Section Q
Alternatives Analysis

Alternatives Analysis

PPL Bell Bend Nuclear Power Plant
Salem Township, Luzerne County, PA

1. Introduction

PPL's preferred alternative (PA) for a new nuclear power plant is the Bell Bend site located adjacent to the existing Susquehanna Steam Electric Station in Salem Township, Luzerne County, Pennsylvania. This section considers and presents an analysis of alternatives as required by both the National Environmental Policy Act of 1969 and the Section 404(b)(1) guidelines from the Clean Water Act (CWA).

To construct a project involving the discharge of dredged or fill material into waters of the United States Section 404 permit applicants must demonstrate in accordance with Section 404(b)(1) guidelines that the proposed project is the least environmentally damaging practicable alternative (LEDPA) to achieve the project purpose. In preparing this alternatives analysis, the Applicant, in accordance with 40 CFR §230.10, understands that "no discharge of dredged, or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem so long as the preferred alternative (PA) does not have any significant environmental consequences." The Section 404(b)(1) guidelines have been applied in this analysis considering the PA in light of its "availability and capability, while taking into consideration cost, existing technology, and logistics as pertaining to the overall project purposes."

The detailed alternatives analysis presented below evaluates, 1) the effects of the no action alternative, where no new power generating facility is constructed, 2) alternate energy sources for generating the proposed amount of power, 3) alternate locations to host the proposed nuclear facility that were identified through a systematic site selection process, and 4) actions taken at the proposed Bell Bend location to avoid and minimize environmental impacts resulting from construction and operation of the proposed nuclear facility.

Through a detailed evaluation of off-site and on-site alternatives, the analysis contained herein demonstrates that the BBNPP is the LEDPA, thereby satisfying Section 404(b)(1) guidelines.

2. Purpose and Need

The primary purpose of this project is to produce 1,600 Megawatts Electric (MWe) of nuclear baseload power for commercial sale to the PJM Interconnection, LLC (PJM) "classic" market area. The proposed action is to construct the BBNPP nuclear power plant (U.S. Evolutionary Power Reactor (EPR) designed to produce approximately 1,600 MWe of net output) thus meeting the project's primary purpose.

The task of evaluating the region's power supply lies with the PJM Regional Transmission Organization (RTO) and the Regional Electric Reliability Organization, Reliability First Corporation (RFC). The PJM is a regional transmission organization that coordinates the movement of wholesale electricity through 13 states in the mid-Atlantic, Midwest, and southern regions of the United States. PJM has projected continuing load growth in the primary PJM east area which includes portions of Pennsylvania, Maryland, New Jersey, Virginia, and the entire state of Delaware. The PJM estimates an annual increase of 1.2% to 1.5% in peak electricity demand over the next 10 years within the subregion of the PJM that BBNPP would serve. The Department of Energy (DOE) has identified New Jersey, Delaware, eastern Pennsylvania, and eastern Maryland as a Critical Congestion Area. PJM expects expanded exports of power into New York, further exacerbating the situation. These energy use projections, limitations in the east-west transmission of energy across the Allegheny Mountains, and the growing demand for baseload power at load centers along the east coast indicate the need for increased power production within the eastern PJM.

The need for power establishes a framework for analysis of project benefits and for the geographic boundaries over which benefits and costs are distributed. Because the BBNPP will be developed as a merchant facility, power generated could be distributed to PJM electricity distribution members or it could be sold outside the relevant primary market area boundary. Merchant facilities have the ability to sell energy to anyone and they are only limited by the transmission system.

While these distribution options are possible, market forces coupled with generation and transmission capabilities and load demands result in a strong partiality toward sales within the primary market area. PJM also imports and exports energy to and from other regions. The PJM has contracts with the Tennessee Valley Authority (TVA),

MidAmerican Energy Company, and New York Independent System Operator (NYISO) for reliability and congestion management.

There is a growing demand for baseload power in the market that would be served by BBNPP. Long-term economic signals have indicated a shift in favor of baseload power, as opposed to peaking facilities. Intermittent or "peaking," facilities are generally used to augment the need for baseload power when demand exceeds capacity for brief periods of time. Peaking facilities have no reserves and little capacity, and are used in response to high levels of demand for energy. While more costly to build, baseload facilities are less costly to run, produce more electricity and improve reliability by providing a constant secure source of power.

The following sections provide a detailed description of all alternatives considered in lieu of the proposed action. All reasonable alternatives have been identified and considered leading to a defined solution satisfying the project purpose and need. Each of the alternatives has been objectively evaluated and reasons are provided as to why the alternatives were eliminated.

3. The No Action Alternative

The No Action Alternative refers to a scenario where no new power generating facilities are constructed, nuclear or non-nuclear. The benefit of implementing the no-action alternative includes avoiding land use, ecological impacts (including flora, fauna, wetlands and waters of the US), and water-related construction and operation impacts associated with a new baseload power generation facility.

Several significant impacts stemming from the No Action Alternative are summarized below:

- There would be the loss of the potential 1,600 MWe of additional generating capacity that the BBNPP would provide.
- There would be increased costs of operation and costs of supplied power.
- There would be increased electricity demands that would need to be met without additional power generation capability. Energy supply issues could affect the economic growth within areas of need.

