

## IPRenewal NPEmails

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**From:** Prussman, Stephen G [SPrussm@entergy.com]  
**Sent:** Wednesday, March 25, 2015 11:41 AM  
**To:** Pickett, Douglas  
**Cc:** Wentzel, Michael; Green, Kimberly  
**Subject:** RE: Indian Point Letter NL-15-028 Rejected by Document Control Desk  
**Attachments:** NL-15-028.pdf

I apologize for that

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**From:** Pickett, Douglas [mailto:Douglas.Pickett@nrc.gov]  
**Sent:** Wednesday, March 25, 2015 10:25 AM  
**To:** Prussman, Stephen G  
**Cc:** Wentzel, Michael; Green, Kimberly  
**Subject:** Indian Point Letter NL-15-028 Rejected by Document Control Desk

Steve –

Indian Point letter NL-15-028, dated March 10, 2015, which is your license renewal RAI response to the NRC letter of December 11, 2014, has been rejected by the Document Control Desk and returned to me.

The reason is that the pages in the attachment are miss-numbered. The first page following the Attachment cover sheet starts as “Page 2 of 46” but after “Page 44 of 46” it says “Page 45 of 47” through “Page 47 of 47.”

If you could get the attachment renumbered and email it to me, I can hand-carry it to the folks at the Document Control Desk.

Doug

Douglas V. Pickett, Senior Project Manager  
Indian Point Nuclear Generating Unit Nos. 2 & 3  
James A FitzPatrick Nuclear Power Plant  
[Douglas.Pickett@nrc.gov](mailto:Douglas.Pickett@nrc.gov)  
301-415-1364

**Hearing Identifier:** IndianPointUnits2and3NonPublic\_EX  
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**From:** Prussman, Stephen G

**Created By:** SPrussm@entergy.com

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"Pickett, Douglas" <Douglas.Pickett@nrc.gov>  
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**Entergy Nuclear Northeast**

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Fred Dacimo  
Vice President  
Operations License Renewal

NL-15-028

March 10, 2015

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11545 Rockville Pike, TWFN-2 F1  
Rockville, MD 20852-2738

SUBJECT:           Reply to Request for Additional Information Regarding the License  
Renewal Application Environmental Review (TAC Nos. MD5411 and  
MD5412)  
Indian Point Nuclear Generating Unit Nos. 2 & 3  
Docket Nos. 50-247 and 50-286  
License Nos. DPR-26 and DPR-64

REFERENCE:       NRC letter, "Request for Additional Information for the Review of the  
Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal  
Application Environmental Review (TAC Nos. MD5411 and MD5412)"  
dated December 11, 2014.

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. is providing, in the Attachment, the additional information requested in the referenced letter pertaining to NRC review of the License Renewal Application for Indian Point 2 and Indian Point 3. It should be noted that although much has changed since the SEIS was published, the information contained in the attached is meant to respond only to the specific questions contained in the RAI. In addition, the new aquatic related information is not being addressed here as it is being addressed in response to separate RAI's.

If you have any questions, or require additional information, please contact Mr. Robert Walpole, Manager Regulatory Assurance, at 914-254-6710.

This letter contains no new commitments.

I declare under penalty of perjury that the foregoing is true and correct. Executed on  
March 10, 2015.

Sincerely,

A handwritten signature in black ink, consisting of a stylized 'J' followed by a horizontal line and a dot.

FRD/rw

Attachment: Reply to NRC Request for Additional Information Regarding the License Renewal Application

cc: Mr. Daniel H. Dorman, Regional Administrator, NRC Region I  
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel  
Mr. Michael Wentzel, NRC Project Manager, Division of License Renewal  
Ms. Kimberly Green, NRC Project Manager, Division of License Renewal  
Dr. Dennis Logan, NRC Aquatic Biologist, Division of License Renewal  
Mr. Douglas Pickett, NRR Senior Project Manager  
Ms. Bridget Frymire, New York State Department of Public Service  
NRC Resident Inspector's Office  
Mr. John B. Rhodes, President and CEO NYSERDA

ATTACHMENT TO NL-15-028

REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION  
REGARDING THE  
LICENSE RENEWAL APPLICATION

ENTERGY NUCLEAR OPERATIONS, INC.  
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3  
DOCKET NOS. 50-247 AND 50-286

Reply to NRC Request for Additional Information Regarding  
the License Renewal Application

NUREG 1437, Revision 1, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants” (GEIS), which incorporates lessons learned and knowledge gained from license renewal environmental reviews conducted by the U.S. Nuclear Regulatory Commission (NRC) since 1996, redefines the number and scope of the generic and site-specific environmental impact issues that must be addressed during license renewal environmental reviews. As documented in the GEIS, and codified in Table B-1 of Appendix B to Subpart A of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, the NRC has determined that there are 78 environmental issues associated with license renewal that are required, as applicable, to be evaluated as part of the NRC staff’s review of a license renewal application. The NRC staff determined that 60 of these issues have been adequately addressed on a generic basis for all applicable nuclear plants. The GEIS identifies these as Category 1 (generic) issues. The NRC does not require additional analysis of those issues in site-specific environmental reviews unless there is new and significant information related to the conclusions in the GEIS that needs to be considered. Of the remaining 18 issues, 17 are identified as Category 2 issues, which require site-specific environmental reviews. The remaining issue, Chronic Effects of Electromagnetic Fields (EMFs), requires no site-specific analysis.

Based on its review of the GEIS and Table B-1 of Appendix B to Subpart A of 10 CFR Part 51, the NRC staff has determined that several environmental issues have been added to the scope of license renewal environmental reviews since the NRC staff issued the Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) final supplemental environmental impact statement (FSEIS) in December 2010 and the supplement to the FSEIS (Volume 4) in June 2013.

By letter dated September 8, 2014, the NRC staff notified Entergy Nuclear Operations, Inc. (Entergy) of its intent to prepare a second supplement to the FSEIS to address Entergy’s (a) revised severe accident mitigation alternatives cost estimates, and (b) new aquatic impact information. In addition to those two issues, the NRC staff’s FSEIS supplement will address continued storage of spent nuclear fuel, and new environmental issues identified in the NRC’s 2013 revisions to the GEIS and 10 CFR Part 51.

Accordingly, the NRC staff has requested the following additional information to support its evaluation of environmental issues related to the license renewal of IP2 and IP3. The staff noted that answers may incorporate or specifically refer to information previously evaluated by the NRC staff, as appropriate.

**RAI 1 (Category 1 Issues)**

<b><i>Resource Category</i></b>		<b><i>Issue</i></b>
<b><i>1.</i></b>	<b><i>Air Quality</i></b>	<b><i>Air quality impacts (all plants)</i></b>
<b><i>2.</i></b>	<b><i>Geologic Environment</i></b>	<b><i>Geology and soils</i></b>
<b><i>3.</i></b>	<b><i>Surface Water Resources</i></b>	<b><i>Effects of dredging on surface water quality</i></b>

4.	<b>Terrestrial Resources</b>	<b>Exposure of terrestrial organisms to radionuclides</b>
5.	<b>Aquatic Resources</b>	<b>Exposure of aquatic organisms to radionuclides</b>
6.		<b>Effects of dredging on aquatic organisms</b>
7.		<b>Impacts of transmission line right-of-way (ROW) management on aquatic resources</b>
8.	<b>Human Health</b>	<b>Human health impact from chemicals</b>
9.		<b>Physical occupational hazards</b>

1. **Based on the guidance in Regulatory Guide 4.2, Supplement 1, Revision 1 (RG 4.2) (June 2013), provide a description of the affected environment and any environmental resources pertinent to the new Category 1 issues listed in Table 1 above that apply to the IP2 and IP3 site. Include information on environmental characteristics, personnel protection programs, physical features and, as appropriate, historical monitoring data that may be relevant to the NRC staff's discussion of these issues in the FSEIS supplement.**

**In addition to the guidance in RG 4.2, include the following matters in your description of the affected environment for the identified resource areas:**

- a. **Air quality impacts: On November 3, 2009, the Commission issued a decision in the William States Lee and Bellefonte combined license proceedings (CLI-09-21), in which it provided guidance to the NRC staff regarding the need to include consideration of carbon dioxide and other greenhouse gas emissions (GHG) in its environmental reviews for major licensing actions under the National Environmental Policy Act.**
  - i. **In support of NRC staff's GHG and climate change impact analysis, provide any significant information beyond that addressed in the GEIS. This should include site-wide emission data (annual) for GHGs for the most recent 5 years. Emissions data should include stationary combustion sources (e.g., generators, boilers, etc.), mobile sources (e.g. commuters, visitors, delivery vehicle, etc.) and other sources (e.g., refrigerant leakage, emissions from switchyard). Please:**
    1. **identify and discuss the GHG emission sources**
    2. **provide information (e.g. operating hours per year, fuel consumption and rates, and energy rating as applicable for each source) used to support the GHG emission values provided;**

- ii. State whether Entergy has received any Notices of Violation for the most recent 5 years from the New York State Department of Environmental Conservation (NYSDEC) associated with IP2 and IP3 air permits (3-5522-00011/00026 and 3-5522-000105/00009)? If, so identify and summarize the violations and any corrective actions taken.*
- iii. Describe the compliance history associated with the IP2 and IP3 air permits for the most recent 5 years.*
- b. Effects of dredging on surface water quality: Provide a summary discussion of dredging practices conducted in the vicinity of surface water intakes, discharge structures, or shoreline structures, and of associated dredge spoil disposal practices. Consider activities conducted over the past 5 years and identify methods, frequency, and whether associated sediment and/or water quality analyses are performed (and summarize results). Provide copies of current, applicable U.S. Army Corps of Engineers (USACE) or NYSDEC permits which govern Entergy's dredging and discharge activities.*
- c. Effects of dredging on aquatic organisms: Provide a written discussion of the effects on aquatic organisms due to dredging conducted in the vicinity of IP2 and IP3 surface water intakes, discharge structures, and shoreline structures. Consider dredging activities conducted over the past 5 years. Also, include a discussion of any biological studies of species, populations, or communities that are potentially affected by dredging operations near Indian Point, including the stated purpose, methods, results, and discussion of those studies. If the USACE or NYSDEC permits assessed the environmental impacts of dredging, provide copies of those assessments.*
- d. Human health impact from chemicals: Provide a summary discussion of the nonradioactive chemical management program and procedures for the use, storage, and discharge of chemicals and sanitary wastes at the IP2 and IP3 site to minimize the impacts to human health.*
- e. Physical occupational hazards: Provide a summary discussion of occupational safety program at IP2 and IP3.*

#### Entergy Response

Below are Entergy's responses to the Category 1 issues listed in the following resource areas: Air Quality, Geologic Environment, Surface Water Resources, Terrestrial Resources, Aquatic Resources, and Human Health. Entergy did not identify any new and significant information during our review as it relates to these issues.



