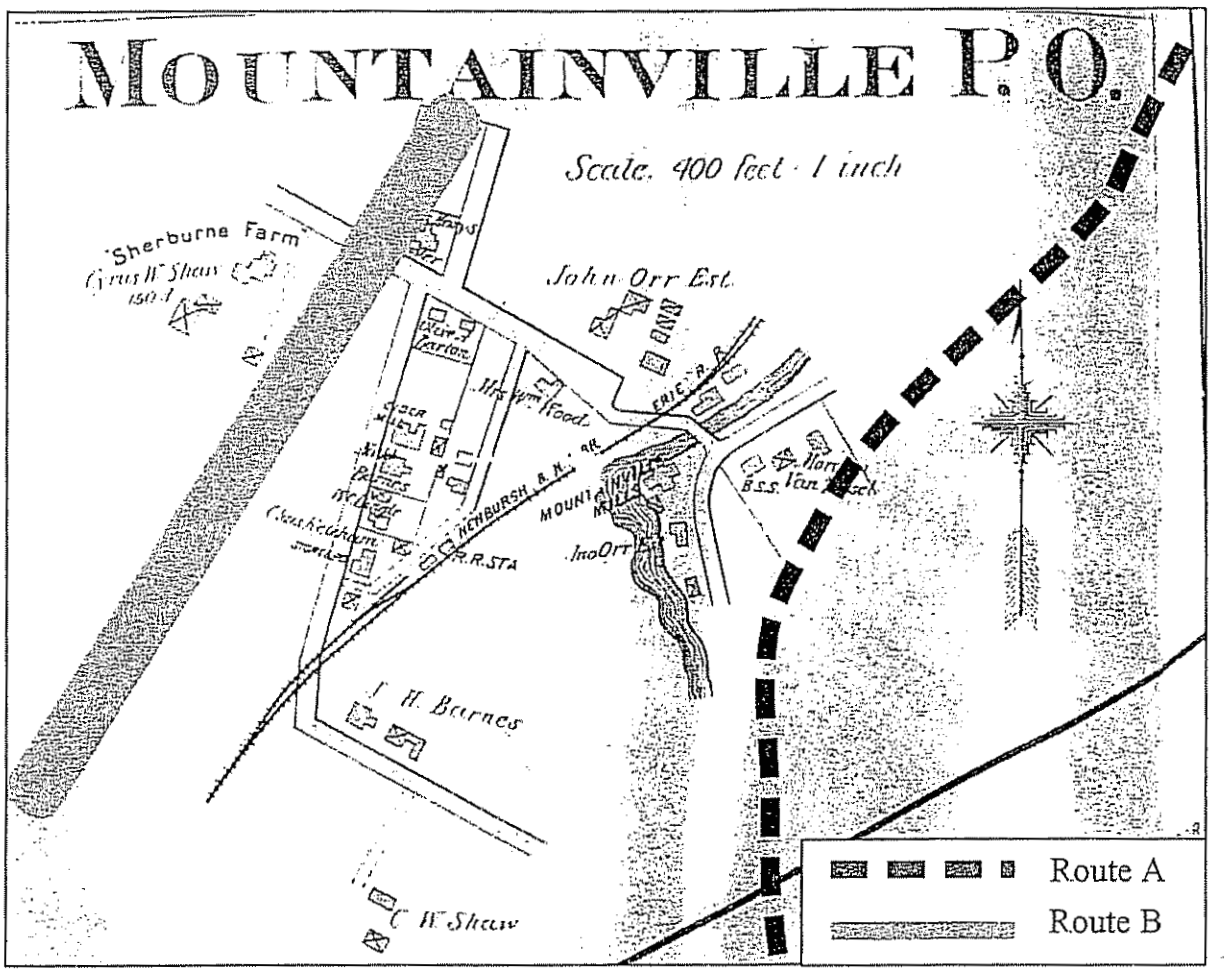


FIGURE 8

Atlas of Orange County, New York.
Lathrop 1903.

Routes A and B, Mountainville, Cornwall, Orange County, New York.

No Scale Available.

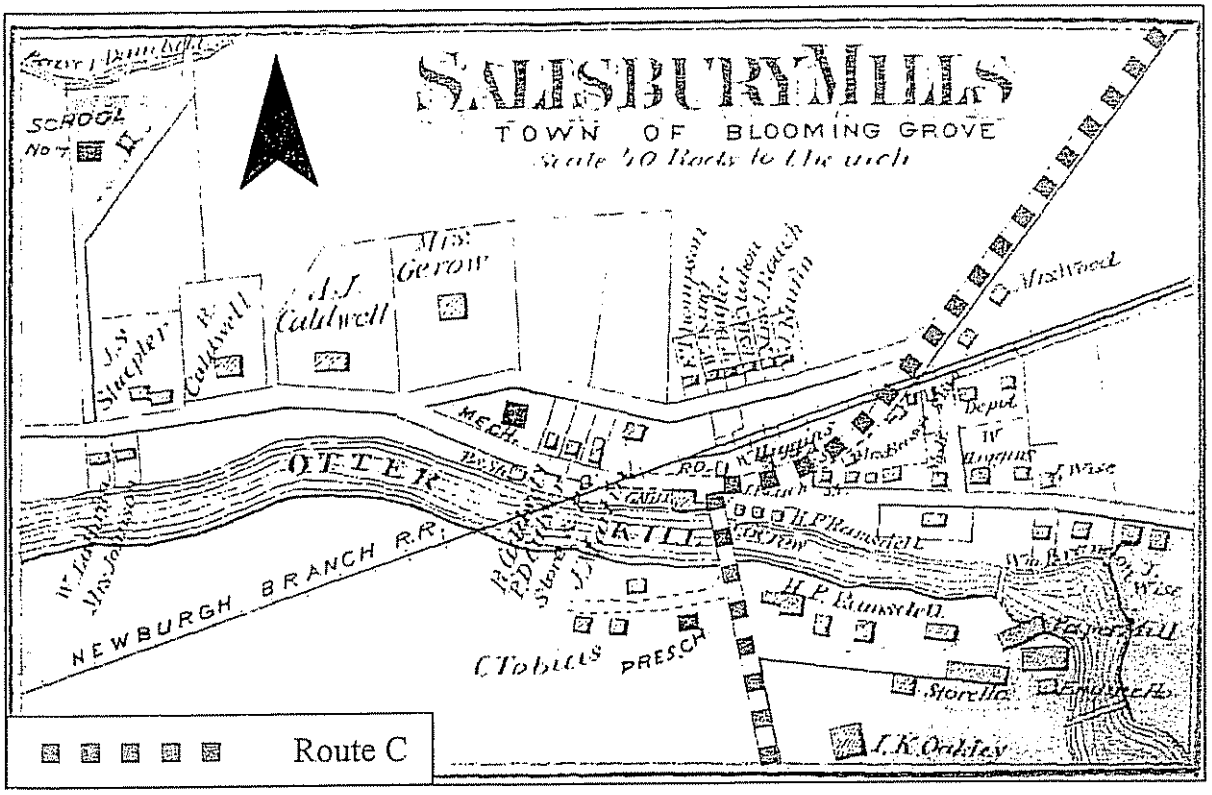


FIGURE 9

County Atlas of Orange, New York.
Beers 1875.

Route C, Salisbury Mills, Blooming Grove, Orange County, New York.

No Scale Available.

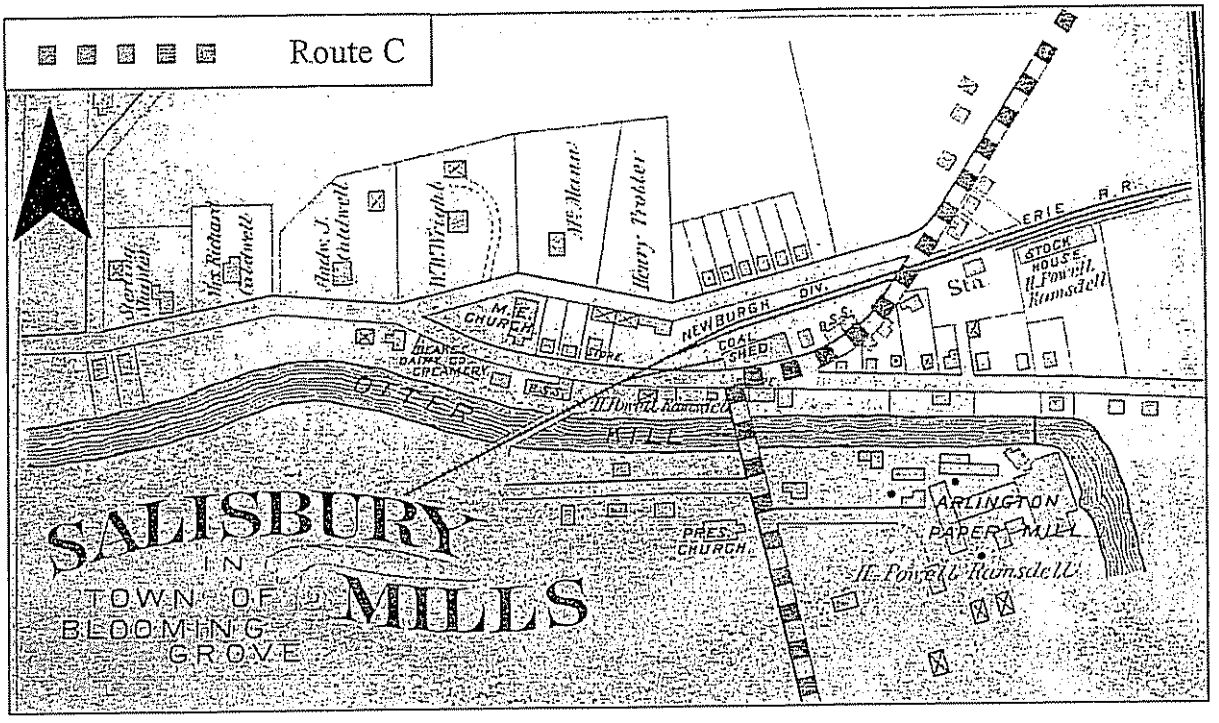


FIGURE 10

Atlas of Orange County, New York.
Lathrop 1903.

Route C, Salisbury Mills, Blooming Grove, Orange County, New York.

No Scale Available.

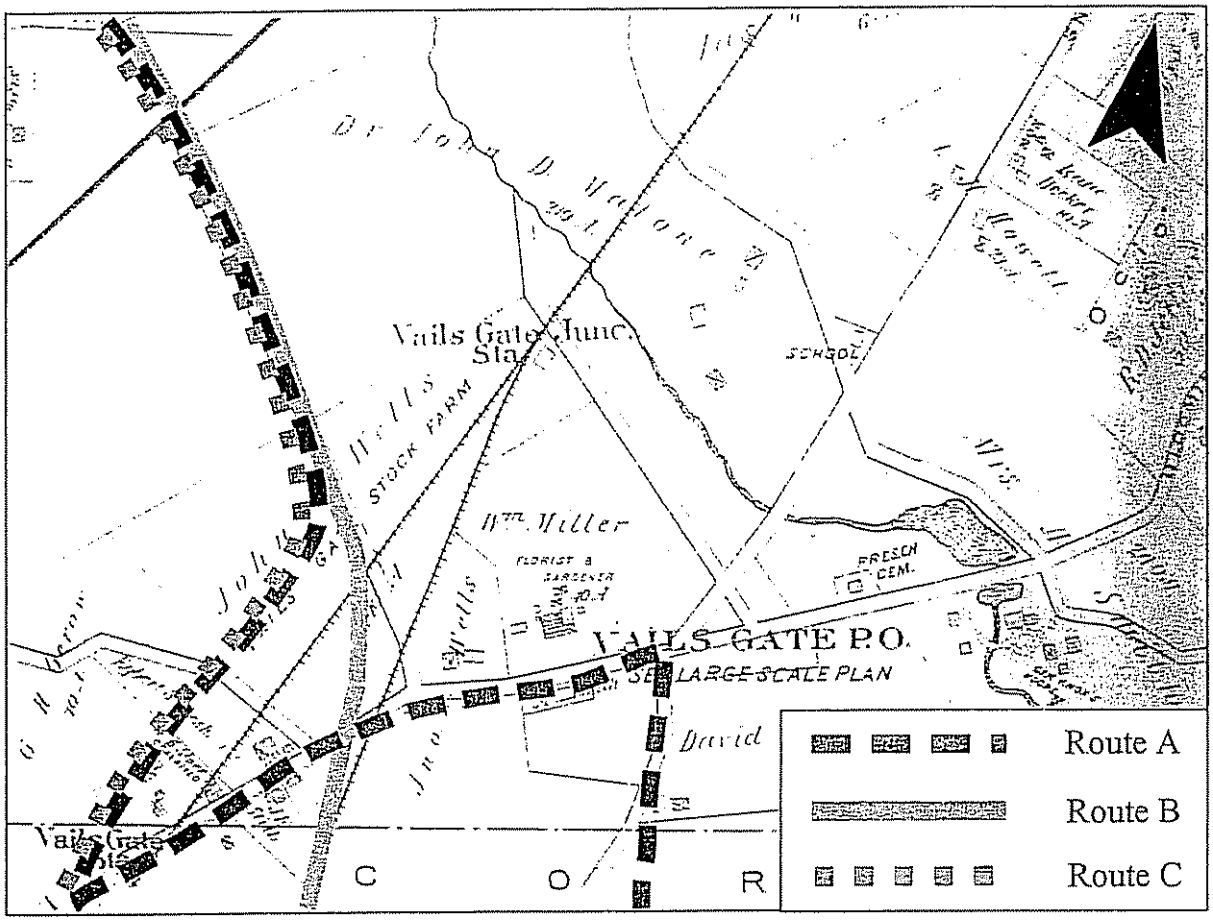


FIGURE 11

Atlas of Orange County, New York.
Lathrop 1903.

Routes A, B, and C, New Windsor, Orange County, New York.

No Scale Available.

