2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

The Nine Mile Point Nuclear Station (Nine Mile Point) is located on the southeastern shore of Lake Ontario in the Town of Scriba, New York. Nine Mile Point consists of two units. Both units are boiling water reactors (BWRs), which produce steam that turns turbines to generate electricity. The plant obtains cooling water from Lake Ontario. Unit 1 employs once-through cooling. Unit 2 has closed-cycle cooling and utilizes a natural-draft cooling tower. Nine Mile Point is operated by Nine Mile Point Nuclear Station, LLC (NMPNS). The plant and its environs are described in Section 2.1, and the environment in which the plant is located is presented in Section 2.2.

2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term

Nine Mile Point is located on the southeastern shore of Lake Ontario, approximately 8 km (5 mi) northeast of Oswego, New York, and 60 km (36 mi) north-northwest of Syracuse, New York (NMPNS 2004e). The area within 10 km (6 mi) of Nine Mile Point is entirely within Oswego County, and is largely rural, characterized by farmland, woods, and small residential communities.

Figure 2-1 is a map of the area surrounding Nine Mile Point. A more detailed map of the area within a 10-km (6-mi) radius circle is shown in Figure 2-2. Figure 2-3 shows the site boundary and the locations of the buildings on the site. The site consists of approximately 360 ha (900 ac), with over 1.6 km (1 mi) of shoreline on Lake Ontario. The James A. FitzPatrick Nuclear Power Plant, owned and operated by Entergy Nuclear, Inc., is located on the east side of the site. The Ontario Bible Conference Camp is located on the Lake Ontario shore to the west of the site.

2.1.1 External Appearance and Setting

The area surrounding Nine Mile Point is rural in nature. The local terrain around the site consists of gently rolling hills increasing in elevation to the south of the Lake Ontario shoreline. The predominant land cover is woodlands consisting of forest and scrub brush. On the site, the ground surface is generally flat with elevation of about 3 m (10 ft) above the record high lake level. A shore protection dike composed of rock fill excavation separates the buildings from the lake. The buildings associated with Nine Mile Point Units 1 and 2 (NMP) are situated in the northeastern part of the site. The total area occupied by the buildings, roads, parking lots and other improvements on the site is approximately 80 ha (200 ac). The facility is enclosed by a site security fence and access to the site is controlled by station security personnel. Transmission lines originate at the switchyards on the site, and generally run parallel towards the south (see Section 2.1.7).

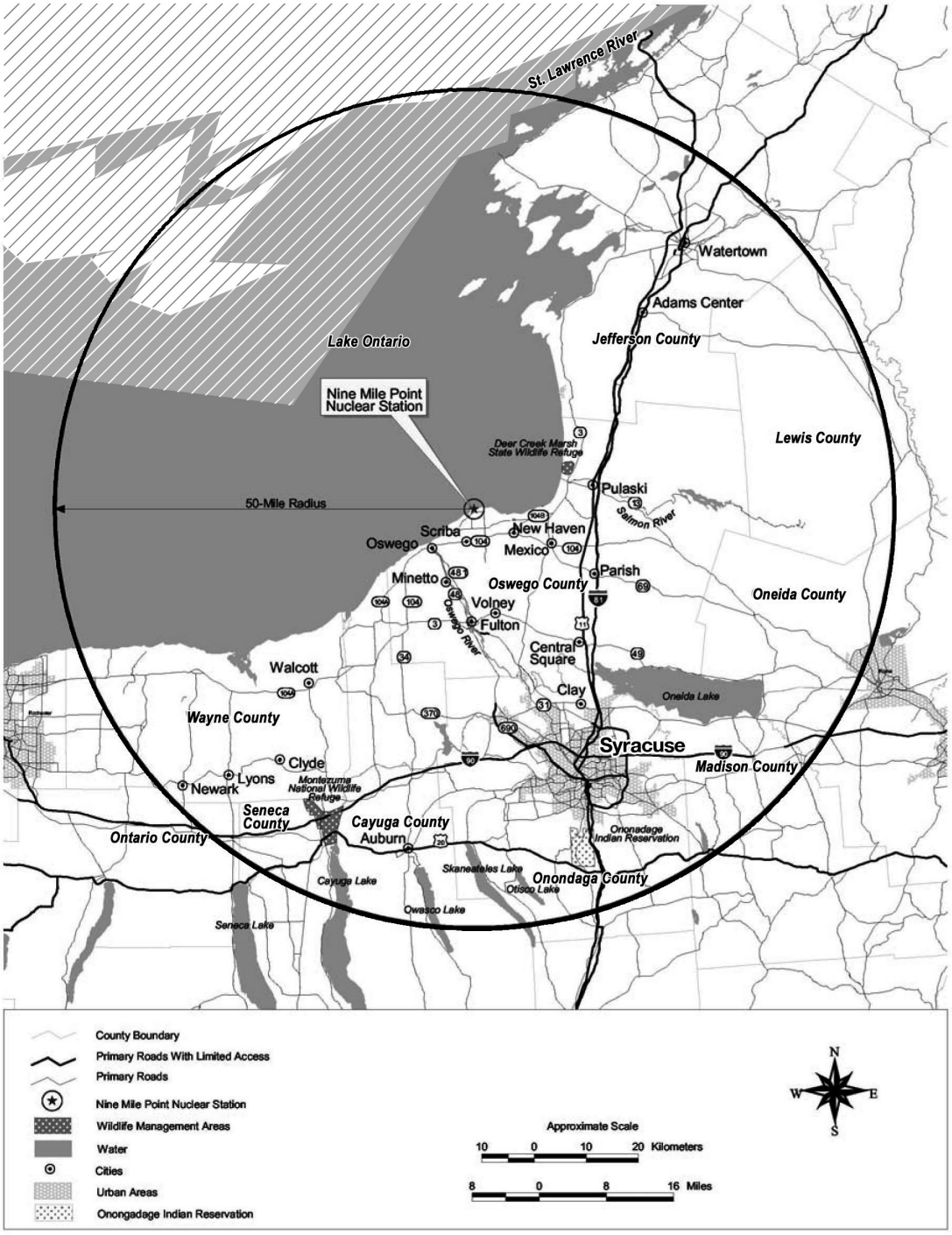

Figure 2-1. Location of Nine Mile Point Units 1 and 2, 80-km (50-mi) Region

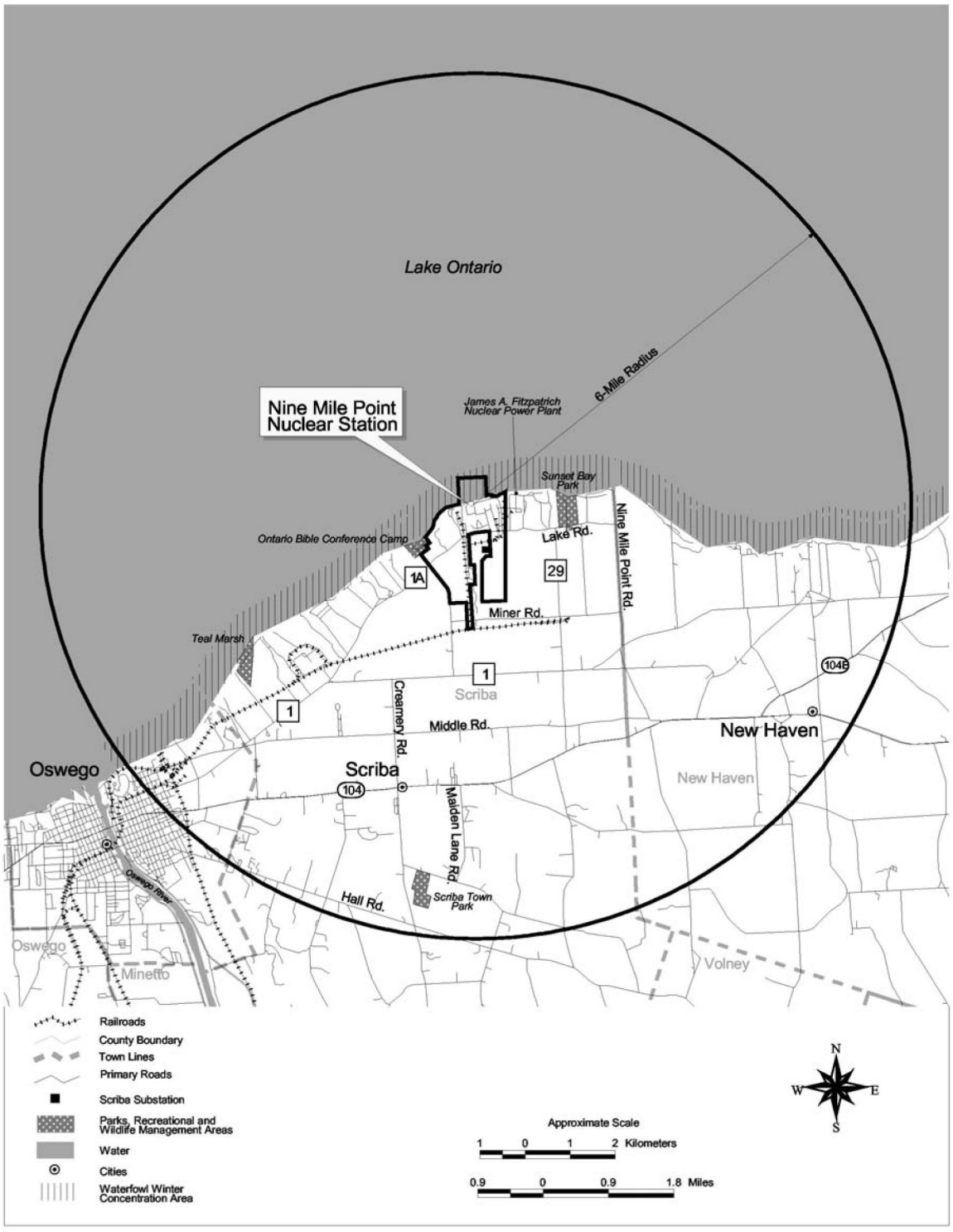

Figure 2-2. Location of Nine Mile Point Units 1 and 2, 10-km (6-mi) Region

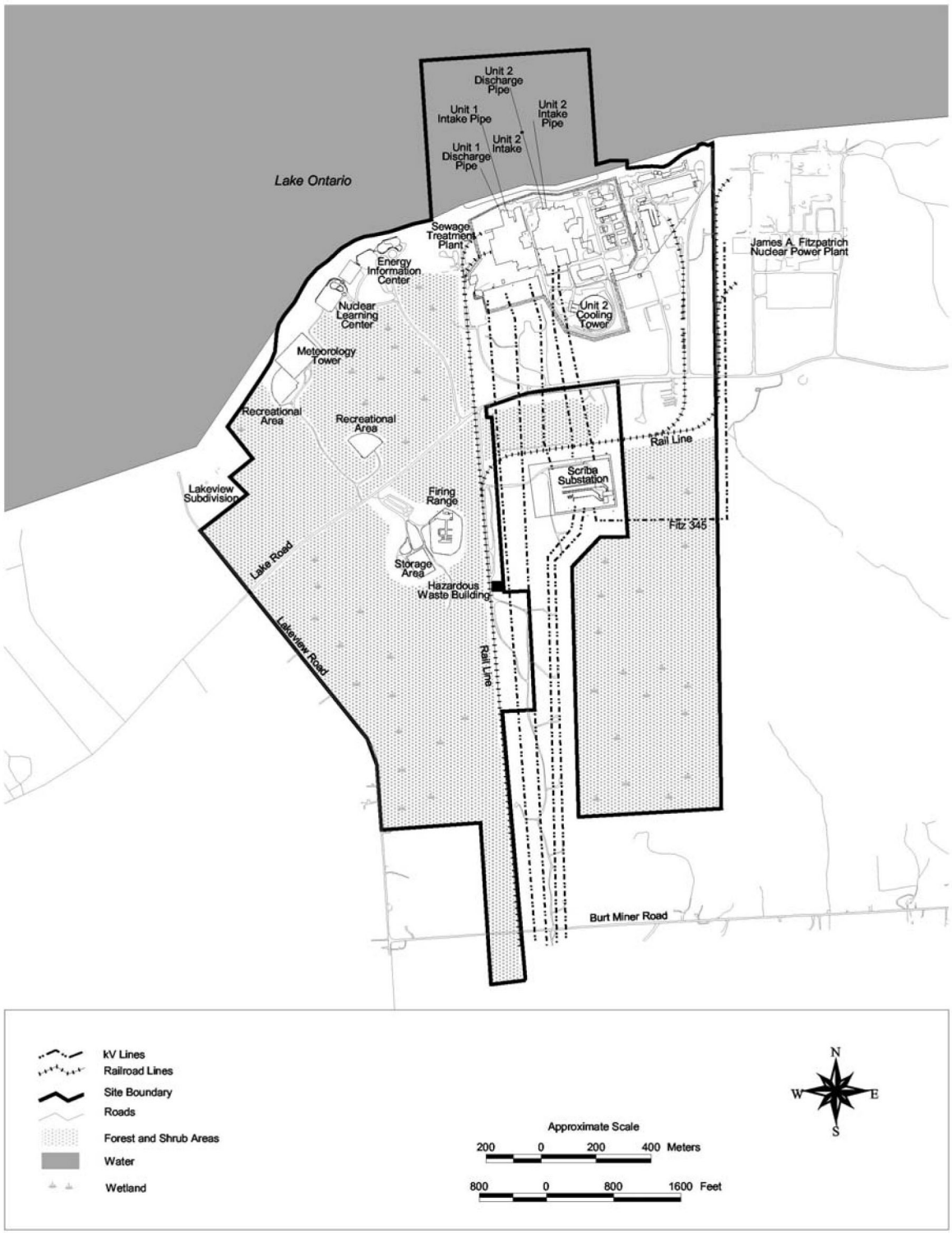

Figure 2-3. Nine Mile Point Site Layout

Within the 80-km (50-mi) radius of the site, there are seventeen state parks and one national wildlife refuge, which is located about 71 km (44 mi) to the southwest. Approximately twenty State Wildlife Management Areas are also located within 80 km (50 mi) of Nine Mile Point, with the closest one being approximately 31 km (19 mi) east-southeast of the site. The closest public parks are Scriba Town Park, Sunset Bay Park, and Independence Park. Scriba Town Park is located 8 km (5 mi) to the south of the Town of Scriba. The park offers a picnic area, playground, and swimming facilities. Sunset Bay Park is located approximately 2 km (1 mi) east of Nine Mile Point on the shore of Lake Ontario. It encompasses 19 ha (48 ac) of mostly woods and brush land, and offers a boat launch, nature trail, and picnic area. Independence Park is located approximately 3 km (2 mi) to the southwest on Lake Ontario. It is a 20-ha (50-ac) wooded tract of land with walking trails and an observation deck.

2.1.2 Reactor Systems

Nine Mile Point Nuclear Station consists of two General Electric BWRs. The layout of the site is shown in Figures 2-3 and 2-4. Unit 1 has a power rating of 1850 megawatts thermal [MW(t)] and 615 megawatts electric [MW(e)]. The major interconnected structures associated with Unit 1 are the following: the reactor building, which encloses the reactor vessel and other associated primary containment system structures, refueling and reactor servicing equipment, and fresh and spent fuel storage facilities; the turbine building, which houses the turbine generator, feedwater heaters, and main condensers; the radioactive waste building; the waste storage building; the screen house and pumphouse; the offgas building; and the administration building. Unit 1 uses once-through cooling from Lake Ontario.

Unit 2 has a power rating of 3467 MW(t) and 1144 MW(e). The major structures associated with Unit 2 are the following: the reactor building, which encloses the reactor vessel and other associated primary containment system structures, refueling and reactor servicing equipment, fresh and spent fuel storage facilities; the turbine building, which houses the turbine generator, condensers and moisture separator reheaters, condensate demineralizer system and feedwater heaters; the radioactive waste building, which contains the tanks and equipment associated with the liquid and solid radioactive waste system; the heater bays and screenwell building; the condensate storage tank building; the control building; the normal switchgear building; and the cooling tower. Unit 2 uses closed-cycle cooling with a natural-draft cooling tower, with makeup water obtained from Lake Ontario.

Other major structures that serve both units are switchyards, the site services and engineering services building, the warehouse, the Nuclear Learning Center, and the Energy Information Center. The tallest structure on the site is the Unit 2 cooling tower with a height of 165 m (541 ft), followed by the Unit 2 main exhaust stack with a height of 131 m (429 ft).

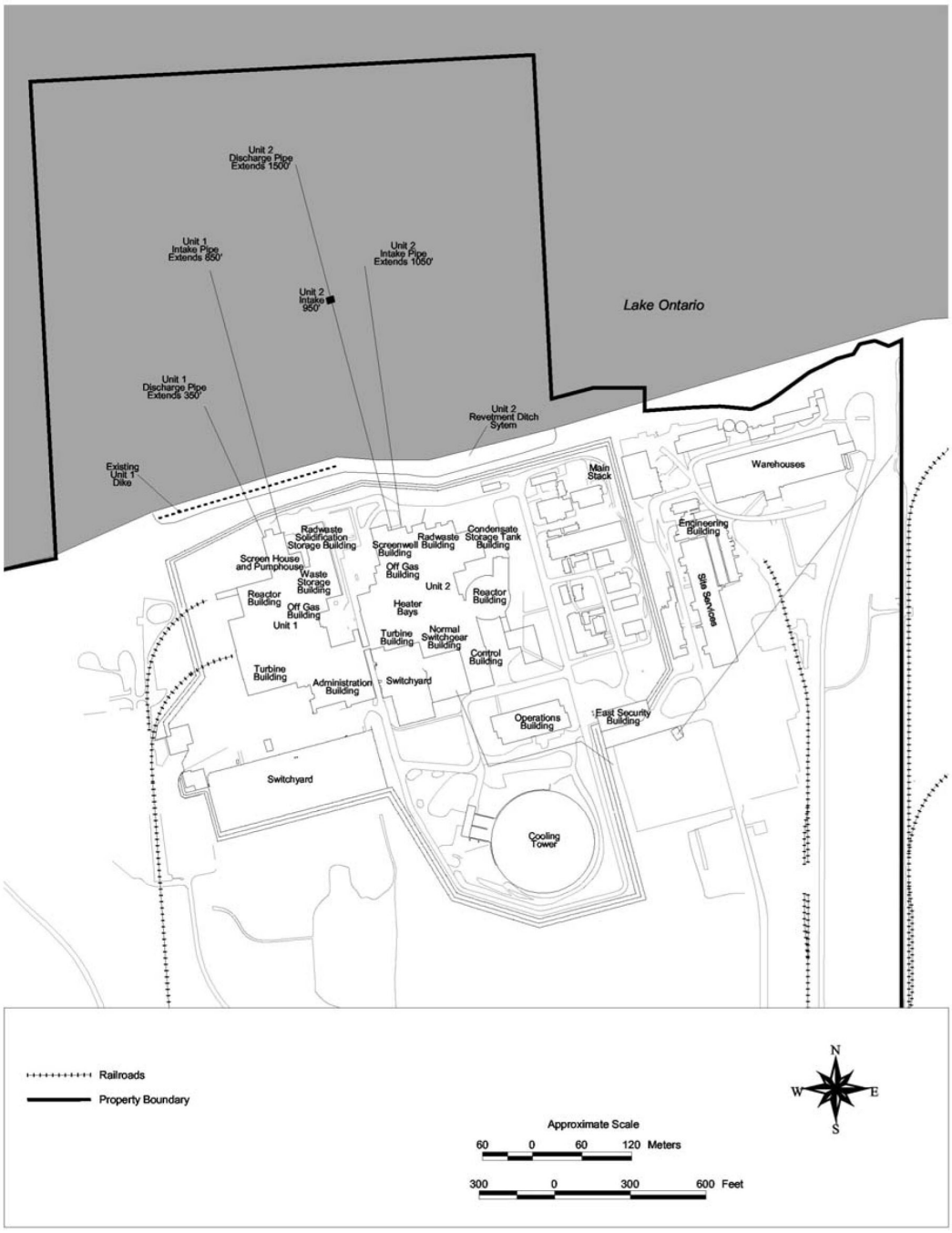

Figure 2-4. Nine Mile Point Building Layout

2.1.3 Cooling and Auxiliary Water Systems

Cooling water systems for each unit include a circulating water system (CWS) and a service water system. For each unit, the CWS circulates cool water through the main condensers to condense steam after it passes through the turbine. Each unit's service water system circulates cooling water through heat exchangers that serve various plant components. Both the CWS and the service water system for Unit 1 are once-through systems. The service water system for Unit 2 is also a once-through system. However, the Unit 2 CWS is a closed-cycle system that uses a cooling tower. Some of the discharge from the service water system is added to the CWS to make up for losses due to evaporation from the cooling tower.

Unit 1 and Unit 2 each have separate intake and discharge structures located offshore in Lake Ontario. Onshore, each has a separate screenwell and pumphouse structure (see Figure 2-4). Details of these systems and structures are described in the following paragraphs.

2.1.3.1 Unit 1 (Once-Through, No Cooling Tower)

The intake structure for Unit 1 is located approximately 260 m (850 ft) from the existing shoreline. Water enters the intake tunnel through a bellmouth-shaped inlet. The inlet is surrounded by a hexagonally shaped concrete guard structure, the top of which is about 1.8 m (6 ft) above the lake bottom and 4.3 m (14 ft) below the lowest anticipated lake water level. The structure is covered with a cap consisting of sheet piling supported on steel beams. Each of the six sides has a water inlet about 1.5 m (5 ft) high by 3 m (10 ft) wide. Galvanized steel racks with bars spaced at 25.4 cm (10 in.) guard each of the six inlets (NMPNS 2003c). The design provides for water to be drawn equally from all horizontal directions with a minimum of disturbance and no vortex at the surface.

The average rate of inflow into the intake structure for Unit 1 during 2003, a year that is representative of nominal operation, was 16.6 to 17.5 m^3/s (264,000 to 289,000 gpm) (Constellation Energy Group 2004). The maximum design flow rate is 18.3 m^3/s (418 million gpd). The water velocity at the intake is approximately 0.6 m/s (2 ft/s). From the intake structure, the water flows at a maximum velocity of 2.4 m/s (8 ft/s) through a concrete-lined 3-m (10-ft) diameter tunnel to the screen house and pumphouse adjacent to the turbine building. Two circulating pumps pump the water at a maximum velocity of 0.26 m/s (0.85 ft/s) from three separate, interconnected bays in the screen house through the trash racks and traveling screens to the condensers (AEC 1974, NMPNS 2003c).

The trash racks remove large items, such as logs and other debris. A total of three traveling screens, constructed of 9-mm (0.4-in.) mesh, collect smaller materials. Periodically, the traveling screens are rotated and washed to remove any accumulation of impinged organisms or other material into a sluiceway, which empties into an impingement collection basket during impingement monitoring. Under normal operating conditions, wash water, fish, and debris are discharged via the Unit 1 discharge tunnel back to Lake Ontario. The aquatic organisms

impinged at Unit 1 have been monitored from 1972 through 1997 in order to estimate species abundance and composition (EA 1998).

The service water system for Unit 1 is intended to provide strained lake water to various critical systems and to be available to supply the reactor building cooling water system under all conditions of operation. Lake water from the intake tunnel passes through the trash racks and traveling screens in the screen house and pumphouse and floods the service water pump well. Two full-capacity 1.3 m^3/s (20,000 gpm) pumps take suction from the well. Each pump is provided with a 0.08-cm (0.03-in.) mesh automatic self-cleaning strainer. Two emergency 0.2-m^3/s (3600-gpm) service water pumps provide backup if the primary pumps fail (NMPNS 2003c).

The Unit 1 discharge tunnel is 3 m (10 ft) in diameter, and is designed for a flow velocity of approximately 2.4 m/s (8 ft/s) (NMPNS 2004e). The tunnel directs the heated water from the screen house to a hexagonally shaped discharge structure located approximately 102 m (335 ft) offshore. The discharge structure has six ports, each 0.9 m (3 ft) high by 2.2 m (7.3 ft) wide, located on the sides. As the water exits the discharge structure, the effluent has an initial velocity of approximately 1.2 m/s (4 ft/s) (AEC 1974).

2.1.3.2 Unit 2 (Closed-Cycle with Cooling Tower)

The closed-loop CWS for Unit 2 employs a single-cell, wet-evaporative, 165-m (541-ft) high natural draft cooling tower with a counter-flow design. The CWS uses the service water system as a makeup source (NMPNS 2002a). The lake intake system conveys required service and cooling water from Lake Ontario through two identical submerged intake structures located approximately 300 m (950 ft) and 320 m (1050 ft) from the existing shoreline, as shown in Figure 2-4. During normal operation, an average total flow of 3.4 m^3/s (53,600 gpm) is withdrawn from the lake: 2.4 m^3/s (38,675 gpm) for the service water system and makeup for the CWS, and 0.9 m^3/s (14,925 gpm) for the fish diversion system. Each intake structure is hexagonal, with a 2.3-m (7.5-ft) wide by 0.9-m (3-ft) high intake opening on each side, and a 0.5-m (1.6-ft) thick roof or velocity cap. The total area of the 12 openings is designed to provide a maximum approach velocity of 0.15 m/s (0.5 ft/s) while drawing water through both structures. The 12 openings are equipped with vertical bar racks that have 0.25 m (10 in.) of clear spacing between the bars to prevent large debris from entering the intake system. Each bar rack consists of nine vertical bars for each opening, of which seven are electronically heated to eliminate the potential for frazil ice adhesion. Each intake structure is independently connected to the onshore screenwell by a 1.4-m (4.5-ft) diameter concrete intake tunnel. At the onshore screenwell, each intake tunnel connects to a separate vertical shaft. Intake water travels at a velocity of approximately 0.9 m/s (3 ft/s) in the intake tunnel and approximately 0.3 m/s (1 ft/s) in the vertical shafts. After passing through the two vertical shafts, the water enters the onshore screenwell building. Water from both vertical shafts merges into a common intake forebay, which is divided at its downstream end into two 1.2-m (4-ft) wide screenbays. An angled, flush-mounted traveling screen and two trash racks, one upstream and one downstream from the traveling screen, are located in each screenbay. Unit 2 is equipped with a fish diversion

system. Fish entering the screenbays pass through the trash racks and are guided by the angled, flush-mounted traveling screens into 15-cm (6-in.) wide bypass slots at the downstream end of the screen. The two slots converge, and, at their junction, the fish are transported through a funnel-shaped transition to two pipes that merge into a single pipe leading to a jet pump. The bypass flow and fish are then transported by the jet pump through this pipe to a vertical riser that discharges into the lake in an easterly direction, parallel to the lake bottom (NMPNS 2002a). This fish diversion system reduces the number of fish that impinge upon the traveling screens (NRC 1985).

The trash racks upstream of the traveling screens are cleaned by a motorized rake. The traveling screens are cleaned by a water spray wash system that is actuated either by a timer or a high differential pressure across the screens. The debris washed from the screens is directed into a trash trough that empties into a perforated trash basket. Water passes through the two screenbays, which merge into a common bay (NMPNS 2002a).

The Unit 2 service water system is a once-through system that provides cooling water to various essential and nonessential components throughout the plant. Essential components are serviced by two 100-percent redundant subsystems. The nonessential components are automatically isolated in the event of a reactor loss of coolant accident. After passing through the system, the discharge is returned to Lake Ontario and/or to the CWS as makeup (NMPNS 2002a).

The Unit 2 discharge system consists of an onshore discharge bay, a discharge tunnel, and a two-port diffuser. The cooling water discharge consists of that portion of service water not used for makeup to the CWS, plus a portion of the circulating water flow that is discharged to maintain dissolved solids at an appropriate concentration in the cooling water blowdown. This discharge is conveyed to the discharge bay, which is located on the west side of the two intake shafts and is separated from them by a wall that acts as a weir. The discharge tunnel terminates at a point approximately 457 m (1500 ft) from the existing shoreline, where the discharge enters a 1.4-m (4.5-ft) diameter steel riser leading to a two-port diffuser located approximately 0.9 m (3 ft) above the lake bottom. Water exits the diffuser nozzles at an approximate velocity of 5.5 m/s (18 ft/s) (NMPNS 2002a).

The CWS for Unit 2 is designed to convey 36.6 m^3/s (580,000 gpm) of cooling water between the main condenser and the cooling tower. Makeup water for the closed-loop CWS is obtained from the service water system; therefore, the only cooling water withdrawn from Lake Ontario is for the service water requirements and fish diversion system. Makeup flow to the CWS fluctuates due to meteorological conditions and CWS blowdown rates. The cooling tower blowdown flow design rate ranges from 0.5 to 1.3 m^3/s (8445 to 20,440 gpm). During icing conditions, the tempering rate[(a)] is approximately 0.2 m^3/s (3000 gpm). The rates are based on copper concentrations present in the cooling water systems that increase with each cycle of concentration. The maximum copper concentration in the blowdown is limited by the State

(a) Tempering is the process of preheating the water to reduce the possibility of ice buildup.

Pollutant Discharge Elimination System (SPDES) permit for Unit 2 (NYSDEC 2004h). Both the cooling tower evaporation rate and the total plant discharge rate depend on meteorological conditions. The estimated cooling tower evaporation rate ranges from 0.3 to 0.9 m^3/s (4560 to 13,800 gpm). The discharge flow from Unit 2 ranges from a minimum of 1.5 m^3/s (23,055 gpm) to a maximum of 2.2 m^3/s (35,040 gpm) during normal operation. During normal shutdown, the maximum plant discharge is approximately 3.1 m^3/s (48,800 gpm) (NMPC 1985).

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

Radioactive wastes resulting from plant operations are classified as liquid, gaseous, and solid waste. Nine Mile Point Units 1 and 2 use liquid, gaseous, and solid radioactive waste management systems to collect and process these wastes to maintain releases within regulatory limits and to maintain levels as low as reasonably achievable (ALARA) before they are released to the environment. The waste disposal systems meet the design objectives and release limits as set forth in Title 10 of the Code of Federal Regulations (CFR) Part 20 and 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

Liquid, solid, and gaseous wastes from NMP are routed to separate onsite radioactive waste facilities for treatment, temporary storage, sampling, and discharge or offsite shipment for further treatment and/or disposal as appropriate. The radioactive waste facilities in each unit handle liquid waste on a batch basis. The batches are either solidified and stored until they can be disposed, or if they meet the release limits, they are released to Lake Ontario with cooling water discharges through the discharge bay of each unit. Packaged solid waste and reusable radioactive material may be temporarily stored in the onsite radioactive waste storage facilities before being shipped offsite. The gaseous waste system in each unit monitors the radiation levels, recombines the radiolytically produced hydrogen and oxygen, removes moisture, provides a holdup time to allow decay of short-lived radionuclides, and filters the noncondensible gases. The gaseous waste (offgas) is then combined with a large volume of ventilation air before it is released through the exhaust stack to the atmosphere. The liquid and the gaseous radioactive waste systems are designed to reduce the activity levels in the liquid and gaseous waste so that concentrations in routine discharges are less than the applicable regulatory limits. Liquid and gaseous effluents are continuously monitored, and the discharge is discontinued if the effluent concentrations exceed predetermined limits.

Radioactive fission products build up within the fuel as a consequence of the fission process. Although these fission products are for the most part contained in the sealed fuel rods, small quantities escape from the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system is also responsible for coolant contamination. Nonfuel solid waste results from treating and separating radionuclides from gases and liquids and from removing contaminated material from various reactor areas. Solid waste also consists of reactor components, equipment, and tools removed from service as well as contaminated protective clothing, paper, rags, and other trash generated from plant operations, during design

modification, and during routine maintenance activities. Solid waste may be shipped to a waste processor for volume reduction before disposal, or it may be sent directly to a licensed burial site. Spent resins and filters are stored or packaged for shipment to an offsite processing or disposal facility (NMPNS 2002a, 2003c).

Fuel assemblies that have exhausted a certain percentage of their fuel and that are removed from the reactor core for disposal are called spent fuel. Nine Mile Point Units 1 and 2 currently operate on a staggered 24-month refueling cycle per unit, with one refueling at the site every year. Spent fuel from each unit is stored onsite in that unit's spent fuel pool.

The *Offsite Dose Calculation Manuals* (ODCMs) for NMP (NMPNS 2003a,b) describe the methods and parameters used for calculating the concentration of radioactive material in the environment and the estimated potential offsite doses resulting from radioactive gaseous and liquid effluents. The ODCMs also specify controls for release of liquid and gaseous effluents from NMP to ensure compliance with U.S. Nuclear Regulatory Commission (NRC) regulations.

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Potentially radioactive liquid waste is collected from various equipment drains, floor drains, containment sumps, chemistry laboratory, laundry drain, and miscellaneous sources. The liquid radioactive waste systems in each unit collect, process, store, monitor, and dispose of all normal and potentially radioactive liquid wastes. Radioactive materials are removed from the liquid waste streams and tested before they are reused in the plant or discharged to Lake Ontario. Liquid waste is processed on a batch basis, and each batch is sampled to determine that all discharge requirements are met prior to release from the waste system (NMPNS 2002a, 2003c). In addition, releases to Lake Ontario must meet the State of New York requirements for liquid discharges to Lake Ontario.

In Unit 1, the low-conductivity liquid wastes consisting of drains from the piping and equipment are initially collected in sumps or tanks located in the drywell, reactor building, the turbine building and the waste storage building. These liquids are pumped to the waste collector tank which is located in the waste storage building. High-conductivity liquid wastes from floor drains in the drywell, the reactor building, turbine building, the radioactive waste building, the offgas building, and the waste storage building are collected in the building sumps and then pumped into the floor drain collector, waste neutralization tank, or utility collector tank which are located in the waste storage building. Other types of liquid wastes such as the chemical waste from the laboratory sinks and equipment decontamination drains, and miscellaneous liquid wastes from the shower facility, personnel decontamination, or other sources are also collected in one of the tanks in the waste storage building.

In Unit 2, the liquid waste system is divided into the following four subsystems: the waste collector subsystem, the floor drain collector subsystem, the regenerant waste subsystem, and the phase separator subsystem. These subsystems permit wastes from various sources to be combined according to similarity of conductivity and isotopic concentration for appropriate

processing. For example, the waste collector subsystem collects, monitors, and processes for reuse or disposal of relatively low-conductivity waste from various equipment drains and removes radioactivity from these liquids via filtration and ion exchange. Similarly, the floor drain collector subsystem collects, monitors, and processes potentially high-conductivity waste from various building drains. The processing equipment in this subsystem consists of the Thermex system and a forced-circulation type evaporator for the concentration of soluble and insoluble waste.

The liquid waste system in Unit 2 is completely independent of the system in Unit 1 except for laundry waste. There is no laundry waste processing in Unit 2. Laundry facilities at Unit 1 have been used in the past for the decontamination of radiation protection apparel and breathing apparatus from both units. Currently, the laundry is being sent offsite to be cleaned and returned to the site by an approved contractor.

All potentially radioactive liquid waste discharges from each unit are routed through a separate line to the discharge bay. The lines have flow meters, an offline radiation monitor, and double valves that are locked closed except when in use.

The liquid waste generated by NMP during 2004 (the most recent year for which data were available at the time this supplemental environmental impact statement [SEIS] was written) is reported in the annual Radioactive Effluent Release Reports (RERRs) for that year (NMPNS 2005a,b). The total volume of liquid waste generated by Nine Mile Point Unit 1 during 2004 was 3.79 m^3 (1000 gal). After dilution, the volume of effluent released to Lake Ontario was 4.52 m^3 (1190 gal). In this effluent, there was a total fission and activation product activity[(a)] of 0.0681 MBq (1.84 x 10^{-6} Ci) and a total tritium activity of 1800 MBq (0.0486 Ci). In the same year, the total volume of liquid waste generated by Nine Mile Point Unit 2 was 970 m^3 (256,000 gal). After dilution, the volume of effluent released to Lake Ontario was 207,000 m^3 (5.47 x 10^7 gal). In this liquid effluent, there was a total fission and activation product activity of 792 MBq (0.0214 Ci) and a total tritium activity of 2.15 x 10^5 MBq (5.8 Ci). The total activity released from both units combined in 2004 was approximately 792 MBq (0.0214 Ci) for fission and activation products and 2.16 x 10^5 MBq (5.85 Ci) for tritium.

Based on the values reported in the annual and semiannual RERRs for the two units over the five-year period from 2000 through 2004 (NMPNS 2005a,b; 2004 a,b: 2003d,e; 2002b,c; 2001a–c; 2000a,b), the average annual liquid releases from NMP are shown in Table 2-1. The total activity of the average annual liquid releases from the two units combined over the same years was approximately 43,300 MBq (1.17 Ci) for fission and activation products and 9.65 x 10^5 MBq (26.1 Ci) for tritium. The annual releases were within the regulatory limits as specified in the ODCMs (NMPNS 2003a,b).

(a) Exclusive of tritium activity (which is given separately), activity of dissolved and entrained gases (which is generally below levels of detection), and gross alpha radioactivity (which is negligibly small).

NMPNS does not anticipate any significant annual increases in liquid waste released during the renewal period. See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

Table 2-1. Average Annual Liquid Releases from Nine Mile Point Units 1 and 2 Over the Years 2000 Through 2004

	Nine Mile Point Unit 1	Nine Mile Point Unit 2
Fission/activation products[(a)]	3.96×10^4MBq (1.07 Ci)	3700 MBq (0.1 Ci)
Tritium	3.14×10^5 MBq (8.49 Ci)	6.51×10^5 MBq (17.6 Ci)

(a) Exclusive of tritium activity (which is given separately), activity of dissolved and entrained gases (which is generally below levels of detection), and gross alpha radioactivity (which is negligibly small).

Sources: NMPNS 2005a,b; 2004a,b; 2003d,e; 2002b,c; 2001a–c; 2000a,b

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

Nine Mile Point ventilation systems are designed to maintain gaseous effluents to ALARA levels. Each reactor unit is provided with a separate and independent gaseous radioactive waste/offgas system (NMPNS 2002a, 2003c). The gaseous waste system for Unit 1 consists of the offgas system, the steam-packing exhauster system, ventilation systems from the turbine building, reactor building, radioactive waste building, offgas building, waste storage building, and the exhaust stack. The gaseous waste management system for Unit 2 includes the offgas system, the standby gas treatment system, various building ventilation systems, and two monitored release points, namely the main stack and the combined radioactive waste/reactor building vent.

The stack for Unit 1 is 110 m (350 ft) high and is located 30 m (100 ft) east of the northeast corner of the reactor building. The main stack for Unit 2 is 131 m (429 ft) above grade. The main stack releases exhaust air from the following plant areas and systems: turbine building, containment purge, turbine generator gland seal and exhaust steam system, offgas system, mechanical vacuum pump discharge, standby gas treatment system, condensate storage tanks and sumps. The combined radioactive waste/reactor building vent is located 60 m (187 ft) above ground level and releases exhaust air from the radioactive waste building equipment and area exhaust, the auxiliary boiler building area exhaust, and the reactor building ventilation exhaust.

The offgas system in each unit collects, contains, and processes the radioactive gases extracted from the steam condenser. The gases are exhausted by the steam jet air ejectors and flow through a preheater to a catalytic recombiner, where the hydrogen is recombined with oxygen to form steam. All steam from the offgas stream is condensed for return as condensate,

and the noncondensible gases flow to a holdup pipe. The holdup pipe allows the short lived radioisotopes such as nitrogen-16, nitrogen-17, and oxygen-19 to decay. The gas flow continues through a cooler condenser, a moisture separator, electric reheaters, a prefilter, activated charcoal adsorber vessels, and high-efficiency particulate air (HEPA) filters. Then, along with dilution make-up air, it continues to each unit's respective stack for discharge to the environment. Xenon and krypton isotopes are adsorbed on the charcoal, allowing them to decay, thereby significantly reducing the offsite doses (NMPNS 2002a, 2003c).

Continuous stack radiation monitoring at sample points in the stack base provides an indication of radioactive releases from the offgas system. The offgas effluent radiation monitor and control system is used to monitor the condition of reactor fuel and alert operators if offgas activity levels are increasing. The ODCM for each unit prescribes alarm/trip set points for the monitor and control instrumentation to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 for gaseous effluents (NMPNS 2003a,b).

The actual gaseous effluents for the year 2004, the most recent year for which data were available at the time this SEIS was written, were reported in the RERRs for Units 1 and 2 (NMPNS 2005a,b). A total of 57,000 MBq (1.54 Ci) of noble gases, 23.2 MBq (6.28×10^{-4} Ci) of iodine-131, 262 MBq (0.00709 Ci) of beta-gamma emitters as airborne particulate matter, and 1.73×10^{6} MBq (46.8 Ci) of tritium were released to the environment from Unit 1. Similarly a total of 2.30×10^{6} MBq (62.1 Ci) of noble gases, 8.44 MBq (2.28×10^{-4} Ci) of iodine-131, 47.7 MBq (0.00129 Ci) of beta-gamma emitters as airborne particulate matter, and 2.61×10^{6} MBq (70.4 Ci) of tritium were released to the environment from Unit 2. The total activity released from both units combined in 2004 was approximately 2.35×10^{6} MBq (63.6 Ci) for noble gases, 31.7 MBq (8.56×10^{-4} Ci) for iodine-131, 310 MBq (0.00838 Ci) for particulate matter, and 4.34×10^{6} MBq (117 Ci) for tritium.

Based on the values reported in the annual and semiannual RERRs for the two units over the five year period from 2000 through 2004 (NMPNS 2005a,b; 2004a,b; 2003d,e; 2002b,c; 2001a–c; 2000a,b), the average annual gaseous releases from NMP are shown in Table 2-2. The total activity of the average annual gaseous releases from the two units combined over the same years was approximately 3.03×10^{6} MBq (81.9 Ci) for noble gases, 59.7 MBq (1.61×10^{-3} Ci) for iodine-131, 1030 MBq (2.79×10^{-2} Ci) for particulate matter, and 6.18×10^{6} MBq (167 Ci) for tritium. The annual releases were within the regulatory limits as specified in the ODCMs (NMPNS 2003a,b).

Table 2-2. Average Annual Gaseous Releases from Nine Mile Point Units 1 and 2 Over the Years 2000 Through 2004

	Nine Mile Point Unit 1	Nine Mile Point Unit 2
Noble gases	4.78×10^{4} MBq (1.29 Ci)	2.98×10^{6} MBq (80.6 Ci)
Iodine-131	47.1 MBq (1.27×10^{-3} Ci)	12.6 MBq (3.40×10^{-4} Ci)
Particulate matter	916 MBq (2.48×10^{-2} Ci)	116 MBq (3.15×10^{-3} Ci)
Tritium	4.62×10^{6} MBq (125 Ci)	1.56×10^{6} MBq (42.1 Ci)

Sources: NMPNS 2005a,b; 2004a,b; 2003d,e; 2002b,c; 2001a–c; 2000a,b

NMPNS does not anticipate any significant increases in the radioactive gaseous releases during the renewal period. See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

2.1.4.3 Solid-Waste Processing

Solid wastes from NMP include filter sludge, spent resin, radioactive tools and equipment, and miscellaneous trash from plant operations, laboratory, maintenance and cleanup operations. The solid wastes are collected, processed, and temporarily stored onsite before being shipped offsite for disposal or further processing and disposal by an authorized third party. Radiation levels of shipped containers are maintained within the standards set forth by the NRC and the U.S. Department of Transportation (DOT) (NMPNS 2002a, 2003c).

The solid radioactive waste system in each unit consists of those systems and components that are used to process and package wet and dry solid waste so that the waste is suitable for transport and disposal. The system is not used for spent fuel storage and shipment. The spent fuel from each unit is currently stored in that unit's spent fuel storage pool onsite.

High-activity reactor wastes other than the spent fuel are stored in the fuel storage pool to allow radioactive decay, then packaged, and transferred in approved shipping containers for offsite burial. Maintenance waste, such as contaminated clothing and tools, are packed in suitable DOT-approved containers and may be stored prior to shipment. Process waste, such as filter sludges and spent resins, is collected in tanks, processed, and stored prior to shipment.

Dry active waste (DAW), generated as a result of operation and maintenance activities, is collected throughout the radiological-controlled areas of the facility. Typical DAW includes air filters, cleaning rags, protective tape, paper and plastic coverings, discarded contaminated clothing, tools, equipment parts, and solid laboratory wastes. Most DAW has relatively low radioactive content and may be handled manually. The DAW is normally stored in various work areas and then moved to the process area. DAW with radiation levels greater than 1 mSv/hr (100 mrem/hr) is normally stored in the radioactive waste building container storage areas.

