



**FINAL ENVIRONMENTAL IMPACT STATEMENT  
FOR COMBINED LICENSE (COL) AT THE BELL  
BEND NUCLEAR POWER PLANT**

**READER'S GUIDE**

**April 2016**



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## INTRODUCTION

On October 10, 2008, PPL Bell Bend, LLC (PPL) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a combined license to construct and operate a new nuclear unit at the Bell Bend Nuclear Power Plant (BBNPP). The proposed is located near Berwick, Pennsylvania, adjacent to the existing Susquehanna Steam Electric Station. PPL notified the NRC of changes in its power generation business by letter dated May 12, 2015. PPL Bell Bend, LLC was renamed Bell Bend, LLC, and Bell Bend, LLC became a generation affiliate of Talen Energy Corporation (Talen Energy). The transaction became official on June 1, 2015. For purposes of this review, the abbreviation “PPL” will still be used to indicate the applicant. Bell Bend, LLC, under Talen Energy, is the applicant.

### ***WHERE CAN I FIND MORE INFORMATION?***

- » Review the electronic version of the entire environmental impact statement found on the compact disc included with this summary.
- » View an online version at <http://www.nrc.gov/reactors/new-reactors/col/bell-bend.html>
- » Review a printed copy or compact disc at
  - ◇ McBride Memorial Library at 500 North Market Street, Berwick, Pennsylvania; Mill Memorial Library at 495 East Main Street, Nanticoke, Pennsylvania
  - ◇ Contact the U.S. Nuclear Regulatory Commission Environmental Project Managers, Tomeka Terry, at [Tomeka.Terry@nrc.gov](mailto:Tomeka.Terry@nrc.gov) or Patricia Vokoun, at [Patricia.Vokoun@nrc.gov](mailto:Patricia.Vokoun@nrc.gov)

### ***MAJOR FEDERAL ACTION***

- » New and continuing projects and programs that may have a significant effect on the environment;
- » Requires an environmental impact statement to provide a detailed analysis of potential environmental effects due to the activity.

of providing approximately 1600 megawatts of electricity (MWe) of baseload-generating capacity. The proposed new reactor includes a closed-cycle, wet-cooling system that uses two natural draft cooling towers at the BBNPP site in Luzerne County, Pennsylvania.

### **WHAT IS THIS DOCUMENT?**

The NRC has reviewed the combined license application submitted by PPL and has prepared a final environmental impact statement for the BBNPP site. This Reader’s Guide summarizes the impacts of the building and operation of one new nuclear unit at the BBNPP site as presented in the final environmental impact statement. It also summarizes the cumulative impacts and alternatives evaluated.

### **WHAT IS BEING PROPOSED AND WHY?**

PPL is seeking approval to build and operate one new reactor unit at the BBNPP site to provide additional electricity for use in the northeast portion of the Pennsylvania, New Jersey, and Maryland service area. The one new AREVA U.S. Evolutionary Power Reactor (U.S. EPR) pressurized water reactor unit would be capable

The growing population and development in the PPL service area requires additional sources of electricity to meet the anticipated power needs in the 2022 to 2028 time period. The building and operation of a new nuclear reactor is considered a major Federal action.

### ***NATIONAL ENVIRONMENTAL POLICY ACT***

The National Environmental Policy Act is a national policy for the environment that establishes the basis for considering environmental issues in the conduct of Federal activities.

The Act requires the following:

- » Use a systematic, interdisciplinary approach for decision-making on actions that may affect man's environment.
- » Inform and involve the public in the decision-making process.
- » Consider significant environmental impacts associated with the action.
- » Consider alternatives and their impacts on the proposed action.

The environmental impact statement provides the necessary information required under this Act.

### ***ENVIRONMENTAL IMPACT STATEMENT***

An environmental impact statement is required for any action that may have significant effects on the environment.

An environmental impact statement describes the potential for project effects on the environment and is used to help determine whether an action should be permitted.

information and collectively determined the environmental impact levels. The NRC staff, U.S. Army Corps of Engineers staff, and contractor experts are known as the "review team."

A detailed description of how the NRC determines whether to issue a license to PPL is explained in the following sections. After the U.S. Army Corps of Engineers has completed its review, it will issue a Record of Decision.

### **WHO IS LEADING THE REVIEW OF THE BBNPP NUCLEAR POWER PLANT PROJECT?**

The NRC is the lead Federal agency for granting the combined license. The U.S. Army Corps of Engineers is cooperating with the NRC in the preparation of information in a single environmental impact statement for both agencies' decision-making processes. The NRC license decision relates to the construction and operation of nuclear power facilities. Permits from the U.S. Army Corps of Engineers are necessary to perform building and operation activities that may affect nearby water bodies. Both agencies must ensure that the National Environmental Policy Act process is properly conducted and completed before they can approve the project. Because the reviews necessary for both agencies are similar, having both agencies work together saves time when reviewing an application. Both agencies work together to produce the environmental impact statement, which describes the effects of building and operating a new nuclear reactor on the environment.

The NRC staff (including its contractor staff at Pacific Northwest National Laboratory and Numark, Inc.) and U.S. Army Corps of Engineers staff reviewed PPL's application and environmental

## WHAT IS THE U.S. NUCLEAR REGULATORY COMMISSION'S PROCESS FOR ISSUING A NEW REACTOR LICENSE?

Once an application has been accepted, the NRC conducts two separate reviews—a safety review and an environmental review.

Exhibit A shows the complete review process for combined license reviews. The final product from the safety review is a safety evaluation report that details reactor design and safety issues. The final product from the environmental review is an environmental impact statement that describes the environmental effects of building and operating a new nuclear plant. Both reviews will be addressed in a mandatory hearing in front of the Commissioners of the U.S. Nuclear Regulatory Commission. A contested hearing may be held if an outside group successfully files a petition that raises safety or environmental concerns about a combined license. The final decision about whether to grant a combined license will be made by the NRC's five-member Commission.

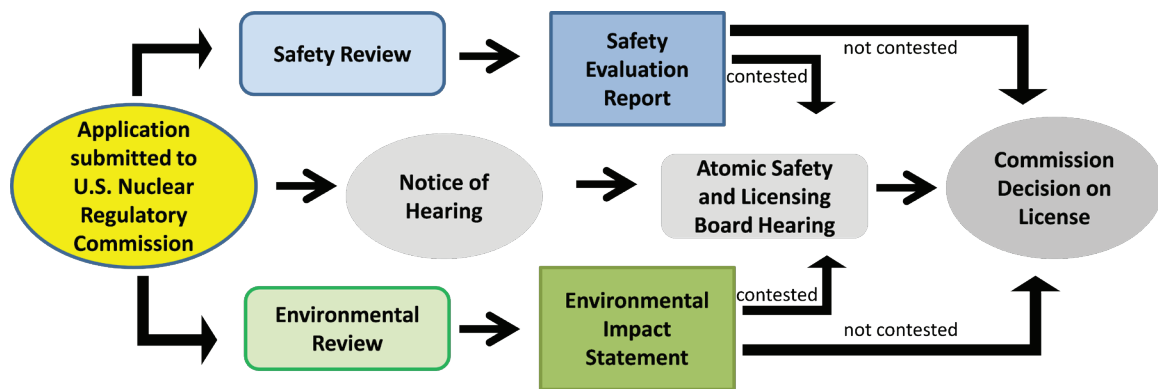


EXHIBIT A. NEW REACTOR LICENSING PROCESS

### SAFETY REVIEW PROCESS

The purpose of the safety review is to ensure the new reactor will be safely built and operated according to NRC regulations and requirements. The review includes an evaluation of the design of the facility, siting requirements, quality assurance programs, physical security, and emergency preparedness. Additional information included in the analysis describes radioactive waste management and radiation protection. There are opportunities for public participation during the safety review process. The NRC's analysis is documented in the safety evaluation report.

The Advisory Committee on Reactor Safeguards reviews each application and the NRC's safety evaluation report, and provides advice to the NRC's five-member Commission about the potential hazards for the new nuclear plant and the acceptability of the proposed safety standards.

Exhibit B shows the steps involved in the safety review process leading up to the mandatory hearing and potential issuance combined license.

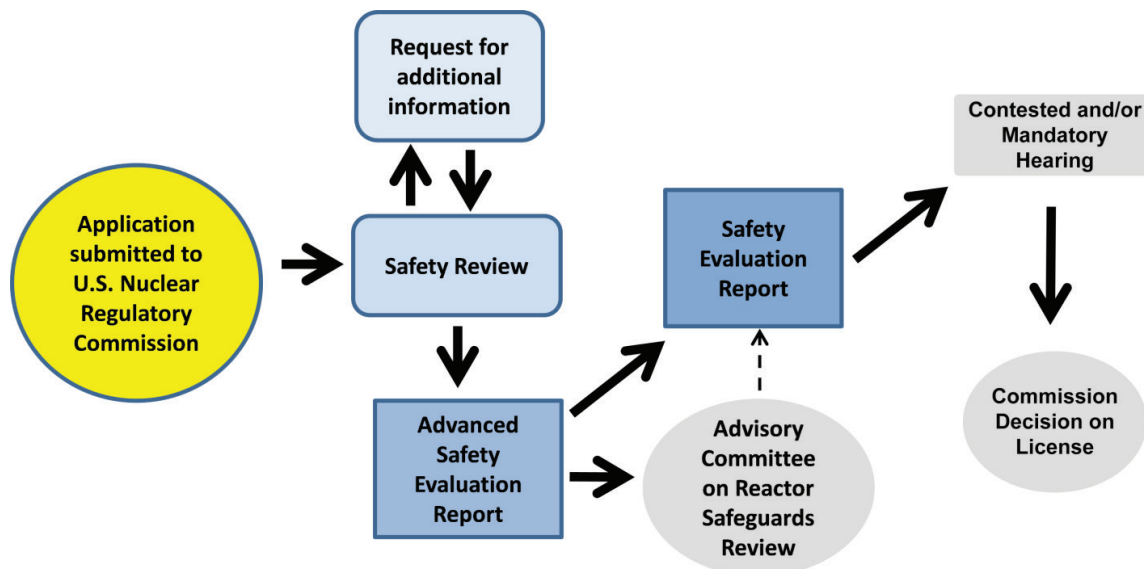


EXHIBIT B. SAFETY REVIEW PROCESS

## ENVIRONMENTAL REVIEW PROCESS

The environmental review includes a careful look at the potential environmental impacts of building and operating a new nuclear reactor and the potential mitigation measures for reducing environmental effects. The NRC applies the National Environmental Policy Act and the U.S. Nuclear Regulatory Environmental Standard Review Plan, which provides detailed instructions for the review of each environmental subject area (e.g., water, human health, ecology).

### **ADVISORY COMMITTEE ON REACTOR SAFEGUARDS**

The Advisory Committee on Reactor Safeguards is composed of non-U.S. Nuclear Regulatory Commission technical experts. It is structured so that experts representing many technical areas can provide independent advice to the U.S. Nuclear Regulatory Commission.

