Appendix E

Applicant's Environmental Report

Operating License Renewal Stage

Indian Point Energy Center

Introduction

Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC (hereafter referred to as "Entergy") submits this Environmental Report (ER) in conjunction with the application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Indian Point Units 2 and 3 (IP2 and IP3) for twenty years beyond the end of the current license terms. In compliance with applicable NRC requirements, this ER analyzes potential environmental impacts associated with renewal of the IP2 and IP3 Operating Licenses. This ER is designed to assist the NRC staff with the preparation of the IP2 and IP3 specific Supplemental Environmental Impact Statement (SEIS) required for license renewal.

The IP2 and IP3 ER is provided in accordance with 10 CFR 54.23, which requires license renewal applicants to submit a supplement to the ER that complies with the requirements of Subpart A of 10 CFR Part 51. This report also addresses the more detailed requirements of NRC environmental regulations in 10 CFR 51.45 and 10 CFR 51.53(c), as well as the intent of the National Environmental Policy Act (NEPA), 42 USC 4321 et seq. For major federal actions, NEPA requires federal agencies to prepare a detailed statement that evaluates environmental impacts, alternatives to the proposed action, and irreversible and irretrievable commitments of resources associated with implementation of the proposed action.

Entergy used Supplement 1 to Regulatory Guide 4.2, "Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses," as guidance on the format and content of this ER. In addition, it utilized the Generic Environmental Impact Statement (GEIS) for License Renewal for Nuclear Plants (NUREG-1437) and Appendix B to 10 CFR Part 51 preparation of this report. The level of information provided on the various topics and issues in this ER are commensurate with the environmental significance of the particular topic or issue.

Based upon the evaluations discussed in this ER, Entergy concludes that the environmental impacts associated with renewal of the IP2 and IP3 Operating Licenses are small. No plant refurbishment activities have been identified as necessary to support the continued operation of IP2 and IP3 beyond the end of the existing operating license term. Ongoing plant operational and maintenance activities will be performed during the license renewal period for economic and operational reasons, but no significant environmental impacts associated with such activities are expected since established programs and procedures are in place to ensure that proper environmental screenings are conducted.

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ACRONYMS AND ABBREVIATIONS

AC	alternating current
ADV	atmospheric dump valve
AFW	auxiliary feedwater
ALARA	as low as reasonably achievable
AMSAC	Anticipated Transient without SCRAM mitigating system actuation circuitry
ASMFC	Atlantic State Marine Fisheries Commission
ANO-2	Arkansas Nuclear One - Unit 2
ASSS	alternate safe shutdown system
ATWS	anticipated transient without scram
BACT	best available control technology
BNL	Brookhaven National Laboratory
BSS	Beach Seine Survey
Btu	British thermal unit
°C	degrees Celsius
CAA	Clean Air Act
CaO	calcium oxide
$CaSO_4$ $2H_2O$	calcium sulfate dihydrate
cc	cubic centimeter
CCW	component cooling water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CET	containment event tree
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cfy	cubic feet per year
CHGEC	Central Hudson Gas & Electric Corporation

Acronyms and Abbreviations (continued)

Ci/ml	curies per milliliter
cm^2	square centimeter
CMR	conditional mortality rate
CNP	Cook Nuclear Plant
CO	carbon monoxide
CO_2	carbon dioxide
COE	cost of enhancement
CSD	Central School District
Csi	cesium iodide
ConEdison	Consolidated Edison Company of New York, Inc.
CVCS	chemical and volume control system
CWA	Clean Water Act
CWIS	circulating intake water structure
DAW	dry active waste
dB(A)	decibel weighted
DEIS	Draft Environmental Impact Statement
DC	direct current
DCH	direct containment heating
DOE	U.S. Department of Energy
DOT	Department of Transportation
DPR	demonstration project reactor
EA	Environmental Assessment
ECL	Environmental Conservation Law
ECCS	emergency core cooling system
EDG	emergency diesel generator
EEI	Edison Electric Institute

Acronyms and Abbreviations (continued)

EIA	Energy Information Administration
EIS	Environmental Impact Statement
ENN	Entergy Nuclear Northeast
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EPZ	emergency planning zone
ESA	Endangered Species Act
ER	Environmental Report
ESBWR	Economic Simplified Boiling Water Reactor
ESRI	Environmental Systems Research Institute
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FES	Final Environmental Statement
FEIS	Final Environmental Impact Statement
FIVE	fire induced vulnerability event
fps	feet per second
FSB	Fuel Storage Building
FSS	Fall Shoals Survey
ft	feet
ft^3	cubic feet
GE	General Electric
GEIS	Generic Environmental Impact Statement
GIS	Geographical Information System
gpd	gallons per day
gpm	gallons per minute
GSA	gamma spectroscopy analysis

Acronyms and Abbreviations (continued)

HEPA	high efficiency particulate air filters
HPME	high pressure melt ejection
HRA	human reliability analysis
HRSA	Hudson River Settlement Agreement
HVAC	heating, ventilating, and air conditioning
Hz	hertz
IP1	Indian Point Unit 1
IP2	Indian Point Unit 2
IP3	Indian Point Unit 3
IPE	Individual Plant Examination
IPEC	Indian Point Energy Center
IPEEE	Individual Plant Examination of External Events
ISFSI	independent spent fuel storage installation
ISFSSI	interim spent fuel storage slab installation
ISLOCA	interfacing system loss of coolant accident
ISO	International Standards Organization
IVSWS	Isolation Valve Seal Water System
kg	kilogram
KTONS	kilotons
km	kilometer
km^2	square kilometer
Kr	krypton
kV	kilovolts
kW	kilowatt
kWh	kilowatt-hour
lb	pound

Acronyms and Abbreviations (continued)

LERF	large early release frequency
LIOWP	Long Island Offshore Wind Park, LLC
LNG	liquefied natural gas
LOCA	loss of coolant accident
LOS	level of service
LRS	Longitudinal River Survey
LWR	light water reactor
m	meters
m^3	cubic meter
mA	milliamperes
MAAP	modular accident analysis program
MACCS2	Melcor Accident Consequences Code System 2
µc	microcuries
MCC	motor control center
MFTDS	Modular Fluidized Transfer Demineralization and Sluice System
mgd	million gallons per day
µg/l	micrograms/liter
mg/l	milligrams per liter
mgy	million gallons per year
mGy	milligray (a unit for absorbed dose)
mho	milliohm
ml	milliliter
mlw	mean low water
MM	million
MMS	Minerals Management Services
MMBtu	million British thermal unit

Acronyms and Abbreviations (continued)

MOV	motor-operated valve
mph	miles per hour
mrad	millirad
mrem	millirem
MSIV	main steam isolation valve
MSL	mean sea level
mSv	millisievert
MT	metric ton
MW	megawatt
MWD/MTU	megawatt-days per metric tonne
MWD/T	megawatt day/ton
MWe	megawatts, electric
MWh	megawatt, hour
MWt	megawatts, thermal
N-16	Nitrogen-16
NA	not applicable
NASS	National Agricultural Statistics Service
NCF	no containment failure
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NMFS	National Marine Fisheries Service
NNE	nitrogen to nuclear equipment
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission

Acronyms and Abbreviations (continued)

NRHP	National Register of Historic Places
NRR	(Office of) Nuclear Reactor Regulation
NSPS	New Source Performance Standard
NSR	New Source Review
NUREG	U.S. Nuclear Regulatory Commission Document
NWJWW	Northern Westchester Joint Water Works
NYOSPRHP	New York Office of State Parks, Recreation, and Historic Preservation
NYS	New York State
NYSDOS	New York State Department of State
NYCRR	New York Code of Rules and Regulations
NYNHP	New York Natural Heritage Program
NYPA	New York Power Authority
NYPSC	New York Public Service Commission
NYRHP	New York Register of Historic Places
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
ODCM	Offsite Dose Calculation Manual
OECR	offsite economic cost risk
OSGSF	Original Steam Generator Storage Facility
OL	Operating License
PAB	primary auxiliary building
PCB	polychlorinated biphenyl
PDR	population dose risk
PDS	plant damage states
PILOT	Payment-in-Lieu-of-Taxes
PJM	Pennsylvania - New Jersey - Maryland

Acronyms and Abbreviations (continued)

$PM_{2.5}$	particulates having diameter less than 2.5 microns
PM_{10}	particulates having diameter less than 10 microns
PORV	pressure-operated relief valve
ppm	parts per million
PRA	probabilistic risk assessment
PSA	probabilistic safety assessment
PSD	prevention of significant deterioration
psig	pounds per square inch
PWR	pressurized water reactor
PWS	public water system
PYSL	post yolk-sac larvae
RAI	request for additional information
RCDT	reactor coolant drain tank
RCP	reactor coolant pump
RCS	reactor coolant system
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RHR	residual heat removal
RM	river mile
RMP	Risk Management Plan
ROI	region of interest
ROW	right-of-way
RHR	residual heat removal
RRW	risk reduction worth
RWST	refueling water storage tank
ry	reactor year

Acronyms and Abbreviations (continued)

S	sulfur
SAFSTOR	Safe Storage for Subsequent Decommissioning
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SB	class B saline
SBO	station blackout
scfm	standard cubic foot per minute
SCDHEC	South Carolina Department of Health and Environmental Control
SCR	selective catalytic reduction
SEIS	Supplemental Environmental Impact Statement
SEQRA	State Environmental Quality Review Act
SFA	spent fuel assemblies
SFP	Spent Fuel Pool
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Officer
SI	safety injection
SMSA	Standard Metropolitan Statistical Area
SO_2	sulfur dioxide
SO_x	oxides of sulfur
SPDES	State Pollutant Discharge Elimination System
SPHINX	State Preservation Historical Information Network Exchange
TDEC	Tennessee Department of Environment and Conservation (Division of Radiological Health)
TDH	total design head
TSP	total suspended particulates
TVA	Tennessee Valley Authority
UWNY	United Water New York

Acronyms and Abbreviations (continued)

U.S.	United States
USAEC	U.S. Atomic Energy Commission
USC	United States Code
USCB	U.S. Census Bureau
USCOE	United States Corp of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USWAG	Utility Solid Waste Activities Group
V	volts
WCCPPS	Weld Channel and Containment Penetration Pressurization System
WCDOH	Westchester County Department of Health
WDS	Waste Disposal System
WJWW	Westchester Joint Water Works
WOG	Westinghouse Owner's Group
Xe	xenon
yd^2	square yards
yr	year
YOY	young-of-year
YSL	yolk-sac-larvae

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

For license renewal the NRC has adopted the following definition of purpose and need, stated in Section 1.3 of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants*: "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) decision makers."

Nuclear power plants are licensed by the NRC to operate up to 40 years, and the licenses may be renewed [10 CFR 50.51] for periods up to 20 years. 10 CFR 54.17(c) states, "[a]n application for a renewed license may not be submitted to the Commission earlier than 20 years before the expiration of the operating license currently in effect."

The proposed action is to renew the operating licenses for IP2 and IP3 for a period of twenty (20) years beyond the current operating licenses' expiration dates. For IP2 (Facility Operating License DPR-26), the requested renewal would extend the existing license expiration date from midnight, September 28, 2013 until midnight, September 28, 2033. For IP3 (Facility Operating License DPR-64), the requested renewal would extend the existing license expiration date from midnight, December 12, 2015 to midnight, December 12, 2035.

1.1 Environmental Report

NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled, "Applicant's Environmental Report - Operating License Renewal Stage." This appendix to the IP2 and IP3 license renewal application fulfills that requirement.

Entergy has prepared Table 1-1 to document, in checklist form, that the 10 CFR Part 51 requirements for information to be provided in an ER in support of a license renewal application have been met. The requirements regarding information to be included in an ER are codified at 10 CFR 51.45 and 51.53(c). Table 1-1 provides the 10 CFR 51 regulatory language and regulatory citation, along with the ER section(s) that satisfy the 10 CFR 51 requirements.

1.2 Licensee and Ownership

By NRC order dated September 6, 2001, Con Edison's ownership and operation of Indian Point IP1 and IP2 was transferred to Entergy Nuclear Indian Point 2, LLC, as the owner of IP1 and IP2, and Entergy Nuclear Operations, Inc. as the operator of IP2 and maintainer of IP1.

By NRC order dated November 9, 2000, New York Power Authority's (NYPA) ownership and operation of IP3 was transferred to Entergy Nuclear Indian Point 3, LLC, as the owner of Indian Point IP3, and Entergy Nuclear Operations, Inc. as the operator of IP3.

For the purposes of this ER, Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, and Entergy Nuclear Operations, Inc., who are submitting this application to the NRC, are collectively referred to as "Entergy".

Table 1-1
Environmental Report Responses to License Renewal
Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental Reports - General Requirements [10 CFR 51.45]		
Environmental report contains a description of the proposed action.	10 CFR 51.45(b)	3.0
Environmental report contains a statement of the purposes of the proposed action.	10 CFR 51.45(b)	1.0
Environmental report contains a description of the environment affected.	10 CFR 51.45(b)	2.0
Environmental report discusses the impact of the proposed action on the environment.	10 CFR 51.45(b)(1)	4.0
Environmental report discusses any adverse environmental effects which cannot be avoided should the proposal be implemented.	10 CFR 51.45(b)(2)	6.3
Environmental report discusses alternatives to the proposed action.	10 CFR 51.45(b)(3)	7.0 and 8.0
Environmental report discusses the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.	10 CFR 51.45(b)(4)	6.5
Environmental report discusses any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.	10 CFR 51.45(b)(5)	6.4
Environmental report includes an analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects.	10 CFR 51.45(c)	4.0, 6.0, 7.0, and 8.0

Table 1-1
Environmental Report Responses to License Renewal
Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental report lists all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and describes the status of compliance with these requirements.	10 CFR 51.45(d)	9.0
Environmental Reports - General Requirements [10 CFR 51.45]		
Environmental report includes a discussion of the status of compliance with applicable environmental quality standards and requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements.	10 CFR 51.45(d)	9.0
The discussion of alternatives in the report includes a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements.	10 CFR 51.45(d)	8.0
The information submitted pursuant to 10 CFR 51.45 (b) through (d) should not be confined to information supporting the proposed action but should also include adverse information.	10 CFR 51.45(e)	4.0 and 6.3
Operating License Renewal Stage [10 CFR 51.53(c)]		
Environmental report description of the proposed action includes the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21. The report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment.	10 CFR 51.53(c)(2)	3.3 and 3.4
The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below.	10 CFR 51.53(c)(3)(ii)	4.0

Table 1-1
Environmental Report Responses to License Renewal
Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15 x 10^{12} ft^3/year (9 x 10^{10} m^3/year)		
Environmental report contains an assessment of the impact of the proposed action on the flow of the river.	10 CFR 51.53(c)(3)(ii)(A)	4.1 and 4.6
Environmental report contains an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.	10 CFR 51.53(c)(3)(ii)(A)	4.1 and 4.6
Related impacts on in-stream and riparian ecological communities are provided.	10 CFR 51.53(c)(3)(ii)(A)	4.1 and 4.6
Plant utilizes once-through cooling or cooling pond heat dissipation systems		
A copy of current Clean Water Act 316(b) determinations and, if necessary, a 316(a) variance in accordance with 40 CFR Part 125, or equivalent State permits and supporting documentation are provided, **OR**	10 CFR 51.53(c)(3)(ii)(B)	4.2, 4.3, and 4.4
Environmental report contains an assessment of the impact of the proposed action on fish and shellfish resources resulting from heat shock and impingement and entrainment.	10 CFR 51.53(c)(3)(ii)(B)	4.2, 4.3, and 4.4
Plant uses Ranney wells or pumps more than 100 gallons (total onsite) of groundwater per minute		
Environmental report contains an assessment of the impact of the proposed action on groundwater use.	10 CFR 51.53(c)(3)(ii)(C)	4.5 and 4.7
Plant is located at an inland site and utilizes cooling ponds		
Environmental report contains an assessment of the impact of the proposed action on groundwater quality.	10 CFR 51.53(c)(3)(ii)(D)	4.8
All Plants		
Environmental report contains an assessment of the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats.	10 CFR 51.53(c)(3)(ii)(E)	4.9 and 4.10

Table 1-1
Environmental Report Responses to License Renewal
Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental report contains an assessment of the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act.	10 CFR 51.53(c)(3)(ii)(E)	4.9 and 4.10
Plant is located in or near a Clean Air Act non-attainment or maintenance area		
Environmental report contains an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce in accordance with the Clean Air Act as amended.	10 CFR 51.53(c)(3)(ii)(F)	4.11
Plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow rate of less than 3.15 x 10^{12} ft^3/year (9 x 10^{10} m^3/year)		
Environmental report contains an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water.	10 CFR 51.53(c)(3)(ii)(G)	4.12
Plants with transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system		
Materials demonstrating that transmission lines meet the recommendations of the National Electric Safety Code for preventing electric shock from induced currents are provided, **OR**	10 CFR 51.53(c)(3)(ii)(H)	4.13
Environmental report contains an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines.	10 CFR 51.53(c)(3)(ii)(H)	4.13
All Plants		
Environmental report contains an assessment of the impact of the proposed action on housing availability.	10 CFR 51.53(c)(3)(ii)(I)	4.14
Environmental report contains an assessment of the impact of the proposed action on land-use.	10 CFR 51.53(c)(3)(ii)(I)	4.17 and 4.18
All Plants		
Environmental report contains an assessment of the impact of the proposed action on public schools (impacts from refurbishment activities only) within the vicinity of the plant.	10 CFR 51.53(c)(3)(ii)(I)	4.16

Table 1-1
Environmental Report Responses to License Renewal
Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental report contains an assessment of the impact of population increases attributable to the proposed project on the public water supply.	10 CFR 51.53(c)(3)(ii)(I)	4.15
Environmental report contains an assessment of the impact of the proposed project on local transportation during periods of license renewal refurbishment activities and during the term of the renewed license.	10 CFR 51.53(c)(3)(ii)(J)	4.19
Environmental report contains an assessment as to whether any historic or archaeological properties will be affected by the proposed project.	10 CFR 51.53(c)(3)(ii)(K)	4.20
Plants for which the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment		
Environmental report contains a consideration of alternatives to mitigate severe accidents.	10 CFR 51.53(c)(3)(ii)(L)	4.21
All Plants		
Environmental report must contain a consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues.	10 CFR 51.53(c)(3)(iii)	4.0 and 6.2
Environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.	10 CFR 51.53(c)(3)(iv)	5.0

2.0 SITE AND ENVIRONMENTAL INTERFACES

2.1 Location and Features

IP2 and IP3 are located on the eastern bank of the Hudson River at Indian Point, in the Village of Buchanan, in upper Westchester County, New York. The site is owned by Entergy and contains facilities located on approximately 239 acres, bounded on the north, south, and east by privately-owned land and on the west by the Hudson River. IP2 and IP3 (see Figure 3-1) are located north and south, respectively, of IP1, which is in safe storage until subsequent decommissioning (SAFSTOR). The site is located about 24 miles north of the New York City boundary line. The nearest urban area within 6 miles of the site is the City of Peekskill, New York, which is located approximately 2.5 miles northeast of IP2 and IP3. The location of the site is shown in Figure 2-1 and Figure 2-2.

The general orientation of the site is northeast to southwest. One mile northwest of the site, Dunderberg Mountain lies on the western side of the Hudson River across from the City of Peekskill, New York. North of Dunderberg Mountain and the site, high grounds reaching an elevation of 800 feet form the eastern bank of the Hudson River. At this location the Hudson River makes a sharp turn to the northwest. To the east of the site, peaks are generally lower than those to the north and west. The Spitzenberg and Blue Mountains average about 600 feet in height and there is a weak, poorly-defined series of ridges that run in a north-northeast direction. To the west of the site, there are the Timp Mountains at an elevation of 846 feet. To the south of the site, elevations of 100 feet or less gradually slope toward the Village of Verplanck. South of the site the river makes another sharp bend to the southeast and then widens as it flows past the Village of Croton and the Town of Haverstraw. Figure 2-6 shows topographic features of the site and the surrounding areas.

In 2000, the Village of Buchanan had a population of approximately 2,189, and the City of Peekskill, located 2.5 miles northeast, had a population of approximately 22,441. The largest town within 6 miles is Haverstraw, New York, located to the southwest on the western bank of the Hudson River, with a 2000 population of approximately 33,811 [USCB 2000b]. New York City, located approximately 24 miles south of the plant, is the largest city within 50 miles with a 2000 population of approximately 8,008,278. Areas adjacent to the station are primarily residential, large parks, and military installations. The Village of Croton-on-Hudson, New York, lies on the eastern bank of the Hudson River south of the Village of Buchanan. Approximately 90% of the area within 6 miles of the station is residential with the remainder occupied by commercial properties. There are no Native American lands within a 50-mile radius of IP2 and IP3 [USCB 2000a]. There are a number of local and county parks, golf courses, forest lands and wildlife refuges, and other public recreation lands within a 50-mile radius of IP2 and IP3. Major state and federal lands within a 6-mile and 50-mile radius of IP2 and IP3 are shown in Figure 2-4 and Figure 2-5. Table 2-1 provides a list of all New York State parks in Westchester, Rockland, Putnam, Orange, and Dutchess Counties, the five primary counties closest to IP2 and IP3. Figure 2-27 shows all state and county parks in Westchester County. In addition, West Point Military Academy is located 7.5 miles northwest of the site, Camp Smith, New York State National

Guard, is located 2.3 miles north of the site, and the Picatinny Arsenal is located 35.5 miles southwest of the site in New Jersey.

The immediate area around the station is completely enclosed by a fence with access to the station controlled at a security gate. The plant site can be accessed by road or from the Hudson River. Land access to the plant site is from Broadway (main entrance). The existing wharf is used to receive heavy equipment as needed, although access to the site from the river is controlled by site access procedures. The plant site is not served by railroad. The exclusion area, as defined by 10 CFR 100.3, surrounds the site as shown in Figure 2-3. The nearest residences lie 0.25 miles beyond the site boundary to the southeast [ENN, Table 2-9].

The station as a whole can be seen from the river, but it is shielded from the land side by surrounding high ground and vegetation due to its position along the river in the Hudson River Valley. With the exception of Broadway, the site is shielded from view from the Village of Buchanan and the vicinity. The superheater stack for IP1 (334 ft tall), the IP2 and IP3 turbine buildings (each 134 ft tall), and reactor containment structures (each 250 ft tall) dominate the landscape of the site and can be seen from the Hudson River side of the site. The structures housing the turbine generator buildings and service facility have been designed with brick exterior to create an attractive appearance, the maximum extent possible, from the river side.

Noise from the site is detectable offsite. However, the Village of Buchanan has a sound ordinance (Chapter 211-23 of the Village Zoning Code) that limits allowable sound levels from a facility by octave band levels and is applicable at the property line of the sound generating facility. The combined octave band center frequencies equate to an overall level of 48 dB(A). An ambient noise level monitoring program was conducted in the vicinity of IP2 and IP3 between September 2001 and January 2002 which showed that the site meets the Village of Buchanan's sound ordinance. [Enercon, Section 4.2]

IP2 and IP3 features include the containment buildings, auxiliary buildings, turbine buildings, intake structures, discharge structure, switchyard, and associated transmission lines. Figure 3-1 shows the general features of the IP2 and IP3 site. Section 3.2 describes key features of IP2 and IP3, including reactor and containment systems, cooling and auxiliary water systems, radwaste systems, and transmission facilities.

Table 2-1
State Parks in Westchester, Rockland, Putnam, Orange, and Dutchess Counties

State Parks[a]	Direction and Distance from IP2 and IP3[b]	Location
Westchester County		
Franklin D. Roosevelt State Park	NE, 8.9 miles	Yorktown Heights, NY
Old Croton Aqueduct State Historic Park	SE, 18.3 miles	Dobbs Ferry, NY

Table 2-1
State Parks in Westchester, Rockland, Putnam, Orange, and Dutchess Counties (Continued)

State Parks[a]	Direction and Distance from IP2 and IP3[b]	Location
Rockefeller State Park	SE, 12.62 miles	Tarrytown, NY
Rockland County		
Blauvelt State Park	S, 13.04 miles	Bear Mountain, NY
Haverstraw Beach State Park	SW, 4.18 miles	Haverstraw, NY
High Tor State Park	SW, 5.59 miles	New City, NY
Hook Mountain State Park	SW, 7.0 miles	Upper Nyack, NY
Nyack Beach State Park	SE, 10 miles	Upper Nyack, NY
Palisades State Park	SE, 19 miles	SE Rockland County, Border with NJ
Rockland Lake State Park	SE, 8.5 miles	Congers, NY
Rockwood Hall State Park	Extension of Rockefeller State Park	North Tarrytown, NY
Tall Man Mountain State Park	S, 16.5 miles	Bear Mountain, NY
Orange County		
Bear Mountain State Park (portion in Rockland County)	(closest point < 1 mile NW) NW, 3 miles	Bear Mountain, NY
Goose Pond Mountain State Park	NW, 16 miles	Bear Mountain, NY
Harriman State Park	(closest point < 1 mile NW) NW, 7 miles	Bear Mountain, NY
Highland Lakes State Park	NW, 24.5 miles	Bear Mountain, NY
Sterling Forest State Park	NW, 24 miles	Tuxedo, NY
Storm King State Park	NNW, 11 miles	Bear Mountain, NY
Putnam County		
Clarence Fahnestock Memorial State Park	NE, 12 miles	Carmel, NY
Hudson Highlands State Park	N, 12 miles	Beacon, NY
Dutchess County		

Table 2-1
State Parks in Westchester, Rockland, Putnam, Orange, and Dutchess Counties (Continued)

State Parks[a]	Direction and Distance from IP2 and IP3[b]	Location
Clermont State Historic Park	N, 56 miles	Germantown, NY
James Baird State Park	NNE, 30 miles	Pleasant Valley, NY
Margaret Lewis Norrie State Park	N, 39 miles	Staatsburg, NY
Mills Memorial State Park	N, 40 miles	Staatsburg, NY
Taconic State Park	NNE, 54 miles	Millerton, NY

a. Source: NYOSPRHP
b. Distances are approximate

2.2 Aquatic and Riparian Ecological Communities

2.2.1 Physical and Chemical Environment

The lower Hudson River is a 152-mile-long tidal estuary extending from the Battery at the southern tip of Manhattan Island in New York City to Troy Dam (immediately below the confluence of the Hudson River and its major tributary, the Mohawk River). The diversity and abundance of the plant and animal communities in the vicinity of the Indian Point site and within the Hudson River estuary as a whole are greatly affected by the physical and chemical environment, including a variety of human influences.

The Indian Point site is located on the eastern shore of the Hudson River at River Mile (RM) 43, approximately 43 miles from the river mouth at the Battery. The Hudson River in the vicinity of the Indian Point site is approximately 4,500 feet wide and 40 feet deep on average. Approximately 600 feet north and 300 feet offshore of the site, the river depth is nearly 80 feet. About 600 feet south of the discharge canal, and a comparable distance offshore, the depth of the river is less than 50 feet. [CHGEC, Section IV.B.2.2.a]

The net downstream flows due to freshwater inflow have been reported to be in excess of 11,700,000 gallons per minute (gpm) 20% of the time, 6,800,000 gpm 40% of the time, 4,710,000 gpm 60% of the time, 3,100,000 gpm 80% of the time, and 1,800,000 gpm 98% of the time [IP3 UFSAR, Section 2.5]. Flooding at the Indian Point site is historically non-existent, and flood stages are primarily influenced by tidal flows and secondarily by runoff. Tidal amplitude at the Indian Point site (RM 43) averages about 4 feet, and the highest recorded water elevation in the vicinity of the site was 7.4 feet above mean sea level (MSL) during a severe hurricane in November 1950 [IP3 UFSAR, Section 2.5; IP2 UFSAR, Section 2.5].

The flow of the Hudson River estuary is controlled more by tides than freshwater inflow from the surrounding watershed. Due to the estuary's low gradient (5 feet in 152 miles), it is tidal all the way upriver to Troy Dam (RM 152), where the tidal amplitude there averages 4.7 feet. Tidal flow past the Indian Point site is approximately 80 million gpm about 80% of the time, and the estimated flow 500 feet off the shoreline is about nine million gpm in a 500-600 foot wide section. [IP3 UFSAR, Section 2.5]

These large flows provide complete mixing of the site's discharge water. In addition, the discharge for IP2 and IP3 is designed to use the dilution characteristics of a large tidal flow and does not contravene regulatory limitations [IP2 UFSAR, Section 2.5].

The 1999 Draft Environmental Impact Statement (DEIS) generally classified two major habitats within the Hudson River estuary that were studied from 1974 through 1997: the brackish water portion extending from RM 1 (Battery) through RM 55 (Storm King Mountain, just north of West Point at RM 52), and the freshwater portion extending from RM 56 to the Troy Dam (RM 152) [CHGEC, Section V.D.1.b]. The Hudson River from Jones Point (RM 44) upstream to Storm King Mountain (RM 55) is a narrow, deep and turbulent area known as "The Highlands". The Highlands is a natural geological "bottleneck" separating the wide and slow flowing segments of the Hudson River to the north (Newburgh Bay) and south (Haverstraw Bay) into predominantly freshwater and brackish regions, respectively. Portions of these bays to the north and south of the Hudson highlands serve as nursery areas for freshwater and brackish species. The freshwater-saline water transition zone fluctuates seasonally and from year to year based on the volume of drainage basin freshwater flow from surface and groundwater discharge, with the transition zone reaching farther upriver during the summer months when freshwater inflows are the lowest. The Indian Point site is located within the area of the river generally considered brackish, at RM 43; although in the spring the water in the Hudson River at the site may be fresh water due to heavy spring runoff. [USFWS 1997]

The Hudson River can be more finely divided into four salinity habitat zones based on average annual salinities and the associated flora and fauna: the polyhaline (high salinity) zone from Manhattan (RM 1) north to the City of Yonkers (RM 19); the mesohaline (moderate salinity) zone from Yonkers north to the Town of Stony Point (RM 40); the oligohaline (low salinity) zone from to the Town of Stony Point north to the Village of Wappingers Falls (RM 68); and the tidal freshwater zone from Wappingers Falls north to Troy Dam (RM 152). The boundaries of these salinity zones vary greatly with the season, with the salt front pushed approximately as far south as the Tappan Zee Bridge (RM 26) during spring periods of high freshwater inflows and brackish water extending approximately as far north as the City of Poughkeepsie (RM 75) during the summer period of typically low freshwater inflow. The Hudson River estuary has a very low gradient, dropping only 5 feet in elevation over the 152 miles between Troy Dam and the mouth of the river at New York City (Battery). The Hudson River estuary is a tidally dominated system with an average of only 10% of the total flow made up by freshwater inflows. [USFWS 1997]

Salinity influences the distribution and function of both plants and animals within the Hudson River estuary. The distribution of tidal marsh communities and plants in the Hudson River is influenced by surface water salinity. Freshwater tidal marsh communities generally occur north

of the cities of Newburgh and Beacon (RM 62) and brackish tidal marsh communities generally occur south of Newburgh and Beacon. Benthic communities also vary in distribution depending on bottom water salinity. A typically marine benthos dominated by marine worms and crustacea occurs beginning in Haverstraw Bay at the Town of Stony Point (RM 40) and extending south to the Battery, a mixture of freshwater and marine organisms occurs from Stony Point approximately as far north as Poughkeepsie (RM 75), and snails, clams, chironomid midges, and other insects typical of a freshwater community are present in the Hudson River Estuary north of Poughkeepsie all the way to the Troy Dam (RM 152). Coastal and estuarine fish species tolerate a wide range of salinities and may move throughout the entire Hudson River Estuary. Anadromous (migratory) fish species require different salinities at the different phases of their life cycles and seek the appropriate habitats within the Hudson River Estuary necessary for completing their life history requirements. [USFWS 1997]

The mid-estuary from the Town of Stony Point (RM 40) to the City of Poughkeepsie (RM 76) is generally the oligohaline (0.5 to 5 parts per thousand salinity) zone in the Hudson River, marking the seasonal inland extent of brackish water in the Hudson River, although the limits of this zone change with the amount of freshwater inflow. Indian Point (RM 43) is in this mid-estuary section, and so is Lovett Generating Station, which has a cooling water intake and thermal discharge on the west (opposite) shore approximately 1 mile south of the Indian Point (east) site. The mid-estuary begins north of Haverstraw and Tappan Zee Bays at the Town of Stony Point (RM 40). North of the City of Peekskill at RM 44, the river passes into the Hudson Highlands where it narrows to an average width of about 1,800 feet. The Hudson Highlands area of the river is a deep (49 to 197 feet) and turbulent mixing zone with little shoal area and steep rocky shorelines. The adjacent uplands are steep and forested, rising to heights of 1,200 feet to 1,400 feet above the Hudson River at Storm King Mountain (RM 55) with limited development. Moving upstream beyond the Hudson Highlands into the Town of Cornwall at RM 56, the Hudson River widens to an average width of 5,800 feet in an area called Newburgh Bay. The average mid-channel depth of Newburgh Bay is about 40 feet. There are wider shoal areas along the shoreline, especially on the eastern shore, supporting growth of submerged aquatic vegetation. The adjacent uplands are more gently sloping, with a mix of forested, agricultural, and developed land (residential, commercial, and industrial). North of the Village of Wappingers Falls (RM 67), the river narrows again and increases in depth to as much as 125 feet. Throughout the entire mid-estuary, there are railroads on both east and west shorelines, cutting off embayments and forming isolated wetlands with little water exchange with the river except through culverts. Several cities are located on this portion of the river, including Peekskill (RM 43), Newburgh (RM 60), and Poughkeepsie (RM 76). [USFWS 1997]

Water temperature in the Hudson River varies according to natural, north-temperate seasonal cycles, with the greatest rate of change occurring as the water warms from solar insolation during the spring and radiantly cools during the fall. The City of Poughkeepsie (RM 75) maintains a municipal potable water withdrawal near the river bottom and provides the best available long-term daily record of Hudson River water temperatures throughout the year. During the period 1951-1997, average annual temperatures measured daily at Poughkeepsie Water Works (RM 75) ranged from 52°F to 56.5°F, with an average temperature of approximately 54.3°F for the 47 year period. Minimum water temperatures in January and February average approximately 34°F

and maximum water temperatures in August average approximately 77°F. From April through June, temperatures increase at an average rate of 0.2°F per day, with temperatures falling at the same rate from mid-September through mid-December. [CHGEC, Section V.B.4]

The Hudson River is used by various industries including chemical companies; bulk petroleum storage facilities; paper and textile manufacturers; sand, gravel, and rock processors; power plants; and cement companies. The Hudson River is also widely used for recreational purposes, with sport fishing and boating being popular recreational activities in the lower Hudson valley. North (upstream) of the Hudson Highlands, the Hudson River is used by at least five municipalities as a source of potable water, including a major flood-skimming withdrawal at Chelsea (RM 67) supplying potable water into the New York City water supply system of reservoirs and aquaducts [CHGEC, Section V.A.9].