## 1. Air Quality

### Air Quality Impacts (all plants)

As has been widely recognized, steam-electric nuclear facilities, including Indian Point 2 (IP2) and Indian Point 3 (IP3), are base load electric generation facilities that produce electricity, largely without the criteria air pollutants or carbon emissions. As a function of the United States power supply mix, when nuclear facilities, such as IP2 and IP3, do not operate, the largely fossil-fuel replacement power operates with emissions of criteria air pollutants and carbon.

Thus, the discussion of IP2 and IP3's air quality impacts is primarily and overwhelmingly a discussion of its day-to-day benefits to local, regional and national air quality, with recognition of the insignificant or minor contributions of authorized emissions from emergency equipment, occasional maintenance and mobile sources.

IP2 and IP3 are located in Westchester County, New York which is part of the Environmental Protection Agency (EPA) designated New Jersey-New York-Connecticut Interstate Air Quality Control Region ([40 CFR 81.13](#)). Four states are located within a 50-mile radius of the site. These include Connecticut, New Jersey, New York and Pennsylvania. Based on the EPA's Green Book list of non-attainment counties for all criteria pollutants ([EPA 2015a](#)), as of January 2015, the following counties are in nonattainment for the ozone 8-hour standard.

- Connecticut: Fairfield, New Haven and Litchfield. Fairfield County is part of the EPA designated New Jersey-New York-Connecticut Interstate Air Quality Control Region.
- New York: Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, and Westchester. With the exception of Orange and Putnam counties, all counties are part of the EPA designated New Jersey-New York-Connecticut Interstate Air Quality Control Region.
- New Jersey: Bergen, Essex, Hudson, Middlesex, Morris, Passaic, Somerset, Sussex, Union and Warren. With the exception of Sussex and Warren counties, all counties are part of the EPA designated New Jersey-New York-Connecticut Interstate Air Quality Control Region.

The portion of Pike County in Pennsylvania is in attainment for all criteria pollutants.

Based on Section 2.2.4.3 of the Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Numbers 2 and 3 (hereafter referred to as the "SEIS"), there are no mandatory Class I Federal areas within 50 miles of the IP2 and IP3 site. The closest Class I Area is Lye Brook Wilderness Area, Vermont, approximately 150 miles east-northeast of the site. ([NRC 2010](#), Section 2.2.4.3)

Given the operational infrequency and short duration of maintenance testing associated with generators and boilers at IP2 and IP3, it is not expected to be an air quality concern in or adjacent to nonattainment areas. However, the combined IP2 and IP3 Air Permit 3-5522-00011/00026 issued by the New York State Department of Environmental Conservation

(NYSDEC) in December 2014, regulates air emissions from combustion sources at the site. This permit contains conditions established by the NYSDEC to protect New York's ambient air quality standards to ensure impacts are maintained at acceptable levels. These same conditions would regulate any future activities at IP2 and IP3 that may increase air pollutants or threaten the attainment status of counties within New York.

As discussed in Section 3.2.3 of the SEIS, air emissions associated with the hypothetical replacement of IP2's and IP3's reactor vessel head and control rod drive mechanism replacement would be of short duration and result in only minor impacts to air quality. (NRC 2010, Section 3.2.3)

As discussed in Section 4.2.1 of the SEIS, the two 345-kilovolt (kV) transmission lines that distribute power to the electric grid, and the two 138-kV lines that use the same transmission towers to supply offsite (standby) power, are contained within the IP2 and IP3 property boundary (NRC 2010, Section 4.2.1). Based on the Section 4.3.1.1 of GEIS, it was determined through several studies that the amount of ozone generated by even the largest lines in operation (765 kV) would be insignificant. (NRC 2013, Section 4.3.1.1)

Therefore, air quality impacts from IP2 and IP3 operations and associated transmission lines would be SMALL and would continue to be bounded by the analyses contained in Section 4.3.1.1 of NUREG-1437, Generic Environmental Impact Statement, Revision 1 (hereafter referred to as the "GEIS").

### *Greenhouse Gas Emissions*

Direct greenhouse gas (GHG) emissions can result from stationary combustion sources (diesel generators and boilers), mobile combustion sources (fleet vehicles), and fugitive fluorinated gases (electrical and refrigerant equipment). Indirect GHG emissions can originate from mobile combustion sources (workforce commuting). Since IP2 and IP3 are not required to measure and report GHG emissions, data does not exist for mobile sources such as visitors and delivery vehicles. Therefore, Entergy calculated GHG gas emissions on those direct and indirect plant activities where information was readily available. These include direct GHG emissions from stationary combustion sources shown in Table 1, fugitive fluorinated gases (sulfur hexafluoride), and indirect GHG emissions from workforce commuting. Perfluorocarbons are not utilized in any of the IP2 and IP3 electrical equipment.

Although ozone depleting substances (i.e., chlorofluorocarbons and hydrochlorofluorocarbons) are present at IP2 and IP3 and can potentially be emitted, estimating GHG emissions from these substances is complicated due their ability to deplete ozone, which is also a GHG, making their global warming potentials difficult to quantify. These ozone depleting substances are regulated by the Clean Air Act (CAA) under Title VI. Entergy maintains a program to manage stationary refrigeration appliances at IP2 and IP3 to recycle, recapture, and reduce emissions of ozone depleting substances and is in compliance with Section 608 of the Clean Air Act. Therefore, Entergy did not include potential emissions as result of leakage, servicing, repair, and disposal of refrigerant equipment at IP2 and IP3.

Calculated annual GHG emissions from 2009 – 2013 are shown in [Table 2](#). Direct GHG emissions for the stationary combustion sources (and capacity rating) shown in [Table 1](#) were calculated based on the following gallons of diesel fuel usage:

Year	Total
2009	31,877
2010	73,249
2011	35,178
2012	27,927
2013	47,896

#### *Notice of Violations*

Based on review of records over the previous 5 years (2010–2014), there have been no notices of violations associated with either IP2 Air Permit 3-5522-00011/00026 or IP3 Air Permit 3-5522-000105/00009, which have now been combined into IP2 and IP3 Air Permit 3-5522-00011/00026 issued by the NYSDEC in December 2014.

#### *Compliance History*

IP2 and IP3 possessed individual NYSDEC issued air permits to operate diesel generators, diesel starters, heating boilers, furnaces, instrument air diesel, diesel fire pumps, and a propane emergency generator, until the NYSDEC decided to combine them and issue a single joint permit in December 2014. Operation of these air emission sources is maintained within the opacity, fuel sulfur content, operational run times and fuel usage limits established in the air permit. As required by the air permit, reports of fuel sulfur content and emissions are submitted annually to the NYSDEC. For purposes of the CAA, IP2 and IP3 are considered minor air emission sources. IP2 and IP3 have been in compliance with these permits over the previous five years (2010-2014).

**Table 1**  
**List of Emission Sources and Capacity Rating**

Indian Point Unit 2		
Facility ID Number	Description	Capacity Rating
ED21	21 Emergency Diesel Generator	2,400 Horsepower
ED22	22 Emergency Diesel Generator	2,400 Horsepower
ED23	23 Emergency Diesel Generator	2,400 Horsepower
DS001	Diesel Starting Engine for GT1	525 Horsepower
DS003	Diesel Starting Engine for GT3	450 Horsepower
TSEDG	Technical Services Center EDG	590 Horsepower
FPEDG	Fire Pump Diesel	280 Horsepower

CPEDG	Security Diesel	155 Horsepower
BSGT1	Black Start Diesel for GT001	422 Horsepower
BSGT3	Black Start Diesel for GT003	250 Horsepower
GT1	Gas Turbine 001	260 Horsepower
GT3	Gas Turbine 003	239 Horsepower
APPR	New Appendix R Diesel	3,740 Horsepower
TC1	Training Center Furnace #1	0.560 MMBtu/hr
TC2	Training Center Furnace #2	0.490 MMBtu/hr
HSB 21	House Service Boiler 1	65 MMBtu/hr
HSB 22	House Service Boiler 2	65 MMBtu/hr

**Indian Point Unit 3**

31 EDG	31 Emergency Diesel Generator	2,760 Horsepower
32 EDG	32 Emergency Diesel Generator	2,760 Horsepower
33 EDG	33 Emergency Diesel Generator	2,760 Horsepower
App R	Appendix R Diesel Generator	3,710 Horsepower
TSC	Technical Service Center Diesel Generator	1,036 Horsepower
MET	Met Facility Backup Diesel Generator	40 Horsepower
STP	Sewage Treatment Plant Diesel Generator	80 Horsepower
FPD01	Fire Pump Diesel Generator	315 Horsepower
FPD02	Training Fire Pump Diesel Generator	304 Horsepower
OIACD	(Onsite) Instrument Air Compressor Diesel	313 Horsepower
TCB	Training Center Boiler	2.51 MMBtu/hr
TCWH	Training Center Water Heater	0.7 MMBtu/hr
HSB	House Service Boiler	163 MMBtu/hr

(IPEC 2014)

**Table 2**  
**Carbon Dioxide Equivalent (CO<sub>2</sub>e) Emissions, 2009 – 2013**

<b>Year</b>	<b>Combustion Sources (metric tons)</b>	<b>Sulfur Hexafluoride<sup>(a)</sup> (metric tons)</b>	<b>Workforce Commuting<sup>(b)</sup> (metric tons)</b>	<b>Total (metric tons)</b>
2009	326	1,246	4,465	<b>5,948</b>
2010	750	3,739	4,465	<b>8,865</b>
2011	360	1,246	4,465	<b>5,982</b>
2012	286	6,232	4,465	<b>10,894</b>
2013	490	0	4,465	<b>4,866</b>