Wet solid radioactive waste results from the processing of spent demineralizer resins (both bead and powdered) and spent filter material from the equipment drain and floor drain subsystems, and from the water clean-up systems. The wet waste is solidified, dried, or dewatered for acceptability for a disposal site. Contractor solidification or drying services are also used at the station or performed offsite. Radioactive waste requiring solidification includes concentrator waste, certain sludges, and ion-exchange resins. If storage is required for any of these types of waste, the containers of waste may be temporarily stored onsite.

Disposal and transportation of solid radioactive waste are performed in accordance with the applicable requirements of 10 CFR Part 61 and Part 71, respectively. There are no releases to the environment from solid radioactive wastes generated at NMP. In 2004, Nine Mile Point Unit 1 made 18 shipments of solid radioactive waste with a volume for dewatered spent resins, dry active waste consisting of compactible and non-compactible waste materials and contaminated equipment, and sewage and torus sediment of 601 m^3 (21,200 ft^3), and a total activity of 1.48 x 10^6 MBq (40 Ci) (NMPNS 2005a). In the same year, Nine Mile Point Unit 2 made 40 shipments of solid radioactive waste with a volume for dewatered spent resins, dry active waste consisting of compactible and non-compactible waste materials and contaminated equipment, and tank sediment of 987 m^3 (34,900 ft^3) and a total activity of 1.21 x 10^7 MBq (326 Ci) (NMPNS 2005b). The total number of shipments made from the two units combined in 2004 was 58, with a total activity of approximately 1.36 x 10^7 MBq (366 Ci). Based on the values reported in the annual and semiannual RERRs for the two units over the five-year period from 2000 through 2004 (NMPNS 2005a,b; 2004a,b; 2003d,e; 2002b,c; 2001a–c; 2000a–d), the average number of solid radioactive waste shipments from Nine Mile Point Unit 1 was 20 per year, with an average activity of 9.56 x 10^6 MBq (259 Ci) per year. Over the same period, the average number of shipments from Nine Mile Point Unit 2 was 36 per year, and the activity of the solid waste was 3.45 x 10^8 MBq (9310 Ci) per year. The average number of shipments from the two units combined over the same years was 56 per year, with a total average activity of approximately 3.55 x 10^8 MBq (9570 Ci) per year. NMPNS does not anticipate any significant increases in the solid radioactive waste generation rates during the renewal period.

2.1.5 Nonradioactive Waste Systems

The principal nonradioactive effluents from NMP consist of chemical and biocide wastes, lubrication oil waste, resin regeneration waste, Freon™ filters, and sanitary waste. Nine Mile Point stopped using chlorinated solvents and oils several years ago. The chemistry laboratory may generate small quantities of expired chemicals. Other wastes could include laboratory packs and mercury switches. Spent batteries and discarded fluorescent lights are recycled. Sanitary waste is sent to the onsite sewage treatment plant, which is permitted for up to 454 m^3/d (120,000 gpd) as a 30-day average. Daily flows range from 132 to 908 m^3/d (35,000 to 240,000 gpd) (NMPNS 2004e). The treated sanitary waste water is discharged to Lake Ontario. Dried sewage residue from the treatment plant is sent offsite to a permitted landfill for disposal.

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for the safe and reliable operation of a nuclear power plant. Maintenance activities conducted at NMP include inspection, testing, and surveillance to maintain the current licensing basis of the units and to ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactors are operating. Others require that the affected unit be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as the replacement of a major component. Each of the two units is refueled on a 24-month staggered schedule, resulting in an average of one refueling every year for the site.

An updated final safety analysis report (UFSAR) supplement (NMPNS 2004d) regarding the effects of aging on systems, structures, and components was included in the application for renewed operating license in accordance with 10 CFR Part 54. Chapter 3 and Appendix B of the NMPNS License Renewal Application describe the programs and activities that will manage the effects of aging during the license renewal period. NMPNS expects to conduct activities related to the management of aging effects during plant operation or normal refueling and other outages, but plans no outages specifically for the purpose of refurbishment.

2.1.7 Power Transmission System

The electricity generated by Nine Mile Point is connected to the grid by three single-circuit 345-kilovolt (kV) transmission lines (see Figure 2-5). Two of these lines connect to Unit 1's 345-kV Switchyard (Clay Line 8 and Scriba Line 9) and one is connected to Unit 2's 345-kV Switchyard (Scriba Line 23). At the other end, Lines 9 and 23 connect to the grid at the Scriba Substation, located approximately 600 m (2000 ft) southeast of the Unit 1 and 2 Switchyards. Line 8 extends approximately 42 km (26 mi) southeast and connects to the grid at the Clay Substation. The transmission line corridor for Line 8 is approximately 150 m (500 ft) wide and is owned by Niagara Mohawk Co.

In addition to the two 345-kV switchyards for outgoing electricity, each unit at Nine Mile Point has a 115-kV switchyard that brings in electricity from offsite sources. The switchyard for Unit 1 is next to the 345-kV Switchyard and is connected to two single-circuit 115 kV lines (South Oswego Line 1 and FitzPatrick Line 4). The Switchyard for Unit 2 is also connected to two incoming single-circuit 115 kV lines (Scriba Line 5 and Scriba Line 6).

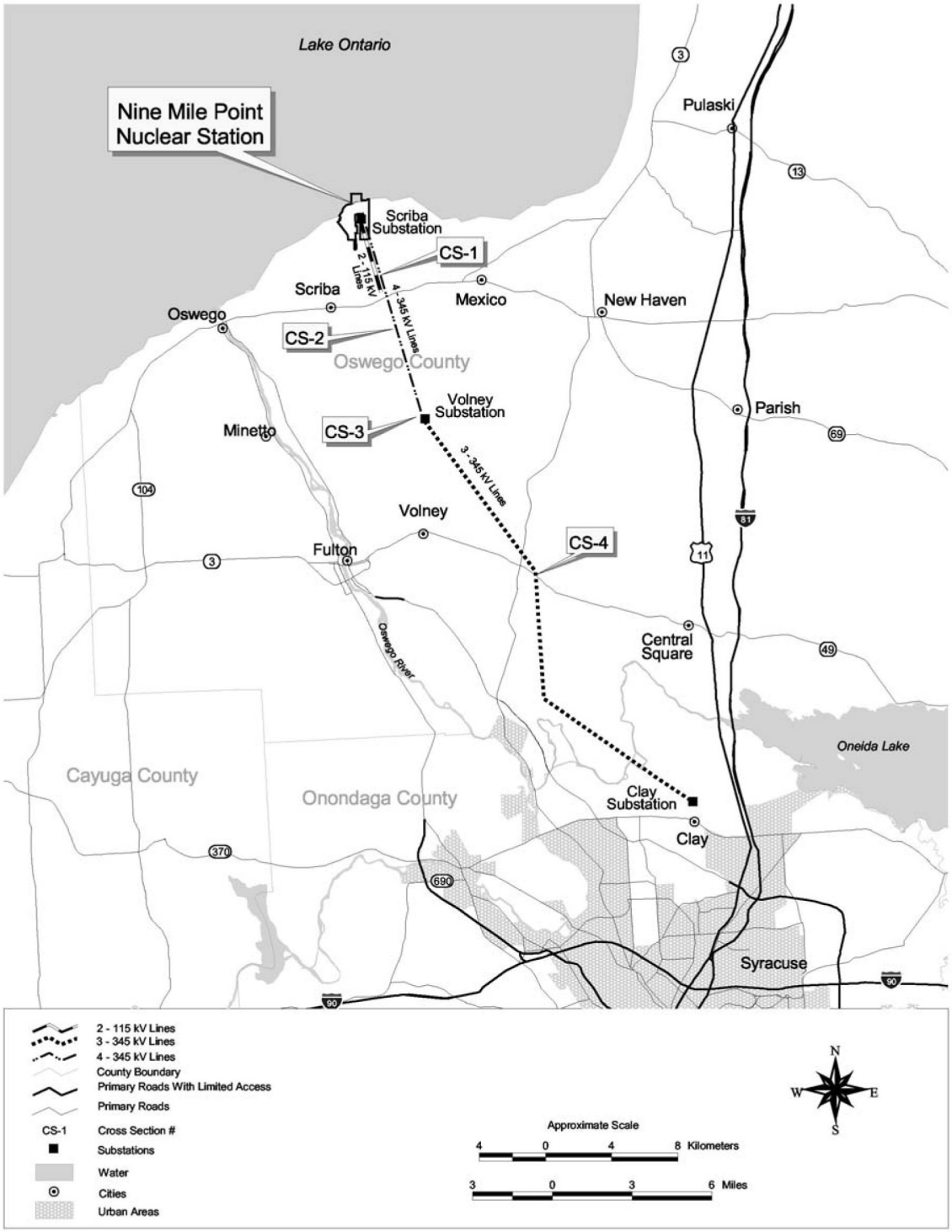

Figure 2-5. Nine Mile Point Site Transmission Lines

Between the Scriba Substation and the Volney Substation (about 14 km [9 mi] southeast of Unit 1), four additional 345-kV lines share the 150-m (500-ft) corridor with Line 8 for all or part of the distance. The maximum number of lines at any point along this approximately 14-km (8.5-mi) stretch is four.

Line 8, which carries part of the electricity generated by Unit 1 to the Clay Substation, is supported by lattice steel towers for the first 2.7 km (1.7 mi) and the final 0.5 km (0.3 mi) of its length. The rest of the line is supported on wooden H-frame poles. South Oswego Line 1 and another line that connects to Scriba Substation but not to Nine Mile Point switchyards (Lighthouse Hill Line 2) occupy the western edge of the right-of-way for the transmission line near the units. The 115-kV FitzPatrick Line 4 runs in the east-west direction between the Unit 1 115-kV switchyard and the James A. FitzPatrick Plant.

Line 23, which carries the electricity generated by Unit 2 to the Scriba Substation, is supported by tubular steel poles. Scriba Line 5, which is used to bring in offsite power to Unit 2, runs parallel to Line 23. Scriba Line 6, also used to bring in offsite power to Unit 2, runs approximately 370 m (1200 ft) east of the Scriba Substation after leaving this substation and then is routed north to Unit 2.

The ownership, as well as inspection and maintenance responsibilities for the transmission lines, substations, and rights-of-way are shared by several companies. The Scriba Substation is owned by Niagara Mohawk and New York State Electric and Gas (NYSEG). The transmission corridor south of Lake Road is solely owned by Niagara Mohawk. The area between the Unit 1 Switchyards and the Unit 2 Switchyards up to the northern boundary of Lake Road is owned by NMPNS. All the transmission lines are owned by Niagara Mohawk with the exception of Line 5, Line 6, and Line 23, which are owned by NMPNS. NMPNS owns 100 percent of the Unit 1 345-kV and 115-kV Switchyards and 82 percent of the Unit 2 345-kV and 115-kV Switchyards (the remaining 18 percent is owned by the Long Island Lighting Power Authority). NMPNS has easements for access, construction, operation, maintenance, repair, alteration, and renovation for the three lines it owns that are located on the transmission corridor owned by Niagara Mohawk. Niagara Mohawk has easements with NMPNS for the lines owned by Niagara Mohawk that are located on property owned by NMPNS.

Niagara Mohawk has a New York State Public Service Commission approved long-range vegetation management plan for the rights-of-way. This plan embodies the use of selected management techniques to foster the goal of maintaining a low-growing vegetative community and to keep the transmission facility free of interruptions from trees and tall-growing shrub species. Additional information on right-of-way maintenance is presented in Section 2.2.6.

2.2 Plant Interaction with the Environment

Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near Nine Mile Point. They also provide detailed descriptions where needed to support the analysis of potential

environmental impacts and operation during the renewal term, as discussed in Chapters 3 and 4. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts associated with other Federal project activities.

2.2.1 Land Use

Nine Mile Point nuclear generating station is located on the southeastern shore of Lake Ontario in the Town of Scriba, Oswego County, New York. The site is in a rural area approximately 8 km (5 mi) miles northeast of Oswego, 58 km (36 mi) north northwest of Syracuse, and 100 km (65 mi) east of Rochester, New York. Syracuse is the largest city within 80 km (50 mi) of Nine Mile Point. Lake Road (County Road 1A) provides road access to the site and transverses Nine Mile Point property in an east-west direction just south of the main operational facilities. The exclusion area for the plant is centered at Nine Mile Point and extends 1.6 km (1 mi) to the east, 1.4 km (0.87 mi) to the southwest, and 2 km (1.3 mi) to the southern site boundary (see Figure 2-3) (NMPNS 2004e).

The site consists of approximately 360 ha (900 ac), with over 1.6 km (1 mi) of shoreline on Lake Ontario. Approximately 76 ha (188 ac) are used for power generation and support facilities. The remaining acres are generally undeveloped, with the exception of the Energy Information Center and adjacent picnic area, the Nine Mile Point Nuclear Learning Center (training facility), a former construction and demolition landfill, and a firing range for security personnel training (NMPNS 2004e).

Nine Mile Point is located in the Town of Scriba in Oswego County. There are no land-use or zoning restrictions applicable to land within unincorporated portions of Oswego County.

The local terrain consists of undulating hills reflecting a bedrock surface modified by repeated glaciations that eroded weathered rock and deposited glacially derived sediments. The site, however, does not have any of the prominent drumlins that are characteristic of the Erie-Ontario Lowlands (NMPNS 2002a). Onsite, the ground surface is generally flat and slopes gently north toward Lake Ontario with elevations ranging from 75 m (246 ft) mean sea level (msl) at the shoreline to approximately 84 m (276 ft) msl near the southern end of the developed portion of the site (Geomatrix Consultants, Inc. 2000). The predominant land cover is woodlands, consisting of forest and brushlands. Federal and State designated wetlands consisting of shrub wetlands, bogs, marshes, and wooded wetlands, along with inactive agricultural land, occur onsite (NMPC 1985). There are no major streams or rivers within the drainage area that contains the site and no history of stream or river flooding at the site (NRC 2002). There are no natural water courses onsite. A revetment ditch runs from the Unit 2 cooling tower area westward and then northward to Lake Ontario. The revetment ditch receives site stormwater runoff and monitored discharges from the wastewater treatment facility and oil retention pond.

Section 307(c)(3)(A) of the Coastal Zone Management Act (16 USC 1456[c][3][A]) requires that applicants for Federal licenses that conduct an activity in a coastal zone provide a certification that the proposed activity complies with the enforceable policies of the State's coastal zone

program. Both Nine Mile Point units are within the State of New York's coastal zone. The New York State Department of State determined that renewal of the operating licenses (OLs) for NMP is consistent with the New York Coastal Management Program.

2.2.2 Water Use

Water use associated with the operation of NMP consists of fresh water withdrawn from Lake Ontario, which is used primarily for cooling. Water from Lake Ontario is used for the main condensers, auxiliary systems, and reactor shutdown heat removal. Municipal water obtained from the Port of Oswego Authority is also withdrawn from the lake to be used as drinking water, makeup for demineralized water, and other miscellaneous purposes. NMPNS holds a Great Lakes Water Withdrawal Registration, issued by the New York State Department of Environmental Conservation (NYSDEC), that allows withdrawal of water from Lake Ontario (NYSDEC 2001). Most of the water used for site operations is returned to Lake Ontario. Net water consumption from the site includes evaporation losses (for example, from the cooling tower), water in disposed solids or radioactive waste solutions, and other minor losses.

Waste water flows by gravity, and where needed, is pumped via lift stations from the NMP facilities, the Energy Information Center, and the Nuclear Learning Center to the sewage treatment plant, located east of the Energy Information Center. After preliminary treatment to shred large solids, the flow is pumped via a dual-pipe force main consisting of a 10-cm (4-in.) and a 15-cm (6-in.) pipe to the adjacent treatment units. Two pumps are normally used, with a third acting as a standby. Waste water enters a flow distribution structure and is split evenly by weirs to two extended aeration (activated sludge) units each 79 m^3 (2800 ft^3) in volume. Only one of the aeration units is required to handle current waste water volumes. From there, the mix liquor is sent to a settling tank/clarifier, one for each aeration unit. The clarifiers are center-fed with radial outward flow to facilitate separation of the sludge. As a result of the biological activity, scum forms on the water surface and is removed from the final settling tanks by a rotary wiper arm and discharged to a scum trough. The scum is flushed to a scum well and air-lifted to the aerated sludge holding tanks. Some of the sludge is recycled back to the head of the aeration tanks to maintain constant mixed liquor, suspended solids, and solids retention time in the aeration tanks. Excess sludge is concentrated in the aerated sludge holding tanks, then dewatered by means of evaporation and drainage via an underground drainage system. Water from the drainage system is periodically pumped to the influent of the treatment plant (NMPNS 2004e).

Nine Mile Point is not a direct user of groundwater and there are no plans for direct groundwater use in the future. There are no production wells on the site. The Unit 1 reactor building has a peripheral drain for collecting any groundwater seepage which is then pumped to Lake Ontario. However, Unit 2 does have a permanent dewatering system, which consists of perimeter drains and two sumps located below the reactor building. The Unit 2 dewatering system is designed to maintain the water table below the reactor mat elevation of approximately 50 m (164 ft) National Geodetic Vertical Datum (NGVD). Submersible pumps are located in each of the sumps, which together discharge groundwater at an estimated average of 0.01 m^3/s (200 gpm) to maintain the

cone of depression. The water is then discharged to Lake Ontario through a storm drain system. Because the dewatering system has been operating for over fifteen years, the cone of depression is at equilibrium with the surrounding groundwater system.

The cone of depression surrounding the Unit 2 reactor building estimated to result from this dewatering is steep; the groundwater table is estimated to reach 65.5 m (215 ft) NGVD within a radius of 61.0 to 68.6 m (200 to 225 ft) of the reactor building (NMPNS 2002a). Results of groundwater monitoring at Nine Mile Point, performed in 2002 to evaluate petroleum-impacted groundwater at the former vehicle maintenance area, indicate that the groundwater table reaches approximately 77.4 m (254 ft) NGVD within 183 m (600 ft) northeast of the reactor building, illustrating the limited radius of influence of the dewatering operation (Geomatrix Consultants, Inc. 2002). Lake Ontario establishes the base level for the regional water table regulated to fall no lower than approximately 74.2 m (243 ft) NGVD. This information demonstrates, the cited monitoring location is well outside the zone of influence of the dewatering cone of depression. The NRC concluded in the Unit 2 Final Environmental Statement (FES) that the cone of depression created by the dewatering system was small and would have no effect on offsite groundwater use (NRC 1985).

The area affected by petroleum compounds is approximately 18 m x 23 m (60 ft x 75 ft), as identified in a 2002 report (Geomatrix Consultants, Inc. 2002). Periodic monitoring conducted since that report and required by the State of New York shows no growth of the affected area and concentrations of petroleum compounds declining to near or below cleanup levels (Constellation Energy Group 2006). The nearest edge of the area affected by petroleum compounds is over 150 m (500 ft) from the edge of the drawdown cone of depression (Constellation Energy Group 2006). Because concentrations within the affected area are very near the cleanup criteria and declining and geographically separated from the effects of the Unit 2 dewatering, monitoring of the dewatering effluent is not conducted. The State of New York Department of Environmental Conservation regulates and regularly evaluates the monitoring of all plant discharges through the State Pollutant Discharge Elimination System permit currently in effect for the NMP.

Due to the geologic conditions surrounding the Unit 1 reactor building, an active dewatering system was deemed unnecessary for that unit. According to the Unit 1 Updated Final Safety Analysis Report (NMPNS 2003c), very little groundwater seeps into the reactor building due to the lack of open joints in the surrounding strata at depths more than 6.1 m (20 ft) below the rock surface. Therefore, there is no need to maintain the groundwater table below normal levels around the Unit 1 reactor. The exterior of the reactor building below grade is provided with a peripheral drain for collecting any groundwater seepage. The drain discharges into a sump pit with two 0.009 m^3/s (150 gpm) submersible pumps (NMPNS 2003c).

Potable water in the area is supplied to residents either through the Scriba Water District, which receives water from the City of Oswego, or from private wells (Heritage Power 2000). Currently, operation of private groundwater wells in Oswego County is not regulated, nor does any agency keep a listing of all groundwater wells in the area.

Groundwater is available from the unconfined aquifer and deeper confined aquifers. The unconfined aquifer is composed of non-lithified glacial deposits and fill material and the upper portion of the Oswego Sandstone beneath the soil. The unconfined water table aquifer is generally of sufficient yield capacity for domestic use only. Within 3.2 km (2 mi) of Nine Mile Point, groundwater wells yield an estimated 0.3 to 0.5 L/s (5 to 8 gpm) from the unconsolidated deposits, and up to 0.6 L/s (10 gpm) from the lower strata (NMPNS 2002a).

A groundwater well census conducted in 1972 revealed the existence of approximately 102 domestic wells within 3.2 km (2 mi) of Nine Mile Point, but only 70 were in use. The average pumping rate of the active wells in use was 0.03 L/s (650 gpd). The nearest domestic well was approximately 1.6 km (1 mi) from the Unit 2 reactor building (NMPNS 2002a). A review of aerial photographs taken in March 1995 did not reveal any residential or industrial development within 1.6 km (1 mi) of Nine Mile Point. Currently, the nearest residence is approximately 1.6 km (1 mi) from the site (NMPNS 2002a). The Town of Scriba has designated the majority of the land within the 1.6-km (1-mi) radius of Nine Mile Point as either industrial (including Nine Mile Point and James A. FitzPatrick plants) or as a valued natural resource, limiting the potential for future residential growth in the area (Town of Scriba 2000). Therefore, it is unlikely that any private groundwater supply wells have been installed significantly closer than 1.6 km (1 mi) from the Nine Mile Point reactor buildings.

2.2.3 Water Quality

The site is located near the Erie-Ontario Lowlands subdivision of the Central Lowlands Physiographic Province.

Nine Mile Point is located on the southeastern shore of Lake Ontario in Oswego County, New York. Lake Ontario, an international body of water forming part of the border between the U.S. and Canada, is the smallest and easternmost of the Great Lakes, with a surface area of approximately 19,010 km^2 (7,340 mi^2) and a total volume of 1,638 km^3 (393 mi^3). The lake is 310 km (193 mi) long and 85 km (53 mi) wide in its largest dimensions, and has an average and maximum depth of 86 m (283 ft) and 244 m (802 ft), respectively (NRC 1985).

The Nine Mile Point site is located on a slight promontory (also named Nine Mile Point) on the southeastern shore of the lake. The offshore slope at the site is steep (5-percent to 10-percent grade) at the beach, flattening to a 2-percent to 3-percent grade at the 4.6-m (15-ft) depth contour, then increasing to a 4-percent slope lakeward. In general, bottom sediments in nearshore areas are characterized by a greater predominance of coarser sands, pebbles, cobbles, and boulders, while finer sediments occur further offshore (NRC 1985).

Approximately 80 percent of the water flowing into Lake Ontario comes from Lake Erie through the Niagara River near Buffalo, New York. The remaining water flow comes from Lake Ontario basin tributaries and precipitation. Approximately 93 percent of the water in Lake Ontario flows out to the St. Lawrence River (see Figure 2-1) and the remaining 7 percent disperses through evaporation. Water retention time is estimated to be approximately eight years. Since Lake

Ontario is the most downstream of the Great Lakes, it is impacted by human activities occurring throughout the Lake Superior, Michigan, Huron, and Erie basins (EPA et al. 1998). Lake circulation is influenced by the prevailing west-northwest winds and the eastward flow of water from the Niagara River, resulting in a counter-clockwise flow. Circulation of water generally occurs along the eastern nearshore areas and within sub-basins of the main lake (EPA et al. 1998). Water currents typically move in an eastward direction along the south shore of Lake Ontario in a relatively narrow band. However, circulation patterns at a specific time can be affected by winds. Major shifts in wind distribution can alter currents in a matter of hours. Wind speed frequency data collected during current measurement studies at Nine Mile Point and reported by the NRC in the Unit 2 FES indicate that, over the year, winds in excess of 8.9 m/s (20 mph) occur over 21 percent of the time based on readings averaged over a six-hour period. From June to September, winds in excess of 8.9 m/s (20 mph) occur 13 percent of the time. At the 5.8-m (19-ft) depth contour, the measured current speed of six-hour duration exceeded with comparable frequency is about 0.06 m/s (0.2 ft/s) (NRC 1985).

Two other important examples of wind-induced effects on the general circulation pattern of Lake Ontario are upwelling and internal oscillation of thermocline depth. Upwelling is characterized by the rising of colder, heavier, bottom water toward the surface. As noted by the NRC in the Unit 2 FES, a variety of theories have been proposed to account for the oscillations, which are a common feature of Lake Ontario temperature records. The most direct explanation is that an upwelling displaces the thermocline from equilibrium by converting the kinetic energy from wind gusts into potential energy that alters the thermocline position. When the wind stress is removed, internal waves are set in motion and contribute to the dissipation of this energy. Internal waves increase in amplitude after storms. In Lake Ontario, approximately three complete oscillations occur every two days (NRC 1985).

Lake Ontario is a large, temperate lake that exhibits a seasonally dependent pattern of thermal stratification, which alters circulation patterns. Changes in stratification result from atmospheric heat exchange and wind-induced mixing. In spring months, the shallow nearshore waters warm more quickly than the deep offshore waters, setting up isotherms roughly parallel to shore. As the lake temperature continues to warm, vertical stratification develops as a result of the combined effects of the lake warming and advection of the warmer, near-shore waters. Most of the lake is vertically stratified during the summer with the warm surface waters (epilimnion) averaging nearly 21˚C (70˚F) and cool deeper waters (hypolimnion) ranging between 3.8 and 4˚C (38.8 and 39.2˚F). Mixing of these strata begins as the thermocline breaks down during September as a result of surface water cooling, and continues until water temperatures are the same throughout the water column (NRC 1985, EPA et al. 1998).

The lake water temperatures begin to warm in mid-March, and by late June the offshore ambient temperature stays above 3.9˚C (39˚F). Generally, vertical stratification is established over the entire basin by this time (NRC 1985). During the warmest water temperature period (June to September) at Nine Mile Point, the ambient temperature of Lake Ontario exceeds 21.7˚C (71˚F) approximately 10 percent of the time in the waters surrounding Nine Mile Point. The mean summer ambient temperature of Lake Ontario at Nine Mile Point is reportedly 19.4˚C

(67˚F), with a maximum surface temperature rise above ambient of approximately 6.9˚C (12.4˚F) at capacity operation (NMPC 1976). In late September, the warming process ends, the mean surface temperature drops rapidly below 17.2˚C (63˚F), and the thermocline breaks down, marking the beginning of the winter season. The date of overturn varies each year due to storms. After overturn and when the lake surface cools to below 3.9˚C (39˚F), isotherms tend to be parallel to shore. During the winter months, nearshore areas of the lake freeze while the deep offshore waters remain open (NRC 1985).

Since 1960, Lake Ontario outflows have been regulated to control lake water levels, under the supervisory authority of the International St. Lawrence River Board of Control (ISLRBC), by a series of dams on the St. Lawrence River. The ISLRBC was created in 1952 under the Boundary Waters Treaty of 1909 to help prevent and resolve disputes over the use of water along the Canadian and U.S. boundary (ISLRBC 2004).

One requirement in the ISLRBC's order was to regulate Lake Ontario water levels within a target range from 74.2 to 75.4 m (243 to 247 ft) International Great Lakes Datum (IGLD) (ISLRBC 2002a). [Note: The only difference between IGLD (1985) and NGVD (1988) is that the IGLD (1985) bench mark elevations are published as dynamic heights and the NGVD (1988) elevations are published as Helmert orthometric heights (Zilkoski et al. 1992)]. The ISLRBC aims to maintain levels above 74.2 (243 ft) IGLD from April 1 through November 30 annually. Under the most extreme dry conditions, all possible relief is provided to navigation and power production facilities (ISLRBC 2002b). Data compiled by the U.S. Army Corps of Engineers for the period of record 1918 to 2001 indicate that average lake water levels range from approximately 74.5 to 75.0 m (244.5 to 246.2 ft) IGLD; minimum and maximum lake water levels during that period were approximately 73.7 and 75.8 m (241.9 ft and 248.6 ft) IGLD, respectively (USACE 2002).

The water quality of Lake Ontario has changed dramatically since the mid-1960s, when work began at Nine Mile Point. Historic changes in land uses and uncontrolled pollutant discharges into all the Great Lakes had contributed to a general eutrophication of the entire lake system (Stewart et al. 1999). These nutrient-rich waters were characterized by high phosphorus concentrations and high turbidity up to the late 1970s (see 1972 data in Table 2-3).

Changes in selected basic water quality parameters over the past thirty years are shown in Table 2-3. These data were collected at the Nine Mile Point area in 1972 and 1978, the City of Oswego water intake located about 13 km (8 mi) southwest of the project site in 1998 and 1999, and at the Monroe County water intake in 2000, approximately 80 km (50 mi) west of Nine Mile Point. General reductions in pollutants such as phosphorus and dissolved solids, and in turbidity levels have been observed over the past thirty years. However, while some nutrients have decreased, nitrogen input has increased (NYSDEC 2000).

Table 2-3. Selected Water Quality Parameters of Lake Ontario

	Year			
Parameter	**1972[a]**	**1978[b]**	**1998-99[c]**	**2000[e]**
pH	8.0	8.4	7.96	7.6
Total Alkalinity (mg/L)	72–90	94.2	92	83
Total Phosphorus (mg/L)	0.01–0.28	0.027	0.006[d]	0.005[d]
Total Dissolved Solids (mg/L)	107–186	202	N/A	160
Total Nitrates (mg/L)	0.04–0.40	< 0.18	N/A	0.34
Turbidity	2–6 (JTU)	3.0 (NTU)	0.5 (NTU)	0.09 (NTU)

(a) Source: AEC 1974
(b) Source: NMPC 1985
(c) Source (except total phosphorus): Heritage Power 2000
(d) Source: EPA 2005
(e) Source (except total phosphorus): MCWA 2001; pH and alkalinity data are from water distribution system and not from ambient lake water.

JTU = Jackson Turbidity Unit(s)
mg/L = milligram(s) per liter
N/A = no data available
NTU = Nephelometric Turbidity Unit(s)

The gradual changes in Lake Ontario's water quality have also contributed to successive changes in the biological communities of the lake. Nutrient supplies and other environmental pressures (for example, toxic pollutants) have also caused direct effects upon all trophic levels within the lake ecosystem (Stewart et al. 1999).

The largest source of pollutants, including phosphorus, into Lake Ontario is Lake Erie, via the Niagara River (Stewart et al. 1999). Additional phosphorus and nitrogen enter Lake Ontario directly through runoff from agricultural lands, urban areas, and sewage outflows. The eutrophication of Lake Ontario was recognized by Canada and the U.S. in the 1960s, and led to the bi-national Great Lakes Water Quality Agreement (GLWQA) in 1972. Since the implementation of the U.S. Clean Water Act (CWA) and the GLWQA, phosphorus levels have been significantly reduced (NYSDEC 2000).

Nitrogen concentrations in Lake Ontario were not considered a major cause of eutrophication in the 1960s and 1970s. However, since the 1970s, nitrogen has been increasing in Lake Ontario, as well as in all of the other Great Lakes. The causal factors are not well understood, but agricultural runoff and atmospheric deposition are considered the most likely sources (NYSDEC 2000).

Persistent, bioaccumulative, toxic chemicals (PBTs), which include mirex, polychlorinated biphenyls (PCBs), dioxins, and others, entered Lake Ontario via tributaries and historically were accumulated in the sediments. Canada and the U.S. developed and implemented the "Lake Ontario Toxics Management Plan," in 1989, to address the PBTs through regulation of the toxic chemicals' manufacture and use (NYSDEC 2000). Reductions in toxic chemical concentrations in some Lake Ontario biota have been reported by NYSDEC from the 1960s to the 1980s. The reductions have been generally attributed to restrictions placed on the manufacture and use of those chemicals. The downward trend of toxic chemical concentrations has leveled off since the 1980s and may be due, in part, to a sequestering of the toxics within the lake's benthic sediments. Consumption advisories for numerous fish species continue to be issued by the NYSDEC, based on concentrations of PBTs found in fish samples (NYSDEC 2000).

The configuration of the thermal plume from Unit 1 has been found to vary with wind-induced currents, wave action, and upwelling (NMPC 1975). However, no relationship between the size and the extent of the plume and either wind speed or station heat load has been demonstrated, reflecting the stochastic nature of the plume as influenced by lake hydrodynamics.

The current SPDES permit allows a maximum daily discharge temperature of 46.1˚C (115˚F) from Unit 1; the maximum allowable intake-discharge temperature difference is 19.4˚C (35˚F) (NYSDEC 2004h). For Unit 2, the current SPDES permit allows a maximum daily discharge temperature of 43.3˚C (110˚F), and a maximum allowable intake-discharge temperature difference of 16.7˚C (30˚F) (NYSDEC 2004h). A review of the most recent SPDES annual report show that the thermal discharges of both units are in compliance with SPDES permit requirements (Constellation Energy Group 2004).

The thermal data for the discharge of both units for the calendar year 2003 was reviewed. On January 12, 2003, both units were operating at nominal electric output and the average lake water temperature was -0.3˚C (31.4˚F), the lowest average temperature for the lake water recorded during 2003. The maximum discharge water temperature for Unit 1 as measured according to SPDES permit requirements was 18.7˚C (65.7˚F), a temperature difference of 19.1˚C (34.3˚F). For the same day, the maximum discharge water temperature for Unit 2 was 7.2˚C (45.0˚F), a temperature difference of 7.6˚C (13.6˚F). On August 21, 2003, the maximum discharge water temperature for Unit 1 occurred at 42.8˚C (109.1˚F). The average lake water temperature was 25.0˚C (77.0˚F) on that day, resulting in a temperature difference of 17.8˚C (32.1˚F). On the previous day, the discharge from Unit 2 reached a maximum for the year at 29.6˚C (85.3˚F), and the average lake water temperature was 24.3˚C (75.8˚F), a difference of 5.3˚C (9.5˚F). Both units were operating at nominal electric output on those days (Constellation Energy Group 2004).

Cooling and service water systems are treated with sodium hypochlorite and other oxidants to control biofouling. Until zebra mussels (*Dreissena polymorpha*) were discovered in the water intakes in 1989 (McMahan 1991), fouling was likely to be caused by microscopic organisms and slimes, filamentous *Cladophora* algae, or the Asiatic clam (*Corbicula* sp). With the introduction

of zebra mussels, additional measures have been taken to control colonization in the facility's water systems.

The site-specific SPDES permit (NYSDEC 2004h) specifies the molluscicides that may be used at Nine Mile Point to control zebra mussels. An example is EVAC™, which has been used in recent years. A maximum limit of two treatments per year for each unit is conducted and the applications are made in the warmer summer months when the organisms are certain to filter water and be exposed to the chemical. Units 1 and 2 each receive up to two 48-hour treatments. Unit 2 has one delivered at the submerged, offshore intake structure, and the other is delivered at the onshore traveling screen inlets to the water systems. Unit 1 treatments are delivered onshore. The SPDES permit Special Conditions (NYSDEC 2004h) require 48-hour notification to the NYSDEC before EVAC™ is applied and monitoring is performed to ensure the effluent concentration does not exceed the SPDES limit.

Treated effluent from the sanitary waste water treatment system undergoes chlorination and subsequent dechlorination before being discharged via a 30.5-cm (12-in.) pipe to a drainage ditch eventually flowing to Lake Ontario (NMPNS 2002a, 2003c). The discharge is permitted as Outfall 030. The effluent is monitored for flow, biochemical oxygen demand, suspended solids, settable solids, pH, and total residual chlorine. Maximum permitted flow is 0.005 m^3/s (120,000 gpd) as 30-day average (NYSDEC 2004h). Daily flow ranges from 0.002 to 0.01 m^3/s (35,000 to 240,000 gpd) (NMPNS 2003c).

The plant operates in accordance with applicable local, state, and federal discharge limitations (NMPNS 2002a). No notices of violation have been reported in the past five years, the length of record reviewed.

Four hydrostratigraphic units exist below Nine Mile Point: non-lithified sediments, Oswego Sandstone, Pulaski Formation, and Whetstone Gulf Formation, in descending order. Groundwater is available from an unconfined aquifer and deeper confined aquifers. The unconfined aquifer is composed of non-lithified glacial deposits and fill material and the upper portion of the Oswego Sandstone. The non-lithified deposits rest on a permeable fractured zone at the top of the Oswego Sandstone. The Oswego Sandstone formation becomes relatively impermeable within approximately 6.1 m (20 ft) of its upper surface (NMPNS 2002a).

Within a 3.2-km (2-mi) radius of Nine Mile Point, the local water table ranges in elevation from 91.4 m (300 ft) NGVD in the southeast to the lake water level, approximately 75.0 m (246 ft) NGVD, with annual variations of approximately 0.6 m (2 ft) (NMPNS 2002a). The normal groundwater table in the Nine Mile Point complex area is approximately 77.7 m (255 ft) NGVD. The average gradient is approximately 0.7 percent to the north-northwest (NMPNS 2002a).

Water enters the groundwater system as a result of infiltration of precipitation and local seepage from ponds and swamps through the non-lithified deposits and bedrock outcrops. This process is known as groundwater recharge. Due to the low permeability of the surficial soils in the vicinity of the site, most of the precipitation runs off toward the lake, leaving approximately 5 cm

(2 in.) available for recharge annually. The Oswego Sandstone is recharged by seepage from the non-lithified deposits and local outcrops located to the south and southeast of the site. Recharge of the lower zones of rock beneath the surface occurs through outcrops upgradient to the site, or possibly through fractures. Groundwater flow velocities in the Nine Mile Point site vicinity are slow due to low hydraulic conductivities. The maximum estimated regional velocity of groundwater in the unconfined aquifer is no more than a few yards annually, based on a gradient of 0.7 percent and an assumed average permeability of 1×10^{-5} cm/s (4×10^{-6} in./s) (NMPNS 2002a).

2.2.4 Air Quality

The climate of New York state is broadly representative of the humid continental type, which prevails in the northeastern U.S., but its diversity is not usually encountered within an area of comparable size. Differences in latitude, character of the topography, and proximity to large bodies of water, such as Lake Ontario, have pronounced effects on the climate. Nine Mile Point is located in a moist continental climate (Cf) zone characterized by the dominance from tropical air masses in summer and polar air masses in winter, and the presence of deciduous forest that covers the eastern parts of the U.S. and southern Canada. Seasonal changes between summer and winter are very large, with an average seasonal temperature change of 56°F (31°C). Mean or normal daily minimum and maximum temperatures for the Oswego East NWS station from 1971 through 2000 range from -8.9°C (16°F) in January to 16.7°C (62°F) in July and August, and from -0.6°C (31°F) in January to 27.2°C (81°F) in July, respectively (NOAA 2004a). Cold winters are caused by polar and arctic air masses moving south. Abundant local precipitation occurs throughout year, with a typical increase in summer rainfall due to invading tropical air masses. Meteorological records for north central New York (Ithaca area) are generally representative of the Nine Mile Point area. The data from this area indicate that lowest precipitation amounts for the year generally last for about a month or two, typically in January and/or February. Mean or normal monthly temperatures for north central New York range from -10.6°C to -1.1°C (12.9°F to 30.1°F) in January to 14.0°C to 26.6°C (57.2°F to 79.8°F) in July and August (NOAA 2004b). The mean annual precipitation for the region is 90.2 cm (30.5 in.). Normal monthly precipitation ranges from 1.3 to 16.3 cm (0.5 to 6.4 in.) in the dry season (January) to 2.5 to 33 cm (1 to 13 in.) in the wet season (July).

Onsite meteorological conditions are monitored from the 61-m (200-ft) main tower, and at a secondary tower approximately 30 m (100 ft) in height. At the main tower, winds (speed and direction) and temperature are measured at three levels, 9.1 m (30 ft), 30.5 m (100 ft) and 61 m (200 ft), including horizontal wind direction variations. Atmospheric stability is determined using the "delta T" method, with temperature differences between the 61-m (200-ft) and 9.1-m (30-ft) levels and the 30.5-m (100-ft) and the 9.1-m (30-ft) level. Hourly data recorded from measurements at the 61-m (200-ft) and 9.1-m (30-ft) levels over a five-year period (1999 through 2003) were used to generate seasonal wind roses. The data show that the meteorological influence of Lake Ontario water temperature does not appear to have a discernable influence on winds typical at shoreline locations, which tend to exhibit strong lake and land breeze circulation patterns in the spring and fall. Winds during the winter season tend

to be stronger, with mean winds exceeding 5 m/s (11 mph) predominately out of the west. During the spring and summer, winds are more often from the west-southwest, while in the fall, they tend to come from the south to southeast about 30 percent of the time.

Severe thunderstorms with winds exceeding 26 m/s (58 mph) and/or with property damage occur on average 2 to 3 days per year (NOAA 2004c). During June through August, the daily occurrence of thunderstorms is approximately one day per month, with a total of 126 thunderstorm and wind damage reports filed for Oswego County from January 1, 1950 to June 30, 2004. Through the last half of the last century, 1950 to 2004, a total of eight tornadoes touched down in Oswego County (NOAA 2004c). Seven of these produced slight or moderate property damage and were categorized as in the low intensity range of the Fujita Tornado Scale, F-0 or F-1 category tornados.[(a)] The one tornado that did produce significant damage was an F-3 storm in May 1983, which resulted in $250,000 in property damage (NOAA 2004c). Based on statistics for the 30 years from 1954 through 1983 (Ramsdell and Andrews 1986), the probability of a tornado striking a point in a 1° latitude-longitude square at Nine Mile Point is expected to be about 1.0×10^{-4} per year. Severe weather Procedure AG-108, Rev. 4 has been implemented at Nine Mile Point as a guideline to provide the station with items to be considered in the event severe weather is forecasted to impact the area.

The wind resources are expressed in terms of wind power classes, ranging from class 1 to class 7 (Elliott et al. 1986). Each class represents a range of mean wind power density or approximate mean wind speed at specified heights above the ground. The wind energy resource for most of the Lake Ontario and Lake Erie shoreline region of New York state, including Oswego County, has good wind power potential. The annual average wind power for this part of the state is rated class 3 (RREDC 2004a). Areas designated class 3 or greater are suitable for most wind energy applications, whereas class 2 areas are marginal and class 1 areas are generally not wind-power suitable.[(b)]

Air quality in a given area is a function of the air pollutant emissions (type of pollutant, rate, frequency, duration, exit conditions, and location of release), atmospheric conditions (climate and meteorology), the area itself (size of airshed and topography of the area), and the pollutants transported from outside the area. Air quality within a 50-km (31-mi) radius of Nine Mile Point is generally considered good, with exceptions occurring within 25 km (16 mi) of designated ozone nonattainment areas. Localized sources of emissions include man-made sources of commercial, residential and transportation-related emissions. Natural sources of wind-blown dust contribute to temporary increases in air pollution.

(a) Tornado wind speeds range from 17.9 to 32.2 m/s (40 to 72 mph) for F-0 and from 32.6 to 49.2 m/s (73 to 110 mph) for F-1 category tornadoes (Fujita 1987).

(b) Wind power densities ranging from 0 to 100 m^2 at 10 m (33 ft) above ground and 0 to 200 m^2 at 50 m (164 ft) (RREDC 2004b).

Nine Mile Point is located in Oswego County, New York, which is part of the Central Air Quality Control Region (AQCR) covered by Region 7 of NYSDEC. With the exception of ozone, this region is designated as being in attainment or unclassifiable for all criteria pollutants in 40 CFR 81.333. Jefferson County, north of Oswego County, is designated as a nonattainment area for ozone, and classified moderate for the 8-hour and marginal for the 1-hour ozone National Ambient Air Quality Standards. No Prevention of Significant Deterioration Class I areas are located within 100 km (62 mi) of Nine Mile Point.

There are five emergency diesel generators at Nine Mile Point. The Nine Mile Point Unit 1 (NMP1) emergency diesel generator system consists of two identical, physically separate, and electrically independent standby diesel generators. Each of the NMP1 generators have a nominal rated capacity of approximately 2600 kW(e) (3500 hp). The Nine Mile Point Unit 2 (NMP2) emergency power supply system consists of three standby diesel generators . One of the NMP2 generators has a nominal rated capacity of approximately 2600 kW(e) (3500 hp), while the other two Unit 2 generators are nominally rated at approximately 4500 kW(e) (6100 hp). The diesel generators are used for emergency backup power, providing a standby source of electric power for equipment required for mitigation of the consequences of an accident, for safe shutdown, and for maintenance of the station in a safe condition under postulated event and accident scenarios. The diesel generators are tested once per month for 1- and 4.5-hour test burn durations for Units 1 and 2, respectively. Maintenance tests for each generator—for example to replace pumps and test for leaks—lasting 10 to 30 hours are run as needed. Twenty-four endurance burns are run for the large Unit 2 generators on a staggered test schedule, once every other year. Under the air pollution rules and regulations of the NYSDEC, Subpart 201-3, Exemptions and Trivial Activities, emergency diesel generators meeting certain operating criteria are exempt from State operating permit requirements. The rules define emergency power generating units as stationary internal combustion engines that operate as a mechanical or electrical power source only when the usual supply of power is unavailable. These sources are provided a permit exemption if they operate less than 500 hours per year for the engine, including operation during emergency situations, routine maintenance, and routine exercising (for example, test firing the engine for one hour per week to ensure reliability). During the site audit, the applicant stated that all the Nine Mile Point emergency diesel generators operate for less than 400 hours per year, therefore, emissions from these sources are not regulated under New York State's Permit Operating Program.