### **COUNCIL ON ENVIRONMENTAL QUALITY**

The Council coordinates environmental efforts between Federal agencies and the White House offices to develop environmental policies. The Chair of the Council serves as the environmental policy advisor to the President.

Environmental effects are explained using descriptions from the Council on Environmental Quality.

The environmental review includes consultation and coordination with local, State, and Federal agencies and Tribal Nations, as well as independent evaluations by the NRC and U.S. Army Corps of Engineers, and contractor experts. These experts review the applicant's information about the environment; visit and tour the proposed site; request further information from the applicant as needed; review other published studies and reports; and, when necessary, perform additional analyses to confirm the applicant's conclusions. The review team's analysis of the environmental impacts is documented in the environmental impact statement.



In addition, the environmental review includes input from the public by inviting comments before the draft environmental impact statement is prepared, and again after the draft environmental impact statement is issued. Impacts are categorized as SMALL, MODERATE, LARGE, or a range of these categories, which are the accepted descriptions from the Council on Environmental Quality.

Exhibit C shows a more detailed process flow for environmental reviews leading up to the mandatory hearing and potential license issuance.



EXHIBIT C. ENVIRONMENTAL REVIEW PROCESS

## COMMISSION REVIEW AND DECISION

A mandatory hearing examining both safety and environmental issues will be conducted prior to a decision on the issuance of a combined license. In addition, a contested hearing may be held by the Atomic Safety and Licensing Board if an outside party successfully files a petition that raises safety or environmental concerns about the licensing the plant. The Atomic Safety and Licensing Board then makes a recommendation to the Commission about whether to grant a combined license. The NRC’s five-member Commission makes the final decision about whether or not to grant a combined license.

## WHO ELSE DID THE U.S. NUCLEAR REGULATORY COMMISSION WORK WITH DURING THE ENVIRONMENTAL REVIEW?

A large number of Federal, State of Delaware, New York, and Pennsylvania, Tribal and local agencies, and community organizations were contacted during the development of the environmental impact statement. These parties provided comments and information used to develop a good understanding of the environmental resources in the area and the potential for environmental impacts. Detailed information about consultations can be found in Appendix F of the final environmental impact statement.

See Appendix C of the final environmental impact statement for more information about how this project has coordinated with Federal, States of Delaware, New York, and Pennsylvania, Tribal, and local agencies.

## ***AGENCIES AND TRIBES INVOLVED WITH THIS PROJECT***

- » Absentee-Shawnee Tribe of Oklahoma, Shawnee, Oklahoma
- » Advisory Council on Historic Preservation
- » Cayuga Nation, Seneca Falls, New York
- » Delaware Nation, Anadrako, Oklahoma
- » Delaware River Basin Commission
- » Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri
- » Heron Clan Representative for the Cayuga Nation, Versailles, New York
- » National Marine Fisheries Service, Northeast Regional Office
- » New Jersey Highlands Council
- » New Jersey National Heritage Program
- » Oneida Nation of New York, Verona, New York
- » Oneida Tribe of Indians of Wisconsin, Oneida, Wisconsin
- » Onondaga Nation, Nedrow, New York
- » Pennsylvania Department of Conservation and Natural Resources
- » Pennsylvania Department of Environmental Protection
- » Pennsylvania Fish and Boat Commission
- » Pennsylvania Game Commission
- » Pennsylvania Historical and Museum Commission
- » St. Regis Mohawk Tribe, Hogansburg, New York
- » Seneca-Cayuga Tribe of Oklahoma
- » Seneca Nation of Indians, Salamanca, New York
- » Shawnee Tribe, Miami, Oklahoma
- » Society of Pennsylvania Archaeology
- » Stockbridge-Munsee Community Band of the Mohican Indians of Wisconsin
- » Susquehanna River Commission
- » Tonawanda Seneca Nation, Basom, New York
- » Tuscarora Nation, Lewiston, New York
- » U.S. Army Corps of Engineers Baltimore District
- » U.S. Environmental Protection Agency, Region 3, Philadelphia, Pennsylvania
- » U.S. Fish and Wildlife Service, Pleasantville, New Jersey
- » U.S. Fish and Wildlife Service, State College, Pennsylvania

In addition to a combined license from the NRC, PPL will need many other environmental permits and authorizations to begin building and operating a new nuclear plant at the BBNPP site. Appendix H of the final environmental impact statement contains a comprehensive list of all the permits and requirements will be needed.

## DESCRIPTION OF THE PROJECT

The BBNPP site is in Salem Township, Luzerne County, Pennsylvania, approximately 115 miles northwest of Philadelphia. The site is approximately 5 miles northeast of the Borough of Berwick near the west bank of the North Branch of the Susquehanna River, and adjacent to the west boundary of Susquehanna Steam Electric Station Units 1 and 2. The site consists of approximately 975 acres within the 2,055-acre BBNPP project area. Exhibit D is a conceptual figure of the BBNPP site.

### EXHIBIT D. CONCEPTUAL LAYOUT OF THE BBNPP NUCLEAR POWER PLANT



EXHIBIT D. CONCEPTUAL LAYOUT OF THE BELL BEND NUCLEAR POWER PLANT

### WHAT ARE PEOPLE'S CONCERNS?

To learn about the concerns of interested groups and individuals across the country, public comments were invited for 75 days through a notice in the Federal Register, mailings, and news releases about the scope of this project.

Most of the concerns within the scope of the environmental impact statement centered on the following issues:

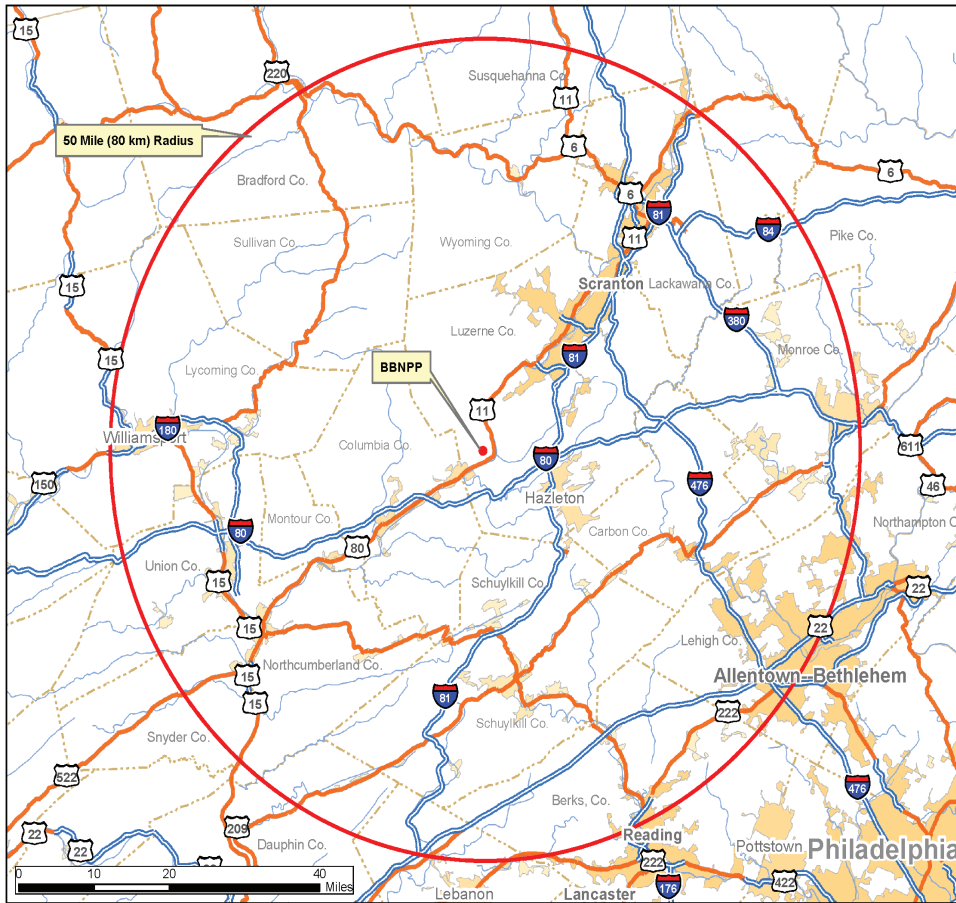
- What is the cumulative impact on water use and availability in the Susquehanna River Basin due to the addition of a new nuclear power plant at the BBNPP site?
- What are the impacts of water withdrawal and discharge upon aquatic communities in the Susquehanna River Basin, including potentially negative impacts on fisheries?

## HOW DOES THE PROJECT AFFECT THE ENVIRONMENT?

The building and operation of a new nuclear power plant at the BBNPP site would have effects on multiple environmental resources. The environmental impact statement considers the potential for impact on each resource. Exhibit E shows the location of the BBNPP site in Pennsylvania.

## LAND-USE IMPACTS

The project, including all associated transmission lines, pipelines, and access roads, would be situated on a presently undeveloped tract of approximately 975 acres consisting mostly of forest, scrub, and agricultural land immediately adjacent to the Susquehanna Steam



*EXHIBIT E. LOCATION OF BELL BEND SITE IN PENNSYLVANIA*

Electric Station. Use of the land would not interfere with existing or anticipated land uses in the surrounding area and would not interfere with ongoing or anticipated natural resource development. No national parks, national monuments, national forests, wild and scenic rivers, or wilderness areas would be affected, and none of the affected lands are known to be under jurisdiction of Native American Tribes.

The project would result in irreversible loss or degradation of approximately 292 acres of prime farmland but these effects would have only a minimal effect on agricultural land uses in the surrounding landscape.

The only offsite land-use impacts would be from consumptive-use mitigation and site-specific low flow protection. Building and operating water-treatment facilities needed to use water from the abandoned Rushton Mine would require permanent

## **PUBLIC PARTICIPATION**

- » A 75-day public scoping process began on January 6, 2009.
- » On January 29, 2009, two public scoping meetings were held at Berwick High School in Berwick, Pennsylvania. All environmental impact statement topics were discussed.
- » A 30-day supplemental public scoping process began on June 15, 2012 regarding the revised site layout that included a relocated power-block footprint developed to avoid wetland impacts.
- » All scoping comments received and their corresponding responses were included as Appendix D in the draft environmental impact statement.
- » The draft environmental impact statement was released on April 24, 2015, for a 75-day public review and comment period.
- » During June 2015, two public meetings were held in Bloomsburg, Pennsylvania, to receive comments on the draft environmental impact statement.
- » Comments received on the draft environmental impact statement and their corresponding responses are included as Appendix E in the final environmental impact statement.



use of approximately 25 acres of undeveloped surface land on the mine property. Use of that land would not interfere with surrounding land uses. Drawdowns of Cowanesque Lake could place temporary and infrequent limitations on uses of shoreline land managed for outdoor recreation. Downstream releases of water could likewise temporarily and infrequently limit uses of riverside lands adjacent to receiving waters.