- a. Pounds of sulfur hexafluoride added to electrical equipment are not tracked; therefore, emission calculations are based on the number of canisters (115 pounds/canister) issued from the Warehouse, and assuming the entire canister represented GHG emissions.
- b. Indirect GHG emissions from workforce commuting were assumed to remain constant from 2009 - 2013. Emissions are based on the following:
  - 1. Statistical information from U. S. Census Bureau (USCB) indicates that 10.5 percent of U.S. residents carpool to work ([USCB 2015](#)). Number of IP2 and IP3 employees as of January 2015 was 1,050 ([Entergy 2015](#)). Utilizing the 10.5 percent USCB carpool statistic, a value of "940" passenger vehicles per day was utilized.
  - 2. EPA's GHG Equivalencies Calculator shows that the CO<sub>2</sub>e/vehicle/year was estimated to be 4.75 metric tons ([EPA 2015b](#)).
  - 3. Carbon dioxide has a global warming potential (100-year time horizon) of "1" ([40 CFR Part 98, Subpart A, Table A-1](#)).
  - 4. 940 vehicles × 4.75 metric tons CO<sub>2</sub>e/vehicle/year × 1 (GWP)

## 2. **Geologic Environment**

### Geology and Soils

#### *Geology*

A general description of the site geologic setting at IP2 and IP3 are contained in the following documents that were submitted to the Nuclear Regulatory Commission (NRC):

- Section 6.4 of the Indian Point Energy Center Hydrogeologic Site Investigation Report submitted January 7, 2008 (ADAMS Ascension Number ML080320540)
- Sections 2.1 and 2.3.1 of the Entergy Seismic Hazard and Screening Report for IP2 submitted March 31, 2014 (ADAMS Ascension Number ML14099A110)
- Sections 2.1 and 2.3.1 of the Entergy Seismic Hazard and Screening Report for IP3 submitted March 31, 2014 (ADAMS Ascension Number ML14099A111)

#### *Onsite Soils*

As is addressed in the general description of the geology above, the site was excavated from rock, with the active area of site operations fully built out and retained buffer zones forested, where possible. Thus, the site has a low fraction of soils and low potential for erosion. Detailed soil units within the IP2 and IP3 property boundary are shown on [Figure 1](#) and include Charlton loam (8 to 15 and 25 to 35 percent slopes), Charlton-Chatfield complex (rolling, very rocky), Chatfield-Charlton complex (hilly, very rocky), Chatfield-Hollis-Rock outcrop complex (hilly), Hinckley gravelly loamy sand (3 to 8, 8 to 15 and 15 to 25 percent slopes), Leicester loam (0 to 3 percent slopes, stony, Pits (quarry), Sun loam, Udorthents (smoothed), Urban land, and Urban land-Charlton-Chatfield complex (rolling, very rocky). These soil units, associations, and descriptions are presented in [Table 3](#). As seen in [Figure 1](#), Urban land and Charlton-Chatfield complex are the two predominate soil series within the IPEC property.

Based on Section 3.0 of the Indian Point Energy Center Hydrogeologic Site Investigation Report (ADAMS Ascension Number ML080320540), it appears that soil or blast rock was the material most commonly used as backfill material against IP2 and IP3 foundation walls.

#### Erosion Potential

Because IP2 and IP3 have been operational since the mid-1980s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture, all soil units listed in [Table 3](#) have some erosion potential with the exception of quarry pit and urban land which were not rated as to erosion potential. However, IP2 and IP3 maintain and implement stormwater pollution prevention plans when construction projects call for them, that identify potential sources of pollution that would reasonably be expected to affect the quality of storm water, such as erosion, and identifies the practices that will be used to prevent or reduce the pollutants in storm water discharges.

These practices, as they relate to erosion, include non-structural preventative measures and source controls, as well as structural controls to prevent erosion or treat storm water containing pollutants caused by erosion. In addition, any earth change that disturbs one or more acres requires a construction storm water permit to be obtained from the NYSDEC. The construction storm water permit specifies best management practices to reduce erosion caused by storm water runoff and therefore the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the storm water may contact.

### Prime Farmland Soils

Natural Resources Conservation Service maps do not identify any prime farmland on or surrounding the IP2 and IP3 property as shown in [Figure 2](#). Since a large portion of the site is committed to industrial development and has been previously disturbed by site-related activities, the majority of the site would likely be exempted from the definition of prime farmland. However, even if areas of the property were designated prime farmland, IP2 and IP3 would not be subject to the Farmland Protection Policy Act, since Section 4.4.1 of the GEIS specifies that the Act does not include Federal permitting or licensing for activities on private or non-Federal lands ([NRC 2013](#), Section 4.4.1). License renewal is considered a Federal licensing activity and IP2 and IP3 are located on private land.

As shown in [Figure 2](#), there are portions of the site and some areas adjoining or near the property boundary that are designated farmland of state importance. However, there are no areas of the IP2 and IP3 property or immediately adjacent to it that are currently used as farmland. Soil units designated as prime farmland are included in [Table 3](#).

Therefore, geology and soils impacts from IP2 and IP3 operations are anticipated to be SMALL and would continue to be bounded by the analysis contained in Section 4.4.1 of the GEIS.

### *Seismic History*

Seismic activity in the area is rare and no damage to IP2 and IP3 has resulted therefrom ([Entergy 2013](#), Section 1.2.1). Within a 50-mile radius of IP2 and IP3 from 1914 – 2014, there have been 13 recorded seismic events with a recorded magnitude of 3.0 or greater as shown in [Table 4](#).

Based on Section 2.0 of the Entergy Seismic Hazard and Screening Report for IP2 (ADAMS Ascension Number ML14099A110) and Entergy Seismic Hazard and Screening Report for IP3 (ADAMS Ascension Number ML14099A111), IP2 and IP3 are located in Zone I of the Uniform Building Code with intensities limited to V and VI on the Modified Mercalli Intensity Scale of 1931 and only slight earthquake activity can be expected. However, the facilities were built per requirements of Zone 2 of the Uniform Building Code, i.e., corresponding to an intensity VII on the Modified Mercalli Intensity Scale of 1931. The range of expected horizontal acceleration of ground motion for earthquakes of this intensity is 70-150 cm/sec<sup>2</sup> near the epicenter or about 0.15g max. At a distance of 100 miles from the epicenter, the acceleration drops to 50%. ([Entergy 2014a](#); [Entergy 2014b](#))



At IP2 and IP3, safety-related equipment, components and structures of the plants are designed to withstand an earthquake of the highest intensity which can reasonably be predicted from geologic and seismic evidence developed for the site ([Entergy 2013](#); [Entergy 2014c](#)).



**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

<b>Map Symbol</b>	<b>Soil Unit Name</b>	<b>Description</b>	<b>Erosion Potential</b>	<b>Farmland Designation</b>
ChC	Charlton loam, 8 to 15 percent slopes	The Charlton component makes up 80 percent of the map unit. This component is on till plains, ridges, and hills. The parent material consists of acid loamy till derived mainly from schist, gneiss, or granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.	Slight off-road or off-trail Severe on roads and trails	Farmland of Statewide Importance
ChE	Charlton loam, 25 to 35 percent slopes	The Charlton component makes up 80 percent of the map unit. This component is on till plains, ridges, and hills. The parent material consists of acid loamy till derived mainly from schist, gneiss, or granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.	Moderate off-road or off-trail Severe on roads and trails	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
CrC	Charlton-Chatfield complex, rolling, very rocky	<p>The Charlton component makes up 50 percent of the map unit. Slopes are 2 to 15 percent. This component is on till plains, ridges, and hills. The parent material consists of acid loamy till derived mainly from schist, gneiss, or granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.</p> <p>The Chatfield component makes up 30 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills, and ridges. The parent material consists of loamy till derived mainly from granite, gneiss, or schist. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.</p>	<p>Slight off-road or off-trail</p> <p>Severe on roads and trails</p>	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
CsD	Chatfield-Charlton complex, hilly, very rocky	<p>The Chatfield component makes up 45 percent of the map unit. Slopes are 15 to 35 percent. This component is on hills and ridges. The parent material consists of loamy till derived mainly from granite, gneiss, or schist. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.</p> <p>The Charlton component makes up 35 percent of the map unit. Slopes are 15 to 35 percent. This component is on till plains, ridges, and hills. The parent material consists of acid loamy till derived mainly from schist, gneiss, or granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.</p>	Moderate off-road or off-trail Severe on roads and trails	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
CuD	Chatfield-Hollis-Rock outcrop complex, hilly	<p>The Chatfield component makes up 30 percent of the map unit. Slopes are 15 to 35 percent. This component is on hills and ridges. The parent material consists of loamy till derived mainly from granite, gneiss, or schist. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent. Rock outcrops make up 25% of the mapped unit.</p> <p>The Hollis component makes up 30 percent of the map unit. Slopes are 15 to 35 percent. This component is on ridges and hills. The parent material consists of a thin mantle of loamy till derived mainly from schist, granite, and gneiss. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.</p>	<p>Moderate off-road or off-trail</p> <p>Severe on roads and trails</p> <p>Moderate off-road or off-trail</p> <p>Severe on roads and trails</p>	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

<b>Map Symbol</b>	<b>Soil Unit Name</b>	<b>Description</b>	<b>Erosion Potential</b>	<b>Farmland Designation</b>
HnB	Hinckley gravelly loamy sand, 3 to 8 percent slopes	The Hinckley component makes up 85 percent of the map unit. This component is on outwash plains, proglacial deltas, and terraces. The parent material consists of sandy and gravelly glaciofluvial deposits derived principally from granite, gneiss, and schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria.	Slight off-road or off-trail Moderate on roads and trails	Farmland of Statewide Importance
HnC	Hinckley gravelly loamy sand, 8 to 15 percent slopes	The Hinckley component makes up 85 percent of the map unit. This component is on outwash plains, proglacial deltas, and terraces. The parent material consists of sandy and gravelly glaciofluvial deposits derived principally from granite, gneiss, and schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria.	Slight off-road or off-trail Moderate on roads and trails	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

<b>Map Symbol</b>	<b>Soil Unit Name</b>	<b>Description</b>	<b>Erosion Potential</b>	<b>Farmland Designation</b>
HnD	Hinckley gravelly loamy sand, 15 to 25 percent slopes	The Hinckley component makes up 80 percent of the map unit. This component is on outwash plains, proglacial deltas, and terraces. The parent material consists of sandy and gravelly glaciofluvial deposits derived principally from granite, gneiss, and schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria.	Moderate off-road or off-trail Severe on roads and trails	Not prime farmland

**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

<b>Map Symbol</b>	<b>Soil Unit Name</b>	<b>Description</b>	<b>Erosion Potential</b>	<b>Farmland Designation</b>
LcA	Leicester loam, 0 to 3 percent slopes, stony	<p>The Leicester, poorly drained component makes up 50 percent of the map unit. This component is on depressions. The parent material consists of loamy acid till derived mostly from schist and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 5 percent. This soil meets hydric criteria.</p> <p>The Leicester, somewhat poorly drained component makes up 35 percent of the map unit. This component is on depressions. The parent material consists of loamy acid till derived mostly from schist and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria.</p>	<p>Slight off-road or off-trail</p> <p>Slight on roads and trails</p>	Not prime farmland
Pv	Pits, quarry	Open excavations from which soil and commonly underlying material have been removed, exposing either rock or other material.	Not Rated	Not prime farmland