2.2.5 Aquatic Resources

As the most downstream of the Great Lakes, Lake Ontario is impacted by human activities occurring throughout the upstream water bodies including Lake Superior, Lake Michigan, Lake Huron, and the Lake Erie basins (NMPNS 2004e). Uses of Lake Ontario include navigation, commercial fish harvesting, sport fishing, boating, swimming, and general recreation around the lake (NMPC 1985).

The lake is approximately 306 km (190 mi) long by 80 km (50 mi) wide, with a surface area of about 19,000 km^2 (7340 mi^2). The maximum depth is 244 m (802 ft) and the mean depth is

86 m (283 ft), which is greater than the other Great Lakes, except Lake Superior. Depths of 12 to 30 m (40 to 100 ft) are within 0.6 to 1.2 km (1 to 2 mi) off the southern shore in the area of Ginna. The major source of water for the lake is Lake Erie via the Niagara River. Water flows from Lake Ontario via the St. Lawrence River to the Atlantic Ocean. The predominant surface currents in front of the station are west to east, and the flows tend to swing toward the southern shoreline (NRC 2004).

The lake depth in the vicinity of Nine Mile Point ranges from 0 to approximately 30.5 m (100 ft). The lake bottom is characterized by a series of distinct ridges, running northeast to southwest, that are part of the Rochester Basin. There is a strong resemblance between the shape of the ridges and the topography of onshore drumlin fields north of the lake. In the shallow inshore areas, the combination of wind and wave energies prevents the deposition of silt and mud except in sheltered areas. The shoreline of Lake Ontario in the vicinity of Nine Mile Point is composed of low bluffs with slip faces of sand or cobbles, with larger stones deposited at the bottom of the slope. The shoreline within Nine Mile Point's protected area has been shielded from storm surge wave action by a dike between Unit 1 and the lake, and a revetment-ditch system which extends in front of both Units 1 and 2. The front slope of the revetment-ditch system is reinforced with dolos and concrete armor units in front of Unit 2, and with rock armor in front of Unit 1. The backslope is constructed of rockfill, a layer of rock armor units, and granular filters. The top of the revetment has an elevation of 80 m (263 ft). A ditch located immediately south of the revetment collects rainfall runoff flowing north and conveys it to both ends of the revetment, where it discharges to the lake (NMPNS 2004e).

Lake Ontario has two nearby tributaries: the Little Salmon River and the Oswego River. Little Salmon River is located in the Village of Mexico, New York, approximately 16 km (10 mi) from the site and is one of ten major tributaries of Lake Ontario. It empties into Lake Ontario at Mexico Point. This river is a very productive fish spawning and nursery area. It supports large populations of resident warmwater species including brown bullhead (*Ameiurus nebulosus*), white sucker (*Catostomus commersonii*), rock bass (*Ambloplites rupestris*), largemouth bass (*Micropterus salmoides*), and northern pike (*Esox lucius*). The fish habitat extends approximately 9.7 km (6 mi) upstream to the first dam in the Village of Mexico, New York (NYSDEC 2004a).

The mouth of the Oswego River is located in Oswego, New York, approximately 6.4 km (4 mi) west of the site. This is considered an historic spawning area of the state threatened lake sturgeon (*Acipenser fulvescens*). The Oswego river area provides habitat for a variety of warmwater fish species, including alewife (*Alosa pseudoharengus*), gizzard shad (*Dorsoma cepedianum*), brown bullhead, white perch (*Morone americana*), yellow perch (*Perca flaverscens*), smallmouth bass (*Micropterus dolomieu*), largemouth bass, walleye (*Sander vitreus*), pumpkin seed (*Lepomis gibbosus*), and black crappie (*Pomoxis nigromaculatus*). Important fish and wildlife habitat includes the 2.4-km (1.5-mi) segment of river below Varick Dam and approximately 182 ha (450 ac) of Lake Ontario at the river mouth (NYSDEC 2004).

There are no natural watercourses onsite. A revetment ditch runs from the Nine Mile Point

Unit 2 cooling tower area westward and then northward to Lake Ontario. The revetment ditch receives site stormwater runoff and monitored discharges from the wastewater treatment facility and the oil retention pond.

Historically, the Lake Ontario fish community had abundant top predators offshore, such as Atlantic salmon (*Salmo salar*), lake trout (*Salvelinus namaycush*), and burbot (*Lota lota*). In the warmer nearshore waters, predator species such as yellow perch, walleye, northern pike (*Esox lucius*), and lake sturgeon were in abundance. Prey species included deepwater ciscoes (*Coregonus* spp.) and deepwater and slimy sculpins (*Myoxocephalus thompsoni* and *Cottus cognatus*, respectively) in the deeper offshore areas. The emerald shiner (*Notropis atherinoides*) and spottail shiner *(Notropis hudsonius*) were abundant as nearshore prey species (NMPNS 2004e).

Notable changes to the fish community of Lake Ontario began over 100 years ago with the arrival of several invasive fish species. Alewife, sea lamprey (*Petromyzon marinus*), and rainbow smelt (*Osmerus mordax*) colonized Lake Ontario either by introduction or as a result of migration through the New York State Canal System into the lake. Sea lampreys contributed to the collapse of multiple native fish stocks, including lake trout (NYSDEC 2003c); control measures (physical and chemical) were implemented. Alewife and rainbow smelt became overabundant by the 1960s and served as important forage species in Lake Ontario. Alewife populations decreased during the late 1990s, as the lake's water quality conditions changed to a more oligotrophic state, causing changes in the algal community. The salmonid stocking program also caused a decline in the alewife stocks (NMPNS 2004e, UWSGI 2001, NYSDEC 2003c).

The combination of predation pressure from stocked salmon and the change in the trophic structure of the lake resulted in marked declines of alewife and rainbow smelt by the early 1990s. The results of midwater trawls combined with acoustical transects conducted by NYSDEC and the Ontario Ministry of Natural Resource (OMNR) in Lake Ontario revealed an 80-percent reduction in the alewife population between October 1991 to 1994. The change in the trophic structure of the lake toward a more benthic-oriented food web, that is, zebra mussels (*Dreissena* spp.) colonization, and resultant decrease in open water plankton upon which alewife feed also affect the alewife population. The population of alewife fluctuates and has increased in some years; however, it remains lower in 2002 than in the 1980s (NMPNS 2004e).

A decline in the rainbow smelt population has also been documented, along with a more recent shift in size distribution. The combination of mid-water trawls and acoustic transects resulted in lower biomass estimates for rainbow smelt than for alewife through 1995, although a slight increase in the smelt population was noted in 1996 to 1997. There was no indication of older smelt; the population appeared to have only one spawning age-class. The year classes now present in Lake Ontario also have much smaller age-length frequencies than in the past (NMPNS 2004e).

More recent invasions of exotic fish species include the European river ruffe *(Gymnocephalus cernuus*), blueback herring (*Alosa aestivalis*), and the round goby (*Neogobius melanostomus*).

Blueback herring have not become as abundant as had been expected after their entry through the New York State Canal System, although they have been found in the Oswego area. Round goby, a natural predator of zebra mussels, has recently become established in all of the Great Lakes including Lake Ontario. They are established in Rochester, New York, approximately 81 km (50 mi) to the west and have spread eastward to the Sodus, New York area, approximately 48 km (30 mi) west of Nine Mile Point. Round goby have been collected from northeastern Lake Ontario in the Bay of Quinte, and there was an unconfirmed report of a round goby collected in eastern Lake Ontario. There are no reported occurrences near Nine Mile Point (NMPNS 2004e).

In the mid-1970s, once the sea lamprey populations were under control, Canada and the NYSDEC began lake trout restoration programs. The program was also designed to reduce the alewife population. During the mid-1970s, New York State and the Province of Ontario, Canada, instituted a salmonid stocking program of up to 8 million fish per year aimed at using the extensive forage base of alewife and smelt. For the next 20 years, this program was very successful in both developing a world-class sport fishery on Lake Ontario as well as controlling the forage fish population (NRC 2004). Atlantic salmon stocking was started in 1989 in another attempt to re-establish an absent predator species in Lake Ontario. A variety of other salmonids continue to be stocked and managed through efforts of the NYSDEC and the OMNR, including rainbow trout (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhyhnchus kisutch*).

Currently, the Lake Ontario fish community is in a dynamic state, affected by trophic changes triggered by invasive species as well as through manipulation by agency stocking programs. An imbalance of predators and prey has resulted, with the important forage species alewife and rainbow smelt at low population levels. These lakewide fluctuations in fish populations are reflected in the entrainment and impingement monitoring results for Unit 1 (NMPNS 2004e).

The phytoplankton communities have historically been diverse, while actual abundance of phytoplankton species has varied seasonally. During the 1960s to 1970s, Lake Ontario became significantly eutrophic, with a greatly heightened growth in the algal community, as a result of phosphorus loadings (from wastewater treatment discharges, urban runoff, and agricultural runoff); this productivity also increased the lake's turbidity. Federal and State water legislation (that is, CWA and GLWQA) led to nutrient load reductions and have allowed Lake Ontario's plankton to evolve back into a more balanced, oligotrophic community (NMPNS 2004e).

Shifts in the phytoplankton community structure also indicate improvement in the lake's trophic status and have closely resembled the changes in the available nutrients. However, recently invading zebra mussels have caused a redistribution of a large portion of Lake Ontario's available planktonic nutrients, from the water column to the benthic environment, and contributed to the recent measurable decrease in turbidity throughout the lake (NMPNS 2004e).

The introduced quagga mussel (*Dreissena bugensis*) and zebra mussel (*D. polymorpha*) were first recorded in Lake Ontario in late 1991 and 1989, respectively (NYSDEC 2003c). These mussels have amplified the effects of the reduced nutrient levels by filtering and clarifying the

water column throughout Lake Ontario (NMPNS 2004e). Quagga mussels widely occupy the lake bottom from the edge of the water to a depth of 122 m (400 ft). Zebra mussels are now primarily found in water less than 4.5 m (10 ft) deep (NYSDEC 2003c). The ability of these two invasive species to filter large quantities of water, sometimes exceeding two liters (0.5 gal) per day per individual mussel combined with aggregations of as many as 400,000 mussels/m^2 (37,157 mussels/ft^2), will continue to adversely impact the availability of nutrients to pelagic organisms.

While *D.* spp. populations have caused a relocation of nutrients to the benthic zone of the lake, depriving planktonic populations from these nutrients, the non-bivalve benthic invertebrate populations have benefited. This sequestering of available nutrients from the water column and from the lower food chain organisms has led to expected population shifts among the various biota levels (NMPNS 2004e; NYSDEC 2003c).

The reduction in available nutrients over the past two decades, combined with the increased penetration of light and extended, seasonal, warm water periods, have resulted in the return and increased growth of submerged aquatic vegetation, primarily filamentous *Cladophora* spp. The vegetation coverage provides protection and nursery areas for a number of invertebrate and fish species. However, it is also capable of becoming a nuisance by forming large floating mats when it is separated from the benthic substrate by turbulent currents and wave action. The mats occasionally wash ashore and decay, causing odor and aesthetic problems. Additionally, the increasing clarity of Lake Ontario water may cause a shift of some light-sensitive fish species, such as the walleye, to relocate into deeper waters (NMPNS 2004e).

There are no aquatic species Federally listed as threatened or endangered under the Endangered Species Act (ESA) in the vicinity of Nine Mile Point. Through consultation with the U.S. Fish and Wildlife Service (FWS) (NRC 2004b; FWS 2004c), no aquatic species (fish, molluscs, or aquatic plants) were identified as potentially occurring at the site or along the associated transmission corridors.

A number of aquatic species have been designated as threatened, endangered, or species of special concern by the State of New York that occur in the vicinity of Nine Mile Point. These include four fish species (Table 2-4).

Table 2-4. Aquatic Species Listed as Endangered or Threatened by New York State Potentially Occurring in Oswego and Onondaga Counties

Scientific Name	Common Name	State Status[(a)]
	FISH	
Myoxocephalus thompsoni	deepwater sculpin	E
Acipenser fulvescens	lake sturgeon	T
Erimyzon sucetta	lake chubsucker	T
Lythrurus umbratilis	redfin shiner	SC
Prosopium cylindraceum	round whitefish	E

(a) E = endangered, T = threatened, SC = species of special concern

Source: NYSDEC 2003d

The deepwater sculpin (State endangered) inhabits deep, cool water (4.4°C [40°F] or less) of mainland lakes in northern North America and historically occurred in Lake Ontario. Prior to 1980, the deepwater sculpin was abundant within Lake Ontario. It was considered extirpated from the lake until it was caught in the years 1996, 1998 and 1999 (NYSDEC 2003f). Although there is some potential for the sculpin to occur in the site vicinity, this species has not been found during lake sampling or entrainment and impingement studies for NMP (NMPNS 2004e). It spawns year round and its diet consists of small crustaceans and bottom aquatic insects. The cause for the past decline of the deepwater sculpin is unknown; however, alewife and rainbow smelt predation of deepwater sculpin eggs and larvae as well as their competition with the sculpin for other food resources are possible causes (NYSDEC 2003f).

The lake sturgeon (State threatened) primarily inhabits freshwater lakes and large rivers. It is one of New York's largest freshwater fish, with mature adults averaging between 0.9 to 1.5 m (3 to 5 ft) in length and 4.5 to 36 kg (10 to 80 lbs) in weight, and has been known to occur in Lake Ontario (NYSDEC 2003g). This species has not been observed or collected during lake sampling or entrainment and impingement studies for NMP (NMPNS 2004e). It spawns in the spring to early summer months in areas of clean, large rubble, usually at depths of 5 to 9 m (16 to 30 ft) (FAO 2000-2004). The Oswego River is considered an historic spawning area of the lake sturgeon (NYSDEC undated). The NYSDEC currently identifies only four areas with distinct and reproducing lake sturgeon populations: the St. Lawrence River downstream of Massena, New York; the Niagra River above the falls; the Niagra River below the falls; and the Grasse River in St. Lawrence County (NYSDEC 2003j). As recently as 1993, the New York State Oneida Fish Hatchery released lake sturgeon into the Oswego River (Rathje 2000). The lake sturgeon's diet includes leeches, snails, clams, other invertebrates, small fish, and algae. Reasons for the decline of the lake sturgeon may include impoundments, channelization, pollution, and overfishing (NYSDEC 2003g).

The lake chubsucker (*Erimyzon sucetta*, State threatened) inhabits natural lakes and slow water areas within large streams; the water is usually clear and vegetated with sandy or fine graveled

bottoms. It is intolerant of turbid and silty waters. It feeds on copepods, cladocerans, and chironomid (aquatic insects) larvae from the water bottom. The lake chubsucker spawns in the spring and lays eggs scattered over vegetation or gravel (NYSDEC 2003h). Although the NYSDEC states that no lake chubsuckers have been caught in New York in over 60 years (NYSDEC 2003h), one lake chubsucker was collected during Nine Mile Point lake sampling efforts in 1975, obtained during the summer at the mouth of the Salmon River (13 km [8 mi] east-northeast from the site) (NMPNS 2004e).

The redfin shiner (*Lythrurus umbratilis*, State species of special concern) is a small fish (9 cm [3.5 in.] in length) and inhabits lakes and small to medium-sized streams in a variety of ecological settings, from a slow-flowing bay to high gradient upland reaches. It typically dwells in pools but also prefers streams with a moderate or low gradient with somewhat vegetated sand and gravel bottoms. The redfin shiner spawns in spring and summer. The most recent catch of this species occurred in 1999 and 2000 in Johnson Creek (NYSDEC 2003i). This creek is a tributary of Lake Ontario approximately 18 miles NE of Lockport, NY. The mouth of Johnson Creek in Lake Ontario is over 100 miles west of NMP. The redfin shiner was collected in aquatic monitoring studies associated with the NMP; this collection occurred in 1975 and is recorded only as collected (that is, no quantity is associated with the record) (LMS 1983).

The round whitefish (*Prosopium cylindraceum*, State endangered) is a medium-sized fish, averaging 0.2-0.3 m (8-12 in) in length. The shape of the fish is long and tubular with a nearly round midsection (hence its name). Round whitefish inhabit all the Great Lakes except Lake Erie. Lake Ontario's population provides a limited commercial fishery in Ontario, Canada however the last catch in New York was in 1942. They feed at or near the bottom and eat a variety of invertebrates, small fish, and fish eggs. Round whitefish spawn in the fall (November-December) over gravel shoals of lakes or at river mouths (NYSDEC 2003k). The round whitefish is not know from the NMP site (Logan 2006). Impingement and lake sampling conducted between 1973 and 1981 did not report the presence of this species (LMS 1983).

2.2.6 Terrestrial Resources

Nine Mile Point and associated transmission line corridors are located within the Erie and Ontario Lake Plain eco-region (USFS 1994), which is characterized by flat terrain and shallow entrenchments of the primary drainage systems. The eco-region is a combination of level to gently rolling till-plain and flat lake plain. There are a few areas with broad, low ridges (glacial end moraines) that generally trend parallel to the Lake Ontario shoreline. Natural vegetation communities that occupy this region develop as a function of soil conditions and slight variations in drainage conditions and patterns. Potential vegetation communities include northern hardwood forest, beech-maple forest, and elm-ash forest. Other, regionally defined, important vegetation types include beech-maple forest, maple-basswood forest, hemlock-northern hardwood forest, oak openings, and pitch pine-heath barrens.

Pre-settlement vegetation was most likely composed of upland forest communities and wetland areas associated with riparian areas and soils with poor seasonal drainage. A tightly closed

canopy and a thick layer of humus and leaf litter characterize forest cover on productive soils, encouraging the growth of spring perennial herbs and discouraging bryophytes (Greller 1988). Forest species assemblages would have been highly influenced by the presence of sands or clays in the soil. Natural disturbances produced forest gaps that allowed early succession plant communities to form in what was generally a closed-canopy condition. Fire may have played a role in natural disturbance, but was probably not a dominant factor in controlling vegetation composition. Prior to the establishment of Nine Mile Point, extensive development and alteration of land cover and soils occurred with the establishment of Camp Oswego U.S. Military Reservation in the early 1940s (NMPNS 2004e). Prior to this major disturbance of the project area, agricultural and related settlement activities resulted in the clearing of most forested areas and the draining of wetlands for crop and forage production.

Much of the Nine Mile Point site not occupied by structures or roads consists of upland forest with some small old field and shrub land areas. Plant species in these vegetation communities include dominant trees, such as sugar maple (*Acer saccharum*), white ash *(Fraxinus americana*), quaking aspen (*Populus tremuloides*), and American beech (*Fagus grandifolia*), and a shrub layer composed of younger overstory species and woody species, such as hawthorn (*Crataegus* sp.), juneberry (*Amelanchier* sp.), and silky dogwood (*Cornus amomum*) (NMPC 1985).

As stated earlier, terrestrial communities had been impacted by past land clearing activities associated with military construction and agricultural land use, such as cropland, pasture, and orchards. With the development of Nine Mile Point, much of the area is now in varying stages of plant community succession, reverting from the previous land cover to old field communities and second-growth hardwood forest. Current conditions reflect continuing succession of old fields to secondary forest (NMPC 1985).

Currently, vegetation control at Nine Mile Point consists of managed landscaping around buildings and structures (lawn management, shrub and tree planting and selected removal, and fertilizer application). Based on discussions and observations conducted during the site audit, invasive and noxious plant species have not been identified as a problem on lands at Nine Mile Point.

Seven NYSDEC significant wetland and terrestrial habitats exist in the vicinity of Nine Mile Point and its associated transmission lines. Teal Marsh is located approximately 5.6 km (3.5 mi) west of the site on Lake Ontario. This 101-ha (250-ac) scrub-shrub and forested wetland, separated from Lake Ontario by a narrow barrier beach, is the largest area of predominately scrub-shrub wetland in the Oswego County coastal area. The number and diversity of wildlife species using the area with its diversification of marsh and wooded uplands are unusual for Oswego county (NYSDEC 2004c). This area contains interspersed marsh and wooded uplands; the number and diversity of wildlife species sited in this area are unique to Oswego County. (NYSDEC 2004c).

The nearshore area of Lake Ontario between the Salmon River and the City of Oswego is also considered significant habitat by the NYSDEC. This is an important non-breeding waterfowl winter concentration area used primarily by diving ducks. Species observed include greater scaup (*Aythya marila*), golden eye (*Bucephala clangula*), merganser (*Mergus merganser*), and, in lesser numbers canvasback (*Aythya valisineria*) and oldsquaw (*Clangula hyemalis*).

A Rare Natural Community (that is, a rich shrub fen) is located approximately 6.4 km (4 mi) south of Nine Mile Point and approximately 0.8 km (0.5 mi) west of the transmission corridor (NMPNS 2004e).

Sage Creek Marsh is located in the Town of Mexico, New York, approximately 16 km (10 mi) east of the site. This 14-ha (35-ac) streamside wetland and flood pond system developed at the point where Sage Creek empties into Lake Ontario. Vegetation in the area is dominated by narrow- and broad-leaved nonpersistent emergents, submergent aquatic beds, and wet meadows (NYSDEC 2004d).

Derby Hill is located along the southeastern shore of Lake Ontario, approximately 16 km (10 mi) east of the site and 6.4 km (4 mi) north of Mexico, New York. It is a small drumlin, containing abandoned fields, woodlots, and active agricultural lands. As the highest point of land along the shoreline of eastern Oswego County, it is within the major corridor for spring hawk, as well as other migratory birds, in New York.

Ramona Beach Marsh is located 8 km (5 mi) west of the Village of Pulaski (Richland), New York, approximately 48 km (30 mi) east of the site. This 28-ha (70-ac) emergent wetland developed at the point where the Snake Creek empties into Lake Ontario. It is dominated by narrow-and broad-leaved persistent emergents; it also has scrub-scrub wetland and submergent aquatic beds.

Butterfly Creek Wetlands is located approximately 6.4 km (4 mi) northwest of the Village of Mexico (New Haven), New York, on the shoreline of Lake Ontario, approximately 9.7 km (6 mi) east of the site. This 152-ha (375-ac) wetland, separated from Lake Ontario by a narrow barrier beach, is the second largest wetland area within Oswego County's coastal zone. The concentrations of many wetland wildlife species are among the largest in this county and represent an unusual concentration for Lake Ontario.

No formal wetland delineations or surveys have been conducted for the Nine Mile Point site. However, based on mapping conducted by the FWS (1982) under the National Wetland Inventory (NWI) and surveys conducted by the State of New York, it has been estimated that approximately seven percent of Nine Mile Point is occupied by wetlands (NMPNS 2004e). A land use analysis conducted for the Unit 2 license application estimated that the site contained approximately 24 ha (60 acres) of permanent wetlands (NMPC 1985). These wetland communities are most likely an outcome of relatively impermeable glacial till soils that allow perched groundwater to lie at or near ground surface seasonally or during years of above average precipitation (NMPNS 2004e).

The NWI maps show that wetlands at Nine Mile Point occur as numerous small landscape features with many existing independently of surface streams or drainage systems (FWS 1982). Both the isolated wetlands and those associated with intermittent drainages are located primarily on the undeveloped portion of the site. The wetlands primarily occur within the northern and western portion of the forested area north of Lake Road and in forested areas south of Lake Road, with the exception of the area around and in the firing range. The State-designated wetlands lie entirely south of Lake Road and are all designated Class II wetlands in accordance with criteria set forth in the New York Code of Rules and Regulations (NYCRR) in 6 NYCRR Part 664.5 (NMPNS 2004e).

The types of animal species found on Nine Mile Point are representative of those populations found within the disturbed landscapes of the lower Great Lakes region. The most common small mammals trapped in the 1979 survey of the site were the white-footed mouse (*Peromyscus leucopus*) and the deer mouse (*P. maniculatus*) (NMPC 1985). Other mammals confirmed to be present as a result of these field studies included woodchuck (*Marmota monax*), meadow jumping mouse (*Zapus hudsonius*), meadow vole (*Microtus pennsylvanicus*), red squirrel (*Tamiasciurus hudsonicus*), and white-tailed deer *(Odocoileus virginianus*). Of the 40 species of reptiles and amphibians believed to inhabit Oswego County, only 21 have been observed in the coastal zone (NMPC 1985). During the 1979 survey, wood frogs (*Rana sylvatica*) were observed in mixed hardwood forest, and northern leopard frogs (*R. pipiens*) were observed in wetlands located in disturbed areas. Because no wetland delineation has been conducted for Nine Mile Point, a site-specific species list or wetland characterization is not available.

The array of different habitat types and conditions within the near-shore land and water areas of southern Lake Ontario, including the coastal zone of Oswego County, supports a large number of avian species. In addition, the region is part of the Atlantic Flyway, so avian species abundance and diversity increase with the influx of spring and fall migrants. The diversity and number of bird species in the region were reflected at Nine Mile Point when 69 bird species were observed on and near the site during a roadside count and breeding bird census conducted in 1976 (NMPC 1985). During the winter, large numbers of waterfowl congregate along the Lake Ontario shoreline.

The arrival of the zebra mussel (*Dreissena polymorpha*) in the Great Lakes, including Lake Ontario, provided an excellent food source for over-wintering diving ducks, including greater scaup (*Aytha marila*) and lesser scaup (*Aythya affinis*) (Custer and Custer 1996). For example, Mitchell and Carlson (1993) reported that, of 19 of 21 lesser scaups (*Aythya affinis*) entrained into a power plant in Michigan, nearly 100 percent contained zebra mussels. On January 28, 2000, it was documented that Nine Mile Point Unit 1 had impinged approximately 100 greater and lesser scaup ducks in the screenwall building (NMPC 2000). At the time, it was estimated that approximately 500 to 700 ducks were rafting in the vicinity of the Unit 1 intake structure. The ducks had apparently been feeding on zebra mussels located on or near the intake structures. At the time of the event, the plant had been placed on reverse flow condition for deicing of the hexagonal intake structure. As a result of this incident, all intake structures

now undergo annual cleaning to remove zebra mussels (the food source), and reverse flow conditions are scheduled during periods when diving duck feeding is limited (NMPC 2000).

The 42-km (26-mi) transmission corridor from the Scriba to Clay substations is primarily in Oswego County, with a small portion extending into Onondaga County. Forest and brush land are the major vegetation cover types that occur along the Scriba to Volney portion of the corridor (NMPNS 2004e). Agriculture occupies a small percentage of the land along the corridor. This contrasts with the Volney to Clay portion of the corridor where large areas of active and abandoned agricultural land, forest, and wetlands occur. A detailed description of the plant communities found along the Scriba to Clay corridor can be found in the Article VII Application report prepared for the Independence Station-Clay 345 kV Transmission Line Project (NMPC 1992). The Article VII Application report also includes an assessment of the wildlife species found or that could occur in the habitats along the corridor (NMPC 1992).

Terrestrial species that are listed by the FWS and the State of New York and have the potential to occur in the vicinity of Nine Mile Point or along the transmission corridors are presented in Table 2-5. Based on range and habitat information (Table 2-5), only the following Federally listed terrestrial wildlife species have any reasonable potential to occur in Oswego or Onondaga counties: Indiana bat (*Myotis sodalis*) and piping plover (*Charadrius melodus*), both listed as endangered; bog turtle (*Clemmys muhlenbergii*) and bald eagle (*Haliaeetus leucocephalus*), both listed as threatened; and possibly the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*), which is a candidate species. However, recent correspondence from the FWS indicates that none of these species, with the exception of the Indiana bat and occasional transient individuals of bald eagle and piping plover, are likely to occur on the Nine Mile Point site or along the Nine Mile Point to Clay transmission corridor (NMPNS 2004e, FWS 2004c). This determination confirms previous findings for the Nine Mile Point site (NMPC 1985) and the Scriba to Clay transmission corridor (NMPC 1992).

Table 2-5. Terrestrial Species Listed as Endangered or Threatened by the U.S. Fish and Wildlife Service and Species that are Candidates for Listing as Threatened or Endangered that Occur or Potentially Occur within Oswego and Onondaga Counties

Scientific Name	Common Name	Federal Status[(a)]
	REPTILES	
Clemmys muhlenbergii	bog turtle	T
Sistrurus catenatus catenatus	massasauga rattlesnake	C
	BIRDS	
Charadrius melodus	piping plover	E
Haliaeetus leucocephalus	bald eagle	T
	MAMMALS	
Myotis sodalis	Indiana bat	E
	PLANTS	
Asplenium scolopendrium var. *americanum*	American Hart's-tongue fern	T
Isotria medeoloides	small whorled pogonia	T

(a) E = endangered, T = threatened, C = candidate for Federal listing

Source: NMPNS 2004e, FWS 2004d

The northern population of the bog turtle (*Cemmys muhlenbergii*) was listed as a threatened species on November 4, 1997. This population is currently known to occur at 37 sites in New York State (FWS 2001). The greatest threats to its survival include the loss, degradation, and fragmentation of its habitat, compounded by the take of long-lived adult animals from wild populations for illegal wildlife trade. Bog turtles usually occur in small, discrete populations, generally occupying open-canopy, herbaceous sedge meadows and fens bordered by wooded areas. These wetlands include micro-habitats of dry pockets, saturated areas, and areas that are periodically flooded. Bog turtles depend upon this diversity of micro-habitats for foraging, nesting, basking, hibernation, and shelter (FWS 2001). The bog turtle's range in New York is currently considered limited to the lower Hudson River and Housatonic River drainages in the state's southeastern corner, and to one site in the Finger Lakes area of western New York (FWS 1997b). However, the NYSDEC notes that there are a series of bog turtle populations in the Lake Ontario basin (NYSDEC 2003a). The *New York State Amphibian and Reptile Atlas* (maps with 1990 to 1998 species occurrence data) notes an occurrence of the bog turtle in southwestern Oswego County (NYSDEC 2003b). No bog turtles have been noted at Nine Mile Point or within its vicinity or along its transmission lines (NMPNS 2004e).

The eastern massasauga rattlesnake is currently a candidate for Federal listing. The central New York region represents the eastern extent of its range in the U.S. Throughout much of its range in the eastern U.S., massasauga rattlesnakes are found in wet prairies, sedge meadows, and early successional fields. Preferred wetland habitats are marshes and fens. They avoid open water and seem to prefer the cover of broad-leafed plants, emergents, and sedges. Natural succession of woody vegetation is a leading cause of recent habitat deterioration

throughout its range. Intensive management to retard woody vegetation growth is necessary to maintain suitable habitat conditions. The massasauga is not a forest-dwelling species, and forests impede their movements and dispersal (Ohio Department of Natural Resources 2004). Although Onondaga County is listed by the FWS as one of the eastern massasauga rattlesnake's current counties of occurrence, the FWS indicates that it is not likely to occur in the vicinity of Nine Mile Point or within habitats associated with the transmission lines (FWS 2004c). The *New York State Amphibian and Reptile Atlas* notes an occurrence of the eastern massasauga snake on the border of southeastern Oswego County and northeastern Onondaga County (NYSDEC 2003b). This species has not been observed at Nine Mile Point nor along its transmission line rights-of-way (NMPNS 2004e).

The piping plover is a small, stocky, sandy-colored bird resembling a sandpiper. The adult has yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of its neck. The piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. These birds winter primarily on the Atlantic coast from North Carolina to Florida, although some migrate to the Bahamas and West Indies. Piping plovers return to their breeding grounds in late March or early April. Following establishment of nesting territories and courtship rituals, the pair forms a depression in the sand somewhere on the high beach close to the dunes. The nest is sometimes lined with small stones or fragments of shell (FWS 2003). The piping plover is a transient species and not found in the vicinity of Nine Mile Point or associated rights-of-way.

The bald eagle is a large, powerful, black bird with a white head and tail. Females generally weigh up to 6.3 kg (14 lbs) and have a wingspan up to 2.4 m (8 ft). Males are smaller, weighing 3 to 4.5 kg (7 to 10 lbs) with a wingspan of 2.0 m (6.5 ft). Young bald eagles are mostly dark brown until they reach four to six years of age and may be confused with the golden eagle. The bird's life span in the wild can reach 30 years. Bald eagles mate for life and build huge nests in the tops of large trees near rivers, lakes, and marshes. Nests, which are usually re-used and enlarged every year, can reach 20 feet across and weigh up to 1800 kg (4000 lbs). The birds travel over great distances, but normally return to nest within 160 km (100 mi) of where they were originally raised. Nesting bald eagle pairs now number over 5700 in the continental U.S. (FWS 2004b). The bald eagle is a transient species and not found in the vicinity of Nine Mile Point or associated rights-of-way.

The Indiana bat is a medium-sized myotis, closely resembling the little brown bat *(Myotis lucifugus*) but differing in coloration. The fur of the Indiana bat is a dull, grayish chestnut, with the basal portion back hairs a dull, lead color. The diet has not been well characterized beyond the fact that it consists of insects. Females and juveniles forage in the airspace near the foliage of riparian and flood plain trees. Males forage the densely wooded area at tree-top height. Suitable summer roosting or maternal habitat are dead or living trees greater than or equal to 13 cm (5 in.) diameter at breast height that have exfoliating or defoliating bark, cracks, crevices, or holes. Forested wetland areas, including ponds and impoundments provide suitable foraging areas. The Indiana bat occurs in the midwest and eastern U.S. from the western edge of the Ozark region in Oklahoma, to southern Wisconsin, east to Vermont, and as far south as

northern Florida (FWS 1991). The Indiana bat is known to occur at hibernacula in Onondaga and Oswego counties, New York at distances of 29.8 km (18.5 mi) and 61.2 km (38 mi) from Nine Mile Point, respectively (FWS 2004c). Based on the distance that Indiana bats normally travel, it is possible that Indiana bats could reside at the facility, if suitable habitat is present.

Hart's-tongue fern is found in close association with outcrops of dolomitic limestone, in coulees, gorges, and cool limestone sinkholes in mature hardwood forests. It requires high humidity and deep shade provided by mature forest canopies or overhanging rock cliffs. It prefers soils high in magnesium (FWS 1997a). Even under undisturbed conditions, these habitat requirements occur rarely and result, even under undisturbed conditions, in only small isolated populations of Hart's-tongue fern in the eastern U.S. Occurrences of this species at the Nine Mile Point site or associated transmission corridors has not been documented.

Small whorled pogonia is a perennial with long, pubescent roots and a smooth, hollow stem 9.5 to 25 cm (3.7 to 9.9 in.) tall terminating in a whorl of five or six light green, elliptical leaves that are somewhat pointed and measure up to 8 by 4 cm (3.2 by 1.6 in.). A flower, or occasionally two flowers, is produced at the top of the stem. This species is generally found in open, dry, deciduous woods with acidic soil. It occurs in habitat where there is relatively high shrub coverage or high sapling density; flowering appears to be inhibited in dense shade. Most Northern U.S. populations are centered in the foothills of the Appalachian Mountains in New England and northern coastal Massachusetts (FWS 1996). Occurrence at the Nine Mile Point site or associated rights-of-way has not been documented.

Based on site-specific information received from the FWS (NMPNS 2004e; FWS 2004c), there are no Federally listed plant species in the vicinity of Nine Mile Point or the associated transmission corridors. However, the Federally protected American Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) is noted by the New York Natural Heritage Program data base as having documented occurrence in Onondaga County (Young and Weldy 2004). The southern portion of the Scriba to Clay transmission corridor extends into Onondaga County. However, no Federally listed plant species were noted as occurring along the Scriba to Clay transmission corridor in the Article VII application for the Independence Station - Clay line, which utilizes this corridor (NMPC 1992). In addition, the FWS did not indicate that this plant was present on the project site, including the corridor portion of the project (NMPNS 2004e; FWS 2004c). Table 2-6 lists State of New York listed species that may be found on or near the vicinity of the Nine Mile Point site and associated rights-of-way.

Table 2-6. Terrestrial Species Listed by the State of New York as Endangered, Threatened, or of Special Concern that Have Been Reported to Occur or Potentially to Occur within the Nine Mile Point Site or the Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	State Status[(a)]
	REPTILES AND AMPHIBIANS	
Crotalus horridus	timber rattlesnake	T
Ambystoma jeffersonianum	Jefferson salamander	SC
Ambystoma laterale	blue-spotted salamander	SC
Clemmys guttata	spotted turtle	SC
Clemmys insculpta	wood turtle	SC
	BIRDS	
Aquila chrysaetos	golden eagle	E
Falco peregrinus	peregrine falcon	E
Lanius ludovicianus	loggerhead shrike	E
Chlidonias niger	black tern	E
Asio flammeus	short-eared owl	E
Podilymbus podiceps	pied-billed grebe	T
Ixobrychus exilis	least bittern	T
Circus cyaneus	northern harrier	T
Bartramia longicauda	upland sandpiper	T
Sterna hirundo	common tern	T
Cistothorus platensis	sedge wren	T
Ammodramus henslowii	Henslow's sparrow	T
Gavia immer	common loon	SC
Pandion haliaetus	osprey	SC
Buteo lineatus	red-shouldered hawk	SC
Accipiter striatus	sharp-shinned hawk	SC
Accipiter cooperii	Cooper's hawk	SC
Chordeiles minor	common nighthawk	SC
Melanerpes erythrocephalus	red-headed woodpecker	SC
Eremophila alpestris	horned lark	SC
Vermivora chrysoptera	golden-winged warbler	SC
Dendroica cerulea	cerulean warbler	SC
Pooecetes gramineus	vesper sparrow	SC
Ammodramus savannarum	grasshopper sparrow	SC
	MAMMALS	
Myotis leibii	small-footed bat	SC
	PLANTS	
Lycopodium complanatum	northern running pine	E

Scientific Name	Common Name	State Status[(a)]
Trillium flexipes	nodding trillium	E
Trillium sessile	toad-shade	E
Eleocharis quadrangulata	angled spikerush	E
Eleocharis obtuse var. *ovata*	blunt spikerush	E
Scirpus heterochaetus	slender bulrush	E
Polygonum setaceum var. *interjectum*	swamp smartweed	E
Polystichum archostichoides	Christmas fern	SC
Thelypteris noveboracensis	New York fern	SC
Trillium spp.	trillium	SC
Carex chordorrhiza	creeping sedge	T
Cypripedium arietinum	giant pine-drops	E
Desmodium ciliare	little-leaf tick-trefoil	T

(a) E = endangered, T = threatened, SC = species of special concern in New York

Source: NMPNS 2004e, NYDFWMR 2004

The northern running-pine (*Lycopodium complanatum*) is listed as endangered by the State of New York (Young and Weldy 2004), and it was recorded as occurring on the Unit 2 site or environs during the 1979 field study (NMPC 1985). At the time of the 1979 survey, three other plants found on or near the site were listed as protected: Christmas fern (*Polystichum arcrostichoides*), New York fern (*Thelypteris noveboracensis*), and trillum *(Trillium* spp.). Christmas fern, New York fern, and several species of trillium remain protected, but not listed as threatened or endangered, because they are vulnerable to exploitation under the New York State Environmental Conservation Law (Section 9-1503).

The timber rattlesnake (*Crotalus horridus*), a State-listed threatened species that was identified as likely to occur on the Nine Mile Point site or surrounding area, has been found more recently not to have reasonable occurrence potential (NMPNS 2004e). Timber rattlesnakes are active from late April until mid-October, although they may not emerge until mid-May in northern New York (Brown 1993). Timber rattlesnakes are generally found in deciduous forests in rugged terrain. In the summer, pregnant females seem to prefer open, rocky ledges where temperatures are higher, while the males and non-gravid females seem to prefer cooler, thicker woods where the forest canopy is more closed. This rattler feeds primarily on small mammals, but occasionally takes small birds, amphibians, and other snakes.

Several species designated as species of special concern by New York State have some potential to occur in the general vicinity of Nine Mile Point or associated transmission corridor based on range information from previous assessments of Nine Mile Point (NMPNS 2004e). Included are three species likely to occur as transients: common loon (*Gavia immer*), osprey (*Pandion haliaetus*), and small-footed bat (*Myotis leibii*). Amphibians and reptiles currently listed by New York State as species of special concern noted as likely to occur in the vicinity of Nine Mile Point include Jefferson salamander *(Ambystoma jeffersonianum*), blue-spotted

salamander (*Ambystoma laterale*), spotted turtle (*Clemmys guttata*), and wood turtle (*C. insculpta*) (Table 2-5). Avian species of special concern that may breed in the general vicinity of the site or transmission line corridor and noted in previous assessments of Nine Mile Point include red-shouldered hawk (*Buteo lineatus*), sharp-shinned hawk (*Accipiter striatus*), cooper's hawk (*A. cooperii*), common nighthawk (*Chordeiles minor*), red-headed woodpecker (*Melanerpes erythrocephalus*), horned lark (*Eremophila alpestris*), golden-winged warbler (*Vermivora chrysoptera*), cerulean warbler (*Dendroica cerulea*), vesper sparrow (*Pooecetes gramineus*), and grasshopper sparrow (*Ammodramus savannarum*).

The only state species of special concern terrestrial species observed at Nine Mile Point during monitoring were the cerulean warbler and golden-winged warbler, both observed in the general site area during 1979 field surveys (NMPC 1985). The cerulean warbler inhabits wet woodlands, which occur on the Nine Mile Point site. The golden-winged warbler is a ground nester found in overgrown pastures and briery woodland borders and would likely be expected to occur on or near the transmission corridor.

2.2.7 Radiological Impacts

NMPNS conducts a radiological environmental monitoring program (REMP) at Nine Mile Point. Through this program, radiological impacts to workers, the public, and the environment are monitored, documented, and compared to the appropriate standards. The objectives of the REMP are to:

- provide representative measurements of radiation and radioactive materials in the exposure pathways and of the radionuclides that have the potential for significant radiation exposures to the public.

- supplement the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of effluent measurements and the modeling of the environmental exposure pathways.

Radiological releases are summarized in the Annual Radioactive Effluent Release Reports for Unit 1 (e.g., NMPNS 2005a, 2004a) and Unit 2 (e.g., NMPNS 2005b, 2004b). The limits for all radiological releases are specified in the Nine Mile Point Nuclear Station ODCMs (e.g., NMPNS 2003a,b), and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the aquatic environment (fish, invertebrates, and shoreline sediment), atmospheric environment (airborne radioiodine, gross beta, and gamma), terrestrial environment (vegetation), farm products (e.g., milk and vegetables) and direct radiation. The results of REMP are summarized in the Annual Radiological Environmental Operating Reports (e.g., NMPNS 2005c, 2004c)

NMPNS's review of historical data on releases and the resultant dose calculations showed that the doses to maximally exposed individuals in the vicinity of Nine Mile Point have been a small

fraction of the limits specified in the ODCMs (NMPNS 2003a,b) to meet Environmental Protection Agency (EPA) radiation standards in 40 CFR Part 190. For 2004, dose estimates were calculated based on actual liquid and gaseous effluent release data (NMPNS 2005a,b). Calculations were performed by NMPNS using the plant effluent release data, onsite meteorological data, and appropriate pathways identified in the ODCMs (NMPNS 2003a,b).

An assessment of the radiation dose potentially received by a member of the public due to the individual's activities both inside and outside of the Nine Mile Point site boundary was performed by NMPNS. The individual's activities, locations and other exposure parameters were selected in such a way that the estimated doses would be maximized; that is, the dose actually received by a member of the public would most likely be less than the estimated dose.

Prior to September 11, 2001, the public had access to the Energy Information Center on the Nine Mile Point site for purposes of observing the educational displays or for picnicking and associated activities. In addition, fishing was an activity that occurred near the shoreline adjacent to Nine Mile Point. This activity resulted in the potential maximum dose received by a member of the public. Following September 11, 2001, public access to the Energy Information Center has been restricted and fishing by members of the public at locations onsite is prohibited. Although fishing was not conducted in 2004, the annual dose to a hypothetical fisherman was still evaluated to provide continuity of data from prior years.