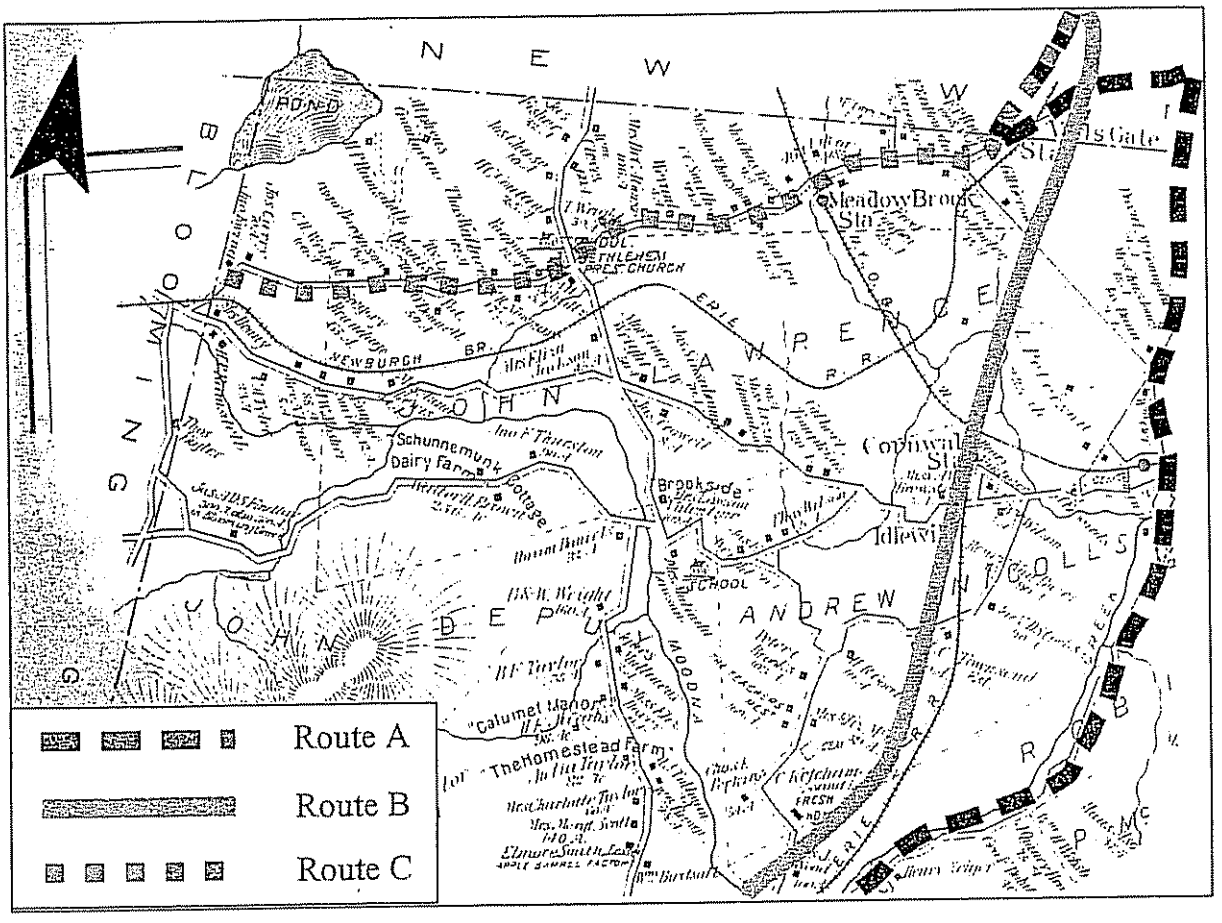


FIGURE 12

Atlas of Orange County, New York.
Lathrop 1903.

Routes A, B, and C, Upper Cornwall, Orange County, New York.

No Scale Available.

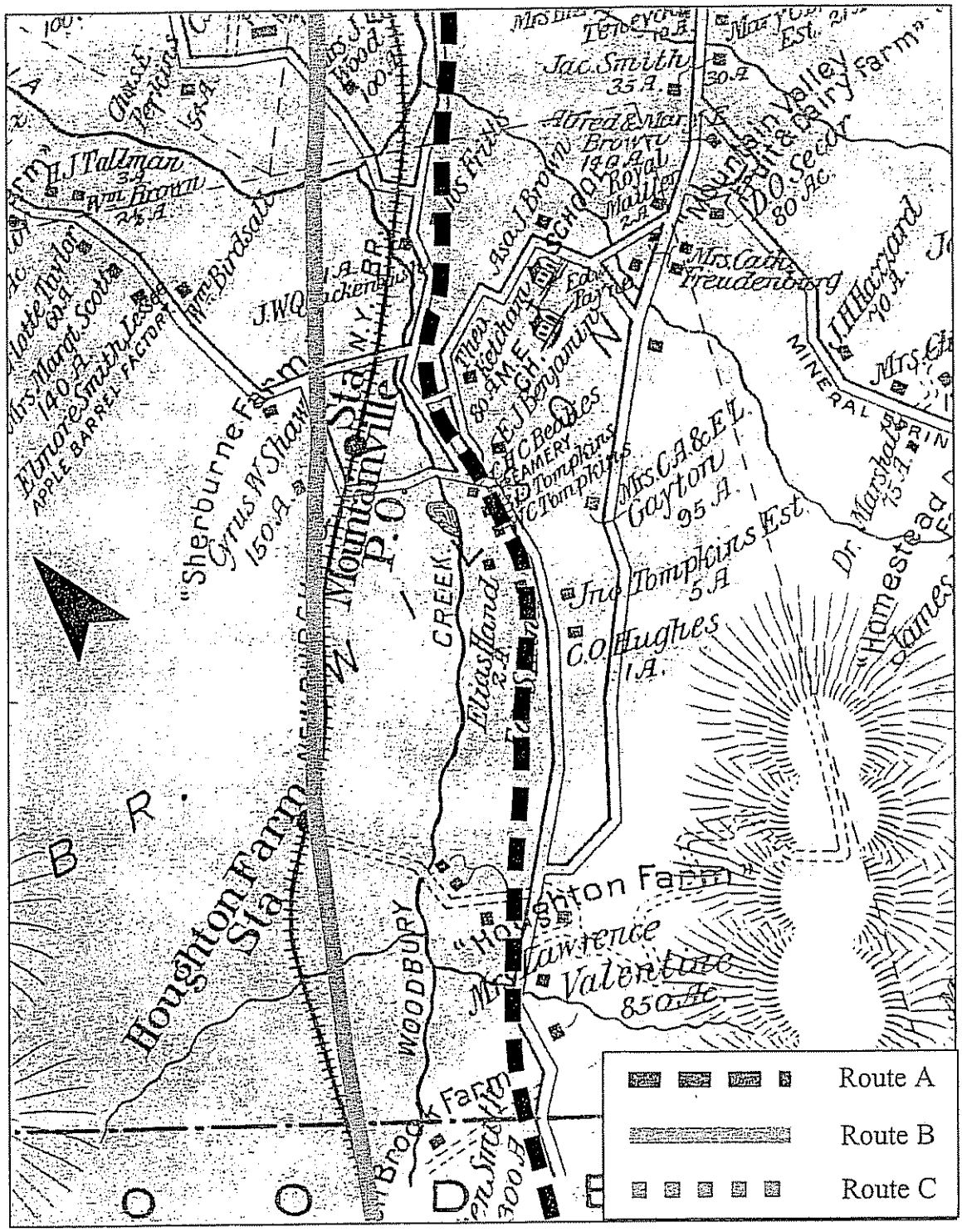


FIGURE 13

Atlas of Orange County, New York.
Lathrop 1903.

Routes A and B, Lower Cornwall, Orange County, New York.

No Scale Available.

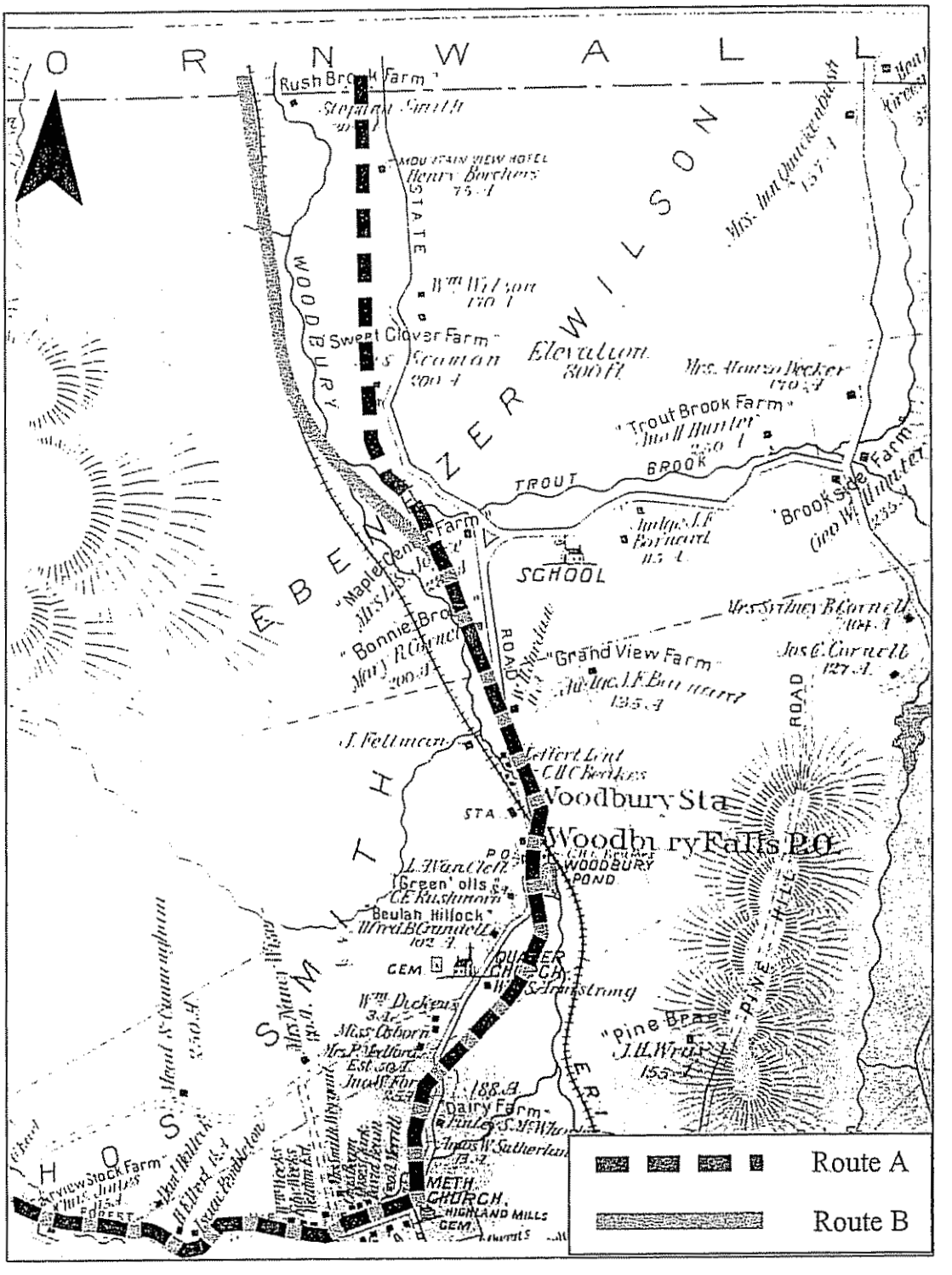


FIGURE 14

Atlas of Orange County, New York.
Lathrop 1903.

Routes A and B, Upper Woodbury, Orange County, New York.

No Scale Available.

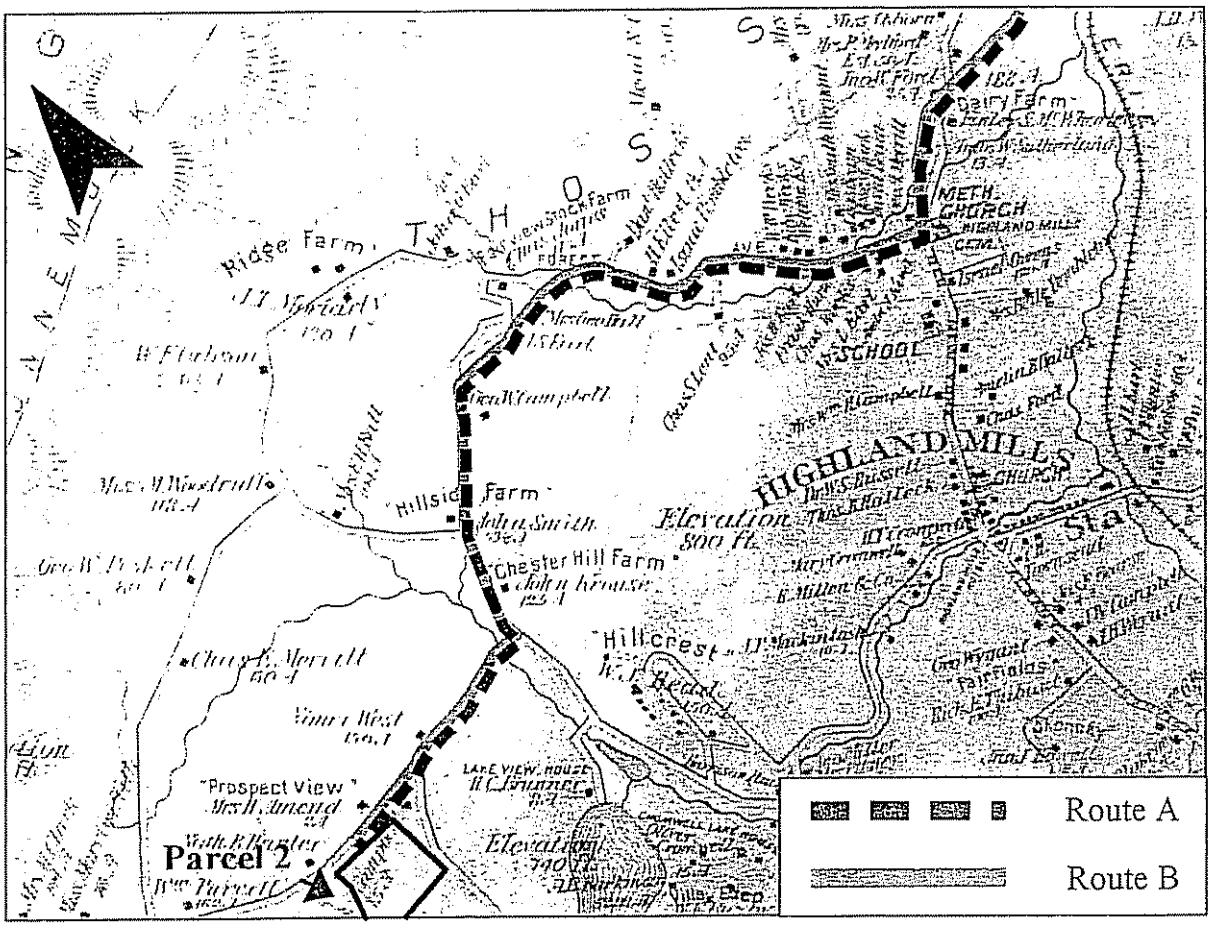


FIGURE 15

Atlas of Orange County, New York.
Lathrop 1903.

Routes A, B, and Parcel 2, Lower Woodbury, Orange County.

No Scale Available.