Eleven facilities each withdraw and/or discharge at least 50 million gallons of water a day (mgd) into the Hudson River estuary, including seven power generating stations utilizing the Hudson River to supply once-through cooling water, two wastewater treatment plants discharging secondarily treated effluent, an office complex, and a resource recovery plant [CHGEC, Section V.A.9.b]. The seven power generating stations are 59th Street Station at RM 7 (70 mgd), Bowline Point at RM 37 (912 mgd), Lovett at RM 42 (496 mgd), Indian Point at RM 43 (2,800 mgd), Danskammer Point at RM 66 (457 mgd), Roseton at RM 67 (926 mgd), and Bethlehem at RM 140 (515 mgd) [CHGEC, Section V.A.9.b]. The wastewater treatment facilities are Yonkers at RM 17 (92 mgd) and North River at RM 10 (170 mgd) [CHGEC, Section V.A.9.b]. The Empire State Plaza office complex at RM 146 (108 mgd) and Westchester Resource Recovery at RM 43 (55 mgd) are the other two facilities with permitted discharges of at least 50 mgd [CHGEC, Section V.A.9.b]. Additional intake of Hudson River water may occur at Chelsea Pumping Station (RM 67), located on the eastern bank of the river across from Roseton Generating Station. The pumping station was constructed in response to municipal water supply shortages and has only been used three times, delivering up to 100 mgd of Hudson River water into the Delaware Aqueduct during droughts for periods of 300 days during the 1966-1967 drought, 154 days in 1985, and two weeks in 1989 [CHGEC, Section V.A.9.c.i].

The lower Hudson River at the Indian Point site (RM 43) meets the criteria and designated uses of class SB (Class B saline) surface waters in New York [NYSDEC 2004b, Appendix A]. New York State's 2004 Section 305(b) Water Quality Report designates the uses for class SB saline surface waters as "Primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival." The Hudson River in the vicinity of the site has long been classified as impaired, which according to the New York State Department of Environmental Conservation (NYSDEC), is a "water body with well documented water quality problems that result in precluded or impaired uses" [NYSDEC 2004b, Appendix B]. Commercial shellfishing (Class 2A) is excluded in Class SB surface waters, which occur in the vicinity of the site in the Hudson River. The Hudson Highlands just north of the Indian Point site (RM 44 through RM 56) is classified as a Significant Coastal Fish and Wildlife Habitat [CHGEC, Section IV.B.2.2.a].

Improvements in wastewater treatment in recent years have decreased the amount of raw sewage discharged into the river from treatment facilities and from combined sewage overflows,

reducing the amount of particulate organic matter and nitrogen available to the food chain. This is true throughout the estuary, but was particularly notable in the New York City area (RM 1 through RM 14) during the 1980s and especially in the early 1990s when three treatment plants went to full secondary treatment [CHGEC, Section V.D.1.a].

One of the most notorious water quality problems in the Lower Hudson River is the effect of toxic/ contaminated sediment in the estuary of the Hudson River main stem. This contamination is primarily the result of historic polychlorinated biphenyl (PCB) discharges from the General Electric Company in the Upper Hudson River region near Glens Falls, N.Y, located about 20 miles upstream from the Troy Dam. Although the impairment of the Hudson River is primarily from sediments contaminated by PCBs, mercury, and cadmium, the river may also be impaired in some segments due to chlordane and other organics [NYSDEC 2004b, 303(d) list]. A 1998 United States Geological Survey (USGS) report on Hudson River Water Quality noted that organochlorine compounds, such as the pesticides chlordane and DDT (dichlorodiphenyltrichloroethane) and their degradation compounds have a long history of use in the Hudson River Basin. Although use of these compounds was banned in the 1970s, they persist in the stream-bottom sediments and biota of the basin. Contaminated sediments have a tendency to shift downstream during spates and other disturbances in upstream areas. Extensive fish consumption advisories were issued and restrictions were placed on recreational and commercial fishing in the Hudson River downstream of Hudson Falls in response to PCB contamination. This included a prohibition on the commercial harvesting of striped bass and restrictions on the consumption of blue crabs from the lower Hudson River. The entire main stem of the lower Hudson River-representing 100% of the estuary waters in the basin-is listed as having use (fish consumption) impairments due to toxic/contaminated sediment [NYSDEC 2004b, Appendix A]. Most agricultural and urban streams studied supported a smaller number of intolerant fish and macroinvertebrate species than would be expected in streams with undisturbed chemistry and habitat. Intolerant species were entirely absent or rare at these sites. Fish communities at highly urbanized sites were numerically dominated by a single fish species. [USGS 1998]

The Mohawk River is the primary tributary to the Hudson River, entering the river from the west at a location about 3 miles north of the Troy Dam (RM 152). The average annual freshwater discharge of the Mohawk River into the Hudson River at Albany (Cohoes) is about 5,740 cfs. All of the 63 tributaries entering the Hudson River Estuary south of the Troy Dam are small (<600 cfs) and collectively contribute less than 25% of the annual freshwater flow. Dams on most of these small mainstem tributaries have resulted in the removal of a great number of miles of suitable diadromous fish spawning habitat from the system. [USFWS 1997] Shapley and Morris noted the potentially serious impact of dams on tributaries of the Hudson, stating "The roughly 357 dams and other barriers on the 63 tributaries of the Hudson River estuary block what is called the stream continuum." Sections of these impounded streams become lake-like, retaining nutrients, trapping sediment, and provide increased surface area for atmospheric warming. Impounded water skimmed off of the surface during the summer may exceed the thermal tolerance of cold-water species such as trout in the free-flowing sections of the tributaries. Dissolved oxygen, at concentrations of 5 mg/l or above, is essential for fish and other aquatic life and has an inverse relationship with water temperature. Therefore, dissolved oxygen

concentrations decrease in warm impounded surface waters of tributaries, and water with lower dissolved oxygen concentrations subsequently flows downstream over the dam. [Shapley]

Transportation has had a major effect on the Hudson River. Railroad bed construction as early as the 1840s paralleled both east and west banks of the river, crossing all tributaries and isolating many of the tidal marsh complexes. Water exchange between these isolated wetlands and the main channel of the Hudson River Estuary is limited to small culverts installed primarily for drainage with little consideration for aquatic habitat. Maintenance and rebuilding of railroads, roads, and bridges along the Hudson River can adversely impact wetlands, rare plants, fish, and wildlife. Herbicide use along roads and railroads could destroy adjacent rare plant populations. Non-point source pollution in the form of runoff is also seen as a concern [USFWS 1997]. There is also some bank erosion due to recreational and commercial boat traffic between the Port of New York and the Port of Albany.

Dredging necessary to maintain a shipping channel in the Hudson River Estuary is a continuing concern because dredge material disposal options are limited. There is also an emerging need for disposal of spoils from dredging activities necessary to maintain the numerous ports and recreational marinas along the river between New York City and the Troy Dam. Many former or proposed dredge disposal sites, especially deepwater sites offshore and outside of the Hudson River basin, are not biologically suitable for dredge disposal. Deposition of dredged material on or adjacent to rare natural communities and plant populations can be a threat. [USFWS 1997] Materials resulting from the infrequent dredging operations at IP2 and IP3 are disposed of in upland disposal facilities and therefore pose no threat to Hudson River plant or animal communities.

To evaluate whether power generation has had an impact on the aquatic resources of the Hudson River Estuary (in addition to variation and changes due to the many natural and human influences discussed above) IP2 and IP3 and the other Hudson River power generating utilities have conducted annual aquatic studies in the Hudson River since 1974. These studies are collectively referred to as the Hudson River Utilities Monitoring Program and are further described below in Section 2.2.5. The results of these annual monitoring studies completed from 1974 through 1997 were reported in a 1999 DEIS completed on behalf of the Hudson River power generation utilities, and in a 2003 NYSDEC Final Environmental Impact Statement (FEIS) completed to evaluate the impacts to the Hudson River from State Pollutant Discharge Elimination System (SPDES) permit renewal [NYSDEC 2003]. Based on the reports summarized in the DEIS, studies completed since 1974 on behalf of the utilities (including IP2 and IP3) included sampling and evaluation of all trophic levels of the aquatic communities found in the Hudson River estuary. Key species, populations, and communities were defined and the dynamic nature of their interactions was described. During the 1980s, studies focused more closely on the individual fish species, particularly those adult and larval fish that use the estuary as spawning and nursery habitat and may be considered Representative Important Species for the purpose of evaluating entrainment and impingement impacts. As a supplement to the Hudson River Utilities Monitoring Program, extensive environmental studies were also conducted by the NYSDEC in the Hudson River estuary.

2.2.2 Plankton Communities

Bacterial communities in the Hudson River at Indian Point are important constituents of the biological community. These organisms are important in that they are responsible for the decomposition of organic matter, thereby providing the raw materials for growth of phytoplankton and other consumers higher in the food chain. Thus bacterial decomposition helps retain important materials in the aquatic ecosystem. Bacteria play an additional role by assimilating dissolved organic matter in the water. The bacteria themselves are food for particle-feeding zooplankton and thereby contribute organic carbon near the base of the food chain leading directly to production at higher trophic levels. Bacterial densities in the Hudson River near Indian Point have been observed to vary with the season. In the winter, the bacterial density may be as low as 1×10^6 per liter or less, while summertime densities may exceed 5×10^7 per liter. [USAEC, Section II.F.a]

Plankton is composed of both microscopic free-living plants (phytoplankton) and animals (zooplankton). Planktonic algae use energy from the sun and elemental nutrients in the water to produce carbon dioxide into the organic material of their cells. These organisms provide the basis for the food web of aquatic systems and are the principal food of most of the zooplankton and some fish species as well. [USAEC, Section II.F.b]

Studies of the phytoplankton community in the Hudson River in the vicinity of IP2 and IP3 showed three different spatial and temporal patterns of occurrence. Diatoms were the most abundant members of the phytoplankton community during periods of low water temperature (winter) and during turbulent water flows in the spring and fall. Green algae were the dominant members of the phytoplankton community during the periods of high water temperatures and low freshwater flows in the summer. Blue-green algae were the most abundant component of the phytoplankton community during late summer and early fall [CHGEC, Section V.D.1.c.i].

According to the IP2 Final Environmental Statement (FES) published in 1972, the dominant phytoplankton species at Indian Point throughout most of the year belong to the chain-forming diatom genus *Melosira* sp., with the radial colony-forming diatom *Asterionella* sp. as a secondary dominant form. The abundance of these two diatom genera varied from 5×10^5 to 6×10^6 per cubic meter of Hudson River water. As salinity increases in the summer in the vicinity of Indian Point due to lower freshwater flows, the phytoplankton species composition changes in favor of more salt-tolerant forms, such as the large, pennate, single-celled genus *Rhizosolenia* sp., the chain-forming genera *Chaetocerus* sp., and *Thalassiosira* sp. About 25 genera of algae (principally pennate diatoms) are present in the Indian Point area of the Hudson River at all times. Some variation in phytoplankton species composition across the river has been observed. However, when averaged for several months, there was little variability in the percentage composition of the major groups of phytoplankton across the river. Diatoms accounted for about 70 percent of the phytoplankton, green algae for about 23 percent, blue-green algae for about 5 percent, and all other divisions of phytoplankton contributed less than 1 percent. [USAEC, Section II.F.b]

The 1972 IP2 FES noted that the zooplankton is a diverse group of animals which provide an important trophic link in the food chain by consuming small forms of particulate organic carbon such as phytoplankton, bacteria, and organic detritus and assimilating these carbon sources into their larger body size (0.035 mm to 2.0 mm), which is more readily consumed by larger organisms. These larger organisms include larger zooplankters, benthic invertebrates, larval fish, and particle-feeding adults of several fish species that feed on zooplankton throughout their life cycle, such as bay anchovy. Studies of the zooplankton in the Hudson River from Haverstraw Bay to the City of Albany between April and December 1987-1989 revealed five dominant taxa, which included a copepod, a cladoceran, and three rotifers. The most abundant invertebrate prey of fish, based upon examination of 190 fish stomachs, was the amphipod *Gammarus*. Dipteran larvae and pupae, adult insects, and smaller crustaceans such as cladocerans, copepods, and ostracods were also important components of the stomach contents. Sizes of the invertebrates in the stomachs varied with the sizes and ages of the fish caught. [USAEC, Section II.F.c]

2.2.3 Macroinvertebrate Communities

An important component of the aquatic environment of estuarine ecosystems is the population of macroinvertebrates, which are small animals (retained on a 0.6 mm mesh sieve) without backbones that typically live near, on, or within the river substrate. Examples of macroinvertebrates are small clams and mussels (bivalves), snails, worms, crustaceans, and aquatic insects. In estuarine environments like the Hudson River Estuary, the macroinvertebrates serve as an important trophic component of the food web, converting non-living organic matter (detritus) and other macroinvertebrates into their tissues which are subsequently consumed by higher trophic levels such as fish. [USAEC, Section II.F.2.c(2)]

Little was known about the quantitative aspects of the macroinvertebrates in the Hudson River at the time of the original license application for IP2 and IP3. The IP2 FES reported that generally, this fauna appeared sparse both in the Indian Point area and throughout the lower part of the estuary. In deeper portions of the Hudson River north of Indian Point and through the Hudson Highlands, grab samples commonly contained no specimens of macrobenthos. Macroinvertebrates common in the Indian Point area prior to the startup of IP2 included *Balanus* sp. (barnacles), *Congeria* sp. (clams), polychaete worms, and *Gammarus* sp. (amphipods) [USAEC, Section II.F.2.c(2)].

The 1999 DEIS, however, reported more recent studies showing that the Hudson River estuary contains a high abundance of macroinvertebrates, consistent with the high turbidity and inputs of organic material into this ecosystem. The abundance of macroinvertebrates in the Hudson River estuary is greater than that reported for many inland freshwater lakes and rivers. The distribution of benthic macroinvertebrates throughout the Hudson River Estuary is primarily determined by their salinity tolerance along the gradient from brackish to freshwater proceeding from downstream to upstream. Polychaete worms are most abundant in brackish water areas, whereas oligochaete worms are most abundant in freshwater areas. In the Hudson River Estuary, epibenthic (living on the bottom) macroinvertebrates in brackish water areas are

typically dominated by mysid shrimp, especially the opossum shrimp (*Neomysis americana*). [CHGEC, Section V.D.1.c.iv]

Sampling conducted in the freshwater portion of the estuary north of the Hudson Highlands indicated that benthic macroinvertebrate densities were near the high end of the normal range compared to other large rivers. Collections in this stretch of the river (upriver from the Indian Point site) were dominated by *Limnodrilus hoffmeisteri*, a common tubificid worm. Epibenthic macroinvertebrates collected in the freshwater portion of the estuary (north of Newburgh, RM 60) were primarily small crustaceans, especially members of the amphipod genus *Gammarus*. Aquatic insect larvae were also collected in these upriver freshwater areas of the Hudson River Estuary. [CHGEC, Section V.D.1.c.iv]

The blue crab (*Callinectes sapidus*) is an abundant decapod crustacean in marine and brackish waters of the United States from Massachusetts to southern Texas, supporting important commercial fisheries in parts of its range. In the Hudson River, juvenile blue crabs are most abundant from August through October, depending on the location. Downriver studies reported peak abundance occurred in August; at upstream sites, Iona Marsh (approximately RM 48) and Moodna Creek (RM 57), peak abundance did not occur until September. Although no historical records of blue crab abundance in the Hudson River were available, impingement rates at Roseton, Bowline Point, and IP2 and IP3 prior to 1988 indicated that the numbers of blue crabs in the Hudson River were relatively low. Impingement rates from 1988 through 1997 varied substantially, but they were at least an order of magnitude higher than in previous years. Relatively mild winters in recent years may have resulted in higher survival of overwintering individuals. Alternatively, the improvement in water quality in the lower estuary may be related to the increase in blue crab abundance. Differences in abundance between male and female blue crabs in impingement collections reflect their migratory habits: after both sexes migrate upriver to lower salinity portions of the estuary to spawn, the males tend to remain in lower salinity waters while females migrate back to deeper, more saline water. [CHGEC, Section V.D.2.p]

During the 1990s a major change in the macroinvertebrate community occurred in the Hudson River Estuary. In 1991, the non-native zebra mussel (*Dreissena polymorpha*) was first identified in the freshwater portions of the Hudson River [IES; Strayer 1996; Strayer 1999]. Within 17 months of first being detected, the biomass of zebra mussels had exceeded that of all other heterotrophs (organisms that require a supply of organic matter or food from the environment, including bacteria, zooplankton, other macroinvertebrates, and fish) in the freshwater areas [Strayer 1996]. The huge and rapid population growth of the zebra mussel has corresponded with a substantial decrease in the abundance of phytoplankton and zooplankton in freshwater areas of the Hudson River because zebra mussels are filter feeders and strain/remove these organisms from the water while feeding [CHGEC, Section V.D.1.c.iv]. Biomass reduction has been estimated at 80 percent for phytoplankton and 70 percent for zooplankton following the invasion [Caraco 1997; Pace 1998]. The native pearly mussels of the Hudson River, which formerly numbered more than one billion, appear to be on the verge of disappearing from the river as a result of the zebra mussel invasion [IES]. Recent studies have shown that the zebra mussel invasion is associated with a decline in open-water shad and herring (pelagic particle feeders), while the littoral fish such as sunfish (benthic feeders) have prospered [IES].

Entergy performs a macrofouling monitoring program, via a contracted vendor, at the site, to identify the presence of the freshwater bivalve zebra mussels (*Dreissina polymorpha*), as well as their salt water version - dark false mussels (*Mytilopsis leucophaeata*). The monitoring program involves settling plates hung in the river at the IP3 intakes, as well as a number of sample boxes within the service water systems. On a monthly basis, sample plates are removed and replaced, with the removed plates taken to an offsite laboratory for evaluation. If any bivalves are found to be present, Entergy is notified by the laboratory within 24 hours and corrective actions are taken as necessary. This monitoring program allows Entergy to identify the presence of bivalves in the area that could potentially present a fouling problem in plant systems, as well as monitor the effectiveness of the program to prevent fouling. Both zebra and dark false mussels are found at the intakes usually from July throughout the rest of the year. The proportion of zebra to dark false mussels changes depending upon the salinity of the Hudson River in the area of the plants.

2.2.4 Vascular Aquatic Plants

Macrophytes (rooted aquatic plants) are important in the river's ecosystem as a source of organic matter and for their habitat value in providing shelter from predators to many fish species, especially as nurseries for the juvenile stage. Rooted aquatic plants in the Hudson River are found primarily within 100 yards of the shoreline and in the backwater marshes and wetlands cut off from the main river channel by the railroad beds. The variety of rooted vegetation is greater in the low saline areas of the river. The IP2 FES identified in Table A-II-1 the aquatic plants that were collected in the vicinity of IP2 and IP3 in the Hudson River. Vascular plants included *Chara* sp., *Eleocharis* sp. (spike rush), *Elodea* sp., *Myriophyllum* sp., Najas flexilis, *Nitella* sp., *Pontederia cordata* (pickerel weed), *Potamogeton crispus*, *Potamogeton pectinatus*, *Potamogeton perfoliatus*, *Potamogeton* sp., *Spartina* sp., *Trapa natans* (water chestnut), and *Vallisneria americana* [USAEC].

Discontinuation of a chemical control program for the introduced freshwater macrophyte species water chestnut in 1976 caused a major change in the vascular aquatic plant community in the Hudson River Estuary. Water chestnut was introduced into the upper Hudson River drainage in 1884 and became a pest in this stretch of the river by the 1930s. The NYSDEC began an eradication program using the herbicide 2,4-D, then discontinued the program in 1976. Since 1976, the water chestnut beds have expanded into dense stands in available habitat in the fresh and low salinity brackish areas of the estuary [CHGEC, Section V.D.1.c.ii]. As of 1999, the exotic water chestnut was the dominant form of rooted vegetation in shallow areas of the estuary upstream of Constitution Island (RM 53). Water chestnut beds in some areas are now so dense that they have adversely affected water circulation, lowered dissolved oxygen concentrations, and may be relatively void of fish [CHGEC, Section V.D.1.c.ii].

2.2.5 Fish Communities

An extensive monitoring program referred to as the Hudson River Utilities Monitoring Program has been conducted along the entire 152 miles of the Hudson River Estuary each year beginning in 1974, including the Longitudinal River Survey (LRS), the Beach Seine Survey (BSS), and the Fall Shoals Survey (FSS). An average of 2,950 LRS samples were collected per year during the

23-year period from 1974-1997, providing estimates of abundance of ichthyoplankton (fish eggs and larvae) during the spring and summer. An average of 1,600 BSS samples were collected per year in alternate weeks from mid-June through October of 1974-1997 to provide estimates of abundance for young-of-the-year (YOY) fish near the shore. An average of 1,570 FSS samples were collected per year on alternate weeks from the BSS during 1974-1997 to provide estimates of the abundance of YOY fish in offshore habitats. The annual numbers of samples described above for the LRS, BSS, and FSS represent the 1974-1997 period examined by the DEIS; these programs are still ongoing annually and represent one of the largest privately-funded environmental monitoring study ever conducted (if not the largest). In addition to the LRS, BSS, and FSS, which primarily target the early life stages of Hudson River fish species, other long-term studies have included impingement and entrainment monitoring programs at most of the power generating stations, and surveys of the pre-reproductive populations of striped bass (*Morone saxatilis*) annually since 1984, spawning adult Atlantic tomcod (*Microgadus tomcod*) since 1982, and spawning adult white perch (*Morone americana*) from 1971 through 1988. [CHGEC]

The Hudson River estuary is an important spawning and nursery area for a variety of fish species, including both year-round inhabitants and species that move into the estuary solely for the purpose of spawning. Based on the 1974-1997 Hudson River studies, over 200 fish species have been collected in the greater Hudson and Mohawk River system [CHGEC, Section V.D.1.c.v]. Fish species collected during these sampling efforts can be categorized into four major groups based on their life histories and general habitat requirements: marine species, freshwater species, estuarine species, and diadromous species.

Major anthropogenic or natural events or trends during 1974-1997 with potential significance to the fish communities of the estuary included increased cooling water withdrawals from the Hudson River for electric power generation, improvements in water quality resulting from improvements of wastewater treatment, substantial increases in area coverage by water chestnuts as a result of the cessation of herbicide treatments, invasion of tidal areas by zebra mussels, and an increase in the abundance of large striped bass as a result of restrictions in commercial and recreational harvests [CHGEC, Section V.D.3.i].

Striped bass is a keystone predator and one of the dominant fish species in the Hudson River. Striped bass have significant commercial and recreational fisheries, both within the Hudson River Estuary, and throughout the mid-Atlantic and New England states. Striped bass have been the subject of a successful recovery program administered by the Atlantic states and their resource agencies as directed by the Atlantic States Marine Fisheries Commission (ASMFC). Following declines in striped bass harvest and poor juvenile production during the 1970s, ASMFC developed and implemented a recovery plan for striped bass that resulted in the passage of the Atlantic Striped Bass Conservation Act of 1986. The management plan implemented increases in the size limits and moratoriums on both commercial and recreational fishing at times during the 1980s to sharply reduce striped bass harvests and protect spawning stocks. The striped bass abundance in the Hudson River Estuary and throughout the Atlantic states dramatically increased between the early 1980s and the early 1990s [CHGEC, Section V.D.1.a].

Atlantic sturgeon (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) are of particular interest in the Hudson River estuary. The shortnose sturgeon is protected as a federally endangered species under the Endangered Species Act. Strong YOY recruitment during 1986-1992 was followed by an increase in the shortnose sturgeon population in the Hudson River Estuary during the 1990s. This recovery was attributed to improved dissolved oxygen concentrations in summertime nursery habitat in the upper estuary (north of the Hudson Highlands) beginning in the 1970s. Shortnose sturgeon is further discussed in Section 2.5 of this ER. The status of the Atlantic sturgeon is currently under review to determine whether listing as a threatened or endangered species under the Endangered Species Act is warranted. [CHGEC, Section V.D.2.p].

Few larval or young sturgeons of either species were collected during 5-14 years of entrainment sampling at six power stations [CHGEC, Section V.D.2.h]. A total of 907 Atlantic sturgeon and 63 shortnose sturgeon were collected at the six power stations during 15-27 years of impingement sampling during 1972-1998 (an average of 23.2 years sampled per plant; the totals do not include estimates for numbers impinged on non-sampling days). Most Atlantic sturgeon impingement at power plant intakes was in the winter. There was no seasonal pattern of impingement for shortnose sturgeon. Based on these data, the National Marine Fisheries Service (NMFS) concluded that future impingement rates due to incidental take at Roseton and Danskammer Point generating stations, even though higher than at Indian Point, are unlikely to jeopardize the continued recovery of the Hudson River shortnose sturgeon population. [NMFS 2000, Section 5.2.2]

The extensive nature of the LRS and BSS data permits a detailed characterization of the Hudson River fish fauna, as well as an examination of long-term trends at the community level. The DEIS emphasized an examination of long-term trends (1974-1997) primarily for the following two life stages of fish representative of impingement (YOY) and entrainment (PYSL). Of the PYSL collected by the LRS, most were marine species (29 taxa), followed by freshwater taxa, then estuarine and diadromous taxa. Marine larvae were largely restricted to brackish water and were dominated by bay anchovy (*Anchoa mitchilli*). The bay anchovy is a schooling species that is very abundant in inshore marine waters of the Atlantic coast of North America. Other common marine species collected as PYSL included weakfish (*Cynoscion regalis*), Atlantic menhaden (*Brevoortia tyrannus*), winter flounder (*Pseudopleuronectes americanus*), and Atlantic herring (*Clupea harengus*). Freshwater PYSL (20 taxa) were dominated by several members of the minnow family (Cyprinidae). Other freshwater taxa included yellow perch (*Perca flavescens*), sunfish (family Centrarchidae), and common carp (*Cyprinus carpio)*. Estuarine PYSL (11 taxa) were dominated by white perch (*Morone americana*). Other common estuarine taxa collected included banded killifish (*Fundulus diaphanus*), inland silverside (*Menidia beryllina*), northern pipefish (*Syngnathus fuscus*), and Atlantic silverside (*Menidia menidia*). Diadromous PYSL (9 taxa) were dominated by striped bass and by "river herring," a taxonomic grouping of alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). The striped bass PYSL were most abundant in the middle portion of the estuary and river herring were found primarily farther upriver. Other diadromous taxa collected as PYSL included American shad (Alosa sapidissima) and rainbow smelt (*Osmerus mordax*). [CHGEC, Section V.D.3.i]

During the 24-year monitoring period from 1974 to 1997, species richness and overall abundance of PYSL increased in most areas of the estuary. Analysis of the long-term trends in the larval fish community in both the marine brackish regions and the freshwater zone revealed an overall increase in the total number of taxa collected. Increases in overall abundance were due to increases in the abundance of larval striped bass in all areas of the estuary and increases in the abundance of larval bay anchovy in brackish areas. [CHGEC, Section V.D.3.i]

Of the YOY fish collected by the BSS, marine species (27 species) were collected primarily in brackish areas. Bay anchovy was the predominant species collected. Other common marine species collected as YOY included bluefish (*Pomatomus saltatrix*), Atlantic menhaden, winter flounder, and rough silverside (*Membras martinica*). Estuarine YOY (11 species) were dominated by white perch, banded killifish, and Atlantic silverside. White perch were found throughout the estuary, while Atlantic silversides were restricted to brackish zones and banded killifish were restricted to freshwater zones. Other common estuarine species collected included mummichog (*Fundulus heteroclitus*) and hogchoker (*Trinectes maculatus*). Freshwater species (33 species) were largely restricted to the freshwater zone and were dominated by spottail shiner (*Notropis hudsonius*) and tessellated darter (*Etheostoma olmstedi*). Other freshwater species commonly collected included Eastern silvery minnow (*Hybognathus regius*), goldfish (Carassius auratus), and pumpkinseed (*Lepomis gibbosus*). Diadromous species (9 species) were dominated by blueback herring in the freshwater and low salinity areas of the estuary. American shad were also relatively abundant. Areas of higher salinity brackish water were dominated by striped bass. Other diadromous species collected as YOY included alewife and Atlantic tomcod. [CHGEC, Section V.D.3.i, pg. V-163]

Of the yearling and older fish collected by the BSS, marine species (28 species) were collected primarily in brackish water areas, where collections were dominated by bay anchovy. Other common marine species collected as yearling and older fish included Atlantic menhaden, Atlantic needlefish (*Strongylura marina*), spot (*Leiostomus xanthurus*), and summer flounder (*Paralichthys dentatus*). Collections of yearling and older estuarine species (12 species) were dominated by white perch, banded killifish, and Atlantic silverside. White perch were found throughout the estuary while Atlantic silversides were restricted to brackish zones. Banded killifish collections were from freshwater zones. Other common estuarine species of yearling and older fish collected included mummichog and hogchoker. Freshwater yearling and older species (46 species) were largely restricted to the freshwater zone and were dominated by spottail shiner, golden shiner (*Notemigonus crysoleucas*), and pumpkinseed. Other commonly collected freshwater species included tessellated darter and redbreast sunfish (*Lepomis auritus*). Nine yearling and older diadromous species were collected during the BSS. The most abundant species were striped bass and American eel (*Anguilla rostrata*). [CHGEC, Section V.D.3.i]

Since submission of the DEIS, the IP2 and IP3, Roseton, and Bowline Point owners have continued to support fisheries studies to develop annual year-class reports outlining the results of the annual monitoring program for each year. These reports provide summaries of the raw data collected and annual estimates of the abundance (i.e., standing crop) of fish in the Hudson River, also providing summary comparisons with previous study results. The recent 2004 annual year-class report continues to confirm that the conclusions developed in the DEIS are still relevant and

supported [ASA]. The NYSDEC's FEIS noted a decline in bay anchovy abundance and suggested it was linked to power generation plant water intakes on the Hudson River [NYSDEC 2003]. Bay anchovy abundance showed an abrupt decline in abundance from 1995 to 2000, however this was considered inconsistent with the expected effects of cooling water withdrawals [Barnthouse]. More recent annual year-class reports indicate juvenile bay anchovy indices rebounded from 2000 to 2004, thus indicating its abundance has remained stable [ASA, Appendix D, Table D-5].