**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
Sh	Sun loam	The Sun component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of loamy till derived primarily from limestone and sandstone, with a component of schist, shale, or granitic rocks in some areas. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 7 percent. This soil meets hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.	Slight off-road or off-trail Slight on roads and trails	Farmland of Statewide Importance
Ub	Udorthents, smoothed	The Udorthents, smoothed component makes up 80 percent of the map unit. Slopes are 0 to 8 percent. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 3 percent. This soil does not meet hydric criteria.	Slight off-road or off-trail Slight on roads and trails	Not prime farmland
Uf	Urban land	The Urban land component is land mostly covered by streets, parking lots, buildings, and other structures of urban areas.	Not rated	Not prime farmland



**Table 3**  
**Onsite Soil Unit Descriptions, IP2 and IP3**

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
UIC	Urban land-Charlton-Chatfield complex, rolling, very rocky	<p>Urban land makes up 40 percent of the map unit. The Urban land component is land mostly covered by streets, parking lots, buildings, and other structures of urban areas.</p> <p>The Charlton component makes up 20 percent of the map unit. Slopes are 2 to 15 percent. This component is on till plains, ridges, and hills. The parent material consists of acid loamy till derived mainly from schist, gneiss, or granite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This soil does not meet hydric criteria.</p> <p>The Chatfield component makes up 15 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills and ridges. The parent material consists of loamy till derived mainly from granite, gneiss, or schist. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 1 percent.</p>	<p>Not rated</p> <p>Slight off-road or off-trail</p> <p>Severe on roads and trails</p> <p>Slight off-road or off-trail</p> <p>Severe on roads and trails</p>	Not prime farmland

Table 3  
Onsite Soil Unit Descriptions, IP2 and IP3

Map Symbol	Soil Unit Name	Description	Erosion Potential	Farmland Designation
W	Water	Ponded and submerged areas	Not applicable	Not prime farmland

(USDA 1993; USDA 2015)

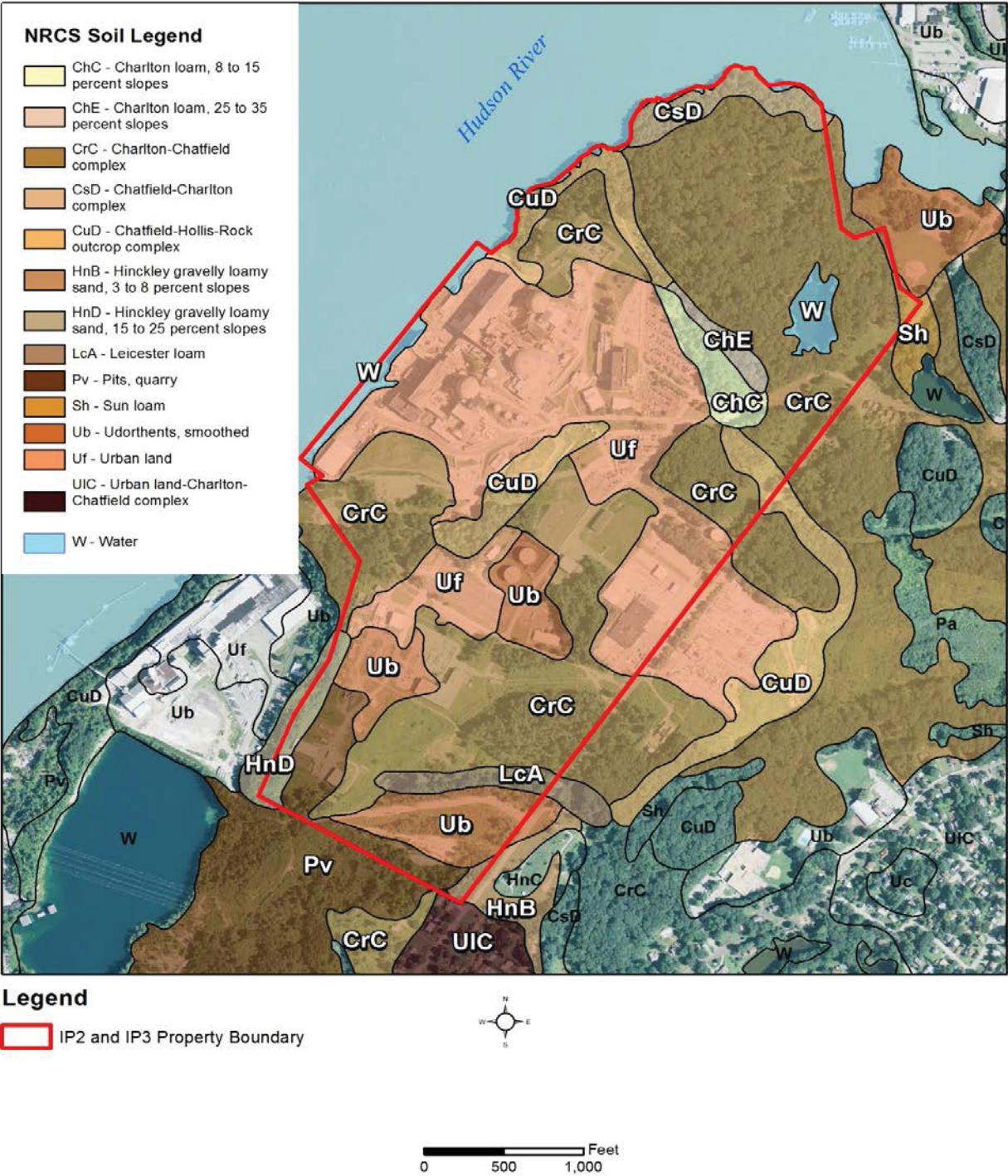
**Table 4 <sup>(a)</sup>**  
**Historic Earthquakes (1914 – 2014), 50-Mile Radius of IP2 and IP3**

<b>Year</b>	<b>Month</b>	<b>Day</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Intensity</b>	<b>Magnitude (MB)</b>	<b>Hypocenter Depth (Miles)</b>	<b>Distance to Site (Miles)</b>	<b>Remarks</b>
1952	10	8	41.70	74.00	V	(b)	(b)	29.8	(b)
1964	11	17	41.20	73.70	V	(b)	(b)	14.0	(b)
1967	11	21	41.20	73.80	V	(b)	(b)	9.3	(b)
1974	6	7	41.57	73.94	(b)	3.3	2.0	20.8	New York
1976	3	11	41.00	74.40	V	(b)	(b)	29.8	(b)
1976	4	13	40.80	74.03	(b)	3.1	0.0	32.7	Greater New York area, New Jersey
1976	4	13	40.80	74.00	VI	(b)	(b)	32.6	(b)
1979	12	30	41.14	73.69	V	(b)	5.0	16.3	(b)
1979	3	10	40.72	74.50	(b)	3.1	3.0	47.6	New Jersey
1983	2	26	41.55	73.66	(b)	3.0	7.0	24.9	New York
1985	10	19	40.98	73.83	(b)	3.6	6.0	21.0	New York
1991	10	28	41.07	73.58	(b)	3.0	10.0	23.9	New York
2009	2	3	40.87	74.52	(b)	3.0	5.0	40.5	Greater New York area, New Jersey

(USGS 2015; Entergy 2013, Table 2.8-1)

- a. Includes only earthquakes with a recorded magnitude of 3.0 or greater.
- b. Information not specified in reference materials.

Figure 1  
Onsite Soil Units, IP2 and IP3 Property



(USDA 2014)



[illegible]

 IP2 and IP3 Property Boundary



A horizontal scale bar labeled "Feet" at the right end. It has tick marks and labels for 0, 500, and 1,000.

### 3. Surface Water Resources

#### Effects of Dredging on Surface Water Quality

Dredging activities at IP2 and IP3 are reviewed and permitted by the U.S. Army Corps of Engineers (USACE) and NYSDEC. However, there have been no dredging activities associated with the intake structures at IP2 and IP3 over the previous five years; therefore, IP2 and IP3 do not currently possess permits from these agencies. Maintenance dredging at the intake structures to facilitate water flow has been infrequent, with the last dredging operations occurring in 1994. When previous dredging activities have occurred at IP2 and IP3, dredge spoils were properly disposed of in upland disposal facilities; thereby posing no risk to the water quality of the Hudson River. Since IP2 and IP3 must comply with the conditions specified in the USACE and NYSDEC permits, including appropriate mitigation measures, dredging impacts on surface water quality would be localized and SMALL and would continue to be bounded by the analysis in Section 4.5.1.1 of the GEIS. While dredging impacts are evaluated, it may well be that no dredging occurs during the license renewal period.

### 4. Terrestrial Resources

#### Exposure of Terrestrial Organisms to Radionuclides

The Department of Energy guideline for radiation dose rates from environmental media recommends limiting the radiation dose to riparian and terrestrial animals to less than 0.1 rad/d and limiting the dose to terrestrial plants to less than 1.0 rad/d. In Section 4.6.1.1 of the GEIS, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on terrestrial biota from continued operations. Site-specific radionuclide concentrations in water, sediment, and soils were obtained from Annual Radiological Environmental Operating Report (AREOR) reports for 15 nuclear plants, including IP2 and IP3. The RESRAD-BIOTA dose evaluation model was used by the NRC to calculate estimated dose rates for terrestrial biota by using the media concentrations presented in the AREOR's. (NRC 2013, Section 4.6.1.1)

NRC's dose rate evaluation results for IP2 and IP3 based on data contained in the 2006 AREOR were 0.00230 rad/d to riparian animals, 0.00222 rad/d to terrestrial animals, and 0.000244 rad/d to terrestrial plants (NRC 2013, Table 4.6-1); all of which are at least two orders of magnitude, on average below the 0.1 rad/d limiting dose rate for riparian and terrestrial animals, and 1.0 rad/d limiting dose rate for terrestrial plants.