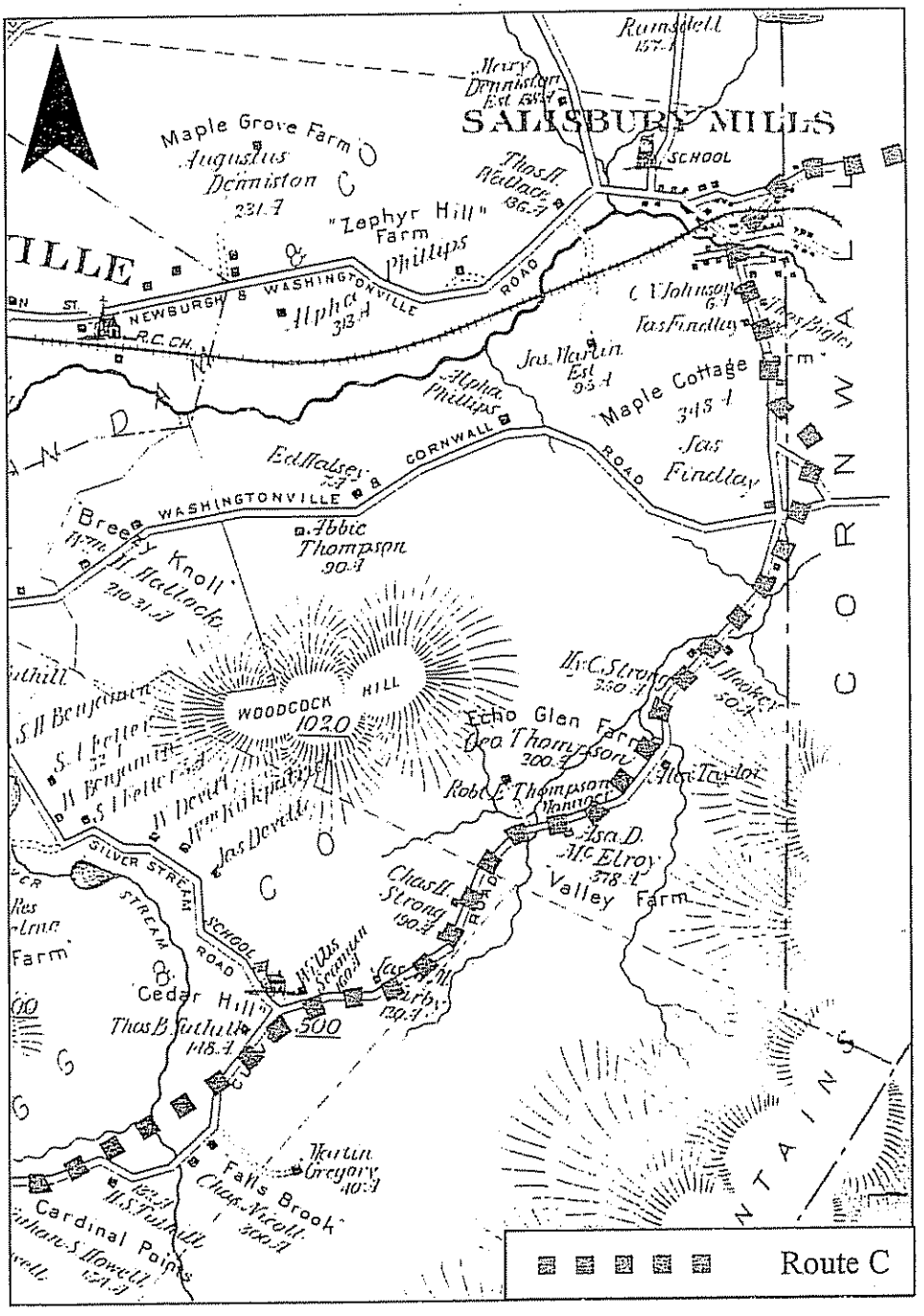


FIGURE 16

Atlas of Orange County, New York.
Lathrop 1903.

Route C, Upper Blooming Grove, Orange County, New York.

No Scale Available.

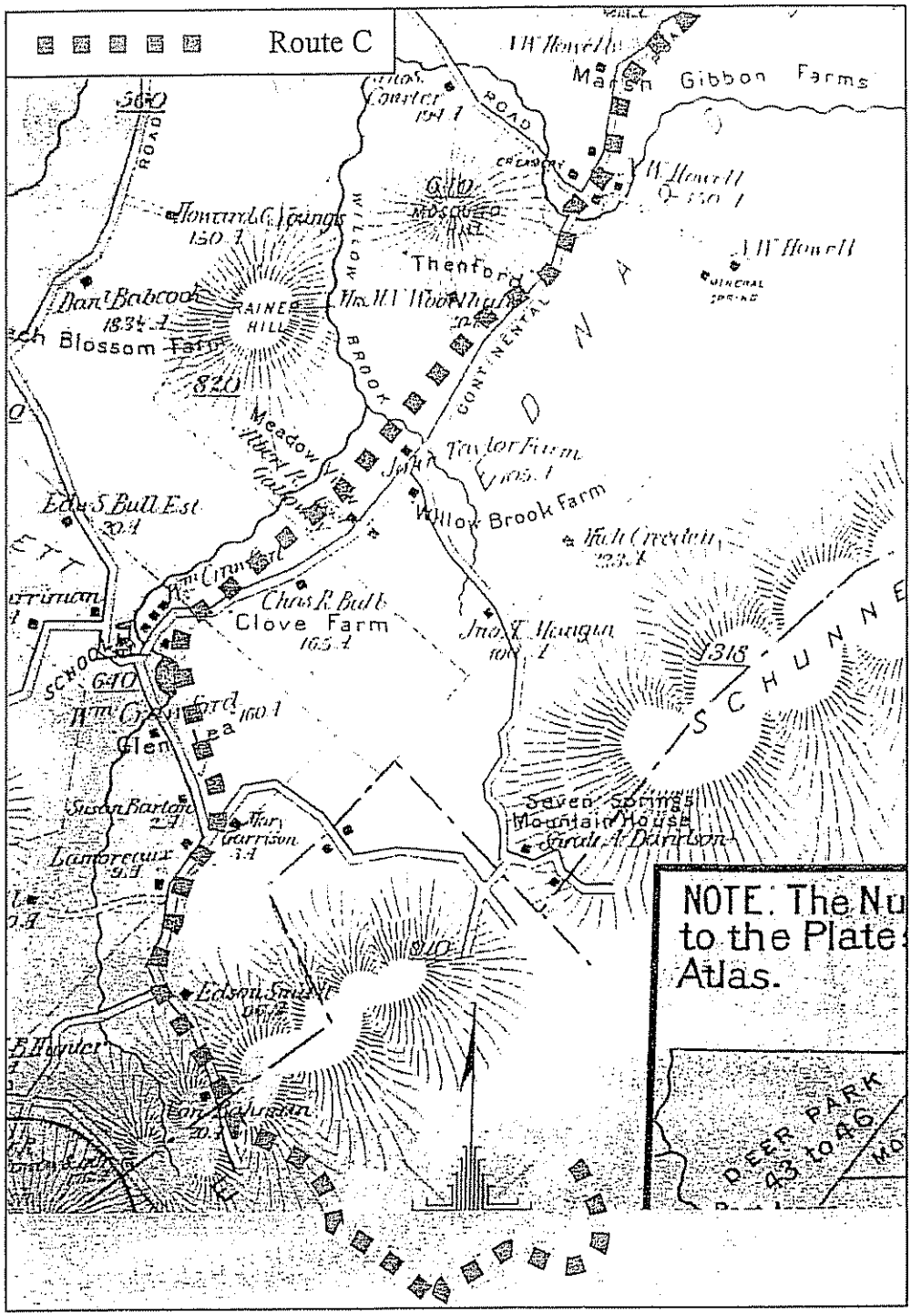


FIGURE 17

Atlas of Orange County, New York
Lathrop 1903

Route C, Mid-lower Blooming Grove, Orange County, New York.

No Scale Available

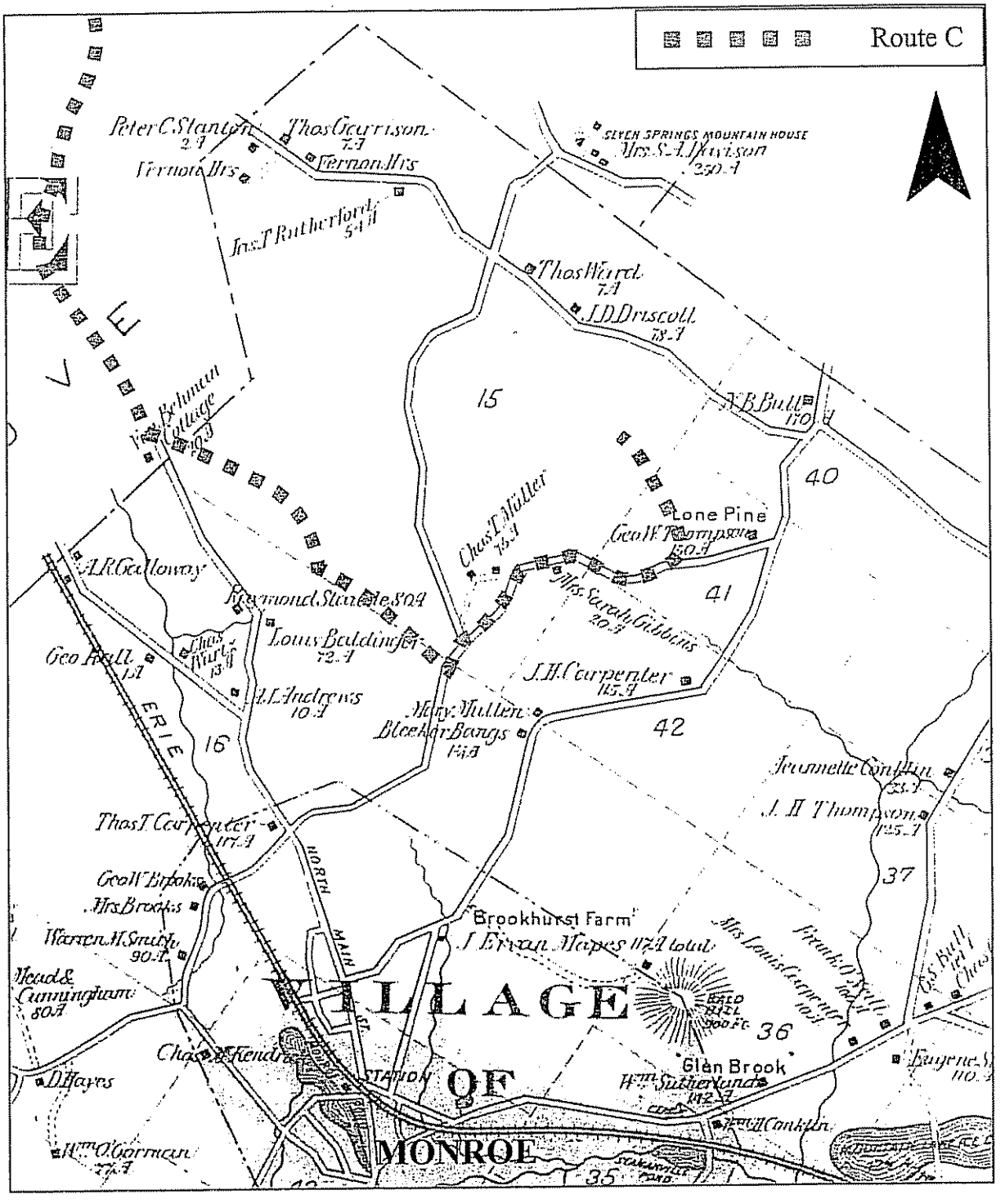


FIGURE 18

Atlas of Orange County, New York.
Lathrop 1903.

Route C, Monroe, Orange County, New York.

No Scale Available.

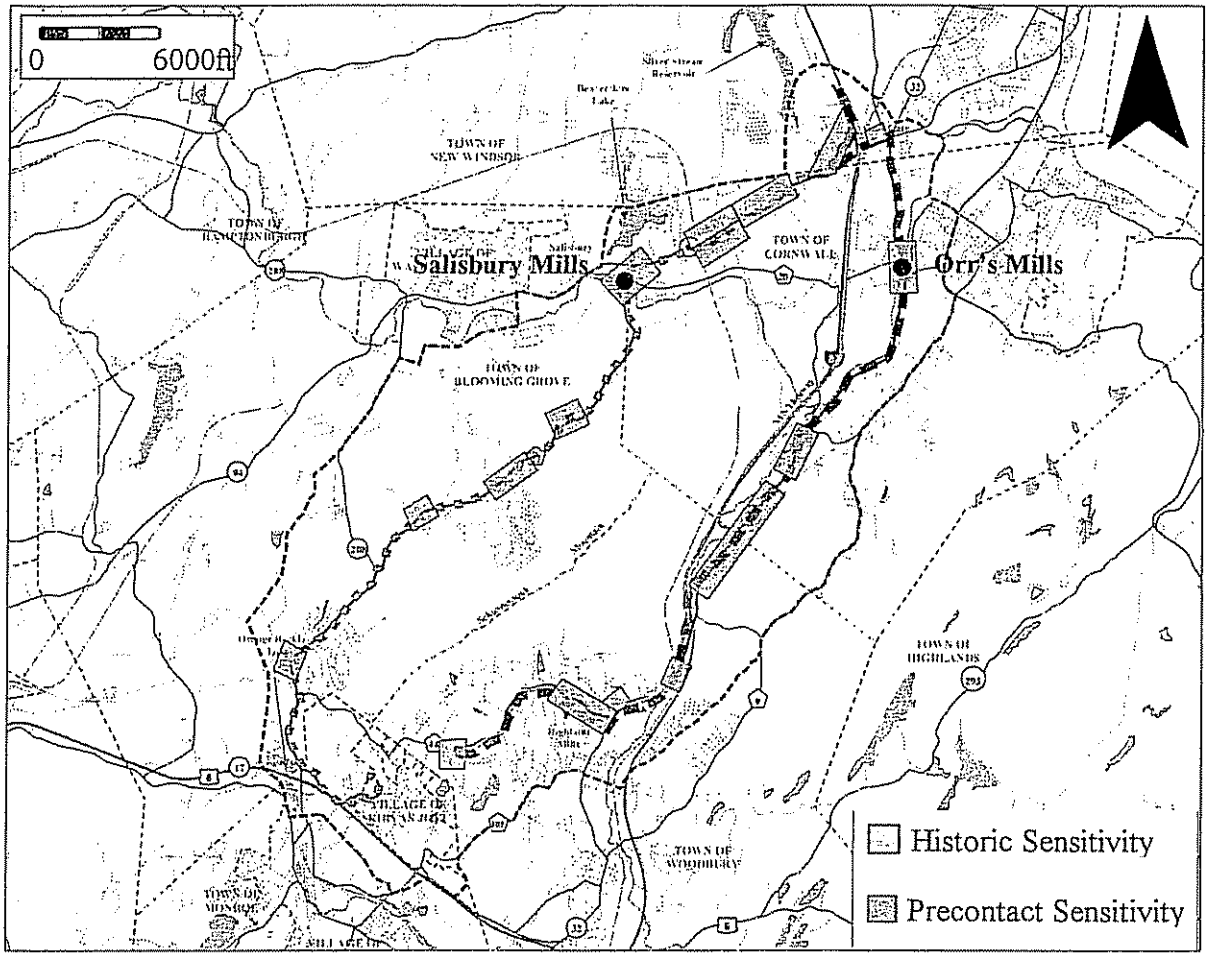


FIGURE 19

Area of Proposed Archaeological Sensitivity, Proposed Catskill Aqueduct Connection, Village of Kiryas Joel, Orange County, New York.

Base Map provided by CDM.

PHOTOS

Photo 1: From Riley Road, west of Interstate 87, Northwest of Vails Gate Junction, looking west at Town of New Windsor Water Treatment Plant.

Photo 2: Immediately west of Vails Gate, Looking North across Route 94 at the Edmonston House (1755). Historic significance.

Photo 3: Looking south down Route 32 from the intersection of Route 94 and Route 32, from the west shoulder (Vails Gate Junction). Note disturbances.