Overall, observations from the Hudson River Utilities Monitoring Program indicate that the fish community of the Hudson River estuary has experienced relatively small changes in species richness and diversity, although these measures have varied among regions of the river and among fish life stages during the 1974-1997 monitoring period. These changes are also discussed in Section 4 of this ER. Both the species and abundance of post yolk-sac larvae have increased slightly. The number and diversity of juvenile and older fish have decreased slightly. In the brackish region of the Hudson River, the decrease in richness and abundance may be due to an increase in salinity (lower freshwater flow) and consequent reduction in collection of freshwater fish species there. [CHGEC, Section V.D.3.ii]

The DEIS summarized and discussed aquatic conditions and fisheries studies conducted from 1974 to 1997. Subsequent to submission of the DEIS, the generators submitted to the NYSDEC, among other things, a review of the Hudson River data set by three leading fisheries biologists (Drs. Charles C. Coutant, Lawrence W. Barnthouse, and Webster Van Winkle), with a trend analysis of the relative abundance and diversity of the fish populations in the River [Barnthouse]. The express purpose of that report was to provide an even greater level of confidence to NYSDEC regarding the DEIS conclusion that no adverse impacts to fisheries have occurred or are likely to occur as a result of the operation of the cooling water intake structures of the various stations, including IP2 and IP3.

There have been two instances of 'fish kill' events at Indian Point. On October 29, 1997, operators performing routine rounds discovered a number (<40) dead fish floating in the discharge canal. The fish were determined to be adult gizzard shad and carp. Although neither species is threatened or endangered, nor considered recreationally or commercially important, this event was reported to the NRC as an unusual event as required by the Environmental Protection Plan contained in Appendix B to the IP2 and IP3 Operating Licenses. Investigations into plant operations, as well as water chemistry and temperature, did not reveal any causal factor for the fish mortality. Although the plant investigation, which was documented in IP3 DER-97-2586, did not determine the cause of the fish mortality, this was an isolated event which did not have any significant impact. A similar event occurred on May 4, 2000 when station personnel observed approximately 25 adult fish floating in the discharge canal. This event was also reported to the NRC as an unusual event as required by the Environmental Protection Plan contained in Appendix B to the IP2 and IP3 Operating Licenses. Again, an investigation was performed and documented in CR-IP3-2000-01061, but there was no indication that the fish mortality was in any way causally related to plant operations. No other such events have occurred.

2.3 Groundwater Resources

The site is on the eastern bank of the Hudson River. The river runs northeast to southwest at this point, but turns sharply northwest approximately 2 miles northeast of the plant. The western bank of the Hudson River is flanked by the steep, heavily-wooded slopes of the Dunderberg and West Mountains to the northwest (elevations 1,086 feet and 1,257 feet, respectively, above MSL) and Buckberg Mountain to the west-southwest (elevation 793 feet above MSL). These peaks extend to the west and gradually rise to slightly higher peaks.

The topography of the site ranges from approximately 145 feet MSL to approximately sea level at the Hudson River (see Figure 2-6). The containment floor elevation of the IP2 and IP3 containment structures is approximately 15 feet MSL. The site slopes generally toward the west, northwest, and toward the river. Surface drainage is toward the Hudson River.

The site is situated on the Upper Ordovician, Balmville Limestone formation with some limited areas of glacial till. The Balmville Limestone is a hard, dark gray, metamorphosed dolomitic limestone. Adjacent to the Balmville Limestone are schist and phyllite formations and the igneous intrusive rocks of the Cortland (mafic) Complex. [USAEC, Section II.E.3]

Groundwater at the site occurs largely in the joints of the limestone rock. Jointing and fracturing in the limestone are irregular as is the porosity and permeability. Wells drilled into the limestone, and to a lesser extent in the schist and phyllite, yield a few gallons of water per minute. Locally, where the glacial till is thicker and more permeable than at the site, wells can be constructed which can yield several hundred gpm. [USAEC, Section II.E.2]

Groundwater is encountered at the site primarily in bedrock fractures and along the jointing or bedding planes of the various rock strata. Thus, groundwater may be encountered at different elevations on the site, dependent upon location, ground surface elevation and the fracture or water bearing facies encountered. Investigations performed in 2005 and 2006 indicated groundwater may be encountered in monitoring wells at the site between three feet to more than 80 feet above MSL and generally is encountered between ten to more than 50 feet beneath the surface (see Figure 2-7). The groundwater is generally encountered nearer the ground surface near the river and is deeper beneath the surface toward the eastern part of the site. Bedrock dip is toward the River, and as such the direction of groundwater flow is toward the river. Based on the depth to bedrock and the higher elevation of the plant relative to the river, water entering the ground at the site will percolate to the river rather than enter any groundwater supply [IP2 UFSAR, Sections 2.1 and 2.5]. The groundwater flow is indicated to be affected by the flow in the river and subject to the tidal effects of the Hudson River. Tidal effect is typically approximately 0.5 feet between low and high tides, but may swing as much as four to five feet under full moon and south wind conditions. It is believed that this tidal effect influences groundwater flow locally at the interface between the river and the bedrock, such that the river may provide some groundwater recharge, or impede the flow of groundwater into the river during high river flow or high tide. The highest recorded water elevation of the Hudson River at the site was 7.4 feet above MSL which occurred during an exceptionally severe hurricane in November 1950 [IP2 UFSAR, Section 2.5].

Figure 2-7 presents the general potentiometric groundwater surface based on temporally averaged groundwater measurements (feet above MSL).

Within a one-mile radius of the site, there are seven USGS registered wells. These wells range in depth from 30 feet to 500 feet below land surface and, based on available information, are listed as unused, domestic use, and commercial use wells. One well is completed in the Sand and Gravel (glacial till) local aquifer, three wells in the Bedrock local aquifer, and three wells in the Basement Complex local aquifer [USGS 2006a]. Pumping rates available for these wells range from 4 gpm to 30 gpm [USGS 2006b]. Table 2-2 provides the location and available information regarding these wells. As noted, there are two out-of-service wells registered by the USGS on the plant site. The nearest off-site well is located approximately 500 feet east-northeast from the site property.

Table 2-2
Registered USGS Wells within One Mile of IP2 and IP3

USGS Registered Well ID	County	Well Depth (below land surface)	Approximate Distance to Site	Status	Capacity (gpm)	Primary Use[a]
WE 245	Westchester	100 ft.	On-site	Unused[b]	4	Domestic
WE 246	Westchester	193 ft.	On-site	Unused[b]	N/A	N/A
WE 244	Westchester	60 ft.	3,950 ft. ESE	N/A	30	Unused
WE 261	Westchester	500 ft.	500 ft. ENE	N/A	25	Unused
RO 307	Rockland	192 ft.	5,280 ft. E	N/A	N/A	Domestic
RO 313	Rockland	30 ft.	4,500 ft. NW	N/A	N/A	Domestic
RO 314	Rockland	110 ft.	5,280 ft. ENE	N/A	N/A	Commercial
N/A: Information not available						

a. USGS 2006b
b. IPEC 2006

The site does not utilize groundwater, either for plant operations or for potable water. Surface water from the Hudson River and city water supply the plant operational needs. Potable water is supplied to the site by the Village of Buchanan, NY Public Water Supply system. Wells located at the site are used for monitoring purposes only and are not equipped to withdraw water for plant operations or as a potable water source.

2.4 Terrestrial Habitats

The site system lies within the eastern deciduous forest biome of North America and more specifically, the oak-chestnut association. This large biome has two canopy levels with the main

canopy being dominated by a variety of oak species (*Quercus*) with smaller amounts of maple (*Acer*) and beech (*Fagus*). The sub-canopy layer is composed of smaller trees. The oak-chestnut association no longer exists in its original composition due to a chestnut blight in the early 20th century. The dominant climax species of the presettlement forest were American chestnut (*Castanea dentata*), chestnut oak (*Quercus prinus*), red oak (*Quercus rubra*), and several other oak species. All of these species, with the exception of the chestnut, continue to be important. Chestnut trees were removed from the oak-chestnut association due to a fungal blight that came to the United States from China near 1900. The fungus destroyed chestnut trees by killing the phloem (food conducting) layer in the trunks and was first reported in New York City in 1906. By 1920, the blight had killed 50 percent of the chestnut trees as far south as Maryland and continued to spread south and west. The loss of the American chestnut was important not only biologically, but also economically. It accounted for one-fourth of all the hardwood timber cut for lumber in the southern Appalachians and its wood was used for construction, furniture, telephone poles, and many other items including chemicals used in the tanning of leather. Today this association could be called the Oak Association, as oak predominantly replaced the chestnut and did not allow an invasion of new species. [Vankat 1992] Figure 2-28 provides illustration of the regional land use and vegetative cover within a 6-mile radius of Indian Point.

As discussed in the *Final Environmental Statement Related to the Operation of Indian Point 3*, a floral survey of the site and adjacent areas (2-mile radius of the site) indicated that dominant overstory species included white oak (*Q. alba*), red oak, eastern hemlock (*Tsuga canadensis*), and river birch (*Betula nigra*). Other dominant species included chestnut oak, shagbark hickory (*Carya ovata*), white pine (*Pinus strobus*), black oak (*Fraxinus nigra*), black cherry (*Prunus serotina*), and maple. Common understory species included yellow poplar (*Liriodendron tulipifera*), sassafras (*Sassafras albidum*), sumac (*Rhus* sp.), catalpa (*Catalpa bignonioides*), and various species typical of an eastern deciduous forest. [NRC 1975]

Land cover at the site includes mixed forest, and industrial and transportation cover types [USGS 2005]. Table 2-3 provides cover types and approximate percentage of area within the 239 acres of the site. Figure 2-29 illustrates the current land use and indication of land disturbance within the IP2 and IP3 exclusion zone. The northern portion of the site includes an 80-acre, well-developed mixed oak and eastern hemlock wooded area with a freshwater pond which was historically used for recreational purposes [USAEC, Section II.B; NRC 1975, Section II]. The transmission line corridor crosses the industrial portion of the site to the Buchanan Substation, located approximately 2,100 feet southeast of the reactors [NRC 1975]. The southern 10 acres of the 80-acre wooded area was recently disturbed for the construction of the Independent Spent Fuel Storage Installation pad. The NYSDEC 1997 Freshwater Wetlands Map indicates no

wetlands areas are identified within the site [NYSDEC 1997]. The nearest state designated wetlands is located 0.45 miles northeast of the site at Lents Cove, east of Broadway.

Table 2-3
IP2 and IP3 Land Cover[a]

Description	Percent
Open Water	1
Commercial/Industrial/Transportation	52
Deciduous Forest	3
Evergreen Forest	17
Mixed Forest	24
Urban/Recreational Grasses	3

a. U.S. Geological Survey (USGS) 1992, EROS Data Center, National Land Cover Data Set (NED) 30 meter

Mammals in the local area include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), American mink (*Mustela vison*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), eastern chipmunk (*Tamias striatus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), grey fox (*Urocyon cinereoargenteus*), and a variety of mice and voles [NYSDEC 2005a]. Several species of snakes, turtles, salamanders, frogs, and toads also inhabit the local area [NYSDEC 1999].

Although there are no state or federal jurisdictional wetlands on the site, the open water of the Hudson River and its emergent wetland habitat supports a number of migrant waterfowl species, including mallard (*Anas platyrhyncos*), Canada goose (*Branta Canadensis*) American black duck (*Anas rubripes*), and wood duck (*Aix sponsa*). In addition, several species of woodpeckers, songbirds, herons, and raptors, such as osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*), utilize the river areas near the site [NYSDEC 2005b]. Peregrine falcons (*Falco peregrinus*) are also found throughout much of the Hudson River Valley, including the vicinity of the site [NYSDEC 2006c].

Westchester County, where Indian Point is located, is in the path of the Atlantic Flyway, one of the primary migratory bird flight paths in North America. As a result of this location, Westchester County sees large numbers of migratory waterfowl, songbirds, and raptors every year.

A waterfowl count is conducted each January by members of the New York State Ornithological Association. In the 2004 survey, a total of 29,622 wintering waterfowl, comprised of 36 different species, were counted in Westchester County. The most numerous bird counted was the Canada goose, with 21,925 birds observed. The Mallard came in a distant second with 3,534 birds observed. [NYSOA]

From 2003-2006 there have been approximately six noted bird death incidents at the site. In 2003, remains of dead birds were removed from a roof drain and a dead pigeon was found on the dock area sidewalk across the alley from the cafeteria. These incidents were documented in Condition Reports CR-IP2-2003-1066 and CR-IP-2003-5322, respectively. In 2004, a dead pigeon was found outside the Unit 1 side of the security door and the incident was documented in Condition Report CR-IP3-2004-502. In 2005, two birds were found in the transformer yard and a dead pigeon was found in the vicinity of the IP3 plant vent. These incidents were documented in Condition Reports CR-IP3-2005-373 and CR-IP3-2005-2591, respectively. In 2006, a dead pigeon was noted in the IP2 Turbine Hall and the incident was documented in Condition Report CR-IP2-2006-03169. Although cause of deaths was unknown, none of these incidents triggered a report to a state or federal agency and review of condition reports since 2003 identified no definable trend.

There are no special species or endangered species on-site, although they could potentially transient the site. In addition, there have been no brush removal activities around wetlands or the shoreline of the Hudson River on the IP site. However, in the event that these events may occur in the future, Entergy has fleet procedural controls in place to ensure that the environmentally sensitive areas, if present, are adequately protected during site operations and project planning. These controls would ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that threatened or endangered species are protected if present, and that other regulatory issues are adequately addressed if necessary.

Herbicide and pesticide usage occurs periodically at the site. Herbicides utilized for weed control and pesticides utilized for control of insects such as wasps, is hand-applied by vendors via sprayers. Sodium hypochlorite which is injected by station personnel into plant systems for chlorination purposes is also listed as a pesticide under New York State law. In accordance with NYSDEC 6 NYCRR Part 325, sodium hypochlorite usage at the site is controlled in accordance with IP2 Pesticide Application Business Registration 12696 and IP3 Pesticide Application Business Registration 13163. Vendor application of other herbicides and pesticides is also managed in accordance with 6 NYCRR Part 325.

Other than terrestrial monitoring associated with the sites' radiological environmental monitoring program described in the IP2 and IP3 ODCMs, there are no other terrestrial monitoring programs conducted at the site.

2.4.1 State-Listed Critical or Important Habitats

Entergy's review identified no state listed critical or important habitats in the vicinity of the site. The New York Natural Heritage Program (NYNHP) was contacted (see Attachment A) regarding any state listed critical or important habitats within a 50-mile radius of the site. Critical and important habitats are those areas managed by the state for species of interest. The NYNHP monitors endangered and threatened plants and animals, rare plants and animals, as well as significant ecological communities throughout the state. No designated critical and important habitats are located in the vicinity of the site based upon consultation with NYNHP.

2.4.2 Federal-Listed Critical or Important Habitats

As addressed in Section 2.5 below, four federally-listed threatened or endangered species potentially occur in the vicinity of the site [USFWS 2006a]. No critical habitat for the federally-listed species has been designated near the site, based on the USFWS Critical Habitat Portal and consultation with the NYSDEC and the United States Fish and Wildlife Service (USFWS) (see Attachment A) [USFWS 2006b].

2.5 Threatened or Endangered Species

Four animal species currently protected and two candidate species under the Endangered Species Act have geographic ranges which could possibly include the site. Federally protected and candidate species potentially represented include two fish, two mammals, one reptile, and one bird. These are the shortnose sturgeon, Atlantic sturgeon, Indiana bat (*Myotis sodalis*), New England cottontail rabbit (*Sylvilagus transitionalis*), bog turtle (*Clemmys muhlenbergii*), and bald eagle. Of these species, the Indiana bat and the shortnose sturgeon are listed as endangered, the bog turtle and bald eagle are listed as threatened, and the Atlantic sturgeon and the New England cottontail rabbit are listed as candidate species.

Bald eagles occur throughout virtually the entire area near the site. The bald eagle is known to nest along the Hudson River and has been seen near the site. In 1997, a nesting pair produced the first eaglet born along the Hudson River in more than 100 years near the Town/Village of Catskill, NY. In 2005, 12 pairs nested and 18 eaglets were fledged along the river [NYSDEC 2005c]. Bald eagles frequently winter along the Hudson River. Habitat for wintering bald eagles is generally described as large open waters, i.e., large rivers and lakes suitable for foraging. Habitat near the facility could possibly support wintering bald eagles because of the location of the site near the Hudson River.

Shortnose sturgeon inhabit rivers and estuaries, and prefers the nearshore marine, estuarine and riverine habitat of large river systems. Shortnose sturgeon, unlike other anadromous species in the region such as American shad or striped bass, do not appear to make long distance offshore migrations. Thus, shortnose sturgeon are more properly considered to be amphidromous in their migratory behavior by some investigators. There is a well established population of shortnose sturgeon in the Hudson River, and this species has been confirmed to be in the vicinity of Indian Point at various times during the year. The Hudson River population of shortnose sturgeon is reported to have grown 450% from about 10,000 fish in 1980 to as many as 55,000 by 1995 [Bain].

Shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America, having a maximum known total length of 143 cm and weight of 23 kg. Maximum known age is 67 years for females, but males seldom exceed 30 years of age. Sex ratio among young adults is one to one, but changes to a predominance of females (4:1) for fish larger than 90 cm fork length. Males and females mature at the same length (45 to 55 cm fork length) throughout their range. However, age of maturation varies from north to south due to a slower growth rate in the north. Males may mature at age three to five from South Carolina to New York. Females exhibit a similar trend and mature at age six to seven from South Carolina to New York. Age of

first spawning in males occurs one to two years after maturity, but among females is delayed for up to 5 years. Approximate age of a female at first spawning is 11 years in the Hudson and Delaware Rivers. Shortnose sturgeon exhibit a punctuated iteroparous spawning pattern, meaning that both sexes spawn intermittently, about once every 2-11 years [Secor and Woodland]. Shortnose sturgeon typically spawn in the Hudson River during April and May. Adult shortnose sturgeon migrate upriver from their lower and mid-Hudson River overwintering areas to freshwater spawning sites in the river north of the Town/Village of Coxsackie (RM 123) [NYSDEC 2006b]. They are benthic feeders. Juveniles are believed to feed on benthic insects and crustaceans. Mollusks and large crustaceans are the primary food of adult shortnose sturgeon. While the shortnose sturgeon was rarely the target of a commercial fishery, it often was taken incidentally in the commercial fishery for Atlantic sturgeon. The USFWS believed the population level of the shortnose sturgeon had declined because of pollution and overfishing, both directly and incidentally in shad gillnets. [NMFS 2007]

Impingement on intake structures has been studied at Hudson River power plants since 1972. In 2000 NMFS stated that only 63 shortnose sturgeon have been collected in impingement samples from all six power plants on the Hudson River during a 26 year interval [NMFS 2000, Section 5]. The condition of some of the individuals collected during impingement sampling events (i.e., degree of decay) indicated that at least some of those collected were dead prior to collection. There was no seasonal pattern of impingement for shortnose sturgeon. Overall for the six electric power generation plants, the average impingement was 10.2 fish per year between 1972-1998, but 7.5 fish per year between 1989 - 1998. The NMFS estimated impingement at Indian Point to be approximately 0.8 per year each at IP2 and IP3 or 1.6 fish per year for the entire site since the installation of the Ristroph screens at the site in 1990 and 1991. By comparison, Roseton and Danskammer Point were estimated to impinge an average of approximately 1.5 and 4.4 shortnose sturgeon per year, respectively. [NMFS 2000, Section 5.2.2].

The Atlantic sturgeon is anadromous, migrating from salt water to spawn in freshwater. Spawning adults migrate upriver in spring, beginning in February-March in the south, April-May in the mid-Atlantic, and May-June in Canadian waters. In some areas, a small spawning migration may also occur in the fall. Spawning occurs in flowing water between the salt front and fall line of large rivers. Following spawning, males may remain in the river or lower estuary until the fall, females typically exit the rivers within four to six weeks. Adults forage on benthic invertebrates (mussels, worms, shrimp), live up to 60 years, reach lengths up to 14 feet, and weigh more than 800 pounds. Juveniles move downstream and inhabit brackish waters for a few months; at about 76-92 cm total length, they move into coastal waters. Age of female sexual maturity is thought to be between 15-30 years in the Hudson River. Tagging data indicate that immature Atlantic sturgeon travel widely once they emigrate from their natal rivers.

A large U.S. commercial fishery (100,000 - 250,000 lbs/yr) existed for the Atlantic sturgeon from the 1950s through the mid-1990s; the origin of the fishery dates back to colonial times. The Atlantic sturgeon is managed under a Fishery Management Plan implemented by the ASMFC; a coast-wide moratorium on the harvest of wild Atlantic sturgeon was implemented in late 1997/ early 1998. This moratorium is to remain in effect until there are at least 20 protected year classes in each spawning stock (anticipated to take up to 40 or more years). The Atlantic

Sturgeon status review was completed in September 1998 in response to a petition, and it was scheduled to be updated in 2003. In 1998, NMFS and USFWS determined that Atlantic sturgeon did not warrant listing as threatened or endangered under the ESA. However, because of concerns regarding its status and uncertainties, NMFS retained this species on its candidate list. In April 2004 the Atlantic sturgeon was transferred to NMFS' species of concern list. The status review report was actually updated in 2005-06, and it is currently undergoing peer review. In October 2006, NMFS determined that any species for which NMFS has initiated an ESA status review that has been announced formally in the Federal Register will be considered a candidate species as well as a species of concern, adding Atlantic sturgeon back to the candidate species list again. [NMFS 2006]

Entergy received NMFS input on the presence of listed species in the vicinity of Indian Point in January 2007. Due to limited resources, the USFWS directed Entergy to their website to determine the occurrence of Federally-listed threatened and endangered species in the vicinity of the site. Both agencies have identified the shortnose sturgeon in the vicinity of Indian Point. NMFS has also mentioned the presence of the Atlantic sturgeon in the vicinity of Indian Point, which NMFS is considering as a Candidate Species, and has initiated a status review for threatened or endangered species listing.

NMFS indicated a potential for entrainment of Atlantic sturgeon larvae in the region in which Indian Point is located. NMFS noted sturgeon yolk sac larvae (YSL) and PYSL have been documented in the vicinity of Indian Point, but assumes the larvae in the lower river area (RM 48 to 110) are Atlantic sturgeon. NMFS also indicated the potential for impingement of shortnose sturgeon on the IP2 and IP3 intake screens. In its January 2007 letter, NMFS requested additional information from Entergy regarding the impacts of its intake and discharge on sturgeon species. In a March 2007 follow-up letter received from the NMFS as a result of discussions between Entergy and the NMFS, the agency clarified its position regarding sturgeon species entrainment and impingement, citing Section 7(a)(2) of the Endangered Species Act (ESA) which requires a Section 7 consultation for a federal action such as the renewal of an operating license. If it is determined through consultation between the NRC and NMFS that the action is not likely to adversely affect any listed species, then no additional measures are necessary. However, if it is determined that the action is likely to adversely affect any listed species, then a formal consultation resulting in the issuance of a Biological Opinion and accompanying Incidental Take Statement would be required (See Attachment A).

The impact on sturgeon is discussed in Section Section 4.10.5 of this ER. Impacts on other fish and shell fish from current operations and during the license renewal stage are discussed in Sections 4.2, 4.3, and 4.4 of this ER. However, as noted above, NMFS has previously stated in biological assessments involving the shortnose sturgeon that, overall, the intakes and discharges of Hudson River power plants are unlikely to jeopardize the recovery of the Hudson River shortnose sturgeon population.

The Indiana bat is described by the NYSDEC in the State of New York as having distribution limited to known wintering locations—caves and mines in which they hibernate. There are eight hibernacula currently known in Albany, Essex, Warren, Jefferson, Onondaga, and Ulster

Counties. It is certain that the summer range of this species extends well beyond these counties as the animals disperse to breeding areas and other habitats to feed and raise their young [NYSDEC 2006a]. However, there have been no sightings of the Indiana bat either onsite or within the vicinity of the site.

The bog turtle has historically been found in many counties throughout the State of New York, but extant populations are currently found in only six New York counties. There are historic records of the bog turtle being found in Westchester County, but it is unknown if there are any extant bog turtle populations in the county. The bog turtle prefers open-canopy wet meadows, sedge meadows, and calcareous fens. The known habitat in the Lake Plain region of the state includes large fens that may include various species of sedges, such as slender sedge (*Carex lasiocarpa*), bog buckbean (*Menyanthes trifoliata*), mosses (*Sphagnum* spp.), pitcher plants (*Sarracenia* sp.), scattered trees, and scattered shrubs. In the Hudson River Valley, bog turtle habitats may be isolated from other wetlands or they may exist as part of larger wetland complexes. [NYNHP 2006a] There have been no sightings of the bog turtle either onsite or within the vicinity of the site.

The State of New York also protects additional species as endangered, threatened, species of special concern, and, in the case of certain plants, rare. Table 2-4 lists federal species and state listed endangered, threatened, or species of special concern possibly occurring in Westchester County, where the site is located, or within 6 miles of the plant. State listed species include an additional nine animal species (five birds, three reptiles/amphibians, and one insect) and 156 plant species. None of these state listed species are known to occur on the site and are therefore not discussed in this ER. Species potentially within 6 miles of the IP site are noted with an asterisk in Table 2-4.

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Reptiles and Amphibians			
Carphophis amoenus	Worm Snake*	-	SC
Clemmys muhlenbergii	Bog Turtle	T	E
Crotalus horridus	Timber Rattlesnake*	-	T
Sceloporus undulatus	Fence Lizard*	-	T
Birds			
Circus cyaneus	Northern Harrier	-	T
Cistothorus platensis	Sedge Wren	-	T
Falco peregrinus	Peregrine Falcon*	-	E

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Haliaeetus leucocephalus	Bald Eagle*	T	T
Ixobrychus exilis	Least Bittern*	-	T
Podilymbus podiceps	Pied-billed Grebe*	-	T
Mammals			
Myotis sodalis	Indiana Bat	E	E
Sylvilagus transitionalis	New England Cottontail Rabbit	C	-
Fish			
Acipenser oxyrhynchus oxyrhynchus	Atlantic Sturgeon	C	-
Acipenser brevirostrum	Shortnose Sturgeon*	E	E
Insects			
Tachopteryx thoreyi	Gray Petaltail*	-	SC
Plants			
Acalypha virginica	Virginia Three-seeded Mercury	-	E
Agastache nepetoides	Yellow Giant-hyssop	-	T
Ageratina aromatica var. *aromatica*	Small White Snakeroot	-	E
Agrimonia rostellata	Woodland Agrimony*	-	T
Amaranthus pumilus	Seabeach Amaranth	-	E
Aplectrum hyemale	Puttyroot	-	E
Arethusa bulbosa	Dragon's Mouth Orchid	-	E
Aristolochia serpentaria	Virginia Snakeroot	-	E
Asclepias variegata	White Milkweed	-	E
Asclepias viridiflora	Green Milkweed	-	T
Bidens beckii	Water Marigold	-	T
Bidens bidentoides	Delmarva Beggar-ticks	-	R
Bidens laevis	Smooth Bur-marigold*	-	T
Blephilia ciliata	Downy Wood-mint	-	E

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Bolboschoenus maritimus ssp. *paludosus*	Seaside Bulrush	-	E
Bolboschoenus novae-angliae	Saltmarsh Bulrush*	-	E
Botrychium oneidense	Blunt-lobe Grape Fern	-	E
Bouteloua curtipendula var. *curtipendula*	Side-oats Grama	-	E
Callitriche terrestris	Terrestrial Starwort*	-	T
Cardamine longii	Long's Bittercress*	-	T
Carex abscondita	Thicket Sedge	-	T
Carex arcta	Northern Clustered Sedge	-	E
Carex bicknellii	Bicknell's Sedge	-	T
Carex conjuncta	Soft Fox Sedge	-	E
Carex cumulata	Clustered Sedge*	-	T
Carex davisii	Davis' Sedge	-	T
Carex hormathodes	Marsh Straw Sedge*	-	T
Carex lupuliformis	False Hop Sedge*	-	R
Carex mesochorea	Midland Sedge*	-	E
Carex mitchelliana	Mitchell's Sedge	-	T
Carex molesta	Troublesome Sedge	-	T
Carex nigromarginata	Black-edge Sedge	-	E
Carex retroflexa	Reflexed Sedge	-	E
Carex seorsa	Weak Stellate Sedge	-	T
Carex straminea	Straw Sedge*	-	E
Carex styloflexa	Bent Sedge	-	E
Carex typhina	Cat-tail Sedge	-	T
Carya laciniosa	Big Shellbark Hickory	-	T

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Castilleja coccinea	Scarlet Indian-paintbrush	-	E
Ceratophyllum echinatum	Prickly Hornwort	-	T
Chamaelirium luteum	Fairy Wand	-	T
Cheilanthes lanosa	Woolly Lip-fern	-	E
Chenopodium berlandieri var. *macrocalycium*	Large Calyx Goosefoot	-	E
Chenopodium rubrum	Red Pigweed	-	T
Crassula aquatica	Water Pigmyweed	-	E
Crotalaria sagittalis	Rattlebox	-	E
Cyperus echinatus	Globose Flatsedge	-	E
Cyperus flavescens	Yellow Flatsedge*	-	E
Cyperus retrorsus var. *retrorsus*	Retrorse Flatsedge	-	E
Cypripedium parviflorum var. *parviflorum*	Small Yellow Ladyslipper	-	E
Desmodium ciliare	Little-leaf Tick-trefoil	-	T
Desmodium humifusum	Spreading Tick-trefoil	-	E
Desmodium laevigatum	Smooth Tick-trefoil	-	E
Desmodium nuttallii	Nuttall's Tick-trefoil	-	E
Desmodium obtusum	Stiff Tick-trefoil	-	E
Desmodium pauciflorum	Small-flowered Tick-trefoil	-	E
Dichanthelium oligosanthes var. *oligosanthes*	Few-flowered Panic Grass	-	E
Digitaria filiformis	Slender Crabgrass	-	T
Diospyros virginiana	Persimmon	-	T
Draba reptans	Carolina Whitlow-grass	-	T
Eclipta prostrata	False-daisy*	-	E
Eleocharis equisetoides	Knotted Spikerush	-	T