The maximum dose that could have been potentially received by a member of the public due to his or her activities within the site boundary was estimated to be approximately 0.0036 mSv (0.36 mrem) to the whole body in 2004. This dose includes the individual's exposure to both NMP as well as the James A. FitzPatrick Nuclear Power Plant, which is located just to the east of the Nine Mile Point units. Approximately 99 percent of this dose is due to direct radiation pathway which consists of four components: direct radiation from the reactor facilities, direct radiation from any possible overhead plume (gaseous releases), direct radiation from ground deposition, and direct radiation from plume submersion (gaseous releases). The individual's maximum organ dose (to the lungs), resulting mainly from the inhalation of gaseous effluents from the NMP, was estimated to be 0.000009 mSv (0.0009 mrem).

An assessment of the radiation dose potentially received by a member of the public living in the vicinity of the Nine Mile Point reactors (outside of the site boundary) during 2004 was also performed by NMPNS. The individual's location, meteorological conditions, and other exposure parameters such as dietary habits were selected in such a way that the estimated doses would be maximized, that is, would be greater than any actual doses potentially received by any individual living near the plants. Liquid and gaseous releases from all three operating plants (NMP and James A. FitzPatrick) as well as direct radiation exposures to all three plants were considered. Based on these considerations, the maximum annual dose potentially received by the most likely exposed member of the public during 2004 was estimated to be 0.0018 mSv (0.18 mrem) to the whole body. About 89 percent of this dose was due to direct radiation from the reactor facilities, from any plumes of gaseous releases, and from any radionuclides deposited on the ground. The individual's maximum organ dose resulting mainly from the

inhalation of gaseous effluents from the three plants was estimated to be 0.0011 mSv (0.11 mrem); this dose was to the thyroid.

Based on the values reported in the annual and semiannual RERRs for the two units over the five-year period from 2000 through 2004 (NMPNS 2005a,b; 2004a,b; 2003d,e; 2002b,c; 2001a–c; 2000a,b), the average of the maximum annual whole-body dose for a member of the public due to his or her activities inside the site boundary was calculated to be 0.0038 mSv (0.38 mrem). The maximum organ dose for the same individual was estimated to be in the range of 6.3×10^{-6} mSv (6.3×10^{-4} mrem) to 4.1×10^{-5} mSv (4.1×10^{-3} mrem), and the organ identified was either the lungs or the thyroid. Over the same period, the average annual maximum whole-body dose received by a member of the public outside the site boundary was estimated to be 0.0059 mSv (0.59 mrem). The average annual maximum organ dose was calculated to be 0.0023 mSv (0.23 mrem), and the organ identified was the thyroid.

The NMPNS ODCMs (NMPNS 2003a,b) and 40 CFR Part 190 limit the total dose to members of the public due to radiation and radioactivity from uranium fuel cycle sources to less than 0.25 mSv (25 mrem) to the whole body or any organ other than thyroid and to less than 0.75 mSv (75 mrem) to the thyroid for a calendar year. Therefore, doses from NMP are only a small fraction of the regulatory limits.

The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from NMP operations during the renewal period; therefore, the radiological impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the Nine Mile Point Nuclear Station License Renewal Application Environmental Report (ER) (NMPNS 2004e) and information received from meetings with local and regional agencies. The following sections describe the housing market, public services, (including water supply, education and transportation), land use, demographics, and the economy in the region surrounding Nine Mile Point.

2.2.8.1 Housing

Nine Mile Point (NMPNS) employs a permanent workforce of approximately 1281 employees (NMPNS 2004e). Approximately 73 percent of the permanent workforce lives in Oswego County and 23 percent lives in Onondaga County (Table 2-7). Both counties are located within the Syracuse Metropolitan Statistical Area (MSA), which also includes Cayuga and Madison counties. The remaining employees live in various other locations. Given the residential locations of NMPNS employees, the most significant impacts of plant operations are likely to occur in Oswego County and Onondaga County. The focus of the analysis in the SEIS is on the impacts of NMPNS in these two counties.

Table 2-7. Nine Mile Point Nuclear Station Employee Residence Information by County

County	Number of Personnel	Percent of Total
Oswego	931	73
Onondaga	298	23
Other counties	52	4
Total	1281	100

Source: NMPNS 2004e

NMPNS refuels each unit at 24-month intervals with one outage scheduled every 12 months. During refueling outages, site employment increases by between 1000 and 1250 workers for 30 to 40 days. Most of these workers are assumed to be located in the same geographic areas as permanent site workers.

The number of housing units and housing vacancies for Oswego and Onondaga counties are shown in Table 2-8. In Oswego County, the total number of housing units and the number of occupied units grew at an annual average rate of 0.8 percent and 0.7 percent, respectively, over the period 1990 to 2000. With an annual average population growth rate of less than 0.1 percent during this period, the number of units available grew faster than housing demand, leading to an annual growth rate in the number of available vacant units of 1.8 percent. In Onondaga County, the total number of housing units grew at an annual average rate of 0.3 percent over the period 1990 to 2000, while average annual growth in occupied units was slightly less at 0.2 percent. With an annual average population growth rate of -0.2 percent in the county over this period, vacant housing grew at an annual rate of 1.8 percent over this period. In Oswego County, the overall vacancy rate was 13.8 percent in 2000; in Onondaga County, the rate was lower at 7.9 percent.

Table 2-8. Housing Units and Housing Units Vacant (Available) by County during 1990 and 2000

	1990	2000	Percentage Change
OSWEGO COUNTY			
Housing Units	48,548	52,831	+8.8
Occupied Units	42,434	45,522	+7.3
Vacant Units	6114	7309	+19.5
ONONDAGA COUNTY			
Housing Units	190,878	196,633	+3.0
Occupied Units	177,898	181,153	+1.8
Vacant Units	12,980	15,480	+19.3

Source: USCB 2005a

2.2.8.2 Public Services

Discussion of public services includes water supply, education, and transportation.

- **Water Supply**

Since water resources in Oswego County would be most impacted by the re-licensing of NMPNS, the discussion on water supply is largely limited to this area. Slightly more than half of the county population receives potable water from one of Oswego County's 29 public water districts, with the remaining population receiving water from private groundwater wells (NMPNS 2004e). Public water districts in the county obtain their water from either Lake Ontario or through a variety of groundwater aquifers and springs and the Onondaga County Water Authority (OCWA) (OCDPCD 1997). Public water suppliers draw water from three principal groundwater aquifers (the Sand Ridge Aquifer, the Fulton Aquifer, and the Tug Hill Aquifer) with substantial groundwater resources available from other local or regional aquifers that have been largely unused (OCDPCD 1997). Table 2.9 summarizes the daily water consumption and areas served by each water system in Oswego County.

Table 2-9. Major Public Water Supply Systems in Oswego County

Water Supplier	Average Daily Use million L/day (million gpd)	Maximum Daily Capacity million L/day (million gpd)
Oswego Water System	30.2 (8.0)	76.0 (20.1)
City of Fulton	9.1 (2.4)	9.1 (2.4)
Metropolitan Water Board	94.5 (25)	236.2 (62.5)

Source: NMPNS 2004e

The Oswego Water System (OWS) provides water service to approximately 23,950 customers in Oswego, Minetto, Scriba, and Volney, and provides potable water to NMPNS (OCDPCD 1997). Current plant usage averages 651,000 L/day (172,000 gpd) with no restrictions on supply (see Section 3.1.3.3). While OWS could potentially withdraw up to approximately 237 million L/day (62.5 million gpd) from Lake Ontario, the design capacity of the water plant is only 76 million L/day (20.1 million gpd) (OCDPCD 1997). County planning officials estimate that the capacity of the OWS is adequate to meet the demands of an additional 4000 to 8000 residential customers (OCDPCD 1997).

The City of Fulton serves approximately 12,900 customers (OCDPCD 1997). The city has ten groundwater wells extracting up to 9.1 million L/day (2.4 million gpd). As average daily demand exceeds supply in the city, the City of Fulton has an agreement with the OCWA to obtain up to 11 million L/day (3 million gpd) to cover the extra demand (OCDPCD 1997). The Metropolitan Water Board (MWB) functions as a potable water wholesaler to public water districts and water

authorities in both Oswego and Onondaga counties. Most of the MWB's water is sold to the OCWA, with 25 percent of its pipeline capacity available to Oswego County. While the capacity of MWB is 230 million L/day (60 million gpd), the MWB withdrew an average of only 95 million L/day (25 million gpd) in 1998, of which 760,000 L/day (200,000 gpd) was provided to communities in Oswego County. The MWB therefore has large excess capacity to support future growth in the county (OCDPCD 1997).

- **Education**

NMPNS is located in the City of Oswego School District, which had an enrollment of 4,974 students in 2003. Expenditures were $11,098 per student (USCB 2005c).

Including the Oswego City School District, Oswego County contains nine school districts. In 2003, there were 24,836 students enrolled in schools in the district with an average class size of 13.3 students. In 2003, the average expenditure per student was $10,817 (USCB 2005c). These numbers are comparable to Onondaga County where average class size was 13.5 in 2003 and the schools spent an average of $10,287 per student.

The State University of New York (SUNY), Oswego is located west of the City of Oswego. The 280-ha (690-ac) campus houses approximately 8500 students and employs over 1000 full-time faculty and staff.

- **Transportation**

Lake Road (County Route 1A) provides primary road access to Nine Mile Point. Lake Road is a two-lane paved roadway that runs east of the intersection of County Route 1A and Lakeview Road, approximately 1.6 km (1 mi) from the site. Lake Road connects with County Route 29 west of the site but through traffic is restricted. County Road 1 intersects with both County Route 1A and Lakeview Road in the site vicinity (see Figure 2-3). These other access roads are also two-lane paved roadways and Oswego County Public Works staff considers each of these roads to be in good condition (Baldwin 2002). According to the Oswego County Planning and Community Development Department, the average daily traffic count for County Route 1A from County Route 1 to Lakeview Road was 4900 vehicles in 1995 (EarthTech 2000).

A capacity analysis of area intersections was performed as part of an application for a proposed gas turbine power plant to be located on Lake Ontario, approximately 3.2 km (2 mi) west of NMPNS. In the study area, intersections were found to exhibit acceptable operating conditions with the exception of the Route 1 eastbound approach at Route1/Route 1A during the morning peak conditions (EarthTech 2000). In addition to the study completed for the proposed plant, the Oswego County Department of Public Works reviewed traffic patterns for the major roads around the NMPNS as part of a reconstruction project for Route 1A. The County determined that traffic counts were within acceptable levels (Baldwin 2004).

2.2.8.3 Offsite Land Use

The majority of Oswego County is rural in nature, with 55 percent of land classified as vacant, forested, or used for agriculture (Table 2-10). Residential uses account for 36 percent of all land in the county with industrial and commercial activities occupying only 3 percent of available land (OCPPCD 1997). Residential growth has been strongest in towns in southern Oswego County, and the Town of Scriba in northern Oswego County. Oswego county also contains one of the largest areas of wetlands in the state (CNYRPDB 2003). Commercial and industrial land uses have centered on the cities of Oswego and Fulton and their surrounding areas in adjoining towns. The Town of Scriba is one of the industrial centers of Oswego County, particularly for energy production. In addition to Nine Mile Point and the adjacent James A. FitzPatrick Nuclear Power Plant, Sithe Industries operates Independence Station, a 1042-MW(e) natural gas fueled power plant. The 77 ha (190 ac) site is located approximately 3 km (2 mi) from NMPNS (NMPNS 2004e).

Onondaga County is more developed than Oswego County, as both residential and commercial land uses increase in towns and villages surrounding Syracuse (CNYRPDB 2003). Growth has been steady throughout Onondaga County, except in the county's southern towns, where the lack of infrastructure and public water availability have limited growth. Agriculture remains a significant land use in southern Onondaga County (Table 2-10) (NMPNS 2004e). Forests in the southern portion of the county are mostly natural and reforested areas owned by the county or state.

Seventeen state parks and one national wildlife refuge are located within a 80-km (50-mi) radius of NMPNS. The Montezuma National Wildlife Refuge is located north of Cayuga Lake in Seneca County, approximately 71 km (44 mi) southwest of Nine Mile Point. Approximately twenty State Wildlife Management Areas (SWMAs) are also located within a 80-km (50-mile) radius of Nine Mile Point (NMPNS 2004e).

In order to accommodate and regulate growth and development, Onondaga and Oswego counties have developed county-specific comprehensive growth management plans characterizing current conditions and setting standards, regulations, and goals for land use and development. Neither county implements growth control measures that limit residential housing development. Land use planning and zoning regulations are primarily developed by the towns, villages, and municipalities located within Oswego and Onondaga counties, meaning that land use standards may vary across each county (NMPNS 2004e).

Table 2-10. Land Use in Oswego (1995) and Onondaga (2004) Counties, New York

Land Use	Percent of Total
OSWEGO COUNTY	
Agriculture, forested and vacant	55
Residential	36
Public	6
Commercial and Industrial	3
ONONDAGA COUNTY	
Agriculture, forested and vacant	51
Residential	29
Public	10
Commercial and Industrial	10

Source: OCPPCD 1997; Kitney 2004

2.2.8.4 Visual Aesthetics and Noise

Nine Mile Point Units 1 and 2 and their supporting structures can be seen from the immediate surrounding area, from County Road 1, and by recreational users on Lake Ontario. The steam plume is visible from the Town of Scriba and Highway 104. The most visible features of Nine Mile Point are the cooling tower at 165 m (541 ft), exhaust stacks, auxillary buildings, the containment structures, and the transmission lines connecting to the Nine Mile Point substations. Onsite, the ground surface is generally flat and slopes gently to the north toward Lake Ontario. The Nine Mile Point site is also visible from Lake Ontario, County Road 1, and Highway 104 at night because of outside lighting used on the exhaust stacks, cooling tower, and the meteorological towers (NMPNS 2004b).

Currently, there are no reports of noise complaints from the areas surrounding the Nine Mile Point facility nor by recreational users of Lake Ontario. Additionally, noise concerns have not been reported by residents of the nearby Bible Camp Retreat or the closest Lake Road residence, located 1.6 km (1 mi) south-southeast of Nine Mile Point. EPA recommends that noise levels for residential areas in the boundary of an industrial facility should not exceed an annual equivalent sound level of 55 decibels. With the exception of the cooling tower, all other significant noise producing equipment are located inside buildings. There is no expected increase in cooling tower noise levels associated with the proposed license renewal activities.

2.2.8.5 Demography

In 2000, there were 109,440 persons living within 32 km (20 mi) of NMPNS, with a population density of 87 persons per square mile within 32 km (20 mi). There are 914,668 persons living within 80 km (50 mi) of NMPNS. This equates to a population density of 117 persons per square mile within 80 km (50 mi). The Syracuse MSA is the largest city within 80 km (50 mi) of the site and had a total population in 2000 of 732,117. As such, NMPNS falls into Category 3 [one or more cities with 100,000 or more persons and fewer than 190 persons per square mile within 80 km (50 mi)] of the NRC sparseness and proximity matrix. A Category 3 value indicates that NMPNS is in a medium density population area (NMPNS 2004b).

Table 2-11 shows population growth rates and projections in Oswego and Onondaga counties, where the majority (96 percent) of NMPNS employees live, from 1970 to 2020. Average annual growth rates in Oswego County show relatively slow growth of 0.1 percent for the period 1990 to 2000, while the average annual growth rate for New York for this period was 0.5 percent. Only slight increases in population are expected for the period 2000 through 2020. In Onondaga County, while there was slight growth during the 1980s, population steadily declined during the 1990s and the trend is expected to continue during the period 2000 to 2020.

The largest city in Oswego County is the City of Oswego, located approximately 8 km (5 mi) southwest of NMPNS, with a population of 17,954 persons in 2000 (USCB 2005a). The second largest municipality is the City of Fulton, located approximately 19 km (12 mi) south of NMPNS. The City of Fulton had 2000 population of 11,855 persons. In New York State, counties are subdivided into towns, which have jurisdiction over all unincorporated lands within the county. In Oswego County, the NMPNS site is located within the Town of Scriba, which had an estimated population of 7,331 persons in 2000. The U.S. Census Bureau lists 22 other towns in Oswego County, all of which have populations between 500 and 9000 persons (USCB 2005a). Most of the remaining portion of the county population lives in unincorporated, rural areas (OCDPCD 1997).

Along with the population of Onondaga County as a whole, the population of Syracuse declined from a 1990 population of 163,860 persons to a population of 147,306 persons in 2000, although some towns and municipalities surrounding Syracuse have experienced modest growth. These include the northern towns of Clay (2000 population 58,805 persons), Cicero (population 27,982 persons), and Lysander (population 19,285 persons), as well as the eastern Town of Manluis (population 31,872 persons). The Onondaga Reservation in southern Onondaga County had an estimated population of 1473 persons.

Table 2-11. Population Growth in Oswego and Onondaga Counties from 1970 to 2020

	Oswego County		Onondaga County	
Year	Population[(a)]	Percent[(b)]	Population[(a)]	Percent[(b)]
1970	100,897	—	472,835	—
1980	113,901	+1.2	463,920	-0.2
1990	121,771	+0.7	468,973	+0.1
2000	122,377	+0.05	458,336	-0.2
2010	123,400	+0.08	442,531	-0.4
2020	123,591	+0.02	423,235	-0.4

(a) Population data for 1970 through 2000 are from U.S. Census Bureau (2005a); population data for 2010 through 2020 are from NMPNS (2004e).

(b) Annual percent growth rate calculated using the equation $N_{(t)} = N_{(o)} (1+r)^t$ where N is population, t is time in years, and r is the annual growth rate expressed as a decimal.

Transient Population

Within 80 km (50 mi) of Nine Mile Point, colleges and recreational opportunities attract daily and seasonal visitors that create demand for temporary housing and services. In Oswego County, 6.6 percent of all housing units are considered temporary housing for seasonal, recreational, or occasional use. By comparison, temporary housing accounts for only 1.0 percent and 3.1 percent of total housing units in Onondaga County and the state of New York, respectively (USCB 2005a).

Migrant Farm Labor

Migrant farm workers are individuals whose employment requires travel to harvest agricultural crops. These workers may or may not have a permanent residence. Some migrant workers may follow the harvesting of crops, particularly fruit, throughout the northeastern U.S. rural areas. Others may be permanent residents near Nine Mile Point who travel from farm to farm harvesting crops.

Migrant workers can be members of minority or low-income populations. Because they travel and can spend a significant amount of time in an area without being actual residents, migrant workers may be unavailable for counting by census takers. If uncounted, these workers would be "underrepresented" in USCB minority and low-income population counts.

Onondaga and Oswego counties host relatively small numbers of migrant workers. According to 1997 Census of Agriculture estimates, 749 temporary farm laborers (those working less than 150 days per year) were employed in Onondaga County, and 565 were employed in Oswego County (USDA 1997).

2.2.8.6 Economy

Discussion of the economy covers employment and income, unemployment, and taxes.

Employment and Income

This section focuses on Oswego and Onondaga counties because the majority of the NMPNS workforce resides in these counties.

Between 1990 and 2002, total employment in Oswego County increased 0.3 percent (24,396 to 24,469 persons) and decreased in Onondaga County by -0.2 percent (232,120 to 223,065 persons) (USCB 2005b). Service industry employment dominates overall employment in both counties, with 57 percent (128,663 people employed) of total employment in Onondaga County and 43 percent (10,861 employees) of the total in Oswego County. The largest employer in Oswego County in 2004 was SUNY Oswego, with 1,736 employees (Table 2-12). Manufacturing also plays an important part in the local economy of the two counties, with more than 12 percent (27,482) of all employment in Onondaga County, and 17 percent (4,292) of the total in Oswego County. Alcan Aluminum is the largest manufacturing employer (680 persons employed) in Oswego County. Wholesale and retail trade is also an important part the economy of both counties, with 20 percent (44,746) of total employment in Onondaga County, and 19percent (4,717) in Oswego County.

Table 2-12. Major Employers in Oswego County, New York, 2004

Activity	Number of Employees
SUNY Oswego	1,736
County of Oswego	1,292
Constellation Energy Group	1,260
Central Square School District	1,080
Oswego Health	876
Oswego County BOCES	789
Entergy Nuclear Northeast	771
Oswego City School District	728
Alcan Aluminum	680
Wal-Mart	637

Source: Oswego County (2004)

The majority of employment in Oswego County is located in the cities of Oswego and Fulton. The villages of Phoenix, Pulaski, and Central Square are also growing commercial centers. Additional commercial growth is occurring to the south of Oneida Lake (OCDPCD 1997).

Energy production and distribution is a large part of the local economy in Oswego County, with 2,110 (8 percent) of the county total, primarily employed at Constellation Energy Group (1,260 people), and Entergy Nuclear Northeast (771 people). In addition to Nine Mile Point, the James A. FitzPatrick Nuclear Power Plant, the fossil-fuel powered Oswego Steam Station, the 1042-MW natural gas-powered Sithe Energies Independence Station, two small co-generation plants, the Oswego County Department of Public Works 1.8-MW waste-to-energy facility, and nine hydroelectric plants are also located in Oswego County (OCDPCD 1997).

Personal income in Oswego County totaled $3.0 billion in 2002 (in 2005 dollars), with a per capita personal income of $24,808. In Onondaga County personal income totaled $15.3 billion, with a per capita income of $33,697. Both are lower than the state's per capita personal income in 2002, which was $39,586 (USDC 2005).

Unemployment

The unemployment rate in Oswego and Onondaga counties was 4.9 and 4.2 percent, respectively (December 2004) (USDOL 2005). The rates in both counties have decreased over the past decade. The unemployment rate in Oswego County has been higher historically than in Onondaga County or New York State. The current rate for the state is 5.8 percent (December 2004).

Taxes

NMPNS is assessed annual property taxes by Oswego County, the Town of Scriba, and the City of Oswego School District. Property taxes paid to Oswego County and the Town of Scriba fund such services as transportation, education, public health, and public safety.

Although the plant is a significant contributor to local tax revenues, property tax contributions for NMPNS to Oswego County between 1995 to 2001 have decreased by over 40 percent, from $36 million (in 2005 dollars) to $15 million. The percentage of these contributions compared to total revenues has also decreased, from 21 percent to 9 percent. Property tax payments are expected to continue to decline by 2005, falling below $10 million, making up only 6 percent of total County revenues. NMPNS property tax payments to the City of Oswego School District have also declined, although less rapidly, from $38 million to $29 million between 1995 and 2001, from 56 percent of total revenues in 1995 to 43 percent in 2000 (Table 2-13). Property tax payments to the School District are expected to continue to decline by 2005, falling to $23 million, making up only 37 percent of total School District revenues.

NMPNS has entered into an agreement with Oswego County, the Town of Scriba, and the City of Oswego regarding property taxes paid to those entities. Instead of calculating property taxes for Nine Mile Point from the assessed value of the plant, NMPNS will make standardized in lieu payments annually to the taxing entities. Beginning in 2002, the agreement set a base level of payments to the taxing entities for each year until 2010 for Unit 1 and until 2011 for Unit 2. The City of Oswego School District, Oswego County, and the Town of Scriba were to receive

57.8 percent, 37.2 percent, and 5.0 percent of the base payments, respectively. These figures were derived from the historical property tax payments made to the taxing entities. The agreement also sets "incentive payments" to be paid to each entity should megawatt production for either Unit 1 or Unit 2 exceed certain annual benchmarks. Incentive payments will be applicable to Unit 1 from 2005 through 2009, and to Unit 2 from 2006 through 2011 (NMPNS 2004e).

The energy market in the state of New York has been deregulated to encourage the development of competition in the production and sale of electricity. A study performed by the New York State Board of Real Property Services concluded that the value of many power-generating plants is likely to decline in a deregulated market (NYSBRPS 1999). Therefore, NMPNS expects that any future property taxes assessed through the license renewal term should be similar to or may be less than the estimated in lieu payments

Table 2-13. Property Taxes Paid by NMPNS; Tax Revenues of Oswego County, Town of Scriba, and the City of Oswego School District, 1995 to 2005

Year	Total Revenues ($ millions 2005)	Property Tax Paid for Nine Mile Point ($ millions 2005)[b]	Property Tax as Percent of Total Revenues (%)
	OSWEGO COUNTY		
1995	169.2	35.6	21
2000	166.9	16.1	10
2005[(a)]	159.4	8.6	5
	TOWN OF SCRIBA		
1995	4.0	2.3	74
2000	4.2	2.4	65
2005[(a)]	7.9	2.0	25
	CITY OF OSWEGO SCHOOL DISTRICT		
1995	67.1	37.5	56
2000	64.7	27.7	43
2005[(a)]	61.9	22.8	37

Source: NMPNS 2004e; NRC estimates[(a)]

(a) Projected values based on annual average growth rates for the years 1995-2005.

(b) Data from Table 2.7-1 in MNPNS 2004b were converted from nominal to real dollars in the SEIS in order to show the growth in tax revenues excluding the effects of inflation.

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known historic and archaeological resources at the Nine Mile Point site and in the surrounding area.

2.2.9.1 Cultural Background

The region around Nine Mile Point contains prehistoric and historic Native American and Euro-American cultural resources. The NMPNS ER mentions 43 properties listed in the National Register of Historic Places within approximately 16 km (10 mi) of Nine Mile Point (NMPNS 2004e). These registered properties are all historic Euro-American places. The nearest National Register site is the Riverside Cemetery in Scriba and none are located in areas affected by operation of Nine Mile Point.

Paleo-Indians occupied North America from 10,000 to 12,000 years ago, living off the land and subsisting on large game, such as mammoths, that have since become extinct. In the New York area, people migrated into an environment that was adjusting after the retreat of glacial ice. Paleo-Indians are typically considered to have been big game hunters. However, evidence from archaeological work in the state suggests that small game and plants played a more significant role in the lifeways of the populations living in this area in Paleo-Indian times than perhaps populations of the same period did elsewhere. Stone tool styles show little variability over wide areas of North and South America; nevertheless, raw material for these tools often have sources far from where archaeologists find the tools. Paleo-Indian sites near Nine Mile Point include the Potts Site located southeast of Scriba (Ritchie 1994).

During the Archaic Period, from approximately 10,000 years ago until about 3500 years ago, people underwent local changes to adapt to resources. In the New York area, as forests evolved from spruce and pine to mixed deciduous communities, populations near present day Nine Mile Point probably were initially low in density, but steadily increased in density through time as both resource quality and the cultural means to access resources improved. By the end of the Archaic Period, at a time when climate reached its modern condition, archaeologists find evidence of more occupation. They interpret the settlement patterns they find as suggestive of an increase in breadth of resources sought by prehistoric people as they lived in smaller territories. Archaic people collected, hunted, and gathered most of what they needed for survival in their home territory. Large base camps found near major water sources provided a focal point for groups during the hard months. During other seasons, camps divided and people engaged in more mobile foraging activities. Near Nine Mile Point, the Oberlander 1 site is a late Archaic archaeological deposit in Oswego County on the Oneida River (Ritchie 1994).

The Transitional Period, from approximately 3500 years ago to about 1000 years ago, is viewed by New York archaeologists as representing a continuum of change in adaptation by prehistoric peoples. The central defining characteristic of the period is the introduction of stone (steatite) vessels at the beginning, then the first production of pottery at the end (Ritchie and Funk 1973). Over the same period, burial treatment became more elaborate, and people once again obtained materials for making stone tools from distant sources (Ritchie and Funk 1973).

Finally there came the Woodland culture, which archaeologists find occupied the region between 3000 years ago and the time of historical contact. In the Woodland culture, Native Americans became regionally distinct cultural entities. Woodland people ultimately became dependent on maize agriculture, lived in villages, used the bow and arrow in hunting, and began to regularly make and use pottery.

Known examples of older prehistoric sites are rare on the shore of Lake Ontario. Archaeological resources in Oswego County are concentrated along the Oswego River, Oneida Lake, along the Salmon River, and at its mouth.

NRC staff reviewed archaeological site files and found no recorded prehistoric or historic archaeological sites within 3.2 km (2 mi) of Nine Mile Point. The project area is situated within a region bordered by Lake Ontario to the north and no major drainage occurs within 8 km (5 mi). In such settings, large prehistoric residential sites are most likely to be found along major waterways and away from Nine Mile Point. Additionally, Nine Mile Point is not within the daily foraging radius of any major river valley, so it is likely that groups that visited the area made overnight camps along minor streams as they hunted and collected local resources. The types of sites expected in the vicinity of Nine Mile Point would manifest themselves by small scatters of stone tools and debris from making stone tools, associated with hearths.

The Native American societies in the region shared several important characteristics at the time they were first contacted by Europeans. These included two primary characteristics. One characteristic involved hunting and gathering along with growing domesticated plants, all of which were used as an economic base. The other characteristic was an annual living cycle that varied between population concentrations. There were large camps in the winter, semi-permanent river-side villages in the summer, and population dispersal among scattered camps in the fall and spring.

The Nine Mile Point site is on the Onondaga Indian Nation's eighteenth-century lands. The territorial boundaries between Native American groups were in flux throughout the historic period until the mid-nineteenth century. By the mid-1600s several eastern tribes had already had been displaced to the west. Treaties of 1794 and 1838 between New York Indians and the U.S. government eroded tribal territorial holdings in the state of New York.

In 1788, the state purchased large tracts of land from the Onondaga, Oneida, and Cayuga nations; the lands, which were divided into parcels, included Scriba's Patent, and that included Nine Mile Point. George Scriba, a resident of Holland, New York, took possession of nearly 0.2 million ha (0.5 million ac) of land in the patent. The patent was divided into sixteen townships in Oswego County, and George Scriba began to sell portions to speculators and settlers (Kozub and Carter 2003).

The Town of Scriba was created in 1811, although settlers in the area arrived as early as 1798. The scene for the first non-Indian settlement was at "Scriba Corners." The earliest business at

Scriba Corners was Heil Stone's log tavern, followed in 1819 by a store (Kozub and Carter 2003).

The early historic economy was based on timber harvesting and lumber production. As forests were cut, residents moved to farming, especially dairy and fruit production (Churchill 1895). The Oswego Canal opened in 1828 and the Syracuse & Oswego Railroad opened in 1848. The canal and railroad precipitated surges in the lumber industry and in agriculture (Churchill 1895). By 1855, more than half of the county's workers were farmers (Wellman 1987). However, by the late 1800s the shipping industry in Oswego collapsed, as did agriculture, and farmers began to leave. It took Oswego County 90 years to return to the population level of 1870. By 1900, at least twelve residences were located in the Nine Mile Point area (USGS 1900). The number of farms and homes remained relatively stable until 1955, when there were fourteen residences (USGS 1955). Fourteen homes and farms were still shown on maps at the time the Nine Mile Point plant construction started (USGS 1982).

2.2.9.2 Historic and Archaeological Resources at and near Nine Mile Point

The NMPNS ER states no historic or archaeological sites "have been identified on site grounds" and "no known archaeological or historic sites have been identified along the transmission line rights-of-way" (NMPNS 2004e). NRC staff reviewed historic and archaeological site files in New York, where they confirmed archaeological and historic architectural sites have not been recorded at Nine Mile Point. In August 2003, the New York State Historic Preservation Office (SHPO) wrote a letter to NMPNS concerning NMP license renewal. The letter confirmed that, while there are no known archaeological sites within the project area, the Preservation Office considers Nine Mile Point "sensitive for cultural resources because of its environmental setting" (NYSOPRHP 2003).

A search of site files indicates that 39 historic period archaeological sites were recorded within Scriba and New Haven districts—23 within Scriba and 16 within New Haven. Most of these consist of foundations and associated artifact scatters. None are recorded within the current boundaries of Nine Mile Point, but it is probable that historic archaeological sites exist in the vicinity of the structure locations shown within the plant area on early maps. NRC staff confirmed the presence of archaeological remains associated with several mapped historic locations within the plant lands during a site visit in September 2004.

The original environmental statement related to operation of Nine Mile Point Unit 1 (AEC 1974) also concluded that there were no known archaeological materials in the area of potential effect, after coordination with the New York SHPO. The Federal Advisory Council on Historic Preservation had written to the Atomic Energy Commission’s Directorate of Licensing to indicate that their review of the draft environmental statement for Nine Mile Point Nuclear Station Unit 1 concluded the statement was adequate (ACHP 1973).

2.2.10 Related Federal Project Activities and Consultations

Staff reviewed the possibility that activities of other Federal agencies might impact the renewal of the OLs for NMP. Any such activities could result in cumulative environmental impacts and the possible need for the Federal agency to become a cooperating agency for preparation of the Nine Mile Point SEIS.

The Montezuma National Wildlife Refuge, located approximately 71 km (44 mi) southwest of Nine Mile Point, is 2860 ha (7068 ac), and provides resting, feeding, and nesting habitat for waterfowl and other migratory birds. This refuge is also situated in the middle of one of the most active flight lanes in the Atlantic Flyway (FWS 2004a).

The Onondaga Reservation, a 2409-ha (5953-ac) Indian reservation, is located in Onondaga County. As of the 2000 census, the Indian reservation had a total population of 1473 (Campus Program.com 2004).

The James A. FitzPatrick Nuclear Power Plant is a single-unit electricity-generating nuclear power plant owned and operated by Entergy Nuclear, Inc. It shares an eastern boundary and a common visitor center with Nine Mile Point. There are also approximately twenty-five hydropower electricity-generating facilities within 80 km (50 mi) of Nine Mile Point.

The NRC is required under Section 102 of the NEPA to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved. Federal agency comment correspondence is included in Appendix E.

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10 CFR Part 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

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3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this SEIS unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1 and, therefore, additional plant-specific review of these issues is required.

License renewal actions may require refurbishment activities for the extended plant life. These actions may have an impact on the environment that requires evaluation, depending on the type of action and the plant-specific design. Environmental issues associated with refurbishment that were determined to be Category 1 issues are listed in Table 3-1.

Environmental issues related to refurbishment considered in the GEIS for which these conclusions could not be reached for all plants, or for specific classes of plants, are Category 2 issues. These are listed in Table 3-2.

Appendix F lists Category 1 and Category 2 issues related to refurbishment that are not applicable to Nine Mile Point Nuclear Station (NMPNS) because they are related to plant design features or site characteristics not found at NMPNS.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

Table 3-1. Category 1 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Impacts of refurbishment on surface-water quality	3.4.1
Impacts of refurbishment on surface-water use	3.4.1
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Refurbishment	3.5
GROUNDWATER USE AND QUALITY	
Impacts of refurbishment on groundwater use and quality	3.4.2
LAND USE	
Onsite land use	3.2
HUMAN HEALTH	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
SOCIOECONOMICS	
Public services: public safety social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section if such actions were planned. Nine Mile Point Nuclear Station, LLC (NMPNS) indicated that it has performed an evaluation of structures and components pursuant to 10 CFR 54.21 to identify activities that are necessary to continue operation of Nine Mile Point Units 1 and 2 (NMP) during the requested 20-year period of extended operation. These activities include replacement of certain components as well as new inspection activities and are described in the Environmental Report (ER) (NMPNS 2004e).

However, NMPNS stated that the replacement of these components and the additional inspection activities are within the bounds of normal plant component replacement and inspections; therefore, they are not expected to affect the environment outside the bounds of plant operations as evaluated in the final environmental statement (AEC 1974; NRC 1981). In addition, NMPNS's evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications necessary to support the continued operation of NMP beyond the end of the existing operating licenses. Therefore, refurbishment is not considered in this final supplemental environmental impact statement.

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Refurbishment impacts	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (nonattainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services: transportation	3.7.4.2	J
Historic and archeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed[(a)]	Not addressed[(a)]

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice is to be addressed in the licensee's environmental report and the staff's environmental impact statement.

3.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Nine Mile Point Nuclear Station, LLC (NMPNS). 2004. *Nine Mile Point Nuclear Station Application for License Renewal, Appendix E—Applicant's Environmental Report*. Lycoming, New York.

U.S. Atomic Energy Commission (AEC). 1974. *Final Environmental Statement Related to the Operation of Nine Mile Nuclear Station Unit 1*. Niagara Mohawk Power Corporation. Docket No. 50-220. Directorate of Licensing. Washington, D.C. January 1974.

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4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, OR LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of Title 10 of the Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B and are applicable to the Nine Mile Point Nuclear Station (Nine Mile Point). Section 4.1 addresses issues applicable to the Nine Mile Point cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality, while Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses potential new information that was raised during the scoping period, and Section 4.8 discusses cumulative impacts. The results of the evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.9. Finally, Section 4.10 lists the references for Chapter 4. Category 1 and Category 2 issues that are not applicable to Nine Mile Point

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

because they are related to plant design features or site characteristics not found at Nine Mile Point are listed in Appendix F.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Nine Mile Point Units 1 and 2 (NMP) cooling system operation during the renewal term are listed in Table 4-1. Nine Mile Point Nuclear Station, LLC (NMPNS) stated in its Environmental Report (ER) (NMPNS 2004b) that it is not aware of any new and significant information associated with the renewal of the NMP operating licenses (OLs). The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-1. Category 1 Issues Applicable to the Operation of Nine Mile Point Units 1 and 2 Cooling System during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1
Altered thermal stratification of lakes	4.2.1.2.3
Temperature effects on sediment transport capacity	4.2.1.2.3
Scouring caused by discharged cooling water	4.2.1.2.3
Eutrophication	4.2.1.2.3
Discharge of chlorine or other biocides	4.2.1.2.4
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4
Discharge of other metals in wastewater	4.2.1.2.4
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4
Entrainment of phytoplankton and zooplankton	4.2.2.1.1
Cold shock	4.2.2.1.5
Thermal plume barrier to migrating fish	4.2.2.1.6
Distribution of aquatic organisms	4.2.2.1.6
Premature emergence of aquatic insects	4.2.2.1.7

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
Gas supersaturation (gas bubble disease)	4.2.2.1.8
Low dissolved oxygen in the discharge	4.2.2.1.9
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10
Stimulation of nuisance organisms	4.2.2.1.11
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)	
Entrainment of fish and shellfish in early life stages	4.3.3
Impingement of fish and shellfish	4.3.3
Heat shock	4.3.3
TERRESTRIAL RESOURCES	
Cooling tower impacts on crops and ornamental vegetation	4.3.4
Cooling tower impacts on native plants	4.3.5.1
Bird collisions with cooling towers	4.3.5.2
HUMAN HEALTH	
Microbial organisms (occupational health)	4.3.6
Noise	4.3.7

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

  Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

- Altered thermal stratification of lakes. Based on information in the GEIS, the Commission found that

Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of altered thermal stratification of lakes during the renewal term beyond those discussed in the GEIS.

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

  These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

  Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

  Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information including plant monitoring data and technical reports, and public comments on the draft SEIS. Therefore, the staff concludes

that there are no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

  Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information including the State Pollutant Discharge Elimination System (SPDES) permit for NMP, discussion with the SPDES compliance office, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

  Effects are readily controlled through SPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information including the SPDES permit for NMP, discussion with the SPDES compliance office, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in wastewater. Based on information in the GEIS, the Commission found that

  These discharges have not been found to be a problem at operating nuclear power plants with cooling tower based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information including the SPDES permit for NMP, discussion with the SPDES compliance office, and public comments on the draft SEIS.

Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

- Water-use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

  These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of water-use conflicts for plants with once-through cooling systems during the renewal term beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

  Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

  Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

  Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

  Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

  Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

  Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas bubble disease). Based on information in the GEIS, the Commission found that

  Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

  Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its review of monitoring programs, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

  These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes

that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms. Based on information in the GEIS, the Commission found that

  Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Entrainment of fish and shellfish in early life stages (cooling-tower-based systems). Based on information in the GEIS, the Commission found that

  Entrainment of fish has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of entrainment of fish and shellfish in early life stages for the Unit 2 cooling tower based system during the renewal term beyond those discussed in the GEIS.

- Impingement of fish and shellfish (cooling-tower-based systems). Based on information in the GEIS, the Commission found that

  The impingement has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of impingement of fish and shellfish for the Unit 2 cooling tower based system during the renewal term beyond those discussed in the GEIS.

- Heat shock (cooling-tower-based systems). Based on information in the GEIS, the Commission found that

  Heat shock has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of heat shock for the Unit 2 cooling tower based system during the renewal term beyond those discussed in the GEIS.

- Cooling tower impacts on crops and ornamental vegetation. Based on information in the GEIS, the Commission found that

  Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on crops and ornamental vegetation during the renewal term beyond those discussed in the GEIS.

- Cooling tower impacts on native plants. Based on information in the GEIS, the Commission found that

  Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no cooling tower impacts on native vegetation during the renewal term beyond those discussed in the GEIS.

- Bird collisions with cooling towers. Based on information in the GEIS, the Commission found that

  These collisions have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of bird collisions with cooling towers during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

  Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of microbiological organisms during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

  Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to Nine Mile Point Unit 1 are discussed in the sections that follow, and are listed in Table 4-2.

Table 4-2. Category 2 Issues Applicable to the Operation of the Nine Mile Point Unit 1 Cooling System during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3	B	4.1.2
Heat shock	4.2.2.1.4	B	4.1.3

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling-water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal. Nine Mile Point Unit 1 uses a once-through cooling system while Unit 2 uses a closed-cycle cooling system that includes a cooling tower. The NRC has determined that entrainment impacts are SMALL for all plants using closed-cycle cooling systems and do not require site-specific analysis for purposes of license renewal. Therefore, this section addresses entrainment only at Nine Mile Point Unit 1. To perform this evaluation, the staff reviewed the NMP ER (NMPNS 2004b), visited Nine Mile Point, and reviewed the applicant's SPDES Permit, No. N.Y.-0001015, issued on October 26, 1994, which is in force until December 01, 2009 (NYSDEC 2004).

Section 316(b) of the Clean Water Act (CWA) requires that the location, design, construction, and capacity of cooling-water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment of fish and shellfish into the cooling-water system is a potential adverse environmental impact that can be minimized by use of the best available technology.

On July 9, 2004, the EPA published a final rule in the *Federal Register* (EPA 2004b) addressing cooling-water intake structures at existing power plants whose flow levels exceed a minimum threshold value of 189 million L/day (50 million gpd). The rule is Phase II in the EPA's development of 316(b) regulations that establish national requirements applicable to the location, design, construction, and capacity of cooling-water intake structures at existing facilities that exceed the threshold value for water withdrawals. The national requirements, which are implemented through National Pollutant Discharge Elimination System (NPDES) permits, minimize the adverse environmental impacts associated with the continued use of the intake systems. Licensees are required to demonstrate compliance with the Phase II performance standards at the time of renewal of their NPDES permit. Licensees may be required as part of the NPDES renewal to alter the intake structure, redesign the cooling system, modify station operation, or take other mitigative measures as a result of this regulation.

The new performance standards are designed to significantly reduce entrainment losses due to plant operation. Any site-specific mitigation would result in less impact due to continued plant operation.

When Unit 1 is at maximum output, the water velocity at the intake structure is approximately 0.6 m/s (2 ft/s). Once the cooling water enters the intake, it flows through the intake tunnel at a maximum rate of 2.4 m/s (8 ft/s). After traveling through the tunnel, the water is pumped through the trash racks and traveling screens by two circulating pumps with a total capacity of 947 m^3/min (250,000 gpm) or 15.8 m^3/s (4167 gps or 360 million gpd). The water travels from these screens to the condensers at a maximum velocity of 0.26 m/s (0.85 ft/s) (NMPNS 2004b). The estimated eastward flow along the south shore of Lake Ontario is 70,000 m^3/s (2.5 million ft^3/s), with a mean speed of 5 km/day (3.1 mi/day) in the belt of this eastward flow (EarthTech 2000). The flow through the plant (a maximum of 15.8 m^3/s [4167 gps or 360 million gpd]) is 0.02 percent of the flow past the plant.

Initial entrainment studies at Nine Mile Point Unit 1 occurred from 1973 through 1978. Similarly designed entrainment studies also were conducted at the James A. FitzPatrick Power Plant from 1975 through 1979. Results of these studies were summarized in 1983. However, the entrainment summary report focused on the 1976 data for Nine Mile Point. Samples were collected a minimum of twice a month during both daylight and nighttime. Prior to and concurrent with the entrainment study, a baseline assessment of abundance and distribution of Lake Ontario fish populations near the Nine Mile Point site was determined using a variety of methods (LMS 1983).

Nearly all the fish species identified as present in the Nine Mile Point vicinity were also found in the entrainment studies conducted at Nine Mile Point and the James A. FitzPatrick Power Plant. Species occurrence in entrainment samples followed species temporal occurrence in the lake. During the period of late spring and summer, peak concentrations of fish eggs and larvae occurred in the lake (that is, alewife dominated). This pattern was similarly demonstrated during the entrainment study, with peak entrainment occurring during this same period. Alewife and rainbow smelt were the most abundant entrained species and also the most abundant in the lake near the Nine Mile Point site. Entrainment collections in early spring contained burbot (*Lota lota*) and Cisco and/or lake herring (*Coregonus* sp.), with rainbow smelt (*Osmerus mordax*) present in mid spring, and alewife (*Alosa pseudoharengus*) present in late spring and summer (LMS 1983).