Photo 4: Photo taken at Orrs Mill, Route 32 between Vails Gate and Mountainville, looking south down Route 32. Bridge in center of picture spans Moodna Creek. Historic mill was located on the east side of Route 32.

Photo 5: Looking north from West shoulder of Route 32 near Mountainville, opposite Rustic Ridge Road. Moodna Creek is on the left, Rt. 32 is on the right. Note creek on left, steep slope on right.

Photo 6: From northbound lane of Interstate 87, east shoulder, due west of Mountainville, Looking South (Schunnemunk Mt. on the right).

Photo 7: Looking south from west shoulder of Route 32 near Mountainvile, one mile north of the boundary between the Towns of Cornwall and Woodbury. Rt. 32 is on the left. Floodplain along creek is ideal for Native American settlement.

Photo 8: Looking east across the intersection of Route 32 and Route 44 (Route 44 is in the foreground). The Cemetery of Highland Mills is to the right of and behind the church in the photo.

Photo 9: Photo taken looking east towards the intersection of Route 32 and Route 44 (Route 44 is in the foreground). Structure on the right is on the parsonage's house lot, in front of the Cemetery of Highland Mills. It may or may not be the original historic structure.

Photo 10: Looking south across Route 94 at abandoned historic structure on hill overlooking Mt. Airy Road Road.

Photo 11: Looking west across the intersection of Route 94 (in the foreground) and South Jackson Avenue (entering from the left and right). The Bethlehem Church is in the upper right hand corner.

Photo 12: Photo taken looking east from the intersection of Route 94 (extending off on the left) and South Jackson Avenue (in the foreground). Floodplain ideal for Native American settlement.

Photo 13: Looking south in the village of Salisbury Mills. The road crossing along the bottom of the photo is Orrs Mills Road (Rt. 20). The road entering from the top right of the photo is Clove Road (Rt. 27), which crosses a bridge over Moodna Creek before joining Orrs Mills Road.

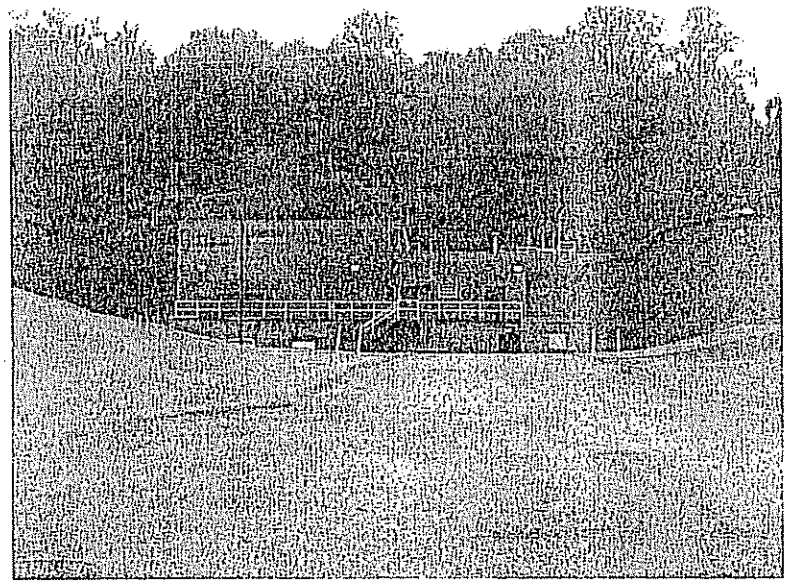
Photo 14: Looking west down Fairway Drive from intersection with Route 208, just north of Route 17. Historic structure in photo currently houses a golf store, but located more than 100 feet from Route 208.

Photo 15: Looking north at historic foundations north of Fairway Drive and west of Route 208. These foundations sit right off the west shoulder of Route 208.

Photo 16: Looking West down Route 17 from the Schunnemunk Road Overpass. Westbound traffic is on the right.

Photo 17: Looking Northwest up Berdichev Drive, Village of Kiryas Joel. The Water Department of the Village of Kiryas Joel is on the right.

Photo 18: Looking East along Route 44 from the intersection of Rt. 44 and Milval Lane. The northern edge of Parcel 2 is on the right.



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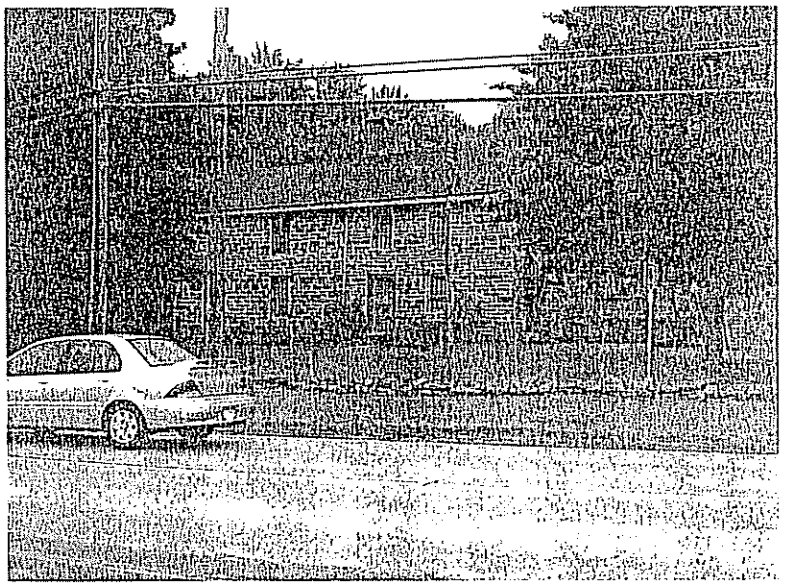

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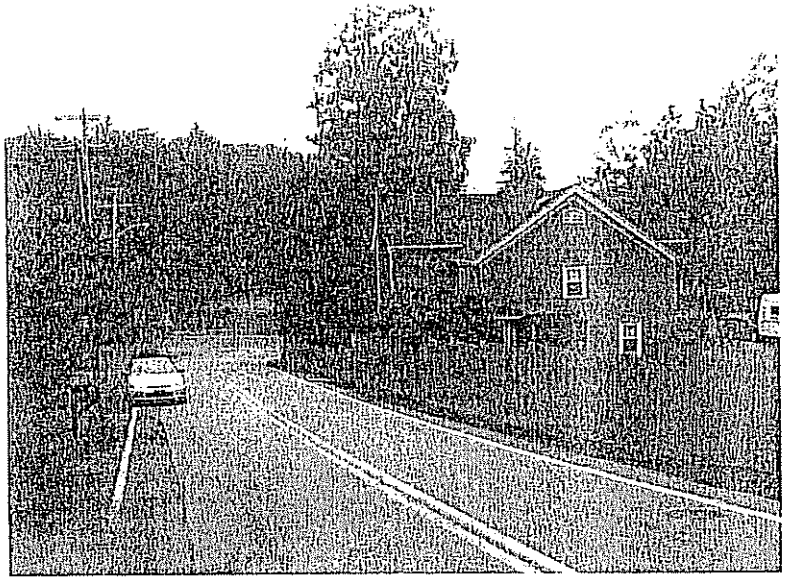
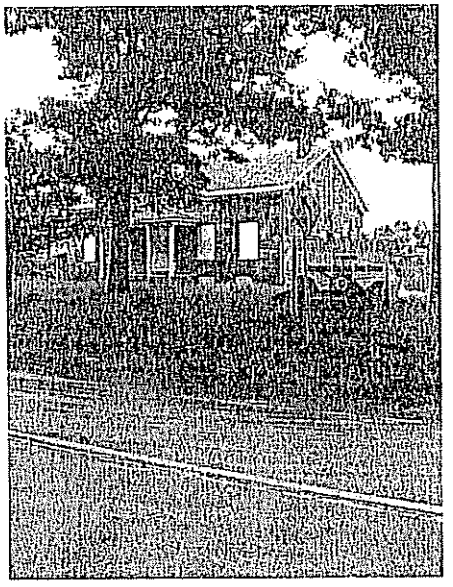
Photos 1-4

R582

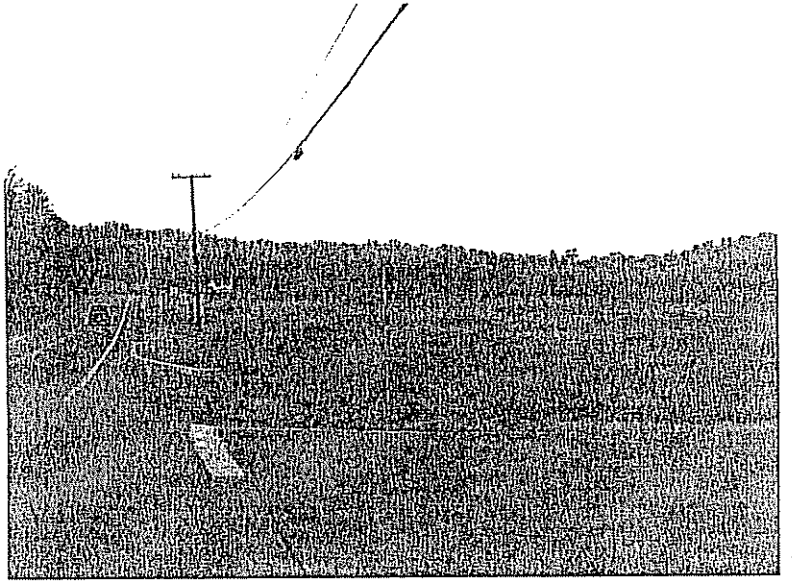


9



10

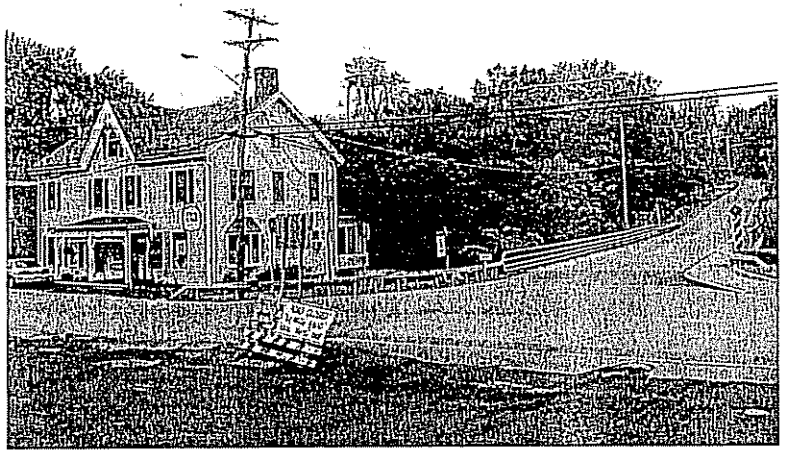
11



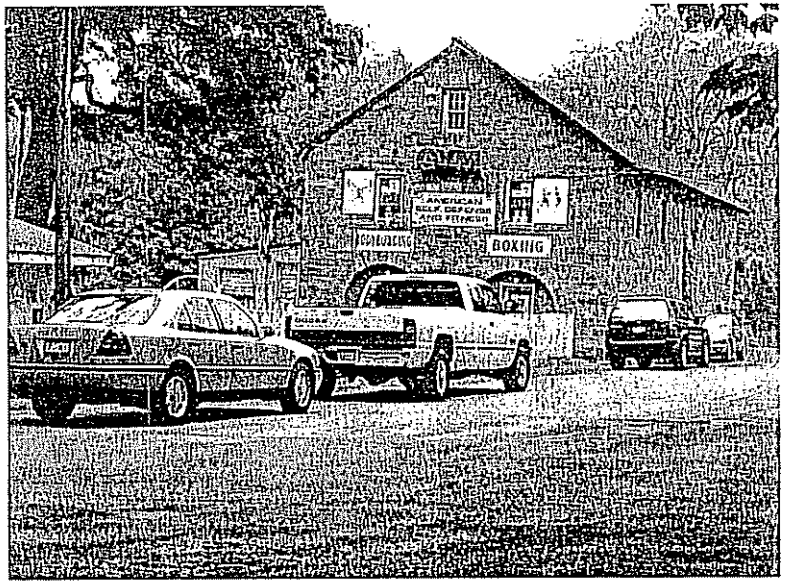
12

Photos 9-12

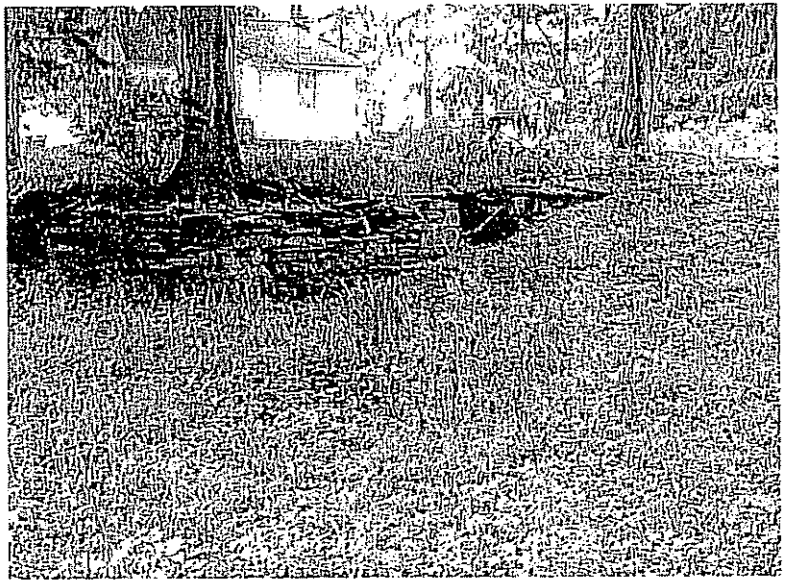
R583



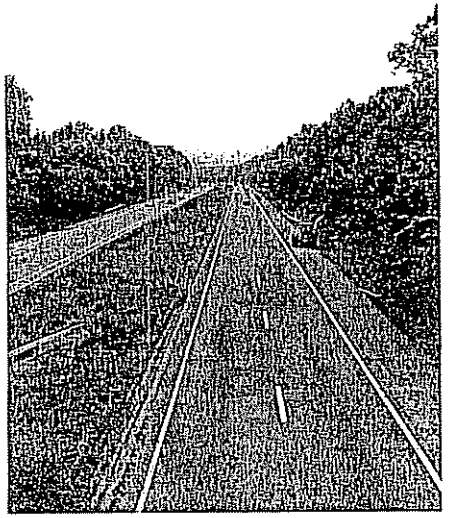
13



14



15

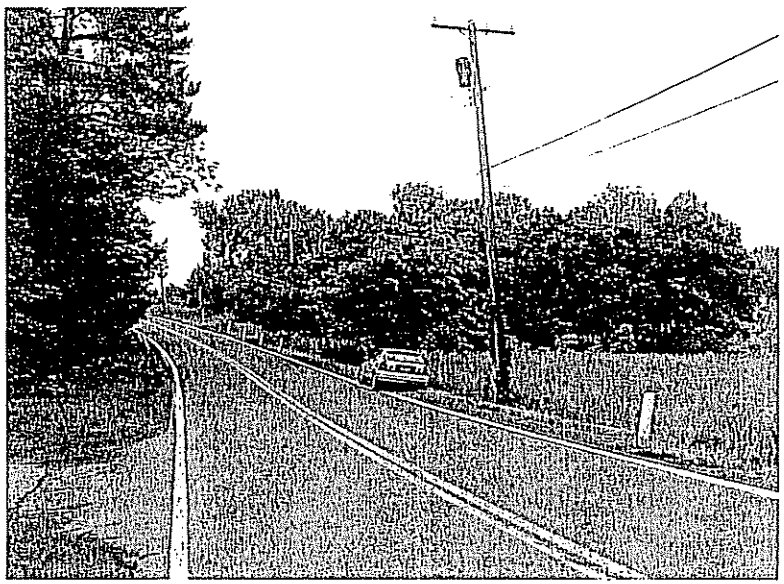


16

Photos 13-16

R584

17



18

Photos 17-18

APPENDIX 1

Cartographic History

Appendices

Appendix 1. Cartographic Histories

The specific history of land use on and around each potential water conveyance route as well as Parcel 2 is documented here based upon cartographic research using historic maps and atlases of Orange County. Information from the maps is presented in chronological order.