## WATER-RELATED IMPACTS

Building the BBNPP would affect surface water bodies on or near the site, primarily the Susquehanna River and Walker Run Stream and its associated floodplain. Building the intake and discharge structures would include dredging and removal of sediment in the



*WALKER RUN (COURTESY OF PACIFIC NORTHWEST NATIONAL LABORATORY)*

Susquehanna River.

These activities would be carried out under conditions of applicable U.S. Army Corps of Engineers permits.

Portions of Walker Run adjacent to the BBNPP site would be relocated to create and improve wetlands and fish habitat and to lessen the effects of permanent stream impacts. Restoring the stream channel to a more natural course, and creating and enhancing the wetlands adjacent to the stream, would improve water quality of the stream.

Cooling-water intake system operation would withdraw about 0.5 percent of the mean annual flow of the Susquehanna River at Wilkes-Barre. The majority of water withdrawn would be consumptively used by the proposed BBNPP cooling system, primarily through evaporation. The Susquehanna River Basin Commission would require mitigation for consumptive use during low-flow periods and would set passby flow requirements for site-specific low-flow protection.

No onsite groundwater would be used for operation of the proposed BBNPP. Water for potable and sanitary water systems would be supplied by the Pennsylvania American Water Company Berwick well system. The well system has sufficient capacity for this use so the impact on nearby users from the BBNPP operational use (non-cooling) of groundwater would be minimal.

## TERRESTRIAL ECOLOGY IMPACTS

The project would disturb approximately 663 acres of terrestrial habitats consisting mostly of deciduous forest, scrub, and agricultural land. All of the affected habitats are common in the surrounding landscape. Approximately 11.1 acres of wetlands would be disturbed and would require permits from the U.S. Army Corps of Engineers and Pennsylvania Department of Environmental Protection. Wetlands contain host plants potentially used by locally rare butterflies like the Baltimore checkerspot, mulberry wing, and black dash butterflies. PPL has proposed onsite permittee-responsible wetland mitigation designed to replace host plants for these species and offset the losses of other ecological and hydrological wetland functions caused by the project.



*HIBERNATING NORTHERN LONG-EARED BAT  
(COURTESY OF NATIONAL PARK SERVICE)*

Deciduous forest on the site could potentially be used in the spring, summer, and fall as roosting and foraging habitat by the endangered Indiana bat and threatened northern long-eared bat, both listed under the Endangered Species Act. PPL has proposed to limit removal of trees greater than 5 inches in diameter at breast height to a period from November 16 to March 31, when both species are known to hibernate. Forest interior birds would be affected by removal and fragmentation of deciduous forest onsite, but loss of nesting birds would be avoided by restricting the timing of

timber harvest to outside the nesting season for most species. Impacts on other wildlife and other rare species would be minimal. Offsite terrestrial ecology impacts would be limited to the loss of about 25 acres of old field habitat on the Rushton Mine property and infrequent brief effects from water drawdowns and releases on shoreline habitats surrounding Cowanesque Lake and bordering downstream receiving rivers.



*BROWN TROUT (COURTESY OF NATIONAL PARK SERVICE)*

## AQUATIC ECOLOGY IMPACTS

Aquatic resources in the Susquehanna River would be affected mainly by building the new cooling-water intake and discharge structures. Potential impacts on aquatic resources in the onsite ponds and tributaries, Walker Run, and the Susquehanna River as a result of building activities would be temporary, localized, and minor. Potential direct impacts on aquatic resources would involve physical alteration of habitat (e.g., infilling, cofferdam placement, dredging, and pile driving), including temporary or permanent removal of associated organisms, sedimentation, changes in hydrological regimes, and changes in water quality. Potential indirect impacts would include increased runoff from water-resistant surfaces. Construction and

preconstruction activities in the transmission-line corridors and offsite consumptive-use mitigation and site-specific low flow protection areas would not affect aquatic resources.

Building the proposed BBNPP would involve some unavoidable, permanent impacts on wetlands and streams that would require mitigation. A portion of this mitigation includes a stream and floodplain restoration project on two reaches of Walker Run. The goal is to improve local hydrology and provide high-quality habitat for Brown Trout (*Salmo trutta*).

The addition of an operating plant at the BBNPP site would increase the potential entrainment and impingement of aquatic biota in the Susquehanna River, but the use of closed-cycle cooling and a low through-screen intake velocity (less than 0.5 feet per second) would minimize impacts. Impacts on aquatic resources and habitat in the Susquehanna River due to the discharge could result from thermal, chemical, and physical effects on the substrate, as well as hydrological changes, but these impacts were found to be minimal. Other impacts from operational activities would be minor and temporary.

There are no Federally listed aquatic animal or plant species in the immediate project area or in the associated offsite consumptive-use mitigation and site-specific low flow protection areas.

## **SOCIOECONOMIC IMPACTS**

The review team considered the entire region within a 50-mile radius of the BBNPP site when assessing socioeconomic impacts. However, because of expected commuter patterns, the distribution of residential communities in the area, the likely socioeconomic impacts, and the location decisions of current staff at the adjacent Susquehanna Steam Electric Station, the review team identified a primary economic impact area composed of Luzerne County and Columbia County. Recreational sites affected by the Susquehanna River Basin Commission requirement that PPL provide an upstream water source are all located on or near the supplemental water sources proposed by PPL in its consumptive-use mitigation plan: Cowanesque Lake, Holtwood Reservoir, and Rushton Mine.

The review team concluded that the physical impacts of building and operating a new nuclear plant at the BBNPP site on workers and the local public from noise, on air quality, on buildings, on roads, and on aesthetics would be minor.

PPL estimates a peak employment level of 4,313 during the construction period. The peak workforce would consist of 3,950 construction workers and 363 operations workers onsite for training purposes. For most socioeconomic resources, the review team analyzed only the impacts of this peak construction workforce as an upper bound on potential impacts, recognizing that impacts would likely be smaller during the remainder of the building period. Based on assessments of worker in-migration levels at nuclear power plants prepared by the NRC and cited by PPL in the environmental report, the review team estimates that 20 to 35 percent of the construction workforce would migrate into the 50 mi region surrounding the BBNPP site. The review team assumed that in-migrating would follow the current Susquehanna Steam Electric Station employees distribution pattern of 44.8 percent live in Columbia County and 42.3 percent in Luzerne County. The in-migration of workers and their families would increase the populations of Columbia and Luzerne Counties by less than 3 percent. The review team considers such population increases to be minor.

Based on the current residential distribution of the Susquehanna Steam Electric Station operations workforce, PPL estimates 87.1 percent of the operations workforce

for a new plant would live in the economic impact area. The estimated influx 363 of operations workers and their families would represent less than a 1 percent increase in the populations of Columbia and Luzerne Counties. The review team considers such population increases to be minor.

The economic impacts in the economic impact area from building a new nuclear power plant at the BBNPP site would be minor and beneficial, with the exception of the economic impacts on Columbia County and the tax impacts on Salem Township where impacts would be noticeable and beneficial. The economic impacts from operations at the BBNPP site would be minor in the economic impact area, but the tax impacts of BBNPP operations on the Berwick Area School District would be noticeable and beneficial.

### ***AREA OF POTENTIAL EFFECT***

» A geographic area in which an action may change the character or use of a historic property.

Infrastructure and community services impacts span issues associated with traffic, recreation, housing, public services, and education. The construction impacts on regional infrastructure and community services would be minor, with the exception of the following noticeable impacts: traffic impacts on the local highway network, housing impacts in the Borough of Berwick, and impacts on the Berwick

Area School District. Each of these noticeable impacts would be temporary and at least partially offset by the beneficial tax impacts of BBNPP construction and operation. The review team recognizes that monetary compensation does not represent mitigation.

### **ENVIRONMENTAL JUSTICE IMPACTS**

The review team determined that there are no environmental, health, or socioeconomic pathways by which the identified minority or low-income populations in the 50-mile region would be likely to suffer disproportionately high and adverse environmental or health impacts because of building or operation activities. There are no minority or low-income census block groups in the vicinity of the BBNPP site. The review team expects that potential adverse socioeconomic impacts from building or operation activities for a new nuclear power plant would not affect the low-income and minority populations in the region disproportionately because the review team found no evidence of any unique characteristics or practices among those communities that could lead to a disproportionately high and adverse impact.

### **HISTORIC AND CULTURAL RESOURCES**

Building and operating a new nuclear power plant at the BBNPP site could affect either known or undiscovered historic and cultural resources. In accordance with the provisions of the National Historic Preservation Act and the National Environmental Policy Act, the NRC and the U.S. Army Corps of Engineers are required to make a reasonable and good faith effort to identify historic properties and cultural resources in the Areas of Potential Effect and permit areas and, if present, determine whether any significant impacts are likely.



As part of its good faith effort, the NRC and the U.S. Army Corps of Engineers consulted with the Pennsylvania State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, 13 tribes, 5 local organizations, and 1 individual. The tribes and local agencies notified are listed in the Appendix B of the final environmental impact statement.

The U.S. Army Corps of Engineers is the lead Federal agency consulting with the Pennsylvania Historical and Museum Commission, Bureau for Historic Preservation, and SHPO. One prehistoric archaeological site, 36LU288, was eligible for listing in the National Registry of Historic Places. PPL and the SHPO have agreed on avoidance and mitigation measures that PPL will take to protect the site.

Three architectural resources in the vicinity of the site—the North Branch Pennsylvania Canal, the Union Reformed and Lutheran Church, and the Woodcrest Farmstead—were identified as eligible for the National Register of Historic Places. No traditional cultural properties have been identified by any Tribes. On February 13, 2013, the SHPO concurred with the U.S. Army Corps of Engineers determination of no adverse effect on cultural resources provided that avoidance measures for archaeological site 36LU288 be included as a special condition in the U.S. Army Corps of Engineers permit.

## **METEOROLOGICAL AND AIR-QUALITY IMPACTS**

Building activities for BBNPP site would result in temporary impacts on local air quality because of the emissions associated with ground-clearing activities and the use of a concrete batch plant. Air emissions during operation would primarily be generated by vehicles and standby diesel generators; however, the diesel generators would be used only intermittently and for brief durations. Release of heat and moisture from operation of the cooling-water system also may affect air quality. Any impacts on meteorology and air quality from these phenomena would be minimal.

Car and truck emissions would vary based on time of day and number of workers driving to and from the BBNPP site, but the overall effects of these traffic emissions would be localized and temporary and would have a minimal impact on air quality.

## **NONRADIOLOGICAL HEALTH IMPACTS**

Nonradiological public health concerns would include occupational injuries and exposure to dust, vehicle exhaust, noise, and electromagnetic fields, and operation of the cooling-water system. Occupational injuries to workers would be mitigated through training and the use of appropriate equipment and protective clothing. A safety and medical program would be provided for workers, including regular health and safety monitoring.