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Eleocharis ovata	Blunt Spikerush	-	E
Eleocharis quadrangulata	Angled Spikerush	-	E
Eleocharis tricostata	Three-ribbed Spikerush	-	E
Eleocharis tuberculosa	Long-tubercled Spikerush	-	T
Equisetum palustre	Marsh Horsetail	-	T
Equisetum pratense	Meadow Horsetail	-	T
Euonymus americanus	American Strawberry-bush	-	E
Fimbristylis castanea	Marsh Fimbry	-	T
Fuirena pumila	Dwarf Umbrella-sedge	-	R
Gamochaeta purpurea	Purple Everlasting	-	E
Geranium carolinianum var. *sphaerospermum*	Carolina Cranesbill	-	T
Geum vernum	Spring Avens	-	E
Geum virginianum	Rough Avens	-	E
Hottonia inflata	Featherfoil	-	T
Houstonia purpurea var. *purpurea*	Purple Bluets	-	E
Hylotelephium telephioides	Live-forever	-	E
Hypericum prolificum	Shrubby St. John's-wort	-	T
Iris prismatica	Slender Blue Flag	-	T
Jeffersonia diphylla	Twin-leaf	-	T
Lechea pulchella var. *moniliformis*	Bead Pinweed	-	E
lechea racemulose	Illinois Pinweed	-	R
Lechea tenuifolia	Slender Pinweed	-	T
Lemna perpusilla	Minute Duckweed	-	E
Lespedeza angustifolia	Norrow-leaved Bush-clover	-	R
Lespedeza repens	Trailing Bush-clover	-	R

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Lespedeza stuevei	Velvety Bush-clover	-	T
Lespedeza violacea	Violet Bush-clover	-	R
Liatris scariosa var. *novae-angliae*	Northern Blazing-star	-	T
Lilaeopsis chinensis	Eastern Grasswort	-	T
Limosella australis	Mudwort	-	R
Linum striatum	Stiff Yellow Flax	-	R
Liparis lilifolia	Large Twayblade	-	E
Lipocarpha micrantha	Dwarf Bulrush	-	E
Listera convallarioides	Broad-lipped Twayblade	-	E
Ludwigia sphaerocarpa	Globe-fruited Ludwigia	-	T
Lycopus rubellus	Gypsy-wort	-	E
Lysimachia hybrida	Lance-leaved Loosestrife	-	E
Magnolia virginiana	Sweetbay Magnolia	-	E
Melanthium virginicum	Virginia Bunchflower	-	E
Mimus alatus	Winged Monkeyflower	-	R
Monarda clinopodia	Basil-balm	-	E
Oldenlandia uniflora	Clustered Bluets	-	E
Oligoneuron rigidum var. *rigidum*	Stiff-leaf Goldenrod	-	T
Onosmodium virginianum	Virginia False Gromwell	-	E
Orontium aquaticum	Golden Club	-	T
Oxalis violacea	Violet Wood-sorrel	-	T
Oxypolis rigidior	Stiff Cowbane	-	E
Panicum rigidulum var. *elongatum*	Tall Flat Panic Grass	-	E
Paspalum laeve	Field Beadgrass	-	E
Pinus virginiana	Virginia Pine*	-	E
Platanthera ciliaris	Orange Fringed Orchid	-	E

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Platanthera hookeri	Hooker's Orchid	-	E
Podostemum ceratophyllum	Riverweed*	-	T
Polygala lutea	Orange Milkwort	-	E
Polygonum douglasii ssp. *douglasii*	Douglas' Knotweed	-	T
Polygonum erectum	Erect Knotweed	-	E
Polygonum glaucom	Seabeach Knotweed		R
Polygonum tenue	Slender Knotweed	-	R
Potamogeton diversifolius	Water-thread Pondweed	-	E
Potamogeton pulcher	Spotted Pondweed*	-	T
Pterospora andromedea	Giant Pine-drops	-	E
Pycnanthemum clinopodioides	Basil Mountain-mint*	-	E
Pycnanthemum muticum	Blunt Mountain-mint	-	T
Pycnanthemum torrei	Torrey's Mountain-mint*	-	E
Ranunculus micranthus	Small-flowered Crowfoot*	-	T
Rhynchospora scirpoides	Long-Beaked Beakrush	-	R
Sabatia angularis	Rose-pink	-	E
Sagittaria montevidensis var. *spongiosa*	Spongy Arrowhead*	-	T
Salvia lyrata	Lyre-leaf Sage	-	E
Scirpus georgianus	Georgia Bulrush	-	E
Scleria pauciflora var. *caroliniana*	Few-flowered Nutrush	-	E
Scutellaria integrifolia	Hyssop-skullcap	-	E
Sericocarpus linifolius	Flax-leaf Whitetop	-	T
Sisyrinchium mucronatum	Michaux's Blue-eyed-grass	-	E
Smilax pulverulenta	Jacob's-ladder	-	E
Solidago latissimifolia	Coastal Goldenrod	-	E

Table 2-4
Federal and New York State Protected Species**

Scientific Name	Common Name	Federal Status	State Status
Solidago sempervirens var. *mexicana*	Seaside Goldenrod	-	E
Sporobolus clandestinus	Rough Rush-grass	-	E
Suaeda linearis	Narrow-leaf Sea-blite	-	E
Symphyotrichum boreale	Northern Bog Aster	-	T
Symphyotrichum subulatum var. *subulatum*	Saltmarsh Aster*	-	T
Trichomanes intricatum	Appalachian Trichomanes	-	E
Trichostema setaceum	Tiny Blue-curls	-	E
Tripsacum dactyloides	Northern Gamma Grass	-	T
Trollius laxus	Spreading Globeflower	-	R
Utricularia minor	Lesser Bladderwort	-	T
Utricularia radiata	Small Floating Bladderwort*	-	T
Veronicastrum virginicum	Culver's-root	-	T
Viburnum dentatum var. *venosum*	Southern Arrowwood	-	T
Viburnum nudum var. *nudum*	Possum-haw	-	E
Viola brittoniana	Coast Violet	-	E
Viola hirsutula	Southern Wood Violet	-	E
Viola primulifolia	Primrose-leaf Violet	-	T
Vitis vulpina	Winter Grape	-	E

References: NYSDEC 2005b
NYNHP 2006b

* Plants and animals denoted by the NYNHP as being within 6 miles of the site.
** "Protected", in this instance only, refers to Threatened, Endangered, Species of Special Concern, and Rare (Plants). It does not include the New York state status of "protected".
E = endangered
T = threatened
SC = special concern
R = rare
C = candidate

2.6 Regional Demography

2.6.1 Regional Population

The *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) presents a population characterization method that is based on two factors: "sparseness" and "proximity" [NRC 1996, Section C.1.4]. "Sparseness" measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles

[NRC 1996]

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Not in close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles
In close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles

[NRC 1996]

The GEIS then uses the following matrix to rank the population in the vicinity of the plant as low, medium, or high.

GEIS Sparseness and Proximity Matrix					
		Proximity			
		1	2	3	4
Sparseness	1	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	3.4
	4	4.1	4.2	4.3	4.4

Low Population Area

Medium Population Area

High Population Area

[NRC 1996]

2000 census data from the U.S. Census Bureau (USCB) was used to determine demographic characteristics in the vicinity of the site. These data were processed at the state, county, and census block levels using ESRI ArcView® [ESRI 2005; Census 2000 TIGER] and Landview geographical information system (GIS) software [Landview 6].

The 2000 census data indicates that approximately 1,113,089 people live within a 20-mile radius of the site, which equates to a population density of 886 persons per square mile [Landview 6]. According to the GEIS sparseness index, the site is classified as Category 4 sparseness (having greater than or equal to 120 persons per square mile within 20 miles).

The 2000 census data indicates that approximately 16,791,654 people live within a 50-mile radius of the site, which equates to a population density of 2,138 persons per square mile [Landview 6]. According to the GEIS proximity index, the site is classified as Category 4 proximity (greater than or equal to 190 persons per square mile within 50 miles).

According to the GEIS sparseness and proximity matrix, the combination of sparseness Category 4 and proximity Category 4 results in the conclusion that the site is located in a "high" population area.

The area within 50 miles of the site includes twenty-eight counties from four states that are wholly or partially included within the 50-mile radius as shown in Table 2-5. According to the 2000 census, the total permanent population (not including transient populations) of these counties was approximately 19,939,233 as shown in Table 2-5. The total population (not including transients populations) within a 50-mile radius of the site was approximately 16,791,654 in 2000 [Census 2000 TIGER]

Since the license renewal period for IP3 would end in 2035, projected permanent populations for each county are shown in Table 2-5 through 2035, which includes the IP2 and IP3 license renewal periods. The total population (not including transient populations) of these counties is projected to be approximately 23,129,314 in 2035, an increase from the 2000 population of 19,939,233. The total population (including transient populations) within a 50-mile radius of the site is projected to be 19,228,712 in 2035. [Brown; Census 2000 TIGER; PPNJ; PPC; PPP].

Table 2-5
State and County Population, 50-Mile Radius of IP2 and IP3

State and County	2000 Population	2035 Projected Permanent Population
New York (14 Counties)	**12,941,380**	**14,649,596**
Suffolk	1,419,369	1,490,766
Rockland	286,753	278,799
Westchester	923,459	914,934
Richmond	443,728	662,838
Bronx	1,332,650	1,634,750
New York	1,537,195	1,570,657
Queens	2,229,379	3,024,717
Kings	2,465,326	2,618,418
Nassau	1,334,544	1,251,644
Orange	341,367	445,234
Ulster	177,749	222,655
Sullivan	73,966	94,055
Dutchess	280,150	319,391
Putnam	95,745	120,738

Table 2-5
State and County Population, 50-Mile Radius of IP2 and IP3

State and County	2000 Population	2035 Projected Permanent Population
Connecticut (3 Counties)	**1,888,768**	**2,032,273**
Fairfield	882,567	918,600
New Haven	824,008	896,364
Litchfield	182,193	217,309
New Jersey (10 counties)	**5,062,783**	**6,344,008**
Sussex	144,166	217,947
Bergen	884,118	1,089,428
Somerset	297,490	470,131
Middlesex	750,162	1,053,511
Passaic	489,049	553,404
Warren	102,437	156,074
Morris	470,212	653,201
Essex	793,633	868,715
Hudson	608,975	690,981
Union	522,541	590,616
Pennsylvania (1 County)	**46,302**	**103,437**
Pike	46,302	103,437
TOTAL POPULATION	**19,939,233**	**23,129,314**

Towns and Villages near the site include the Village of Buchanan, the Village of Croton, and the City of Peekskill, New York (Westchester County), and the Village of Haverstraw, New York (Rockland County). According to the 2000 census, the populations of these areas were 2,189; 7,606; 22,441; and 33,811, respectively [Census 2000 TIGER].

The five counties within New York nearest the site (Dutchess, Putnam, Rockland, Orange, and Westchester Counties) are of special significance in evaluation of demographic and economic impacts. The site is located in Westchester County, but is near the boundaries of Rockland County (across the Hudson River), Putnam County (to the north), and Orange County (northwest across the Hudson River). Dutchess County is located north of Putnam County, but, as of June

2006, has the distinction of being the county with the largest number of IP2 and IP3 employee residences (see Table 3-2). In 2004, Dutchess, Putnam, Rockland, Orange, and Westchester Counties had a combined total permanent population of 2,000,387 (refer to Table 2-6).

From 1990 to 2000, the average annual growth rates for these counties were 0.77 percent for Dutchess County, 0.54 percent for Westchester County, 0.77 percent for Rockland County, 1.32 percent for Putnam County, and 1.05 percent for Orange County. All counties had greater growth rates than the rate of New York State during the same period. From 1990 to 2000, the state-level average annual growth rate for the State of New York was 0.52 percent [Census 2000 TIGER].

Table 2-6 shows estimated total populations and average annual growth rates between each census for the five counties with the greatest potential to be socioeconomically affected by license renewal activities at the site. Average annual growth rates for 2004 are based on comparison against 2000 population data, and rates for 2025 and 2035 are based on comparison against 2004 population data [Census 2000 TIGER; Brown].

Table 2-6
Putnam County (NY), Rockland County (NY), Orange County (NY), Westchester County (NY), and Dutchess County (NY)
Population Growth, 1990–2035

	Putnam County (NY)		Rockland County (NY)		Orange County (NY)		Westchester County (NY)		Dutchess County (NY)	
Year	Population	Average Annual Growth %	Population	Average Annual Growth %	Population	Average Annual Growth %	Population	Average Annual Growth %	Population	Average Annual Growth %
1990[a]	83,941	--	265,475	--	307,647	--	874,866	--	259,462	--
2000[a]	95,745	1.32	286,753	0.77	341,367	1.05	923,459	0.54	280,150	0.77
2004[a]	100,570	1.24	293,626	0.59	370,352	2.05	942,444	0.51	293,395	1.16
2025[b]	113,917	0.60	288,593	-0.08	415,973	0.55	919,864	-0.12	309,007	0.25
2035[a]	120,738	0.58	278,799	-0.34	445,234	0.68	914,934	-0.05	319,391	0.33

a. Census 2000 TIGER
b. Brown; Census 2000 TIGER

2.6.2 Minority and Low-Income Populations

2.6.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact site" and the four states individually when all or part of a block group is in those states as the "geographic area" for comparative analysis. This approach is presented below. Since the site is also located in close proximity to New Jersey, Connecticut, and Pennsylvania, an alternative approach is also addressed, which uses a combined geographic area of New Jersey, Connecticut, Pennsylvania, and New York. Both approaches were used for assessing minority and low-income population criteria.

NRC guidance suggests using the most recent USCB decennial census data. The 2000 census population data and TIGER/Line data for New York, New Jersey, Connecticut, and Pennsylvania were obtained from the USCB web site and processed using ESRI ArcView® GIS software [ESRI 2006]. Population data at the census block group level were used to identify the minority and low-income population data within a 50-mile radius of the site. A total of 13,126 census block groups were found in this area. The results were compiled and maps were produced showing the geographic location of minority and low-income populations in relation to the site. Information for these block groups was then reviewed with respect to the Nuclear Reactor Regulation criteria for minority and low-income populations [NRC 2004].

2.6.2.2 Minority Populations

The NRC Procedural Guidance for Performing Environmental Assessments and Considering Environmental Issues defines a "minority" population as American Indian or Alaskan Native, Asian, Native Hawaiian or Pacific Islander, Black, other, multi-racial, the aggregate of all minority races, or Hispanic ethnicity [NRC 2004, page D-8]. The guidance indicates that a minority population is considered to be present if either of the two following conditions exists.

(1) The minority population in the census block group exceeds 50 percent.

(2) The minority population is more than 20 percentage points greater in the census block group than it is in the minority percentage of the geographic area chosen for the comparative analysis.

The 2000 census indicates 32.1% of the population in New York, and 25.1% of the population for the four-state area were minority for all races combined, as shown in Table 2-7B. Using the above criteria for identification of the presence of a minority population, when New York is used as the geographic area, any census block group with a combined minority population equal to or greater than 52.1% would be considered to be a "minority population" by the second criteria. However, since 52.1% exceeds the criteria of 50%, the first criteria (50%) would be used by default. When the four-state area is used as the geographic area, any block group with a combined minority population exceeding 45.1% would be considered to be a "minority population area" by criterion 2.

A four-state area was evaluated for minority population area within census block groups because the area within a 50-mile radius of IP2 and IP3 includes portions of New York, New Jersey, Connecticut, and Pennsylvania. Populations within each state were considered individually and as a four-state area.

Table 2-7B summarizes the minority populations by race in each state and in the four-state area as a whole. Table 2-7B provides the total population of the racial segment, its percentage when considered against the state population or four-state area, and the criteria percentage which would classify an area with a block group as a minority area of interest using criteria number 2 above. The resulting percentages and criteria are shown in Table 2-7B. Figures 2-8 through 2-23 reveal the areas within block groups within a 50-mile radius that exceed the criteria percentages for race categories defined in Table 2-7B.

The minority population percentages of New York, New Jersey, Connecticut, and Pennsylvania were taken from the USCB data. A combined or aggregate population of the four-state area was calculated based on these state populations.

Each race was considered within each state and within the four-state area as a whole. In addition, an evaluation was completed that identified a percentage of the population where individuals could be classified in two or more racial categories (e.g., Black and American Indian/ Alaska Native) for each state geographical area or for the four-state area as a whole. An evaluation was completed that identified a percentage of the population where all racial categories were combined for comparison against the state population or against the four-state population. Finally, an additional evaluation was completed to identify the percentage of the population where all racial categories were combined and added to the Hispanic population counts for each state geographical area and for the four-state geographical area as a whole (see Table 2-7B).

Because Hispanic is not considered to be a race by the USCB, Hispanics are already represented in the census defined race categories. Because Hispanics can be represented in the any race category, some white Hispanics not otherwise considered as minorities then become classified as a minority when categorized in the All Races Combined plus Hispanics category. Also, Hispanics that are of non-white racial background are included in both the racial group and the Hispanic group, and thereby double counted. The All Race Combined plus Hispanics category, however, results in the greatest chance of consideration of populations within a block group to be classified as minority.

Census block group data was then evaluated using the criteria shown in Table 2-7B. The results of the evaluation are block group areas that are either flagged as not having a minority population or flagged as having a minority population(s). The percentage of block groups flagged as having a minority population are shown in Table 2-7A. The resulting maps, Figures 2-8 through 2-23 show the location of minority populations for each category.

The percentage of census block groups exceeding the All Races Combined minority population criteria was 37.28 percent when a four-state geographic area was used or 34.97 percent when each individual state was used as the geographic area. For the All Races Combined plus

Hispanic category, 45.48 percent of the block groups within the four-state geographic area contained a minority population, and 45.51 percent of the block groups within a 50-mile radius contained minority populations when each individual state was used. The minority population areas within block groups were significantly reduced when races are analyzed individually.

Table 2-7A
Minority Census Block Counts within 50-Mile Radius

	Four State Combined Method		Individual State Method	
	Number of Block Groups with Identified Racial Category	**% of Block Groups within 50 miles**	**Number of Block Groups with Identified Racial Category**	**% of Block Groups within 50 miles**
Black	2817	21.46	2665	20.30
American Indian / Alaska Native	3	0.02	3	0.02
Asian	759	5.78	672	5.12
Native Hawaiian / other Pacific Islander	0	0.00	0	0.00
Two or More Races Combined	17	0.13	16	0.12
Other	1440	10.97	1171	8.92
All Races Combined	4893	37.28	4590	34.97
All Races Combined and Hispanic	5970	45.48	5973	45.51

Table 2-7B
Minority Populations Evaluated Against Criterion

	New York			New Jersey			Connecticut			Pennsylvania			Four-State Area		
	Total Population			*Total Population*			*Total Population*			*Total Population*			*Total Population*		
	18,976,457			8,414,350			3,405,565			12,281,054			43,077,426		
	Minority Population	**%**	**Criterion**	**Count**	**%**	**Criterion**	**Count**	**%**	**Criterion**	**Count**	**%**	**Criterion**	**Count**	**%**	**Criterion**
Black	3,225,998	17	37	1,211,666	14.4	34.4	340,557	10	34.4	10,328,366	10.5	34.4	30,286,554	13.0	33.0
American Indian / Alaska Native	170,788	0.9	20.9	50,486	0.6	20.6	23,839	0.7	20.7	49,124	0.4	20.4	294,237	0.6	20.7
Asian	1,176,540	6.2	26.2	521,690	6.2	26.2	95,356	2.8	22.8	245,621	2	22	2,039,207	4.3	24.3
Native Hawaiian / Other Pacific Islander	37,953	0.2	20.2	8,414	0.1	20.1	3,406	0.1	20.1	-	0	20	49,773	0.1	20.1
Two or More Races	588,270	3.1	23.1	210,359	2.5	22.5	74,922	2.2	22.2	147,373	1.2	21.2	1,020,924	2.3	22.3
All Races Combined	6,091,443	32.1	50.0	2,305,532	47.4	50.0	626,624	18.4	38.4	1,793,034	14.6	34.6	10,816,633	25.1	45.1
All Races Combined and Hispanic	9,791,852	61.6	50.0	3,702,314	44	50.0	1,004,642	29.5	49.5	2,308,838	18.8	38.8	16,807,646	39.0	50.0
Other	1,726,858	9.1	29.1	580,590	6.9	26.9	146,439	4.3	24.3	184,216	1.5	21.5	2,638,103	5.5	25.5

2.6.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds [NRC 2004, page D-8]. The guidance identifies an area as a low-income population area if the percentage of households below the poverty level is significantly greater (typically at least 20 percent) than the low-income household percentage in the area chosen for comparative analysis. As addressed above with minority populations, two alternative geographic areas (New York, New Jersey, Connecticut, and Pennsylvania individually and then all four states combined) were used in this analysis.

The 2000 census data indicate that 14.2 percent of the population of New York, 8.3 percent of the population of New Jersey, 7.6 percent of the population of Connecticut, 10.6 percent of the population of Pennsylvania, and 11.5 percent of the population within the four-state area was composed of low-income individuals as shown in Table 2-8. When New York is used as the geographic area, any census block group within a 50-mile radius of the site with low-income population equal to or greater than 34.2 percent of the total block group population would be considered a "low-income population." Using these criteria for each state, 1,370 of the 13,126 census block groups (10.4 percent) within a 50-mile radius of the site have low-income population percentages which meet or exceed the percentages in Table 2-8. Most of these census block groups are located 29 to 40 miles south of the site in the areas of Bronx, Queens, Kings, and New York counties in New York, and Passaic, Hudson, and Essex counties in New Jersey as shown in Figure 2-24.

When the four-state combined area is used as the geographic area, any census block group within a 50-mile radius of the site with low-income populations equal to or greater than 31.5 percent of the total block group population would be considered a "low-income population." Using these criteria, 1,551 of the 13,126 census block groups (11.8 percent) within a 50-mile radius of the site have low-income population percentages which exceed 31.5 percent. Most of these census block groups are located 29 to 40 miles south of the site in the areas of Bronx, Queens, Kings, and New York counties in New York, and Passaic, Hudson, and Essex counties in New Jersey as shown in Figure 2-25.

Table 2-8
Low-Income Population Criteria Using Two Geographic Areas

Geographic Area	Total Population	Number of Persons Below Poverty Level	Percentage of Persons Below Poverty Level	Percentage of Low-Income Criterion
New York	18,976,457	2,692,202	14.2%	34.2%
New Jersey	8,414,350	699,668	8.3%	28.3%
Connecticut	3,405,565	259,514	7.6%	27.6%
Pennsylvania	12,281,054	1,304,117	10.6%	30.6%
Four-State Area	43,077,426	4,955,501	11.5%	31.5%
Reference: Landview 6				

Overall, low-income populations within the 50-mile radius "impact site" were a small percentage of the overall population. The percentage of census block groups exceeding the low-income population criteria was 11.8 percent when a combined four-state geographic area was used or 10.4 percent when the individual states were used as the geographic area.

2.7 Taxes

Payment-in-lieu-of-taxes (PILOT) payments, property taxes, and other taxes from the site are paid directly to the Town of Cortlandt, the Village of Buchanan, and the Hendrick Hudson Central School District (see Table 2-9). The payments to the Town of Cortlandt are distributed to the Town of Cortlandt, Westchester County, the Verplanck Fire District, the Hendrick Hudson Central School District, and Lakeland Central Schools.

As shown in Table 2-9, the site paid a combined $21.2 million in PILOT payments, property taxes, and other taxes to Westchester County, the Town of Cortlandt, the Village of Buchanan, the Verplanck Fire District, and the Hendrick Hudson Central School District in 2005. PILOT payments, property taxes, and other taxes paid by the site account for a significant portion of revenues for these government agencies (Table 2-9). Approximately 70 percent of the PILOT payments go to the Hendrick Hudson Central School District (see Table 2-9). The remainder is divided between the Village of Buchanan, Westchester County, the Town of Cortlandt, and the Verplanck Fire District.

The Village of Buchanan is the principal local jurisdiction that receives direct revenue from the site. In fiscal year 2005, PILOT payments, property taxes, and other taxes from the site contributed about 39 percent of the Village of Buchanan's total revenue of $5.08 million, which is used for police, fire, health, transportation, recreation, and other community services for over 2,100 residents [NYSOSC]. Additionally in fiscal year 2005, PILOT payments, property taxes,

and other taxes from the site contributed over 35% of the total revenue collected for the Hendrick Hudson Central School District, which serves 2,885 students.

A report by the Nuclear Energy Institute (NEI) concluded that the site, which is located near the Village of Buchanan, had an economic impact of $763 million in 2002 in Westchester, Rockland, Orange, Putnam, and Dutchess counties [NEI]. Taxes and PILOT payments paid by the site have a positive impact on the fiscal condition of Westchester County, especially the school districts. Continued operation of the plant would provide a significant continuing source of tax revenues to the local community.

Entergy also pays approximately one million dollars per year to NYSERDA for lease of the discharge canal structure and underlying land [NYSERDA]. These are additional monies which Entergy contributes to the New York State economic base.

Table 2-9
Tax Distribution, 2003–2006[a]

Taxes Paid To	Tax Recipients	Type of Tax	2003	2004	2005	2006
Town of Cortlandt	Westchester County, Town of Cortlandt, Verplanck Fire District	PILOT and Property Tax	5,023,579	4,659,642	3,773,590	3,748,804
Town of Cortlandt[b]	Hendrick Hudson Central School District (CSD)	PILOT	10,077,000	--	--	--
Hendrick Hudson CSD[b]	Hendrick Hudson Central School District (CSD)	PILOT	--	9,524,000	9,358,500	7,585,000
Hendrick Hudson CSD[c]	Hendrick Hudson Central School District (CSD)	PILOT	9,524,000	9,358,500	7,585,000	7,688,500
Town of Cortlandt[b]	Lakeland Central Schools	Property Tax	32,710	35,569	--	--
Town of Cortlandt[c]	Lakeland Central Schools	Property Tax	35,569	--	--	--
Town of Cortlandt[c]	Lakeland Central Schools and Hendrick Hudson CSD	Property Tax	--	190,099	277,337	314,297

Table 2-9
Tax Distribution, 2003–2006[a]

Taxes Paid To	Tax Recipients	Type of Tax	2003	2004	2005	2006
Village of Buchanan[d]	Village of Buchanan	PILOT and Property Tax	2,271,753	2,184,044	1,984,680	2,023,151
New York State Department of Taxation and Finance	Westchester County	Sales Use	484,149	797,281	279,724	168,253
New York State Department of Taxation and Finance	State of New York	Sales Use	725,014	1,060,973	356,056	199,411
	Total		**28,173,774**	**27,810,108**	**23,614,887**	**21,727,416**

a. Fiscal year, if not otherwise defined, extends from January 1st of indicated year through December 31st of the year.
b. Fiscal year extends from July 1st of prior year through June 30th of the indicated year.
c. Fiscal year extends from July 1st of indicated year through June 30th of the subsequent year.
d. Fiscal year extends from June 1st of indicated year through May 31st of the subsequent year.

The energy market in the State of New York has been deregulated to encourage the development of competition of 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 [SNY]. However, the expectation is that any new PILOT payments negotiated in the license renewal term should be similar to the payments shown in Table 2-9.

2.8 Land Use Planning

Land use planning focuses on Westchester, Rockland, Dutchess, Orange, and Putnam counties in New York, since the operation of the site and its associated tax base as well as employment is important to the economy of these counties. These counties are the major residences for the site employees that affect several facets of land use. Unlike the direct contributions to the Westchester County tax base, the surrounding counties still retain the benefits of increased property tax revenue and an expanded economy based on the 1,255 people employed by the site (as of June 2006).

2.8.1 Existing Land Use Trends

Westchester County occupies roughly 500 square miles (320,000 acres). Westchester County is hillier in the north with elevations ranging from approximately 984 feet above sea level at Bailey Mountain, to approximately sea level along the Hudson River that borders the western edge of the county [USGS 1999]. Approximately 9,917 acres were in agricultural land use as of 2002, and major agricultural land uses consist of woodland (48.84%), cropland (24.83%), pasture (12.81%), and other uses (13.53%) [USCB 2000c; USDA 2002e]. Other than agriculture, the U.S. Census does not define land uses within counties. The USGS National Land Cover Database does provide land use information, including, but not limited to, commercial/industrial and residential land use. Other land uses are provided from the most recent (1992 for New York) USGS database for Westchester County in Table 2-10 [USGS 1992]. As reflected in Table 2-10, residential land areas cover approximately 30.1 percent of the 320,000 acres in Westchester County, with approximately 3.1 percent being devoted to commercial/industrial/transportation uses.

Dutchess County occupies roughly 825 square miles (528,000 acres) [USCB 2000c]. Dutchess County's highest elevation is the summit of Brace Mountain, at 2,315 feet. The lowest elevation of the county is at sea level along the Hudson River, which is the county's western border [USGS 1999].The largest category of land use in Dutchess County is agriculture. Evenly distributed throughout the county, land used for agriculture comprises 21.3% (112,339 acres) of the county's area [USDA 2002a]. Major agricultural land uses consist of cropland (52.75%), woodland (23.32%), pasture (11.12%), and other uses (12.81%) [USDA 2002a]. Other land uses are provided from the most recent (1992 for New York) USGS database for Dutchess County in Table 2-10 [USGS 1992]. As reflected in Table 2-10, residential land areas cover approximately 7.1 percent of the 528,000 acres in Dutchess County, with approximately 1.4 percent being devoted to commercial/industrial/transportation uses.

Dutchess County is distinctively different from its neighboring counties to the south in that it contains a combination of urban and rural settings rather than metropolitan areas. Currently Dutchess County is conserving open spaces such as farms while increasing the number of housing units available in order to have urban areas coexist with farms [GCR].

Orange County occupies roughly 839 square miles (536,960 acres). Orange County's highest elevation is Schunemunk Mountain, at 1,663 feet. The lowest elevation in the county is at sea level along the Hudson River, which creates the eastern county border [USGS 1999]. Approximately 107,977 acres are used for agricultural purposes, with major agricultural land uses consisting of cropland (65.53%), woodland (16.50%), pasture (8.99%), and other uses (8.98%) [USCB 2000c;USDA 2002b]. Other land uses provided from the most recent (1992 for New York) USGS data base for Orange County are shown in Table 2-10 [USGS 1992]. As reflected in Table 2-10, residential land areas cover approximately 7.5 percent of the 536,960 acres in Orange County, with approximately 1.7 percent being devoted to commercial/industrial/ transportation uses.

Within Orange County three interstates intersect, which provide access to any area within the state of New York and across the United States. A by-product of the county's interstate road access is a clustering of industry and commercial development along the corridors. In the past two decades, "big box" retailers have altered shopping patterns, challenging efforts to reinvigorate commercial centers of traditional downtowns [OCCP]. Recently most new development has occurred in the southeastern corner of the county due to the access to major transportation corridors. Additionally, the largest land development in the southeastern part of the county is the United States Military Academy at West Point (Figure 2-2) [OCCP].

Putnam County occupies roughly 246 square miles (157,440 acres). Approximately 6,720 acres (4.3 percent) are in agricultural use, with major agricultural land uses consisting of woodland (59.87%), cropland (26.49%), and other uses (13.65%) [USCB 2000c; USDA 2002c]. Putnam County's highest elevation is Scofield Ridge, at approximately 1,545 feet. The lowest elevation in the county is at sea level along the Hudson River, which creates the western border [USGS 1999].

Putnam County is one of the fastest growing counties in New York [PC]. Due to the hilly topography covering the majority of the county, development has been prevented in the more rugged parts of the county. Additionally, there are many wetlands throughout the landscape. The most significant wetland in the county is the Great Swamp, which is a 4,200-acre wetland that has been delineated by the NYSDEC. Agricultural land use, undeveloped land, and forest land within the county has experienced a reduction. Residential land use occurs on large lot subdivisions or in rural areas. Industrial and commercial development can be found around the Villages and along the major transportation routes [PC]. Residential land use accounts for approximately 6.9 percent of the County's 157,440 acres, while only 1.1 percent is used for commercial/industrial/transportation purposes (see Table 2-10).

Rockland County occupies roughly 199 square miles (127,360 acres). Approximately 610 acres were in farm land use in 1997, with major agricultural land uses consisting of cropland (47.43%), woodland (31.92%), un-disclosable (18.37%), and other uses (2.29%) [USCB 2000c; USDA 2002d]. Rockland County's highest elevation is Rockhouse Mountain, at 1,280 feet. The lowest elevation of the county is at sea level along the Hudson River, which is the county's eastern border [USGS 1999].