Based on a comparison of radiological environmental monitoring program results contained in the 2006 and 2013 AREOR's (ADAMS Ascension Numbers ML071420088 and ML14142A031, respectively), Entergy has determined that there are no significant differences in the results for the two reporting periods, and anticipates that IP2 and IP3 would still be well below the 0.1 rad/d limiting dose rate for riparian and terrestrial animals, and 1.0 rad/d limiting dose rate for terrestrial plants during continued operations. Therefore, exposure of terrestrial organisms to radionuclides from IP2 and IP3 operations are anticipated to have SMALL impacts and would continue to be bounded by the analysis contained in the Section 4.6.1.1 of the GEIS.

## **5.– 7. Aquatic Resources**

### Exposure of Aquatic Organisms to Radionuclides

The Department of Energy's guideline for radiation dose rates from environmental sources recommends limiting the radiation dose to aquatic biota to no more than 1 rad/d. In Section 4.6.1.2 of the GEIS, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on aquatic biota from continued operations. Site-specific radionuclide concentrations in water and sediment were obtained from AREOR reports for 15 nuclear plants, including IP2 and IP3. The RESRAD-BIOTA dose evaluation model was used by the NRC to calculate estimated dose rates to aquatic biota by using the media concentrations presented in the AREOR's. (NRC 2013, Section 4.6.1.2) Total dose rate evaluation results for IP2 and IP3 based on data contained in the 2006 AREOR was 0.0501 rad/d, which is at least two orders of magnitude, on average below 1.0 rad/d limiting dose rate to aquatic biota. (NRC 2013, Table 4.6-5)

Based on a comparison of radiological environmental monitoring program results contained in the 2006 and 2013 AREOR's (ADAMS Ascension Numbers ML071420088 and ML14142A031, respectively), Entergy anticipates that IP2 and IP3 would still be well below the 1.0 rad/d limiting dose rate for aquatic biota during continued operations. This is further supported by the 2011 prefiled testimony of F. Owen Hoffman, President and Director of SENES Oak Ridge, Inc., in the matter of Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC for a State Pollution Discharge Elimination System Permit Renewal and Modification, and Joint Application for Clean Water Act § 401 Water Quality Certification (ADAMS Ascension Number ML14097A326) who calculated estimated dose rates to aquatic biota in the vicinity of the site. Based on Mr. Hoffman's calculations, dose rates were determined to be orders of magnitude below the Department of Energy's 1 rad/d guideline. Therefore, exposure of aquatic organisms to radionuclides from IP2 and IP3 operations are anticipated to have SMALL impacts and would continue to be bounded by the analysis contained in the Section 4.6.1.2 of the GEIS.

### Effects of Dredging on Aquatic Organisms

Dredging activities at IP2 and IP3 are reviewed and permitted by the USACE and NYSDEC. However, there have been no dredging activities associated with the intake structures at IP2 and IP3 over the previous five years; therefore, IP2 and IP3 do not currently possess permits from these agencies. Maintenance dredging at the intake structures to facilitate water flow has been infrequent, with the last dredging operations occurring in 1994. Since IP2 and IP3 must comply with the conditions specified in the USACE and NYSDEC permits, including appropriate mitigation measures, dredging impacts on aquatic resources would be localized and SMALL, and would continue to be bounded by the analysis in Section 4.6.1.2 of the GEIS. While dredging impacts are evaluated, it may well be that no dredging occurs during the license renewal period.

### Impacts of Transmission Line Right-of-Way (ROW) Management on Aquatic Resources

As discussed in Section 4.2.1 of the SEIS, the two 345-kilovolt (kV) transmission lines that distribute power to the electric grid, and the two 138-kV lines that use the same transmission towers to supply offsite (standby) power, are contained within the IP2 and IP3 property



boundary, except for where they cross Broadway (a public road) to connect to the Buchanan substation, (NRC 2010, Section 4.2.1) which is owned by Consolidated Edison. These transmission lines do not cross any aquatic habitat. Therefore, due to the absence of aquatic habitat under the transmission lines, impacts from ROW management would be SMALL, and would continue to be bounded by the analysis in Section 4.6.1.2 of the GEIS.

## **8.-9. Human Health**

### Human Health Impact from Chemicals

The use and storage of chemicals at IP2 and IP3 are controlled in accordance with Entergy's chemical control program procedure and appropriate industrial safety procedures, which ensures that necessary practices are taken to protect the plant worker from exposure to hazardous chemicals. These practices can entail the use of personal protection equipment, industrial hygiene monitoring or respiratory protection, based on the hazards associated with the chemical.

Wastewater discharges, including wastewaters that may contain minimal amounts of chemicals or metals, are controlled by SPDES permit NY-0004472. Therefore, effects from these type discharges are readily controlled through the permit and periodic modifications, if needed, during the license renewal term. In addition, noncompliances associated with the SPDES permit have been infrequent. IP2 and IP3 do not discharge sanitary wastes to surface water. Sanitary wastewater from all plant locations is transferred to the Village of Buchanan publicly owned treatment works system where it is managed appropriately, except for a few isolated plant areas that have their own septic tanks which are pumped out by a septic company, as needed, and taken to an offsite facility for appropriate management.

Industrial practices at IP2 and IP3 involving the use of chemicals are typically associated with painting, cleaning of parts/equipment, refueling activities, use of water treatment additives, and management of wastes. In addition to the chemical storage requirements specified in Entergy's chemical control program procedure, IP2 and IP3 also have site-specific spill prevention plans and waste management procedures which are designed to minimize the potential for a chemical or hazardous waste release to the environment.

Based on the control measures that are in place at IP2 and IP3, human health impact from chemicals are anticipated to be SMALL, and would continue to be bounded by the analysis in Section 4.9.1.1.2 of the GEIS.

### Physical Occupational Hazards

Nuclear power plants are industrial facilities that have many of the typical occupational hazards found at any other electric power generation utility. Workers at or around the IP2 and IP3 sites would be involved in some electrical work, electric power line maintenance, repair work, and maintenance activities, and thus exposed to some potentially hazardous physical conditions (e.g., falls, excessive heat, cold, noise, electric shock, and pressure).

The Occupational Safety and Health Administration (OSHA) governs the occupational safety and health of IP2 and IP3 operations staff. It was determined in Section 3.9.5.1 of the GEIS that

occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment. (NRC 2013, Section 3.9.5.1)

Operational requirements associated with OSHA standards are incorporated into Entergy's fleet occupational health and safety program to address hazards such as falls, excessive heat, cold, noise, electric shock and pressure. Since IP2 and IP3 and its contractors comply with OSHA's substantive requirements standards that are incorporated into Entergy's occupational safety and health practices, impacts associated with physical occupational hazards would be SMALL, and would be bounded by the analysis in Section 4.9.1.1.5.

2. ***Please provide an evaluation of any new and significant information of which you are aware that pertains to these issues, beyond the information addressed in the GEIS, regarding the environmental impacts of IP2/IP3 license renewal.***

Entergy Response

Based on review of the analyses of the new Category 1 issues discussed in the GEIS that were applicable to IP2 and IP3, permits listed in Appendix E of the SEIS, and recent records that may be associated with the new Category 1 issues, Entergy is not aware of new and significant information regarding potential significant adverse environmental impacts of license renewal associated with IP2 and IP3.

**RAI 2 (Category 2 Issues)**

<b><i>Resource Category</i></b>		<b><i>Issue</i></b>
<b><i>1.</i></b>	<b><i>Groundwater Resources</i></b>	<b><i>Radionuclides released to groundwater</i></b>
<b><i>2.</i></b>	<b><i>Terrestrial Resources</i></b>	<b><i>Effects on terrestrial resources (non-cooling system impacts)</i></b>
<b><i>3.</i></b>	<b><i>Environmental Justice</i></b>	<b><i>Minority and low-income populations</i></b>
<b><i>4.</i></b>	<b><i>Cumulative Impacts</i></b>	<b><i>Cumulative impacts</i></b>

1. ***Based on the guidance in RG 4.2, provide relevant information and an analysis of the new Category 2 issues listed in Table 2 above. To the extent that an issue may have been reviewed previously in the 2010 FSEIS or the 2013 FSEIS supplement, you may identify and incorporate the relevant information that was previously reviewed in your response, and provide any additional information needed to satisfy the guidance in RG 4.2. Further, provide an evaluation of any new and significant information regarding the affected environment and the environmental impacts of license renewal of which you are aware, beyond the information considered in the 2010 FSEIS or the 2013 FSEIS supplement.***

## Entergy Response

Below is Entergy's analysis of the following Category 2 issues: Groundwater Resources, Terrestrial Resources, Environmental Justice, and Cumulative Impacts. Entergy did not identify any new and significant information during our analysis as it relates to these issues.

### **1. Groundwater Resources**

#### Radionuclides Released to Groundwater

Consistent with the guidance in Regulatory Guide 4.2, Supplement 1, and previous industry submittals, Entergy is providing the information below to address the impacts from radionuclides in groundwater at the IP2 and IP3 site.

Groundwater beneath the site is not suitable for drinking water purposes. In addition, no groundwater pathway has been identified for contaminated groundwater to reach other drinking water users near IP2 and IP3. Entergy publishes quarterly groundwater monitoring reports that present the monitoring results during the quarter, and presents analyses and conclusions.

These reports can be accessed at <http://www.safesecurevital.com/environment/reports.html>. Based on the second quarter 2014 report, site groundwater contaminants continue to migrate toward the Hudson River to the west, and have not migrated off the site to the north, east or south. In addition, the amount of radionuclides being released through the groundwater pathway remains small compared to permitted levels of radionuclides discharged to the river through the Discharge Canal.

In the prefiled testimony of F. Owen Hoffman, President and Director of SENES Oak Ridge, Inc., in the matter of Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC for a State Pollution Discharge Elimination System Permit Renewal and Modification, and Joint Application for Clean Water Act § 401 Water Quality Certification (ADAMS Ascension Number ML14097A326), Mr. Hoffman determined that the levels of radionuclides released to the Hudson River from groundwater are extremely low, with an immaterial effect on annual dose consequence to man or aquatic biota. Moreover, given the low levels of these releases, and the large volume of water in the Hudson River, there is no evidence that the releases of radionuclides from groundwater have any measurable effect on the level of radionuclides present in the Hudson River from historical sources. As such, there is no credible scientific basis to conclude that releases of radionuclides to groundwater that has migrated to the Hudson River have impaired or will impair its designated best uses, including primary or secondary contact recreation, such as swimming, fishing, and boating.