Building activities that generate dust and vehicle exhaust would occur on the site. The effects of dust and noise upon nearby populations would be minor. During operation, noise levels for plant operation are also expected to be minor.

The cooling-water discharge would carry heated water from the nuclear power plant through a diffuser in the Susquehanna River. Some harmful bacteria and pathogens may grow in warm waters; however, potential health effects on the public and workers from microorganisms that favor warmer water were found to be unlikely.

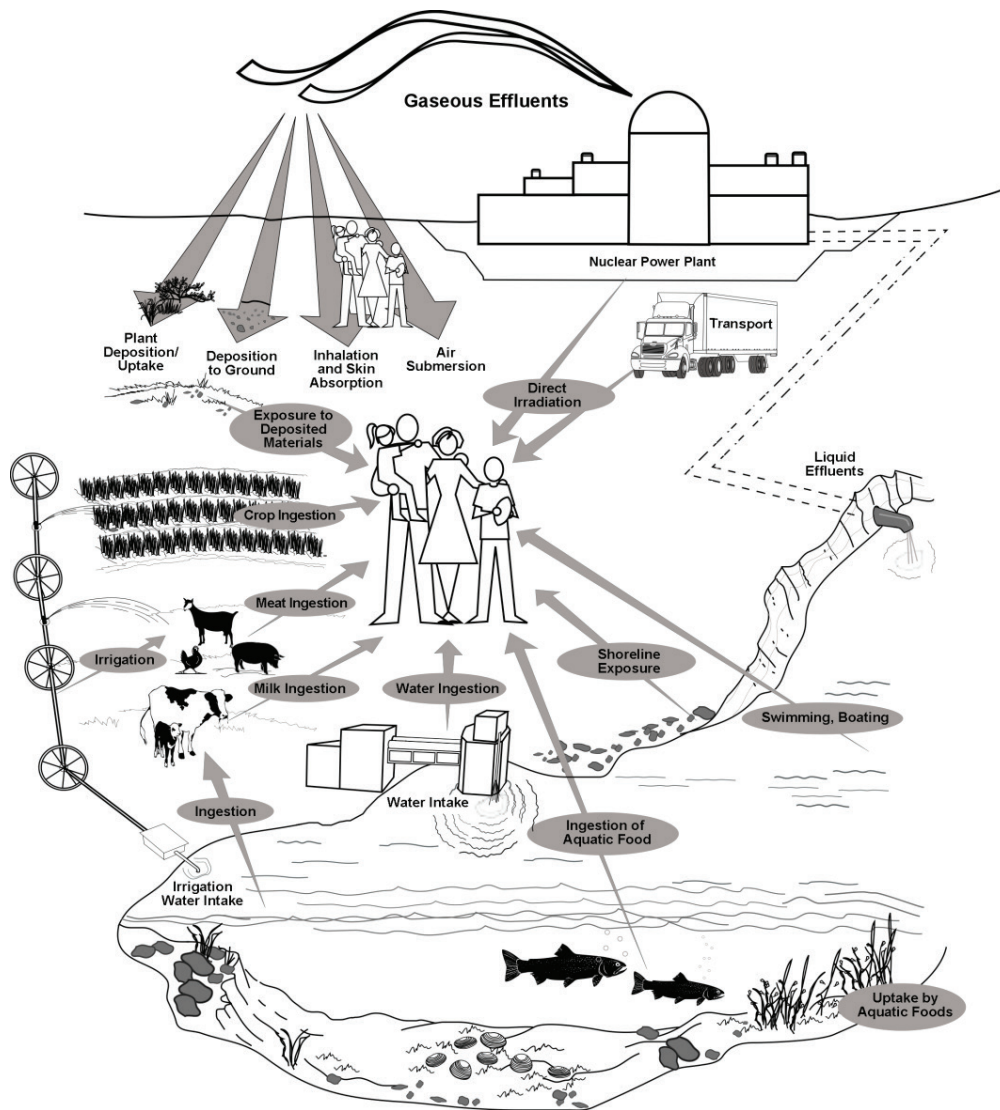


EXHIBIT F. EXPOSURE PATHWAYS TO MAN

## RADIOLOGICAL HEALTH IMPACTS

If a U.S. EPR nuclear power plant is built at the BBNPP site, the sources of radiation exposure from normal operations for plant workers would include direct radiation exposure as well as gas and liquid effluent releases. The public, plants, and animals nearby could receive a radiation dose from the new nuclear power plant through direct exposure, gas effluent releases (breathing or by eating food grown or raised in the vicinity upon which airborne radioactive material may have been deposited), and liquid effluent releases (eating aquatic foods where discharged radioactive material became mixed with local surface water and groundwater), as shown in Exhibits F and G.

Contained sources of radiation for a U.S. EPR nuclear power plant at the BBNPP site would be shielded and, therefore, would provide a negligible contribution to the external dose to the population from direct radiation from the containment building and other plant buildings. The maximum total body dose a member of the public might receive within a 50-mile radius of the BBNPP site would be less than 5 millirem per year. This amount is approximately 60 times less than the average background radiation one receives in a year in the United States,

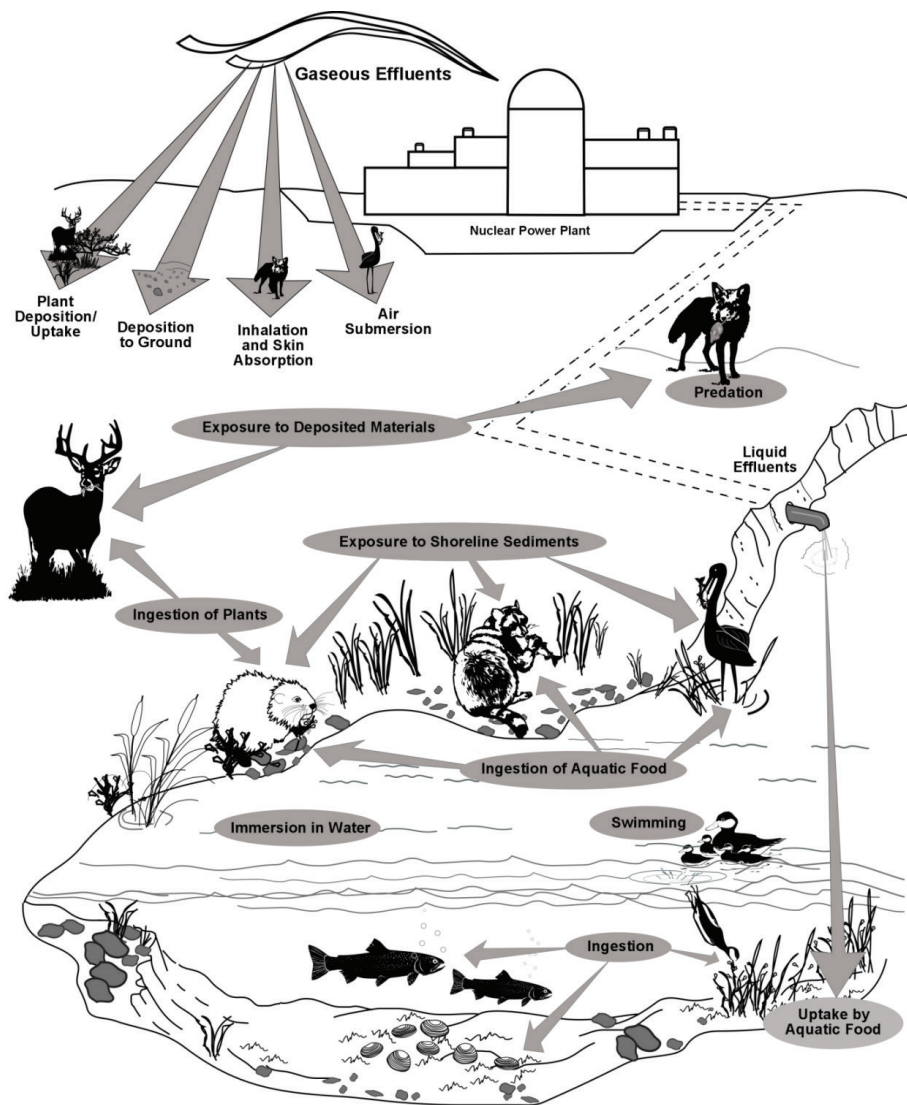


EXHIBIT G. EXPOSURE PATHWAYS TO WILDLIFE AND PLANTS

which is 311 millirem per year. The review team concluded there would be no observable health impacts on the public from normal operation of the proposed plant.

## NONRADIOLOGICAL WASTE IMPACTS

Nonradioactive waste that would be generated, handled, and disposed of during building activities includes construction debris, dredged spoils, stormwater runoff, municipal and sanitary waste, dust, and air emissions. Solid wastes include municipal waste, sewage-treatment sludge, and industrial wastes. Liquid waste includes discharges such as effluents containing chemicals or biocides, wastewater effluents, site stormwater runoff, and other liquid wastes such as used oils, paints, and solvents that require offsite disposal. In addition, small quantities of hazardous waste and mixed waste (i.e., waste with both hazardous and radioactive characteristics) may be generated during plant operations. PPL would be required to follow all regulations related to gaseous, liquid, and air nonradioactive wastes during building and operations. The review team found the impacts would be minimal based on compliance with State and Federal Regulations.

## SUMMARY OF ENVIRONMENTAL IMPACT LEVELS

Exhibit H summarizes the level of impacts to each resource category from building and operating a new nuclear power plant at the BBNPP site.

Resource Category	Building	Operation
Land use	SMALL	SMALL
Water-related		
Water Use - Surface Water	SMALL	SMALL
Water Use - Groundwater Use	SMALL	SMALL
Water Quality - Surface Water	SMALL	SMALL
Water Quality - Groundwater	SMALL	SMALL
Ecology		
Terrestrial Ecosystems	MODERATE (NRC-authorized construction impact level is small)	SMALL
Aquatic Ecosystems	SMALL	SMALL
Socioeconomic		
Physical Impacts	SMALL	SMALL
Demography	SMALL	SMALL
Economic Impacts on the Community	SMALL to MODERATE (beneficial)	SMALL to MODERATE (beneficial)
Infrastructure and Community Services	SMALL to MODERATE	SMALL
Environmental Justice	NONE	NONE
Historic and Cultural Resources	SMALL	SMALL
Air Quality	SMALL	SMALL
Nonradiological Health	SMALL	SMALL
Nonradiological Waste	SMALL	SMALL
Radiological Health	SMALL	SMALL
Postulated Accidents	N/A	SMALL
Fuel Cycle, Transportation, and Decommissioning	N/A	SMALL

EXHIBIT H. LEVELS OF IMPACTS ON RESOURCES

## HOW CAN THE IMPACTS BE REDUCED?

Many of the SMALL impacts are considered minimal because monitoring and use of environmental practices and safeguards would reduce any negative effects on an environmental resource. However, some of the impacts greater than SMALL can be reduced or compensated, or prevented from becoming disruptive.