Based on 1976 entrainment data, weekly average densities ranged from 0 to 34.4 eggs/m^3 and 0 to 0.5 larvae/m^3 for alewife. Corresponding densities for rainbow smelt were 0 to 0.15 eggs/m^3 and 0 to 0.02 larvae/m^3. Extrapolating these weekly average entrainment densities with the maximum plant cooling water flow rate for 1976 (1014.5 m^3/min [268,000 gpm) provides estimates of maximum entrainment. Maximum weekly entrainment for alewife would have been 350 million eggs and 4.9 million larvae. Maximum weekly entrainment

for rainbow smelt would have been 1.5 million eggs and 205,000 larvae (LMS 1983; NMPNS 2004b).

Weekly entrainment losses were compared with the standing lake populations of fish. The standing stock of alewife in Lake Ontario in 1976 was estimated at 12.56 billion. A 1:1 sex ratio was assumed, resulting in 6.28 billion females, each with a fecundity of 26,272 eggs. With the maximum weekly number of alewife eggs entrained at Unit 1 (350 million eggs) divided by this fecundity, it is estimated that the number of eggs lost represents the number that could be produced from 13,322 females; therefore it is estimated that the spawning loss is equivalent to 13,322 females. When this number is divided by the lake population of 6.28 billion alewife females, the estimated loss of the lake population of females equates to a weekly loss of 0.0002 percent. For alewife larvae, the peak weekly estimated number entrained of 4.9 million was compared to the estimated peak standing stock in the lake of 35 billion larvae. The entrainment alewife larvae loss represented a weekly loss of 0.014 percent. Similar calculations for the rainbow smelt yielded a loss of female standing stock due to egg entrainment of 0.00001 percent and a loss of larval standing stock of 0.025 percent. These calculations were based on the peak weekly entrainment during 1976 (NMPNS 2004b).

Additional entrainment monitoring for Nine Mile Point Unit 1 occurred in 1997. This monitoring program consisted of collecting samples from the screenhouse building's discharge tunnel associated with Nine Mile Point Unit 1 from April through August. Monitoring samples were collected during daylight and nighttime one day per week, resulting in a total of 88 samples. This sampling resulted in the collection of nine distinct fish taxa (seven species and two families). The SPDES permit (NY000 1015) identified species of concern and included white perch (*Morone americana*), smallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), alewife, rainbow smelt, white bass (*Morone chrysops*), and all members of the family Salmonidae (EA 1998).

During this 1997 entrainment study, alewife accounted for 96 percent of all fish collected, while alewife, threespine stickleback (*Gasterosteus aculeatus*), and tessleated darter (*Etheostoma olmstedi*) comprised 99 percent of the total. The remaining one percent of species collected were carp (*Cyprinus carpio*), rainbow smelt, yellow perch, and mottled sculpin (*Cottus bairdi*), as well as minnows (Cyprinidae) and sunfishes (Centrarchidae). Based on life stage, juveniles and eggs comprised one percent and 35 percent of life stages collected, respectively, with post yolk-sac larvae the most commonly collected life stage (that is, 40 percent). While three species identified as species of concern by the SPDES permit were entrained, two of the species accounted for less than 1 percent of fish collected while alewives constituted the majority of all fishes entrained (EA 1998; EarthTech 2000).

These 1997 entrainment sample densities and plant cooling water volumes were used to extrapolate total entrainment estimates. This resulted in an estimate of 86.8 million ichthyoplankton entrained at Nine Mile Point Unit 1 during the study period of April through August. Estimates for entrainment of alewife, tessellated darter, and threespine stickleback were 78.7 million, 3.6 million, and 2.4 million, respectively (EA 1998). Rainbow smelt entrained

in 1997 accounted for only 0.1 percent of the total ichthyoplankton entrained, although it was the second-most abundant fish entrained in the 1970s.

Entrainment levels of ichthyoplankton in 1997 was much reduced relative to the earlier entrainment study. The principal reason for the difference in entrainment between 1976 and 1997 was the difference in lakewide abundance of adult alewife and rainbow smelt (i.e., late 1990s lake biomass was reduced by one-half compared to that documented in the early 1980s); this change in abundance is attributed to predation pressure from stocked salmon and changes in nutrient cycling brought about by the invasive zebra and quagga mussels (NMPNS 2004b).

In summary, the primary factor influencing entrainment rates is the abundance of species in the water near the intake. The entrainment losses incurred at Nine Mile Point, in comparison with the standing stock of lake fish species, are very small and not likely to adversely affect the fish community in the lake.

The staff reviewed the available information provided by NMPNS in the Nine Mile Points Units 1 and 2 ER (NMPNS 2004b) related to the CWA 316(b) permitting process. Based on the results of past entrainment studies and the operating history of Nine Mile Point Unit 1's intake structure, the staff concludes that the potential impacts of entrainment of fish and shellfish in the early life stages into the cooling water intake system are SMALL.

The staff considered mitigation measures for the continued operation of Nine Mile Point Unit 1. Based on the assessment to date, the staff expects that the measures in place at Nine Mile Point Unit 1 provide mitigation for impacts related to entrainment, and no new mitigation measures are warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling water system intakes is considered a Category 2 issue, requiring a site-specific assessment before license renewal. Nine Mile Point Unit 1 uses a once-through cooling system, while Unit 2 uses a closed-cycle cooling system that includes a cooling tower. The NRC has determined that impingement impacts are SMALL for all plants using closed-cycle cooling systems and do not require site-specific analysis for purposes of license renewal. Therefore, this section addresses impingement only at Nine Mile Point Unit 1. To perform this evaluation, the staff reviewed the NMP ER (NMPNS 2004b); visited Nine Mile Point; and reviewed the applicant's SPDES Permit , No. N.Y.-0001015, issued on October 26, 1994, and expires in December 01, 2009 (NYSDEC 2004).

Section 316(b) of the CWA requires the location, design, construction, and capacity of cooling-water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Impingement of fish and shellfish on the debris screens

of the cooling-water intake system is a potential adverse environmental impact that can be minimized by use of the best available technology.

On July 9, 2004, the EPA published a final rule in the *Federal Register* (EPA 2004b) addressing cooling-water intake structures at existing power plants whose flow levels exceed a minimum threshold value of 189 million L/day (50 million gpd). The rule is Phase II in the EPA's development of 316(b) regulations that establish national requirements applicable to the location, design, construction, and capacity of cooling-water intake structures at existing facilities that exceed the threshold value for water withdrawals. The national requirements, which are implemented through NPDES permits, minimize the adverse environmental impacts associated with the continued use of the intake systems. Licensees are required to demonstrate compliance with the Phase II performance standards at the time of renewal of their NPDES permit. Licensees may be required as part of the NPDES renewal to alter the intake structure, redesign the cooling system, modify station operation, or take other mitigation measures as a result of this regulation. The new performance standards are designed to significantly reduce impingement losses due to plant operation. Any site-specific mitigation would result in less impact due to continued plant operation.

Initial impingement studies at Nine Mile Point Unit 1 occurred from 1972 through 1981. Impingement studies also were conducted at the James A. FitzPatrick Power Plant from 1975 through 1981. Results of these studies were summarized in 1983. Samples at Nine Mile Point Unit 1 were collected daily when impingement rates were high (that is, exceeded 20,000 fish in a 24-hour period). When impingement fell below this rate, the number of sample days followed a study design that varied by time of year and study year. Aquatic surveillance programs conducted from 1972 to 1981 provided a baseline assessment of Lake Ontario fish populations near the Nine Mile Point site (LMS 1983) (see Table 4-3).

Following the initial impingement studies described above, impingement monitoring continued annually at Nine Mile Point Unit 1 until 1997. The studies were a requirement of the SPDES permit. With the exception of 1996, impingement monitoring at Unit 1 was conducted from 1972 through 1997, providing a nearly continuous 25-year data set. Estimated annual impingement by species demonstrated a highly variable pattern over this study period (NMPNS 2004b). Previous studies for Nine Mile Point indicated that weather conditions affect impingement rates with subsequent studies supporting this observation (LMS 1983).

Table 4-3. List of Fish from Lake Ontario Impinged at the Nine Mile Point Nuclear Power Plant, Unit 1, from 1973 through 1997

		Fish Impingement Rate		Percent of Individuals Collected
Scientific Name	**Common Name**	**Total Number of Fish Impinged, 1973-1997[a]**	**Annual Average Number of Fish Impinged, 1973-1997[a]**	**Average over 24 Years, 1973-1997[a]**
Alosa pseudoharengus	alewife	13,891,754	578,823	60
Osmerus mordax	rainbow smelt	1,038,041	43,252	20
Gasterosteus aculeatus	threespine stickleback	1,482,213	61,759	9
Dorsoma cepedianum	gizzard shad	104,797	4367	2
Cottus sp.	sculpin	54,967	2290	2
Morone americana	white perch	50,741	2114	1

(a) No impingement data for 1996; totals represent 25 years of impingement data.

The alewife was the most common species taken during the entire impingement study period. Rainbow smelt were most abundant in three years (1979, 1982, and 1989). In 1978 and 1997, the threespine stickleback dominated the impingement catch. Although the threespine stickleback is also an inshore spawner, their infrequent dominance of impingement catches is also likely influenced by weather events. Rainbow smelt typically was the second most abundant species impinged each year (NMPNS 2004b).

Highest impingement rates were usually observed during spring when alewife and rainbow smelt move inshore to spawn. These high levels of impingement were followed by a general reduction in fish taken as fish moved further offshore after the spawning season. Increased impingement rates occurred again in late summer and fall with the production of young-of-the-year (EAI 1984; NMPNS 2004b).

The number of fish estimated impinged on an annual basis varied greatly due to a variety of factors, including local abundance, weather-related factors, and plant operation. The lowest estimated annual impingement catch (all species) was 3679 fish in 1988, when Unit 1 was offline all year, with infrequent operation of circulating water pumps. The highest estimated annual total impinged was over five million in 1973 due to high impingement for alewife. For the period of 1972 to 1997, the number of species impinged annually ranged from 16 in 1988 (Unit 1 mainly offline) to 48 species in 1974. In addition to alewife and rainbow smelt, a variety of other forage fishes have been reported impinged, including species of minnows (Cyprinidae), sculpins (*Cottus* sp.), catfish (Ictaluridae), trout-perch (*Percopsis omiscomaycus*) and gizzard

shad (*Dorosoma cepedianum*). Game fish such as smallmouth bass *(Micropterus dolomieu*), white bass (*Morone chrysops*), yellow perch (*Perca flavescens*), white perch (*Morone americana*), lake trout (*Salvelinus namaycush*), and walleye (*Sander vitreus*) were also impinged, but in relatively low numbers compared to alewife and rainbow smelt. Except for walleye, these game fishes were among the "species of concern" designated for detailed evaluation during 1997 at Unit 1 in the SPDES permit. Using data from 1973 to 1981, the staff concluded that impingement of game species at Unit 1 represented a negligible impact based on zero to very low tag returns and comparisons to commercial catches, where available. Tagging studies were conducted from 1972 through 1976; the low tag returns noted during the study indicated that the number impinged is a small proportion of the population (NMPNS 2004b).

Impinged fish have been collected at the James A. FitzPatrick plant since 1975. Total monthly impingement estimates for Nine Mile Point Unit 1 and James A. FitzPatrick (1976 to 1997, all years combined for each month) demonstrate a lower total number of fish impinged for Nine Mile Point (33 percent less overall). Monthly averages generally follow a similar pattern between the two plants, although differences in numbers impinged do exist between the two plants (for example, the monthly average for April is 22.5 percent for Nine Mile Point and 9.9 percent for James A. FitzPatrick; the monthly average for June is 4.2 percent for Nine Mile Point and 9.5 percent for James A. FitzPatrick). However, for both plants, impingement abundance is highest in the spring and peaks in May, with an impingement rate of 37 percent for Nine Mile Point and 35 percent for James A. FitzPatrick. This highest abundance coincides with the movement of fish to nearshore areas for spawning (Earth Tech 2000).

A variety of factors may affect the composition and rates of species impinged. Species abundance in near shore area of Nine Mile Point Unit 1 largely influences the dominant species impinged. Natural fluctuations in concentrations of alewife have been shown to widely vary from year to year, possibly due to periodic large die-offs of alewives during the winter.

Although a variety of factors can affect impingement rates, the overriding factor is the abundance of species in the water body near the intake. Lake-wide fluctuations in abundance of alewife may be the primary influence on impingement of alewife at Nine Mile Point Unit 1. Using average annual impingement catch for the period of 1973 to 1981, the impact of impingement at Unit 1 was compared to the standing lake stocks of alewife and rainbow smelt; impingement for this time period was found to be 0.01 percent of these lake-wide standing stocks for both species. A similar assessment was performed for 1982 to 1997 using lake-wide population estimates of alewife and rainbow smelt. The proportions impinged were found to be low in all years and similar to result from the previous period. The greatest proportional impingement of the lake-wide stock in any year was just under 0.05 percent in 1985 for the alewife, and just under 0.02 percent in 1984 for the rainbow smelt. The ER for the R.E. Ginna Nuclear Power Plant also reported reduced impingement catches of alewife and smelt in recent years, concurrent with reduced numbers in the Eastern Basin of Lake Ontario (NRC 2004a).

The staff has reviewed the available information. Based on the results of past impingement studies and the operating history of the Nine Mile Point Unit 1 intake structure, the staff concludes that the potential impacts of impingement of fish and shellfish are SMALL.

The staff considered mitigation measures for the continued operation of Nine Mile Point Unit 1. Based on the assessment to date, the staff expects that the measures in place at Nine Mile Point Unit 1 provide mitigation for impacts related to impingement, and no new mitigation measures are warranted.

4.1.3 Heat Shock

For plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue, requiring a site-specific assessment before licensing renewal. Nine Mile Point Unit 1 uses a once-through cooling system while Unit 2 uses a closed-cycle cooling system with a cooling tower. The NRC has determined that heat shock impacts are SMALL at all plants using closed-cycle cooling systems and do not require a site-specific analysis for purposes of license renewal. Therefore, this section addresses heat shock only for Nine Mile Point Unit 1. The NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue for once-through plants because of continuing concerns about thermal-discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996). Information to be considered includes (1) the type of cooling system (whether once-through or cooling pond) and (2) evidence of a CWA Section 316(a) variance or equivalent State documentation. To perform this evaluation, the staff did the following: reviewed the NMP ER (NMPNS 2004b); visited Nine Mile Point; reviewed the facilities 316(a) demonstration report dated December 8, 1975 and submitted the report to the EPA, Region II; and reviewed the applicant's SPDES Permit, No. N.Y.-0001015, issued on October 26, 1994, which is in force until December 01, 2009 (NYSDEC 2004).

Nine Mile Point Unit 1 has a once-through heat dissipation system. Heat shock is caused by high temperatures in the discharge water adversely affecting aquatic biota. Section 316(a) of the CWA establishes a process whereby the applicant can obtain facility-specific thermal discharge limits. The Niagara Mohawk Power Corporation submitted a CWA 316(a) Demonstration in 1975 that evaluated thermal discharges at the Nine Mile Point plant with respect to its impact on aquatic biota and proposed alternate thermal discharge limitations. Supplemental information was submitted in 1976 in response to the EPA's request for additional information. This demonstration was approved by the New York State Department of Environmental Conservation (NYSDEC) in 1983 (NMPNS 2004b).

The nature of the discharge plume and its potential impact on the aquatic community were studied during the first five fully operational years of Unit 1 (1970 to 1975) and included 25 plume measurement surveys. The configuration of the thermal plume from Unit 1 has been found to vary with wind-induced currents, wave action, and upwelling. However, no relationship

between the size and the extent of the plume and either wind speed or station heat load has been demonstrated, reflecting the stochastic nature of the plume as influenced by lake hydrodynamics. In 25 surveys, the size of the plume, defined as the area or volume within the 2°C (3.6°F) above ambient isotherm, has varied between 14 and 150 surface ha (34 and 370 surface ac) and 66,610 and 1,516,000 m^3 (54 and 1229 ac-ft). A frequency analysis identified the median plume size as approximately 49 surface ha (120 surface ac). The plume exceeded 65 ha (160 ac) 30 percent of the time. The 65 surface ha (160 surface ac) extends approximately 572 m (1875 ft) on each side of the discharge point along the shore, and a maximum distance of nearly 732 m (2400 ft) offshore. As is typical of heated discharges, the warmer water in the plume is buoyant and thus largely a surface phenomenon. The 65 surface ha (160 surface ac) plume had a volume of 431,700 m^3 (350 ac-ft), and a calculated depth from the surface of 0.68 m (2.19 ft) (NMPNS 2004b).

The current SPDES permit allows a maximum daily discharge temperature of 46°C (115°F) from Unit 1. The maximum allowable intake-discharge temperature difference is 19°C (35°F). The maximum daily flow is 1580 million L/day (418 million gpd). The areal extent of the permitted mixing zone is 172 surface ha (425 surface ac) in Lake Ontario, from the point of discharge, and outside of this mixing zone a temperature increase of no more than 1.7°C (3°F) may occur. The compliance history of Nine Mile Point Unit 1 demonstrates that they routinely and consistently meet the thermal limitations in their SPDES permit. There have been no heat shock incidents (elevated receiving water temperatures) during station operation resulting in the immediate distress or acute mortality of fish.

In parallel with the physical plume studies, extensive biological studies were carried out in the vicinity of Unit 1. These data are summarized in the applicant's 316(a) demonstration report. Surveys included phytoplankton, zooplankton, ichthyoplankton, benthos, and fish. These studies were conducted during early spring through December and sampled various depths and locations near Unit 1 during 1969 to 1974. With the approval of the EPA, Region II, emphasis was placed on several "Representative Important Species (RIS)," including macroalgae (*Cladophora* sp.), macroinvertebrates (*Gammarus* sp.), and fish (alewife [*Alosa pseudoharengus*], coho salmon [*Oncorhynchus kisutch*], brown trout [*Salmo trutta*], rainbow smelt [*Osmerus mordax*], threespine stickleback [*Gasterosteus aculeatus*], smallmouth bass [*Micropterus dolomieu*], and yellow perch [*Perca flavescens*]). The results of these studies demonstrated that no aspect of the biotic community was influenced or impacted by the heated discharge of Unit 1 (NMPNS 2004b).

The staff has reviewed the available information, including that provided by the applicant, the staff's site visit, the applicant's 316(a) demonstration, and other public sources. The staff evaluated the potential impacts to aquatic resources due to heat shock during continued operation. It is the staff's conclusion that the potential impacts to fish and shellfish due to heat shock during the renewal term are SMALL.

The staff considered mitigation measures for the continued operation of Nine Mile Point Unit 1 during the license renewal period. Based on the staff's assessment, measures in place at Nine

Mile Point provide mitigation of impacts related to heat shock, and no new mitigation measures are warranted.

4.2 Transmission Lines

Nine Mile Point has three transmission lines that connect NMP to the national grid system. The transmission lines as well as their ownership and shared responsibilities for their maintenance are described in Section 2.1.7. The transmission line rights-of-way covers approximately 638 ha (1576 ac) over a total length of approximately 42 km (26 mi). Niagara Mohawk, the company that owns most of the transmission corridor, has a New York State Public Service Commission-approved long-range vegetation management plan for its transmission line rights-of-way (NMPNS 2004b). Following this plan, selected management techniques are used to maintain a low-growing vegetative community and to keep the transmission lines free of interruptions from trees and tall-growing shrub species. Niagara Mohawk performs routine and emergency helicopter and foot patrols to inspect the transmission corridor and facilities. In addition to these routine patrols, Niagara Mohawk performs an annual assessment of each rights-of-way in the spring and mid-summer to ensure the continued operation of the transmission system.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from NMP are listed in Table 4-4. In the Nine Mile Point ER, NMPNS stated that it is not aware of any new and significant information associated with the renewal of the NMP OLs. The staff has not identified any new and significant information during its independent review of the Nine Mile Point Nuclear Station ER. No information was identified during the staff's site audit, the scoping process, consultation with the U.S. Fish and Wildlife Service (FWS) and NYSDEC, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-4. Category 1 Issues Applicable to the Nine Mile Point Transmission Lines during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
TERRESTRIAL RESOURCES	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collision with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Floodplains and wetland on power line right-of-way	4.5.7
AIR QUALITY	
Air quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

A brief description of the staff's review and GEIS conclusions, as codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, for each of these issues follows.

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

  The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power line right-of-way maintenance during the renewal term beyond those discussed in the GEIS.

- Bird collision with power lines. Based on information in the GEIS, the Commission found that

  Impacts are expected to be of small significance at all sites.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS.

Therefore, the staff concludes that there are no impacts of bird collision with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

  No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains and wetlands on power line right-of-way. Based on information in the GEIS, the Commission found that

  Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power line right-of-way on floodplains and wetlands during the renewal term beyond those discussed in the GEIS.

- Air quality effects of transmission lines. Based on information in the GEIS, the Commission found that

  Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

  Projected onsite land use changes required during [...] the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no onsite land use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way. Based on information in the GEIS, the Commission found that

  Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, consultation with the FWS and the NYSDEC, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power line right-of-way on land use during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-5 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-5. Category 2 and Uncategorized Issues Applicable to the Nine Mile Point Transmission Lines during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	N/A	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

Based on the GEIS, the Commission found that electric shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants, and generally are not expected to be a problem during the

license renewal term. However, a site-specific review is required to determine the significance of the electric shock potential of the site.

In the GEIS (NRC 1996), the staff found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC) criteria (IEEE 1997), it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

To support its conclusion that the three single-circuit 345-kV transmission lines at Nine Mile Point are in compliance with the NESC 5-mA, electric-field induced current limit, NMPNS performed field measurements and computer analyses. These measurements and analyses demonstrated that the electric-field-induced current from these transmission lines at Nine Mile Point is below the 5-mA limit and that the transmission lines meet the NESC recommendations for preventing electric shock from induced currents (NMPNS 2004b).

The staff has reviewed the available information, including that provided by the applicant, the staff's site visit, the scoping process, and other public sources. Using this information, the staff evaluated the potential impacts for electric shock resulting from operation of NMP and associated transmission lines. It is the staff's conclusion that the potential impacts for electric shock during the renewal term are SMALL. During the course of its evaluation, the staff considered mitigation measures for the continued operation of NMP. Based on the assessment to date, the staff expects that the measures in place at Nine Mile Point (e.g., transmission lines in compliance with the NESC) are appropriate, and no additional mitigation measures are warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or Category 2, and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy. A recent report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. Footnote 5 to Table B-1 states:

> If, in the future, the Commission finds that, contrary to current indications, a consensus has been reached by appropriate Federal health agencies that there are adverse health effects from electromagnetic fields, the Commission will require applicants to submit plant-specific reviews of these health effects as part of their license renewal applications. Until such time, applicants for license renewal are not required to submit information on this issue.

The staff considers the GEIS finding of "not applicable" still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to NMP in regard to radiological impacts are listed in Table 4-6. NMPNS stated in its ER (NMPNS 2004b) that it is not aware of any new and significant information associated with the renewal of the NMP OLs. The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Radiological Impacts of Normal Operations during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

  Radiation doses to the public will continue at current levels associated with normal operations.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

  Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-7. NMPNS stated in its ER (NMPNS 2004b) that it is not aware of any new and significant information associated with the renewal of the Nine Mile Point OLs. The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-7. Category 1 Issues Applicable to Socioeconomics during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

  Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services: education (license renewal term). Based on information in the GEIS, the Commission found that

  Only impacts of small significance are expected.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

  No significant impacts are expected during the license renewal term.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

  No significant impacts are expected during the license renewal term.

The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

Table 4-8 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

Table 4-8. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
	SOCIOECONOMICS		
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services: public transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed[(a)]	Not addressed[(a)]	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice is to be addressed in the licensee's environmental report and the staff's environmental impact statement.

4.4.1 Housing Impacts During Operations

In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NRC 1996), which presents a population characterization method that is based on two factors, "sparseness" and "proximity" (GEIS Section C.1.4 [NRC 1996]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS

Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

In 2000, 109,440 persons were living within 32 km (20 mi) of Nine Mile Point, which equals a population density of 87 persons per square mile within 32 km (20 mi). Based on this data, Nine Mile Point falls into Category 3 of the NRC's GEIS sparseness classification.[a] There are an estimated 914,668 persons living within 80 km (50 mi) of Nine Mile Point, which equates to a population density of 117 persons per square mile within 80 km (50 mi). Since Syracuse is the largest city within 80 km (50 mi) of the site and has a total population well over 100,000 persons, Nine Mile Point falls into Category 3 of the GEIS proximity classification. According to the NRC's GEIS sparseness and proximity matrix, Nine Mile Point's sparseness Category 3 and proximity Category 3 indicate that Nine Mile Point is in a medium density population area (NMNPS 2004b).

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. However, NMPNS does not plan to perform refurbishment and concluded that there would be no refurbishment-related impacts to area housing. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current employee distribution; and (3) each new job created (direct and indirect) represents on housing unit. As described in Section 2.2.8.1, approximately 95 percent of employees live in Oswego and Onondaga counties. Therefore, the focus of the housing impact analysis is on these areas in Section 2.2.8.1.

10 CFR Part 51, Subpart A, Appendix B, Table B-1 states that impacts on housing availability are expected to be of small significance at plants located in a medium-population area where growth-control measures are not in effect. This conclusion is supported by the following site-specific housing analysis. The GEIS assumes that an additional staff of 60 permanent NMPNS employees per unit might be needed during the license renewal period to perform routine maintenance and other activities. Section 3.4 of the Nine Mile Point ER (NMPNS 2004b) states that a total of 60 new direct jobs and 143 indirect jobs would be created for a total of 203 new workers needed. If it is assumed that each of the 203 new workers would located in the Onondaga and Oswego combined-county area, an additional 203 new housing units would be needed. This would not create a discernible change in housing availability, change rental rates and housing values, or spur housing construction or conversion. The Year 2000 Census estimated the population at 580,713 persons, and estimated housing vacancy rates in Onondaga and Oswego counties at 7.9 and 13.8 percent, respectively (NMPNS 2004b).

(a) Category 3 is defined as having 23 to 46 persons/km^2 (60 to 120/persons/mi^2), or having fewer than 23 persons/km^2 (60 persons/mi^2) with at least one community with 25,000 or more persons within 32 km (20 mi).

The staff reviewed the available information relative to housing impacts and NMPNS's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and additional mitigation measures are not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to the level of demand, and thus there is no need to add capital facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

Analysis of impacts on the public water supply system considered plant demand and plant-related population growth. Section 2.1.3 describes the Nine Mile Point permitted withdrawal rate and actual use of water. Nine Mile Point acquires potable water through the Oswego Water System, the largest public water supply provider in Oswego County. Current plant usage averages 651,000 L/day (172,000 gpd), with no restrictions on supply (see Section 3.1.3.3). The Oswego Water System serves approximately 23,950 customers in the City of Oswego and in portions of the towns of Oswego, Minetto, Scriba, and Volney. The water plant obtains its water from Lake Ontario, and its allowable withdrawal allocation is approximately 237 million L/day (62.5 million gpd), well in excess of its needs. The full design capacity of the water plant is 76 million L/day (20.1 million gpd), though 30 million L (8 million gal) is reserved for Sithe Energies, Inc., with the remaining 46 million L (12 million gal) available for other industrial, residential, and commercial customers (NMPNS 2004b). In 2001, consumptive daily demand averaged 30 million L/day (8 million gpd), and peak demand was approximately 38 million L/day (10 million gpd) (NMPNS 2004b). Since NMPNS is planning no major refurbishment, the plant demand is not expected to change.

In Section 3.4 of the ER (NMPNS 2004b), the applicant assumes that a maximum of 203 additional jobs are created during the license renewal period (60 direct jobs and 143 indirect jobs). It is also assumed that these new employees would primarily live in Oswego and Onondaga counties. Using a mulitplier of 2.61 (the average number of persons per household), it can be assumed that the 203 jobs would lead to a population increase of 530 people in the two counties. The increase in population in Oswego or Onondaga Counties resulting from license renewal would not create shortages in capacity of the water supply systems in either of the counties, because the largest suppliers of water to communities in each county are likely to be operating below capacity during the license renewal period.

The staff has reviewed the available information and the analysis discussed above. Because the increase in water use is a small percentage of available capacity in the region, the staff

concludes that the impact of the increase in water use is SMALL, requiring no additional mitigation.

4.4.3 Offsite Land Use During Operations

Offsite land use during the license renewal term is a Category 2 issue (10 CFR Part 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR Part 51 Subpart A, Appendix B notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

Section 4.7.4 of the GEIS defines the magnitude of land use changes as a result of plant operation during the license renewal term as follows:

> SMALL—Little new development and minimal changes to an area's land use pattern.
>
> MODERATE—Considerable new development and some changes to the land use pattern.
>
> LARGE—Large-scale new development and major changes in the land use pattern.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land use pattern, and (3) the extent to which the community already has public services in place to support and guide development.

NMPNS is assessed annual property taxes for Nine Mile Point by Oswego County, the Town of Scriba, and the City of Oswego School District. Property taxes paid to Oswego County and the Town of Scriba fund such services as transportation, education, public health, and public safety. From 1995 to 2001, NMPNS property tax contributions for Nine Mile Point to Oswego County have decreased from 21 percent to 9 percent of total revenues. By comparison, Nine Mile Point property tax payments to the City of Oswego School District have also fallen from 56 percent to 43 percent of total revenues during the time period of 1995 to 2000. Property tax payments from Nine Mile Point have historically constituted a significant portion of Town of Scriba revenues, although the percentage of the contributions compared to total revenues has decreased from 74 percent to 39 percent (NMPNS 2004b).

NMPNS has entered into an agreement with Oswego County, the Town of Scriba, and the City of Oswego school district regarding property taxes paid to those entities for Nine Mile Point. The agreement stipulates that NMPNS, instead of paying property taxes for Nine Mile Point based on the assessed value of the plant, will make standardized annual payments in lieu of taxes to the taxing entities (Section 2.2.8.6).

Because (1) NMPNS only proposes to employ a small number of additional personnel during the license renewal period, and (2) NMPNS does not anticipate major refurbishment or construction during this period, and therefore, does not anticipate any increase in the assessed value of Nine Mile Point during the license renewal period, the staff concludes that the net impact of plant-related population increases is likely to be SMALL.

4.4.4 Public Services: Transportation Impacts During Operations

Although no major refurbishment is planned at NMPNS, an additional 60 employees may be added during the license renewal term, representing a five-percent increase in the current number of permanent employees. NMPNS has staggered starting times for workers at Nine Mile Point, which minimizes the impact on local transportation conditions caused by plant workers currently entering and leaving the site.

As described in Section 2.2.8.2, road access to Nine Mile Point is via Lake Road (County Road 1A). This roadway, County Road 1, and Lakeview Road are considered to be in good condition by Oswego County Public Works. The annual average daily traffic count for the segment of County Road 1A from County Road 1 to Lakeview Road was 4900 in 1995. The level of service (LOS) rating of the approaches for the two intersections closest to Nine Mile Point along County Road 1A for peak use hours ranged from "A" to "C" with one approach having an "F" rating; however the majority of approaches carried an "A" or "B" rating. The 60 additional employees associated with license renewal for Nine Mile Point would represent a 4.7 percent increase in the current number of permanent employees and an even smaller percentage of employees present onsite during a typical refueling outage.

Given the employment projections and the staggered shifts used at Nine Mile Point, the staff concludes the impacts of license renewal on traffic conditions would be SMALL and additional mitigative measures would be unwarranted.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA 1966), as amended through 2000, requires Federal agencies to take into account the potential effects of their undertakings on historic properties. The historic-review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation (ACHP) at 36 CFR Part 800. Renewal of an OL for a nuclear power plant is an undertaking that could possibly affect either known or potential historic properties that may be located at the plant. Therefore, in accordance with the provisions of the NHPA, the NRC is required to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Office (SHPO) before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking. In general, lands within the boundaries of a nuclear-plant site fall into one of the following categories:

(1) Areas with no potential for archaeological resources. These areas include lands where past disturbances related to the construction of the power station and appurtenant facilities have taken place to such an extent that once-extant cultural resources are no longer present. No further archaeological investigations would be recommended for these areas.

(2) Areas with low potential for archaeological resources. Lands within the plant site that fall into this category are those that are relatively undisturbed but that possess characteristics that would normally indicate a low possibility for most types of cultural resources to occur. For most of these areas, further archaeological work would not be necessary, although there could be smaller areas within the larger zone where specific ground conditions could require investigation.

(3) Areas with moderate to high potential for archaeological resources. These areas are classified as those that are relatively undisturbed by past activities and have a likelihood for prehistoric and historic archaeological sites, according to local models of prehistoric and historic land use and settlement patterning. Archaeological investigation would be recommended prior to undertaking any ground-disturbing activities in these areas.

Nine Mile Point is primarily made up of areas of no and low potential for archaeological resources. Limited portions of the Nine Mile Point site represent areas of moderate to high potential for archaeological sites. No archaeological sites, either historic or prehistoric in age, are recorded at Nine Mile Point or the transmission corridor that transits south and east from Nine Mile Point to the Clay Substation in Onondaga County. However, early maps of the project area indicate that a suite of residences, mostly of nineteenth century origin, existed in the Nine Mile Point site land area. These occupations produced historic archaeological deposits; the NRC staff verified that such deposits are present on Nine Mile Point property during a September 2004 site visit.

Nine Mile Point has not been investigated by professional archaeologists at a level that would conclusively determine current presence or absence of archaeological sites at locations where maps show houses and outbuildings were located in the nineteenth and twentieth centuries, or to define the significance of any such resources that exist on these lands. However, the Nine Mile Point license renewal application for continued operations does not include proposals for future land-disturbing activities or structural modifications beyond routine maintenance at the plant. Such disturbances may occur over the term of the license, but they are unlikely to occur without additional review.

Constellation Nuclear Services initiated communication with the New York SHPO about the re-licensing in a letter dated December 13, 2002, and Constellation Energy Group followed up with a similar letter on February 28, 2004 (NMPNS 2002, 2004a). The letters express Constellation's desire to assess the effects of the license renewal on historic properties, as required by the NRC of applicants for operating license renewal. The letters include the Nine

Mile Point site itself and a transmission corridor that extends approximately 42 km (26 mi) southeast to the Clay Substation within the purview of the undertaking. The applicant notes in its letters that it does not expect the operation of Nine Mile Point, including maintenance of the identified transmission line, through the license renewal term to adversely affect cultural or historical resources. The 2002 letter (NMPNS 2002) states that "there are no planned operational or land disturbing activities associated with the period of extended operation that would impact previously undisturbed areas of the site." Both letters request information of any kind that might alter a conclusion that operations in the license renewal period would not impact cultural resources. A response by the SHPO states there are no known archaeological sites within the Nine Mile Point site or in the transmission corridor (NYSOPRHP 2003).

The NRC has forwarded its own letter to the New York SHPO. The area of potential effect (APE) for the license renewal action is defined as the area of the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The letter includes notification, in accordance with 36 CFR Part 800.8, that the NRC will review impacts to historic and archaeological resources in a SEIS (NRC 2004c). A similar notification was sent to the ACHP (NRC 2004b).

The staff reviewed the applicant's assumptions and resulting conclusions as they relate to historical and archaeological resources and determined that unrecorded and archaeological resources could be present on the site. The setting of Nine Mile Point, adjacent to Lake Ontario in an area settled by non-Native Americans in the nineteenth century, indicates a moderate to high potential for discovery of significant archaeological resources of historic age. However, that potential occurs in limited areas of sensitivity. Specifically, those areas are locations within 152 m (500 ft) of historic roads, except for those places heavily disturbed already by plant and building construction, and previously little-disturbed areas within 152 m (500 ft) of permanent water sources on or flowing through the lands controlled by the applicant at Nine Mile Point. These considerations require adequate plans to protect archaeological sites from inadvertent disturbance or destruction.

No historic properties would be affected by a decision to renew the licenses for operation of Nine Mile Point. Considering (1) the applicant's understanding that portions of the Nine Mile Point site have moderate to high potential for discovery of archaeological sites, (2) the procedure the applicant has in place to evaluate proposed actions that could significantly affect the environment, and (3) the applicant has initiated a new procedure to assist employees in recognizing and protecting cultural resources, the staff determines that the impact of license renewal on historical and archaeological resources is SMALL and additional mitigation is not warranted. The staff notes that the New York SHPO office requires archeological investigations for all areas potentially affected by individual actions.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions on minority[(a)] or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). On August 24, 2004, the Commission published a Final Policy Statement in the *Federal Register* on the treatment of environmental justice matters in the NRC regulatory and licensing actions (NRC 2004c). The Final Policy Statement reaffirms that the Commission is committed to full compliance with the requirements of NEPA. Although the Executive Order is not mandatory for independent agencies, the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203 Rev 1, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2004e). In 2004 the Commission issued a *Final Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions* (NRC 2004f).

The scope of the review as defined in NRC guidance (NRC 2004) includes identification of impacts on minority and low-income populations, the location and significance of any environmental impacts during operations on these populations and any additional information pertaining to mitigation. It also includes an evaluation of whether these impacts are likely to be disproportionately high and adverse.

The staff identifies minority and low-income populations within the 80-km (50-mi) radius of the site. For the staff's review, a minority population exists in a census block group[(b)] if the percentage of each minority and aggregated minority category within the census block group exceeds the percentage of minorities in the state of which it is a part by 20 percentage points, or the percentage of minorities within the census block group is at least 50 percent. A low-income population exists if the percentage of low-income population within a census block groups exceeds the percentage of low-income population in the state of which it is a part by

(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native; Native Hawaiian or other Pacific Islander; or Black races; or Hispanic ethnicity. "Other" races and multiracial individuals may be considered a separate minority category (NRC 2004e).

(b) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts.

20 percentage points, or if the percentage of low-income population within a census block group is at least 50 percent.

For the Nine Mile Point review, the staff examined the geographic distribution of minority and low-income populations within 80-km (50-mi) from the center of the site, using data from the 2000 Census (NMPNS 2004b). Figures 4.1 and 4.2 show the distribution of census block groups for the minority and low-income populations, respectively, in the vicinity of the NMPNS site.

There were a total of 50 census block groups that exceeded the CEQ thresholds defining minority population. Onondaga County has 45 block groups with a Black or African American minority population and Cayuga County has one block group with a Black or African American minority population. Onondaga County is the only county within the 80-km (50-mi) radius of Nine Mile Point to have a block group with a Native American and Alaska Native minority population (one block group). There were no census block groups identified in any of the counties within the 80-km (50-mi) radius of Nine Mile Point to have an Hispanic or Latino minority population. Forty-six of the 48 census blocks groups with an aggregate minority population were located in Onondaga County. Cayuga and Oneida counties each had one census block group with an aggregate minority population (NRC 2006).

Onondaga County is home to both the Onondaga Indian Reservation and the City of Syracuse. The only block group within the Nine Mile Point 80-km (50-mi) radius with a Native American and Alaska Native minority population is located on the Onondaga Indian Reservation. Many of the other block groups with minority populations within the 80-km (50-mi) radius of Nine Mile Point are located within Syracuse, typical for an urban center with a high population density.

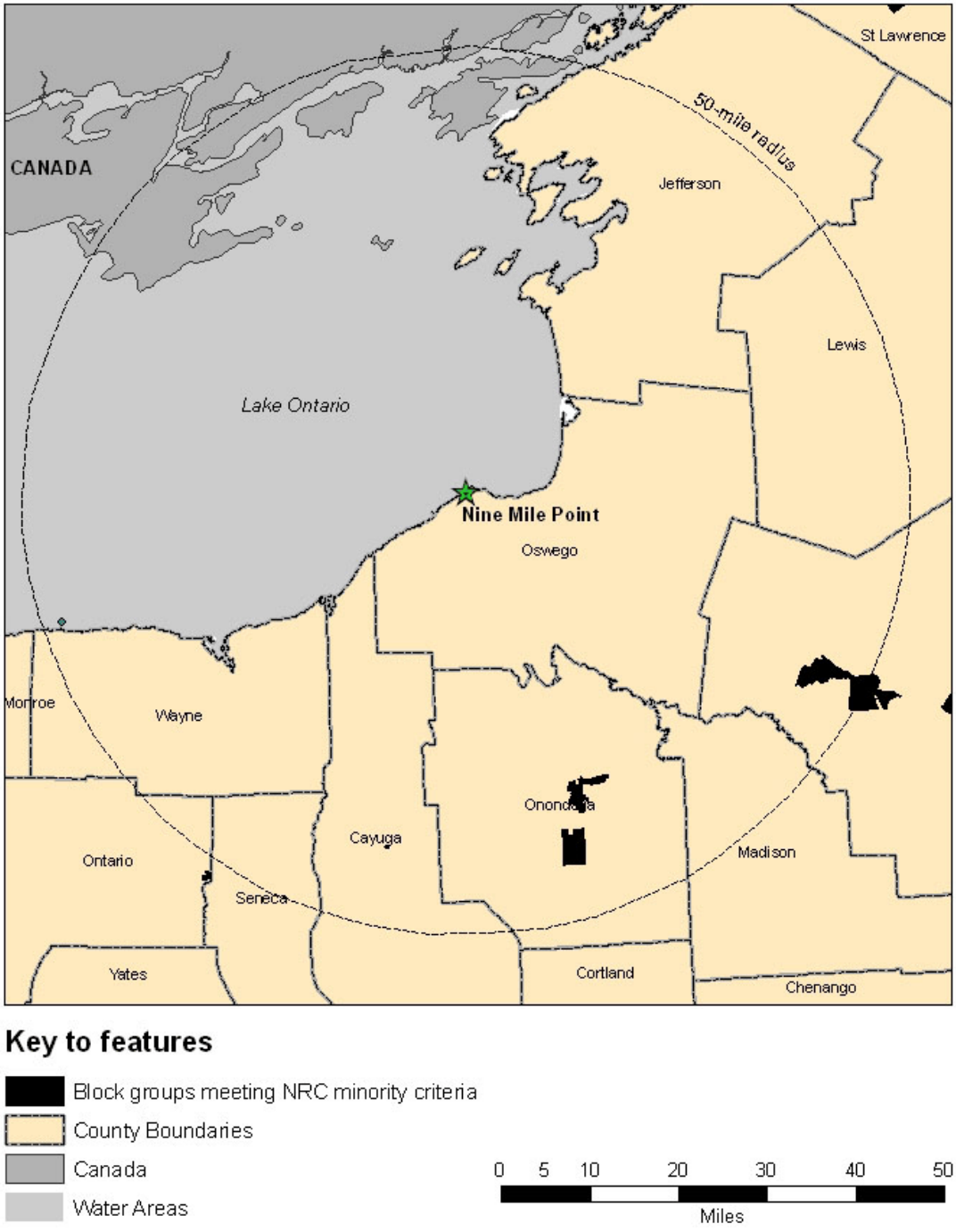

Figure 4-1. Geographic Distribution of Minority Populations (Shown in Shaded Areas) Within 80 km (50 mi) of Nine Mile Point Units 1 and 2 Based on Census Block Group Data

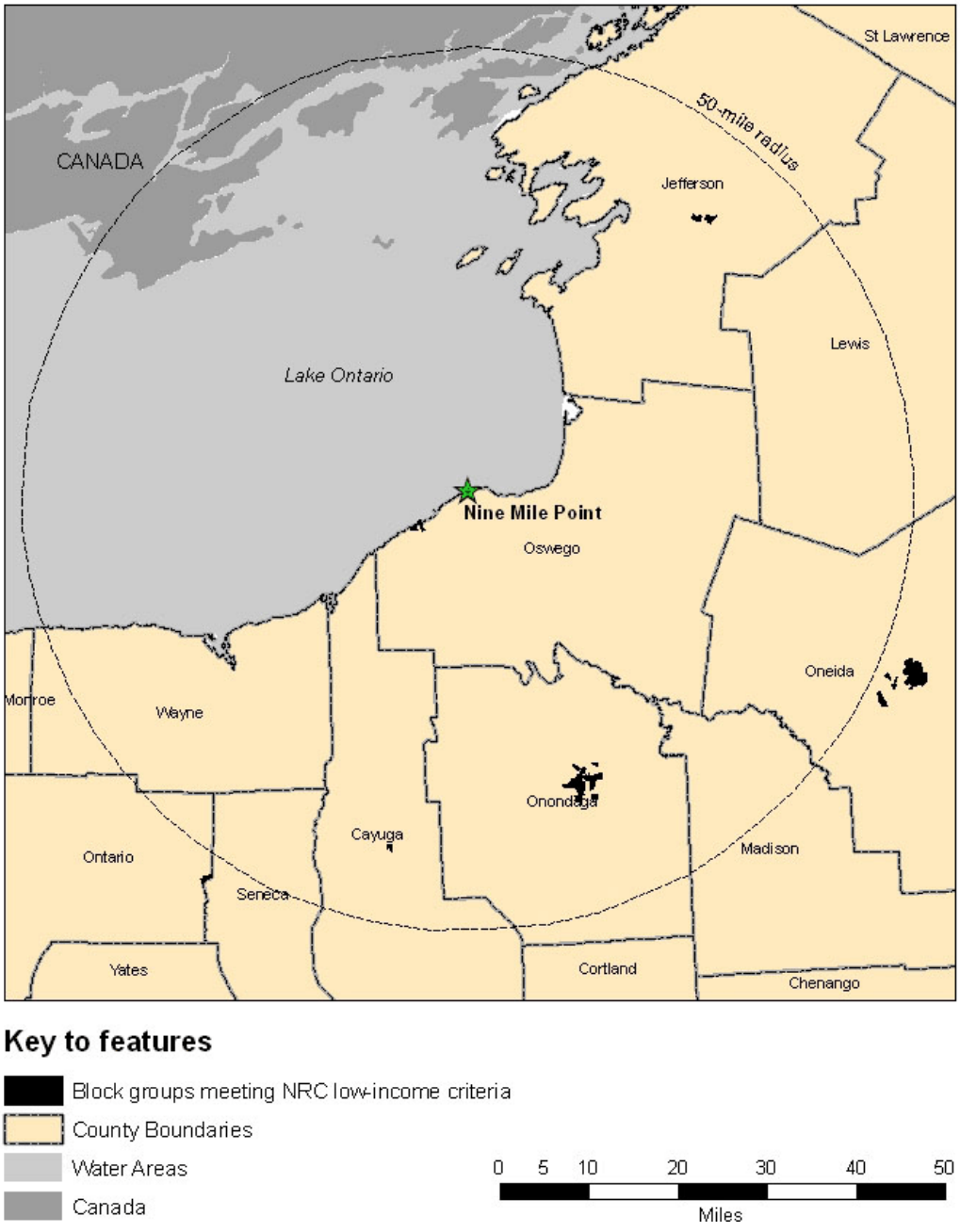

Figure 4-2. Geographic Distribution of Low-Income Populations (Shown in Shaded Areas) Within 80 km (50 mi) of Nine Mile Point Units 1 and 2 Based on Census Block Group Data

A total of 54 census block groups within the 80-km (50-mi) radius of Nine Mile Point meet the criteria for low-income populations. The majority of the census block groups with a low-income population were located in Onondaga County (46 block groups with a low income population) in the City of Syracuse. Three other counties—Cayuga, Jefferson, and Oswego—each had less than three census blocks with a low-income population (NRC 2006a).