Route A (The Eastern Route)

This route begins at the Aqueduct in New Windsor, proceeds south along Riley Road to State Route 94, turns east to Vails Gate, turns south on State Route 32, turns west on County Road 44 in Highland Mills, and terminates at the potential WTP site in Kiryas Joel (see Parcel 2; Figures 2 and 3). The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route. The cartographic history of this route follows the old roads, many of which have since been straightened.

De Witt 180? This map recreated from original surveys shows the boundaries, dates and acreage of early land patents. While major waterways are shown, no roads are indicated. Moodna and Woodbury Creek are both called Murderer's Creek. Landholders are shown as follows from north to south in the path of Route A:
Mary Ingoldsby and Mary Pimhorn, 4000 acres, New Windsor to the Hudson River.
Children of Mary Pimhorn, 1000 acres, Canterbury, New Windsor and Cornwall.
John Lawrence, 1779, 2000 acres, Cornwall, north of Murderer's Creek.
Andrew Nichols, 1721, acreage unknown, both sides of Murderer's Creek north of Otter Kill.
Isaac Bobbin, 1726, acreage unknown, east of Murderer's Creek.
Ebenezer Wilson and Benjamin Aske, 2000 acres, both sides of Murderer's Creek.
Thomas Smith, June 14, no acreage or year, shown at end of Murderer's Creek.
Nathanial Hazard, two plots of land, 1200 and 15 acres, from end of Murderer's Creek to the town and village of Monroe.
Monroe is surrounded by small, square plots of land, with no names, dates, or acreage shown.

Smith 1810 (1936) This research map recreates Orange County prior to 1810. Several historical sites along with dates are indicated along roads and streams, although their precise locations are difficult to determine. The following sites are shown along or near Route A:
Edmonston House, 1755, Vail's Gate.
MacGonigal House, 175-, shown west of Murderer's Creek, west side of road (currently State Route 32).

Ketcham's Mill, Mountainville, shown on west side of Murderer's (Moodna) Creek.
Thos. Seaman House, 1800, shown on east side of Murderer's Creek, west of road.
Post-Road Inn, 1773, shown on east side of Murderer's Creek and east side of road.
Quaker Meeting House, Woodbury, 1803, shown west of Woodbury Creek and road.
"Near Earl's Tavern", Orange (Highland Mills), west of road, states "the army encamped, Central Valley 1779". This area is south of the proposed route.

Burr 1829 — This map shows the boundaries of the townships of Orange County (Figure 4). At this time, Woodbury was still part of Monroe. Old land patents are also shown on this map. From north to south, the following landowners and features are shown along this route:
New Windsor: Ingoldsby & Pinkborn, Children of Mary Pinkborn.
Cornwall: Andrew Nicolls (along Murderers Creek), Ebenezer Wilson (within whose property the current town of Woodbury begins), Thomas Smith. Note: four furnaces are indicated on the east side of the road (current State Route 32) around the property of Thomas Smith. A large unassigned tract is present between Smith and the section of Monroe divided into small equal plots.
Monroe: Small, individual plots, no assignment.

Sidney 1851 — Individual houses and landscape features are portrayed on this more detailed map of Orange County. Homelots tend to be widely disbursed along rural roads, with a few concentrations in hamlets or small villages, often around creeks. Many roads shown on this map correspond to modern roads. However, the scale of this map does not permit precise determination of structure locations.
This map indicates that at this time the Newburgh Railroad line passed through Vail's Gate, referred to at this time as Nortonville. Although Riley Road does not yet exist, the road that will become State Route 94 exists, as does State Route 32 to some extent and County Road 44. Several other roads are also present by this time; their current names will be used here. Houselots or farmsteads are indicated on this map and will be noted from north to south:
No structures are shown in the area of Riley Road.
Two homelots and a district school are shown on the north side of State Route 94 southwest of Vail's Gate. The school is located near the intersection.
Just northeast of the intersection of Vail's Gate, a hotel is indicated on the north side of the road.
On the west side of State Route 32 just south of Vail's Gate is the homelot of T. J. DeLancey.
The homelot of I. Townsend is located at the northwest corner of the intersection of State Route 32 and Holloran Road.

Where the old road meets Murderers Creek and continues along the west side of the creek, the current State Route 32 now passes over to the east side of the creek (at Orr's Mill Road). A mill is located on the west side of the creek and the Townsends Bridge crosses the creek where the State Route 32 currently crosses Murderers Creek.

No structures are shown in the immediate vicinity of the location of State Route 32 from Orr's Mill Road until the area of Pleasant Road.

Highlandville was located around where Pleasant Road meets State Route 32. A church and district school were once located east of the route.

Slightly further south along State Route 32 is the homelot of J. Burton on the east side of the road, then L Hand on the east side of the road.

South of Highlandville, the old State Route 32 appears to be located just east of the new State Route 32 until it meets Trout Brook Road just north of Highway 87. The homelot of S. Ketcham is located on the west side of the old State Route 32. It is unclear if this lot would have been impacted by the construction of the new State Route 32 or if this is located along Interstate 87.

The homelot of Cox is located between the old State Route 32 and the creek just north of the border of Cornwall.

The homelot of I. Titus is also between the old State Route 32 and the creek, just south of the border of Cornwall.

The homelot of J. Seaman is located on the west side of what appears to now be a private road just west of State Route 32.

The homelot of J. Coleman is located just west of the junction of Trout Brook Road (County Road 34) and State Route 32.

Between Trout Brook Road and Seven Springs Road (County Road 44) the creek crosses from the west to the east side of the State Route 32 at Woodbury Clove. Seven houses, a hotel, a Friends Meeting house, and a store are located along the west side of the road and three structures are along the east side of the road around this hamlet. A grist mill and ruins of a furnace are located off the road to the east.

A Methodist Church is located at the east side of the junction of State Route 32 and County Road 44.

Along County Road 44 from Route 32 to Schunnemunk Road are four houses along the north side of the road and one structure on the south side of the road, just west of Route 32.

Along County Road 44 west of Schunnemunk Road, one house is located on the south side of the road, east of Ridge Drive, while two houses are located on the north side of County Road 44, one on each side of Owens Drive. Additionally, a district school is located on the north side of County Road 44 west of Ridge Drive.

The homelot of J. Rumsey is located on the north side of County Road 44, just west of Bakertown Road.

French, Wood and Beers 1859. This map is very similar to the Sidney Map of 1851, but population is slightly more concentrated in villages and hamlets Large black lines delineating town boundaries obscure information at the

borders, however. Nortonville is called Mortonville on this map. Additional information on this map not shown on Sidney 1851 is noted below:

Three more homelots are located along State Route 32 between Vail's Gate and Holloran Road, three on the west side of the road and one on the east side.

Orr's Mill, where State Route 32 crosses Murderers Creek is no longer called Highlandville. Several home lots attributed to Orrs are shown with houses in the immediate area. A gristmill is indicated on the west bank of the river, along the east side of the road. A piano-forte factory and Baptist Church are shown on the west side of the river south of the bridge where the road crosses over to the east side of the river. A Methodist Church and district school are shown.

While some names have changed, there are no significant changes evident on the rest of the route until the hamlet (Woodbury Clove on Sidney 1851) at the junction of County Road 44 and State Route 32. The store on the west side of the road is no longer indicated, but a tavern and nine houses are now indicated along the west side of State Route 32 between County Road 34 and County Road 44, and four are shown on the east side of the road. Further development within this hamlet is shown south of the project area.

Additionally, another homestead is shown on the north side of County Road 44 at Bakertown Road.

This map also indicates larger past land tracts. Major landholders from north to south include John Lawrence, Andrew Nicholls, Ebenezer Wilson, and Thomas Smith.

Beers 1875: While no atlas pages were available for the towns encompassing this route, an engraving (Figure 6; Plate 119) shows a scene from Cornwall at Orr's Mill. This image shows several structures on the road crossing the creek. These include the "Res. Of Mrs. J. E. Ryder, Piano Factory", the "Res. Of Wm Orr", the "Cornwall Flouring Mill, Established 1776, Rebuilt by J. & W. Orr, 1866", and an "Iron Suspension Bridge". Off all of these structures, only the mill appears to be on the road itself. The bridge is formed with substantial brick supports on either side of the river. The river is shown with a physical break or barrier along the west side fed by a small, channeled offshoot of the river, forming a tranquil fishing pond on the western banks and rushing waters passing by to the east.

Lathrop 1903: This atlas shows several broad changes since 1875 (Figures 5, 7, 8, 11-15). Woodbury is now its own township. Murderers Creek is now called Moodna Creek. Additionally, two new railroad lines are now indicated. In addition to the Newburgh line passing through Vail's Gate and Salisbury Mills, another Erie line passes south along the east side of Vail's Gate and the Schunnemunk Mountains, passing through Mountainville in Cornwall and Woodbury Falls. This railroad is roughly in the same location as Interstate 87. Another New York railroad line now loops south from New Windsor and passes through Orr's Mills before heading north again. The

location of roads has not changed. Population density has increased overall, both in rural areas and in hamlets and villages; however the area is still shown teeming with agricultural and dairy farms and the mills are still active along streams. Rural houses tend to be fairly evenly spaced along roads near streams and rivers. Specific houses will not be enumerated, but new notable structures or features will be listed below:

At Vail's Gate, the historic Edmonston House now appears to be occupied by a Florist and Gardener (Figure 5; Plate 8).

Orr's Mills is shown in a close up view, with the Old New York & Newburgh Turnpike passing through to the north (Figure 7; Plate 9). William Orr is shown as the principle landowner, with several structures around the Moodna Creek as well as "Moodna Mansion" attributed to him. The mill is still located along the western banks of the river, on the east side of the road that then crosses the river to the south. The bridge crosses a small island of land in the middle of the river.

The hamlet of Mountainville is well established along the east side of the project route. The Mountainville Mills are shown on an inset map along the west banks of the river, and the Mountainville P.O. is west of the route (Figure 8; Plate 10). A school and Methodist Church are located in Mountainville, outside of the project area (Figure 7; Plate 9).

Crossing into Woodbury, several structures are shown along both sides of State Route 32, including a Quaker Church and cemetery on the east side (Figure 14). The cemetery appears to be behind the church, away from the road.

The Methodist Church and Highland Mills Cemetery are shown at the intersection of State Route 32 and County Road 44, here called Forest Avenue (Figures 14 and 15). The Highland Mills Cemetery is also shown in detail on an inset map at the southeast corner of State Route 32 and County Road 44, outside of the project area (Plate 13). No additionally notable features are shown along County Road 44, although several more houses are located just west of State Route 32.

Route B (The Central Route)

This route begins at the Aqueduct in New Windsor, proceeds south along Riley Road to a paved access point onto the New York State Thruway (Interstate 87), proceeds south on Interstate 87 until it intersects with State Route 32, proceeds south on Route 32, turns west on County Road 44, and terminates at the potential WTP site in Kiryas Joel (see Parcel 2). The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route.

De Witt 180?: This map recreated from original surveys shows the boundaries, dates and acreage of early land patents. Landholders are shown as follows from north to south in the path of Route B:

Mary Ingoldsby and Mary Pimhorn, 4000 acres, New Windsor to the Hudson River.
Children of Mary Pimhorn, 1000 acres, Canterbury, New Windsor/Cornwall.
John Lawrence, 1779, 2000 acres, Cornwall, north of Murderer's Creek.
Andrew Nichols, 1721, acreage unknown, both sides of Murderer's Creek north of Otter Kill.
John Depuy, May 5, 1722, 1250 acres, west of Murderer's Creek.
Ebenezer Wilson and Benjamin Aske, 2000 acres, both sides of Murderer's Creek.
Thomas Smith, June 14, no acreage or year, shown at end of Murderer's Creek.
Nathanial Hazard, two plots of land, 1200 and 15 acres, from end of Murderer's Creek to the town and village of Monroe.
Monroe is surrounded by small, square plots of land, with no names, dates, or acreage shown.

Smith 1810 (1936). This research map recreates Orange County prior to 1810. Several historical sites along with dates are indicated along roads and streams, although their precise locations are difficult to determine. The following sites are shown along or near Route B:
Edmonston House, 1755, Vail's Gate.
MacGonigal House, 175-, shown west of Murderer's Creek, west side of the road (currently State Route 32).
Ketcham's Mill, Mountainville, shown on west side of Murderer's (Moodna) Creek.
Thos. Seaman House, 1800, shown on east side of Murderer's Creek, west of road.
Post-Road Inn, 1773, shown on east side of Murderer's Creek and east side of road.
Quaker Meeting House, Woodbury, 1803, shown west of Woodbury Creek and road.
"Near Earl's Tavern", Orange (Highland Mills), west of road, states "the army encamped, Central Valley 1779". This area is south of the proposed route.

Burr 1829: This map shows the boundaries of the townships of Orange County (Figure 4). At this time, Woodbury was still part of Monroe. Old land patents are also shown on this map. From north to south, the following landowners and features are shown along this route:
New Windsor: Ingoldsby & Pinkborn, Children of Mary Pinkborn.
Cornwall: Andrew Nicolls (along Murderers Creek), Ebenezer Wilson (within whose property the current town of Woodbury begins), Thomas Smith. Note: four furnaces are indicated on the east side of the road (current State Route 32) around the property of Thomas Smith. An unassigned section is between Thomas Smith and the small tracts around the village of Monroe.
Monroe: Small individual plots, no assignment.

Sidney 1851: Individual houses and landscape features are portrayed on this more detailed map of Orange County. Homelots tend to be widely disbursed along rural roads, with a few concentrations in hamlets or small villages, often around creeks. Many roads shown on this map correspond to modern roads. However, the scale of this map does not permit precise determination of structure locations.

This map indicates that at this time the Newburgh Railroad line passed through Vail's Gate, referred to at this time as Nortonville. Although Riley Road and Interstate 87 do not yet exist, the road that will become State Route 94 exists, as does State Route 32 to some extent and County Road 44. Several other roads are also present by this time; their current names will be used here. Houselots or farmsteads are indicated on this map and will be noted from north to south:

No structures are shown in the area of Riley Road or the beginning of Interstate 87. The area of the northern section of this proposed water conveyance route passes through Nortonville.

The following small homelots are present in the area of the route: W. Edmonston is indicated along Orr's Mill Road. A small hill called "Pea Hill" is shown to the west of the path of the interstate.