### TERRESTRIAL IMPACTS

Approximately 11.2 acres of wetlands would be disturbed by building BBNPP. Mitigation of impacts on terrestrial and wetland resources may include restoration of disturbed habitats, creation of new habitat in previously disturbed areas, and enhancement of other natural habitat. PPL would incorporate planting host plants for State-ranked butterfly species into PPL's mitigation plans for wetland creation and enhancement (noted above) and restoration of temporarily affected wetlands

### INFRASTRUCTURE AND COMMUNITY SERVICES IMPACTS

Planned improvements to Federal, State, and county roads and bridges would have short-term physical impacts on the road system. Mitigation measures to address traffic impacts, including installing signals at the BBNPP entrance access road; realigning lanes on U.S. Route 11; adding new entrance and exit lanes on the access road at the intersection of U.S. Route 11; retiming signals; restriping; adding through lanes, temporary traffic signals, parking restrictions, and additional school buses and drivers; possibly relocating school bus stops off of U.S. Route 11; and/or other measures at intersections affected by construction traffic. Increased property and worker-related taxes can help offset some of the problems related to increased population (e.g., community facilities and infrastructure, police, fire protection, and schools).

### MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS

In its evaluation of potential environmental impacts during operation of the proposed BBNPP unit, the review team considered PPL's compliance with the following measures and controls that would limit adverse environmental impacts:

- compliance with applicable Federal, State, and local laws, ordinances, and regulations intended to prevent or minimize adverse environmental impacts (e.g., solid-waste management, erosion and sediment control, air emissions, noise control, stormwater management, spill response and cleanup, hazardous material management)
- compliance with applicable requirements of permits or licenses required for operation of the new unit (e.g., Department of the Army Section 404 Permit and National Pollutant Discharge Elimination System Permit)
- compliance with existing Susquehanna Steam Electric Station processes and/or procedures applicable to the proposed BBNPP for environmental compliance activities for the BBNPP site
- incorporation of environmental requirements into construction contracts
- implementation of best management practices and good construction practices to limit potential impacts

The review team considered these measures and controls in its evaluation of the impacts of building and operating a new nuclear power plant at the BBNPP site. They are fully analyzed in Sections 4.11 and 5.11 of the environmental impact statement. For every environmental resource area, some kind of coordination with another Federal, State, or local agency is required to gain permission to build and operate BBNPP. The required permits and certifications are in Appendix H of the environmental impact statement. Exhibit I provides a summary of planned activities to help minimize environmental effects from building and operating BBNPP.

**EXHIBIT I. SUMMARY OF PLANNED MEASURES AND CONTROLS TO MINIMIZE ENVIRONMENTAL IMPACTS**

Resource Area	Impact Minimization Plan
<b>Land Use</b>	<ul style="list-style-type: none"> <li>• Mitigation measures proposed by the applicant to reduce building activity impacts would include soil erosion and sedimentation control, controlled access roads, and restricted construction zones. Areas of temporary disturbance would be stabilized and restored after completion of building activities, and permanently disturbed locations would be stabilized and contoured to blend with the surrounding area.</li> <li>• Vegetation and stabilization and restoration methods would comply with applicable laws, regulations, permit requirements and conditions, good engineering and construction practices, and recognized environmental best management practices.</li> <li>• New onsite transmission lines would be routed to avoid and/or minimize impacts on existing aquatic resources and any identified threatened and endangered species.</li> </ul>
<b>Water-related Impacts</b>	<ul style="list-style-type: none"> <li>• Comply with National Pollutant Discharge Elimination System (NPDES) permits.</li> <li>• Implement a stormwater-management plan that includes the use of control of erosion and sediment transport.</li> <li>• Use filtration basins to increase groundwater recharge, reduce runoff, and maintain water quality.</li> <li>• Use cofferdams during in-water construction and conduct dredging activities in compliance with permits and requirements.</li> <li>• Use a low-permeability flow barrier around excavations during groundwater dewatering.</li> </ul>
<b>Resource Area</b>	<ul style="list-style-type: none"> <li>• Impact Minimization Plan</li> <li>• Limit planned effluent discharges in compliance with Clean Water Act regulations, Federal Water Pollution Control Act, and NPDES permit specifications.</li> <li>• Implement a post-construction stormwater-management plan and maintain stormwater drainage and infiltration system.</li> <li>• Implement low-intake-velocity design.</li> <li>• Comply with SRBC requirements for surface-water withdrawal, consumptive-use mitigation, and site-specific low-flow protection.</li> </ul>



**Terrestrial Ecosystems**

- Site preparation and development of the BBNPP site project area and expansion of the Rushton Mine water-treatment facilities for consumptive-use mitigation would be conducted according to Federal and State regulations, permit conditions, and established BMPs. These BMPs would protect terrestrial habitats adjacent to disturbed surface soils on the BBNPP site.
- Perform appropriate permittee-responsible onsite mitigation dictated through the permitting process of Section 10 of the Rivers and Harbors Appropriation Act and Section 404 of the Clean Water Act, to regulate the discharge of dredged or fill material into waters of the United States.
- Provide makeup water to compensate for impacts on wetland and stream hydrology posed by dewatering associated with construction of the essential service-water emergency makeup system pond. PPL has set a target of no more than a 3-inch deviation from baseline groundwater elevation trends.
- Include measures to provide habitat for the multiple State-ranked butterfly species in habitats created or enhanced by the proposed wetland mitigation.
- Remove trees greater than 5 inches in diameter breast high on the BBNPP site only from November 16 through March 31 in order to protect the Federally endangered Indiana bat and Federally threatened northern long eared bat.
- Implement BMPs for established vegetation management in transmission-line corridors, to avoid impacts on wetlands.

**Aquatic Ecosystems**

- Develop and implement a site stormwater pollution prevention plan (SWPPP).
- Implement erosion and sediment control plans that incorporate recognized BMPs.
- Install appropriate infiltration beds, barriers, and buffer zones, and use BMPs to protect water bodies and aquatic organisms.
- Implement a Spill Prevention, Control, and Countermeasure Plan (SPCCP) for site-development activities. Restrict activities using petroleum products and solvents to designated areas that are equipped with spill containment.
- Obtain and comply with the Department of the Army permit, State 401 water-quality certification, and BMPs, including development of a mitigation action plan for wetland/stream impacts.
- Coordinate with the Pennsylvania Fish and Boat Commission prior to initiating installation of intake and discharge structures to ensure impacts on mussels are avoided or minimized.
- Use closed-cycle cooling technology and U.S. Environmental Protection Agency Phase I regulations, properly sized intake screens, and low approach velocity of traveling screens to minimize impingement and entrainment.
- Obtain an NPDES permit to regulate discharges to the Susquehanna River and follow requirements such as ensuring that chemical concentrations remain below criteria protective of aquatic life.
- Use BMPs for transmission-line corridor maintenance activities that comply with Federal and State permits to prevent degradation of water quality.
- Use a multiport diffuser to mitigate thermal and physical impacts.

<b>Socioeconomics and Environmental Justice</b>	<ul style="list-style-type: none"> <li>• Comply with Occupational Safety and Health Administration regulations for worker safety and health.</li> <li>• Comply with applicable Pennsylvania Department of Environmental Protection and Salem Township noise restrictions.</li> <li>• Maintain noise-limiting devices on vehicles and equipment, shield high-noise sources near their origins, and conduct non-routine activities such as blasting during weekday business hours.</li> <li>• Comply with applicable U.S. Environmental Protection Agency and Pennsylvania Department Environmental Protection air-quality regulations.</li> <li>• Implement a routine vehicle/equipment inspection and maintenance program.</li> <li>• Implement and maintain measures to comply with Ambient Air Quality Standards and National Emissions Standards for Hazardous Air Pollutants regulatory limits.</li> <li>• Obtain required permits and/or operating certificates.</li> <li>• Bring heavy plant equipment to the site on rail when possible and install a new site perimeter and access road.</li> <li>• Use low points in topography to create the lowest visual profile practicable and place new structures on the river shoreline near existing structures.</li> <li>• Minimize tree and vegetation removal and, where feasible, use native trees and vegetation during post-construction restoration.</li> <li>• Add a new access road.</li> <li>• Cover exteriors of structures, where practicable, with a color that is compatible with the surrounding area.</li> <li>• Install signals at the BBNPP entrance access road, realign lanes on US 11, add new entrance and exit lanes on the access road at the intersection of US 11, retime signals, restripe, add through lanes, install temporary traffic signals, implementing parking restrictions, add school buses and drivers, possibly relocate school bus stops off of US 11, and/or implement other measures at intersections affected by construction traffic.</li> <li>• Increased property and worker-related taxes can help offset some of the problems related to increased population (e.g., community facilities and infrastructure, police, fire protection, and schools).</li> </ul>
<b>Historic and Cultural Properties</b>	<ul style="list-style-type: none"> <li>• Follow procedures agreed upon by PPL and the Pennsylvania State Historic Preservation Office (SHPO) to protect 36LU288.</li> <li>• PPL follows its procedures if ground-disturbing activities discover historic or cultural resources.</li> </ul>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• Make roadway improvements to accommodate projected traffic and minimize backup and congestion. Obtain air permits, operate systems within permit limits, and monitor emissions as required.</li> </ul>



**Nonradiological Health**

- Implement procedures based on those already established for SSES Units 1 and 2 to limit adverse impacts during building activities. Impose operational controls to mitigate dust emissions (e.g., watering unpaved roads and exposed soils [when the surface is dry], stabilizing construction roads and spoil piles, and phasing grading activities and ceasing them during high winds and/or during extreme air pollution episodes).
- Implement safety and medical programs and provide required training to all employees and contractors to make sure that all workers onsite are trained in all appropriate safety requirements.
- The safety and medical program promotes safe work practices, responds to occupational injuries and illnesses, and maintains a safety manual for employees. The safety manual provides employees with important workplace safety-related information to help prevent accidents.
- Limit public access to area in order to avoid exposure to etiological agents (thermophilic organisms).
- Conform to National Electric Safety Code standards to minimize the potential for acute effects of electromagnetic fields from transmission lines.
- Adhere to NRC, OSHA, and State safety standards, practices, and procedures during operation of the new unit and implement a safety and medical program to protect workers from industrial safety risks.

**Radiological Health**

- Maintain doses to construction workers below NRC public dose limits.
- Maintain doses to members of the public below the NRC's and the U.S. Environmental Protection Agency's regulatory standards.
- Maintain occupational doses below NRC standards and ensure implementation of a program to maintain plant worker doses as low as reasonably achievable.
- Implement radiological effluent and environmental monitoring programs.