#### Current issues

In 2014 - 2015, periodic increases in tritium concentrations in 3 monitoring wells occurred, which were consistent with site conceptual model and known site retention mechanisms. While these conditions are receiving focused attention, they reflect expected variability in the management of a known and well-characterized condition, the potential environmental impacts of which have been fully analyzed

In April 2014, Indian Point through its ground water monitoring program identified elevated tritium in the vicinity of three monitoring wells on site (to date the peak concentration was 938,500 pCi/L). The initial samples were obtained in the last week of March 2014 during the Unit 2 refueling outage. The three wells are located near the Unit 2 Spent Fuel, maintenance and outage and primary auxiliary buildings.

The apparent cause of the elevated levels has been determined to be from a floor drain that backed-up during system draining operations during the 2014 IP2 refueling outage ultimately contacting floor/wall joint areas where water passed through to the bedrock area below the floor. The concentrations in the wells near the building/floor location continues to fluctuate at levels greater than the pre-outage baseline. While elevated, the trend behavior is consistent with the site conceptual model and known tritium retention mechanisms in the area, and are expected to subside and show a consistent downward trend by the end of 2015. The offsite impact of the increased levels observed remains fully bounded by prior impact assessments and hence is a small fraction of regulatory effluent limits. Monitoring and trending of the well concentrations continues in accord with Entergy's long-term monitoring program.

Therefore, Entergy concludes that impacts from a radiological dose perspective and EPA drinking water perspective are SMALL.

## **2. Terrestrial Resources**

### Effects on Terrestrial Resources (Non-Cooling System Impacts)

Terrestrial resources are described in Section 2.2.6 of the SEIS. Entergy has not identified any license-renewal-related construction activities or changes in operational practices that would involve disturbing habitats. Entergy would continue to conduct ongoing plant operational and maintenance activities during the license renewal period. However, these activities are expected to have minimal impacts on terrestrial resources because activities would not occur within previously undisturbed habitats.

Operational and maintenance activities that Entergy might undertake during the renewal term, such as maintenance and repair of plant infrastructure (e.g., roadways, piping installations, fencing and other security infrastructure), would likely be confined to previously disturbed areas of the site. Furthermore, Entergy has administrative controls in place at the IP2 and IP3 site to ensure that operational changes or construction activities is reviewed, and the impacts minimized through implementation of best management practices, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to such as stormwater management, spill prevention, dredging, and herbicide usage further serve to minimize impacts to terrestrial resources.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the IP2 and IP3 license renewal period. Therefore, Entergy concludes the impacts to the terrestrial ecosystems from license renewal are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

### 3. Environmental Justice

#### Minority and Low-Income Populations

The demographic characteristics, specifically the minority and low-income populations, presented in the 2000 and 2010 U.S. Census Bureau counts were evaluated for the IP2 and IP3 50-mile region ([Table 5](#)). A comparison of minority populations was also made for the individual state and four-state geographic areas, consistent with what was previously reported in the Indian Point Energy Center Environmental Report ([Table 6](#)). Low-income populations were also evaluated and the results are listed in [Tables 7](#) and [8](#).

As noted in [Table 5](#), two minority categories (e.g. Native Hawaiian/Other Pacific Islander and Two or More Races), showed a decrease in population from 2000 to 2010, a decrease in the percent of minority, and a slight decrease in the criteria percentage. The remaining seven minority categories showed a net increase in reported population, percentage, and criteria, with one exception. The Black Category illustrated an increase in population within the region; however, both the percentage of Black persons within the region and the criteria percentage declined slightly.

As shown in [Table 6](#), each individual state and the Four-State Area had both net increases and decreases of populations within the different race categories, with net decreases primarily occurring in the Black, American Indian/Alaskan Native, Native Hawaiian/Other Pacific Islander, and Other Categories.

To evaluate low-income, the 2000 and 2010 individual data was collected for each state represented in the region (e.g. Connecticut, New Jersey, New York, and Pennsylvania) and the Four-State Geographic Area. The results of this evaluation are listed in [Table 7](#).

The low-income statistics for families and individuals was also calculated for the 50-mile region. As noted in [Table 8](#), approximately 13.2 percent of the families and 13.6 of the individuals were classified as meeting the U.S. Census Bureau defined poverty threshold.

Based on this comparison, Entergy has concluded that NRC's conclusion in Section 4.4.6 of the SEIS regarding no disproportionately high and adverse human health impacts as a result of renewal of the IP2 and IP3 operating licenses remains valid.

### 4. Cumulative Impacts

#### Cumulative Impacts

Other than the known or reasonably foreseeable Federal projects or other activities that could contribute to the cumulative environmental impacts of license renewal at the IP2 and IP3 site identified in Section 2.2.10 of the SEIS, Entergy is only aware of one additional project, although its' certainty is not known at this time.

Spectra is proposing an expansion of the Algonquin gas pipeline, a small portion of which would cross a portion of the IP2 and IP3 property. This expansion would involve the construction and operation of about 37.4 miles of natural gas pipeline and associated equipment and facilities in

New York, Connecticut, and Massachusetts. The majority of the pipeline facilities (about 26.3 miles) would replace existing Algonquin pipelines, while the remainder of the pipeline facilities (about 11.1 miles) consists of new mainline pipeline, new loop pipeline, and one new lateral pipeline. ([FERC 2015](#))

Even if this project proceeds, Entergy's review of NRC's impact level findings in Sections 4.8.1 (aquatic resources), 4.8.2 (terrestrial resources), 4.8.3 (radiological), 4.8.4 (socioeconomics) and 4.8.5 (groundwater) of the SEIS are still bounded. Therefore, no new and significant information exists for these resource areas.

To satisfy the guidance in Regulatory Guide 4.2, Supplement 1, Entergy is providing the information below to address additional resource areas that were not included in the SEIS as it relates to cumulative impacts.

### **Air Quality and Noise**

#### ***Air Quality***

The geographic area considered in the cumulative air quality analysis is the county of the proposed action, as air quality designations for criteria air pollutants are generally made at the county level. Counties are further grouped together based on a common airshed known as an air quality control region (AQCR) to provide for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). IP2 and IP3 are located in Westchester County, New York, which is part of the New Jersey-New York-Connecticut Interstate AQCR ([40 CFR 81.13](#)). This AQCR also includes several counties in Connecticut and New Jersey. The EPA regulates six criteria pollutants under the NAAQS, carbon dioxide, lead, nitrogen dioxide, sulfur dioxide, and particulate matter. Westchester County is a non-attainment area with respect to the 8-hour ozone standard based on EPA's Green Book list of current non-attainment counties in New York ([EPA 2015a](#)).

IP2 and IP3 possess a NYSDEC issued air permit to operate diesel generators, diesel starters, heating boilers, furnaces, instrument air diesel, diesel fire pumps, and a propane emergency generator. Operation of these air emission sources, which are operated intermittently, is maintained within the opacity, fuel sulfur content, operational run times and fuel usage limits established in the air permits. No additional increases of air emissions associated with IP2 and IP3 are anticipated during the license renewal period. Therefore, cumulative changes to air quality within a 50-mile radius of the site would be the result of changes to present-day emissions, as well as future projects and actions within a 50-mile radius of the site.

As discussed in Section 3.2.3 of the SEIS, the hypothetical replacement of IP2's and IP3's reactor vessel head (RVH) and control rod drive mechanism (CRDM) replacement (estimated to require an additional 400 workers for 65 days) may occur at IP2 and IP3. The main contributors to air quality impacts associated with these activities would be fugitive dust from site excavation and grading for construction of any new waste storage facilities and emissions from motorized equipment and workers' vehicles. The vehicle air emissions resulting from the additional workforce for these replacement activities would be temporary and are estimated to result in an additional 0.95 tons (0.86 metric tons (MT)) of volatile organic compounds, 16.1 tons (14.6 MT) of carbon monoxide, and 1.02 tons (0.926 MT) of nitrogen oxides being emitted, which do not



exceed the regulatory conformity thresholds for volatile organic compounds, carbon monoxide and nitrogen oxides of 50 tons (45 MT), 100 tons (90.7 MT), and 50 tons (45 MT), respectively, as indicated in 40 CFR 51.853(b). Therefore, the additional emissions resulting from these activities at IP2 and IP3 are expected to be minor. (NRC 2010, Section 3.2.3)

Continued air emissions from existing projects and foreseeable projects such as the Spectra project as well as proposed new source activities would contribute to air emissions.

Development and construction activities associated with regional growth of housing, business, and industry, as well as associated vehicular traffic, would also result in additional air emissions. Project timing and location, which are difficult to predict, affect cumulative impacts to air quality. However, permitting and licensing requirements, efficiencies in equipment, cleaner fuels, and various mitigation measures can be used to minimize cumulative air quality impacts.

Climate change can affect air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change influences. Sunshine, high temperatures and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase in the Southeast region, ozone levels will not necessarily increase since ozone formation is also dependent on the relative amount of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States however, must continue to comply with the CAA and ensure air quality standards are met. (NRC 2014, Section 4.16.1.1)

### *Noise*

With the exception of emergency sirens, most of the customary noise sources, including during scheduled refueling outages at IP2 and IP3 are not audible at the site boundary and are intermittent and considered a minor nuisance. As a major industrial facility, IP2 and IP3 noise emissions could potentially reach 65–75 A-weighted decibels (dBA) levels on site, which attenuates with distance (NRC 2014, Section 4.16.1.2). The nearest residence from IP2 and IP3 is approximately 0.22 miles southwest of the site, and the nearest parks (Bear Mountain State Park and Harriman State Park) closest point is less than one mile in distance northwest of the site. Local ordinances and State policy govern noise in the absence of Federal regulation, in a manner designed to protect human health and the environment. Therefore, cumulative impacts to noise levels would be the result of continued operation sources from IP2 and IP3 and around the site, as well as future projects and actions in the vicinity of the site.

Noise levels in the vicinity of a nuclear power plant could increase from planned activities associated with urban, industrial, and commercial development. The magnitude of cumulative impacts depends on the nuclear plant's proximity to other noise sources. Ongoing or foreseeable future projects in and around the IP2 and IP3 site would increase noise levels only in the vicinity of their noise sources, and combined noise levels are not expected to be high enough to cause noise issues. For instance, activities at the IP2 and IP3 site related to RVH and CRDM replacement, if they occur, would increase noise levels as a result of construction activities related to the motorized equipment and increased vehicles. Additional noise from construction activities would be temporary and intermittent and the majority of work activities

would occur inside of buildings. The additional noise sources are not expected to be audible beyond the site boundary. Therefore, contributions to noise levels from future actions are limited by projects in the vicinity of IP2 and IP3. Accordingly, cumulative impacts on noise levels are expected to be minor and remain minor during the license renewal term.