The largest category of land use in Rockland County is state park land. Located in the north and west portions of the county, state park land encompass 30,000 acres or 23.6% of land use in the county [RCNY 2006] Single-family residential area comprises 26% of land development whereas commercial and business development is comprised of 1.7% and is concentrated along major transportation corridors [RCNY 2001].

Westchester County occupies roughly 432 square miles (276,480 acres). According to the 2002 USDA Census of Agriculture County Profile, 129 farms were located in Westchester County, which is a 10% increase since 1997 [USDA 2002e]. Land acreage associated with farms increased 14% during this period with total acreage increasing from 8,681 acres to over 9,917 acres. The average size of farms also increased 4%, from 74 to 77 acres from 1997 to 2002.

Farming commodities include truck crops (melons, potatoes, and vegetables), berries, sod, and nursery products. The major crops in the county are hay and silage. The major farm commodities in Westchester County are nurseries and greenhouses. [USDA 2002e] As reflected in Table 2-10, residential land uses cover approximately 30.1 percent of the 276,480 acres in Westchester County, with approximately 3.1 percent being devoted to commercial/ transportation uses.

The Town of Cortlandt, located within Westchester County, encompasses 34.5 square miles (22,080 acres) [TOCNY 2006]. Land use is predominately residential zoning with half-acre to two-acre plots further protecting environmentally sensitive areas and open spaces [TOCNY 2004]. The town's growth was intentionally slowed over the past several decades, allowing the town's leaders to plan its development. Significant commercial development has taken place along major transportation corridors, as well as new community facilities within the area.

The Village of Buchanan is located within the Town of Cortlandt in Westchester County, New York and encompasses 1.4 square miles (896 acres) [VBNY 1998]. Land use in the Village has changed very little over the last 20 to 30 years. The Village of Buchanan recently began restoring older buildings to beautify the Village square [Miller]. The Village of Buchanan has zoning ordinances, subdivision ordinances, and a development review board [Miller].

Table 2-10
Dutchess County (NY), Orange County (NY), Putnam County (NY), Rockland County (NY), and Westchester County (NY) Land Use
1992 Land Use Type (%)

DESCRIPTION	Putnam	Westchester	Rockland	Orange	Dutchess
Open Water	5.37433	4.10038	2.97018	2.12432	1.25066
Low Intensity Residential	5.60736	24.86982	31.67071	6.35610	5.72884
High Intensity Residential	1.27632	5.26930	5.63640	1.18909	1.35081
Commercial/Industrial/ Transportation	1.10678	3.12225	3.71102	1.70774	1.35554
Bare Rock/Sand Clay	0.00000	0.02296	0.00466	0.00000	0.00000
Quarries/Strip Mines/Gravel Pits	0.04057	0.07591	0.07638	0.08915	0.26937
Deciduous Forest	38.70785	13.11314	19.58748	31.37327	35.13230
Evergreen Forest	4.71496	8.16721	3.52290	3.35159	4.23283
Mixed Forest	34.38621	32.05603	27.81898	27.28232	27.13790
Pasture/Hay	3.36646	3.07115	0.34010	17.18076	16.45764
Row Crops	0.78436	0.56710	0.17219	5.53976	2.86614
Urban/Recreational Grasses	0.76144	3.62480	2.75737	1.38914	1.06345

Table 2-10
Dutchess County (NY), Orange County (NY), Putnam County (NY), Rockland County (NY), and Westchester County (NY) Land Use
1992 Land Use Type (%)

Woody Wetlands	3.57529	1.70070	1.40142	2.29430	2.99986
Emergent Herbaceous Wetlands	0.29808	0.23926	0.33019	0.12244	0.15468
Total Percent	100.00000	100.00000	100.00000	100.00000	100.00000

Reference: USGS 1992

2.8.2 Future Land Use Trends

Urban sprawl and its associated conversion of forest and farmlands to commercial and residential development is an important issue in New York. Since 1992, land use and development have been regulated by the Open Space Conservation Plan and are enforced by the Quality Communities Task Force [NYSL]. Open space is land that is not intensively developed for residential, commercial, industrial, or institutional use [NYSL].

Dutchess County is planning to create developments in central locations by developing mass transit systems and waterways. Retail areas are planned to be centralized and within convenient walking distance from these transient terminals. Developments outside the primary growth areas are designed to blend into the natural landscape. In this way, Dutchess County hopes to maintain its open spaces and farming culture [PAD; GCR].

Rockland County has developed a budget line item that will allow for the acquisition of greenways in need of preservation. Many municipalities within the county are working together to utilize and improve the waterfront along the Hudson River. With innovative zoning solutions addressing the issue of housing and open space preservation, many municipalities within Rockland have encouraged open space preservation [RCNY 2001].

Orange County's Comprehensive Development Plan continues to recognize the importance of transportation hubs, interchanges, crossroads, and corridors linking these infrastructures with their historic centers [OCCP]. A challenge for the County is generated by the dynamic real estate market and the loss of open spaces. The county, along with civic organizations, is inventorying current open spaces and defining and recommending future open space needs. The county also plans to initiate a redevelopment program to assist with historically improving the city and villages within the county. With the growth of Orange County increasing, nontraditional zoning strategies will help maintain historical and open spaces throughout the county [OCCP].

Putnam County's development is integrated into the natural environment that enhances the views of the Hudson River [PC]. The county and municipalities within are working together by changing the zoning ordinances and subdivision regulations to preserve strategic historic structures and protect open spaces, while providing affordable housing and development throughout the county [PC].

Westchester County has incorporated money within its budget funds for open space preservation [NYLCV]. Residents have also approved several tax increases as well as certain bonds to help with open space preservation [WLT]. Since November 2000, fifteen Westchester cities, towns, and villages have set aside 35 million dollars for land preservation [WLT]. The long-range plan for the physical development of Westchester County concentrates on three distinct physical characteristics: centers, corridors, and open space [WCD].

The Town of Cortlandt, located within Westchester County, has had great success in maintaining open space and protecting its environment and natural resources. By revising its zoning codes, the town will be able to reduce the potential full build by 40% and control its growth and development [TOCNY 2004]. From 1992 to 2004, the Town of Cortlandt has increased open

space by 65% from 2,729 acres to 4,502 acres [TOCNY 2004]. The town also has made an effort to increase public access to the Hudson River waterfront and encourage historic preservation [TOCNY 2004].

2.9 Housing

As of June 2006, the site has a permanent staff of approximately 1,255 employees. Due to the significant population in the site vicinity, site employees generally reside within the 50-mile radius surrounding the station. The nearest five counties with employee residences are Dutchess, Orange, Putnam, Rockland, and Westchester Counties in the State of New York. The remainder of the employees lives in outlying counties, including some employees that live in New Jersey, Connecticut, Pennsylvania, and other states.

Between 1990 and 2000, the total population of the counties near the site has increased (Table 2-6). The population increased from 259,462 to 280,150 in Dutchess County, from 307,647 to 341,367 in Orange County, from 83,941 to 95,745 in Putnam County, from 265,475 to 286,753 in Rockland County, and from 874,866 to 923,459 in Westchester County. During this same period, the number of housing units increased at about the same pace as the population increase. In the five-county area near the site, total housing units increased approximately 6% as shown in Table 2-11. Total housing units increased from 97,632 to 106,103 in Dutchess County, from 110,814 to 122,754 in Orange County, from 31,898 to 35,030 in Putnam County, from 88,264 to 94,973 in Rockland County, and from 336,727 to 349,445 in Westchester County.

The vacancy rates in the five counties have changed from 1990 to 2000 as shown in Table 2-11. Putnam County had the highest vacancy rate of approximately 6.6% in 2000, a decrease of 44.5% since 1990. The vacancy rate in Dutchess County decreased from 8.3 to 6.2%, Orange County decreased from 8.4 to 6.5%, in Rockland County the rate decreased from 3.8% to 2.4%, and in Westchester County the rate dropped from 5.0% to about 3.5%.

The median home values for the five-county area increased between 1990 and 2000 as shown in Table 2-11. Values increased 3.4% in Dutchess County, 2.0% in Orange County, 6.1% in Putnam County, 11.7% in Rockland County, and 14.9% in Westchester County. In the 10-year period, the median monthly rent (contracted) increased in the five counties. Dutchess County increased by 17.8%, Orange County increased by 23%, Putnam County increased by 21%, Rockland County increased by 28.1%, and Westchester County increased by 44%.

Vacancy rates have decreased and the total number of new housing units has kept pace with the low to moderate growth in the area population. In all five of the nearest counties, home values and rental rates have shown moderate increases. Overall, the housing market in the surrounding area shows steady growth since 1990.

Table 2-11
Dutchess County (NY), Orange County (NY), Putnam County (NY), Rockland County (NY), and Westchester County (NY) Housing Statistics, 1990–2000

	1990[a]	2000[b]	% Change
Dutchess County, NY			
Total Housing Units	97,632	106,103	8.7
Occupied Units	89,567	99,536	11.1
Vacant Units	8,065	6,567	(18.6)
Vacancy Rate (%)	8.3	6.2	(25.3)
Median House Value ($)	149,200	154,200	3.4
Median Rent ($/month)	600	707	17.8
Orange County, NY			
Total Housing Units	110,814	122,754	10.8
Occupied Units	101,506	114,788	13.1
Vacant Units	9,308	7,966	(14.4)
Vacancy Rate (%)	8.4	6.5	(22.6)
Median House Value ($)	141,700	144,500	2.0
Median Rent ($/month)	513	631	23.0
Putnam County, NY			
Total Housing Units	31,898	35,030	9.8
Occupied Units	28,094	32,703	16.4
Vacant Units	3,804	2,327	(38.8)
Vacancy Rate (%)	11.9	6.6	(44.5)
Median House Value ($)	195,000	206,900	6.1
Median Rent ($/month)	672	813	21.0
Rockland County, NY			
Total Housing Units	88,264	94,973	7.6
Occupied Units	84,874	92,675	9.2
Vacant Units	3,390	2,298	(32.2)

Table 2-11 (Continued)
Dutchess County (NY), Orange County (NY), Putnam County (NY), Rockland County (NY), and Westchester County (NY) Housing Statistics, 1990–2000

	1990[a]	2000[b]	% Change
Vacancy Rate(%)	3.8	2.4	(36.8)
Median House Value ($)	217,100	242,500	11.7
Median Rent ($/month)	633	811	28.1
Westchester, NY			
Total Housing Units	336,727	349,445	3.8
Occupied Units	320,030	337,142	5.3
Vacant Units	16,697	12,303	(26.3)
Vacancy Rate(%)	5.0	3.5	(30.0)
Median House Value ($)	283,500	325,800	14.9
Median Rent ($/month)	543	782	44.0

a. BCWC
b. NYLCV

2.10 Social Services and Public Facilities

2.10.1 Public Water Supply

The site is located in the northwest corner of Westchester County, New York, approximately four miles south of the Putnam County line and approximately four miles southeast of the Orange County line. Rockland County, New York, is located across the Hudson River to the west.

The site does not utilize a public-water system for plant circulating and service water purposes, but instead relies on surface water from the Hudson River. Potable water and process water is supplied to the site by the Village of Buchanan water supply system. Based on invoiced water bills, the site utilizes approximately 2,326,200 cubic feet or 17,400,000 gallons per month of potable water [VBNY 2006]. There are no identified restrictions on the supply of potable water from the Village of Buchanan. As discussed below, the Village of Buchanan obtains water from two sources, the City of Peekskill Public Water System (PWS) and the Montrose Improvement District. While the demand on the City of Peekskill PWS currently appears to be near the system design capacity, the contract with the Montrose Improvement District (now consolidated with the Northern Westchester Joint Water Works) will be able to provide adequate supply based on treatment capacity upgrades discussed below.

Public water supply systems (see Table 2-12) in the vicinity of the site include community and non-community (including non-transient non-community and transient non-community) systems. Community water systems within a 10-mile radius of the site include Westchester, Putnam, Orange, and Rockland County systems. Each of these county systems utilize both groundwater and surface water sources [USEPA 2006b]. Although outside the 10-mile radius, public water supply systems in Dutchess County were reviewed in this evaluation because Dutchess County provides residence to the largest percentage of site permanent full-time employees (42%). Approximately 57% of the Dutchess County community water systems, including the Poughkeepsie water supply system, obtain water from surface water sources which include the Hudson River [USEPA 2006b].

The Village of Buchanan purchases water from the City of Peekskill Public Water System (PWS) and the Montrose Improvement District. The City of Peekskill has two sources of water, both of which are surface waters. The City of Peekskill's year round major water source originates in the Town of Putnam Valley (Putnam County). The City of Peekskill's second source of water is an emergency source from a neighboring community, via the Catskill Aqueduct. Water is pumped to the Camp Field Reservoir in the City of Peekskill, where it is then filtered and treated. [PWD].

The Catskill Aqueduct obtains its water from the Ashokan and Schoharie Reservoirs. The Delaware Aqueduct obtains its water from the Rondout, Neversink, Pepaction, and Cannonsville reservoirs which then flows into the Kensico Reservoir [WCDH].

Eighty percent of the Town of Cortlandt water supply is purchased from the Montrose Improvement District, which treats raw water purchased from the New York City Catskill Aqueduct. Ten percent is purchased from the City of Peekskill, which filters and treats raw water pumped from the Peekskill Hollow Brook to the city's Camp Field Reservoir, and ten percent is purchased from the Town of Yorktown, which purchases water filtered and treated by the Westchester County-owned Amawalk treatment plant. [CCWD]

The Cortlandt Consolidated Water District has joined with the Yorktown and Montrose Improvement District in a new corporation known as the Northern Westchester Joint Water Works (NWJWW). The NWJWW has assumed ownership of the Amawalk treatment plant, which has been upgraded to 7 million gallons per day (gpd) capacity. A new NWJWW 7,000,000 gpd plant (Catskill water treatment plant) has been in operation since 2000. [CCWD]

Westchester Joint Water Works (WJWW) serves the municipalities of the Village/Town of Mamaroneck, Town/Village of Harrison, portions of the City of New Rochelle, and the City of Rye. WJWW, which has a capacity of 14,200,000 gpd and an average daily demand of 13,100,000 gpd, obtains its water from the Catskill and Delaware watersheds of the New York City water system, which includes the Delaware Aqueduct, Rye Lake (Delaware watershed), and the Kensico reservoir. [WJWW]

A majority of Rockland County uses groundwater to supply numerous small public water systems, most of which are supplied by a single well [RWS]. The large public water systems of Rockland County include United Water New York (UWNY), Nyack Village PWS, and Suffern Village PWS. [RWS]. UWNY provides water to approximately 267,000 residents from 53

groundwater wells drilled throughout the county, Lake DeForest, and the Letchworth reservoirs [UWNY]. UWNY's peak demand in 2006 was estimated at 47.5 million gpd and its peak supply at approximately 48.5 million gpd [RCDH].

The Poughkeepsies' Water Treatment Facility, which is owned and operated by the City and Town of Poughkeepsie, provides drinking water in Dutchess County to the City of Poughkeepsie, Town of Poughkeepsie, and Village of Wappingers Falls. The plant is located along and draws water from the Hudson River. The plant was built in 1962 and is currently rated at a maximum capacity of 16 million gpd. Average demand is reported to be approximately 8 million gpd. [PTWD]

The Village of Ossining Water System in Westchester County is supplied from two surface water sources: the Indian Brook Reservoir, located near Fowler Avenue and Reservoir Road, and the Croton Reservoir, which is part of the New York City Water System. The average blend of water is approximately 63 percent from the Croton Reservoir and 37 percent from the Indian Brook Reservoir. The System obtains its water from the Croton watershed in Putnam and Westchester Counties and serves approximately 30,000 people. The Village of Ossining Water System services an average daily demand of approximately 3.7 million gpd. [VOWS]

Many public water supply systems supply only small segments of the population. For example, Orange County has approximately 150 public water systems, but no major public water systems were identified within 10 miles of Indian Point [OCWD]. Groundwater is the primary source of both community and non-community water supply systems and serves 60 to 85 percent of the population in the area [NWWW; OCWD; PCWD; RCDW]. Large areas of Westchester, Putnam, Orange, Rockland, and Dutchess Counties are not served by community water supplies. Therefore, private water supplies rely primarily on groundwater sources. The groundwater quality in New York is generally good, but contamination can and does occur locally. Groundwater quality threats based on land use in Westchester County are illustrated in Figure 2-26. Major contaminants typically include bacteria, nitrates, and organic compounds [WCDP 2003].

The Village of Croton-on-Hudson public water system is supplied by a groundwater well system located downstream from the New Croton Dam and spillway. Groundwater is pumped from the well system directly into the distribution system. The system has a total storage capacity of 2.3 million gallons, and supplies approximately 7,600 people an average of 1.1 million gpd. [VCOH]

Within a one-mile radius of the site, there are seven USGS registered wells. These wells range in depth from 30 feet to 500 feet below land surface [USGS 2006a]. Available information indicated these wells are listed as unused, domestic use, and commercial use wells. Pumping rate information available for these wells range from 4 gpm to 30 gpm [USGS 2006b]. (See Table 2-12.)

Table 2-12
Major Community Water Supply Systems Within the Area

Public Water System (PWS)	County[a]	Source	Capacity (gpd)	Demand (gpd)[b]
Northern Westchester Joint Water Works[c]	Westchester	Surface	14,000,000	6,887,000
Peekskill, NY	Westchester	Surface	4,000,000	3,900,000
Croton-on-Hudson, NY	Westchester	Groundwater	2,300,000	1,100,000
Westchester Joint Water Works	Westchester	Surface	14,200,000	13,100,000
Ossining, NY	Westchester	Surface	6,000,000	3,700,000
Poughkeepsie, NY	Dutchess	Surface	16,000,000	8,870,000
United Water New York	Rockland	Groundwater and Surface	48,500,000	47,500,000
Village of Suffern	Rockland	Groundwater	4,000,000	2,000,000
Village of Nyack	Rockland	Surface	3,000,000	1,800,000

a. Orange County is not included in this table as it is not a major water supplier for the area.
b. Average daily demand. Information obtained from 2005 Annual Drinking Water Quality Report for each respective PWS [PWD; CCWD; VCOH; VOWS; WJWW; RCDH; VSDPW; VNWP]
c. Includes the Cortlandt Consolidated Water District, Yorktown Improvement District, and the Montrose Improvement District [CCWD]

An estimated 85,000 residents north of Kensico Dam in Westchester County use groundwater as their primary water source. Exceptions are residents using surface water or aqueduct sources in Mt. Kisco, parts of the Town of Yorktown, much of the Town of Cortlandt, and most municipalities directly adjoining the Hudson River [WCDP 2003]. Approximately 15 percent of the residents of the Town of Cortlandt are estimated to use groundwater supplies [WCDP 2003, Table 2]. However as the Village of Buchanan, which supplies water to the site, purchases public drinking water from surface water supplies and the site does not utilize groundwater for cooling operations, service water, or potable water, the continued operation of the site is not expected to impact local groundwater supplies [USEPA 2006b]. As already discussed, the site utilizes surface water from the Hudson River for plant operations and the Village of Buchanan PWS supplies potable water and process water. Therefore, the operation of the site is not expected to affect the future demand on the public water supplies identified in Table 2-12.

2.10.2 Transportation

The area within a 6-mile radius of the site is bisected by the Hudson River, with the site located on the eastern side of the river in Westchester County, and with Putnam County located north of Westchester County. Rockland and Orange counties lie on the western side of the Hudson River. Rockland County borders the Hudson River due west of the site, with Orange County to the northwest. Several major highway routes serve as transportation corridors along either side of the Hudson River valley. Level of service (LOS) determinations are performed by the state for major highways, but not for smaller state routes or local roads. Transportation is addressed in the counties within the 6-mile radius of the site.

2.10.2.1 Westchester and Putnam Counties

Westchester County and Putnam County are located on the eastern side of the Hudson River. The primary highways in Westchester County include Interstate 684, US Highways 9, 6, and 202, and the Taconic State and Saw Mill Parkways (Figures 2-1 and 2-2). US Highway 9 runs north and south along the Hudson River Valley through both Westchester and Putnam County. Further east, the Taconic State Parkway also runs north and south through both counties. The Taconic State Parkway and the Saw Mill Parkway connect near Hawthorne, New York, southeast of the site. Interstate 684 runs north and south along the eastern side of Westchester County and connects to Interstate 84 in Putnam County. US Highway 6 runs east and west through the southern end of Putnam County and the northern portion of Westchester County. US 202 runs east and west across northern Westchester County. The Saw Mill Parkway extends northeast and southwest between US Highway 9 at Riverdale, New York, and Interstate 684. Additional highways within the two counties include State Highway Routes 117, 120, 129, 100, 139, and 301.

The nearest highway serving the site area is US Highway 9. Using local roads from US Highway 9, the site can be accessed from Broadway.

The New York State Department of Transportation (NYSDOT) provides traffic counts for major highways [NYSDOT]. A summary of the most current NYSDOT estimates for average annual daily traffic counts on Highway 9 north and south of the site is shown in Table 2-13.

Table 2-13
Average Annual Daily Traffic Counts on US 9 Near the Site, 1996-2004

Location	1996	1997	1999	2000	2002	2003	2004
US Highway 9 from Montrose crossing to Route 9A overlap[a]	No Data	No Data	38,500	No Data	42,700	49,900	50,500
US Highway 9 from Peekskill city line to Montrose crossing	No Data	13,100	No Data	12,200	No Data	11,600	11,800[b]
US Highway 9 from Montrose crossing to Old Post Rd crossing	4,750	No Data	4,800	No Data	5,750	No Data	5,950[b]

a. Readings taken at a Continuous Count Station (accounts for seasonal and daily variation)
b. NYSDOT projection from the latest year for which data was available.

2.10.2.2 Rockland and Orange Counties

Rockland County and Orange County are located on the western side of the Hudson River. The Palisades Interstate Parkway is the largest highway system in Rockland County, running north and south through the county, and connecting with US Highway 6 and US Highway 9W in southeastern Orange County (Figure 2-2). US Highway 9W runs north and south along the Hudson River and connects with Interstate 87 to the south at the Village of Nyack, New York. Interstate 87 travels north and south through Orange County, but loops toward the east across Rockland County, crosses the Hudson and intersects US Highway 9, the Saw Mill Parkway, and the Taconic State Parkway in Westchester County. US Highway 202 runs northeast and southwest through Rockland County till it meets US Highway 9W, and then crosses the Hudson River and runs easterly and intersects the Taconic State Parkway. Route 17 (future Interstate 86) runs northwest and southeast across Orange County to where it intersects Interstate 87, and turns south until it intersects State Highway Route 3 near New York City. Interstate 84 runs east and west through Orange County, crosses the Hudson River, and travels down Dutchess County, and into Putnam County were it meets Interstate 684. Major state highways within a 50-mile radius of the site west of the Hudson River include Route 94, Route 17, and Route 17A in Orange County.

2.10.2.3 Dutchess County

Dutchess County is located approximately thirteen miles north of the site, on the east side of the Hudson River. The major roads in this county are Interstate 84, US Highway 44, US Highway 9, Route 199 (Taconic State Parkway), and Route 22. Interstate 84 and US Highway 44 run east and west in the southern and central portions of the county, respectively. State Highway Route

199 (Taconic State Parkway), Route 22, and US Highway 9 run north and south in the central, eastern, and western portions of the county, respectively.

2.10.3 Education

The State of New York is divided into numerous school districts. School districts within 0.8 km (0.5 mile) of Indian Point are the Lakeland School District, Peekskill School District, Hendrick Hudson Central School District, and the Croton Harmon School District. Indian Point is located in the Hendrick Hudson Central School District.

The NRC's 1996 GEIS reported the Hendrick Hudson Central School District had the same number of schools before the construction of the plant. The local school administrator indicated that the construction and operations phases of Indian Point have not had an effect on schools in the district. An increase in enrollment was concurrent with the development of Indian Point. However, there was also a nationwide baby boom at this time, so this enrollment cannot be directly linked to the plant. [NRC 1996, Appendix C, C.4.4.4.1]

Local school officials in each of the school districts were interviewed by NRC representatives, and the overall finding was of insignificant impacts due to the construction or operation of the plant. The Croton Harmon director of pupil services indicated very little change since the construction of the plant. The Lakeland School District experienced substantial growth in the 1950s and 1960s, reaching a peak enrollment in 1973. Although this growth occurred at roughly the same time as the plant construction, the construction itself did not have a major effect on the district. The Lakeland School District has been more heavily influenced during operations by industry in the Poughkeepsie and Yorktown area as opposed to the operation of the plant. [NRC 1996, Appendix C, C.4.4.4.1]

The Hendrick Hudson Central School District is located at a scenic location along the Hudson River in suburban Westchester County approximately 45 miles north of Manhattan. The District includes Buchanan, Verplanck, Crugers, Montrose, and parts of Cortlandt Manor, Croton, and the City of Peekskill. The Hendrick Hudson district enrollment was reported to be approximately 2,832, with class sizes ranging from 18 to 21 students [HHSD]. The District's reported total general fund expense for 2005-06 was $56,387,279 [NYSED 2006b]. The District reports an approximate cost per pupil of $20,152 [HHSD]. In all, Westchester County has 40 school districts, with a total student enrollment of approximately 147,175. County wide, the county averaged approximately 13 pupils per teacher in 2003, with an average expenditure of $14,837 per pupil [WCDP 2005a].

The Lakeland School District lies in the northwest corner of Westchester County and is the largest suburban district in the county. Its border pushes into Putnam County, then swings south almost to the City of Peekskill. District students live in six different towns: Yorktown, Cortlandt, and Somers in Westchester County and Carmel, Philipstown, and Putnam Valley in Putnam County. The district enrollment was reported to be approximately 6,200, with class sizes ranging from 19 to 24 students [NYSED 2006c]. The District's reported total general fund expense for 2005-06 was $114,471,671 [NYSED 2006a].

The employees of Indian Point live primarily in Westchester, Dutchess, Rockland, Putnam, and Orange Counties in New York, so consideration is given to the education systems for these counties in addition to Westchester County. By contrast, total student enrollment in Dutchess County is approximately 46,000 in 38 private and parochial schools in 16 districts [Dutchess County]. Dutchess County reported the region's highest average pupils per teacher of 14.7, and an average expenditure per pupil of $10,764 in 2003 [WCDP 2005a].

Putnam County reported a total student enrollment of 16,948 in six school districts [NYSED 2005b]. The county had approximately 13.7 pupils per teacher, with an average expenditure of $13,523 per pupil [WCDP 2005a].

Rockland County student enrollment was 42,248 pupils in 9 school districts [NYSED 2005c]. Rockland County had 13 pupils per teacher, and an average expenditure of $14,707 per pupil [WCDP 2005a].

Orange County had 66,020 pupils enrolled in 17 school districts [NYSED 2005a]. The student to teacher ratio was approximately 14.4, with an average expenditure per pupil of $11,022 [WCDP 2005a].

2.10.4 Transient Population

State tourism agencies were contacted to obtain the most recent tourist (transient) information. County level geographical tourism data is not collected by states within 50-miles of IP2 and IP3. Connecticut and New Jersey collect this data only at the state level. New York breaks state level visitation numbers into five counties within the New York City metropolitan area (defined as Bronx, Kings, New York, Queens, and Richmond counties). The rest of New York State and Pennsylvania reports tourists per year at a regional level (The Pocono region, which includes Carbon, Monroe, Pike, and Wayne counties, is the relevant region).

To convert state visitation numbers into county visitation, the ratio of estimated 2004 county population to estimated 2004 state population was multiplied by the total number visitors in the state [USCB 2005, Table 2.2.1]. An estimated 41 million people visit the New York Metropolitan area each year, or approximately 112,329 people per day. In this ER, Entergy focused specifically on the five counties surrounding the plant, in which most IP2 and IP3 employees reside. An estimated 47,074 people visit Westchester, Rockland, Orange, Dutchess, and Putnam counties each day. Almost half of the estimated transients, 22,178 people per day, visit Westchester County, 6,904 people visit Dutchess County per day, 8,715 people visit Orange County per day, 2,367 people visit Putnam County per day, and 6,910 people visit Rockland County per day.

2.10.5 Migrant Farm Labor

Migrant farm labor was reviewed using the U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) data for 2002. NASS only began reporting such data in 2002, which is the most recent data available. Actual migrant worker numbers are not directly reported. County level data on hired farm labor from NASS reported 18 of 194 farms hired migrant labor in Dutchess County, and one farm hiring only contract labor hired migrants. In Orange County, 69 of

349 farms hired migrant labor, with nine farms that hired only contract labor reported hiring migrant labor. Of the 27 farms in Putnam County that reported hiring farm labor, only one farm reported hiring migrant labor and it hired only contract labor. Twenty-one farms in Rockland County hired farm labor, but none reported hiring migrant labor. In Westchester County, 68 farms reported hired farm labor, and three farms hired migrant labor. [USDA 2002f]

A total of 4,493 hired labor workers were reported in the five counties, of which 2,489 were reported to work less than 150 days per year. The largest use of hired farm labor was in Orange County, with 2,572 total hired workers, of which 1,583 worked less than 150 days per year. As would be expected due to more urban populations, Westchester, Rockland, and Putnam counties reported the least number of hired farm workers. The census data does not provide a reasonable means of interpolating the number of migrant farm labor workers, but based on the available data more than half of hired farm labor worked less than 150 days per year, much of which could be migrant labor. However, most of all hired farm labor and consequently most of any migrant farm labor works beyond a six-mile radius of IP2 and IP3. [USDA 2002f]

2.10.6 Economy

2.10.6.1 Employment and Income

The economy most affected by IP2 and IP3 operations are the five counties immediately surrounding the plant where the majority of employees reside. These five counties include Westchester County wherein lies the plant, Rockland County, Putnam County, Orange County, and Dutchess County. Employment information at the IP2 and IP3 facility is provided in Section 3.5. Employment in Westchester County in 2004 was 391,438 [USCB 2004e] with service industries dominating total employment in the county at almost 57 percent (222,874 people employed).

The largest employer in Westchester County is IBM Corporation with approximately 7,475 employees scattered county-wide [Journal News]. The largest employers, after Entergy at Indian Point, within approximately 10 miles of the plant are the Lakeland Central School District with 1,037 employees, and the New York Correctional Department with 1,000 employees [WCDP 2004]. Wholesale and retail trade also plays an important role in the local economy with almost 19 percent of the local employment (73,879 employees) [USCB 2004e]. Construction and finance provide approximately 7 and 6 percent of the employment, respectively, while manufacturing provides only approximately 3.6 percent [USCB 2004e].

The annual payroll in Westchester County was reported to be approximately $19.7 billion in 2004 [USCB 2004e]. Per capita personal income was $55,557 in 2003 and exceeded most other areas except for Manhattan, New York, and Fairfield, Connecticut. The annual change in per capita income was 4.4 percent, exceeded in the region only by the increase of Manhattan. Among all counties in the United States, Westchester County has the sixth highest per capita income, which is 75 percent higher than the national average income per capita [WCDP 2005c].

Total employment in Rockland County in 2004 was 103,241 [USCB 2004d]. The largest single employment sector in 2004 was healthcare and social assistance (20,793 people), followed by

retail trade (15,027 people). Annual payroll reported for 2004 in Rockland County was $3.8 billion. [USCB 2004d] Per capita income for Rockland County in 2003 was $41,661 [WCDP 2005c].

Total employment in Putnam County in 2004 was 21,591 [USCB 2004c]. The largest single employment sector in 2004 was healthcare and social assistance (4,732 people), followed by retail trade (3,282 people). Annual payroll reported for 2004 in Putnam County was a little more than $773 million. [USCB 2004c] Per capita income in 2003 for Putnam County was $39,410 [WCDP 2005c].

Total employment in Orange County in 2004 was 103,420 [USCB 2004b]. The largest single employment sector in 2004 was retail trade (21,532 people), followed by healthcare and social assistance (18,293 people). Annual payroll reported for 2004 in Orange County was $3.2 billion. [USCB 2004b] Per capita income for Orange County in 2003 was $28,903 [WCDP 2005c].