**Nonradioactive Waste**

- Handle solid, liquid, and gaseous wastes generated when building the proposed BBNPP unit according to Federal, State, and local regulations. Recycle solid waste or dispose of in existing, permitted landfills.
- Ensure compliance with the Clean Water Act and the State of Pennsylvania standards through an NPDES permit, which would include a SWPPP for surface-water runoff and groundwater quality and the use of temporary, portable facilities for sanitary waste systems during the construction period..
- Control emissions through a dust-control plan as part of its SWPPP. Mitigation measures in the dust-control plan could include stabilizing construction roads and spoils piles, covering haul trucks, watering unpaved construction roads to control dust, and routine inspections and maintenance on construction vehicles and equipment. Air emissions during the building phase of the proposed BBNPP unit would be permitted through the State Permit to Construct process, and implementation of controls and limits at the source would keep emissions within the site boundary.
- Manage generated waste including sanitary waste in accordance with local, State, and Federal requirements.
- Recycle or reuse operational solid wastes (e.g., office waste, cardboard, wood, and metal) to the extent possible.
- Dispose of municipal solid waste (e.g., resins and debris from trash racks and screens collected from the water intake structure) in offsite, licensed commercial disposal facilities.
- Maintain discharges to the Susquehanna River of liquid effluents used for operations, including wastewater and stormwater, at limits per a NPDES permit.
- Install equipment with appropriate emission controls and comply with all applicable Federal, State, and local air-quality requirements.
- Institute a waste-minimization plan that would reduce the accumulation of mixed waste at the BBNPP site.
- Implement a source-reduction plan that was developed for Susquehanna Steam Electric Station Units 1 and 2 to reduce the amount of mixed waste produced onsite.

**WHAT IS THE RELATIONSHIP OF THIS PROJECT WITH OTHER PROJECTS IN THE AREA?**

Cumulative impacts may result when the environmental effects associated with the proposed action are added to the temporary or permanent effects associated with past, present, and near-future projects. Cumulative impacts can result from the combination of effects that might have been minor by themselves but that become more noticeable when affecting the same resource over a period of time.

A number of projects exist near or are proposed for areas near the BBNPP site. These projects may be complete or in various stages of development. If project information was available and the project had the potential to contribute to cumulative impacts, it was

detailed in the final environmental impact statement. Exhibit J lists projects considered in the cumulative impacts assessment.

**EXHIBIT J. LIST OF PAST, PRESENT, OR NEAR-FUTURE PROJECTS NEAR THE BBNPP SITE**

Project Name	Summary of Project
<b>Energy Projects</b>	
Susquehanna Steam Electric Station (SSES) Units 1 and 2	Two 1,140 MW(e) boiling water reactors, Unit 1 was issued an operating license in 1982, Unit 2 was issued an operating license in 1984. Extension of operations of SSES Units 1 and 2 for an additional 20-year period beyond the end of the current license term, or until 2042 and 2044, respectively. Power uprates - currently operating at 3,952 MW(t), 1,300 MW(e).
Susquehanna Steam Electric Station (SSES) Independent Spent Fuel Storage Installation	Dry spent fuel storage at the SSES site
Limerick Generating Station, Units 1 and 2	Two 3,514-MW(t), 1,134 MW(e) boiling water reactors; Unit 1 was issued an operating license in 1985, Unit 2 was issued an operating license in 1989
Limerick Generating Station Independent Spent Fuel Storage Installation	Dry spent fuel storage at the Limerick site
Moxie Freedom Project	1,050-MW gas fired facility with two power blocks, each consisting of a combustion gas turbine and steam turbine configured in single shaft alignment, sharing a single common electric generator.
Three Mile Island Nuclear Station, Unit 1	One 2,568 MW(t), 786 MW(e) pressurized water reactor; Unit 1 was issued an operating license in 1974
Three Mile Island Nuclear Station, Unit 2	Unit 2 was issued an operating license in 1978. Unit 2 is currently in non-operating status
Peach Bottom Atomic Power Station, Unit 1	200 MW(t) high temperature, gas-cooled reactor operated from June 1967 to final shutdown on October 31, 1974
Peach Bottom Atomic Power Station, Units 2 and 3	Two 3,514 MW(t), 1,112 MW(e) boiling water reactors; Unit 2 was issued an operating license in 1973, Unit 3 was issued an operating license in 1974

Peach Bottom Atomic Power Station Independent Spent Fuel Storage Installation	Dry spent fuel storage at the PBAPS site
Hunlock Power Station	130 MW natural-gas combined-cycle (NGCC) facility
Talen Energy Supply, LLC, Harwood Plant	2.7 MW oil-fired generation facility
Talen Energy Supply LLC, Jenkins Plant	27.6 MW oil-fired generation facility
Montour Power Plant	1,504 MW coal-fired generation facility
Intelliwatt Renewable Energy	13 MW biomass (wood) energy
Good Spring	Two 337 MW NGCC units
Koppers Susquehanna Waste Plant	Pressure-creosoted timber products and cogeneration facility
Panda Patriot Power Plant	829 MW NGCC generating facility
Viking Energy of Northumberland Waste Plant	Biomass power-generation facility
Taylor Energy Partners LP Waste Plant	1.7 MW biomass landfill gas facility
Shamokin Dam Project	4.5 MW hydroelectric power, added to the already existing USACE Shamokin Dam
White Deer Energy Project	7 MW tire-derived energy
Bucknell University Gas Combined Heat and Power Plant	5 MW dual-fuel turbine generator set (natural gas- and oil-fired)
Panda Hummel	Converting retired Sunbury coal plant to 3 NGCC generating burners capable of producing 1,064 MW power
Lackawanna Energy Center	1,480 MW NGCC generating facility
Eureka Resources Wastewater Treatment Facilities	Fracking wastewater treatment
Panda Liberty Power Plant	829 MW NGCC facility
Green Knight Energy Center	9.9 MW biomass landfill gas facility
Tenaska Lebanon Valley Generating Station	Up to 950 W natural-gas-fired facility
Blossburg Generating Station	24 MW natural-gas-fired facility
Brunner Island Power Plant	1,411 MW three-unit, coal-fired facility (Talen Energy owned)

Susquehanna-Roseland 500 kV transmission line and other transmission lines in the region	500 kV power transmission lines
Project Compass	345-kV power transmission line
Marcellus gas pipelines	Numerous natural-gas transmission pipeline
Leidy to Long Island Expansion Project	Natural-gas transmission pipeline
Sunbury Pipeline	Natural-gas transmission pipeline
Atlantic Sunrise Project	Natural-gas transmission pipeline
Other fossil fuel operational energy projects	Numerous operating fossil fuel power-generating facilities (e.g., Wheelabrator Frackville Energy Coal Plant, Foster Wheeler Mt Carmel Cogen Coal Plant, Northeastern Power Co/McAdoo Cogen, Northeast Natural Gas Portfolio (Hazleton), Saint Nicholas Cogeneration Project, Gilberton Power Co., Kline Township, Archibald Power Station)
Wind energy projects	Various wind power-generating projects (e.g., Locust Ridge Wind Farm, Locust Ridge II, Bear Creek Wind Farm, Laurel Hill Wind Farm, Mehoopany Wind Farm, and Waymart Wind Farm)
Solar energy projects	Various solar power-generating projects (e.g., Romark PA Solar, Masser Farms Realty Sola, PA Solar Park, Pocono Raceway Solar Project)
Hydropower energy projects	Various water power projects (e.g., Goodyear Lake Hydroelectric Project, Safe Harbor Water Power Corporation, York Haven Hydroelectric Project, Muddy Run Pumped Storage Facility, and Holtwood) and proposed water projects (i.e., Francis Walter Hydroelectric Project)
<b>Mining Projects</b>	
Spike Island operation	Coal refuse removal
Various surface and subsurface mining projects	Numerous operating anthracite and stone/quarry mining facilities such as Bear Gap Stone/Quarry, UAE Coal Corp/Harmony Mine
Mt. Pisgah uranium deposit	Uranium mines
Various Marcellus natural-gas projects	Natural-gas extraction sites
Various acid mine drainage and abandoned mine remediation	Mine remediation
Nescopeck Outfall	Mine drainage, mine runoff

<b>Transportation Projects</b>	
Susquehanna River transportation projects	Bridge replacements, road, traffic, and pedestrian projects
Parks and Aquaculture Facilities	
Ricketts Glen State Park	Activities include picnicking, boating, swimming, camping, fishing, and hiking
Nescopeck State Park	Activities include hunting, fishing, and hiking
Other State Parks	Various other State parks such as Lehigh Gorge, Hickory Run, Locust Lake, Frances Slocum, Tuscarora, Shikellamy, Beltzville, Loyalsock Township Riverfront Park
State Game Land 260	Public recreational activities
Cherry Hill National Wildlife Refuge	Hiking, wildlife viewing
Other State Game Lands	Public recreational activities
<b>Other Actions/Projects</b>	
Assorted flood control projects	Construction of levees, floodwalls, closure structures, and interior drainage structures
Sandy/Longs Run	Abandoned mine drainage restoration
Various waste water-treatment facilities	Sewage treatment
Various hospitals and industrial facilities that use radioactive materials	Medical and other industrial isotopes
Safety Light Corporation	Manufacturing, former user of radioactive materials
Procter and Gamble Mehoopany Mill	Paper products and natural-gas power generation for facility use
US Gypsum	Wallboard manufacturing facility
Cherokee Pharmaceutical Plant	Steam generation (natural-gas) facility for pharmaceutical production
Great Dane Trailers	Trailer manufacturing
Benton Foundry	Iron Foundry
Foam Fabricators Inc. Bloomsburg	Plastics and foam products
KYDEX LLC	Plastics manufacturing
Corixa Corporation	Pharmaceutical preparations

Hershey Foods Corporation	Chocolate and cocoa products
Jersey Shore Steel Company	Blast furnace/steel works/rolling
Seedco Industrial Park	Various industry and energy projects
Adam T. Bower Memorial Dam	Inflatable dam used in summer to make reservoir
Various other large scale industrial and manufacturing facilities	Industrial facilities
Misc. golf courses	Golf courses
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; and water and/or wastewater treatment and distribution facilities and associated pipelines as described in local land-use planning documents

Exhibit K summarizes the cumulative impact of the proposed project and alternatives.

***EXHIBIT K. COMPARISON OF CUMULATIVE ENVIRONMENTAL IMPACTS BETWEEN PROPOSED SITE AND ALTERNATIVE SITES***

Resource Areas	Proposed Site(a)	Alternative Sites(b)		
	BBNPP	Montour	Humboldt	Seedco
Land Use	SMALL	MODERATE	MODERATE	MODERATE
Surface Water	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater	SMALL	SMALL	SMALL	SMALL
Aquatic Ecology	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE
Terrestrial Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Socioeconomics	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Environmental Justice	NONE	NONE	NONE	NONE
Cultural Resources	SMALL	MODERATE to LARGE	SMALL	MODERATE to LARGE
Air Quality	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE

Nonradiological Health	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL

(a) Cumulative impact determinations taken from Table 7-3 in the final environmental impact statement.