With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionately high or adverse manner. Based on staff guidance (NRC 2004), air, land, and water resources within about 80 km (50 mi) of the Nine Mile Point Plant were examined. Within that area, a few potential environmental impacts could affect human populations; all of these were considered SMALL for the general population.

The pathways through which the environmental impacts associated with NMPNS license renewal can affect human populations are discussed throughout this SEIS. The staff evaluated whether minority or low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting or fishing, through which the populations could be affected in a disproportionately high and adverse way. In addition, the staff did not identify any location-dependant disproportionately high and adverse impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Nine Mile Point to minority and low-income populations would be SMALL, and, therefore, no mitigation is warranted.

4.5 Groundwater Use and Quality

No Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are potentially applicable to Nine Mile Point groundwater use and quality during the renewal term.
The staff has not identified any new and significant information during its independent review of the Nine Mile Point ER (NMPNS 2004b), the staff's site visit, the scoping process, or staff's evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues that are beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation is not likely to be sufficiently beneficial to be warranted.

Category 2 issues related to groundwater use and quality during the renewal term that are applicable to Nine Mile Point are discussed in the sections that follow. The issue that requires plant-specific analysis is listed in Table 4-9.

Table 4-9. Category 2 Issue Applicable to Groundwater Use and Quality during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
GROUNDWATER USE AND QUALITY			
Groundwater use conflicts (plants using more than 100 gpm of groundwater)	4.8.1.1	C	4.5.1

4.5.1 Groundwater Use Conflicts (Plants That Use More Than 100 gpm of Groundwater)

The NRC made groundwater use conflicts a Category 2 issue because, at a withdrawal rate of more than 6.3 L/s (100 gpm), the magnitude of potential impacts the resulting cone of depression has on offsite wells could not be determined generically. The staff evaluated the following site-specific information to assess the potential for groundwater use conflicts: (1) Nine Mile Point groundwater withdrawal rate, (2) size of the cone of depression, (3) location of neighboring wells, and (4) description of wetlands in the vicinity that might be impacted by a lowered water table.

The only ongoing or planned withdrawal of groundwater at Nine Mile Point is the permanent dewatering system that is operated to maintain a cone of depression around the Unit 2 reactor building. Two submersible pumps draw groundwater at an estimated average combined rate of 12.6 L/s (200 gpm) to maintain the cone of depression.

The Unit 2 dewatering system is designed to maintain the water table below the reactor mat elevation of approximately 50 m (164 ft) National Geodetic Vertical Datum (NGVD). The cone of depression created by dewatering activities is steep, as evidenced by studies showing that the water table reaches approximately 77.4 m (254 ft) NGVD within 183 m (600 ft) of the Unit 2 reactor building. The normal groundwater table in the Nine Mile Point plant complex area is approximately 77.7 m (255 ft) NGVD. Therefore, through the current operating period, dewatering activities at Unit 2 have resulted in a groundwater table drawdown of approximately 0.3 m (1 ft) or less beyond 183 m (600 ft) of the reactor building.

This comparison indicates that dewatering results in little or no lowering of the groundwater table offsite. The staff concludes that continued dewatering activities would not impact offsite wells, none of which are nearer than approximately 1.6 km (1 mi) from the Unit 2 reactor. All onsite wetlands are outside the zone of influence and are upgradient of dewatering operations. Considering the evidence presented herein, no noticeable groundwater use conflicts are posed by Nine Mile Point groundwater withdrawals. The staff concludes that impacts to the aquifer in

the area would be SMALL over the license renewal period, and mitigation would not be warranted.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

This issue of threatened or endangered species present at Nine Mile Point requires consultation with appropriate agencies to determine whether any such species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. The staff consulted with the FWS under provisions of Section 7 of the Endangered Species Act (ESA) concerning the potential impacts of an additional 20 years of operation and maintenance activities at NMP on Federally listed species. The staff initiated consultation by requesting a list of threatened and endangered species (NRC 2004d). The FWS responded (FWS 2004) with a determination that, while the Indiana bat may be found at the proposed project site if suitable habitat is present, the potentially suitable habitat is not going to be disturbed by the proposed action. Therefore, the FSW determined that with the exception for the potential for the Indiana bat and occasional transient piping plover and bald eagle individuals, no Federally listed or proposed endangered or threatened species are known to exist in the project area, and no biological assessment (BA) or further Section 7 consultation under the ESA is required with the FWS (2004). This consultation correspondence is in Appendix E.

Therefore, the staff's concludes that the potential impacts on threatened and endangered aquatic and terrestrial species from 20 additional years of operation of Nine Mile Point would be SMALL.

Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

4.6.1 Aquatic Species

No Federally listed or proposed threatened and endangered aquatic species, with the exception of transient individuals, are known to exist in the vicinity of Nine Mile Point or the aquatic habitats crossed by the transmission line associated with NMP (FWS 2003, 2004). There are no plans to conduct refurbishment or construction at NMP during the period covered by the relicensing (NMPNS 2004b). The staff's conclusion is that the potential impacts on threatened and endangered aquatic species from reactor operation for an additional 20 years at Nine Mile Point would be SMALL, and, therefore, mitigation is not warranted.

4.6.2 Terrestrial Species

Federally listed terrestrial species potentially occurring in Oswego and Onondaga counties include Hart's-tongue fern, small whorled pogonia, Indiana bat, bog turtle, piping plover, and bald eagle. Based on consultation with the FWS (2004), only the Indiana bat has the possibility of using the Nine Mile Point or associated transmission line corridors. However, the FWS concluded that the nature of the proposed action would not adversely affect the Indiana bat (FWS 2004). The FWS also stated that the bald eagle and piping plover may be occasional transients to the site and corridor. Therefore, the staff's conclusion is that the potential impacts at Nine Mile Point on threatened and endangered terrestrial species due to reactor operation for an additional 20 years would be SMALL, and therefore, mitigation is not warranted.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS, reviewed a separate report by NMPNS, and conducted its own independent review, including public scoping meetings, to identify issues with new and significant information. The staff has not identified new and significant information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. Processes for identification and evaluation of new information are described in Section 1.2.2.

4.8 Cumulative Impacts

The staff considered potential cumulative impacts during the evaluation of information applicable to each of the potential impacts of operations of Nine Mile Point during the renewal term. The impacts of the proposed license renewal are combined with other past, present, and reasonably foreseeable actions to determine whether cumulative impacts exist. For the purposes of this analysis, past actions were those related to the resources at the time of the plant licensing and construction, present actions are those related to the resources at the time

of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of the plant operation. Therefore, the analysis considers potential impacts through the end of the current license term, and through the 20-year license renewal term. The geographical area over which past, present, and future actions that could contribute to cumulative impacts is dependent on the type of action considered. The geographical area is described below for each cumulative impact.

The impacts of the proposed action, as described in Section 4, are combined with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor but collectively significant actions taking place over a period of time. It is possible an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

4.8.1 Cumulative Impacts Resulting from the Operation of the Plant Cooling System

For the purposes of this analysis, the geographic area considered for cumulative impacts resulting from operation of the Nine Mile Point cooling system is primarily the eastern portion of Lake Ontario within the 80-km (50-mi) radius of Nine Mile Point. As described in Section 4.1, the staff found no new and significant information indicating that the conclusions regarding any of the cooling system-related Category 1 issues as related to NMP are inconsistent with the conclusions in the GEIS. Additionally, the staff determined that none of the cooling system-related Category 2 issues were likely to have greater than a SMALL impact on local water quality or aquatic resources.

In general, the overall water quality of Lake Ontario and the status of the fishery and other aquatic resources have greatly improved since Nine Mile Point started operations. Therefore, there is no basis to conclude that the continuing SMALL impacts of Nine Mile Point operations, including entrainment of fish and shellfish, impingement of fish and shellfish, heat shock, or any of the cooling system-related Category 1 issues are contributing to an overall decline in water quality or in the status of the fishery or other aquatic resources. In addition, the staff has determined that the combined effects of entrainment and impingement, given current information, on fish and shellfish are minor, and together are not noticeably affecting local or lake-wide populations.

During 1987, the governments of Canada and the United States made a commitment, as part of the Great Lakes Water Quality Agreement, to develop a Lakewide Management Plan for each of the five Great Lakes. According to the 1987 Agreement, the plans embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in the lakes. The plans address sources of lake-wide critical

pollutants. The plans are coordinated with other efforts that are best suited to address issues of local concern. In addition, the plans use linkages to other natural resource management activities, such as the development of Lake Ontario fish community objectives by the Great Lakes Fishery Commission and the Lake Ontario Committee of fisheries managers. The plans address impairments found in open waters of the lake and nearshore areas. Tributaries, including the Niagara River, are treated as inputs to the lake. The St. Lawrence River is treated as an output from the lake (EPA 2004a). Given the lake-wide management plans in place to protect Lake Ontario and its environs, the staff concludes that potential cumulative effects will be carefully assessed and managed over time.

In addition to NMP, three other nearby power-producing facilities withdraw from and discharge water to Lake Ontario. These include the James A. FitzPatrick Nuclear Power Plant (adjacent to the east), the gas-powered Sithe Energies Independence Station (5.6 km) [3.5 mi]) southwest, and the fossil-fuel-powered Oswego Steam Station (12 km [7.5mi]) southwest. Withdrawals and discharges from these facilities are also regulated by the State of New York under the SPDES permitting process.

As described in Section 2.2.8.2, local water utilities in Oswego and Onondaga counties withdraw potable water from a variety of groundwater and surface water sources. The average daily water demand by the communities in the area is about 134 million liters (35.4 million gallons). The current capacity of the water supplies in the area is well in excess of the current demand, and withdrawal is regulated and controlled by New York State and other governmental agencies.

The staff, while preparing this document, assumed that other industrial, commercial, or public installations will be located in the general vicinity of Nine Mile Point prior to the end of the Nine Mile Point operation. The intake of water from and the discharge of water to Lake Ontario for these facilities would be regulated by the NYSDEC and other agencies, just as the Nine Mile Point plant is currently regulated. The intake and discharge limits for each installation would be set by the SPDES process considering the overall or cumulative impact of all of the other regulated activities in the area. Therefore, the staff concludes that the potential cumulative impacts of continued operation of Nine Mile Point will be SMALL, and that no additional mitigation measures are warranted.

4.8.2 Cumulative Impacts Resulting from Continued Operation of Transmission Lines

The continued operation of the electrical transmission facilities associated with relicensing of NMP was evaluated to determine if there is a potential for interactions with other past, present, and future actions that could result in adverse cumulative impacts to terrestrial resources (e.g., wildlife populations and the size and distribution of habitat areas), wetlands, floodplains, or aquatic resources. For the purposes of this analysis, the geographic area that encompasses

the past, present, and foreseeable future actions that could contribute to adverse cumulative effects is the area within an 80 km (50 mi) radius of the Nine Mile Point site as depicted in Figure 2-1.

As described in Section 4.2, the staff found no new and significant information indicating that the conclusions regarding any of the transmission line-related Category 1 issues related to NMP are inconsistent with the conclusions in the GEIS. The applicant uses vegetation management practices that are protective of wildlife and habitat resources, including floodplains and wetlands, to maintain its rights-of-way. Transmission line maintenance activities are not expected to alter wetland or floodplain hydrology or adversely affect vegetation characteristics of these habitats. Therefore, continued operation and maintenance of these rights-of-way is not likely to contribute to a regional decline in wetland or floodplain resources. The maintenance procedures ensure minimal disturbance to wildlife and may improve the habitat within the rights-of-way relative to many of the surrounding land uses.

Therefore, the staff has determined that the cumulative impacts of the continued operation of the transmission lines associated with NMP will be SMALL, and that no further mitigation is warranted.

4.8.3 Cumulative Radiological Impacts

The EPA and the NRC established radiological dose limits for protection of the public and workers from both instantaneous and cumulative effects of exposure to radiation and radioactive materials. These dose limits are codified in 40 CFR Part 190 and 10 CFR Part 20. For the purpose of this analysis, the area within a 80-km (50-mi) radius of the Nine Mile Point site was included. As stated in Section 2.2.7, NMPNS and previous owners of NMP have conducted a radiological environmental monitoring program (REMP) around the Nine Mile Point site since 1969. The REMP measures radiation and radioactive materials from all sources, including NMP and the James A. FitzPatrick plant. Additionally, in Sections 2.2.7 and 4.3, the staff concluded that impacts of radiation exposure to the public and workers (occupational) from operation of NMP during the renewal term are SMALL. Hence, the monitoring program and the staff's conclusion address cumulative impacts. The NRC and the State of New York would regulate any reasonably foreseeable future actions in the vicinity of Nine Mile Point site that could contribute to cumulative radiological impacts.

Therefore, the staff concludes that cumulative radiological impacts of continued operations of NMP would be SMALL, and that no further mitigation measures are warranted.

4.8.4 Cumulative Socioeconomic Impacts

Much of the analysis of socioeconomic impacts presented in Section 4.4 of this SEIS already incorporates cumulative impact analysis because of the metrics used for quantification only make sense when placed in the total or cumulative context. For instance, the number of additional housing units that may be needed can only be evaluated with respect to the total number that will be available in the impacted area. Therefore, the geographical area of the cumulative analysis varies, depending on the particular impact considered, and may be distance related, as in the case of environmental justice.

The continued operation of Nine Mile Point is not likely to add to any cumulative socioeconomic impacts beyond those already evaluated in Section 4.4. In other words, the impacts of issues, such as transportation or offsite land use, are likely to be undetectable beyond the regions previously evaluated and will quickly decrease with increasing distance from the site. The staff determined that the impacts on housing, public utilities, public services, and environmental justice would all be SMALL. The staff determined that the impact on offsite land use would be SMALL because no refurbishment actions are planned at Nine Mile Point, and no incremental sources of plant-related tax payments are expected that could influence land use by fostering considerable growth. There are no reasonably foreseeable scenarios that would alter these conclusions in regard to cumulative impacts. Therefore, the staff concludes that the cumulative socioeconomic impacts of continued operation at Nine Mile Point would be SMALL, and additional mitigation is not warranted.

4.8.5 Cumulative Impacts on Groundwater Use and Quality

Groundwater is withdrawn only for dewatering at Nine Mile Point Unit 2 (Section 4.5). Dewatering activities at Unit 2 have resulted in a groundwater table drawdown of approximately one foot or less beyond 183 m (600 ft) of the reactor building, and in little or no lowering of the groundwater table offsite.

The plant imports potable water withdrawn from Lake Ontario from the Oswego Water System for plant use. The impact of current water usage has been determined in Section 4.5 to be SMALL. Because there are no groundwater withdrawals other than for dewatering at Nine Mile Point Unit 2 and there are no additional withdrawals anticipated in the future, the Nine Mile Point site is not causing a detectable change in the regional groundwater usage. Therefore, the cumulative impact is SMALL and no mitigation measures are warranted.

4.8.6 Cumulative Impacts on Threatened or Endangered Species

The geographic area considered in the analysis of potential cumulative impacts to threatened or endangered species includes those counties that contain Nine Mile Point and its associated transmission line rights-of-way (Oswego and Onondago counties) and the waters of Lake Ontario. As discussed in Sections 2.2.5 and 2.2.6, the Indiana bat is known to exist in the

vicinity of the project area, yet is not likely to be adversely affected by the proposed project (FWS 2004). Except for occasional transient bald eagles and piping plovers, no other Federally listed or proposed threatened or endangered species are known to exist in the project area, and no critical habitat, as designated by the ESA, occurs in areas affected by Nine Mile Point (FWS 2003, 2004). The staff's determination, presented in Section 4.6, is that continued operation of the NMP would have a SMALL impact on Federally listed species.

4.8.6.1 Aquatic Species

No Federally listed aquatic species (Table 2-2) occur in the area of Nine Mile Point or within aquatic habitats traversed by the plant's transmission lines (FWS 2003, 2004). The staff, as a result, determined in Section 4.6 that continued operation of Nine Mile Points Units 1 and 2 would have no effect on any Federally listed species. Therefore, the continued operation of the plant is not expected to contribute to adverse cumulative impacts on any Federally listed species.

The staff has determined that the cumulative impacts to aquatic threatened or endangered species due to continued operation of NMP and associated transmission lines would be SMALL, and that no further mitigation measures are warranted.

4.8.6.2 Terrestrial Species

Based on consultation with the FWS (2004), only the Indiana bat, a Federally listed species, has the possibility to occur within the Nine Mile Point facility and associated transmission line corridors. The FWS also concluded that the proposed action was not likely to adversely affect the Indiana bat. Except for occasional transient bald eagles and piping plovers, no other Federally listed terrestrial species (see Table 2-3) are known to occur in the area of Nine Mile Point or within terrestrial habitats traversed by the plant's transmission lines (FWS 2003). The staff, as a result, determined in Section 4.6 that continued operation of Nine Mile Points Units 1 and 2 would not contribute to adverse cumulative impacts to these species.

The staff has determined that the cumulative impacts to terrestrial threatened or endangered species due to continued operation of NMP and associated transmission lines would be SMALL, and that no further mitigation measures are warranted.

4.9 Summary of Impacts of Operation During the Renewal Term

Neither NMPNS nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the Nine Mile Point operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues,

the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 12 Category 2 issues applicable to Nine Mile Point operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For 11 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of Nine Mile Point would be of SMALL significance in the context of the standards set forth in the GEIS and that additional mitigation would not be warranted. For threatened and endangered species, the staff's conclusion is that the impact resulting from license renewal would be SMALL and further investigation is not warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, the staff did not conduct an evaluation of this issue.

4.10 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forest and Public Property,* Part 800, "Protection of Historic and Cultural Resources."

40 CFR Part 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

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5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) Single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term.

5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

5.1.1 Design-Basis Accidents

In order to receive NRC approval to operate a nuclear power facility, an applicant for an initial operating license must submit a safety analysis report (SAR) as part of its application. The SAR

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients, and a broad spectrum of postulated accidents, without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant, but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in Title 10 of the Code of Federal Regulations (CFR) Part 50 and 10 CFR Part 100.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating licenses (OLs). The results of these evaluations are found in license documentation such as the applicant's final safety analysis report (FSAR), the staff's safety evaluation report (SER), the final environmental statement (FES), and Section 5.1 of this final supplemental environmental impact statement (SEIS). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the license renewal period. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, DBAs are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs makes them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal. This issue, applicable to Nine Mile Point Units 1 and 2 (NMP), is listed in Table 5-1.

Table 5-1. Category 1 Issue Applicable to Postulated Accidents during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
POSTULATED ACCIDENTS	
Design basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found that:

> The NRC staff has concluded that the environmental impacts of design basis accidents are of small significance for all plants.

Nine Mile Point Nuclear Station, LLC (NMPNS) stated in its Environmental Report (ER) (NMPNS 2004) that it is not aware of any new and significant information associated with the renewal of the Nine Mile Point Units 1 and 2 OLs. The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to design basis accidents beyond those discussed in the GEIS.

5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. In the GEIS, the staff assessed the impacts of severe accidents during the license renewal period, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Severe accidents initiated by external phenomena such as tornadoes, floods, earthquakes, fires, and sabotage have not traditionally been discussed in quantitative terms in FESs and were not specifically considered for the Nine Mile Point site in the GEIS (NRC 1996). However, in the GEIS the staff did evaluate existing impact assessments performed by NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from sabotage and beyond design basis earthquakes at existing nuclear power plants is SMALL. Additionally, the staff concluded that the risks from other external events are adequately addressed by a generic consideration of internally initiated severe accidents.

Based on information in the GEIS, the Commission found that:

> The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from

severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to NMP, is listed in Table 5-2.

Table 5-2. Category 2 Issue Applicable to Postulated Accidents during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
	POSTULATED ACCIDENTS		
Severe accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

The staff has not identified any new and significant information with regard to the consequences from severe accidents during its independent review of the NMPNS ER (NMPNS 2004), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for NMP. The results of its review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives

Section 51.53(c)(3)(ii)(L) requires that license renewal applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for Nine Mile Point; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

This section presents a summary of the SAMA evaluations for Nine Mile Point conducted by NMPNS and described in the ER and the NRC's review of those evaluations. The details of the review are described in the NRC staff evaluations that were prepared with contract assistance from Information Systems Laboratories, Inc. The entire evaluation for Nine Mile Point is presented in Appendix G.

The SAMA evaluations for Nine Mile Point were conducted with a four-step approach. In the first step NMPNS quantified the level of risk associated with potential reactor accidents using plant-specific probabilistic risk assessments (PRAs) and other risk models.

In the second step NMPNS examined the major risk contributors and identified possible ways (SAMAs) of reducing that risk. Common ways of reducing risk are changes to components, systems, procedures, and training. NMPNS initially identified 220 potential SAMAs for NMP. For each unit, NMPNS performed an initial, qualitative screening in which they eliminated SAMAs that were not applicable to Nine Mile Point, had already been implemented at Nine Mile Point, had associated costs that exceed the maximum attainable benefit, or do not provide a significant benefit. This screening reduced the list of potential SAMAs to 13 for Unit 1 and 20 for Unit 2.

In the third step NMPNS estimated the benefits and the costs associated with each of the remaining SAMAs. Estimates were made of how much each SAMA could reduce risk. Those estimates were developed in terms of dollars in accordance with NRC guidance for performing regulatory analyses (NRC 1997). The cost of implementing the proposed SAMAs was also estimated.

Finally, in the fourth step, the costs and benefits of each of the remaining SAMAs were compared to determine whether the SAMA was cost-beneficial, meaning the benefits of the SAMA were greater than the cost (a positive cost-benefit). NMPNS concluded in its ER that four of the SAMAs evaluated for Unit 1 and 11 of the SAMAs evaluated for Unit 2 would be potentially cost-beneficial (NMPNS 2004).

None of these SAMAs relate to adequately managing the effects of aging during the period of extended operation; therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. NMPNS's SAMA analyses and the NRC's review are discussed in more detail below.

5.2.2 Estimate of Risk

NMPNS submitted an assessment of SAMAs for Nine Mile Point as part of the ER (NMPNS 2004). This assessment was based on the most recent NMP PRA available for each unit at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer program, and insights from the Nine Mile Point Individual Plant Examinations (IPE) for Unit 1 (NMPC 1993) and for Unit 2 (NMPC 1992) and Individual Plant Examination of External Events (IPEEE) for Unit 1 (NMPC 1996) and for Unit 2 (NMPC 1995).

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately 2.7×10^{-5} per year for Unit 1 and approximately 6.2×10^{-5} per year for Unit 2. These CDFs are based on the risk assessment for both internally and externally initiated events. The breakdown of CDF by initiating event for Units 1 and 2 is provided in Table 5-3.

Loss of injection due to fires and station blackout (SBO) are dominant contributors to the CDF for Unit 1. At Unit 2, SBO, loss of injection due to internal events, and loss of heat removal are dominant contributors to CDF. For Unit 1, fires contribute 49 percent and seismic events contribute five percent to the total CDF. Internal flooding events were screened from further consideration. For Unit 2, fires contribute six percent, internal floods contribute two percent, and seismic events contribute one percent to the total CDF.

Table 5-3. Core Damage Frequency

	Unit 1		Unit 2	
Initiator or Accident Class	**CDF (Per Year)**	**Percent Contribution to CDF**	**CDF (Per Year)**	**Percent Contribution to CDF**
Loss of support systems	7.8×10^{-6}	29	4.7×10^{-5}	75
Transients	4.1×10^{-6}	15	8.1×10^{-6}	13
Loss of coolant accidents (LOCAs)	5.4×10^{-7}	2	1.2×10^{-6}	2
Internal floods	NR[(a)]	NR[(a)]	1.2×10^{-6}	2
Internal Events CDF	1.3×10^{-5}	46	5.8×10^{-5}	93
Fires	1.3×10^{-5}	49	3.7×10^{-6}	6
Seismic activity	1.3×10^{-6}	5	6.2×10^{-7}	1
External Events CDF	1.4×10^{-5}	54	4.3×10^{-6}	7
Total CDF	**2.7×10^{-5}**	**100**	**6.2×10^{-5}**	**100**

(a) NR not reported; was screened from analysis

In the ER, NMPNS estimated the dose to the population within 80 km (50 mi) of the Nine Mile Point site to be approximately 0.225 person-Sv (22.5 person-rem) per year for Unit 1, and 0.509 person-Sv (50.9 person-rem) per year for Unit 2. The breakdown of the total population dose by containment release mode is summarized in Table 5-4. Containment failures within the intermediate time frame (6 to 24 hours following event initiation) and late time frame (greater than 24 hours following event initiation) dominate the population dose risk at Nine Mile Point.

Table 5-4. Breakdown of Population Dose by Containment Release Mode

	Unit 1		Unit 2	
Containment Release Mode	**Population Dose (Person-Rem[(a)] Per Year)**	**Percent Contribution**	**Population Dose (Person-Rem[(a)] Per Year)**	**Percent Contribution**
Early containment failure	5.0	22	5.9	12
Intermediate containment failure	10.0	44	12.2	24
Late containment failure	7.5	34	32.7	64
No containment failure (leakage)	0.01	<1	0.1	<1
Total Population Dose	22.5	100	50.9	100

(a) 1 person-Rem = 0.01 person-Sv

The NRC staff has reviewed NMPNS's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDFs and offsite doses reported by NMPNS.

5.2.3 Potential Plant Improvements

Once the dominant contributors to plant risk were identified, NMPNS searched for ways to reduce that risk. In identifying and evaluating potential SAMAs, NMPNS considered insights from the plant-specific PRA, SAMA analyses performed for other operating plants that have submitted license renewal applications, as well as industry and NRC documents that discuss potential plant improvements. NMPNS identified 220 potential risk-reducing improvements (SAMAs) to plant components, systems, procedures and training for Units 1 and 2.

For Unit 1, all but 13 of the the SAMAs were removed from further consideration because they were not applicable to Nine Mile Point, had already been implemented at Nine Mile Point, had associated costs that exceed the maximum attainable benefit, or do not provide a significant benefit. For Unit 2, all but 20 of the SAMAs were removed from further consideration based on the same criteria.

The staff concludes that NMPNS used a systematic and comprehensive process for identifying potential plant improvements for Nine Mile Point, and that the set of potential plant improvements identified by NMPNS is reasonably comprehensive and, therefore, acceptable.

5.2.4 Evaluation of Risk Reduction and Costs of Improvements

NMPNS evaluated the risk-reduction potential of the remaining 13 SAMAs that were applicable to Unit 1 and the remaining 20 SAMAs that were applicable to Unit 2. Many of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit of the risk reduction and are conservative.

NMPNS estimated the costs of implementing the 13 (Unit 1) and 20 (Unit 2) candidate SAMAs. For some of SAMAs considered, the cost estimates were sufficiently greater than the benefits calculated such that it was not necessary to perform a detailed cost estimate. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include contingency costs associated with unforeseen implementation obstacles.

The staff has reviewed NMPNS's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on NMPNS's risk reduction estimates.

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The staff found the cost estimates to be reasonable and generally consistent with estimates provided in support of other plants' analyses.

The staff concludes that the risk reduction and the cost estimates provided by NMPNS are sufficient and adequate for use in the SAMA evaluation.

5.2.5 Cost-Benefit Comparison

The cost-benefit analysis performed by NMPNS was based primarily on NUREG/BR-0184 (NRC 1997) and was executed consistent with this guidance. NUREG/BR-0058 has recently been revised to reflect the agency's revised policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of base case estimates should be developed, one at three percent and one at seven percent (NRC 2004). NMPNS provided both sets of estimates and stated that it would consider for further evaluation any SAMA that was cost-beneficial using a three percent discount rate.

For Unit 1, NMPNS identified four potentially cost-beneficial SAMAs:

- SAMA U1-209—Improve Procedure SOP-14 and provide training: This SAMA involves a procedure revision to prevent the loss of power assuming operators are able to maintain control of the plant.

- SAMA U1-210—Protect critical fire targets: This SAMA would protect critical fire targets from dominant fire sources by moving some of the targets or sources to improve separation and/or providing cable tray protection (e.g., barrier board).

- SAMA U1-212—Add capability to manually operate containment venting: This SAMA involves adding the capability to manually operate the valve that vents primary containment by adding a hand wheel or local air tank (cost-beneficial at three percent discount rate).

- SAMA U1-215—Add a portable charger: This SAMA involves the use of a portable charger for charging the batteries to extend the coping time when AC power has been lost.

For Unit 2, NMPNS identified 11 potentially cost-beneficial SAMAs:

- SAMA U2-23a—Provide redundant ventilation for residual heat removal (RHR) pump rooms: This SAMA involves a revision of the operating procedure to provide additional space cooling via the use of portable equipment or blocking doors open.

- SAMA U2-23b—Provide redundant ventilation for high pressure core spray (HPCS) pump room: This SAMA is similar to SAMA U2-23a.

- SAMA U2-23c—Provide redundant ventilation for reactor core isolation cooling (RCIC) pump room: This SAMA is similar to SAMA U2-23a.

- SAMA U2-213—Enhance loss of service water procedure: This SAMA involves a procedure enhancement of the Unit 2 loss of service water procedure (SOP-11) to provide more specific guidance for events involving loss of service water.

- SAMA U2-214—Enhance SBO procedures: This SAMA involves a procedure enhancement of the SBO procedure to provide entry conditions into SOP-3 and SOP-1 for some of the important failure modes during certain electrical configurations.

- SAMA U2-215—Use of a portable charger for the batteries: This SAMA would provide an additional capability for maintaining the 125V DC battery charged given loss of emergency AC power combined with the capability to align the ADS and containment venting related solenoid-operated valves to DC power (via the uninterruptable power supply).

- SAMA U2-216—Hard pipe diesel fire pump to the reactor pressure vessel: This SAMA involves a hardware modification to allow the diesel fire pump to provide injection to the reactor pressure vessel (RPV).

- SAMA U2-221a—Reduce unit cooler contribution to emergency diesel generator (EDG) unavailability increase testing frequency: This SAMA would provide a more reliable means of cooling the EDG control panel rooms by testing the unit coolers during every cycle.

- SAMA U2-221b—Reduce unit cooler contribution to EDG unavailability provide redundant means of cooling: This SAMA would also provide a more reliable means of cooling the EDG control panel rooms by providing guidance for operators to open the EDG control panel room doors.

- SAMA U2-222—Improve procedure for loss of instrument air: This SAMA involves an enhancement to loss of instrument air procedure N2-SOP-19 to provide a better means of responding to loss of instrument air.

- SAMA U2-223—Improve control building flooding scenarios: This SAMA may involve structural modifications such as a water-tight door or piping modifications (to move firewater header) in order to eliminate the flood source (cost-beneficial at three percent discount rate).

Sensitivity calculations were conducted to examine the potential impact of uncertainties and several parameters and assumptions involved in the severe accident dose calculations. None of these sensitivity calculations altered the results of the cost-benefit comparisons.

It is noted that several of the SAMAs are not independent; that is, implementation of one SAMA could achieve a portion of the benefit of the others. For example, implementing SAMA U1-215 would significantly reduce the benefit of SAMA U1-209. Similarly, implementation of SAMAs U2-23a, -23b, -23c, and -213 can be considered as a combination since loss of service water (SAMA U2-213) is an important contributor and cause of room cooling failure (SAMA U2-23). NMPNS indicated that relationships between the SAMAs have not yet been modeled.

As stated in the ER, NMPNS plans to continue to refine the evaluations for the set of potentially cost-beneficial SAMAs, and consider implementation of the potentially cost-beneficial modifications through the current plant change process as voluntary plant enhancements.

The staff concludes that, with the exception of the four potentially cost-beneficial SAMAs for Unit 1 and the 11 potentially cost-beneficial SAMAs for Unit 2, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis.

5.2.6 Conclusions

The staff reviewed the NMPNS analyses and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by NMPNS are reasonable and sufficient for the license renewal submittal. The inclusion of external events afforded the quantitative evaluation of SAMAs specifically aimed at reducing risk from external events.

Based on its review of the NMPNS SAMA analysis, the staff concurs with NMPNS's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff agrees that further evaluation of these SAMAs by NMPNS is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

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U.S. Nuclear Regulatory Commission (NRC). 2004. *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission*. NUREG/BR-0058, Rev. 4, Washington, D.C.

6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid Waste Management

Environmental issues associated with the uranium fuel cycle and solid waste management are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues that are related to the uranium fuel cycle and solid waste management during the license renewal term that are listed in Table B-1 of Title 10 of the Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B, and are applicable to the Nine Mile Point Nuclear Station (Nine Mile Point) Units 1 and 2. The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52(c), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." The GEIS also addresses the impacts from radon-222 and technetium-99.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

6.1 The Uranium Fuel Cycle

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to Nine Mile Point Units 1 and 2 (NMP) from the uranium fuel cycle and solid waste management are listed in Table 6-1.

Table 6-1. Category 1 Issues Applicable to the Uranium Fuel Cycle and Solid Waste Management during the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (spent fuel and high-level waste disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6
Low-level waste storage and disposal	6.1; 6.2.2.2; 6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6; 6.6
Mixed waste storage and disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6
Onsite spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6, Addendum 1

Nine Mile Point Nuclear Station, LLC (NMPNS) stated in its Environmental Report (ER) (NMPNS 2004) that it is not aware of any new and significant information associated with the renewal of the NMP operating licenses. The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL except for the collective offsite radiological impacts from the fuel cycle and from high-

level waste and spent fuel disposal, as discussed below, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff review and the GEIS conclusions, as codified in Table B-1, 10 CFR Part 51, for each of these issues follows:

- Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste). Based on information in the GEIS, the Commission found that

  Offsite impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of 10 CFR 51.51(b). Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.

The staff has not identified any new and significant information on this issue during its independent review of the NMPNS ER, the staff's site visit, the scoping process, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (collective effects). Based on information in the GEIS, the Commission found that

  The 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations.

  Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA [National Environmental Policy Act] implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for

any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no offsite radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (spent fuel and high level waste disposal). Based on information in the GEIS, the Commission found that

  For the high level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem per year. The lifetime individual risk from 100 millirem annual dose limit is about 3×10^{-3}.

  Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve

very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, EPA's generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR Part 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. Reporting performance standards that will be required by EPA are expected to result in releases and associated health consequences in the range between 10 and 100 premature cancer deaths with an upper limit of 1000 premature cancer deaths worldwide for a 100,000 metric tonne (MTHM) repository.

Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1.

On February 15, 2002, based on a recommendation by the Secretary of the Department of Energy, the President recommended the Yucca Mountain site for the development of a repository for the geologic disposal of spent nuclear fuel and high-level nuclear waste. The U.S. Congress approved this recommendation on July 9, 2002, in Joint Resolution 87, which designated Yucca Mountain as the repository for spent nuclear waste. On July 23, 2002, the President signed Joint Resolution 87 into law; Public Law 107-200, 116 Stat. 735 (2002) designates Yucca Mountain as the repository for spent nuclear waste. This development does not represent new and significant information with respect to the offsite radiological impacts from license renewal related to disposal of spent nuclear fuel and high-level nuclear waste.

EPA developed Yucca Mountain-specific repository standards, which were subsequently adopted by the NRC in 10 CFR Part 63. In an opinion, issued July 9, 2004, the U.S. Court of Appeals for the District of Columbia Circuit (the Court) vacated EPA's radiation protection standards for the candidate repository, which required compliance with certain dose limits over a 10,000-year period. The Court's decision also vacated the compliance period in NRC's licensing criteria for the candidate repository in 10 CFR Part 63. In response to the Court's decision, EPA issued its proposed revised standards on August 22, 2005 (70 FR 49014). In order to be consistent with EPA's revised standards, NRC proposed revisions to 10 CFR Part 63 on September 8, 2005 (70 FR 53313).

Therefore, for the high-level waste and spent-fuel disposal component of the fuel cycle, there is some uncertainty with respect to regulatory limits for offsite releases of radioactive nuclides for the current candidate repository site. However, prior to promulgation of the affected provisions of the Commission's regulations, we assumed that limits would be developed along the lines of the 1995 National Academy of Sciences report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository that would comply with such limits could and likely would be developed at some site.

Despite the current uncertainty with respect to these rules, some judgment as to the regulatory NEPA implications of offsite radiological impacts of spent fuel and high-level waste disposal should be made. The staff concludes that these impacts are acceptable in that the impacts would not be sufficiently large to require the NEPA conclusion that the option of extended operation under 10 CFR Part 54 should be eliminated.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information and public comments on the draft SEIS. Therefore, the staff concludes that there are no offsite radiological impacts related to spent fuel and high-level waste disposal during the renewal term beyond those discussed in the GEIS.

- Nonradiological impacts of the uranium fuel cycle. Based on information in the GEIS, the Commission found that

  The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no nonradiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Low-level waste storage and disposal. Based on information in the GEIS, the Commission found that

  The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient

low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of LLW storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Mixed waste storage and disposal. Based on information in the GEIS, the Commission found that

  The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of mixed waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Onsite spent fuel. Based on information in the GEIS, the Commission found that

  The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of onsite spent fuel associated with license renewal beyond those discussed in the GEIS.

- Nonradiological waste. Based on information in the GEIS, the Commission found that

> No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- Transportation. Based on information contained in the GEIS, the Commission found that

  > The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU [metric tons uranium] and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada, are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4—Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in § 51.52.

Nine Mile Point Units 1 and 2 meet the fuel enrichment and burnup conditions set forth in Addendum 1 to the GEIS. The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, staff evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

There are no Category 2 issues for the uranium fuel cycle and solid waste management.

6.2 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 63. Code of Federal Regulations, Title 10, *Energy,* Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."

40 CFR Part 191. Code of Federal Regulations, Title 40, Protection of Environment, Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste."

Joint Resolution approving the site at Yucca Mountain, Nevada, for the development of a repository for the disposal of high-level radioactive waste and spent nuclear fuel, pursuant to the Nuclear Waste Policy Act of 1982. 2002. Public Law 107-200. 116 Stat. 735.

National Academy of Sciences (NAS). 1995. *Technical Bases for Yucca Mountain Standards*. Washington, D.C.

National Environmental Policy Act (NEPA) of 1969, as amended. 42 USC 4321, et seq.

Nine Mile Point Nuclear Station, LLC (NMPNS). 2004. *Nine Mile Point Nuclear Station Application for License Renewal, Appendix E—Applicant's Environmental Report*. Lycoming, New York.

U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS-0046F. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report. Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report.* NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

7.0 Environmental Impacts of Decommissioning

Environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in the *Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities*, NUREG-0586, Supplement 1 (NRC 2002). The staff's evaluation of the environmental impacts of decommissioning presented in Supplement 1 resulted in a range of impacts for each environmental issue. These results may be used by licensees as a starting point for a plant-specific evaluation of the decommissioning impacts at their facilities.

The incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are evaluated in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)] The evaluation in NUREG-1437 includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one of more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required. There are no Category 2 issues related to decommissioning.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

7.1 Decommissioning

Category 1 issues in Table B-1 of Title 10 of the Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B that are applicable to Nine Mile Point Nuclear Station (Nine Mile Point) Units 1 and 2 decommissioning following the renewal term are listed in Table 7-1. Nine Mile Point Nuclear Station, LLC (NMPNS) stated in its Environmental Report (ER) (NMPNS 2004) that it is aware of no new and significant information regarding the environmental impacts of Nine Mile Point Units 1 and 2 license renewal. The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 7-1. Category 1 Issues Applicable to the Decommissioning of Nine Mile Point Units 1 and 2 following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
DECOMMISSIONING	
Radiation doses	7.3.1; 7.4
Waste management	7.3.2; 7.4
Air quality	7.3.3; 7.4
Water quality	7.3.4; 7.4
Ecological resources	7.3.5; 7.4
Socioeconomic impacts	7.3.7; 7.4

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of the issues follows:

- Radiation doses. Based on information in the GEIS, the Commission found that

  Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there

are no radiation dose impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Waste management. Based on information in the GEIS, the Commission found that

  Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts from solid waste associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Air quality. Based on information found in the GEIS, the Commission found that

  Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on air quality associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Water quality. Based on information found in the GEIS, the Commission found that

  The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on water quality associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Ecological resources. Based on information found in the GEIS, the Commission found that

  Decommissioning either after the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on ecological resources associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Socioeconomic impacts. Based on information found in the GEIS, the Commission found that

  Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

The staff has not identified any new and significant information during its independent review of the NMPNS ER, the staff's site visit, the scoping process, its evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no socioeconomic impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

7.2 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Nine Mile Point Nuclear Station, LLC (NMPNS). 2004. *Nine Mile Point Nuclear Station Application for License Renewal, Appendix E—Applicant's Environmental Report*. Lycoming, New York.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report, Section 6.3—Transportation, Table 9.1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants, Final Report.* NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*. NUREG-0586, Supplement 1, Volumes 1 and 2, Washington, D.C.

8.0 Environmental Impacts of Alternatives to Operating License Renewal

This chapter examines the potential environmental impacts associated with the following: denying the application for the renewal of the operating licenses (OLs) for Nine Mile Point Nuclear Station (Nine Mile Point) Units 1 and 2 (the no-action alternative); the potential environmental impacts from electric generating sources other than Nine Mile Point Units 1 and 2 (NMP); the possibility of purchasing electric power from other sources to replace power generated by NMP and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of power generated by NMP. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines and set forth in the footnotes to Table B-1 of Title 10 of the Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B:

SMALL—Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.

LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999)[(a)] with the additional impact category of environmental justice.

8.1 No-Action Alternative

The NRC's regulations implementing the National Environmental Policy Act (NEPA) of 1969, 10 CFR Part 51, Subpart A, Appendix A(4), specify that the no-action alternative be discussed in an NRC environmental impact statement (EIS). For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the Nine Mile Point OLs, and Nine Mile Point Nuclear Station, LLC (NMPNS) would then cease plant operations by the end of the current licenses and initiate the decommissioning of the plants.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

NMPNS will be required to shut down Nine Mile Point and to comply with NRC decommissioning requirements in 10 CFR 50.82 whether or not the OLs are renewed. If the Nine Mile Point OLs are renewed, shutdown of the units and decommissioning activities will not be avoided, but will be postponed for up to an additional 20 years.