### *Conclusion*

The incremental impacts on air quality and noise from the proposed renewal of the IP2 and IP3 operating licenses would be SMALL. Given that there are no expected changes in air emissions or noise levels, cumulative air quality and noise impacts would be the result of changes to present-day and reasonably foreseeable projects and actions. The timing and location of new projects, which are difficult to predict, affect cumulative impact on air quality and noise levels. Although air quality impacts could affect a States' ability to maintain attainment status with EPA's criteria pollutants, there are various strategies and techniques available to limit these impacts. Also, noise abatement and controls can be incorporated to reduce noise impacts. Therefore, Entergy concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions on air quality and noise levels during the IP2 and IP3 license renewal term would be SMALL.

### **Geology and Soils**

This section addresses the direct and indirect effects of license renewal on geology and soils when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. Activities associated with the hypothetical replacement of IP2's and IP3's RVH and CRDM, including ongoing operation and maintenance activities at the IP2 and IP3 site are expected to be confined to previously disturbed areas. Any geologic materials, such as aggregates used to support operation and maintenance activities, would be procured from local and regional sources. These materials are abundant in the region. Geologic conditions are not expected to change during the license renewal term. Thus, activities associated with continued operations are not expected to affect the geologic environment. Considering ongoing activities and reasonably foreseeable actions, Entergy concludes that the cumulative impacts on geology and soils during the IP2 and IP3 license renewal term would be SMALL.

### **Water Resources**

#### *Surface Water*

As discussed in Section 2.2.5.1 of the SEIS, the Hudson River originates at Tear-of-the-Clouds in the Adirondack Mountains of northern New York State. From its source, the river flows south 315 miles to its mouth at the Battery, at the south end of the island of Manhattan. The Hudson River basin extends 128 miles from east to west and 238 miles from north to south and drains an area of 13,336 square miles, with most of this area located in the eastern-central part of New York State and small portions in Vermont, Massachusetts, Connecticut, and New Jersey. (NRC 2010, Section 2.2.5.1)

As discussed in Section 2.2.5.2 of the SEIS, in 1609, the Hudson River watershed was almost entirely forested; by 1880, 68 percent of the watershed was farmland. Available records show that from the early 18<sup>th</sup> century to 1993, nearly 800 dams were constructed in the watershed. In



addition, the human population has substantially increased into the millions since the first census in 1790. (NRC 2010, Section 2.2.5.2)

Some of the more significant environmental issues and anthropogenic impacts to the Hudson River as discussed in more detail in Section 2.2.5.2 of the SEIS, included the following: dredging, channelization, and dam construction; industry and water use impacts; municipal wastewater treatment plants; chemical contaminants; nonpoint pollution; and invasive or exotic species. (NRC 2010, Section 2.2.5.2) In addition, deforestation and human development, and commercial and residential also contributed to impacts to the Hudson River.

The Hudson River was and is used as a source of potable water, a location for permitted or authorized intake and discharge, a mode of transportation, and a source of cooling water by industry and municipalities. Based on Section 2.2.5.2 of the SEIS, the chemical industry has the greatest number of industrial users, followed by oil, paper, and textile manufacturers; sand, gravel, and rock processors; power plants; and cement companies. Between Poughkeepsie and Yonkers (River Mile 24–77, there are four steam power generating stations that use water from the Hudson River for condenser cooling (Danskammer Point, Roseton, IP2 and IP3, and Bowline Point). (NRC 2010, Section 2.2.5.2)

The Hudson River at IP2 and IP3 is tidally influenced. IP2 and IP3 have a once-through condenser cooling system that withdraws water from the Hudson River. The same amount of water that is withdrawn for condenser cooling is discharged. However, the discharged water is at an NYSDEC-authorized temperature in compliance with New York State Water Quality Standards and, therefore, can induce some additional evaporation. Based on Section 2.2.2 of the SEIS, it was conservatively estimated that this induced evaporation from elevated discharge temperature is less than 60 cubic feet per second. (NRC 2010, Section 2.2.2) Because IP2 and IP3 withdraw water for cooling purposes from a river that is tidally influenced, they are not expected to contribute to cumulative impacts on surface water use.

As discussed in Section 4.8.1 of the SEIS, there is evidence to conclude that the overall quality of water in the lower Hudson River is improving. Cleanup of polychlorinated biphenyls in stretches of the river above the Troy Dam continues, and upgrades to wastewater treatment facilities during the past 20 years have reduced the amount of untreated sewage discharged into the river and contributed to reductions in nutrients and an apparent increase in dissolved oxygen. Chemical contaminants continue to persist in the tissues of fish and invertebrates inhabiting the lower Hudson River, and the presence of nonpoint discharges of chemicals and constituents continues to be a concern of local, state, and federal regulatory agencies and nongovernmental organizations. The NRC staff concluded in the SEIS that the quality of water and sediment in the lower Hudson River will continue to be a concern and a potential contributor to cumulative impacts. (NRC 2010, Section 4.8.1)

Climatic changes may result in increased precipitation overall across the region including increased heavy-precipitation events and associated increased runoff. This increase, combined with coastal and riverine flooding due to sea level rise and storm surge, could affect and is already affecting surface water use and quality as a result of saltwater intrusion into freshwater drinking supplies, and an increase in the quantity of pollutants released to the Hudson River as a result of precipitation runoff. The extent and magnitude of climate change impacts to the Hudson River is uncertain. Therefore, impacts could range from SMALL to MODERATE.

Surface water use from continued IP2 and IP3 operations will continue to be a very small percentage of the overall flow of the Hudson River, and ongoing and future surface water demands by users are expected to be supported. Surface water discharges to the Hudson River and other industrial users will be monitored and kept at acceptable limits via State Pollutant Discharge Elimination System permits. Therefore, cumulative impacts to surface water use and quality from existing Hudson River users are anticipated to be SMALL. However, when combined with other past, present, and reasonably foreseeable future activities, specifically climate change, impacts to surface water use and quality could range from SMALL to MODERATE.

#### *Groundwater*

Groundwater is not used at the IP2 and IP3 site. Entergy obtains potable and process water for IP2 and IP3 from the Village of Buchanan, which obtains its source of water from the City of Peekskill Public Water System and the Montrose Improvement District (part of the Northern Westchester Joint Water Works). Both of these systems' water source is surface water. Therefore, there would be no cumulative impact to groundwater use as a result of water use at IP2 and IP3.

IP2 and IP3 historical releases of liquids containing radionuclides have not affected groundwater quality beyond the site boundary. Groundwater beneath the site is not suitable for drinking water purposes. In addition, no groundwater pathway has been identified for contaminated groundwater to reach other drinking water users near IP2 and IP3. Entergy has an active groundwater monitoring program in place to monitor the extent of the contamination. This monitoring program will continue during the IP2 and IP3 license renewal term. In summary, IP2 and IP3 operations have not affected and are not expected to affect the quality of groundwater in any aquifers that are a current or potential future source of water for offsite users. Therefore, considering ongoing activities and reasonably foreseeable actions, Entergy concludes that the cumulative impacts on groundwater use and quality during the IP2 and IP3 license renewal term would be SMALL.

As previously discussed above, sea level rise and storm surge due to climate change, could result in saltwater intrusion into freshwater drinking supplies, including groundwater supplies. The magnitude of these impacts is uncertain and could potentially range from SMALL to MODERATE.

#### **Historic and Cultural Resources**

The geographic area considered in this analysis is the area of potential effect (APE). The APE is the area at the IP2 and IP3 site, the transmission lines up to the Buchanan substation, and immediate environs that may be affected by the license renewal decision.

The archaeological record for the region indicates prehistoric and historic occupation of the IP2 and IP3 site and its immediate vicinity. As the result of disturbances associated with site preparation and construction, the power block areas at IP2 and IP3 have little or no potential for archeological resources. There is potential for archeological resources to be present in the wooded area northeast of the main generating station areas. In addition, historic and prehistoric resources on less-disturbed portions of the site south of the power block areas may be present.

Direct impacts can occur if historic and cultural resources in the APE were physically removed or disturbed. Indirect visual or noise impact could occur from new construction or maintenance. The following projects are located within the geographic area considered for cumulative impacts:

- Algonquin (Spectra) gas pipeline expansion,
- independent spent fuel storage installation (ISFSI) expansion
- hypothetical replacement of IP2's and IP3's RVH and CRDM, and
- future urbanization in the immediate vicinity of IP2 and IP3.

As described in Section 4.4.5.2 of the SEIS, no cultural resources would be adversely affected by IP2 and IP3 license renewal activities (NRC 2010, Section 4.4.5.2). The Spectra natural gas pipeline project, ISFSI expansion, IP2 and IP3 RVH and CRDM replacement, and future urbanization all have the potential to result in impacts on cultural resources through inadvertent discovery during ground-disturbing activities. However, Entergy has administrative controls (Cultural Resources Protection Plan) in place for consideration of cultural resources ahead of any future ground-disturbing activities at the plant site. Therefore, Entergy concludes that the cumulative impact of the proposed license renewal on historic and cultural resources, when combined with other past, present, and reasonably foreseeable future activities, would have no effect.

### **Environmental Justice**

As discussed in Section 4.4.6 of the SEIS, NRC determined that there would be no disproportionately high and adverse impacts on minority and low-income populations from the continued operation of IP2 and IP3 during the license renewal term (NRC 2010, Section 4.4.5.2). Because Entergy has no plans to hire additional workers during the license renewal term, employment levels at IP2 and IP3 would remain relatively constant, and there would be no additional demand for housing or increased traffic. Based on this information, it is not likely there would be any disproportionately high and adverse contributory effect on minority and low-income populations from the continued operation of IP2 and IP3 during the license renewal term. In fact, the operation of IP2 and IP3 is part of the solution to widespread perceptions of adverse impacts to environmental justice areas of criteria air pollutants in New York. Therefore, the only contributory effects would come from the other reasonably foreseeable future planned activities, unrelated to the proposed action (license renewal).

### **Waste Management**

As with any major industrial facility, IP2 and IP3 generate waste as a consequence of normal operations. The expected waste generation rates during the license renewal term would be the same as during current operations, and radioactive waste (low-level, high-level, and spent nuclear fuel) and nonradioactive waste will continue to be generated. Hazardous waste would continue to be packaged and shipped to offsite Resource Conservation Recovery Act-permitted treatment and disposal facilities. Typically, hazardous waste is not held in long-term storage at IP2 and IP3 as they are shipped to an approved permitted facility for disposition.