(b) Cumulative impact determinations taken from Table 9-17 in the final environmental impact statement.

### IMPACT OF DIFFERENCES WHEN CUMULATIVE IMPACTS ARE CONSIDERED

A few of the environmental resource areas were determined to change from minor effects to more noticeable impacts when considered in combination with other past, present, and near-future projects near the BBNPP site.

- Surface-water use and quality – The extensive past and present use and contamination of surface water in the Susquehanna River Basin is the primary driver of the review team’s change in impact level. However, water use by and discharge from BBNPP by itself would have minimal effects.
- Aquatic Ecology – Past actions, such as the building of dams in the Susquehanna River watershed and abandoned mine drainage, have had noticeable and sometimes destabilizing effects on many aquatic species and communities. These past actions, when considered in combination with current and future increases in urbanization, were the drivers for the review team change in impact level. However, the construction and operation of a new nuclear power plant at the BBNPP site would, by itself, contribute minimally to such impacts.
- Socioeconomic, Physical Impacts – Cumulative impacts of planned improvements to Federal, State, and county roads and bridges led to the review team’s change in impact level. However, the incremental physical impacts on local road systems from NRC-authorized activities would be SMALL.
- Air Quality – The national and worldwide cumulative impacts of greenhouse gas emissions have noticeable effects. The proposed BBNPP would not significantly contribute to greenhouse gas emissions in the region.

### WHAT ALTERNATIVES WERE CONSIDERED?

#### ***NO ACTION***

The no-action alternative would result in the combined license not being granted by the NRC or permits not being issued by the U.S. Army Corps of Engineers. Upon such denials, construction and operation at BBNPP site would not occur and the predicted environmental impacts would not take place. If no other power-generating facility were to be built and no other strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation to be provided by BBNPP would not occur, and the need for baseload power would not be met.



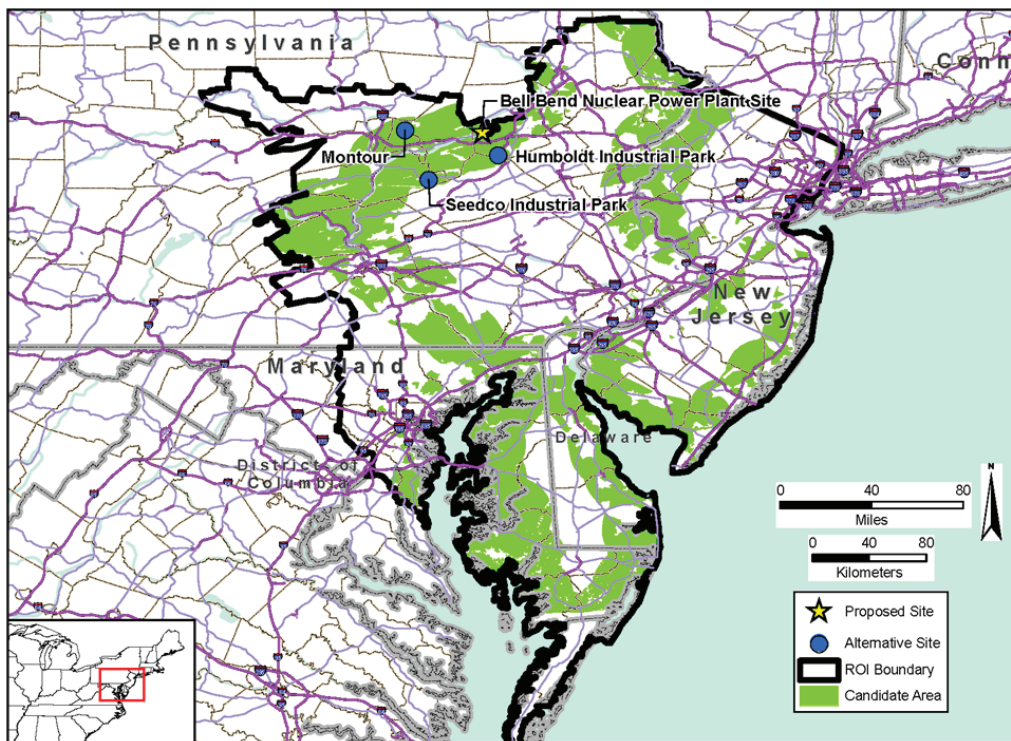
## ALTERNATIVE SITES

Candidate areas for siting a new nuclear power plant in the region of interest (parts of Pennsylvania, New Jersey, Delaware, Virginia, and Maryland) were identified by the applicant after considering the following criteria: population density, water availability, proximity to high-voltage transmission lines and load centers, and avoidance of designated lands (national and State parks and tribal lands). Further review of the candidate areas included eliminating sites that could not provide the requisite 420 acres needed for construction of an U.S. EPR. This resulted in a list of 14 potential sites, a few of which were eliminated due to licensing issues and closer examination of site-specific features. Nine potential sites remained.

PPL then selected alternative sites from its list of nine potential sites using 16 major criteria categories and 40 sub-criteria and ranking each site against these criteria. Ultimately, three alternative sites—as shown in Exhibit L—were chosen for additional site suitability analyses, which resulted in the BBNPP site being chosen as the preferred site. The remaining three sites are listed and evaluated as alternative sites in the environmental impact statement:

- Montour site in Montour County, Pennsylvania
- Humboldt site in Luzerne County, Pennsylvania
- Seedco site in Northumberland County, Pennsylvania

The review team concluded that all of the sites were generally comparable, and it would be difficult to state that one site is preferable to another from an environmental perspective. In such a case, the proposed site prevails because none of the alternative sites is clearly environmentally preferable.



**EXHIBIT L. ALTERNATIVE SITES AND PROPOSED SITE.**

## ALTERNATIVE ENERGY SOURCES



*WIND FARM IN TEXAS (PHOTO COURTESY OF LLANO ESTACADO/PANORAMO)*



*(PHOTO COURTESY OF BUREAU OF LAND SOLAR POWER STATION IN CALIFORNIA)*

To compare different types of energy plants with a new nuclear power plant, the review team analyzed other power generation sources, a combination of sources, and power-generation technologies that are technically reasonable and available. The three primary energy sources for generating electric power in the United States are coal, natural gas, and nuclear energy. Coal-fired plants are the primary source of baseload power generation in the United States. Natural gas combined-cycle power generation plants are often used as intermediate generation sources but also can be used for baseload power.

For the coal-fired generation alternative, the effects of air emissions would be greater than for a new nuclear power plant because of the release of carbon dioxide gas and other air pollutants. Coal combustion generates waste in the form of ash. Disposal of this waste could affect land use noticeably because

of the acreage needed and affect groundwater quality. Other environmental effects and cumulative effects would be similar to those associated with a new nuclear power plant at the BBNPP site.

For the natural-gas-fired alternative, the review team assumed the building and operation of six combined-cycle units with a net capacity of 400 MW(e) per unit, producing a net capacity of 2,400 MW(e), based on information in the SSES final environmental impact statement. Air emissions would be similar to those for a coal-fired plant, but in lower amounts. There would be fewer ecological impacts than for a new nuclear power plant because less land would be required. Building a new underground gas pipeline to the site could result in permanent loss of some ecological resources. Other environmental effects and cumulative effects would be similar to those associated with a new nuclear power plant at the BBNPP site.

The review team also analyzed a combination of energy sources. An installed capacity of 1,025 MW(e) of natural gas combined-cycle units with contributions of 400 MW(e) from solar, 650 MW(e) from wind, and 575 MW(e) from biomass sources would be required to match the output of a 1600 MW(e) nuclear power plant when the operating capacity factors of each alternative energy source are taken into consideration. This combination of alternatives would have environmental effects similar to natural-gas-fired units, with the exception of land use, where impacts would be greater due to the large commitment of land for solar and wind resources.

The review team concluded that none of the reasonable alternatives—coal, natural gas, and the combination of energy sources—would be environmentally preferable to the proposed nuclear unit at the BBNPP site.

Renewable energy sources such as wind and solar power were considered, but current technologies for these energy sources by themselves are not reasonably capable of producing baseload power similar to the BBNPP. With respect to wind energy, approximately 2,400 wind turbines occupying 288,000 acres would be needed to produce a similar amount of power. Solar photovoltaic and/or solar thermal technologies would require a land area of 5,000 to 10,000 acres.

### ***BASELOAD POWER***

» The minimum amount of power that a utility must make available to its customers all of the time.

### **ALTERNATIVE SYSTEM DESIGNS**

The review team considered a variety of alternatives for heat-dissipation systems and cooling-water systems. About two-thirds of the heat from a commercial nuclear reactor is rejected as heat to the environment. The remaining one-third of the reactor's generated heat is converted into electricity. Normal heat-dissipation systems transfer this rejected heat into the atmosphere as evaporation and/or heated discharge water to mix with nearby water bodies. The review team considered seven alternative heat-dissipation systems but found none of them would be environmentally preferable to the two natural draft cooling towers proposed by PPL. Each cooling tower would be up to 475 feet high and 350 feet in diameter.

Cooling-water systems withdraw (intake) water from the source water body and return (discharge) a slightly reduced volume of water to the receiving water body at a higher temperature. One of the main interactions a nuclear power plant has with the environment occurs at the intake and discharge structures. The review team considered two alternative intake and two alternative discharge options; however, none of these alternatives was found to be environmentally preferable to those proposed.

The review team also considered alternative water sources for the cooling-water system because withdrawal of water has the potential to affect the environment. PPL's proposed system design would withdraw makeup water from the Susquehanna River using a new shoreline intake structure. The review team considered alternative sources of water including water reuse and water supplies from groundwater. However, the review team concluded that none of these sources of water would be a viable alternative to the Susquehanna River.

### **WHAT ARE THE UNAVOIDABLE ENVIRONMENTAL IMPACTS?**

The National Environmental Policy Act requires that an environmental impact statement include information about any negative environmental effects that cannot be avoided if the new nuclear power plant is built and operated. These impacts are usually the building activities involved with clearing the land, excavating, filling wetlands, installing roads, and dredging.

Exhibit M lists the negative environmental impacts from building and operating a new nuclear plant at the BBNPP site. The impacts discussed are based on information presented in Tables 10-1 and 10-2 of the final environmental impact statement.