The environmental impacts associated with decommissioning following a license renewal period of up to 20 years or following the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the license renewal GEIS (NRC 1996), Chapter 7 of this supplemental environmental impact statement (SEIS), and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586, Supplement 1 (NRC 2002). The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

Impacts from the decision to permanently cease operations are not considered in NUREG-0586, Supplement 1.[(a)] Therefore, immediate impacts that occur between plant shutdown and the beginning of decommissioning are considered here. These impacts will occur when the units shut down regardless of whether the licenses are renewed or not, which are discussed below, with the results presented in Table 8-1. Plant shutdown will result in a net reduction in power production capacity. The power not generated by Nine Mile Point during the license renewal term would likely be replaced by (1) power purchased from other electricity providers, (2) generating alternatives other than Nine Mile Point, (3) demand-side management (DSM) and energy conservation, or (4) some combination of these options. The environmental impacts of these options are discussed in Section 8.2.

- **Land Use**

In Chapter 4, the staff concluded that the impacts of continued plant operation on land use would be SMALL. Onsite land use will not be affected immediately by the cessation of operations. Plant structures and other facilities are likely to remain in place until decommissioning. The transmission lines associated with the project would be expected to remain in service after the plants stop operating. As a result, maintenance of the rights-of-way will continue as before. Therefore, the staff concludes that the impacts on land use from plant shutdown would be SMALL.

(a) Appendix J of NUREG-0586 Supplement 1 discusses the socioeconomic impacts of plant closure, but the results of the analysis in Appendix J are not incorporated in the analysis presented in the main body of the NUREG.

Table 8-1. Summary of Environmental Impacts of the No-Action Alternative

Impact Category	Impact	Comment
Land Use	SMALL	Impacts are expected to be SMALL because plant shutdown is not expected to result in changes onsite or offsite land use.
Ecology	SMALL	Impacts are expected to be SMALL because current aquatic impacts are SMALL. Terrestrial impacts are not expected because there will not be any land use changes.
Water Use and Quality—Surface Water	SMALL	Impacts are expected to be SMALL because surface water intake and discharges will decrease.
Water Use and Quality—Groundwater	SMALL	Impacts are expected to be SMALL because groundwater use will decrease.
Air Quality	SMALL	Impacts are expected to be SMALL because discharges related to plant operation and worker transportation will decrease.
Waste	SMALL	Impacts are expected to be SMALL because generation of high-level waste will stop, and generation of low-level and mixed waste will decrease.
Human Health	SMALL	Impacts are expected to be SMALL because radiological doses to workers and members of the public, which are within regulatory limits, will be reduced.
Socioeconomics	MODERATE to LARGE	Impacts are expected to be MODERATE to LARGE because of a decrease in employment and tax revenues.
Socioeconomics (Transportation)	SMALL	Impacts are expected to be SMALL because the decrease in employment would reduce traffic.
Aesthetics	SMALL	Impacts are expected to be SMALL because plant structures will remain in place.
Historic and Archaeological Resources	SMALL	Impacts are expected to be SMALL because shutdown of the plant will not change land use.
Environmental Justice	SMALL to LARGE	Impacts are expected to be SMALL to LARGE because loss of employment opportunities is expected.

- **Ecology**

In Chapter 4 of this SEIS, the NRC staff concluded that the ecological impacts of continued plant operation were SMALL. Plant closure and cessation of operations will be accompanied by a reduction in cooling-water flow and the thermal plume from the plant. The impact of plant closure on the terrestrial ecosystem will be negligible because the transmission lines to the

plant will remain in use. Therefore, the staff concludes that ecological impacts from shutdown of the plant would be SMALL.

- **Water Use and Quality—Surface Water**

In Chapter 4 of this SEIS the NRC staff concluded that impacts of continued plant operation on surface water use and quality were SMALL. When the plant stops operating there will be an immediate reduction in the consumptive use of water because of reduction in cooling-water flow and in the amount of heat rejected to Lake Ontario. Therefore, the staff concludes that the impacts on surface water use and quality from plant shutdown would be SMALL.

- **Water Use and Quality—Groundwater**

In Chapter 4, the staff concluded that impacts of plant groundwater use on groundwater availability and quality were SMALL. When the plant stops operating, there will be an immediate reduction in groundwater dewatering for Unit 2. Therefore, the staff concludes that groundwater use and quality impacts from shutdown of the plant would be SMALL.

- **Air Quality**

In Chapter 4, the staff found the impacts of plant operation on air quality to be SMALL. When the plant stops operating, there will be a reduction in emissions from activities related to plant operation such as use of diesel generators and workers' transportation. Therefore, the staff concludes that the impact on air quality from shutdown of the plant would be SMALL.

- **Waste**

The impacts of waste generated by plant operation are discussed in Chapter 6. The impacts of low-level and mixed waste from plant operation are characterized as SMALL. When the plant stops operating, the plant will stop generating high-level waste, and generation of low-level and mixed waste associated with plant operation and maintenance will be reduced. Therefore, the staff concludes that the impact of waste generated after shutdown of the plant would be SMALL.

- **Human Health**

In Chapter 4 of this SEIS the NRC staff concluded that the impacts of plant operation on human health were SMALL. After the cessation of operations the amount of radioactive material released to the environment in gaseous and liquid forms will be reduced. Therefore, the staff concludes that the impact of shutdown of the plant on human health will be SMALL. In addition, the variety of potential accidents at the plant will be reduced to a limited set associated with shutdown events and fuel handling. In Chapter 5 of this SEIS the NRC staff concluded that the

impacts of accidents during operation were SMALL. Therefore, the staff concludes that the impacts of potential accidents following shutdown of the plant would be SMALL.

- **Socioeconomics**

In Chapter 4, the NRC staff concluded that the socioeconomic impacts of continued plant operation would be SMALL. There would be immediate socioeconomic impacts associated with the shutdown of the plant because of the reduction in the staff at the plant. Localized employment impacts might be moderated somewhat by the proximity to the Syracuse metropolitan area job market. There may also be an immediate reduction in property tax revenues for Oswego County, which would mean that property tax rates would likely be increased in order to produce sufficient revenue to maintain the existing level of public infrastructure and services provided in the county. The NRC staff concludes that the socioeconomic impacts of plant shutdown would range from MODERATE to LARGE. Some of these impacts could be offset if new power generating facilities are built at or near the current site. See Appendix J to NUREG-0586, Supplement 1 (NRC 2002), for additional discussion of the potential impacts of plant shutdown.

- **Socioeconomics (Transportation**)

In Chapter 4, the staff concluded that the impacts of continued plant operation on transportation would be SMALL. Cessation of operations will be accompanied by reduction in traffic in the vicinity of the plant. Most traffic reduction will be associated with a reduction in the plant workforce, but there will also be a reduction in shipment of material to and from the plant. Therefore, the staff concludes that the impact of plant closure on transportation would be SMALL.

- **Aesthetics**

In Chapter 4, the staff concluded that the aesthetic impacts of continued plant operation would be SMALL. Cessation of operations will be accompanied by reduction in visible plumes from the cooling towers. Plant structures and other facilities are likely to remain in place until decommissioning. Therefore, the staff concludes that the aesthetic impacts of plant closure would be SMALL.

- **Historic and Archaeological Resources**

In Chapter 4, the staff concluded that the impacts of continued plant operation on historic and archaeological resources would be SMALL. Onsite land use will not be affected immediately by the cessation of operations. Plant structures and other facilities are likely to remain in place until decommissioning. The transmission lines associated with the project are expected to remain in service after the plant stops operating. As a result, maintenance of transmission line rights-of-way will continue as before. Therefore, the staff concludes that the impacts on historic and archaeological resources from plant shutdown would be SMALL.

- **Environmental Justice**

In Chapter 4, the staff concluded that the environmental justice impact of continued operation of the plant would be SMALL because continued operation of the plant would not have a disproportionately high and adverse impact on minority and low-income populations. Shutdown of the plant could have disproportionately high and adverse impacts on minority and low-income populations because of secondary socioeconomic impacts. The staff concludes that the environmental justice impacts of plant shutdown could range from SMALL to LARGE. Some of these impacts could be offset if new power generating facilities are built at or near the current site. See Appendix J to NUREG-0586, Supplement 1 (NRC 2002), for additional discussion of these impacts.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electricity to replace the electricity generated by NMP, assuming that the OLs for Units 1 and 2 are not renewed. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts.

The following generation alternatives are considered in detail:

- Coal-fired generation at an alternate greenfield site[(a)] (Section 8.2.1)
- Natural gas-fired generation at the Nine Mile Point site and at an alternate site (Section 8.2.2)
- Nuclear generation at the Nine Mile Point site and at an alternate site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at NMP is discussed in Section 8.2.4. Other power generation alternatives and conservation alternatives considered by the staff and found not to be reasonable replacements for NMP are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an *Annual Energy Outlook*. In its *Annual Energy Outlook 2005* with

(a) A greenfield site is assumed to be an undeveloped site with no previous construction.

Projections to 2025, EIA projects that combined-cycle[(a)] or combustion turbine technology fueled by natural gas is likely to account for approximately 60 percent of new electric generating capacity between the years 2005 and 2025 (DOE/EIA 2005). Coal-fired plants are projected by EIA to account for approximately 35 percent of new capacity during this period (DOE/EIA 2005). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(b)] requirements. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, biomass gasification, and municipal solid waste units, are projected by EIA to account for the remaining 5 percent of capacity additions. EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by EIA to have the lowest generation cost in 2005 and 2020 followed by coal-fired plants and then wind generation (DOE/EIA 2005).

EIA projects that oil-fired generation will decrease in the U.S. through 2025 because of rising fuel costs and lower efficiencies. EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. The cost of new oil-fired generation is not expected to be competitive with that of coal and natural gas. EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States during the 2005 to 2025 time period because natural gas and coal-fired plants are projected to be more economical (DOE/EIA 2005). In spite of this projection, since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR Part 52 Subpart B. Therefore, a new nuclear plant alternative for replacing power generated by NMP is considered in Section 8.2.3. The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants.

Nine Mile Point Units 1 and 2 have a combined net rating of 1759 megawatts electric (MW[e]). For the coal alternative, the staff assumed construction of an 1800-MW(e) plant. For the natural-gas alternative, the staff assumed construction of a 1620-MW(e) plant. These assumptions are consistent with the NMPNS Environmental Report (ER) (NMPNS 2004). For the new nuclear alternative, the staff assumed construction of two1000-MW(e) plants. This assumption will overstate the environmental impacts of replacing the 1759-MW(e) from NMP by roughly 13.5 percent.

(a) In a combined cycle unit, hot combustion gas in a combustion turbine rotates the turbine to generate electricity. The hot exhaust from the combustion turbine is routed through a heat-recovery boiler to make steam to generate electricity.

(b) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation; i.e., these units generally run near full load.

8.2.1 Coal-Fired Generation

The staff believes that the Nine Mile Point site would not be a viable location for a representative coal-fired plant. Considerations pertinent to this determination include the fact that undeveloped parts of the site amount to only approximately 202 ha (500 ac), substantially less than the estimated 300 ha (740 ac) required, and configuration of the site property does not lend itself to efficient arrangement of associated facilities. Use of the site would necessitate offsite disposal of combustion waste. In addition, an essential buffer with respect to surrounding areas, including the Ontario Bible Conference Camp immediately west, would be jeopardized. Finally, the numerous wetlands on the site would be eliminated, and similar elimination of wetlands would likely occur from disposal of ash on adjacent land if it could be acquired. Therefore, the staff assumes that the representative coal-fired plant would be located at a greenfield site in upstate New York.

Development of the representative coal-fired plant would require approximately 300 ha (740 ac), of which up to approximately 226 ha (560 ac) would be used for flyash waste disposal, assuming a 40-year plant life. Additional land would be necessary to allow for onsite and peripheral buffers; the NRC estimates that 688 ha (1700 ac) would be required for a 1000-MW(e) plant. Depending on the specific location of the plant, additional land could be required for offsite infrastructure, in particular transmission lines to connect the plant to the grid and facilities for coal and limestone delivery, most likely including a rail spur and possibly some upgrades to existing or recently abandoned rail lines. Construction of a barge terminal could also be a reasonable option for a plant located on Lake Ontario.

Consistent with NMPNS's ER (NMPNS 2004), the staff assumes construction of three 600-MW(e) units, for a combined capacity of 1800 MW(e), as potential replacements for NMP. The assumption of 1800 MW(e) is slightly more generating capacity than Nine Mile Point's capacity of 1759 MW(e), but the staff concludes that the differences are not significant and would not change the standard of significance (SMALL, MODERATE, or LARGE) of any impacts.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the NMPNS ER (NMPNS 2004). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant).

The coal-fired plant would consume approximately 4.63 million metric tons (MT) (5.11 million tons) per year of pulverized bituminous coal with an ash content of approximately seven percent (NMPNS 2004). NMPNS assumes a heat rate[(a)] of 9.6 MJ/kWh (9100 BTU/kWh) and a capacity

(a) Heat rate is a measure of generating station thermal efficiency. In English units, it is generally expressed in British Thermal Units (BTUs) per net kilowatt-hour (kWh). It is computed by dividing the total BTU content of the fuel burned for electric generation by the resulting kWh generation. The corresponding metric unit for energy is

factor[(a)] of 0.85 in its ER (NMPNS 2004). After combustion, 99.9 percent of the ash would be collected and disposed of at the plant site. In addition, approximately 292,000 MT (322,000 tons) of scrubber sludge would be disposed of at the plant site based on annual limestone usage of approximately 181,400 MT (200,000 tons). Limestone is used in the scrubbing process for control of sulfur dioxide (SO_2) emissions.

For purposes of this section, the staff assumed that a coal-fired plant located at an alternate site would use a closed-cycle cooling system. The overall impacts of the coal-fired generating system are discussed in the following sections and summarized in Table 8-2. The extent of impacts at an alternate greenfield site will depend on the location of the particular site selected.

- **Land Use**

Land use impacts from development of the plant at a greenfield site are conjectural. However, the staff assumes that the location and design of the facilities would be subject to substantial regulatory scrutiny and that a reasonable potential exists that disposal areas eventually could be restored and developed for compatible uses that would not affect landfill integrity (e.g., recreation). Under these assumptions, the staff expects that land use impacts would be clearly noticeable, but would not affect essential land use characteristics in the vicinity of the plant. Depending particularly on transmission line and rail line routing, this alternative would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Potential impact on ecological resources from construction and operation of the representative coal-fired plant are highly site-specific. However, as much as 300 ha (740 ac) of terrestrial habitat could be displaced by the plant and onsite flyash waste disposal site, and additional terrestrial habitat could be adversely affected from development of offsite infrastructure (e.g., transmission line connection, rail spur construction).

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the joule (J).

(a) The capacity factor is the ratio of electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Site Using Closed-Cycle Cooling

Impact Category	Impact at Alternate Site	Comments
Land Use	MODERATE to LARGE	Uses approximately 300 ha (740 ac) for roads, parking areas, office buildings, cooling system, and transmission line. There would be additional land impacts for coal and limestone mining. The total impact would depend on whether the alternate site has been previously disturbed or has existing infrastructure.
Ecology	SMALL to MODERATE	Impacts depend on whether the site has been previously disturbed. Factors to consider include location and ecology of the site, transmission line route, and rail spur route. In total, impacts could include habitat degradation, fragmentation, or loss as a result of construction activities and conversion of land to industrial use. Ecological communities might experience reduced productivity and biological diversity from disturbing previously intact land.
Water Use and Quality—Surface Water	SMALL	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality—Groundwater	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the aquifers.
Air Quality	MODERATE	Sulfur oxides: 4934 MT/yr (5440 tons/yr). National and regional impacts would be minimal because of emissions offsets through the SO_2 trading program. Nitrogen oxides: 1161 MT/yr (1280 tons/yr). Particulates: 37 MT/yr (41 tons/yr) of PM_{10} (particulate matter having an aerodynamic diameter less than or equal to 10 microns). Carbon monoxide: 1161 MT/yr (1280 tons/yr). Small amounts of mercury, other hazardous air pollutants, and naturally occurring radioactive materials—mainly uranium and thorium.
Waste	MODERATE	Total waste volume would be approximately 621,000 MT/yr (685,000 tons/yr) of ash and scrubber sludge requiring approximately 226 ha (560 ac) for disposal during the 40-year life of the plant.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.
Socioeconomics	SMALL to LARGE	Construction impacts depend on location, but could be LARGE if plant is located in an area that is more rural than the Nine Mile Point site. Oswego County would experience loss of tax base and employment, potentially offset by projected economic growth.
Socioeconomics (Transportation)	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site-dependent, but can be characterized as SMALL to MODERATE. For rail transportation of coal and lime, the impact is considered MODERATE to LARGE. For barge transportation, the impact is considered SMALL.

Impact Category	Impact at Alternate Site	Comments
Aesthetics	SMALL to LARGE	Impacts could include visual impairment, development of new transmission lines, and infrastructure for delivery of coal and limestone. The severity of impacts is highly dependent on location but could be reduced by locating the plant in an industrial area.
Historic and Archaeological Resources	SMALL	Alternate location would necessitate cultural resource studies.
Environmental Justice	SMALL to LARGE	Impacts will vary depending on population distribution and makeup at the site.

Impact to aquatic communities as a result of construction could include some permanent alteration of habitat, particularly in the event a barge terminal would be developed for delivery of coal and limestone. Fish and benthic communities would be initially disrupted, but would be expected to reestablish with accompanying localized changes in species composition and distribution in response to changes in bottom substrate availability, water depth, and other factors. Potential for some adverse impact on aquatic communities would persist through the operational period as a result of large-boat traffic, periodic maintenance dredging, and potential for spills of coal, petroleum products, or other materials. However, construction and maintenance dredging would be conducted in accordance with the provisions of applicable permits from the United States Army Corps of Engineers (USACE) and the New York State Department of Environmental Conservation (NYSDEC). Similarly, spill prevention measures would be in effect during the operational period.

Operation of the cooling-water system for the plant is also a potential source of impact to aquatic communities. However, the system would be designed and operated in compliance with the Federal Water Pollution Control Act (also known as the Clean Water Act [CWA]), including State Pollutant Discharge Elimination System (SPDES) limitations for physical and chemical parameters of potential concern and provisions of CWA Sections 316(a) and 316(b), which are respectively established to ensure appropriate protection of aquatic communities from thermal discharges and cooling-water intakes. The cooling-water intake and discharge flows would be comparable to or less than that of Nine Mile Point, from which the impact is considered to be SMALL.

Given this information, the staff concludes that development of the representative coal-fired plant at a greenfield site in upstate New York would have a SMALL to MODERATE impact on ecological communities.

- **Water Use and Quality—Surface Water**

Construction phase impacts on water quality of greatest potential concern at a greenfield site include (1) erosion and sedimentation associated with land-clearing operations, and (2) suspension of bottom sediments during construction of cooling-water intake and discharge structures, and from construction of barge delivery facilities in the event that option is chosen.

However, land-clearing activities subject to storm water protections in accordance with the SPDES program and work in waterways would be regulated by the USACE under the CWA Section 404 and Section 10 of the Rivers and Harbors Act of 1899, by the NYSDEC via permits, and by the New York Department of State under the State's Coastal Zone Management program (if located within the coastal zone). In addition, these adverse effects would be localized and temporary. The staff concludes that impacts on surface water quality associated with construction of the representative plant would be SMALL.

Potential impacts on water quality and use associated with operation of the representative plant would be to some extent site-specific. Cooling water and other wastewater discharges would be regulated by a SPDES permit, regardless of location. Cooling-water intake and discharge flows for the representative coal-fired plant, assumed to use a closed-cycle cooling system, would be substantially lower than those for Nine Mile Point Unit 1, which uses a once-through cooling system that results in SMALL impacts. Therefore, a representative plant located at a site comparable to Nine Mile Point on Lake Ontario would be expected to also result in SMALL impacts. The staff concludes that the impacts of surface water use and quality from operation of a representative plant located at a greenfield site would be SMALL.

- **Water Use and Quality—Groundwater**

Use of groundwater for a coal-fired plant at an alternate site is possible. Groundwater withdrawal could require a permit. Overall, the impact to groundwater at an alternate site is considered SMALL to MODERATE, and would depend on the volume of water withdrawn and discharged, and the characteristics of the aquifers.

- **Air Quality**

The air-quality impacts of coal-fired generation vary considerably from those of nuclear generation due to emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), particulates, carbon monoxide, hazardous air pollutants such as mercury, and naturally occurring radioactive materials.

Oswego County is designated as unclassifiable or in attainment for all criteria pollutants. The nearest area of non-attainment is Jefferson County, which is classified as marginal for ozone. Onondaga County, where Syracuse is located, is a maintenance area for carbon monoxide and classified as moderate, i.e., less than or equal to 12.7 parts per million.

A new coal-fired generating plant located in upstate New York would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR 60 Subpart D(a). The standards establish limits for particulate matter and opacity (40 CFR 60.42[a]), SO_2 (40 CFR 60.43[a]), and NO_x (40 CFR 60.44[a]). The facility would be designed to meet best available control technology or lowest achievable emissions rate standards, as applicable, for control of criteria pollutants.

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as in attainment or unclassified under the Clean Air Act.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. The EPA issued a new regional haze rule in 1999 (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a state, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)]. If a coal-fired power plant were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. It is assumed that an alternate site would not be chosen near a mandatory Class I area.

In 1998, the EPA issued a rule requiring 22 eastern states, including New York, to revise their state implementation plans to reduce NO_x emissions. NO_x emissions contribute to violations of the national ambient air quality standard for ozone. The total amount of NO_x that can be emitted by each of the 22 states in the year 2007 ozone season (May 1 to September 30) is set out at 40 CFR 51.121(e). For New York, the amount is 172,660 MT (190,360 tons).

Impacts for particular pollutants are as follows:

Sulfur oxides emissions. A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. The EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the coal alternative than the OL renewal alternative, because a nuclear power plant releases almost no SO_2 during normal operations.

Constellation Energy estimates that by using the best available control technology to minimize SO_x emissions, the total annual stack emissions would be approximately 4934 MT (5440 tons) of SO_x (NMPNS 2004).

Nitrogen oxides emissions. Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO_2 emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (EPA 1998), limits the discharge of any gases that contain NO_x (expressed as NO_2) in excess of 200 nanograms per joule (ng/J) of gross energy output (1.6 pound per megawatt-hour [lb/MWh]), based on a 30-day rolling average.

Constellation Energy estimates that by using NO_x burners with overfire air and selective catalytic reduction (SCR), the total annual NO_x emissions for a new coal-fired power plant would be approximately 1161 MT (1280 tons). Regardless of the control technology, this level of NO_x emissions would be greater than the OL renewal alternative, because a nuclear power plant releases almost no NO_x during normal operations.

Particulate emissions. Constellation Energy estimates that the total annual stack emissions would include 37 MT (41 tons) PM_{10} (particulate matter having an aerodynamic diameter less than or equal to ten microns). Fabric filters or electrostatic precipitators would be used for control. In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative since a nuclear plant releases few particles during normal operations.

During the construction of a coal-fired plant, fugitive dust would be generated. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

Carbon monoxide emissions. Constellation Energy estimates that the total carbon monoxide emissions would be approximately 1161 MT (1280 tons) per year. This level of emissions would be greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). The EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by the EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). The EPA concluded that mercury is the hazardous air pollutant of greatest concern. The EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, the EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000b).

Uranium and thorium. Coal contains uranium and thorium. Uranium concentrations are generally in the range of one to ten parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant released roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

Carbon dioxide. A coal-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming. The level of emissions from a coal-fired plant would be greater than the OL renewal alternative.

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants, but implied that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_x and NO_x emissions as potential impacts (NRC 1996). Adverse human health effects, such as cancer and emphysema, have been associated with the products of coal combustion.

The staff concludes that the overall impact on air quality from a coal-fired plant, located at a greenfield site in upstate New York, would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

- **Waste**

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge. The representative coal-fired plant would generate approximately 621,000 MT (685,000 tons) of this waste annually for 40 years. The waste would be disposed of onsite, accounting for approximately 226 ha (560 ac) of land area over the 40-year plant life. Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occur. Disposal of the waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses. Debris would be generated during construction activities.

In May 2000 the EPA issued a "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels" (EPA 2000a). The EPA concluded that some form of national regulation is warranted to address coal combustion waste products because: (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) the EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that, in 1995, these wastes were being managed in 40 percent to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (4) the EPA

identified gaps in state oversight of coal combustion wastes. Accordingly, the EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act of 1976.

For all of the preceding reasons, the appropriate characterization of impacts from waste generated from burning coal is MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

- **Human Health**

Coal-fired power generation introduces worker risks from fuel and limestone mining, from fuel and lime/limestone transportation, and from disposal of coal combustion waste. In addition there are public risks from inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

In the GEIS, the staff stated that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates, but it did not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including the EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, the EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal are characterized as SMALL.

- **Socioeconomics**

As stated in the NMPNS ER (NMPNS 2004), it is assumed that the representative coal-fired alternative would be constructed at a greenfield site as two projects timed to coincide with expiration dates of the Nine Mile Point licenses. It is estimated that a one-unit project, due for completion in 2009, would be constructed in approximately three years and the two-unit project, assumed to be completed in 2026, would be constructed in approximately four years. The work force would be expected to vary between 1750 and 3000 workers during the construction period (NMPNS 2004).

Potential impacts from construction of the coal-fired alternative at a greenfield site would be highly location-dependent. As the NRC notes in the GEIS, socioeconomic impacts are expected to be larger at a rural site than at an urban site, because more of the peak

construction work force would need to move to the area to work. Not considering impacts of terminating Nine Mile Point operations, socioeconomic impacts at a remote rural site could be LARGE, while impacts at a site in the vicinity of a more populated metropolitan area (e.g. Syracuse), could be SMALL to MODERATE. Communities in Oswego County in particular would experience losses in both employment and tax revenues due to the Nine Mile Point closure, assuming the plant is constructed outside the area. This impact could be MODERATE to LARGE.

Overall, the socioeconomic impacts of a coal-fired plant at an alternate greenfield site would be SMALL to LARGE depending on the alternate site location.

- **Socioeconomics (Transportation)**

Transportation-related impacts associated with commuting construction workers at an alternate greenfield site are site-dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant personnel would also be site-dependent, but can be characterized as SMALL to MODERATE.

At an alternate greenfield site, coal and lime would likely be delivered by rail or barge. Transportation impacts would depend upon the site location. For rail transportation of coal and lime, the impact is considered MODERATE to LARGE. For barge transportation, the impact is considered SMALL.

- **Aesthetics**

Potential aesthetic impacts of construction and operation of the representative coal-fired plant at an alternate greenfield site include visual impairment resulting from the presence of a large industrial facility including the following: a building housing the boilers; turbine generators; emission control equipment; 152-m (500-ft) high stacks; fuel, limestone, and waste-receiving/handling and storage facilities; stormwater runoff control basins; and mechanical-draft cooling towers, approximately 30 m (100 ft) high. The stacks and condensate plumes from the mechanical-draft cooling towers could be visible some distance from the plant. There would be a significant, negative aesthetic impact associated with construction of a new transmission line to connect to other lines to enable delivery of electricity to the area. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants. Noise impacts from a rail spur, if required, would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise ensures that the impact would be SMALL.

These impacts are highly site-specific. Therefore, the staff concludes that aesthetic impacts associated with development and operation of a coal-fired plant at an alternate site could range from SMALL to LARGE, depending on location.

- **Historic and Archaeological Resources**

Before construction at an alternate greenfield site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and, as such, are considered SMALL.

- **Environmental Justice**

Environmental impacts on minority and low-income populations associated with a replacement coal-fired plant built at an alternate site in New York state would depend upon the site chosen and the nearby population distribution. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of Nine Mile Point would result in the loss of approximately 1280 operating jobs. Resulting economic conditions could reduce employment prospects for minority or low-income populations. Overall, the impacts could vary between SMALL and LARGE.

Coal-fired generation would introduce mechanical sources of noise, including noise both from plant operation and from rail delivery of coal and limestone. The noise sources are both continuous and intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and limestone delivery, use of outside loudspeakers, and the commuting of plant employees. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site.

8.2.2 Natural Gas-Fired Generation

The environmental impacts of the natural gas-fired alternative are examined in this section. Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.2 are from the NMPNS ER (NMPNS 2004). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the natural gas-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a natural gas-fired plant).

The staff assumed that a replacement natural gas-fired plant would use combined-cycle technology (NMPNS 2004). In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste-combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

For operation of a natural gas-fired facility at the existing Nine Mile Point site, an additional 40 km (25 mi) of pipeline for gas supply would need to be constructed. Offsite infrastructure needed to locate the plant at an alternate greenfield site is conjectural, but could reasonably

include a natural gas supply pipeline, transmission line, and makeup water and discharge pipelines. The extent to which such infrastructure would be required is location specific; however, such needs would be considered in siting the facility and would be subject to regulatory scrutiny under Articles VII and X of New York's Public Service Law or comparable process (NMPNS 2004).

The natural gas-fired alternative is analyzed for both the existing Nine Mile Point site and for an unnamed alternate greenfield site. Siting a new natural gas-fired plant at the site of an existing nuclear plant would reduce environmental impacts by allowing the new facility to take advantage of existing infrastructure at the Nine Mile Point site, including transmission facilities, roads, parking areas, office buildings, and the existing cooling system (to the extent needed). Approximately 45 ha (110 ac) would be required to locate the natural gas-fired plant at an alternative greenfield site. Although the staff considered an unnamed alternate site, it is unlikely that it would be beneficial to place a new natural gas-fired facility at an alternate site based purely on environmental considerations.

The staff assumed that construction of the natural gas-fired units would be implemented as two projects timed to coincide with expiration dates of the Nine Mile Point OLs. Consistent with the NMPNS ER (NMPNS 2004), the staff assumed a combined-cycle natural gas facility based on three 540-MW combined-cycle units, for a total facility size of 1620 MW (NMPNS 2004). This assumption understates the environmental impacts of replacing the 1759-MW from NMP. As a rough estimate, if a natural gas-fired plant of exactly 1759 MW were to be built, any numerical impacts in this section, for example, quantities of air pollutants, might simply be adjusted upward accordingly. However, given these adjustments, the staff has determined that the differences in impacts between 1620 MW and 1759 MW of natural gas-fired generation would not be significant and would not change the standard of significance (SMALL, MODERATE, or LARGE) of any impacts.

The staff assumed that the plant would use closed-cycle cooling using mechanical-draft cooling towers, which are assumed to range in height from approximately 11 m (37 ft) to 18 m (60 ft). In Section 8.2.2.2, the staff also evaluated the impacts of using the existing open-cycle cooling system at Nine Mile Point.

8.2.2.1 Closed-Cycle Cooling System

The overall impacts of the natural gas-generating system are discussed in the following sections and summarized in Table 8-3. The extent of impacts at an alternate greenfield site will depend on the location of the particular site selected.

Table 8-3. Summary of Environmental Impacts of Natural Gas-Fired Generation at the Nine Mile Point Site and an Alternate Site Using Closed-Cycle Cooling

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comment	Impact	Comment
Land Use	SMALL to MODERATE	The natural gas-fired alternative would use undeveloped portions of the Nine Mile Point site. It would require upwards of 45 ha (110 ac) for power block, offices, roads, and parking areas. It would use existing infrastructure, minimizing new land requirements. There would be additional land impacts for construction of an underground gas pipeline.	SMALL to LARGE	Land-use requirements would be larger at the alternate site than at the Nine Mile Point site because of the need for infrastructure such as transmission facilities, roads, parking areas, office buildings, and cooling system. The total impact would depend on whether the alternate site is previously disturbed.
Ecology	SMALL	The natural gas-fired alternative would result in the displacement of up to approximately 36 ha (90 ac) of natural vegetation, consisting primarily of forest with some advanced shrub land formerly in agricultural use. Some wetland habitats within this area (estimated to be 1.2 to 2.0 ha [3 to 5 ac]) could also be lost, and require mitigation.	SMALL to MODERATE	Impacts would depend on whether the alternate site is previously disturbed. Factors to consider include location and ecology of site and transmission line route. In total, impacts could include habitat degradation, fragmentation, or loss as a result of construction activities and conversion of land to industrial use. Ecological communities might experience reduced productivity and biological diversity from disturbing previously intact land.
Water Use and Quality—Surface Water	SMALL	Combined-cycle units have lower water requirements than nuclear and coal-fired power plants. The natural gas-fired alternative would use closed-cycle cooling system to the degree necessary.	SMALL to MODERATE	Combined-cycle units have lower water requirements than nuclear and coal-fired power plants. The natural gas-fired alternative would use closed-cycle cooling system to the degree necessary. Total impacts would depend on the volume of water withdrawal, the constituents of the discharge water, the characteristics of surface water, and the new intake structures required.

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comment	Impact	Comment
Water Use and Quality—Ground-water	SMALL	Nine Mile Point uses little groundwater.	SMALL to MODERATE	Impact depends on volume of water withdrawal.
Air Quality	MODERATE	Sulfur oxides: 91 MT/yr (100 tons/yr) Nitrogen oxides: 291 MT/yr (321 tons/yr) Carbon monoxide: 177 MT/yr (195 tons/yr) PM_{10} particulates: 336 MT/yr (371 tons/yr) Other: (1) hazardous air pollutants, including arsenic, formaldehyde, and nickel and (2) carbon dioxide emissions, which contribute to global warming.	MODERATE	The impacts at an unnamed alternate site would be the same as those for the Nine Mile Point site.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	The impacts at an unnamed alternate site would be the same as those for the Nine Mile Point site.
Human Health	SMALL	Impacts are considered to be minor.	SMALL	The impacts at an unnamed alternate site would be the same as those for the Nine Mile Point site.
Socio-economics	MODERATE	During construction, impacts would be MODERATE. Up to 1200 additional workers would be required during the peak of the two-year construction period, followed by reduction from current NMP workforce of 1280 to 50. Impacts during operation would be MODERATE.	MODERATE to LARGE	During construction, impacts would be MODERATE to LARGE. Up to 1200 additional workers would be required during the peak of the two-year construction period. Oswego County would experience loss of tax base and employment.
Socio-economics (Transpor-tation)	MODERATE	Transportation impacts associated with construction workers would be MODERATE.	MODERATE	Transportation impacts associated with construction workers would be MODERATE.

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comment	Impact	Comment
Aesthetics	SMALL	The natural gas-fired plant represents an incremental addition to the existing plant with similar characteristics.	MODERATE to LARGE	The structures and operation would be similar to the Nine Mile Point site, but the significance of impacts would depend on the characteristics of the alternate site. The natural gas-fired alternative at an alternate site could require transmission lines, with attendant aesthetic impacts.
Historic and Archaeo-logical Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same as Nine Mile Point; any potential impacts can likely be effectively managed.
Environ-mental Justice	SMALL to MODERATE	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to MODERATE	Impacts would vary depending on population distribution and characteristics at the new site.

- **Land Use**

For siting at Nine Mile Point, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the natural gas-fired replacement plant alternative would make use of transmission facilities, roads, parking areas, office buildings, and the existing cooling system (to the extent needed). The GEIS assumes that approximately 45 ha (110 ac) would be needed for a 1000-MW natural gas facility (NRC 1996). Scaling up for the 1600-MW facility considered by NMPNS would indicate a proportionally larger land requirement. Operation of a new combined-cycle facility at the Nine Mile Point site would require the construction of approximately 40 km (25 mi) of pipeline. It is estimated that this pipeline would require approximately 93 ha (230 ac) for an easement. The likely route for the pipeline would be the existing route from the Empire Pipeline to the Independence Station or the transmission line corridor that extends southward from the site to within three miles of Phoenix, New York. The onsite facilities would represent expansion of an existing industrial land use, and NMPNS expects there would be little or no adverse impact on land uses adjacent to the site.

For construction at an alternate site, the full land requirement of 45 ha (110 ac) for a natural gas-fired facility would be necessary because no existing infrastructure would be available. Additional land could be impacted by construction of a transmission line and natural gas pipelines to serve the plant. The gas line requirements at an alternate site would depend on the characteristics and location of the alternate site.

Regardless of where the natural gas-fired plant is built, additional land would be required for natural gas wells and collection stations. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for NMP. In the GEIS (NRC 1996), the staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a nuclear power plant.

Overall, the land-use impacts of constructing the natural gas-fired alternative at the Nine Mile Point site are considered SMALL to MODERATE. The land-use impacts of siting the natural gas-fired alternative at an alternate site would depend on the chosen site, but are characterized as SMALL to LARGE.

- **Ecology**

NMPNS expects that development of the natural gas-fired alternative plant at the Nine Mile Point site would result in the displacement of up to approximately 36 ha (90 ac) of natural vegetation, consisting primarily of forest with some advanced shrub land formerly in agricultural use. Some wetland habitats within this area (estimated to be 1.2 to 2.0 ha [3 to 5 ac]) could also be lost, and require mitigation. To accommodate a natural gas-fired plant at the Nine Mile Point site, a 40-km (25-mi) gas supply line would need to be constructed, which, assuming a construction right-of-way of 22 m (75 ft), could disrupt up to 93 ha (230 ac) of terrestrial habitat. However, the permanent right-of-way would be reduced to 15 m (50 ft) and is assumed to be located on or near an existing transmission or pipeline corridor for most of its length. Ecological impacts to the plant site and utility easements could include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity.

The most significant potential impacts to aquatic communities relate to operation of the cooling-water system. However, the cooling-water intake and discharge flows for the natural gas-fired plant would be less than currently used by Nine Mile Point.

Considering the quantity and quality of habitat permanently displaced by the plant, mitigation available to replace wetland values lost, and assumed environmental protections that would be afforded in routing the natural gas pipeline, the staff concludes that development of the natural gas-fired plant at the Nine Mile Point site would have little noticeable impact on ecological resources of the area, and impacts, therefore, would be SMALL.

Impact on ecological resources from construction and operation of the representative natural gas-fired plant and associated offsite infrastructure at a greenfield site is conjectural. However,

ecological resources throughout much of the area would be similar to those for the Nine Mile Point site alternative. The staff concludes that the associated impact on ecological resources would be SMALL to MODERATE.

- **Water Use and Quality—Surface Water**

Overall, water requirements for combined-cycle generation are much less than for conventional generators such as nuclear-fired generators and coal-fired generators. The natural-gas fired alternative at the existing site or at an alternate site would use a closed-cycle cooling system with cooling towers. Plant discharges would consist mostly of cooling tower blowdown characterized primarily by increased temperature, increased concentration of dissolved solids relative to the receiving body of water, and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary wastewater may also be discharged. All discharges would be regulated by NYSDEC through an SPDES permit. Some erosion and sedimentation probably would occur during construction (NRC 1996). Water-quality impacts from sedimentation during construction were characterized in the GEIS as SMALL. The staff also noted in the GEIS that operational water quality impacts would be similar to, or less than, those from other generating technologies.

A natural gas-fired plant at an alternate greenfield site is assumed to use a closed-cycle cooling system with cooling towers. The staff assumed that surface water would be used for cooling makeup water and discharge. Intake and discharge would involve relatively small quantities of water compared to the coal alternative. The impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State of New York. The impacts would be SMALL to MODERATE.

- **Water Use and Quality—Groundwater**

Use of groundwater at the Nine Mile Point site is unlikely, but is possible for a natural gas-fired plant at an alternate site. Any groundwater withdrawal would require a permit from the local permitting authority. Overall, impacts to groundwater use and quality of a new natural gas-fired plant with a closed-cycle cooling system at the Nine Mile Point site are considered SMALL, and the impacts to groundwater use and quality of such a plant at an alternate site are considered SMALL to MODERATE, depending on the volume of groundwater withdrawn.

- **Air Quality**

Natural gas is a relatively clean-burning fuel. The natural gas-fired alternative would release similar types of emissions, but in lesser quantities than the coal-fired alternative. Hence, it would be subject to the same type of air quality regulations as a coal-fired plant, discussed in Section 8.2.1. The greatest concerns from combined-cycle facilities are the emissions of NO_x, VOCs, and other ozone precursors.

NMPNS projects the following emissions for the natural gas-fired alterative (NMPNS 2004):

- Sulfur oxides: 91 MT/yr (100 tons/yr)
- Nitrogen oxides: 291 MT/yr (321 tons/yr)
- Carbon monoxide: 177 MT/yr (195 tons/yr)
- PM_{10} particulates: 336 MT/yr (371 tons/yr)

A natural gas-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming. While these emissions have not traditionally been an important environmental concern, they are becoming increasingly relevant on both a national and an international level.

In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units. Natural gas-fired power plants were found by the EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal and oil-fired plants, the EPA did not determine that emissions of hazardous air pollutants from natural gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would cause temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process and by employee and delivery vehicles during operations.

The preceding emissions would likely be the same at Nine Mile Point or at an alternate greenfield site. Impacts from the above emissions would be clearly noticeable but would not be sufficient to destabilize air resources as a whole. The overall air-quality impact for a new natural gas-fired plant sited at Nine Mile Point or at an alternate greenfield site is considered MODERATE.

- **Waste**

There will be spent SCR catalyst from NO_x emissions control and small amounts of solid-waste products (i.e., ash) from burning natural gas fuel. In the GEIS, the staff concluded that waste generation from natural gas-fired technology would be minimal (NRC 1996). Natural gas firing results in very few combustion by-products because of the clean nature of the fuel. Waste-generation impacts would be so minor that they would not noticeably alter any important resource attribute. Construction-related debris would be generated during construction activities.

In the winter it may become necessary for a replacement base-load natural gas-fired plant to operate on fuel oil due to lack of gas supply. Oil combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge.

The amount of ash and sludge generated would depend on the type and quantity of fuel oil combusted; Number 2 fuel oil produces no appreciable ash.

Overall, the waste impacts would be SMALL for a natural gas-fired plant sited at Nine Mile Point or at an alternate greenfield site.

- **Human Health**

In Table 8-2 of the GEIS, the staff identifies cancer and emphysema as potential health risks from natural gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from any natural gas-fired plant would be regulated. For a plant sited in New York, NO_x emissions would be regulated by the NYSDEC. Human health effects would not be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural gas-fired alternative sited at Nine Mile Point or at an alternate greenfield site are considered SMALL.

- **Socioeconomics**

Construction of a natural gas-fired plant would take approximately two years. Peak employment would be approximately 1200 workers (NRC 1996). The staff assumed that construction would take place while NMP continue operation and would be completed by the time they permanently cease operations. During construction, the communities surrounding the Nine Mile Point site would experience demands on housing and public services that could have SMALL impacts. These impacts would be tempered by construction workers commuting to the site from other parts of Oswego and Onondaga counties. After construction, the communities would be impacted by job loss. The current NMP work force (1280 workers) would decline through a decommissioning period to a minimal maintenance size. The natural gas-fired plant would introduce a replacement tax base at Nine Mile Point or an alternate greenfield site and approximately 50 new permanent jobs. Impacts in Oswego and Onondaga counties resulting from decommissioning of NMP may be offset by potential job opportunities in the Syracuse area.

In the GEIS (NRC 1996), the staff concluded that socioeconomic impacts from constructing a natural gas-fired plant would not be very noticeable and that the small operational work force would have the smallest socioeconomic impacts of any nonrenewable technology. Compared to the coal-fired and nuclear alternatives, the smaller size of the construction work force, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts. For these reasons, natural gas-fired generation socioeconomic impacts associated with construction and operation of a natural gas-fired power plant would be MODERATE for siting at Nine Mile Point. Depending on other growth in the area, socioeconomic effects could be noticed, but they would not destabilize any important socioeconomic attribute.

Socioeconomic impacts of constructing and operating the representative natural gas-fired alternative at a greenfield site in upstate New York would be highly location-dependent. Not considering impacts from terminating Nine Mile Point operations, community impacts resulting from location of the representative natural gas-fired plant in areas within reasonable distance to large population centers (i.e., Syracuse), would likely be small, with moderate impacts possible in more rural areas (NMPNS 2004). However, communities in Oswego County in particular would experience losses in both employment and tax revenues due to Nine Mile Point closure, assuming the natural gas-fired alternative plant is constructed outside the area. Considered in combination with Nine Mile Point closure, overall socioeconomic impacts of the natural gas-fired alternative at a greenfield site would likely range from MODERATE to LARGE.

- **Socioeconomics (Transportation)**

Transportation impacts associated with construction and operating personnel commuting to the plant site would depend on the population density and transportation infrastructure in the vicinity of the site. The impacts can be classified as MODERATE for siting at Nine Mile Point or at an alternate greenfield site.