J. & S. Van Duxor and J. Hunter are located to the north of Murderers Creek just before it meets Otter Kill. These appear more likely to have been located along Pleasant Hill Road than Interstate 87, however.

After crossing Murderers Creek, the path of Interstate 87 would have passed through the hamlet of Ketchamtown, including S. Ketcham. Most development in this hamlet, however, was located east of the creek.

No development is shown east of Murderers Creek until Trout Brook Road, where the Interstate 87 now links with State Route 32.

The homelot of J. Coleman is located just west of the junction of Trout Brook Road (County Road 34) and State Route 32.

Between Trout Brook Road and Seven Springs Road (County Road 44) the creek crosses from the west to the east side of the State Route 32 at Woodbury Clove. Seven houses, a hotel, a "Free Methodist" house, and a store are located along the west side of the road and three structures are along the east side of the road around this hamlet. A grist mill and ruins of a furnace are located off the road to the east.

A Methodist Church is located at the east side of the junction of State Route 32 and County Road 44.

Along County Road 44 from Route 32 to Schunnemunk Road are four houses along the north side of the road and one structure on the south side of the road, just west of Route 32.

Along County Road 44 west of Schunnemunk Road, one house is located on the south side of the road, east of Ridge Drive, while two houses are located on the north side of County Road 44, one on each side of Owens Drive. Additionally, a district school is located on the north side of County Road 44 west of Ridge Drive.

The homelot of J. Rumsey is located on the north side of County Road 44, just west of Bakertown Road.

French, Wood and Beers 1859: This map is very similar to the Sidney Map of 1851, but population is slightly more concentrated in villages and hamlets. Large black lines delineating town boundaries obscure information at the borders, however. Nortonville is called Mortonville on this map. Additional information on this map not shown on Sidney 1851 is noted below:

Five more homesteads are indicated in the area of Interstate 87 between Vail's Gate and the area of Orr's Mill Road near Pea Hill. Again, these homesteads are more likely to have been located along Pleasant Hills Road than Interstate 87.

Ketchamtown is not labeled as such any more, but an Orrs homelot is indicated in this hamlet.

While some names have changed, there are no significant changes evident on the rest of the route until the hamlet (Woodbury Clove on Sidney 1851) at the junction of County Road 44 and State Route 32. The store on the west side of the road is no longer indicated, but a tavern and nine houses are now indicated along the west side of State Route 32 between County Road 34 and County Road 44, and four are shown on the east side of the road. Further development within this hamlet is shown south of the project area.

Additionally, another homestead is shown on the north side of County Road 44 at Bakertown Road.

This map also indicates larger past land tracts. Major landholders from north to south include John Lawrence, Andrew Nicholls, Ebenezer Wilson, and Thomas Smith.

Lathrop 1903: This atlas shows several broad changes since 1875 (Figures 11-15). Woodbury is now its own township. Murderers Creek is now called Moodna Creek. Additionally, two new railroad lines are now indicated. In addition to the Newburgh line passing through Vail's Gate and Salisbury Mills, another Erie line passes south along the east side of Vail's Gate and the Schunnemunk Mountains, passing through Mountainville in Cornwall and Woodbury Falls. This railroad is roughly in the same location as Interstate 87. Another New York railroad line now loops south from New Windsor and passes through Orr's Mills before heading north again. The location of roads has not changed. Population density has increased overall, both in rural areas and in hamlets and villages. Rural houses tend to be fairly evenly spaced along roads near streams and rivers and the area is still used largely for agricultural or dairy farms. Mills are still present along the rivers at hamlets and villages.

Specific houses will not be enumerated, but new notable structures or features will be listed below:

The railroad route that will later become Interstate 87 passes through largely farmland until it reaches Woodbury Falls, located at the junction of

the interstate and State Route 32, labeled "State Road" or "Old New York & Albany Turnpike" on this atlas (Figures 12 and 13; Plates 9 and 12). Several structures are shown along both sides of State Route 32, including a Quaker Church and cemetery on the east side (Figures 14 and 15). The cemetery appears to be behind the church, away from the road.
The Methodist Church and Highland Mills Cemetery are shown at the intersection of State Route 32 and County Road 44, here called Forest Avenue. The Highland Mills Cemetery is also shown in detail on an inset map at the southeast corner of State Route 32 and County Road 44, outside of the project area (Figure 14; Plate 13). No additionally notable features are shown along County Road 44, although several more houses are located just west of State Route 32.

Route C (The Western Route)

This route begins at the Aqueduct in New Windsor, proceeds south along Riley Road to State Route 94, turns west to Clove Road at Salisbury Mills (County Road 27), turns south on County Road 27 to State Route 208, turns south on State Route 208 to State Route 17, follows the Exit 130 north ramp to the trunk of State Route 17, follows State Route 17 to Shunnemunk Road, turns northeast on Shunnemunk Road to Berdichev Drive, and turns northwest on Berdichev Drive to Kiryas Joel's Village WTP. The APE for this route, therefore, consists of the strips of land extending 100 feet out from the middle of the roads covered in this route.

De Witt 180?: This map recreated from original surveys shows the boundaries, dates and acreage of early land patents. Landholders are shown as follows from north to south in the path of Route C:
Mary Ingoldsby and Mary Pimhorn, 4000 acres, New Windsor to the Hudson River.
Children of Mary Pimhorn, 1000 acres, Canterbury, New Windsor and Cornwall.
James Henderson, no acreage or year, Cornwall, north of Murderer's Creek.
Vincent Pierce, 1000 acres, north of Murderer's Creek.
Richard Van Dam, 1000 acres, north of Murderer's Creek/Otter Kill.
Rip Van Dam & Co., 3000 acres, north and south of Otter Kill.
Joseph Sackett & Hazard, 2440 acres, Jun. 16, 1727, both sides of Otter Kill (which turns to the southwest).
Edward Blagg, 2000 acres, east of Otter Kill.
[empty tract between Blagg's tract and town and village of Monroe]
Monroe is surrounded by small, square plots of land, with no names, dates, or acreage shown.

Smith 1810 (1936): This research map recreates Orange County prior to 1810. Several historical sites along with dates are indicated along roads and streams, although their precise locations are difficult to determine. The following

sites are shown along or near Route C, described in order from north (New Windsor) through Blooming Grove south to Monroe.
Edmonston House, 1755, Vail's Gate.
Cook House, 17--, located along the north side of the road heading southwest into Blooming Grove (currently State Route 94).
Bethlehem, originally established 1729 west of road, later church east of road around 1800, in Blooming Grove.
Thompson House, 177-, north of road, just north of Salisbury Mills.
Salisbury Mills, noted that Mathews had first mill, shown on road (Now Clove Road) north of creek.
"Sarah Wells Following the Indian Trail, 1712", outside the project area directly west of Salisbury Mills, above Washingtonville.
Maringoman's Indian Castle, located outside of the project area to the west, appears to be a fortification, northwest of Woodcock Hill.
Francis Scott House, about 1800, west of road.
Samuel Moffat House, 1766, west of old road.
Lime Kiln, west of old road below Samuel Moffat House.
Distillery, east of old road, southeast of Lime Kiln.
Blagg's Clove, "Sylvanus Whilte Came 1734", on east side of the road junction (currently where Round Hill Road meets Clove Road).
Hezekiah Howell, 1797, "Nathaniel Strong was shot by Claudius Smith, 1778", on east side of the road junction (currently where State Route 208 meets Clove Road).
Nathaniel Satterly Mill, 1765, west side of road (State Route 208).
Isaac Still House, east side of road (State Route 208).
Smith Mills before 1788, Smith's Clove, outside of the route APE.

Burr 1829: This map shows the boundaries of the townships of Orange County (Figure 4). At this time, Woodbury was still part of Monroe. Old land patents are also shown on this map. From north to south, the following landowners and features are shown along this route:
New Windsor: Ingoldsby & Pinkborn, Children of Mary Pinkborn.
Cornwall: John Lawrence (the village of Bethlehem lies within his parcel), John Depuy.
Blooming Grove: R. Van Dam & Co. (around Murderers Creek), Edward Blagg & Co., unassigned parcel before reaching the town of Monroe.
Monroe: Individual plots, no assignment.

Sidney 1851: Individual houses and landscape features are portrayed on this more detailed map of Orange County. Homelots tend to be widely disbursed along rural roads, with a few concentrations in hamlets or small villages, often around creeks. Many roads shown on this map correspond to modern roads. However, the scale of this map does not permit precise determination of structure locations.
This map indicates that at this time the Newburgh Railroad line passed through Vail's Gate, referred to at this time as Nortonville. Although Riley Road does not yet exist, the road that will become State Route 94 exists. Several other roads are also present by this time; their current

names will be used here. Houselots or farmsteads are indicated on this map and will be noted from north in New Windsor, west through Cornwall to Blooming Grove, and south to Monroe.

No structures are shown in the area of Riley Road.

State Route 94 meets the future location of Riley Road at the border of New Windsor and Cornwall. Between the location of Riley Road and the railroad crossing, two or three homelots are shown on the north side of the road and two homelots are shown on the south side of the road.

Between the railroad crossing and Airy Road, two homelots and a shop are shown on the north side of the road while one homelot is on the south side of the road.

The next section of State Route 94 between Airy Road and Jackson Avenue terminates in what is portrayed here as the village of Bethlehem. Four homelots are north of State Route 94 between Airy Road and Jackson Avenue and two homelots are located on the south.

The next major village along State Route 94 heading west is Salisbury Mills. Along the way, a parsonage is located on the north side of the road, closer to Bethlehem. Further west, two homelots are on the north side of Route 94 and two more are shown on the south side before the railroad crosses the road.

Clove Road crosses Otter Kill before State Route 94 reaches the center of Salisbury Mills. On the section of Clove Road north of Otter Kill, three structures are located on either side of the road. A mill is located on the south side of Otter Kill.

Along Clove Road from the creek to Otter Kill Road, three homelots are located on the west side of the road and one structure is located on the east side.

Between Otter Kill Road and Felter Hill Road, on the north side of Clove Road, five homelots are well-spaced towards the southwest end, with one structure on the south side of the road. A district school is located on the west side of Felter Hill Road, outside the project area.

Between Felter Hill and Round Hill Road, three houses are on the south side of Clove Road and one is located on the north side, just west of Felter Hill Road. Several lots belong to individuals named Howell. On the west side of Round Hill Road and the north side of Clove Road is yet another district school, this one along the proposed route.

From Round Hill Road until Clove Road meets State Route 208, another four homelots are found, two on each side of the road, two of which belong to a Howell. The entire area is identified as Blaggs Clove

State Route 208 from Clove Road to Pedler Hill Road has two homelots on the west side and two structures on the east, one of which is identified as a shop. An "S & G Mill" is located at the northwest corner of State Route 208 and Pedler Hill Road.

Satterly's Pond is shown just south of the junction of State Route 208 and Pedler Hill Road on the east.

About half way between Pedler Hill Road and County Road 44, a Methodist Church is shown on the east side of State Route 208. Another homelot is shown on the west side of the route just to the south.

Between County Road 44 and the border between Blooming Grove and Monroe, another two homelots are shown on either side of State Route 208.

Within the township of Monroe and the area of Kiryas Joel, no structures or homelots are shown in the immediate area of the proposed route.

French, Wood and Beers 1859: This map is very similar to the Sidney Map of 1851, but population is slightly more concentrated in villages and hamlets. Large black lines delineating town boundaries obscure information at the borders, however. Nortonville is called Mortonville on this map. Additional information on this map not shown on Sidney 1851 is noted below:

Vail's Gate is now labeled as such. Riley Road does not yet exist, but it will parallel the railroad tracks to the north. A handful of structures are shown along the railroad tracks in the vicinity of Riley Road, however, thick black lines demarcating township boundaries obscure much of this area.

A close-up view of Salisbury Mills is provided with this map. Another three structures are indicated on the east side of Clove Road just north of Otter Kill.

An additional structure is shown on the north side of Clove Road between Otter Kill Road and Felter Hill Road.

Two additional structures are shown on the south side of Clove Road between Felter Hill Road and Round Hill Road.

No further additions are seen on this map.

Beers 1875: Plate 108 of this atlas of Orange shows the district divisions of the town of Blooming Grove, as well as old land patents. Plate 112 additionally portrays a closeup view of Salisbury Mills (Figure 9).

On Plate 112 (Figure 9), Salisbury Mills is shown with four structures located directly on the east side of the road between the railroad line and Otter Kill. Two structures plus the railroad office are located on the northwest side of the road. A large Grist Mill is located along the west side of the road on the north side of Otter Kill, south of the railroad station. On the south side of Otter Kill, no structures are shown directly on the road. However, a Presbyterian Church is located along a side road just west of Clove Road.

On Plate 108, Otter Kill is labeled Murderers Creek. Only a few more houses are portrayed along Clove Road and State Route 208 compared with earlier maps.

At the northeast corner of State Route 208 and Pedler Hill Road, three structures are labeled Cider Mill and Saw Mill. On previous maps, these were labeled "S & G Mill".

No plates were available for surrounding towns.

Lathrop 1903: This atlas shows several broad changes since 1875 (Figures 5, 10, 11, 12, 16-18). However, the location of roads has not changed. Population density has increased overall, both in rural areas and in hamlets and villages. Rural houses tend to be fairly evenly spaced along roads near streams and rivers. Surrounding land is used primarily for agricultural or dairy farms and mills continue to be present along rivers. Specific houses will not be enumerated, but new notable structures or features will be listed below.

The Bethlehem Presbyterian Church and Parsonage are still located at the northwest corner of State Route 94 and Jackson Avenue (Figure 16; Plate 19). An inset showing the village of Salisbury Mills indicates the Presbyterian Church is still located on the west side of Clove Road just south of Otter Kill and the large Arlington Paper Mill is located to the east of the road, although apparently outside of the project area.

Schools are still located on the west side of the project route at Felter Hill Road and Round Hill Road (Figure 17; Plate 22). Round Hill is shown with a graphite deposit. Another school is located on the east side of State Route 208 north of Pedler Hill Road near the former location of the Cider and Saw Mills.

Schunnemunk Road is shown in its current location, although development along it is very sparse (Figure 18; Plate 14). Only one house, belonging to a Mrs. Sarah Gibbons, is located along the road within the project area; the house is located on the east side of the road near the current location of Berdichev Drive.

The Additional Water Treatment Plant, Parcel 2, Site 13-1-49

The plot of land under consideration for a new Water Treatment Plant is Parcel 2 (Site 13-1-49), which is located just west of the intersection of Seven Springs Road (County Road 44) and Bakertown Road in the Village of Kiryas Joel. Specifically, until the exact location of the WTP is established, the APE considered here includes all 30 acres of the undeveloped land in Parcel 2, although the WTP itself requires one acre of land.

De Witt 180?: This map recreated from original surveys shows the boundaries, dates and acreage of early land patents. Land holders in the vicinity of Parcel 2 are as follows: Nathanial Hazard is shown with, two plots of land, 1200 and 15 acres, from end of Murderer's Creek to the town and village of Monroe. Monroe is surrounded by small, square plots of land, with no names, dates, or acreage shown. Due to the general quality of the map, it is unclear if the area of Parcel 2 falls in the former tract or one of the latter, smaller parcels.