**EXHIBIT M. UNAVOIDABLE IMPACTS.**

Environmental Resource	Unavoidable Impact	Impact Level	
		Building	Operation
<b>Land Use</b>	Approximately 663 acres on the BBNPP site would be committed to the project throughout preconstruction and construction, of which 357 acres would be permanently occupied by project facilities until operations cease and decommissioning is completed. Effects on shoreline and riverside lands caused by consumptive use mitigation and site-specific low-flow protection would be too infrequent, brief, and limited in extent to place meaningful limitations on land use.	SMALL	SMALL
<b>Water</b>	Use Local and temporary alteration of Susquehanna River flow. Local and temporary drawdown of local aquifers from excavation dewatering. Temporary reduction in groundwater discharge to Walker Run. Surface-water availability would not be noticeably altered, but during very dry years requiring prolonged consumptive-use mitigation and site-specific low flow protection, drawdown of Cowanesque Lake would adversely affect recreational use of the lake.	SMALL	SMALL
	Quality Local and temporary increase in suspended solids from construction in Susquehanna River. Potential temporary increase in sediment discharge to waterbodies due to runoff and erosion. Temporary and localized impacts from discharge of excavation dewatering product and spills. Localized increase in water temperature and concentration of chemicals in cooling-tower blowdown downstream from the outfall diffuser.	SMALL	SMALL

<b>Environmental Resource</b>		Unavoidable Impact	Impact Level	
<b>Ecology</b>	Terrestrial and Wetland Resources	Approximately 663 acres of terrestrial habitat would be lost during preconstruction and construction. Effects on terrestrial habitats in shoreline and riverside lands caused by consumptive use mitigation and site-specific low-flow protection would be too infrequent, brief, and limited in extent to alter the properties of those habitats.	MODERATE	SMALL to MODERATE
	Aquatic Resources	Physical alteration of habitat (e.g., infilling, coffer dam placement, dredging) including temporary or permanent removal of associated benthic organisms, sedimentation, and changes in water quality. Aquatic habitats affected would include the intake and discharge locations in the North Branch Susquehanna River, the North Branch Canal Outlet, and 2,799 linear ft of Walker Run. Other impacts include permanent shading over onsite tributaries from bridge installation, and installation of a culvert under the proposed rail extension. Increased stormwater runoff. Impingement and entrainment of river biota by cooling-water intake system. Temporarily increased turbidity from maintenance dredging and cleaning of intake and discharge systems. Temporary disturbance of receiving waters during consumptive-use mitigation and site-specific low-flow protection water releases.	SMALL	SMALL
<b>Socioeconomic</b>	Physical	None	SMALL	SMALL
	Demography	None	SMALL	SMALL
	Economic and Tax	None	SMALL	SMALL

<b>Environmental Resource</b>	Unavoidable Impact	Impact Level	
Infrastructure and Community Services	Temporary, localized periodic traffic impacts during building. Temporary impacts on housing availability and prices in Berwick area during building. Temporary impacts on school facilities and student-to-teacher ratios in Berwick Area School District during building.	SMALL to MODERATE MODERATE for traffic impacts on the local highway network, housing impacts in the Borough of Berwick, and impacts on the Berwick Area School District. SMALL for other infrastructure and community service impacts)	SMALL
<b>Environmental Justice</b>	None	SMALL	SMALL
<b>Historic and Cultural Resources</b>	None	SMALL	SMALL
<b>Meteorology and Air Quality</b>	Temporary degradation of local air quality due to vehicle emissions and fugitive dust emissions during ground clearing, grading excavation activities, and operation of other temporary sources. Slight increases in certain criteria pollutants and greenhouse gas emissions due to plant auxiliary combustion equipment (e.g., standby diesel generators) and plumes and drift deposition from cooling towers.	SMALL	SMALL
<b>Nonradiological Health</b>	Dust emissions, noise, occupational injuries, traffic accidents. Increase in etiological agent growth, cooling-tower and pump noise, occupational injuries, acute and chronic electromagnetic field exposures.	SMALL	SMALL

Environmental Resource	Unavoidable Impact	Impact Level	
<b>Radiological Health</b>	Radiological doses to the public and to construction workers at the BBNPP site from the adjacent SSES Units 1 and 2 would be below the NRC public dose limits. Small radiation doses to members of the public below NRC and EPA standards; as low-as-reasonably-achievable doses to workers; and non-human biota doses less than National Council on Radiation and Measurements and International Atomic Energy Agency guidelines.	SMALL	SMALL
<b>Nonradioactive Waste</b>	Consumption of some landfill capacity. Minor discharges to receiving waters and to atmosphere.	SMALL	SMALL
<b>Fuel Cycle, Transportation, and Decommissioning</b>	Small impacts from fuel cycle as presented in Table S 3, 10 CFR Part 51 (TN250). Small impacts from carbon dioxide, radon, and technetium-99. Small radiological doses that are within the NRC and DOT regulations from transportation of fuel and radioactive waste.		SMALL

## WHAT ARE THE IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES?

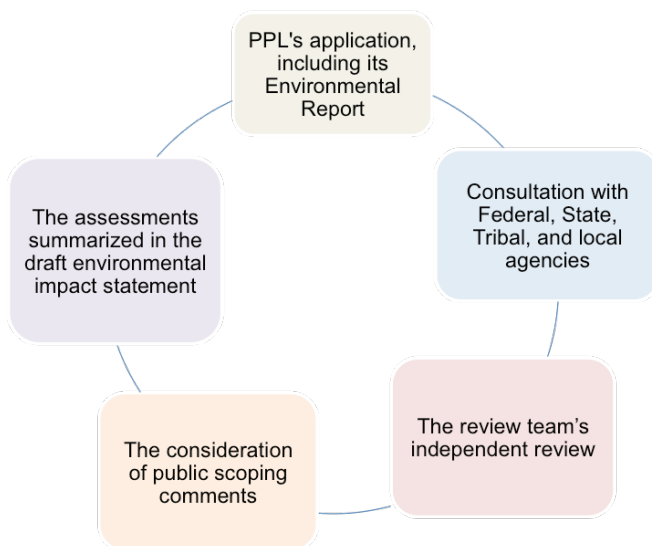
The term “irreversible commitments of resources” refers to environmental resources that would be permanently changed and could not be restored later by the building or operation activities authorized by the NRC and U.S. Army Corps of Engineers permitting and licensing decisions.

Exhibit N lists the irreversible environmental resources from building and operating BBNPP. The term “irretrievable commitments of resources” refers to environmental resources that would be used or consumed by the new unit in such a way that they could not be recycled or restored for other uses. The review team expects that the use of building materials in the quantities needed for BBNPP would be irretrievable, but would be of small significance with respect to the availability of such resources.



## EXHIBIT N. IRREVERSIBLE COMMITMENTS

Environmental Resource	Irreversible Commitment
Land Use	Land committed to the disposal of radioactive and nonradioactive wastes is committed to that use and cannot be used for other purposes during the operational period.
Water Use	Under average conditions, 17,064 gallons per minute of surface water would be lost through evaporation and drift. Minor consumptive use of groundwater from a municipal supply (40 gallons per minute).
Terrestrial Biota	Approximately 1.2 acres of wetlands would be permanently filled and 0.9 acre of wetlands would be temporarily filled. None of the filled wetlands can be expected to revert to wetlands through natural succession.
Aquatic Biota	Onsite aquatic habitats losses include filling of the 617 linear feet of the North Branch Canal Outlet, abandonment of 2,799 linear feet of Walker Run stream segments, and loss of 125 feet of benthic habitat in Unnamed Tributary 5. Dredging activities result in a loss of 0.08 acre of river-bottom habitat. Benthic organisms present in these sediment habitats would be lost.
Socioeconomics	No irreversible commitments
Historic and Cultural Resources	No irreversible commitments
Air Quality	No irreversible commitments



**EXHIBIT O. BASIS OF THE REVIEW TEAM'S PRELIMINARY RECOMMENDATION**

## WHEN WILL THE U.S. NUCLEAR REGULATORY COMMISSION DECIDE?

After considering the environmental impacts of the proposed action, the review team preliminarily recommended to the Commission that the combined license be issued as proposed. This preliminary recommendation was determined using the criteria in Exhibit O.

The Commission will make a decision about whether to issue



the combined license following the issuance of the staff's final environmental impact statement and final safety evaluation report and the conclusion of the mandatory hearing process.

## **WHAT IS IN THE ENVIRONMENTAL IMPACT STATEMENT?**

### ***CHAPTER 1 – INTRODUCTION***

This introductory chapter defines the proposed action and the purpose of and need for the proposed action and provides a brief outline of the NRC and U.S. Army Corps of Engineers environmental review processes.

### ***CHAPTER 2 – AFFECTED ENVIRONMENT***

This chapter describes the location of the BBNPP site and the existing conditions at the site and surrounding area. It provides the “baseline” for the analysis.

### ***CHAPTER 3 – SITE LAYOUT AND PLANT DESIGN***

This chapter describes the proposed site layout and the key plant characteristics that are used for the impact analysis of the proposed actions.

### ***CHAPTER 4 – ENVIRONMENTAL IMPACTS OF CONSTRUCTION***

This chapter describes the potential impacts from building BBNPP site and the safeguards and controls that would limit the negative impacts of building the new units.

### ***CHAPTER 5 – ENVIRONMENTAL IMPACTS OF OPERATION***

This chapter examines the potential impacts from operating BBNPP site and the safeguards and controls that would limit the adverse impacts during operation over the 40-year license period.

### ***CHAPTER 6 – FUEL CYCLE, TRANSPORTATION, AND DECOMMISSIONING***

This chapter addresses the environmental impacts from (1) the uranium fuel cycle and solid-waste management, (2) the transportation of radioactive material, and (3) the decommissioning of the BBNPP site.

### ***CHAPTER 7 – CUMULATIVE IMPACTS***

This chapter describes the cumulative impacts that may result when the effects of building and operating BBNPP site are added to, or interact with, other past, present, and reasonably foreseeable future actions on the same resources.

### ***CHAPTER 8 – NEED FOR POWER***

This chapter discusses the staff's evaluation of the need for baseload-generating capacity within the region of interest.

### ***CHAPTER 9 – ALTERNATIVES***

This chapter contains the evaluation of energy alternatives, site location alternatives, and nuclear plant design alternatives.

## **CHAPTER 10 – CONCLUSIONS AND RECOMMENDATIONS**

The final chapter provides the staff’s preliminary recommendation for whether the combined licenses should be issued to PPL.

### **WHAT ARE THE NEXT STEPS?**

The draft environmental impact statement has been issued on April 24, 2015, for a 75-day public review and comment period. All comments received on the draft statement will be considered and addressed in Appendix E of the final environmental impact statement. A mandatory hearing with the Commission will be held after the final environmental impact statement and the final safety evaluation report are issued. The Bell Bend safety review is on hold until further notice. For additional information, please contact Tomeka Terry, Environmental Project Manager, at [Tomeka.Terry@nrc.gov](mailto:Tomeka.Terry@nrc.gov) or Patricia Vokoun, Environmental Project Manager, at [Patricia.Vokoun@nrc.gov](mailto:Patricia.Vokoun@nrc.gov).



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