- **Aesthetics**

The turbine buildings (approximately 32 m [106 ft] tall) and exhaust stacks (approximately 69 m [225 ft] tall) would be visible during daylight hours from offsite. The gas pipeline compressors would also be visible. However, development of the representative natural gas-fired plant at the Nine Mile Point site would represent an incremental addition to an existing plant with similar characteristics, and a forest buffer provides a visual screen to residential developments bordering the site. Overall, the staff concludes that aesthetic impacts from development of a natural gas-fired plant at the Nine Mile Point site would be SMALL.

At an alternate greenfield site, the buildings, cooling towers, cooling tower plumes, and the associated transmission line and gas pipeline compressors would be visible offsite. The visual impact of a new transmission line would be especially significant. Aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with an alternate greenfield site are categorized as MODERATE to LARGE. The greatest contributor to this categorization is the aesthetic impact of the new transmission line.

Natural gas generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeaker and the commuting of plant employees. Based on noise impact studies conducted for the proposed Heritage Station two miles west of the Nine Mile Point site, which considered impacts to nearby residences as close as approximately 304 m (1000ft), and assuming use of comparable noise abatement design provisions, staff expects that the representative plant would comply with all

applicable noise ordinances and standards. Therefore, the noise impacts of a natural gas-fired plant at the Nine Mile Point site are considered to be SMALL.

At an alternate site, these noise impacts would be SMALL to LARGE depending on the site.

Historic and Archaeological Resources

At both Nine Mile Point and an alternate greenfield site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at Nine Mile Point or an alternate greenfield site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission and pipeline corridors, or other rights-of-way). Impacts to cultural resources can be effectively managed under current laws and regulations and kept SMALL.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural gas-fired plant were built at the Nine Mile Point site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of NMP would result in a decrease in employment of approximately 1230 operating employees, which would possibly be offset by employment opportunities in the Syracuse area. Following construction of the natural gas plant, it is possible that the reduction in employment opportunities at the plant and in the surrounding community could reduce local government tax revenues and consequently reduce local government funding for social services. Overall, impacts are expected to be SMALL to MODERATE. The ability of minority and low-income populations to commute to other jobs outside Oswego and Onondaga counties could mitigate any adverse effects.

Impacts at an alternate greenfield site would depend upon the site chosen and the nearby population distribution, but are likely to also be SMALL to MODERATE.

8.2.2.2 Once-Through Cooling System

The environmental impacts (SMALL, MODERATE, or LARGE) of constructing a natural gas-fired generation system at the Nine Mile Point site using once-through cooling are the same

as the impacts for a natural gas-fired plant using the closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-4 summarizes the incremental differences.

Table 8-4. Summary of Environmental Impacts of Natural Gas-Fired Generation at the Nine Mile Point Site and an Alternate Site Using Once-Through Cooling

Impact Category	Comparison with Closed-Cycle Cooling System
Land Use	Impacts may be less (e.g., through elimination of cooling towers) or greater (e.g., if a reservoir is required).
Ecology	Impact would depend on ecology at the site. Potential impacts are associated with entrainment of fish and shellfish in early life stages, impingement of fish and shellfish, and heat shock.
Water Use and Quality—Surface Water	Increased water withdrawal leading to possible water-use conflicts; thermal load higher than with closed-cycle cooling.
Water Use and Quality—Groundwater	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Socioeconomics (Transportation)	No change.
Aesthetics	Elimination of cooling towers.
Historic and Archaeological Resources	No change.
Environmental Justice	No change.

8.2.3 Nuclear Power Generation

Since 1997 the NRC has certified three new standard designs for nuclear power plants under 10 CFR 52, Subpart B. These designs are the 1300-MW(e) U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the 1300-MW(e) System 80+ Design (10 CFR 52, Appendix B), and the 600-MW(e) AP600 Design (10 CFR 52, Appendix C). All of these plants are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to the NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants. Recent escalation in prices of natural gas and electricity has made new nuclear power plant construction more attractive from a cost standpoint. Additionally,

System Energy Resources, Inc., Exelon Generation Company, LLC, and Dominion Nuclear North Anna, LLC, have recently submitted applications for early site permits for new advanced nuclear power plants under the procedures in 10 CFR Part 52, Subpart A (SERI 2003; Exelon 2003; Dominion 2003).

Consequently, construction of a new nuclear power plant at both the Nine Mile Point site and alternate greenfield is considered in this section. The staff assumed that the new nuclear plant would have a 40-year lifetime. Consideration of a new nuclear generating plant to replace NMP was not included in the NMPNS ER (NMPNS 2004).

The NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs, sited at Nine Mile Point or an alternate greenfield site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect impacts of 1759-MW(e) of new nuclear power. The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of the NRC's findings on National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants in Table B-1 of 10 CFR 51 Subpart A, Appendix B, is also relevant, although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using closed-cycle cooling is presented in Section 8.2.3.1 and using open-cycle cooling in Section 8.2.3.2.

8.2.3.1 Closed-Cycle Cooling System

The overall impacts of the nuclear generating system are discussed in the following sections. The impacts are summarized in Table 8-5. The extent of impacts at an alternate greenfield site will depend on the location of the particular site selected.

- **Land Use**

The existing facilities and infrastructure at the Nine Mile Point site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that a replacement nuclear power plant would use the existing transmission facilities, roads, parking areas, office buildings, and the existing cooling system. According to the GEIS, a light-water reactor requires approximately 200 to 400 ha (500 to 1000 ac) excluding transmission lines (these estimates are not scaled to any particular facility size). Much of the land that would be used has been previously disturbed. The Nine Mile Point site consists of approximately 364 ha (900 ac) and should be adequate to support a new nuclear facility. There would be no net change in land needed for uranium mining because land needed to supply the new nuclear plant would offset the land needed to supply uranium for fueling the existing reactors at NMP. Overall, the impact of a replacement nuclear generating plant on land use at

the existing Nine Mile Point site is characterized as MODERATE. The impact would be greater than the OL renewal alternative.

Table 8-5. Summary of Environmental Impacts of New Nuclear Power Generation at the Nine Mile Point Site and an Alternate Site Using Closed-Cycle Cooling

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comments	Impact	Comments
Land Use	MODERATE	Requires approximately 200 to 400 ha (500 to 1000 ac) for the plant and 400 ha (1000 ac) for uranium mining.	MODERATE to LARGE	Same as Nine Mile Point site plus potential need for land for transmission line. Overall, the impacts would depend on whether the alternate site is previously disturbed.
Ecology	SMALL to MODERATE	Uses undeveloped areas at current Nine Mile Point site. Potential habitat loss and fragmentation; reduced productivity and biological diversity.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality—Surface Water	SMALL	The nuclear alternative would use the existing closed-cycle system.	SMALL to MODERATE	The nuclear alternative would use closed-cycle cooling. Impacts would depend on the volume of water withdrawn and discharged and the characteristics of the surface water sources.
Water Use and Quality—Ground-water	SMALL	The nuclear alternative would use the existing closed-cycle system.	SMALL to MODERATE	The nuclear alternative would use closed-cycle cooling. Impacts would depend on the volume of water withdrawn and discharged, and the characteristics of the groundwater source.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation.	SMALL	Same impacts as Nine Mile Point site.
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as Nine Mile Point site.

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comments	Impact	Comments
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1.	SMALL	Same impacts as Nine Mile Point site.
Socio-economics	SMALL to MODERATE	During construction, impacts would be MODERATE, with up to 2500 workers during peak period of the five-year construction period. During operation, employment levels would be similar to those for NMP. Overall, socioeconomic impacts from operation are SMALL.	SMALL to LARGE	The characteristics of the construction period and operation at an alternate site would be similar to those at Nine Mile Point. Socioeconomic impacts to the local community would depend on the characteristics of the alternate site and might vary from SMALL to LARGE.
Socio-economics (Transpor-tation)	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of commuting personnel would be SMALL.	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of commuting personnel could be SMALL to MODERATE.
Aesthetics	MODERATE	There would be visual aesthetic impacts associated with plant buildings and structures, along with cooling tower plumes. There would be both intermittent and continuous noise impacts from plant operation.	SMALL to LARGE	The structures and operation would be similar to the Nine Mile Point site, but the significance of the impacts would depend on the characteristics of the alternate site. The nuclear alternative at an alternate site could require transmission lines, with attendant aesthetic impacts.
Historic and Archaeo-logical Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same impacts as Nine Mile Point site.
Environ-mental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to MODERATE	Impacts will vary depending on population distribution and makeup at the site. Impacts to minority and low-income residents of Oswego and Onondaga counties associated with closure of NMP could be significant, but could be offset by potential job opportunities in the Syracuse metropolitan area.

Land-use requirements at an alternate greenfield site would be similar to siting at Nine Mile Point plus the possible need for land for a new transmission line. In addition, it may be necessary to construct a rail spur to an alternate site to bring in equipment during construction. Depending particularly on transmission line routing, siting a new nuclear plant at an alternate greenfield site would result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a replacement nuclear power plant at the Nine Mile Point site would alter ecological resources because of construction, and because of the need to convert currently unused land to industrial use. In total, impacts could include habitat degradation, fragmentation, or loss as a result of construction activities and conversion of land to industrial use. Ecological communities may experience reduced productivity and biological diversity from disturbing previously intact land. Overall, the ecological impacts of the nuclear alternative at the Nine Mile Point site are considered SMALL to MODERATE. The impact would be greater than the OL renewal alternative.

At an alternate site, there would be construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts may alter the ecology. Impacts could include: (1) habitat degradation, habitat fragmentation, or habitat loss, (2) reduced ecosystem productivity, and (3) reduced biological diversity. Construction and maintenance of transmission lines, a rail spur, or a barge offloading facility could result in the same types of ecological impacts. Use of makeup cooling water from a nearby surface water body could have adverse aquatic resource impacts. Overall, the impacts of the nuclear alternative at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality—Surface Water**

The replacement nuclear plant alternative at the Nine Mile Point site is assumed to use the existing closed-cycle cooling system, which would minimize incremental water-use and quality impacts. Surface-water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

Cooling towers would likely be used at the alternate site. For an alternate site, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the State of New York. The impacts would be SMALL to MODERATE.

- **Water Use and Quality—Groundwater**

There is a permanent dewatering system in Unit 2 that is operated to maintain the water table below the reactor mat elevation. Dewatering results in little or no lowering of the groundwater table offsite. It is unlikely that groundwater would be used for an alternative nuclear power plant

sited at Nine Mile Point. Use of groundwater for a nuclear power plant sited at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority. Overall, the impacts of the nuclear alternative at the Nine Mile Point site would be SMALL. The impacts of the nuclear alternative at an alternate site would be SMALL to MODERATE.

- **Air Quality**

Construction of a new nuclear plant sited at Nine Mile Point or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with diesel generators and other minor intermittent sources. These emissions would be regulated by NYSDEC. Overall, emissions and associated impacts to air quality of a nuclear plant at either the Nine Mile Point site or an alternate site are considered SMALL.

- **Waste**

The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR 51, Subpart A, Appendix B. Construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts of a new nuclear plant at either the Nine Mile Point site or an alternate site are considered SMALL.

- **Human Health**

Human health impacts for an operating nuclear power plant are set out in 10 CFR 51 Subpart A, Appendix B, Table B-1. Overall, human health impacts of a new nuclear power plant at either the Nine Mile Point site or an alternate site are considered SMALL.

- **Socioeconomics**

The construction period and the peak work force associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantitative data, staff assumed a construction period of five years and a peak work force of 2500. The staff assumed that construction would take place while the existing nuclear units continues operation and would be completed by the time NMP permanently cease operations.

If the facility were constructed at the Nine Mile Point site, these construction workers would be in addition to the employees that currently work at the site. Surrounding communities would experience significant, but not destabilizing, demands on housing and public services. After construction, the communities would be impacted by the loss of the construction jobs. In total, the socioeconomic impacts during the construction period for the nuclear-fired alternative at the Nine Mile Point site are considered MODERATE.

At an unnamed alternate site, the construction impacts could be smaller or larger than those at the Nine Mile Point site, depending on how close the site is to a vital economic center. These impacts are considered to be SMALL to LARGE depending on the site.

The replacement nuclear unit(s) are assumed to have an operating work force comparable to the 1280 workers currently working at NMP. The replacement nuclear unit(s) would provide a new tax base to offset the loss of tax base associated with decommissioning of NMP. For all of these reasons, the appropriate characterization of socioeconomic impacts for operating a new nuclear power plant constructed at Nine Mile Point is considered SMALL.

The impacts of operating the nuclear alternative at an unnamed alternate site could be smaller or larger than those at the Nine Mile Point site, depending on how close the alternate site is to an economic center. These impacts are considered SMALL to LARGE, depending on the site.

- **Socioeconomics (Transportation)**

During the five-year construction period, up to 2500 construction workers would be working at the Nine Mile Point site, in addition to the 1280 workers at Units 1 and 2. The addition of the construction workers could place significant traffic loads on existing highways. Such impacts would be MODERATE to LARGE. Transportation impacts associated with operation of Units 1 and 2 are considered SMALL.

Transportation-related impacts associated with commuting construction workers at an alternate greenfield site are site-dependent, but could be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site-dependent, but can be characterized as SMALL to MODERATE.

- **Aesthetics**

The nuclear alternative would result in aesthetic impacts, both visual and auditory. Visual impacts would result from several structures, including, most prominently, the containment buildings and the cooling towers. Cooling tower plumes are visible from greater distances than the towers themselves. The replacement nuclear units would also likely be visible at night because of outside lighting. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. Overall, the visual aesthetic impacts of the nuclear-fired alternative at the Nine Mile Point site are considered MODERATE.

At an alternate greenfield site, there would be an aesthetic impact from the buildings, cooling towers, and the plume associated with the cooling towers. There could also be a significant, negative aesthetic impact associated with the potential need for significant transmission line infrastructure. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants. Overall the aesthetic impacts associated with locating at an alternative site can be

categorized as MODERATE to LARGE. The greatest contributor to this categorization is the aesthetic impact of the new transmission line, if needed.

Nuclear generation would introduce mechanical sources of noise from plant operation. The noise sources are both continuous and intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeakers and the commuting of plant employees. At the Nine Mile Point site, the plant operation noises would be similar to existing noise levels from operating Units 1 and 2. The noise impacts of the nuclear alternative at Nine Mile Point are considered to be SMALL.

At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site.

- **Historic and Archaeological Resources**

At both Nine Mile Point and an alternate greenfield site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at Nine Mile Point or another site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement nuclear plant were built at the Nine Mile Point site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority and low-income populations. After completion of construction of the new nuclear plant, it is possible that the reduction in employment opportunities at the plant and in the surrounding community could reduce local government tax revenues and, consequently, reduce local government funding for social services. Overall, impacts are expected to be SMALL.

Impacts at other sites would depend upon the site chosen and the nearby population distribution, but are likely to be SMALL to MODERATE. Impacts to minority and low-income residents of Oswego and Onondaga counties associated with closure of NMP could be significant, but could also be offset by potential job opportunities in the Syracuse metropolitan area.

8.2.3.2 Once-Through Cooling System

The environmental impacts (SMALL, MODERATE, or LARGE) of constructing a nuclear power plant at the Nine Mile Point site using once-through cooling are relatively the same as the impacts for a nuclear power plant using a closed-cycle system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-6 summarizes the incremental differences.

Table 8-6. Summary of Environmental Impacts of a New Nuclear Power Plant Sited at the Nine Mile Point Site with Once-Through Cooling

Impact Category	Comparison with Closed-Cycle Cooling System
Land Use	Impacts may be less (e.g., through elimination of cooling towers) or greater (e.g., if a reservoir is required).
Ecology	Impacts would depend on ecology at the site. Potential impacts are associated with entrainment of fish and shellfish in early life stages, impingement of fish and shellfish, and heat shock.
Water Use and Quality—Surface Water	Increased water withdrawal leading to possible water-use conflicts; thermal load higher than with closed-cycle cooling.
Water Use and Quality—Groundwater	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Socioeconomics (Transportation)	No change.
Aesthetics	Elimination of cooling towers.
Historic and Archaeological Resources	No change.
Environmental Justice	No change.

8.2.4 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew the Nine Mile Point OLs. The New York State Energy Plan is designed to promote competition in energy supply markets by facilitating participation by non-utility suppliers. A regulatory structure is in place to appropriately anticipate and meet electricity demands, and the New York Independent System Operator (NYISO) anticipates that adequate supplies of electricity will be available to meet anticipated future demands through at least 2021. In view of these conditions, NMPNS assumed in the ER that adequate supplies of electricity would be available, and that purchased power would be a reasonable alternative to meet its load requirements in the event the OLs for Nine Mile Point are not renewed.

The source of the purchase power that would potentially replace Nine Mile Point's power is speculative, but may reasonably include new generating facilities developed elsewhere in the state, from neighboring U.S. power pool jurisdictions, or from Canada. The technologies that would be used to generate this purchased power are similarly conjectural. However, considering the current projected development of additional generating capabilities in New York state noted above, natural gas-fired, combined-cycle units, such as those described in Section 8.2, would be the most likely candidate.

NMPNS does not anticipate that any additional transmission infrastructure would be needed to facilitate transfer of this purchased power to replace Nine Mile Point capacity. Upstate New York has sufficient capacity to meet local loads, and Constellation Energy anticipates that the Nine Mile Point to Clay transmission line and transmission lines from Scriba Substation would remain in service in the event the Nine Mile Point plants cease operation; therefore, no local load pocket would be created requiring construction of new transmission lines. The traditional strain on the New York state transmission system is west-to-east as a result of relatively low-cost generation in western upstate New York and higher demand in the east and downstate. As noted by a recent study sponsored by the NYISO (Sanford et al. 2001), power imports from New England in the next few years are expected to relieve this strain in the near term, and the addition of new generation within the state is expected to reduce the frequency of encountering transmission constraints in the future.

If power to replace NMP capacity were to be purchased from sources within the U.S. or a foreign country, the generating technology would likely be one of those described in this SEIS and in the GEIS (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies in Chapter 8 of the GEIS is representative of the purchased electrical power alternative to renewal of the NMP OLs. Thus, the environmental impacts of imported power would still occur but would be located elsewhere within the region, nation, or another country. For these reasons, the staff does not believe that purchasing power to make up for the generation at NMP is a meaningful alternative that requires independent analysis.

8.2.5 Other Alternatives

Other generation technologies considered by the NRC are discussed in the following paragraphs.

8.2.5.1 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the U.S. through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2000). Oil-fired operation is more expensive than nuclear or coal-fired operation. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. Increasing domestic concerns over oil security will only exacerbate the move away from oil-fired electricity generation. Therefore, the staff does not consider oil-fired generation, by itself, a feasible alternative to NMP.

8.2.5.2 Wind Power

Wind power, by itself, is not suitable for large base-load capacity. As discussed in Section 8.3.1 of the GEIS, wind has a high degree of intermittency, and average annual capacity factors for wind plants are relatively low (less than 30 percent). Wind power, in conjunction with energy storage mechanisms, might serve as a means of providing base-load power. However, current energy storage technologies are too expensive for wind power to serve as a large base-load generator.

Most of western New York is in wind power Class 2 or 3 regions (average wind speeds at 9-m [30-ft] elevation of 4.4 to 5.6 meters per second [m/s] [9.8 to 12.5 miles per hour (mph)]) (Elliott et al. 1986; DOE 2002) with a narrow band of Class 3 or 4 along the shore of Lake Ontario. Wind turbines are economical in wind power Classes 4 through 7 (average wind speeds of 7.0 to > 8.8 m/s [16 to 20 mph] [DOE 2001]). Wind turbines typically operate at a 25- to 35-percent capacity factor, compared to 80 to 95 percent for a base-load plant (NWPPC 2000). The largest commercially available wind turbines are in the range of 1 to 3 MW (e); therefore, at least 586 to 1759 units would be required to replace the Nine Mile Point generating capacity. Given the intermittent nature of the wind resource (perhaps 30 to 35 percent availability), approximately three times this number would be required to replace the amount of electricty generated by Nine Mile Point.

As of January 2003, there were approximately 48 MW of grid-connected wind power facilities in New York State, with an additional 637 MW of additional capacity in various stages of planning (AWEA 2004). Statewide, the New York State Energy Research and Development Authority (NYSERDA) estimates that there is a potential for approximately 17,000 MW of installed capacity, of which approximately 3200 MW would be available for the peak summer load (NYSERDA 2002). Access to many of the best wind power sites would require extensive road building, as well as clearing (for towers and blades) and leveling (for the tower bases and

associated facilities) in steep terrain. Also, many of the best-quality wind sites are on ridges and hilltops that could have greater archeological sensitivity than surrounding areas. For these reasons development of large-scale, land-based wind-power facilities are likely to not only be costly, but could have MODERATE to LARGE impacts on aesthetics, archaeological resources, land use, and terrestrial ecology.

The offshore wind speeds in Lake Ontario are higher than those onshore, and could thus support greater energy production than onshore facilities. Ten offshore wind power projects are currently operating in Europe, but none have been developed in the U.S. The European plants together provide approximately 260 MW, which is significantly less than the electrical output of Nine Mile Point (BWEA 2003). Development of an offshore wind-power facility could impact shipping lanes, may disrupt the aquatic ecology, and would be visible for many miles, resulting in considerable aesthetic impacts. These impacts could be MODERATE to LARGE.

For these reasons, the staff concludes that wind power alone is not a feasible substitute at this time for the base-load generation from NMP. However, the staff recognizes that wind power projects are being developed in areas with significant wind potential. Therefore, it is reasonable to include wind power in a combination of alternatives that could replace the generation from NMP. Combined alternatives are discussed in Section 8.2.6.

8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat, cooling, light, hot water, and electricity for homes, businesses, and industry. Solar-power technologies, both photovoltaic (PV) and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of PV cells is about 25 percent, and the capacity factor for solar thermal systems is about 25 to 40 percent. These capacity factors are low because solar power is an intermittent resource, providing power when the sun is strong, whereas NMP provide constant base-load power. Solar technologies simply cannot make up for the capacity from NMP during the night and in overcast conditions.

There can be substantial impacts to natural resources (wildlife habitat, land use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS, land requirements are high—140 km^2 (55 mi^2) per 1000 MW for PV and approximately 57 km^2 (22 mi^2) per 1000 MW for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the Nine Mile Point site, and both would have large environmental impacts at a greenfield site.

Currently available PV cell conversion efficiencies range from approximately 7 to 17 percent. The average annual solar energy flux throughout the year falling in New York is approximately 2.8 kWh/m^2 per day (NMPNS 2004). Assuming a conversion efficiency of ten percent, PV cells would yield an annual electricity production of approximately 102 kWh(e)/m^2 per year in the New York area. This assumed rate of generation, replacing the 12.8 million MWh(e) generated by

Nine Mile Point Units 1 and 2 in 2003 (DOE/EIA 2003) would require approximately 125 million m^2 or 125 km^2 (78 mi^2) of PV arrays.

Installations of solar panels on residential and commercial rooftops are referred to as "distributed solar power." Based on an average house size of 139 m^2 (1500 ft^2) with a useable roof space of 70 m^2 (753 ft^2) and a higher conversion efficiency of 15 percent, over one million new or existing homes would have to be fitted with solar panels to replace the generation from NMP. Without significant government or utility incentives, installation of distributed solar panels on this scale is unlikely. However, distributed solar power could be included in a combination of alternatives to replace NMP. Distributed solar power would result in fewer construction-related impacts because solar panels would usually be placed on existing buildings, eliminating the need for land clearing or transmission lines. Negative aesthetic impacts would be only marginally greater than those already created by the existing or new buildings.

Because of the area's relatively low rate of solar radiation, the natural resource impacts (land, ecological, and aesthetic), and high technology costs, solar power is not deemed a feasible base-load alternative to license renewal of NMP. However, the staff recognizes that distributed solar power does provide generation and that during the license renewal period generation from solar power could continue to grow. Therefore, it is reasonable to include solar power in combinations of alternatives to replace the generation from NMP. Combined alternatives are discussed in Section 8.2.6.

8.2.5.4 Hydropower

New York state has a technical potential for 2527 MW of additional installed hydroelectric capacity by 2022, only 909 MW of which represents summer peak capacity. If all this capacity were developed, it would be enough to replace the 1759 MW generating capacity of NMP. However, as stated in Section 8.3.4 of the GEIS, the staff points out hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses. DOE/EIA states that potential sites for hydroelectric dams have already been largely established in the U.S., and environmental concerns are expected to prevent the development of any new sites in the future (DOE/EIA 2002).

The staff estimated in the GEIS that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e). Replacement of NMP generating capacity would require flooding substantially more than this amount of land. Due to the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace NMP, the staff concludes that local hydropower alone is not a feasible alternative to NMP OL renewal on its own. Any attempts to site hydroelectric facilities large enough to replace NMP would result in LARGE environmental impacts. However, the staff recognizes that hydropower does provide generation and that during the license renewal period generation from hydropower could continue to grow.

Therefore, it is reasonable to include hydropower in combinations of alternatives to replace the generation from NMP. Combined alternatives are discussed in Section 8.2.6.

8.2.5.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for base-load power where available. However, geothermal technology is not widely used as base-load generation due to the limited geographical availability of the resource and immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental U.S., Alaska, and Hawaii where hydrothermal reservoirs are prevalent. A study commissioned by NYSERDA and the DOE, completed in 1996, found that there is some potential for geothermal electric power production in western upstate New York, but high cost inhibits its development (NMPNS 2004). Therefore, the staff concludes that geothermal energy is not a feasible alternative to renewal of the NMP OLs.

8.2.5.6 Wood Waste

The use of wood waste to generate electricity is largely limited to those states with significant wood resources, such as California, Maine, Georgia, Minnesota, Oregon, Washington, and Michigan. Electric power is generated in these states by the pulp, paper, and paperboard industries, which consume wood and wood waste for energy, benefitting from the use of waste materials that could otherwise represent a disposal problem.

A wood-burning facility can provide base-load power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in capacity. Estimates in the GEIS suggest that the overall level of construction impact per megawatt of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a base-load generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the NMP OLs.

8.2.5.7 Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001). Municipal waste

combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001). Mass-burning technologies are most commonly used in the U.S. This group of technologies process raw municipal solid waste "as is," with little or no sizing, shredding, or separation before combustion.

Growth in the municipal waste-combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste-combustion facilities more expensive relative to less capital-intensive waste disposal alternative such as landfills; (2) the 1994 Supreme Court decision *(C&A Carbone, Inc. v. Town of Clarkstown),* which struck down local flow control ordinances that required waste to be delivered to specific municipal waste-combustion facilities rather than landfills that may have had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste-combustion facilities (DOE/EIA 2001).

The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics, particularly with electricity prices declining.

Municipal solid-waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue-gases using fabric filters and/or scrubbers (DOE/EIA 2001).

Currently there are approximately 89 waste-to-energy plants operating in the U.S. These plants generate approximately 2500 MW(e), or an average of approximately 28 MW(e) per plant (IWSA 2004), much smaller than needed to replace the 1759 MW(e) of NMP.

The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities. This is due to the need for specialized waste-separation and handling equipment for municipal solid waste (NRC 1996). Furthermore, estimates in the GEIS suggest that the overall level of construction impact from a waste-fired plant should be approximately the same as that for a coal-fired plant. Additionally, waste-fired plants have the same or greater operational impacts (including impacts on the aquatic environment, air, and waste disposal). Some of these impacts would be moderate, but still larger than the environmental effects of license renewal of Nine Mile Point. Therefore, municipal solid-waste combustors would not be a feasible alternative to renewal of the NMP OLs, particularly at the scale required.

8.2.5.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff points out that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant such as NMP. For these reasons, such fuels do not offer a feasible alternative to renewal of the NMP OLs.

8.2.5.9 Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode, passing air over a cathode, and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. These fuel cells are commercially available at cost of approximately $4500 per kW of installed capacity (DOE 2004). Higher-temperature second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

The U.S. Department of Energy has launched a major initiative, the Solid State Energy Conversion Alliance, to bring about dramatic reductions in fuel cell costs. The goal is to cut costs to as low as $400 per kilowatt by 2010, which would make fuel cells competitive for virtually every type of power application (DOE 2004). For comparison, the installed capacity cost for a natural gas-fired, combined-cycle plant is about $456 per kW (DOE/EIA 2000). However, at the present time, fuel cells are not economically or technologically competitive with other alternatives for base-load electricity generation. Fuels cells are, consequently, not a feasible alternative to renewal of the NMP OLs.

8.2.5.10 Delayed Retirement

As noted in the GEIS, extending the lives of existing non-nuclear generating plants beyond the time they were originally scheduled to be retired represents another potential alternative to license renewal. Current generating capability in New York other than Nine Mile Point that is directly controlled by Nine Mile Point's owners consists of 2800 MW of generation from generic types often used for base-load service. This capability, located mostly downstate, is composed of numerous, mostly small units, including 16 non-nuclear steam turbine plants firing oil or natural gas and one natural gas-fired combined-cycle unit. Although some of this capability may be suitable for base-load service, most (approximately 1855 MW) is represented by units with

in-service dates prior to 1970 (NMPNS 2004) and therefore would be at or beyond the normal design life of 40 years when the Nine Mile Point OLs expire.

Older plants, such as those noted above, that may be candidates for retirement tend to use less-efficient generation and pollution control technologies than modern plants. Therefore, substantial upgrades are typically required to achieve efficiencies necessary to cost-effectively extend their operations and meet applicable environmental standards. Considering only the plants noted above, upgrades would be necessary for numerous units to achieve capacity equivalent to that of Nine Mile Point.

New York Independent System Operator load and capacity projections assume that nuclear generating units in the state will cease operation upon expiration of their current operating licenses, but do not acknowledge retirement of any non-nuclear generating units in the State from 2005 through 2021 (NMPNS 2004). Therefore, any such retirements that do occur in this period would merely act to further increase projected demand.

Based on this information, the staff concluded that delayed retirement of other generating units directly controlled by owners of Nine Mile Point would not be a feasible alternative to renewal of NMP OLs.

8.2.5.11 Utility-Sponsored Conservation

The utility-sponsored conservation alternative refers to a situation in which NMP cease to operate, no new generation is brought online to meet the lost generation, and the lost generation is instead replaced by more efficient use of electricity. More efficient use would arise from utility-sponsored conservation programs, potentially including energy audits, incentives to install energy-efficient equipment, and informational programs to inform electricity consumers of the benefits of, and possibilities for, electricity conservation.

Since the 1980s, Niagara Mohawk has participated in residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption. These programs are commonly referred to as demand-side management (DSM). Statewide, these DSM programs through 2001 have resulted in a cumulative summer peak reduction of approximately 1600 MW between 1999 and 2000, and additional peak demand reductions on the order of 900 to 1300 MW are projected in the 2004 to 2006 time frame (NMPNS 2004). These DSM-induced load reductions are acknowledged in load forecasts; therefore they cannot be used as credits to offset the power generated by Nine Mile Point. As a practical matter, it would be impossible to increase those energy savings by an additional 1759 MW to replace the Nine Mile Point generating capability, particularly in upstate New York, which represents a relatively small fraction of electrical load in the State.

Therefore, the staff does not consider energy efficiency, by itself, as a feasible alternative to license renewal. However, the staff recognizes that energy conservation is promoted and increases in energy efficiency occur as a normal result of replacing older equipment with

modern equipment. It is reasonable to include conservation in a combination of generation sources that could replace the Nine Mile Point Unites 1 and 2. Combined alternatives are discussed in Section 8.2.6.

8.2.6 Combination of Alternatives

Even though individual alternatives to NMP might not be sufficient on their own to replace NMP capacity due to the small size of the resource or lack of cost effective opportunities, it is conceivable that a combination of alternatives might be cost-effective.

There are many possible combinations of alternatives. As discussed previously, these combinations could include base-load natural gas-fired or coal-fired plants, purchased power, alternative and renewable technologies, and conservation. For the purpose of this discussion, one combination of alternatives has been assumed: 1200 MW(e) of generation from a combined-cycle facility at the Nine Mile Point site, 300 MW(e) of energy conservation, and 259 MW(e) purchased from other generators. The impacts of other combinations, such as those from combinations that include wind or solar power, would be different and possibly less than the assumed combination. In some areas, such as the aesthetic impact of solar panel or wind turbines, the impacts would be at least as large as the impact of the assumed combination of alternatives. In other areas, such as waste, impacts would be smaller for these alternative technologies.

Table 8-7 contains a summary of the environmental impacts of an assumed combination. The impacts associated with the combined-cycle, natural gas-fired units are based on the natural gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generation capacity. While the DSM measures would have few environmental impacts, operation of the new natural gas-fired plant would result in increased emissions and environmental impacts. The environmental impacts associated with power purchased from other generators would still occur but would be located elsewhere, as discussed in Section 8.2.4. The impacts of purchased power are not shown in Table 8-7. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewal of the NMP OIs.

Table 8-7. Summary of Environmental Impacts of an Assumed Combination of Generation and Acquisition Alternatives—Does Not Include Impacts from Purchased Generation

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	The natural gas-fired alternative would use undeveloped portions of the Nine Mile Point site. It would require upwards of 45 ha (110 ac) for power block, offices, roads, and parking areas. It would use existing infrastructure, minimizing new land requirements. There would be additional land impacts for construction of an underground gas pipeline.	SMALL to LARGE	Land-use requirements would be larger at an alternate site than at the Nine Mile Point site because of the need for infrastructure such as transmission facilities, roads, parking areas, office buildings, and cooling system. The total impact would depend on whether the alternate site is previously disturbed.
Ecology	SMALL to MODERATE	The natural gas-fired alternative would use undeveloped areas at the Nine Mile Point site. There would be potential for significant habitat loss, habitat fragmentation, and reduced productivity and biological diversity.	SMALL to MODERATE	Impacts would depend on whether the alternate site is previously disturbed. Factors to consider include location and ecology of site and transmission line route. In total, impacts could include habitat degradation, fragmentation, or loss as a result of construction activities and conversion of land to industrial use. Ecological communities might experience reduced productivity and biological diversity from disturbing previously intact land.
Water Use and Quality—Surface Water	SMALL	Combined-cycle units have lower water requirements than nuclear and coal-fired power plants. The natural gas-fired alternative would use closed-cycle cooling to the degree necessary.	SMALL to MODERATE	Combined-cycle units have lower water requirements than nuclear and coal-fired power plants. The natural gas-fired alternative would use closed-cycle cooling to the degree necessary. Total impacts would depend on the volume of water withdrawal, the constituents of the discharge water, the characteristics of the surface water source, and the new intake structures required.

Impact	Nine Mile Point Site		Alternate Site	
Category	**Impact**	**Comments**	**Impact**	**Comments**
Water Use and Quality—Ground-water	SMALL	Use of groundwater is very unlikely.	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge.
Air Quality	MODERATE	Sulfur oxides: 62 MT/yr (68 tons/yr) Nitrogen oxides: 198 MT/yr (218 tons/yr) Carbon monoxide: 121 MT/yr (133 tons/yr) PM_{10} particulates: 229 MT/yr (252 tons/yr) Other: (1) hazardous air pollutants, including arsenic, formaldehyde, and nickel and (2) carbon dioxide emissions, which contribute to global warming.	MODERATE	Same impacts as the Nine Mile Point site.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Same impacts as the Nine Mile Point site.
Human Health	SMALL	Impacts are considered to be minor.	SMALL	Same impacts as the Nine Mile Point site.
Socio-economics	SMALL to MODERATE	During construction, impacts would be MODERATE. Construction workers could place noticeable burdens on existing infrastructure, including housing and transportation. During operation, employment would decrease from 1280 permanent workers to approximately 50, reducing impacts on transportation. Impacts on housing and vitality of the local economy would be negative. Overall, socioeconomic impacts from operation are SMALL.	SMALL to LARGE	The characteristics of the construction period at an alternate site would be similar to those at the Nine Mile Point site. Socioeconomic impacts to the local community would depend on the characteristics of the alternate site, and might vary from SMALL to MODERATE. The characteristics of the operation of the natural gas-fired alternative at an alternate site would be similar to those at the Nine Mile Point site. Socioeconomic impacts to the local community would depend on the characteristics of the alternate site, and might vary from SMALL to LARGE.

Impact	Nine Mile Point Site		Alternate Site	
Category	Impact	Comments	Impact	Comments
Socio-economics (Transportation)	MODERATE	Transportation impacts associated with construction workers would be MODERATE.	MODERATE	Same impacts as the Nine Mile Point site.
Aesthetics	SMALL	There would be visual aesthetic impacts associated with plant buildings and structures. There would be both continuous and intermittent noise impacts from plant operation.	MODERATE to LARGE	The structures and operation would be similar to the Nine Mile Point site, but the significance of the impacts would depend on the characteristics of the alternate site. The natural gas-fired alternative at an alternate site could require transmission lines, with attendant aesthetic impacts.
Historic and Archaeo-logical Resources	SMALL	Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant. Any potential impacts can likely be effectively managed.	SMALL	Same impacts as the Nine Mile Point site.
Environ-mental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to MODERATE	Impacts would vary depending on population distribution and characteristics at the new site.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, license renewal, are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal, for which a single significance level was not assigned). The alternative actions, i.e., no-action alternative (discussed in Section 8.1), new generation alternatives (from coal, natural gas, and nuclear discussed in Sections 8.2.1 through 8.2.3, respectively), purchased electrical power (discussed in Section 8.2.4), alternative technologies

(discussed in Section 8.2.5), and the combination of alternatives (discussed in Section 8.2.6) were considered.

The no-action alternative would require the replacement of electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than NMP, or (4) some combination of these options. For each new generation alternative (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For example, the land-disturbance impacts resulting from construction of any new facility would be greater than the impacts of continued operation of NMP. The impacts of purchased electrical power (imported power) would still occur, but would occur elsewhere. Alternative technologies are not considered feasible at this time, and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with renewal of the NMP OLs.

The staff concludes that the alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

8.4 References

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10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR Part 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR Part 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

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9.0 Summary and Conclusions

By letter dated May 26, 2004, the Nine Mile Point Nuclear Station, LLC (NMPNS), submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Nine Mile Point Units 1 and 2 (NMP) for an additional 20-year period (NMPNS 2004). The application was supplemented by letters dated March 3, 2005, and July 14, 2005. If the OLs are renewed, State regulatory agencies and NMPNS will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the plants must be shut down at or before the expiration of the current OLs, which expire on August 22, 2009, for Unit 1, and October 31, 2026, for Unit 2.

Section 102 of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of the NEPA in Title 10 of the Code of Federal Regulations (CFR) Part 51. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*s (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[(a)]

Upon acceptance of the NMPNS application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping (NRC 2004a) on August 11, 2004. The staff held public scoping meetings on September 21, 2004, in Oswego, New York and visited the Nine Mile Point site on September 22, 2004 (NRC 2004b). The staff has reviewed the NMPNS Environmental Report (ER) (NMPNS 2004) and compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of this draft supplemental environmental impact statement (SEIS) for NMP. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this SEIS.

The staff held two public meetings in Oswego, New York, in November 2005, to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments on the draft SEIS. The staff considered and addressed all of the comments received on the draft SEIS. These comments are recorded and addressed in Appendix A, Part 2, of this SEIS.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

This SEIS includes the NRC staff's analysis that considers and weighs the cumulative impacts of the action, the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The NRC has adopted the following statement of purpose and need for license renewal from the GEIS:

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decisionmakers.

The evaluation criterion for the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine:

> ... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OLs.

NRC regulations (10 CFR 51.95[c][2]) contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).[(a)]

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates

(a) The title of 10 CFR 51.23 is "Temporary Storage of Spent Fuel After Cessation of Reactor Operations—Generic Determination of No Significant Environmental Impact."

92 environmental issues using NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

SMALL—Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For 69 of the 92 issues considered in the GEIS, the staff analysis in the GEIS shows the following:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must also be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This SEIS documents the staff's consideration of all 92 environmental issues identified in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The

alternatives to license renewal that were considered include the no-action alternative (not renewing the OLs for NMP) and alternative methods of power generation. These alternatives were evaluated assuming that the replacement power generation plant is located at either the Nine Mile Point site or some other unspecified location.

9.1 Environmental Impacts of the Proposed Action—License Renewal

NMPNS and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither NMPNS nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the public comments, NMPNS, nor the staff has identified any new issue applicable to NMP, that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to Nine Mile Point.

NMPNS's license renewal application presents an analysis of the Category 2 issues that are applicable to Nine Mile Point, plus environmental justice and chronic effects from electromagnetic fields. The staff has reviewed the NMPNS analysis for each issue and has conducted an independent review of each issue plus environmental justice and chronic effects from electromagnetic fields. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at Nine Mile Point. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. NMPNS has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of NMP, for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to the Operation of Nine Mile Nuclear Station Unit 1* (AEC 1974).

Twelve Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this SEIS in relation to operation during the renewal term. For all 12 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required.

For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the NMPNS SAMA analysis, the staff concurs with NMPNS's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff agrees that further evaluation of these SAMAs by NMPNS is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate the environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts of continued operation identified are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives if NMP cease operation at or before the expiration of the current OLs will not be smaller than those associated with continued operation of these units, and the adverse impacts may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of NMP during the current license period was made when the facility was built. The resource commitments to be considered in this SEIS are associated with continued operation of the plant for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactors, and ultimately, permanent offsite storage space for the spent fuel assemblies.

The most significant resource commitments related to operation during the renewal term are the fuel and the permanent HLW storage space. Approximately one-third of the fuel assemblies in

each of the two Nine Mile Point units is replaced during every refueling outage, which occurs on a staggered 24-month cycle.

The likely power generation alternatives if Nine Mile Point ceases operation on or before the expiration of the current OLs will require a commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the Nine Mile Point site was set when the plants were approved and construction began. That balance is now well established. Renewal of the OLs for NMP and continued operation of the plant will not alter the existing balance, but may postpone the availability of the site for other uses. Denial of the application to renew the OLs will lead to shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the Nine Mile Point site into a park or an industrial facility are quite different.

9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OLs for NMP. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at NMP. Chapters 4 through 7 discuss environmental issues associated with renewal of the OLs. Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OLs); the no-action alternative (denial of the application), alternatives involving nuclear, coal-, or gas-fired generation of power at the Nine Mile Point site and an unspecified alternate site, and a combination of alternatives are compared in Table 9-1. The use of closed-cycle cooling systems for both the Nine Mile Point site and an alternate site is assumed for Table 9-1.

Substitution of once-through cooling for the recirculating cooling system in the evaluation of the nuclear, coal-, and gas-fired generation alternatives would result in somewhat greater environmental impacts in some impact categories.

Table 9-1 shows that the significance of the environmental effects of the proposed action is SMALL for all impact categories (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). The alternative actions, including the no-action alternative, may

have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the GEIS (NRC 1996; 1999), (2) the ER submitted by NMPNS (NMPNS 2004), (3) consultation with Federal, State, and local agencies, (4) the staff's own independent review, and (5) the staff's consideration of public comments, the recommendation of the staff is that the Commission determine the adverse environmental impacts of license renewal for NMP are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable.

Table 9-1. Summary of Environmental Significance of Proposed Action, the No-Action Alternative, and Alternative Methods of Generation Using Closed-Cycle Cooling

	Proposed Action	No-Action Alternative	Coal-Fired Generation	Natural Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
Impact Category	License Renewal	Denial of Renewal	Alternate Site	Nine Mile Point Site	Alternate Site	Nine Mile Point Site	Alternate Site	Nine Mile Point Site	Alternate Site
Land Use	SMALL	SMALL	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Ecology	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE
Water Use and Quality—Surface Water	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Use and Quality—Groundwater	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	SMALL	SMALL	MODERATE	MODERATE
Waste	SMALL	SMALL	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL[(a)]	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	MODERATE to LARGE	SMALL to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Socioeconomics (Transportation)	SMALL	SMALL	SMALL to LARGE	MODERATE	MODERATE	SMALL to LARGE	SMALL to LARGE	MODERATE	MODERATE
Aesthetics	SMALL	SMALL	SMALL to LARGE	SMALL	MODERATE to LARGE	MODERATE	SMALL to LARGE	SMALL	MODERATE to LARGE
Historic and Archaeological Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent-fuel disposal, for which a significance level was not assigned. See Section 6 for details.

9.4 References

10 CFR Part 51. Code of Federal Regulations, Title 10*, Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10*, Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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U.S. Nuclear Regulatory Commission (NRC). 2004b. *Environmental Impact Statement Scoping Process: Summary Report—Nine Mile Point Units 1 and 2, Oswego, New York*. Washington, D.C.