Entergy maintains waste management programs for all radioactive and nonradioactive waste generated at IP2 and IP3 and is required to comply with Federal and State permits and other regulatory requirements for the management of waste material. Current waste management activities at the site would likely remain unchanged during the license renewal term. The existing onsite ISFSI at IP2 and IP3 may be expanded to handle the additional spent nuclear fuel generated during the license renewal term; however, the impacts of this expansion would be addressed under the existing 10 CFR Part 72 ISFSI license. Nonradioactive and nonhazardous waste generated during the license renewal term would continue to be shipped offsite by commercial haulers to permitted treatment and disposal facilities.

Since current waste management activities at IP2 and IP3 would continue during the license renewal term, there would be no new or increased contributory effect beyond what is currently being experienced. Therefore, the only new contributory effects would come from reasonably foreseeable future planned activities at IP2 and IP3, unrelated to the proposed action (license renewal), and other reasonably foreseeable planned offsite activities. All radioactive and nonradioactive waste treatment and disposal facilities within a 50-mile radius of the site would also be required to comply with Federal and State permits and other regulatory requirements. In addition, the waste management activities at other industrial facilities generating radioactive and nonradioactive waste would also have to meet the same or similar requirements. Considering ongoing activities and reasonably foreseeable actions, Entergy concludes that the cumulative impacts on waste management during the IP2 and IP3 license renewal term would be SMALL.

**Table 5**  
**Minority Population Comparison for the 50-Mile Region<sup>(b)</sup>**

	2000 Census Data			2010 Census Data			Comparison Statistics		
Total Population (a)	17,007,390			17,426,514			419,124		
Census Categories	Population by Census Category*	Percent	Criteria (%)	Population by Census Category*	Percent	Criteria (%)	Delta Population	Delta Percent (2000)	Delta Criteria (% 2010)
White	10,217,340	60.1	50	10,054,152	57.7	50	-163,188	-2.4	0
Black	3,268,017	19.2	39.2	3,309,428	19	39	41,411	-0.2	-0.2
American Indian \ Alaskan Native	62,064	0.4	20.4	89,286	0.5	20.5	27,222	0.1	0.1
Asian	1,225,884	7.2	27.2	1,663,722	9.5	29.5	437,838	2.3	2.3
Native Hawaiian \ Other Pacific Islander	8,830	0.1	20.1	8,262	0	20	-568	-0.1	-0.1
Other	1,586,137	9.3	29.3	1,713,313	9.8	29.8	127,176	0.5	0.5
Two or More Races	639,118	3.8	23.8	588,351	3.4	23.4	-50,767	-0.4	-0.4
Aggregate of All Minority Races	6,790,050	39.9	50	7,372,362	42.3	50	582,312	2.4	0
Hispanic	3,457,816	20.3	40.3	4,145,922	23.8	43.8	688,106	3.5	3.5

Aggregate of All Minority Races and Hispanic	10,247,866	60.3	50	11,518,284	66.1	50	1,270,418	5.8	0
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a. U.S. Census Bureau (State Demographic Data 2010)

b. Statistics based on using the 50-mile region as the geographic region for comparison.

**Table 6**  
**Minority Population Comparison for the Individual State and Four-State Geographic Areas**

Census	Total Population	Topic	Black	American Indian \ Alaska Native	Asian	Native Hawaiian \ Other Pacific Islander	Other	Two or more Races	Aggregate of All Minority Races	Hispanic	Aggregate of All Minority Races and Hispanic
Connecticut	2010	Population	362,296	11,256	135,565	1,428	198,466	92,676	801,687	479,087	1,280,774
		Percent	10.1	0.3	3.8	0.0	5.6	2.6	22.4	13.4	35.8
		Criteria	30.1	20.3	23.8	20.0	25.6	22.6	42.4	33.4	50.0
	2000	Population	340,557	23,839	95,356	3,406	146,439	74,922	626,624	Not Reported in IPEC ER	1,004,642
		Percent	10.0	0.7	2.8	0.1	4.3	2.2	18.4		29.5
		Criteria	30.0	20.7	22.8	20.1	24.3	22.2	38.4		49.5
New Jersey	Delta	Population	21,739	12,583	40,209	1,978	52,027	17,754	175,063		276,132
		Percent	0.1	0.4	1.0	0.1	1.3	0.4	4.0		6.3
		Criteria	0.1	0.4	1.0	0.1	1.3	0.4	4.0		0.5
	2010	Population	1,204,826	29,026	725,726	3,043	559,722	240,303	2,762,646	1,555,144	4,317,790
		Percent	13.7	0.3	8.3	0.0	6.4	2.7	31.4	17.7	49.1
		Criteria	33.7	20.3	28.3	20.0	26.4	22.7	50.0	37.7	50.0
New Jersey	2000	Population	1,211,666	50,486	521,690	8,414	580,590	210,359	2,305,532	Not Reported in IPEC ER	3,702,314
		Percent	14.4	0.6	6.2	0.1	6.9	2.5	47.4		44.0
		Criteria	34.4	20.6	26.2	20.1	26.9	22.5	50.0		50.0
	Delta	Population	6,840	21,460	204,036	5,371	20,868	29,944	457,114		615,476
		Percent	0.7	0.3	2.1	0.1	0.5	0.2	16.0		5.1

	Census	Total Population	Topic	Black	American Indian \ Alaska Native	Asian	Native Hawaiian \ Other Pacific Islander	Other	Two or more Races	Aggregate of All Minority Races	Hispanic	Aggregate of All Minority Races and Hispanic
			Criteria	0.7	0.3	2.1	0.1	0.5	0.2	0.0		0.0
New York	2010	19,378,102	Population	3,073,800	106,906	1,420,244	8,766	1,441,563	585,849	6,637,128	3,416,922	10,054,050
			Percent	15.9	0.6	7.3	0.1	7.4	3.0	34.3	17.6	51.9
			Criteria	35.9	20.6	27.3	20.1	27.4	23.0	50.0	37.6	50.0
	2000	18,976,457	Population	3,225,998	170,788	1,176,540	37,953	1,726,858	588,270	6,091,443		9,791,852
			Percent	17.0	0.9	6.2	0.2	9.1	3.1	32.1		61.6
			Criteria	37.0	20.9	26.2	20.2	29.1	23.1	50.0	Not Reported in IPEC ER	50.0
Pennsylvania	Delta	401,645	Population	152,198	63,882	243,704	29,187	285,295	2,421	545,685		262,198
			Percent	1.1	0.3	1.1	0.2	1.7	0.1	2.2		9.7
			Criteria	1.1	0.3	1.1	0.1	1.7	0.1	0.0		0.0
	2010	12,702,379	Population	1,377,689	26,843	349,088	3,653	300,983	237,835	2,296,091	719,660	3,015,751
			Percent	10.8	0.2	2.7	0.0	2.4	1.9	18.1	5.7	23.7
			Criteria	30.8	20.2	22.7	20.0	22.4	21.9	38.1	25.7	43.7
Four State	2000	12,281,054	Population	1,328,366	49,124	245,621	-	184,216	147,373	1,793,034	Not Reported in ER	2,308,838
			Percent	10.5	0.4	2.0	0.0	1.5	1.2	14.6		18.8
			Criteria	30.5	20.4	22.0	20.0	21.5	21.2	34.6		38.8
	Delta	421,325	Population	49,323	22,281	103,467	3,653	116,767	90,462	503,057		706,913
			Percent	0.3	0.2	0.7	0.0	0.9	0.7	3.5		4.9
			Criteria	3.6	0.2	0.7	0.0	0.9	0.7	3.5		4.9
Four State	2010	44,446,472	Population	6,018,611	174,031	2,630,623	16,890	2,500,734	1,156,663	12,497,552	6,170,813	18,668,365
			Percent	13.5	0.4	5.9	0.0	5.6	2.6	28.1	13.9	42.0
			Criteria	33.5	20.4	25.9	20.0	25.6	22.6	48.1	33.9	50.0
	2000	43,077,426	Population	6,106,587	294,237	2,039,207	49,773	2,638,103	1,020,924	10,816,633	Not Reported in ER	16,807,646
			Percent	13.0	0.6	4.3	0.1	5.5	2.3	25.1		39
			Criteria	33.0	20.7	24.3	20.1	25.5	22.3	45.1		50
Delta	1369046		Population	87,976	120,206	591,416	32,883	137,369	135,739	1,680,919		1,860,719
			Percent	0.5	0.2	1.6	0.1	0.1	0.3	3.0		3.0



Census	Total Population	Topic	Black	American Indian \ Alaska Native	Asian	Native Hawaiian \ Other Pacific Islander	Other	Two or more Races	Aggregate of All Minority Races	Hispanic	Aggregate of All Minority Races and Hispanic
		Criteria	0.5	0.3	1.6	0.1	0.1	0.3	3.0		0.0

Note: The 2000 values reported in this table were obtained from Table 2-7B of the IPEC Environmental Report. Two exceptions to this are: (1) the Four-State Area, where the population value for the Black Category was revised to equal a sum of the individual states; and (2) the Black Category for Pennsylvania had an apparent error in the reported population and the extraneous zero was removed (e.g. 10,328,366 was revised to 1,328,366); and 3) the criteria for the Black Category for Pennsylvania and Connecticut were corrected.



**Table 7**  
**Low-Income Population Comparison (persons)**

Year	Geographic Area	Total Population	Persons Below Poverty Level (persons)	Persons Below Poverty Level (%)	Low-Income Criterion (%)
2000	New York	18,976,457	2,692,202	14.2	34.2
2010		18,710,113	2,650,166	14.2	34.2
Delta		-266,344	-42,036	0	0
2000	New Jersey	8,414,350	699,668	8.3	28.3
2010		8,544,303	777,968	9.1	29.1
Delta		129,953	78,300	0.8	0.8
2000	Connecticut	3,405,565	259,514	7.6	27.6
2010		3,434,901	314,306	9.2	29.2
Delta		29,336	54,792	1.6	1.6
2000	Pennsylvania	12,281,054	1,304,117	10.6	30.6
2010		12,199,544	1,509,858	12.4	32.4
Delta		-81,510	205,741	1.8	1.8
2000	Four-State Area	43,077,426	4,955,501	11.5	31.5
2010		42,888,861	5,252,298	12.2	32.2
Delta		-188,565	296,797	0.7	0.7

**Table 8**  
**2010 Low-Income Statistics for Individuals and Families within the 50-Mile Region**

	Population by Census Category*	Percent	Criteria
Total Families	6,297,839		
Families In Poverty	830,654	13.2	<b>33.2</b>
Total Individuals	16,915,645		
Individuals in Poverty	2,296,115	13.6	<b>33.6</b>

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