Smith 1810 (1936): This research map recreates Orange County prior to 1810. Several historical sites along with dates are indicated along roads and streams, although their precise locations are difficult to determine. The area of

Parcel 2 lies between Highland Mills and Bald Hill on this map; no historic structures or features are noted in the immediate area.

Burr 1829: This map shows the boundaries of the townships of Orange County (Figure 4). At this time, Woodbury was still part of Monroe. Old land patents are also shown on this map. The area of Parcel 2 may lie within an unassigned area north of the lots that divide up the village of Monroe or may be located within those lots.

Sidney 1851: This more detailed map shows individual homelots along roads. The house of J. Rumsey is portrayed on the north side of County Road 44, west of Bakertown Road. This house falls just north of the proposed Parcel 2. The homelot of B. Hunter is shown on the east side of Bakertown Road slightly further south of County road 44, probably falling within the 30 acres of Parcel 2.

French, Wood and Beers 1859: In addition to the house of J. Rumsey, another homestead is shown on the north side of County Road 44 at Bakertown Road, just north of Parcel 2.

Lathrop 1903: The homelot of S. A. Campbell is shown at the southwest corner of County Road 44 and Bakertown Road (Figure 15). This house is either located immediately northeast of Parcel 2 or within the parcel near the northeast edge.

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APPENDIX 2

Site File Search Results

Appendix 2. Site File Search Results, NYCLPC, NYSOPRHP and NYSM

The following sites were identified within a one-mile radius of the entire project area. Sites are reported separately for the proposed water conveyance routes east of Schunnemunk Mountain (Routes A and B) that follow State Routes 32 and 87, respectively, and the proposed route (Route C) that follows Clove Road, County Road 27 and State Route 208, west of Schunnemunk Mountain. See Section 1.4 Area of Potential Effect for complete descriptions of the three proposed routes. No sites were identified that fell within the area of Parcel 2.

Sites are listed from north to south along each of the routes to the degree that specific location can be determined. Sites that fall directly on or adjacent to the proposed routes are identified as such, when specific locations are given in the file searches. Thus, some of the sites listed below, although not noted as such, may still impact the project area, because no specific location may have been provided.

Route A

Identification	Location	Description
SHPO A071-15-0013	North of the project area along State Route 32	Area of the First Massachusetts Brigade, New Windsor Cantonment. Outside project area.
USN# 07115.0000706 Vantage One Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
USN # 07115.000707 Vantage Two Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
USN # 07115.000098 Beach-Still House (Young Residence)	New Windsor, NY 94 at Vail's Gate, west of I87	Stone structure, c. 1786. 1790 deed to property witnessed by Aaron Burr and William Edmonston. Adjacent to project area.
NRL Edmonston House, NY94	Vail's Gate, west of Temple Hill Road along State Route 94	National Registered Landmark, historic house dating to 1755, used as a medical facility and headquarters during the Revolutionary War. Abuts project area.
Survey # 294, Historic Stone House	Cornwall, hamlet of Meadowbrook, south of State Route 94 at Mt. Airy Road	Two-story brick dwelling, dates prior to 1851. Just outside project area.

SHPO A071-15-0007, NRL Haskell House	West of Route 32 between Vail's Gate and Newburgh	National Registered Landmark, John Haskell House. Outside project area.
SHPO A07115.000705	New Windsor, east of Vail's Gate	Prehistoric, stray find. Outside project area.
SHPO A07115.000704	New Windsor, east of Vail's Gate	Prehistoric, stray find. Outside project area.
USN # 07103.000152 W.A. Woodward House	Cornwall, NY32, east side, near town of New Windsor Line	No further information available.
NRL B. Woodruff House, NY32	Cornwall, West side of Route 32 near town of New Windsor Line	National Registered Landmark, historic house. Abuts project area.
USN # 07103.000063 Orr's Mills, Abandoned Mill	Cornwall, NY32, east side, near Moodna Creek Bridge, down private drive	Eligible for National Register status, grist and flour mill, current structure dates to 1866. Built on foundation of former revolutionary-era mill. Just outside project area.
USN # 07103.000148 Parker Truss Bridge Bin 1-02224-0, Owner NYS-DOT, DOT PIN 8460.36 95PR0040	Cornwall, NY32, Orrs Mill, over Moodna Creek	No information available.
USN # 07103.000060 Moodna Mansion (Morizzo Residence)	Cornwall, Orr's Mills Rd, north side, west side of Rte 32	Eligible for National Landmark status, wood frame structure, 1870. Land abuts project area.
USN # 07103.000059 Orr's Summerhouse (Incanno Residence)	Cornwall, Orr's Mills Rd, at intersection Rte 32, west side, Moodna Creek to the east	Wood frame structure, wine cellar built into hill, remnants of mill structures surrounding. c 1750, rebuilt 1872. Boathouse turned into piano factory in early 20th century. Abuts project area.
USN # 07103.000244 Building	Cornwall, 473 Orr's Mill Rd.	Eligible for National Landmark status, no further information available.
USN # 07103.0002246 William Orr House	Cornwall, Orr's Mill Rd. and NY32	Eligible for National Landmark status, no further information available.
USN # 07103.000243 Building	Cornwall, 473 Orr's Mill Rd.	Eligible for National Landmark status, no further information available.

NRL Isaac Cocks House	Cornwall, 26 Old Pleasant Hill Road	National Registered Landmark, historic house. Outside of project area.
NRL Kellogg House	Cornwall, Old Pleasant Hill Road at south end	National Registered Landmark, historic house. Outside of project area.
NRL Wilford Wood House	Cornwall, 28 Pleasant Hill Road	National Registered Landmark, historic house. Outside of project area.
NRL Mary Van Duzer-Sayer House	Cornwall, Taylor Road, west side, north of NYS Thruway	National Registered Landmark, historic house. Outside of project area.
NYSM 4389, Maringoman's Castle (ACP ORNG 12)	Cornwall, Schunnemunk Mountain, east of Interstate 87	Village and cemetery, c. 1650-1700. Cited in Ruttenbur and Clark 1882, "...palisaded village...at time of [the patents]...occupied by Maringoman ... and his people". Location disputed, another map places this site c. 2.5 miles west. (see also Smith 1936, Appendix) Outside of project area.
NYSM 7700, Mountainville Camp	Cornwall, Mountainville, between State Route 32 and Interstate 87	Camp, no info. Abuts project area.
NYSM 566, Cyprus Shaw Farm	Cornwall, Mountainville, between State Route 32 and Interstate 87	no info. Outside project area.
NYSM 567, Shaw Farm	Cornwall, Mountainville, between State Route 32 and Interstate 87	no info. Outside project area.
NYSM 568, Dan Secor Farm	Cornwall, Mountainville, east of State Route 32	no info. Outside project area.
NRL Mountainville Grange Hall, NY32	Cornwall, State Route 32 at Star Entrance Road	National Registered Landmark. Abuts project area.
NRL Elias Hand House, NY32	Cornwall, State Route 32 at Star Entrance Road	National Registered Landmark, historic house. Abuts project area.
NYSM 7702, Mountainville Camp	Cornwall, Mountainville, east of State Route 32	Camp, no info. Outside project area.

NYSM 7701, Mountainville Rockshelter	Cornwall, south of Mountainville, between State Route 32 and Interstate 87	Rockshelter, no info. Outside project area.
NYSM 4388, Cemetery	Cornwall, south of Mountainville between State Route 32 and Interstate 87	Burial ground, "base of the Schunnemunk... c. 300' south of Dark Hollow Brook. On Houghton Farm." Outside project area.
USN # 07120.000006 Mountainville Site	Woodbury	Location unknown, see Trailside Museum at Bear Mtn. records.
USN # 07120.000207 Revolutionary Encampment	Woodbury, NY32, East side of Woodbury Creek	No information available
USN # 07120.000212 Rockshelter Prehistoric Site	Woodbury	Woodland Period. Outside project area.
USN # 07120.000004 The Riverbank Rockshelter	Woodbury	Woodland Period, near the Hudson River in Fort Montgomery. Outside project area.
USN # 07120.000219 Woodbury Common Prehistoric Site	Woodbury	Period unknown, disturbed site in former plow zone. South of project area.
SHPO A07120.000241	Woodbury, east side of County Road 44	Historic period well. Abuts project area.
SHPO A07120.000209, Furnace Ruins	Woodbury, east side of County Road 44	Furnace ruins at Woodbury Falls. Abuts project area.
USN # 07120.000227 Cemetery of the Highlands	Woodbury, NYS32	National Registered Landmark. Outside of project area.
USN # 07120.000228 Methodist Episcopal Church	Woodbury, NYS32, adjacent to Cemetery of the Highlands	Eligible for National Landmark status. Outside of project area
USN # 07120.000233	Woodbury, 612 NYS32	National Registered Landmark, no further information available.
USN # 07120.000232	Woodbury, 632 NYS32	National Registered Landmark, no further information available.
USN # 07120.000231	Woodbury, 635 NYS32	National Registered Landmark, no further information available.
USN # 07120.000230	Woodbury, 649 NYS32	National Registered Landmark, no further information available.

USN # 07120.000229	Woodbury, 653 NYS 32	National Registered Landmark, no further information available.
USN # 07120.000027 Seaman Homestead	Woodbury, Quaker Hill Road, Old Rte. 32	Wood frame house, 1826. Near project area.
USN # 07120.000025 J.P. Ford House	Woodbury, Quaker Rd., at intersection Rte. 32, south side	Wood frame house and guesthouse, c. 1810-20. Abuts project area.
USN # 07120.000026 Leffert House	Woodbury, Quaker Rd., at intersection Rte. 32, north side	Wood frame house with barn, shed and well, c. 1780. Possibly used as tavern. Abuts project area.
NRL Smith Clove Meeting House	Woodbury, Quaker Hill Road	National Registered Landmark, historic meeting house. Outside project area.

Route B

Identification	Location	Description
SHPO A071-15-0013	North of the project area along State Route 32	Area of the First Massachusetts Brigade, New Windsor Cantonment. Outside project area.
USN# 07115.0000706 Vantage One Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
USN # 07115.000707 Vantage Two Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
NRL Edmonston House, NY94	Vail's Gate, west of Temple Hill Road along State Route 94	National Registered Landmark, historic house dating to 1755, used as a medical facility and headquarters during the Revolutionary War. Outside project area
Survey # 294, Historic Stone House	Cornwall, hamlet of Meadowbrook, south of State Route 94 at Mt. Airy Road	Two-story brick dwelling, dates prior to 1851. Outside project area.
SHPO A071-15-0007, NRL Haskell House	West of Route 32 between Vail's Gate and Newburgh	National Registered Landmark, John Haskell House. Outside project area.
SHPO A07115.000705	New Windsor, east of Vail's Gate	Prehistoric, stray find. Outside project area.

SHPO A07115.000704	New Windsor, east of Vail's Gate	Prehistoric, stray find. Outside project area.
NRL B. Woodruff House, NY32	Cornwall, West side of Route 32 near town of New Windsor Line	National Registered Landmark, historic house. Outside project area.
NRL Isaac Cocks House	Cornwall, 26 Old Pleasant Hill Road	National Registered Landmark, historic house. Outside of project area.
NRL Kellogg House	Cornwall, Old Pleasant Hill Road at south end	National Registered Landmark, historic house. Outside of project area.
NRL Wilford Wood House	Cornwall, 28 Pleasant Hill Road	National Registered Landmark, historic house. Outside of project area.
NRL Mary Van Duzer-Sayer House	Cornwall, Taylor Road, west side, north of NYS Thruway	National Registered Landmark, historic house. Outside of project area.
NYSM 4389, Maringoman's Castle (ACP ORNG 12)	Cornwall, Schunnemunk Mountain, east of Interstate 87	Village and cemetery, c. 1650-1700. Cited in Ruttenbur and Clark 1882, "...palisaded village . at time of [the patents] ...occupied by Maringoman ...and his people". Location disputed, another map places this site c. 2.5 miles west. (see also Smith 1936, Appendix) Outside of project area.
NYSM 7700, Mountainville Camp	Cornwall, Mountainville, between State Route 32 and Interstate 87	Camp, no info. Abuts project area.
NYSM 566, Cyprus Shaw Farm	Cornwall, Mountainville, between State Route 32 and Interstate 87	no info. Outside project area.
NYSM 567, Shaw Farm	Cornwall, Mountainville, between State Route 32 and Interstate 87	no info. Outside project area.
NYSM 568, Dan Secor Farm	Cornwall, Mountainville, east of State Route 32	no info. Outside project area.
NRL Mountainville Grange Hall, NY32	Cornwall, State Route 32 at Star Entrance Road	National Registered Landmark. Outside project area
NRL Elias Hand House, NY32	Cornwall, State Route 32 at Star Entrance Road	National Registered Landmark, historic house. Outside project area.

NYSM 7702, Mountainville Camp	Cornwall, Mountainville, east of State Route 32	Camp, no info. Outside project area.
NYSM 7701, Mountainville Rockshelter	Cornwall, south of Mountainville, between State Route 32 and Interstate 87	Rockshelter, no info. Outside project area.
NYSM 4388, Cemetery	Cornwall, south of Mountainville between State Route 32 and Interstate 87	Burial ground, "base of the Schunnemunk . . c. 300' south of Dark Hollow Brook. On Houghton Farm." Outside project area.
USN # 07120.000006 Mountainville Site	Woodbury	Location unknown, see Trailside Museum at Bear Mtn. records.
USN # 07120.000207 Revolutionary Encampment	Woodbury, NY32, East side of Woodbury Creek	No information available.
USN # 07120.000212 Rockshelter Prehistoric Site	Woodbury	Woodland Period. Outside project area.
USN # 07120.000004 The Riverbank Rockshelter	Woodbury	Woodland Period, near the Hudson River in Fort Montgomery. Outside project area.
USN # 07120.000219 Woodbury Common Prehistoric Site	Woodbury	Period unknown, disturbed site in former plow zone. South of project area.
USN # 07120.000227 Cemetery of the Highlands	Woodbury, NYS32	National Registered Landmark. Outside of project area.
USN # 07120.000228 Methodist Episcopal Church	Woodbury, NYS32, adjacent to Cemetery of the Highlands	Eligible for National Landmark status. Outside of project area
USN # 07120.000233	Woodbury, 612 NYS32	National Registered Landmark, no further information available.
USN # 07120.000232	Woodbury, 632 NYS32	National Registered Landmark, no further information available.
USN # 07120.000231	Woodbury, 635 NYS32	National Registered Landmark, no further information available.
USN # 07120.000230	Woodbury, 649 NYS32	National Registered Landmark, no further information available.
USN # 07120.000229	Woodbury, 653 NYS 32	National Registered Landmark, no further information available.

USN # 07120.000027 Seaman Homestead	Woodbury, Quaker Hill Road, Old Rte. 32	Wood frame house, 1826. Near project area.
USN # 07120.000025 J.P. Ford House	Woodbury, Quaker Rd., at intersection Rte. 32, south side	Wood frame house and guesthouse, c. 1810-20. Abuts project area.
USN # 07120.000026 Leffert House	Woodbury, Quaker Rd., at intersection Rte. 32, north side	Wood frame house with barn, shed and well, c. 1780. Possibly used as tavern. Abuts project area.
SHPO A07120.000241	Woodbury, east side of County Road 44	Historic period well. Abuts project area.
SHPO A07120.000209, Furnace Ruins	Woodbury, east side of County Road 44	Furnace ruins at Woodbury Falls. Abuts project area.
NRL Smith Clove Meeting House	Woodbury, Quaker Hill Road	National Registered Landmark, historic meeting house. Outside project area.