Total employment in Dutchess County in 2004 was 98,683 [USCB 2004a]. The largest single employment sector in 2004 was healthcare and social assistance (18,317 people), followed by manufacturing (17,616 people) and retail trade (15,148 people). Annual payroll reported for 2004 in Dutchess County was $3.8 billion. [USCB 2004a] Per capita income for Dutchess County in 2003 was $32,635 [WCDP 2005c].

2.10.6.2 Unemployment

The unemployment rate in Westchester County is similar to Rockland and Putnam counties, but significantly lower than New York City and New York State as a whole. The unemployment rate for Westchester County was approximately 4.1 percent, compared to 5.8 percent for New York State as a whole [WCDP 2005b]. The unemployment in November 2006 was reported by the New York State Department of Labor, Division of Research and Statistics to be 16,500 workers, or approximately 3.4 percent of the labor force [NYSDL]. By comparison the unemployment rate for Putnam County in November 2006 was 3.0 percent, 3.5 percent in Rockland County, 3.4 percent in Dutchess County, and 3.8 percent in Orange County [NYSDL].

2.11 Meteorology and Air Quality

The site is located in the Village of Buchanan, New York, in Westchester County on the eastern bank of the Hudson River at approximately RM 43. The river bisects the area within a 6-mile radius of the site and geographically separates Westchester County from Rockland County to the west. The Hudson River flows northeast to southwest at the site, but turns sharply northwest approximately two miles northeast of the plant. The western bank of the Hudson River is flanked by the steep, heavily-wooded slopes of the Dunderberg and West Mountains to the northwest (elevations 1086 and 1257 feet above MSL, respectively) and Buckberg Mountain to the west-southwest (elevation 793 feet above MSL). These peaks extend to the west and gradually rise to slightly higher peaks.

Westchester County is mild in the summer and extremely cold in the winter. Based on previous climatological records for the Village of Buchanan, New York, area, mean daily maximum

temperatures range from about 27.6°F in winter to about 86.7°F in summer with mean daily minimum temperatures ranging from about 20.3°F in winter to about 71.5°F in summer [IPEC 2000-2004]. Precipitation averages 37.2 inches per year and is distributed rather evenly throughout the 12-month period, with the lowest amount falling in February and highest falling in May [IPEC 2000-2004]. Although the Village of Buchanan area is subjected to a wide range of snowfall amounting to as little as 20 inches or as much as 70 inches, Westchester County snowfall amounts typically average between approximately 25 to 55 inches per year [BCWC; NRCC].

There is an average of seven tornadoes in the state of New York every year [USDOC 2006a]. On average, 69 percent of all tornadoes are considered weak, with winds less than 110 miles per hour, 29 percent are considered strong, with winds of 111–205 miles per hour, and only 2 percent are considered violent, with winds above 206 miles per hour [NSSL]. According to the National Climatic Data Center, Westchester County has had a total of eight tornadoes since 1950, seven of which have been F1 or less [USDOC 2006b]. An additional tornado, rated as an F2 at its maximum intensity, but an F1 for most of its existence, struck the Westchester County area on July 12, 2006. This means that there is an average of one tornado in Westchester County every six years. Based upon this, the probability of a tornado striking the site is small.

Four states are located within a 50-mile radius of the site. These include Pennsylvania (eastern tip), Connecticut, New York, and New Jersey. The air quality non-attainment issues associated with the portions of these states located within a 50-mile radius are associated with ozone (8-hour standard) and particulate matter < 2.5 microns in diameter ($PM_{2.5}$). The portion of Pennsylvania (Pike County) located within the 50-mile radius is in attainment with the National Ambient Air Quality Standards. The entire States of New Jersey and Connecticut are designated non-attainment for ozone (8-hour standard). Several counties in Central and Southeastern New York within a 50-mile radius are also in non-attainment status for the 8-hour ozone standard [USEPA 2006a]. The New York City Metropolitan Area, which includes Westchester County and the site, is located in a severe non-attainment area for the 8-hour ozone standard.

The Connecticut counties of Fairfield and New Haven (wholly or partially within a 50-mile radius of the site) are designated as non-attainment for $PM_{2.5}$. Ten northern New Jersey counties (wholly or partially within the site's 50-mile radius) have also been designated as non-attainment for $PM_{2.5}$. Several counties in the New York City Standard Metropolitan Statistical Area (SMSA) (Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester counties), and Orange County are also designated as non-attainment for $PM_{2.5}$. Several counties in southeastern New York, including Westchester County, are also designated as being a severe non-attainment area.

There are no Class I areas designated by the National Park Service, USFWS, or the U.S. Forest Service within 50 miles of the site [NPS]. Class I areas, as defined in the Clean Air Act, are the following areas that were in existence as of August 7, 1977: national parks over 6,000 acres, national wilderness areas and national memorial parks over 5,000 acres, and international parks.

IP2 and IP3 state air permits, 3-5522-00011/00026 and 3-5522-000105/00009, respectively, regulate emissions from boilers, turbines, and generators. These permits have a NO_x cap of 25 tons per year per station which is controlled by engine run time and fuel use limits. IP2 and IP3 are not subject to the Risk Management Plan (RMP) requirements described in 40 CFR 68, as no RMP regulated chemicals stored on-site exceed the threshold values listed in 40 CFR 68.

2.11.1 Meteorological System

The meteorological measurement program consists of three instrumented towers, redundant power and ventilation systems, redundant communication systems, and a mini-computer processor/recorder. The meteorological measurement program complies with the acceptance criteria stated in Sections 2.3.3 and 17.2 of NUREG-75/087, Revision 1 (superseded by NUREG-0800, Rev. 2, July 1981) with the former section dealing with meteorological sensors and recorders and the latter dealing with the Quality Assurance Program. The meteorological measurements program consists of primary and backup systems. The accuracy of the meteorological sensor and recording systems meet the system specifications given in Section C.4 of proposed Revision 1 to Regulatory Guide 1.23. [IP3 UFSAR, Section 2.6.5]

2.11.1.1 Primary System

A 122-meter, instrumented tower is located on the site and provides the following:

(1) wind direction and speed measurement at a minimum of two levels, one of which is representative of the 10-meter level:

(2) standard deviations of wind direction fluctuations as calculated at all measured levels;

(3) vertical temperature difference for two layers (122–10 meters and 60–10 meters);

(4) ambient temperature measurements at the 10-meter level;

(5) precipitation measurements near ground level; and

(6) Pasquill stability classes as calculated from temperature difference. [IP3 UFSAR, Section 2.6.5]

To assure acceptable data recovery, the meteorological measurements system and associated controlled environmental housing is connected to a power supply system which has a redundant power source. A diesel generator has been installed to provide immediate power to the meteorological tower system in the event of a power outage. The generator becomes fully powered within 15 seconds after an automatic transfer switch is tripped. Various support systems include an uninterruptible power supply, dedicated ventilation systems, halon fire protection, and dedicated communications. [IP3 UFSAR, Section 2.6.5]

The meteorological data is transmitted simultaneously to two data loggers located at the Primary Tower site. One data logger transmits 15-minute average meteorological data to a computer to determine joint frequency distributions, and the second data logger transmits 15-minute average meteorological data to a computer located in the Buchanan Service Center, which provides the capability for accessing the meteorological data remotely. [IP3 UFSAR, Section 2.6.5]

Meteorological data can be transmitted simultaneously to the IP3 / IP2 emergency response organization and the NRC in a format designated by NUREG-0654/FEMA-REP-1. Fifteen minute averages of meteorological parameters covering the 12-hour period previous to a recall command is available upon interrogation of the system. [IP3 UFSAR, Section 2.6.5]

2.11.1.2 Backup Systems

In the event of a failure of the primary meteorological measurement system, a backup meteorological system is used at the Indian Point site. This system is independent of the primary system and consists of an instrumented meteorological tower (a backup tower located approximately 2700 feet north of the primary tower). The associated data acquisition system for the backup tower is located in the Emergency Operations Facility. The backup system provides measurements of the 10-meter level of wind direction and speed and an estimate of atmospheric stability (Pasquill category using sigma theta, which is a standard deviation of wind fluctuation). The backup system provides information in real-time mode. Changeover from the primary system to the backup system occurs automatically. In the event of a failure of the backup meteorological measurement system, a standby backup system exists at the 10-meter level of the Buchanan Service Center building roof. It also provides measurements of the 10-meter level of wind direction and speed and an estimate of atmospheric stability (Pasquill category using sigma theta, which is a standard deviation of wind fluctuations). The changeover from the backup system to the standby system also occurs automatically. [IP3 UFSAR, Section 2.6.5]

As in the case of the primary system, the backup meteorological measurements system and associated controlled environmental housing system is connected to a power system which is supplied from redundant power sources. [IP3 UFSAR, Section 2.6.5]

In addition to the backup meteorological measurements system, a backup communications line to the meteorological system is operational. During an interim period, the backup communications is provided via telephone lines routed through a telephone company central office separate from the primary circuits. [IP3 UFSAR, Section 2.6.5]

2.11.2 Radiological Environmental Monitoring Program Air Sampling Program

There are five radiological environmental monitoring program air sampling stations required by the ODCM. Three of the stations (A1–A3) are located close to the site boundary in different sectors with the highest calculated annual average ground-level D/Q at distances of 0.28–0.46 miles (SW, S, and SSW sectors); one station (A4) is located in the vicinity of a community having the highest calculated annual average ground level D/Q (SSW sector) at a distance of 0.88 miles (SSW sector); one control location station (A5) is located in a sector with the least prevalent wind direction at a distance of 20.7 miles (N sector). Although not required by the ODCM, there

are also four additional air sampling stations that have been established. These stations are located at distances from 1.6 to 6.36 miles in the WSW, NE, SW, and SSE sectors.

Each station collects airborne particulates using glass fiber filters (47 millimeter diameter) and radioiodine using charcoal cartridges (2 x 1 inch). The samplers run continuously and the charcoal cartridges and particulate filters are changed on a weekly basis. Sample volume is determined by use of calibrated gas flow meters located at the sample discharge. Gross beta analysis is performed on each particulate filter. Charcoal cartridges are analyzed for radioiodine using gamma spectral analysis. The particulate filters are composited monthly by location and analyzed for gamma-emitting radionuclides.

2.12 Historic and Archaeological Resources

The New York State Historic Preservation Office (SHPO) Environmental Review program is a planning process that helps protect New York's historic and cultural resources from the potential impacts of projects that are funded, licensed, or approved by state or federal agencies. Under Section 106 of the National Historic Preservation Act and Section 14.09 of the New York State Historic Preservation Act, the SHPO's role in the review process is to ensure that effects or impacts on eligible or listed properties are considered and avoided or mitigated during the project planning process. In addition, the SHPO advises local communities on local preservation environmental reviews, upon request, under the provisions of the State Environmental Quality Review Act [NYSHPO 2006a]. The Environmental Review Program includes the following.

- Section 106 of the National Historic Preservation Act of 1966. The New York SHPO reviews projects when a federal agency is involved with the project. It is the federal agency's responsibility to seek comments about the project from the SHPO.

- Section 14.09 of Article 14 of the Parks, Recreation and Historic Preservation Law, which was enacted by the New York State Historic Preservation Act of 1980 (Chapter 354 of the Laws of 1980). The SHPO reviews projects when a state agency is involved with the project. It is the state agency's responsibility to seek comments about the project from the SHPO.

- State Environmental Quality Review Act (SEQRA) - 6 NYCRR Part 617 of the New York State Environmental Conservation Law, establishes a set of uniform regulations by which all state, county, and local governmental agencies incorporate consideration of environmental impacts into their planning, review and decision-making processes. SEQRA applies to projects undertaken or permitted by county and local governments.

The New York SHPO is the primary contact for the two historic registers that track New York's historic resources. The National Register of Historic Places (NRHP) is the official federal listing of significant historic, architectural, and archaeological resources. The New York State Register of Historic Places (NYRHP) is the list of significant historic and prehistoric resources throughout New York.

The New York SHPO, the Mohawk Tribal Historic Preservation Officer (THPO), and the Mohican THPO were contacted in November 2006 for information related to any known archeological resources in the vicinity of IP2 and IP3. A letter was received in December 2006 from the NYSHPO stating that it was the SHPO's opinion that the renewal of IP2 and IP3 Operating Licenses would have No Adverse Effect upon cultural resources in or eligible for inclusion in the NRHP (see Attachment B). However, a response was not received from the Mohawk and Mohican THPOs.

2.12.1 Prehistoric Era

Paleo-Indian Period groups were the first prehistoric occupants of the Hudson River Basin. These occupations began after retreat of the last Wisconsin glacial front about 11,000 years ago. The American Indian groups of this period subsisted by hunting large mammals that lived in the area, but they also made use of small animals, fish, and plants. Because of possible over-hunting or changes in forage conditions due to climate change, populations of large mammals decreased in the Hudson Valley approximately 6,000-9,000 years ago. With these changes, the nomadic Paleo-Indian culture came to an end. [CHGEC, Section V.A.6.a]

Archaeological evidence suggests that human occupation in the Hudson Valley did not occur again for another 4,000 years. In fact, the early Archaic Period occupations that followed the Paleo-Indian Period were confined to the southern edge of the Hudson Valley on Staten Island and in the Delaware Valley north of Water Gap. When this 4,000-year period concluded, prehistoric groups began to gradually reoccupy the Hudson Valley over a period of about 1,000 years. [CHGEC, Section V.A.6.a]

At the beginning of the Woodland Period around 3,000 years ago, the use of clay pottery spread throughout the Hudson Valley, and this indicated that local prehistoric groups had attained a more sedentary way of life. Human subsistence during this period was focused on the hunting of small game, fishing, and gathering from populations of indigenous plants. Although hunting and gathering were still important, the Woodland Period was characterized by increasing dependence on cultivated squash, gourds, and maize. In time, maize would become the principal source of cultivated food. During the Woodland Period, it is estimated that 60,000 to 70,000 people occupied the Hudson Valley area. [CHGEC, Section V.A.6.a]

Numerous prehistoric archaeological sites have been identified within a 6-mile radius of the site. The precise locations of these sites are state-restricted information that cannot be released to the public. However, the New York State SHPO has used existing survey information on prehistoric and historic archaeological sites to identify archaeologically sensitive areas and the information on these sensitive areas is stored in the New York State Historic Preservation Office Geographic Information System (GIS)-Public Access [NYSHPO 2006a]. These sensitive areas are broadly conceived spatial locations where archaeological sites are known to be present or are likely to be present. Within a 6-mile radius of the site, approximately 70 percent of the land has been officially designated as an archaeologically sensitive area. Large expanses of archaeologically sensitive land are located immediately to the south and east of the site. The GIS system does

not indicate such coverage for the land on the site, which is consistent with a location that is known to have been extensively disturbed by past construction.

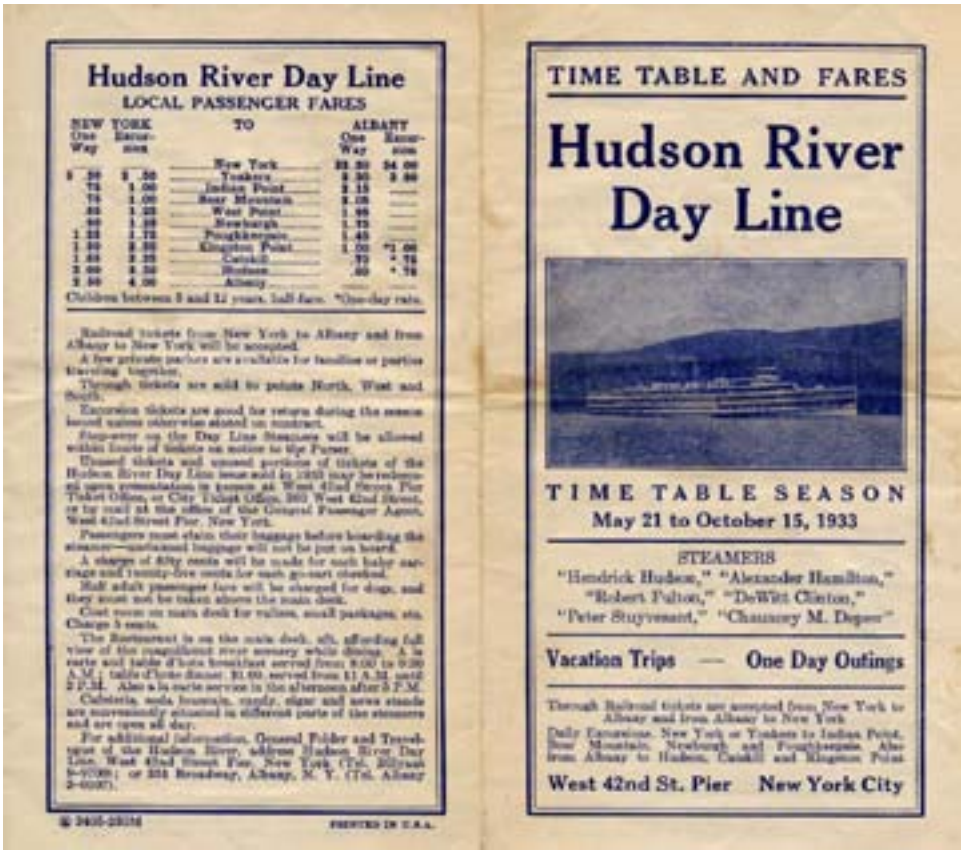
2.12.2 Historic Era

Historic archaeological sites are the buried remains of ground surface occupations that occurred after the first Euroamerican exploration in the Hudson Valley area, which began with Henry Hudson in 1609 [CHGEC, Section V.A.6.a]. Up to around 1650, a band or small tribe of Indians, called the Kitchawank, lived on the east shore of the Hudson River between Croton and Anthony's Nose (across from Bear Mountain). Their principal village, Kitchawank, appears to have been at the mouth of the Croton River. The Kitchawak also occupied a small village at Peekskill, called Sackhoes. Although some historic archaeological sites represent very late Native Americans occupations, most tend to be Euroamerican homesteads, farmsteads, and industrial sites.

At the time of the first Euroamerican contact and exploration in the early 17th century, the Hudson-Mohawk basin was occupied primarily by the Algonquins, which consisted of the Delaware, Wappinger, Mohican, and Montauk tribes, along the lower Hudson River and the eastern end of the Mohawk River. [CHGEC, Section V.A.6.a]

Except for troop movements in the Revolutionary War, the Indian Point site has no historic significance. In 1777 the British landed at Lents Cove to raid the City of Peekskill. The nearest landmarks of consequence are St. Patrick's Church in Cortlandt, St. Peter's Church and Cemetery in the Village of Verplanck, and St. Mary's cemetery along Broadway in Buchanan. Stony Point Battle Reservation is on the western bank of the river two miles downstream. The Palisades Interstate Park is west of the Stony Point area on the western side of the river. The National Register of Historic Places (including designated National Historic Landmarks) and the Hudson River Valley Commission's preliminary inventory of historic resources list many buildings and sites within several miles of the Station, but none that are affected by it. Both Stony Point Battlefield and the Palisades Interstate Park are Registered National Historic Landmarks. [USAEC, Section II.D]

Around 1900, light farming and a brickyard owned by Charles Southard existed on or near Indian Point. Also at this time, dozens of steamboats, owned by numerous steamboat companies, traveled up and down the Hudson River on a daily basis. Steamboats had begun service on the river in the 1820s. During the heyday of steamboating, every landing along the approximately 143 miles of Hudson River from New York City to Albany was served by a steam-propelled vessel of some type. The last steamboat service was the Hudson River Day Liner (an offshoot of the original Hudson River Day Line company formed in 1863), which passed by the Indian Point site each day up until the mid 1980s.



Hudson River Day Line
LOCAL PASSENGER FARES

NEW YORK One Way	NEW YORK Excursion	TO	ALBANY One Way	ALBANY Excursion
$ .50	$ .50	New York	$1.50	$1.00
.75	1.00	Yonkers	1.25	1.50
.75	1.00	Indian Point	1.15	----
.75	1.00	Bear Mountain	1.05	----
.85	1.25	West Point	1.00	----
.90	1.25	Newburgh	1.75	----
1.25	1.75	Poughkeepsie	1.45	----
1.50	2.00	Kingston Point	1.20	*1.00
1.65	2.25	Catskill	.75	*.75
2.00	2.50	Hudson	.60	*.75
2.50	4.00	Albany	----	----

Children between 5 and 12 years, half fare. *One-day rate.

Railroad tickets from New York to Albany and from Albany to New York will be accepted.

A few private parlors are available for families or parties traveling together.

Through tickets are sold to points North, West and South.

Excursion tickets are good for return during the season hereof unless otherwise stated on contract.

Stop-overs on the Day Line Steamers will be allowed within limits of tickets on notice to the Purser.

Unused tickets and unused portions of tickets of the Hudson River Day Line issued in 1933 may be redeemed upon presentation in person at West 42nd Street Pier Ticket Office, or City Ticket Office, 501 West 42nd Street, or by mail at the office of the General Passenger Agent, West 42nd Street Pier, New York.

Passengers must claim their baggage before boarding the steamer—unclaimed baggage will not be put on board.

A charge of fifty cents will be made for each baby carriage and twenty-five cents for each go-cart checked.

Half adult passenger fare will be charged for dogs, and they must not be taken above the main deck.

Coat room on main deck for valises, small packages, etc. Charge 5 cents.

The Restaurant is on the main deck, aft, affording full view of the magnificent river scenery while dining. A la carte and table d'hote breakfast served from 8:00 to 9:30 A.M.; table d'hote dinner, $1.00, served from 11 A.M. until 2 P.M. Also a la carte service in the afternoon after 3 P.M.

Cafeteria, soda fountain, candy, cigar and news stands are conveniently situated on different parts of the steamers and are open all day.

For additional information, General Folder and Travelogue of the Hudson River, address Hudson River Day Line, West 42nd Street Pier, New York City, Tel. [illegible] or 304 Broadway, Albany, N. Y. (Tel. Albany [illegible]).

© [illegible]

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TIME TABLE AND FARES

Hudson River Day Line

TIME TABLE SEASON
May 21 to October 15, 1933

STEAMERS
"Hendrick Hudson," "Alexander Hamilton,"
"Robert Fulton," "DeWitt Clinton,"
"Peter Stuyvesant," "Chauncey M. Depew"

Vacation Trips — One Day Outings

Through Railroad tickets are accepted from New York to Albany and from Albany to New York.

Daily Excursions, New York or Yonkers to Indian Point, Bear Mountain, Newburgh and Poughkeepsie. Also from Albany to Hudson, Catskill and Kingston Point.

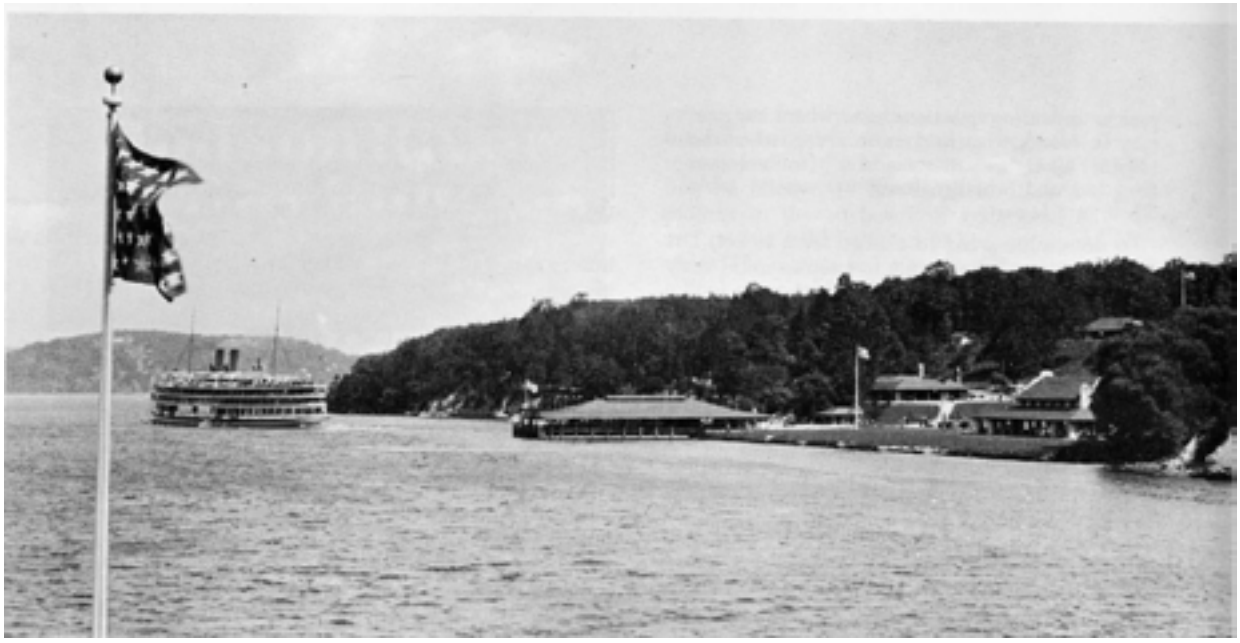
West 42nd St. Pier New York City

Hudson River Day Line timetable from 1933. Indian Point Park was the second stop after leaving New York City.

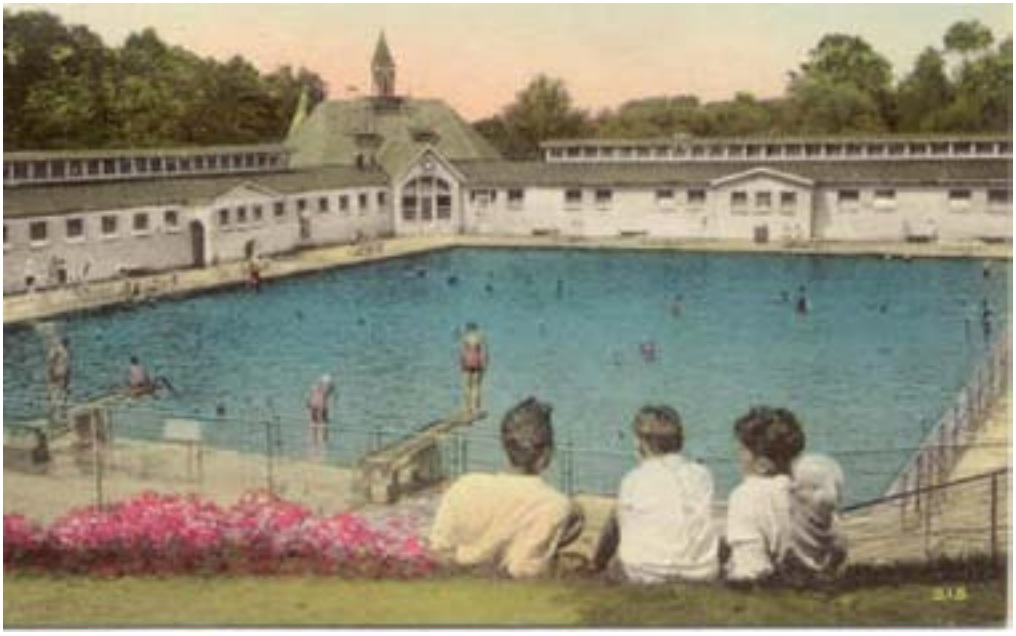
In the 1920s, in order to add non-steamboat revenue to the Day Line company, the company considered having a park of its own that would attract some of the people who went to Bear Mountain and thereby have captive customers all day long.

This is the playground at Indian Point Park in 1924. Across the river is the laid-up fleet of World War I freighters.

The Day Line selected a site on the east side of the river below Peekskill and acquired 320 acres of park ground. Claiming that its property had been a meeting place for Indians, the Day Line called the park Indian Point, a name calculated to have an attractive ring for its younger passengers. Indian Point Park opened on June 26, 1923. Set in a less rugged terrain than Bear Mountain, there were facilities for picnicking, dining in a cafeteria, or swimming in the 100- by 150 foot-pool. There was a dance hall and a beer hall. A quarter got visitors into the park; a dime bought a ride in a speedboat. Indian Point drew more than 5000 people on the weekends and hundreds on weekdays.



The steamship De Witt Clinton is shown departing the pier at Indian Point Park.



Postcard view of the 100- x 150-ft pool at Indian Point Park.
Circa 1940

After World War II, however, the popularity of the park began to decline as the use of the automobile broadened the choice of day trips and vacation spots. In 1949, the Hudson River Day Line, its steamboats, and certain landings were sold to another private company which continued to operate the steamboats. Indian Point Park was not purchased in the deal. In 1950, arrangements were made to allow the new "Day Line" to resume landing at the park. By the mid-50s the owner was looking to sell. The Consolidated Edison Company (Con Ed) was looking to buy.

Con Ed was struggling to meet the growing electricity needs of the mushrooming suburbs of Westchester County. Con Ed needed new plants, but was already weathering criticism over air pollution from its oil and coal plants. An answer was emerging in a promising new technology: atomic energy. Indian Point Park closed in 1956.

Construction of Indian Point 1

IP1 and its on-site support facilities were completed and ready for commercial operations by August 1962 [CHGEC, Section IV.B.2.a]. Construction activity at the site revealed no evidence of items having archaeological value. The IP2 FES stated that most of the sites at Indian Point spared by construction or other modern activities have been heavily molested by relic collectors over a very long period and relatively few have received attention from competent archaeologists [USAEC, Section II.D]. For many years before its acquisition by the original owners of Indian Point for construction of IP1, the site was a commercial amusement area operated by the

Hudson River Day Line and, presumably, was overrun by relic collectors. No other indication of important archaeological activity in the general area could be located. Thus, the Indian Point site probably contains no valuable prehistoric archaeological deposits.

2.12.3 Cultural Resource Properties

No prehistoric or historic sites eligible for listing on or already listed on the NRHP or the NYRHP are located on the site. Historic archaeological sites have been identified within a 6-mile radius of the site. Historic sites are areas of land that usually contain aboveground historic structures and objects such as old homes, barns, churches, cemeteries, business districts, and residential districts. The GIS for the NYSHPO shows no eligible or listed historic sites on the site or in the immediately surrounding area out to at least 1.5 miles. Therefore, no aboveground historic sites eligible for listing on or already listed on the NRHP or NYRHP are located on the site.

The State Preservation Historical Information Network Exchange (SPHINX) database, which is constructed and maintained by the NYSHPO, is used to store up-to-date information on New York aboveground historic sites that are eligible for listing or are already listed on the NRHP and NYRHP [NYSHPO 2006b]. The area within a 6-mile radius of the site covers portions of Westchester County, Putnam County, Orange County, and Rockland County. This four-county area has seen almost 400 years of Euroamerican history, the development of a large local population, and years of intensive historical survey work. As a result, the SPHINX database contains entries for many hundreds of individual historic sites and districts eligible for listing and already listed on the NRHP and NYRHP. Westchester County alone has 217 listed aboveground historic sites. Two of the closest listed historic sites to the site are the City of Peekskill Downtown Historic District, which is about 2 miles to the northeast, and Stony Point Battlefield, which is about 1.5 miles south of the site. Additional listed sites within a 6-mile radius of the site are provided in Table 2-14.