Route C

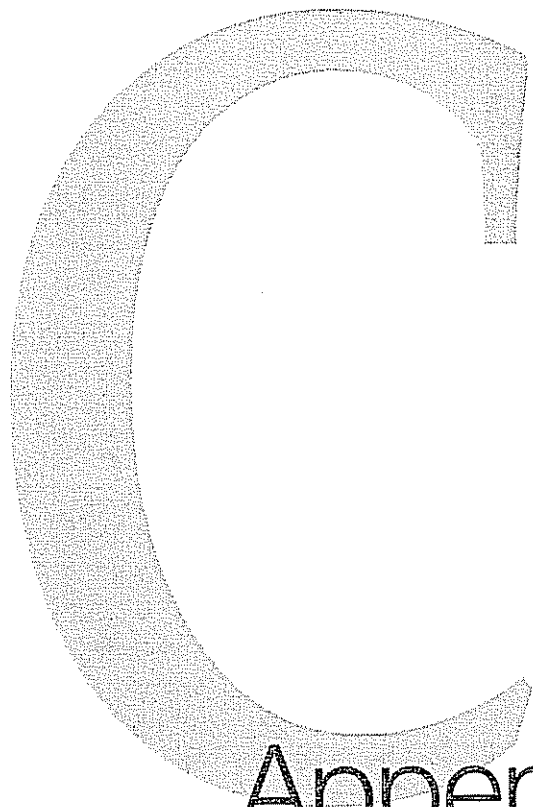
Identification	Location	Description
SHPO A071-15-0013	North of the project area along State Route 32	Area of the First Massachusetts Brigade, New Windsor Cantonment. Outside project area.
USN# 07115.0000706 Vantage One Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
USN # 07115.000707 Vantage Two Prehistoric Site	New Windsor, West of Riley Road	Material recovered below plow zone. Near project area.
USN # 07103.000002 Bethlehem Presbyterian Church and Cemetery	Cornwall, NY94, north side, west side of Jackson Ave.,	National Registered Landmark. Church and Cemetery. Original church built 1730, current structure built 1828. Structure faces road, cemetery located to the north and west of church. Washington is said to have attended services while headquartered at the Ellison House in New Windsor. Abuts project area.
USN # 07103.000119 Bethlehem School House	Cornwall, NY94	National Registered Landmark, no further information available.

USN # 07103.000073 J. Denniston House (Costello Residence)	Cornwall, NY94, south side, east of Mt. Airy Rd.	Eligible for National Landmark status, stone structure, c. 1817. Built using salvaged timbers from the Temple of virtue on the New Windsor Cantonment. In 1916, sold to Frances Hodgeson Burnett, author of Little Lord Fauntleroy. Adjacent to project area.
USN # 07103.000072 J.W. Denniston House (De Ronde Residence)	Cornwall, NY94, south side, west of Meadowbrook RR crossing	Simulated variegated cut stone front (grout), 1864. Abuts project area
USN # 07103.000071 Smith-Moffat House (Sauer Residence)	Cornwall, NY94, north side, east of Jackson Ave.	Wood frame structure, stone fencing, c. 1750. Abuts project area.
USN # 07103.000074 Thursten House (Makuen Residence)	Cornwall, NY94, north side, between Jackson Ave. and Mt. Airy Rd.	National Registered Landmark, no further information available.
USN # 07103.000117 Farrell House	Cornwall, NY94, Meadowbrook	National Registered Landmark, Stone and stucco, 1825. Adjacent to project area.
NRL A. Walsh Stone House and Farm Complex, NY 94	1570 State Route 94, north side between Jackson Avenue and Shore Drive	National Registered Landmarks, including a mid-19th century two-story Greek Revival stone house. Abuts project area.
SHPO A071-03-0006, I. Denniston House Site	Cornwall, west of Route 94, north of shore or under Beaver Dam Lake	Underwater house site, prior to 1851. Outside of project area.
SHPO A071-03-000240, Prehistoric Site	Cornwall, south side of Route 94 along east side of railroad, south of Bethlehem	Middle Archaic through Transitional Period (3,500-500 BC), stone tool workshop and/or camp site. Dispersed material in plow zone. Abuts project area.
SHPO A071-03-0005	Cornwall, east of Shore Drive	Old road remains, walls visible on surface. Outside of project area.
USN # 07103.000114 Salisbury Railroad Trestle	Cornwall, Otterkill Rd., railroad over Otterkill Rd.	National Registered Landmark, no further information available.

USN # 07103.000019 Thursten House-Spring Valley Farm (Glen Oden Farms)	Cornwall, Otterkill Rd., southside, at intersection Jackson Avenue	No further information available.
USN # 07103.000245 Building	Cornwall, 100 Otterkill Rd.	Eligible for National Landmark status. No further information available.
NYSM 564, Moodna Creek North	Cornwall, Orrs Mill Road, north bank of creek below the trestle.	No info. Outside of project area.
NYSM 8694, Village?	Cornwall, near Maringoman's Castle, between Orrs Mill Road and Otter Kill Road, north of Schunnemunk Mountain	Village? No info. Outside of project area.
NYSM 565, Salisbury Mills	Cornwall, Salisbury Mills	Site of historic village. Project area passes through east end of village.
USN # 07101.000002 Salisbury Mill	Blooming Grove, Rte 27, east side, in bend of Otter Kill Creek, south of Salisbury Mills	Paper mill, early 18th/late 19th century. Abuts project area.
NYSM 8693, Maringoman's Castle	Cornwall, between Orrs Mill Road and Otter Kill Road, east of Clove Road.	Village? no info. Outside of project area.
NYSM 4389, Maringoman's Castle (ACP ORNG 12)	Cornwall, Schunnemunk Mountain, west of Clove Road	Village and cemetery, c. 1650-1700. Cited in Ruttenbur and Clark 1882, "...palisaded village...at time of [the patents]...occupied by Maringoman ...and his people". Location disputed, another map places this site c. 2.5 miles west. (see also Smith 1936; Appendix) Outside of project area.
SHPO A071-01-0019	Blooming Grove, adjacent to Woodcock Mountain Road, southwest of intersection of Station Road and Route 94.	House and barn site, no visible evidence. Outside of project area.
SHPO A071-01-0024	Blooming Grove, East side of Woodcock Hill, south of Woodcock Mountain Road	Surface collection, no info. Outside of project area.

USN # 07101.000014 Hope Chapel	Blooming Grove, Clove Rd, Salisbury Mills	See USN # 07101.000072, Presbyterian Chapel, below
USN # 07101.000072 Presbyterian Chapel, also known as Hope Chapel	Blooming Grove, Clove Rd., Salisbury Mills (Rte. 27) west side, south of Orr's Mills Rd.	Wood frame Gothic chapel, c. 1840. Abuts project area.
USN # 07101.000073 S.W. Moffat-James Kirby House (Morgan Residence)	Blooming Grove, Clove Rd, (Rte. 27), west side, north of Felter Hill Rd.	Wood frame house, barn, well, railroad in rear. 1766. Abuts project area.
USN # 07101.000093 Benjamin S. Tuthill House	Blooming Grove, Clove Rd., CR 27, west side, south of Camp Lenni-Len-A-Pe	No further information available.
USN # 07101.000094 David C. Smith House	Blooming Grove, Clove Rd, CR 27, east side, north of Camp Lenni-Len-A-Pe	No further information available.
USN # 07101.000109 Crawford House	Blooming Grove, NYS209 (208?)	Eligible for National Landmark status, no further information available.
USN # 07101.000044 Round Hill School House #2 (Muirheid Residence)	Blooming Grove, Round Hill Rd, South side, west of Clove Rd. (O.C. Rte. 27)	Stone structure with bell tower, off road in wooded area, one of original single-room school buildings, converted to private dwelling. Outside project area.
USN # 07101.000066 H.W. Bull Barn Apartments	Blooming Grove, Rte 208, west side, at junction with Rte 44	Stone structure, incl. barn and house, 1852, currently used as apartments. Just outside project area.
USN # 07101.000062 Jeremiah Horton House (Gurnett Residence)	Blooming Grove, Rte 208, west side, at intersection Horton Rd, north side	Stone structure, barn, stables, c. 1793. Outside project area.
USN # 07101.000063 Samual Moffatt II House	Blooming Grove, Rte 208, south side, west of Moffat Rd., near Goshen Rd.	Wood frame house and shed, c. 1770. Outside project area.

SHPO A07101.000095, NYSM 8652 NRE, Survey # 171, Snail Rockshelter	Blooming Grove, west of Clove Road north of Felter Hill Road	Iroquois? Woodland Period. Artifacts recovered include ceramics, lithic debitage and tools, charcoal and bone. Chert outcrops (raw lithic material) were identified but no further study was merited after Stage 1B study (BTK Associates, Inc 1995). Area of study abuts project area, rockshelter is outside of project area.
NYSM 8543	Monroe, south of Interstate 17	Prehistoric, stray find: uniface scraper and lithic debitage. Abuts project area.
Survey # 333, Hidden Creek Site	Spring Street and Freeland Street, southeast of village of Monroe	Prehistoric, two isolated chert flakes recovered from 170 shovel test pits (CITY/SCAPE: Cultural Resource Consultants 2003). Outside project area.



Appendix C

Appendix C

Sound Level Monitoring Data

Kiryas Joel Environm. .al Impact Statement
Sound Level Monitoring
Tuesday June 3, 2003

Monitoring Location	Start Time	End Time	Total Time	Leq 10 min	Leq 15 min	Leq 20 min	L10	L90	L max	L min	L50
Location 1 (Riley Road & Dean Hill Road)	7:50 AM	8:11 AM	21:36	57.6	57.2	58.1	59.7	48.8	77.7	46.1	51.7
	11:15 AM	11:35 PM	20:00	56.1	57.5	57.3	57.9	48.4	76.4	45.3	51.4
	3:30 PM	3:45 PM	15:03	58.8	59.1	-	61.9	49.6	76.0	46.3	52.6
Location 2 (State Route 94)	8:45 AM	9:00 AM	15:17	62.0	61.7	-	64.9	44.1	78.0	37.2	56.9
	1:00 PM	1:20 PM	20:04	63.6	62.8	62.8	65.6	44.2	80.4	36.1	57.1
	3:55 PM	4:10 PM	15:04	62.2	62.7	-	65.5	49.4	79.2	42.2	59.4

R616

Kiryas Joel Environn .l Impact Statement
Sound Level Monitoring
Tuesday June 3, 2003

Monitoring Location	Start Time	End Time	Total Time	Leq 10 min	Leq 15 min	Leq 20 min	L10	L90	L max	L min	L50
Location 3 (County Route 27)	9:20 AM	9:35 AM	15:23	59.7	60.3	-	65.1	42.1	75.9	38.0	50.6
	12:05 PM	12:20 PM	15:03	61.2	60.8	-	65.5	41.9	77.2	37.7	51.4
	4:20 PM	4:40 PM	20:02	60.4	61.9	62.0	67.5	45.2	75.8	39.3	54.5
Location 4 (State Route 208)	10:00 AM	10:15 AM	15:08	63.2	63.2	-	66.6	51.4	77.0	44.2	61.4
	12:30 PM	12:45 PM	15:05	64.0	63.5	-	67.0	51.2	78.2	40.0	60.8
	4:50 PM	5:05 PM	15:07	63.1	63.2	-	66.3	56.6	74.5	47.5	62.0

R617

Kiryas Joel Environmental Impact Statement
Sound Level Monitoring
Tuesday June 3, 2003

Monitoring Location	Start Time	End Time	Total Time	Leq 10 min	Leq 15 min	Leq 20 min	L10	L90	L max	L min	L50
Location 5 (Clove Road)	SKIPPED										
	1:30 AM	1:50 AM	20:03	55.1	58.7	58.3	58.1	45.7	82.9	42.6	50.5
	SKIPPED										

R618

consulting · engineering · construction · operations

SEQRA
Notice of Completion of Draft EIS
Notice of Hearing

Project # DWSRF 16906 Date: October 7, 2003

TO: Involved / Interested Agencies and Members of the Public

RE: Village of Kiryas Joel Water Supply Project

This notice is issued pursuant to Part 617 of the implementing regulations pertaining to Article 8 (State Environmental Quality Review) of the Environmental Conservation Law.

A Draft Environmental Impact Statement has been completed and accepted by the Board of Trustees of the Village of Kiryas Joel, as lead agency, and is available at Village Hall for the proposed action described below. Comments on the Draft EIS are requested and will be accepted by the contact person until November 24, 2003.

Please take notice, that a public SEQRA hearing will be held by the Board of Trustees concerning the action on November 14, 2003 at 10.30 am, at the Village Hall, 51 Forest Road, Monroe, NY 10950

NAME OF ACTION: Catskill Aqueduct Connection

SEQR STATUS: Type 1 ____X_____ Positive Declaration – August 6, 2002

DESCRIPTION OF ACTION: Construction of a tap of the Catskill Aqueduct and a transmission main to transport water supplies to the Village of Kiryas Joel. The project will include a water treatment plant and pumping station.

LOCATION OF ACTION:

The water supply pipeline will extend from the NYC Catskill Aqueduct connection in New Windsor, NY along Riley Rd, State Rt.94, Clove Rd., County Rt. 27, State Rt 208, and State Rt. 17 to its termination in the Village of Kiryas Joel, Orange County, NY.

FOR FURTHER INFORMATION

CONTACT PERSON: Hon. Gedalye Szegedin, Village Clerk

ADDRESS: PO Box 566, Monroe, NY 10950

TELEPHONE NUMBER: (845) 783-8300

TIMES HERALD-RECORD

40 Mulberry Street, Middletown, NY 10940

R621

State of New York }
County of Orange } ss:

Patricia Foddrill

being duly sworn deposes and says that ORANGE COUNTY PUBLICATIONS Division of Ottaway Newspapers-Radio, Inc is a corporation organized under the laws of the State of New York and is, at all the times hereinafter mentioned, was the printer and publisher of The Times Herald-Record, a daily newspaper distributed in the Orange, Ulster, Rockland, Dutchess, Pike, Pa., Delaware and Sullivan Counties, published in the English language in the City of Middletown, County of Orange. State of New York, that deponent is the

Principal Clerk

of said The Times Herald-Record acquainted with the facts hereinafter stated, and duly authorized by said Corporation to make this affidavit; that the

Legal Notice

a true printed copy of which is hereunto annexed, has been duly and regularly published in the manner required by law in said The Times Herald-Record in each of its issues published upon each of the following dates, to wit: In its issues of

10/12/2003

Principal Clerk D. Foddrill

Sworn in before me this 13th

day of October 2003

Avis L Norton

Notary Public, Orange County

AVIS L. NORTON
Notary Public, State of New York
Qualified in Orange County
#4700803
Term Expires 1/31/06

Legal Notices | Legal Notices

NYS Environmental Conservation Law
VILLAGE OF KIRYAS JOEL

SEQRA
Notice of Completion of Draft EIS
Notice of Hearing
Project # DWSRF 16906 Dated: October 7, 2003

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