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
Westchester County			
Standard House	City of Peekskill	Yes	Yes
Peekskill Freight Depot	City of Peekskill	Yes	Yes
Thomas Nelson House	City of Peekskill	Yes	Yes
Peekskill Presbyterian Church	City of Peekskill	Yes	Yes
Aaron Copland House	Town of Cortlandt	Yes	Yes

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3
(Continued)

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
St. Peter's Episcopal Church	City of Peekskill	Yes	Yes
Isaac Young House	Town of New Castle	Yes	Yes
Peekskill Downtown Historic District	City of Peekskill	Yes	Yes
Old St. Peter's Church and Old Cemetery at Van Cortlandtville	Town of Cortlandt	Yes	Yes
Carrie Chapman Catt House	Town of New Castle	Yes	-
Ford Administration Building	City of Peekskill	Yes	-
Fort Hill-Nelson Avenue Historic District	City of Peekskill	Yes	-
St. Augustine's Episcopal Church	Village of Croton-on-Hudson	Yes	-
Old St. Peter's Church	Town of Cortlandt	Yes	Yes
Old Croton Dam; Site of New Croton Dam	Town of Cortlandt	Yes	Yes
Van Cortlandt Upper Manor House	Town of Cortlandt	Yes	Yes
Bear Mountain Bridge Road	Town of Cortlandt	Yes	Yes
Van Cortlandtville School (Common District School No. 10)	Town of Cortlandt	Yes	Yes
John Jones Homestead	Town of Cortlandt	Yes	Yes
Old Croton Aqueduct	Town of Cortlandt	Yes	Yes
Old Chappaqua Historic District	Town of New Castle	Yes	Yes
Chappaqua Railroad Depot and Depot Plaza	Town of New Castle	Yes	Yes
Church of Saint Mary the Virgin and Greely Grove	Town of New Castle	Yes	Yes
Greely House	Town of New Castle	Yes	Yes
Rehoboth	Town of New Castle	Yes	Yes
Sarles' Tavern-Granite House	Town of New Castle	Yes	Yes
Williams-DuBois House	Town of New Castle	Yes	Yes

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3
(Continued)

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
Drum Hill High School	City of Peekskill	Yes	Yes
Beecher-McFadden Estate	City of Peekskill	Yes	Yes
Villa Loretto	City of Peekskill	Yes	Yes
United States Post Office-Peekskill	City of Peekskill	Yes	Yes
Van Cortlandt Manor	Village of Croton-on-Hudson	Yes	No
Croton North Railroad Station	Village of Croton-on-Hudson	Yes	Yes
St. Mary's Complex	City of Peekskill	Yes	-
St. Patrick's Church	Town of Cortlandt	Yes	-
Mount Florence	City of Peekskill	Yes	Yes
Quaker Bridge Road	Town of Cortlandt	Yes	-
Asbury United Methodist Church; Bethel Chapel and Cemetery	Village of Croton-on-Hudson	Yes	Yes
Rockland County			
Henry M. Peck House	Town of Haverstraw	Yes	Yes
Philadelphia Toboggan Company Carousel No. 15	Town of Clarkstown	Yes	Yes
Bear Mountain Inn	Town of Stony Point	Yes	Yes
H.R. Stevens House	Town of Clarkstown	Yes	Yes
Terneur-Hutton House	Town of Clarkstown	Yes	Yes
Blauvelt House	Town of Clarkstown	Yes	Yes
Commander	Town of Stony Point	Yes	Yes
Stony Point Battlefield	Town of Stony Point	Yes	Yes
Stony Point Lighthouse	Town of Stony Point	Yes	Yes
Homestead	Town of Haverstraw	Yes	Yes
Henry Garner Mansion	West Haverstraw	Yes	Yes

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3
(Continued)

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
Fraser-Hoyer House	West Haverstraw	Yes	Yes
Rockland County Courthouse and Dutch Gardens	Town of Clarkstown	Yes	Yes
King's Daughters Public Library	Town of Haverstraw	Yes	Yes
Mount Moor African American Cemetery	Town of Clarkstown	Yes	Yes
Central Presbyterian Church	Town of Haverstraw	Yes	-
William H. Rose House	Town of Stony Point	Yes	Yes
Bear Mountain Bridge and Toll House	Town of Stony Point	Yes	Yes
United States Post Office-Haverstraw	Town of Haverstraw	Yes	Yes
Orange County			
St. Mark's Baptist Church	Village of Highland Falls	Yes	Yes
Fort Montgomery Site	Town of Highlands	Yes	Yes
Cragston Dependencies	Town of Highlands	Yes	No
St. Mark's Episcopal Church	Town of Highlands	Yes	No
Storm King Highway	Town of Highlands	Yes	No
U.S. Bullion Depository	Town of Highlands	Yes	No
U.S. Military Academy (West Point)	Town of Highlands	Yes	Yes
Center Street, House at 37	Village of Highland Falls	Yes	No
Church of the Holy Innocents and Rectory	Village of Highland Falls	Yes	No
First Presbyterian Church of Highland Falls	Village of Highland Falls	Yes	No
Highland Falls Railroad Depot	Village of Highland Falls	Yes	No
Highland Falls Village Hall	Village of Highland Falls	Yes	No

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3
(Continued)

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
House at 116 Main Street	Village of Highland Falls	Yes	No
Parry House	Village of Highland Falls	Yes	No
Pine Terrace	Village of Highland Falls	Yes	No
The Squirrels	Village of Highland Falls	Yes	No
Stonihurst	Village of Highland Falls	Yes	No
Webb Lane House	Village of Highland Falls	Yes	No
Queensboro Ironworks Historic District	Town of Highlands	Yes	-
Bear Mountain State Park Historic District	Town of Highlands	Yes	Yes
Palisades Interstate Parkway	Town of Highlands	Yes	Yes
Putnam County			
Boscobel	Town of Philipstown	Yes	Yes
Castle Rock	Town of Philipstown	Yes	Yes
DeRham Farm	Town of Philipstown	Yes	Yes
Old Albany Post Road	Town of Philipstown	Yes	Yes
The Birches	Town of Philipstown	Yes	Yes
Eagle's Rest (Jacob Rupert Estate)	Town of Philipstown	Yes	Yes
Garrison Landing Historic District	Town of Philipstown	Yes	Yes
Garrison Union Free School	Town of Philipstown	Yes	Yes
Glenfields	Town of Philipstown	Yes	Yes
Hurst-Pierrepont Estate	Town of Philipstown	Yes	Yes
Mandeville House	Town of Philipstown	Yes	Yes

Table 2-14
Listed Historic Sites Located in the Vicinity (6-Mile Radius) of IP2 and IP3
(Continued)

Site Name	Nearest City or Town	Listed NRHP	Listed NYRHP
Montrest	Town of Philipstown	Yes	Yes
Moore House	Town of Philipstown	Yes	Yes
Normandy Grange	Town of Philipstown	Yes	Yes
Oulagisket	Town of Philipstown	Yes	Yes
Rock Lawn and Carriage House	Town of Philipstown	Yes	Yes
Walter Thompson House and Carriage House	Town of Philipstown	Yes	Yes
Walker House	Town of Philipstown	Yes	Yes
Wilson House	Town of Philipstown	Yes	Yes
Woodlawn (Malcolm Gordon School)	Town of Philipstown	Yes	Yes
Fair Lawn	Town of Philipstown	Yes	Yes
West Point Foundry	Town of Philipstown	Yes	Yes
Manitoga (Russell Wright Estate)	Town of Philipstown	Yes	Yes
Dick's Castle	Town of Philipstown	Yes	Yes
Plumbush	Town of Philipstown	Yes	Yes
St. Philips Church in the Highlands Complex	Town of Philipstown	Yes	Yes
Frederick Osborn House	Town of Philipstown	Yes	Yes
Indian Brook Road Historic District	Town of Philipstown	Yes	Yes
Garrison Grist Mill Historic District	Town of Philipstown	Yes	Yes
NYSHPO 2006b			

Note: - in table above indicates site may be proposed on state list, but approval of its listing has not yet occurred.

The proposed action upon which this ER is based is for the renewal of the IP2 and IP3 Operating Licenses, to extend to 2033 and 2035, respectively. As discussed in Section 3, Entergy does not foresee a need for refurbishment during the license renewal period, nor is any major construction planned that will result in significant land disturbance.

A Phase IA Literature Review and Archeological Sensitivity Assessment was performed for the site property in November 2006. As a result of this review and assessment, the following was determined.

- Previously disturbed areas shown in Figure 2-29 have been disturbed down to the bedrock layer. Therefore, no cultural resources would be expected.
- Cultural resources on the southern portion of the site property are unlikely to be present.
- Although the northern portion of the site property was subject to heavy surface mining during the latter nineteenth century, four potentially archeological sensitive areas were identified.

Entergy does not have plans for further development of the property in association with the application for license renewal. However, a fleet procedure is in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. This procedure, which requires reviews, investigations and consultations as needed, ensures that existing or potentially existing cultural resources are adequately protected and assists Entergy in meeting state and federal expectations. [Entergy]

2.13 Related Federal Project Activities

During the preparation of this report, Entergy did not identify any known or reasonably foreseeable federal projects or other activities that could contribute to the cumulative environmental impacts of license renewal at the site.

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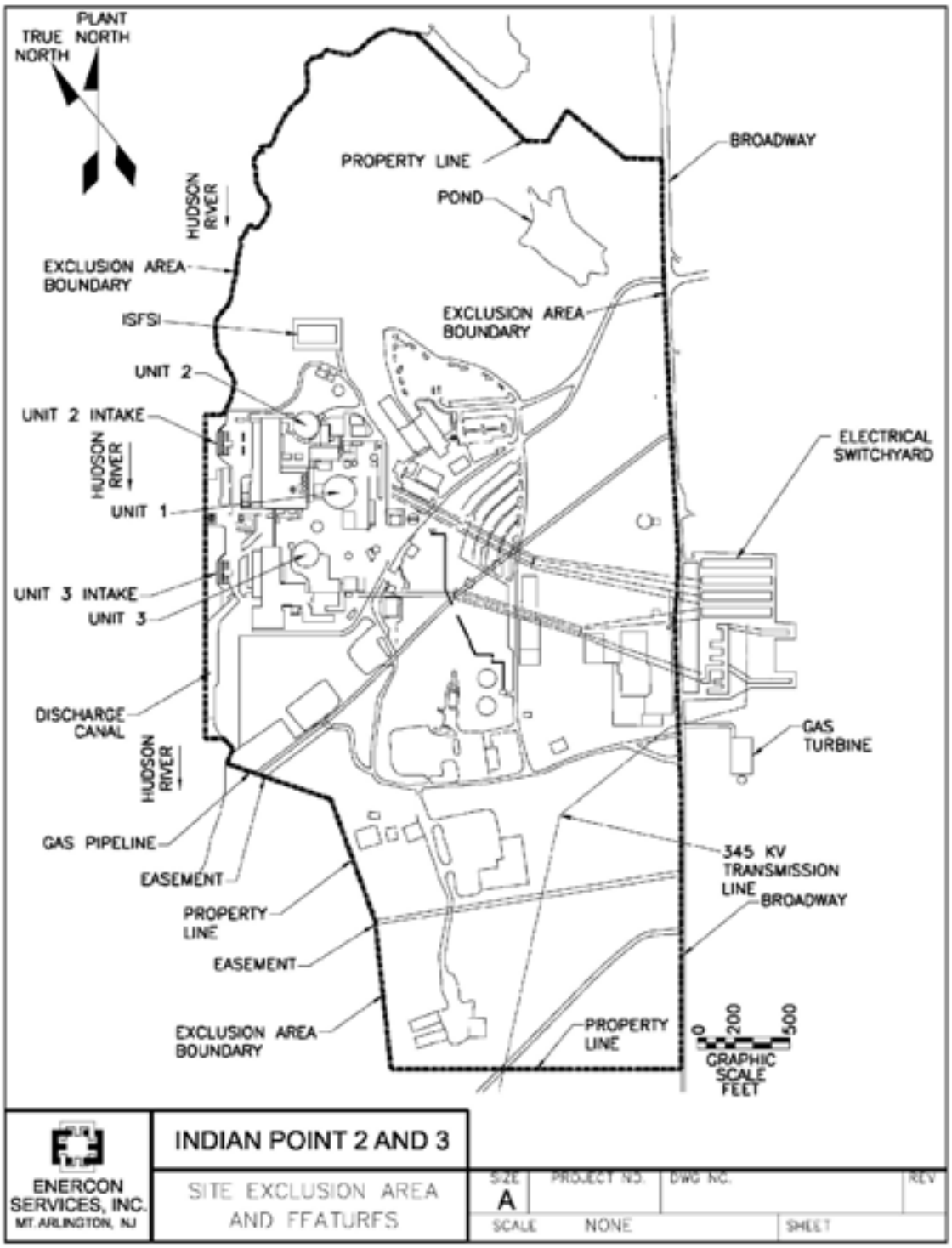

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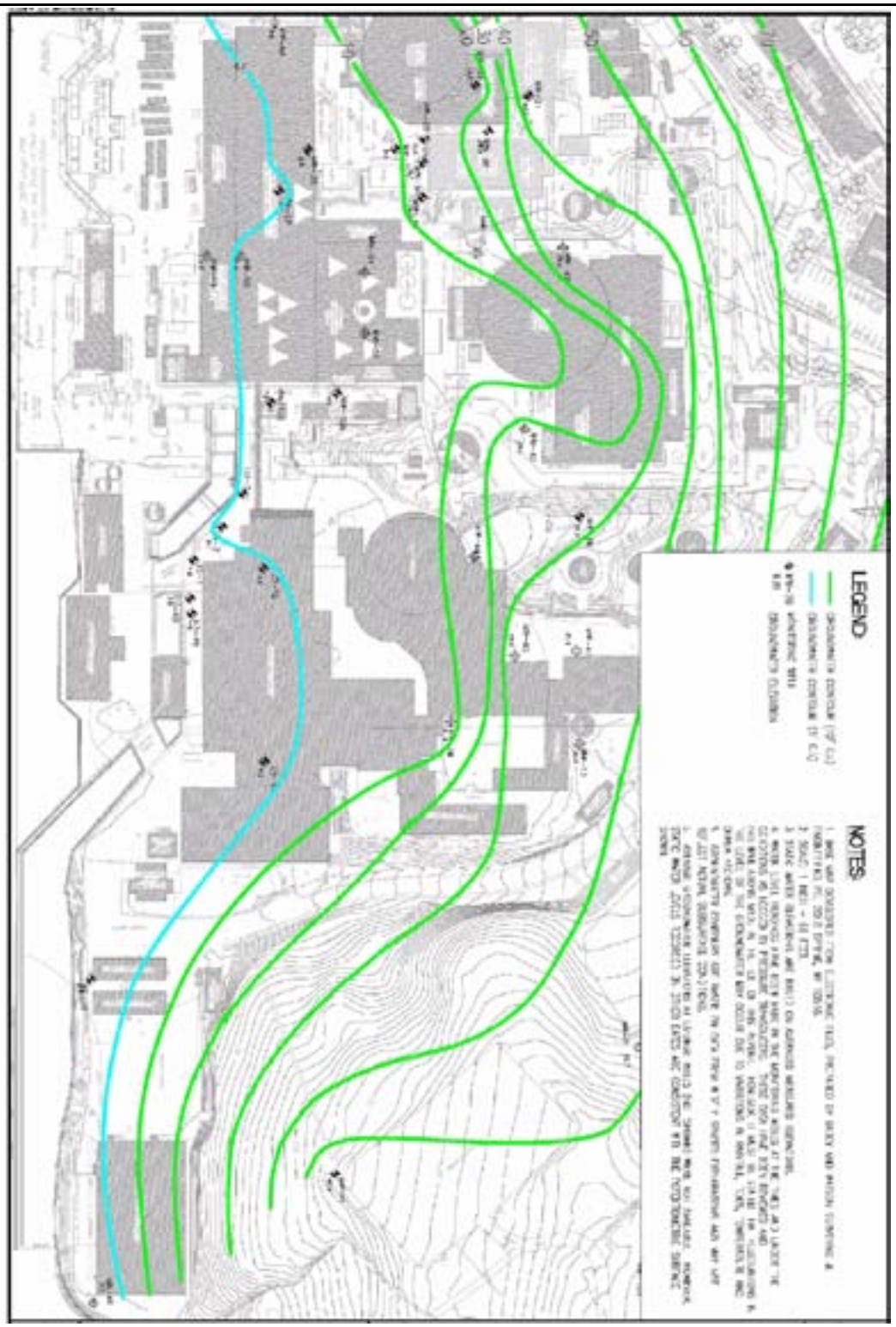

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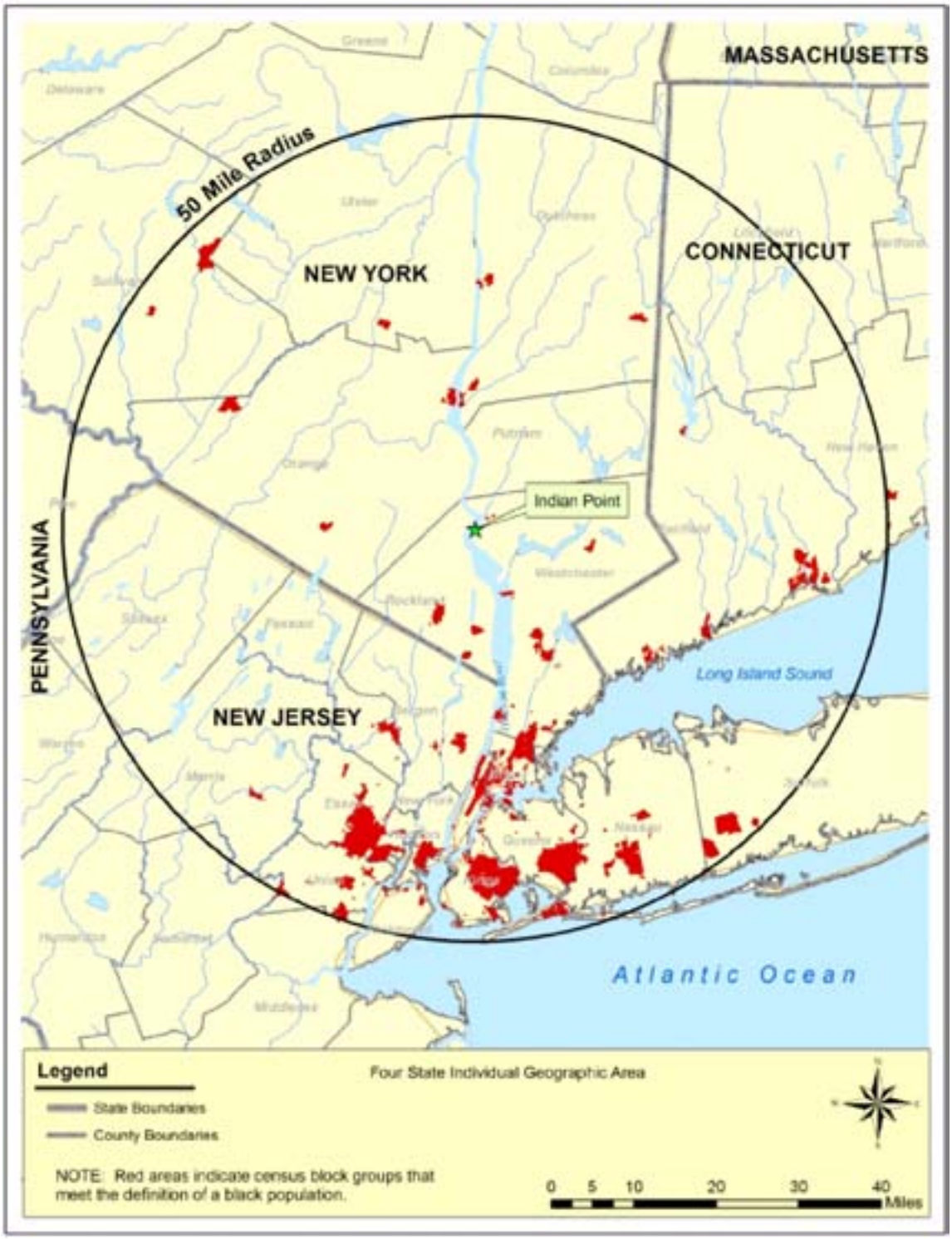

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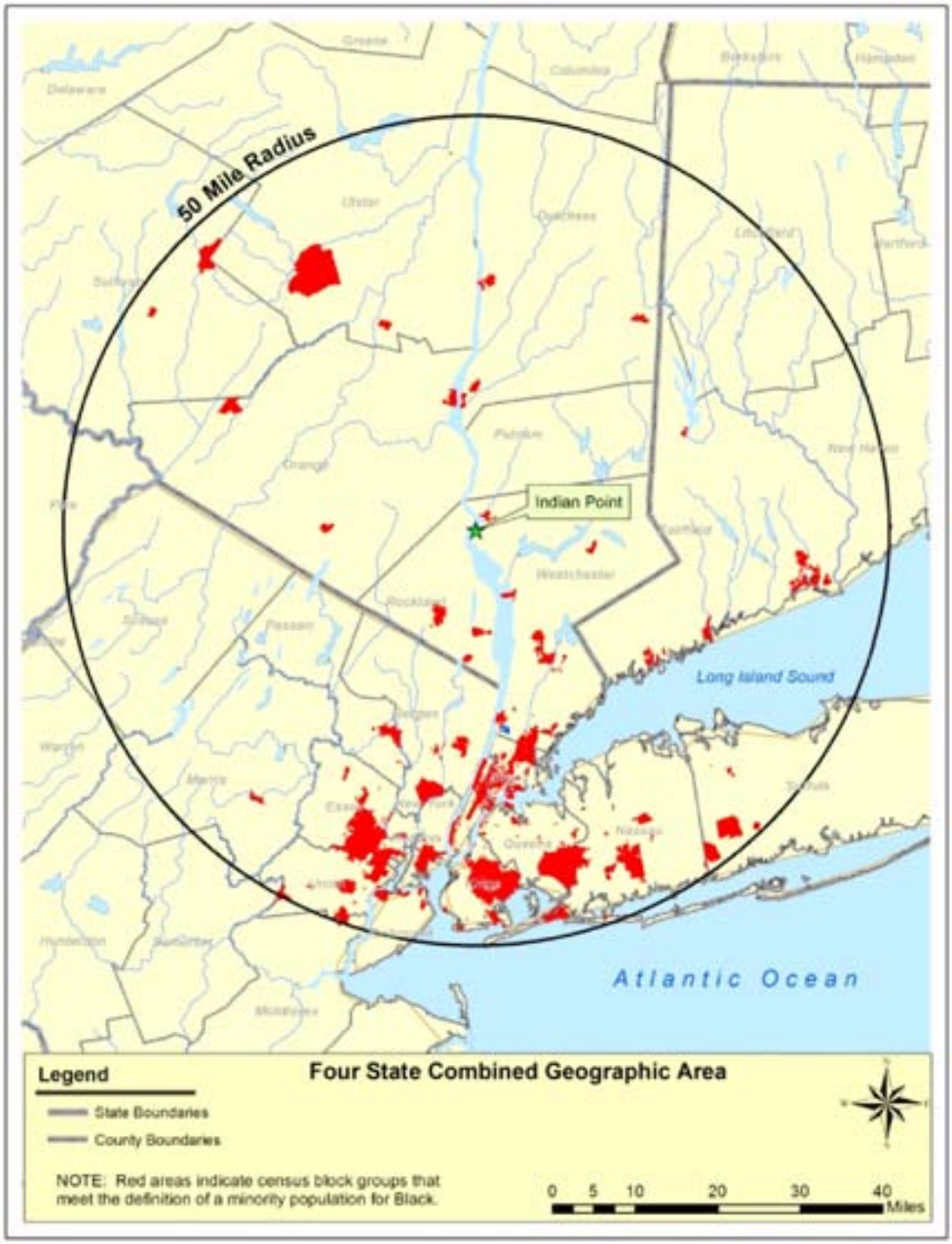

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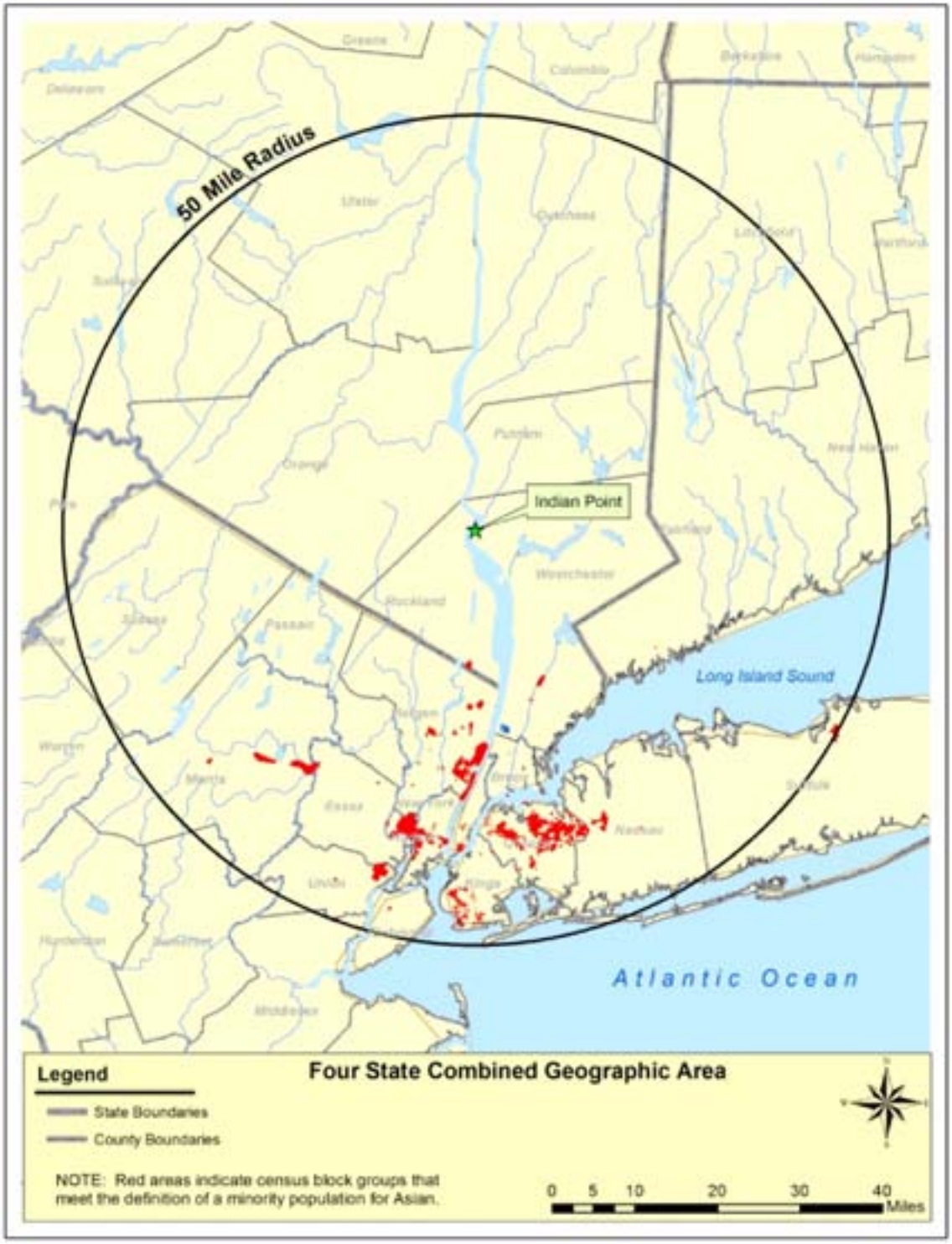

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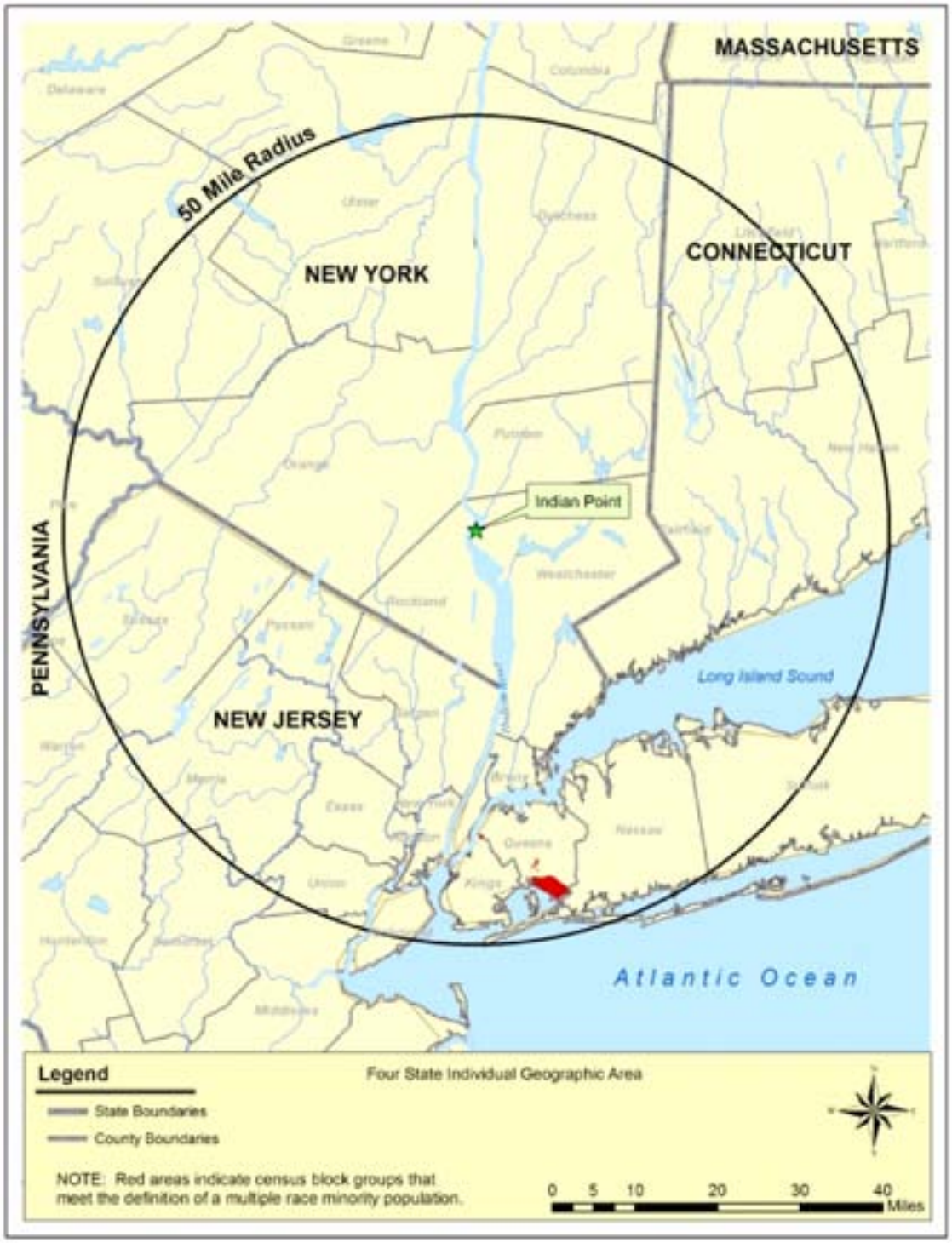

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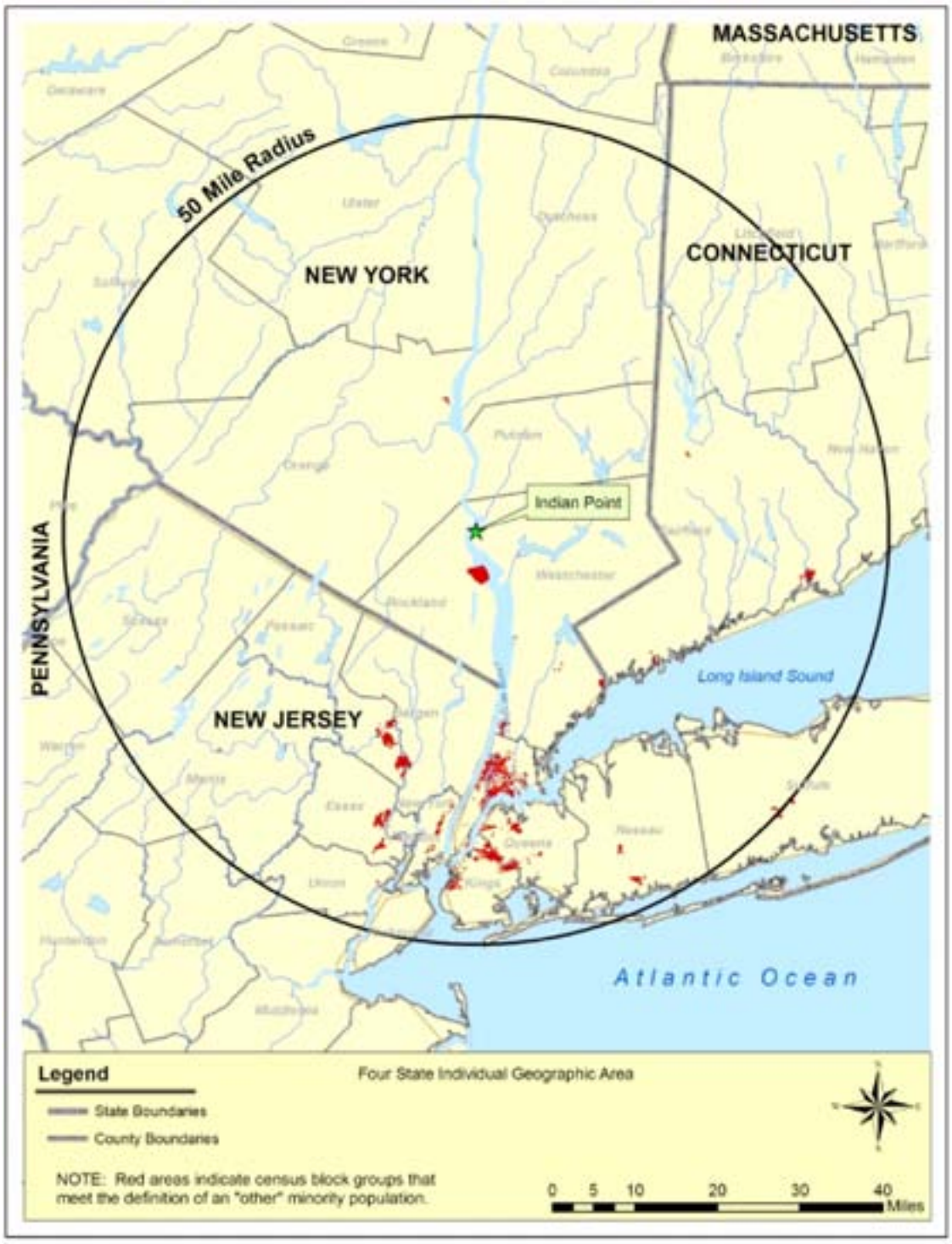

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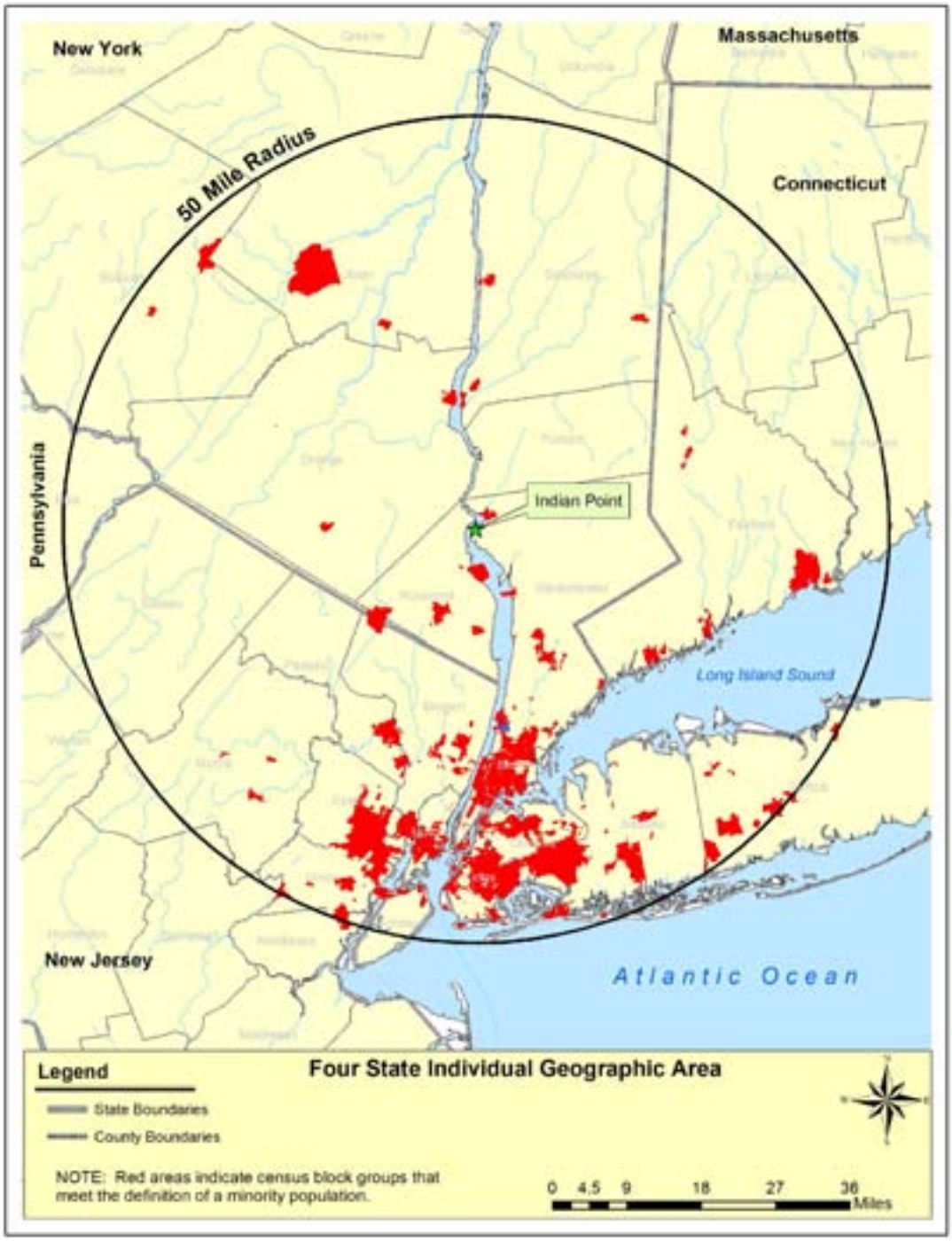

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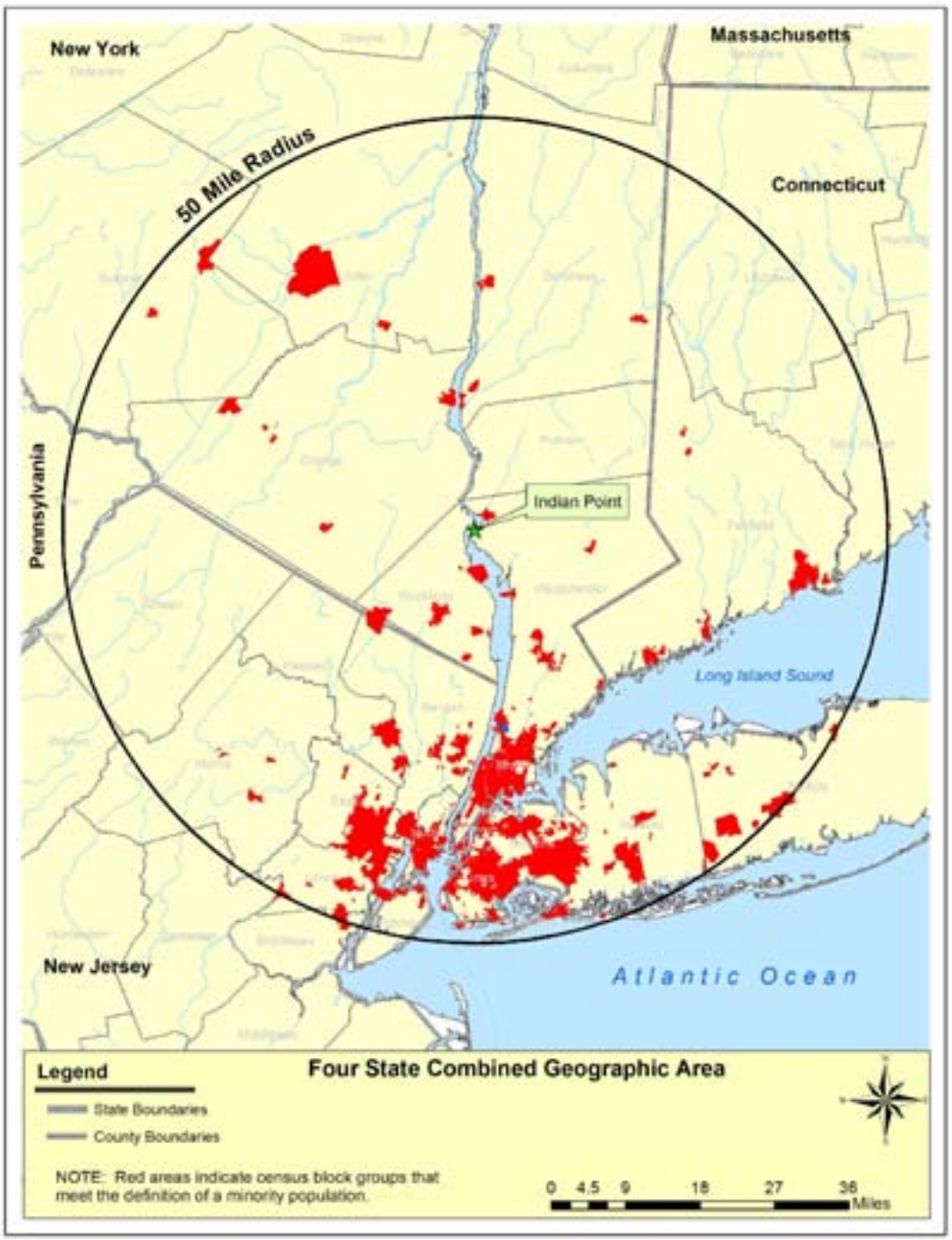

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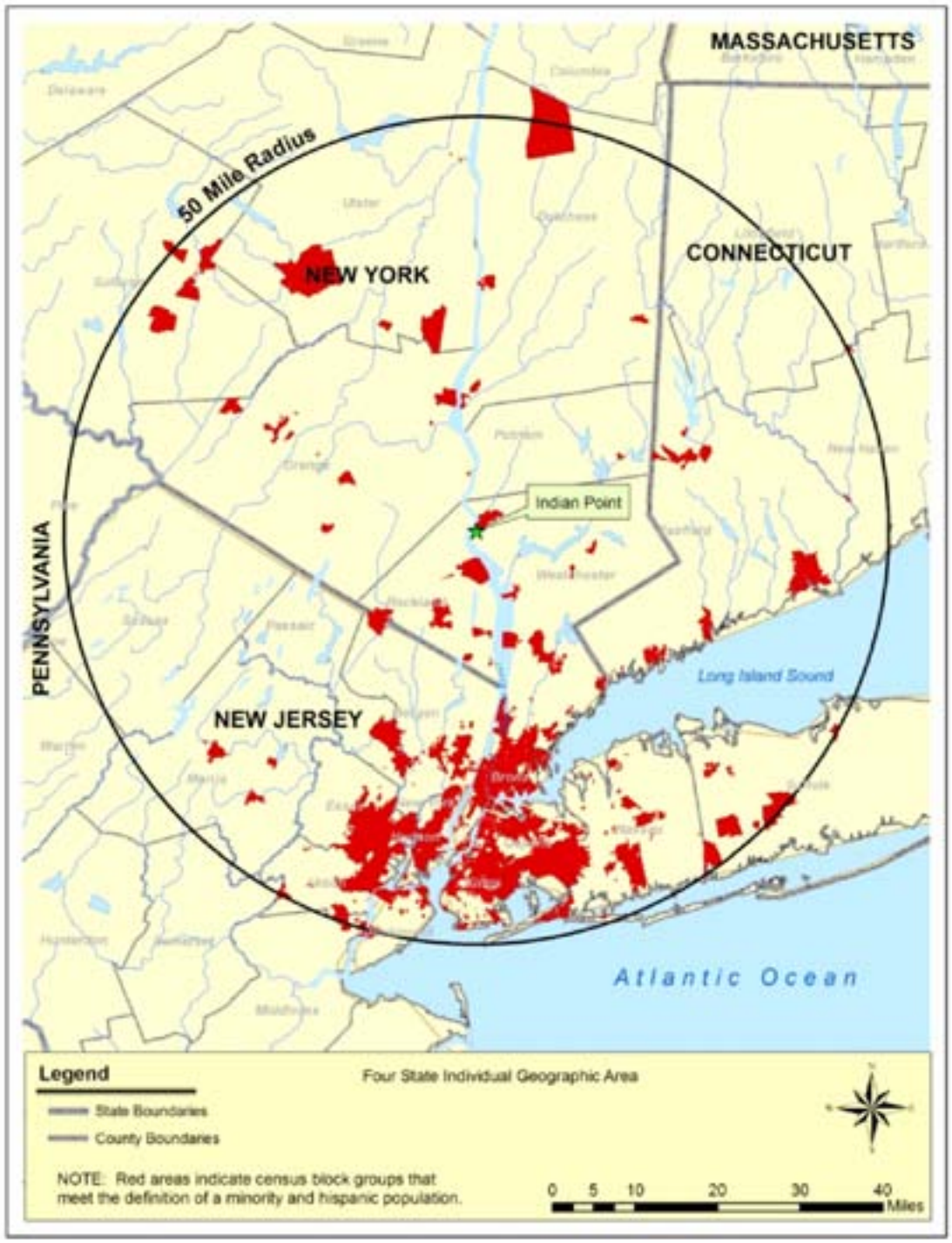

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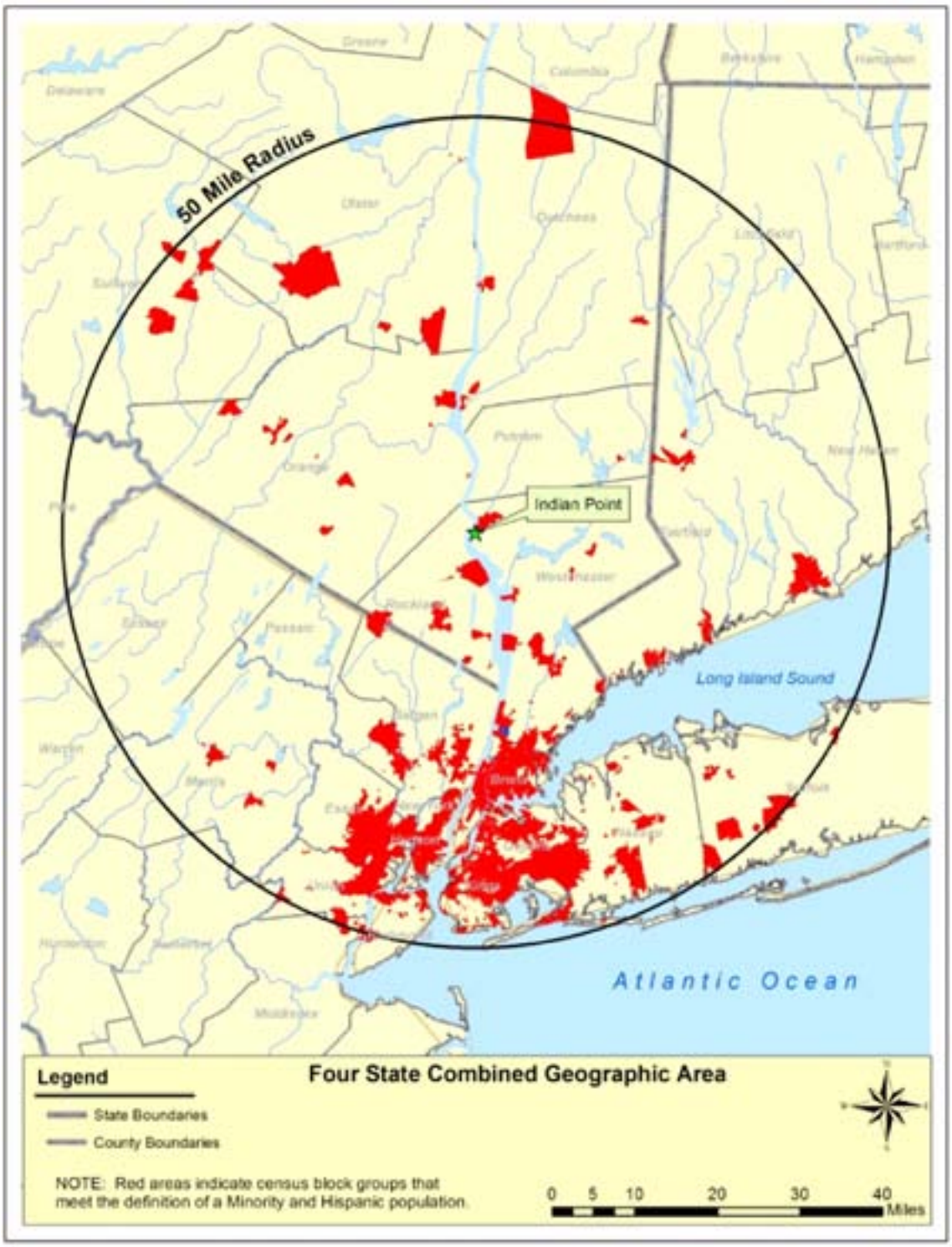

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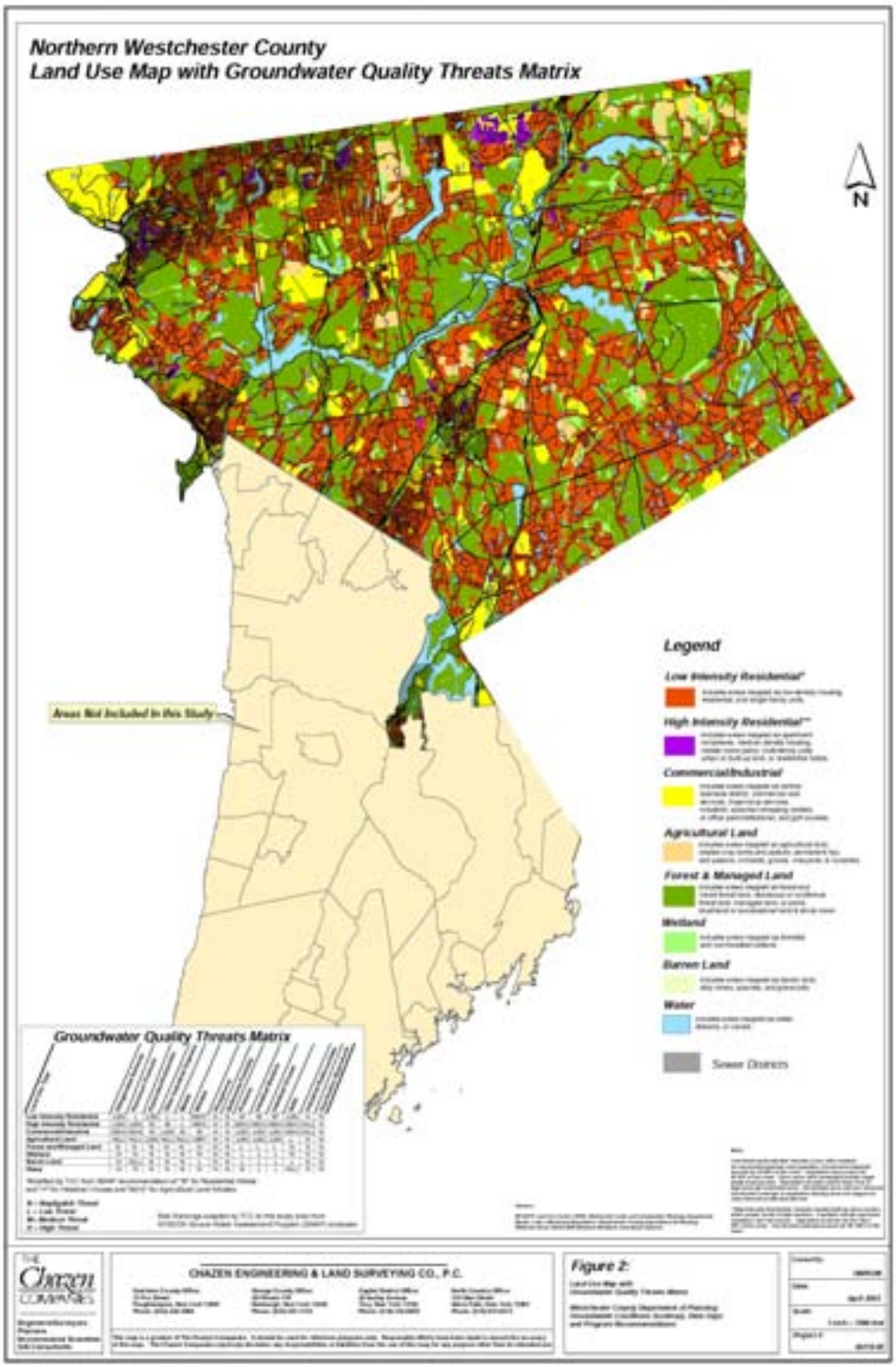

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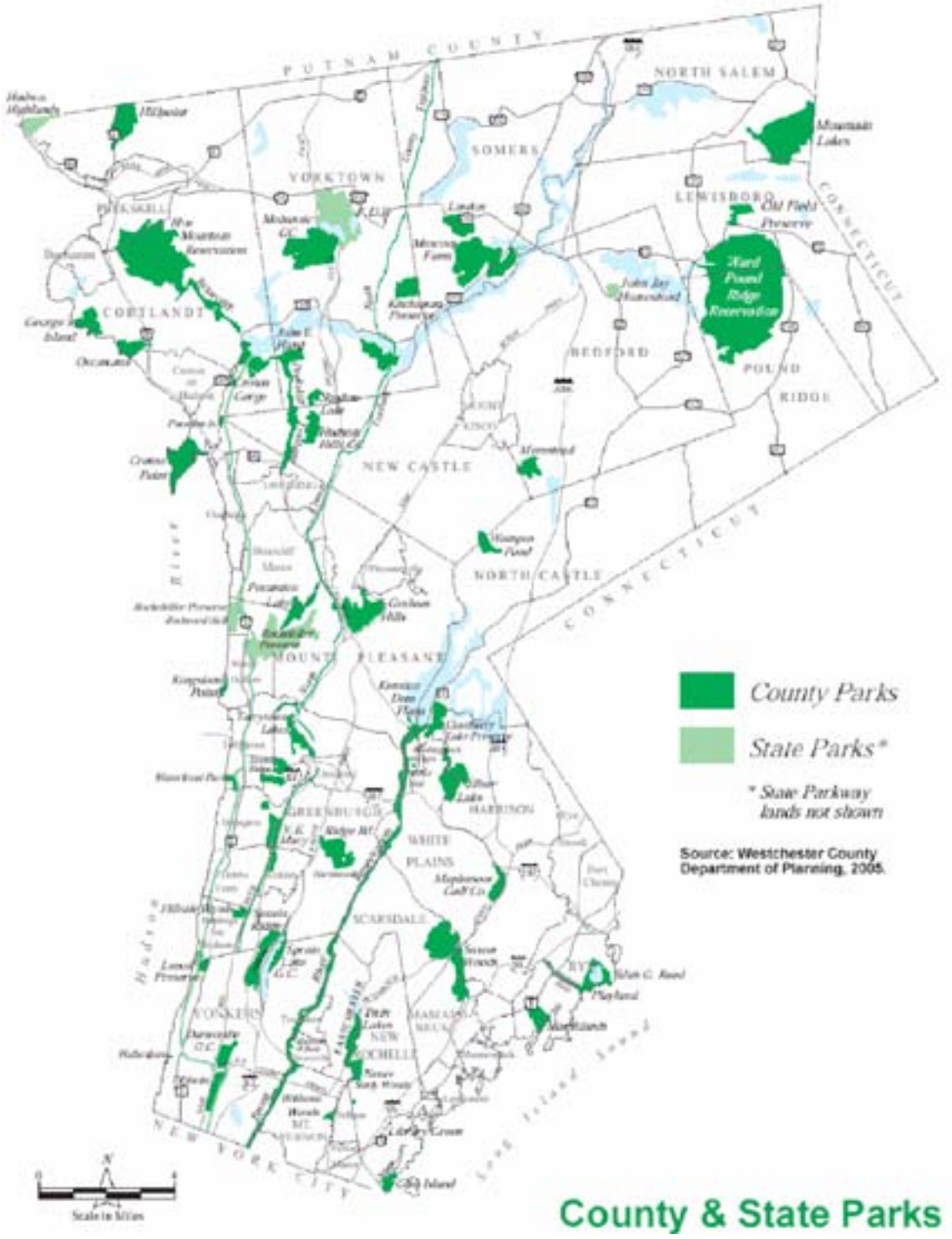

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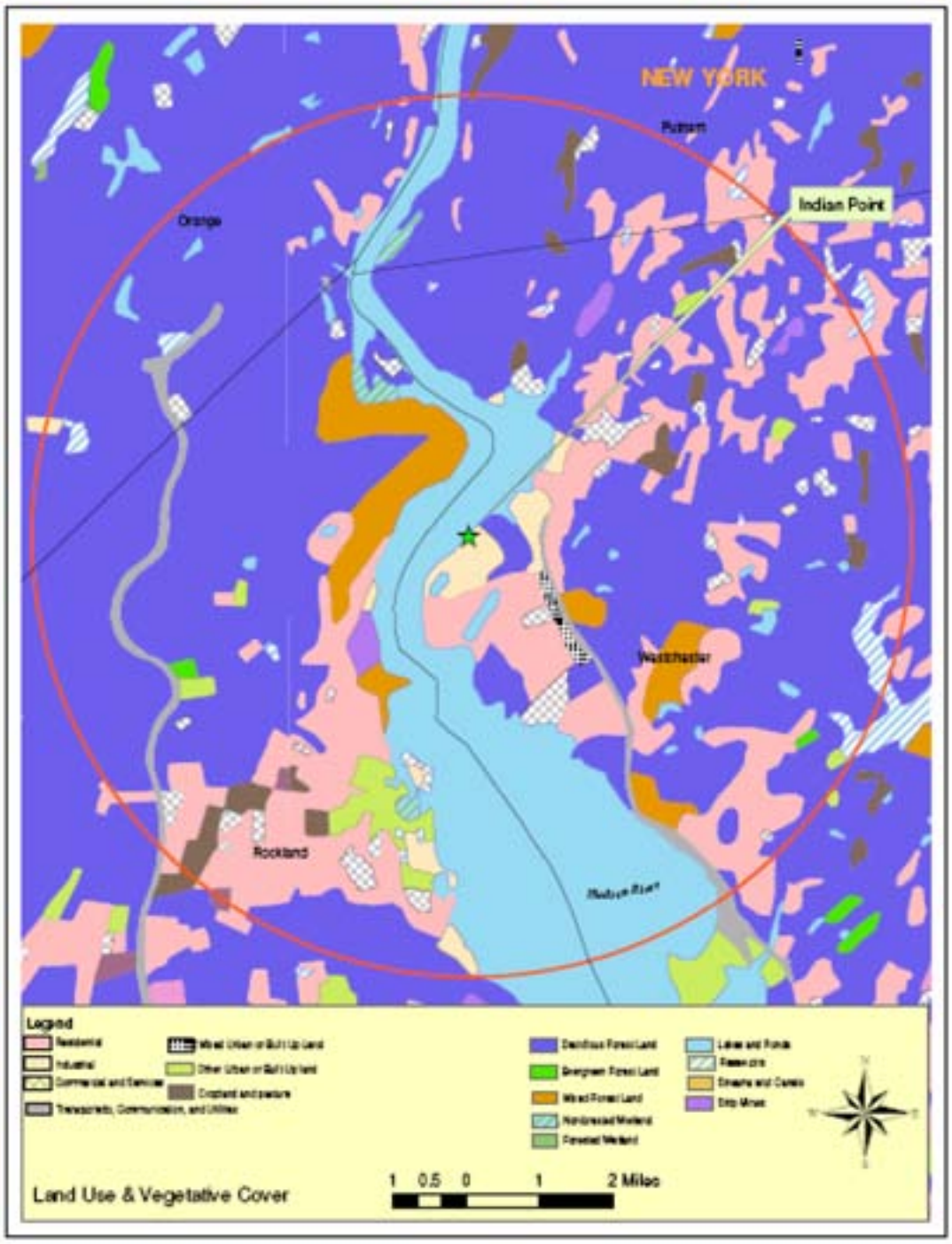

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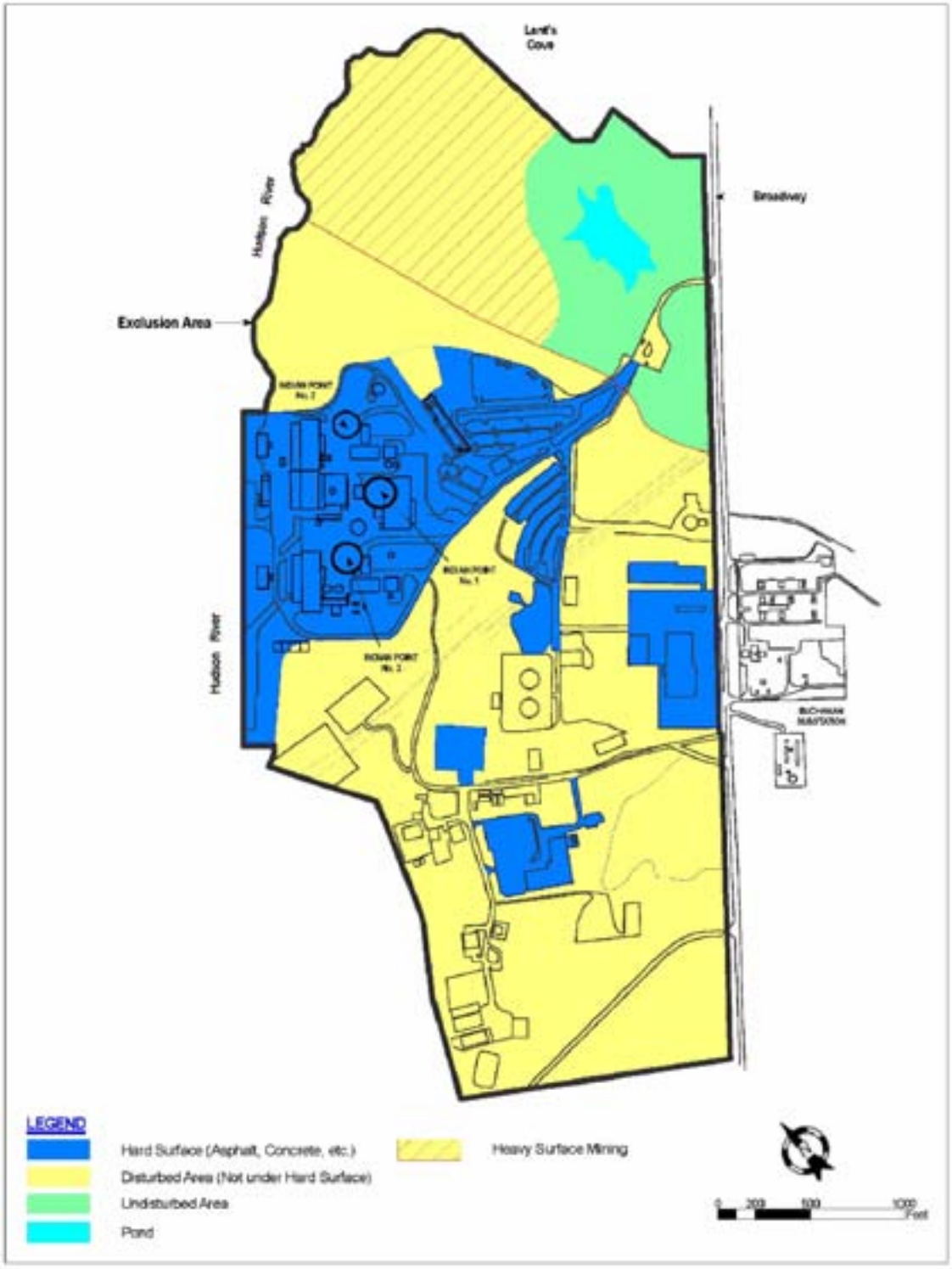

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