- If growth exceeds power supply, rolling blackouts and brownouts could be implemented in order to meet demand. Neither option is favorable.
- If PPL took no-action to meet growth demands, the ability to supply low cost, reliable power would be greatly inhibited, negatively affecting the public interest.

Under the No Action Alternative, and particularly in the time in which we live, benefits such as critical job creation from the construction and operation of the proposed plant, as well as economic and tax impacts would not be realized by the region surrounding the proposed power plant. This particular impact would be of great concern to the region's general constituency.

In addition to economic concerns, air quality and climate change could also be impacted by the No Action Alternative.

PPL Electric Utilities (PPLEU), an affiliate of the applicant, currently has a corporate climate change policy that includes: 1) reducing greenhouse gas emissions while maintaining a strong economy, 2) reducing dependency on foreign energy sources, and 3) providing reliable electricity supply and infrastructure. PPLEU will not meet these objectives under the No Action Alternative. Implementation of the No Action Alternative could result in the future need for other generating sources, including continued reliance on carbon intensive fuels, such as coal and natural gas.

Finally, the No Action Alternative does not address the need for additional baseload power generation within the eastern PJM subregion. Additionally, the need to diversify sources of energy, the national policy to reduce fossil fuel dependence, or the potential to reduce the average electricity cost for the consumer is not met by this alternative.

In conclusion, due to the numerous considerations mentioned above, the No Action Alternative is not a practicable alternative warranting further consideration and is therefore eliminated.

4. Energy Generation Alternatives

This section evaluates alternatives to a nuclear power plant that do not require new power generation as well as alternate methods of generating the designated amount of power.

4.1 Alternatives Not Requiring New Generation

The three alternatives evaluated that would not require new generation capacity include:

1) the implementation of energy conservation programs,

2) reactivating, or extending the life of existing power generating facilities, and

3) purchasing power from other utility generators.

Energy conservation programs provide technical assistance and financial incentives to encourage reduced energy consumption while promoting the utilization of more energy efficient systems. These programs represent a management technique called, "Demand Side Management" (DSM), because they affect the quantity and pattern of energy use. Each State within the primary market area is implementing energy plans and programming to conserve energy use while emphasizing cleaner energy production. PPLEU has implemented its own energy saving programs. The primary goals of these programs are to:

- help their customers save energy,
- promote energy efficiency, and
- reduce electricity use and cost.

DSM has been successful at reducing peak load usage, but it does not address the need for baseload power.

Another approach is to manage demand side response (DSR) during peak demand periods. DSR is used to manage customer consumption of electricity in response to supply conditions such as requesting customers to curtail usage. "In the summer of 2006, the demand response contributions of PJM totaled 2,050 MW, or approximately 1.4% of the peak load" (Federal Energy Regulatory Commission, 2007). Unlike a new power generation facility, DSR cannot be expected to provide steady capacity output over a set period. There currently is not a firmly established industry standard for incorporating demand response into system planning. Until there is, the 2008 RTEP (Regional Transmission Expansion Plan) concludes that DSR must be conservatively evaluated to ensure that reliability is not jeopardized.

It is impractical to increase energy savings through conservation programs by an additional 1,600 MWe to substitute for the needed baseload generation. Therefore, this option will not fulfill the project purpose, and is not a practicable alternative to a new baseload power generation facility.

Extending the life of existing baseload power generating facilities is also not a feasible alternative to replace the 1,600 MWe of proposed power generation. The decision to retire or extend the life of a facility rests with the facility owner, and not the PJM. A PPL affiliated company retired two coal-fired units at Martins Creek SES in 2007, totaling 280 MWe of power. None of the known retired facilities are able to supply the 1,600 MWe of baseload power needed. Facility owners are required to give only 90 days notice prior to the retirement of a facility. Facilities would also need to undergo costly upgrades to comply with current environmental regulations, thus creating an economic hurdle to extending facility life.

Purchasing power instead of generating power for commercial sale is not consistent with the purpose of the BBNPP project which is "to generate energy for commercial sale". In addition, there are several significant reasons for not pursuing this alternative. Purchasing power to meet the energy needs within the eastern portion of the PJM would require that adequate power is available for purchase through other power generators and that the infrastructure is present to transport the power to the area of need. The eastern portion of the PJM was chosen for nuclear power plant construction because it is the area with the highest projected growth rates. The eastern PJM's reliance on power generated in the western PJM has steadily increased over the past 10 years further congesting the transmission system (PJM, 2007). If new power sources were not constructed within the eastern PJM, additional high voltage transmission lines would be necessary to transport power from the west to the east. Transmission line impacts are expected to be moderate to large depending on whether portions of the line can be constructed adjacent to existing rights-of-way. Power facilities within the western PJM are primarily carbon intensive. Increased reliance on western generation facilities to replace the power generated from a proposed 1,600 MWe facility within the eastern PJM could increase environmental impacts from plant emissions.

For these reasons, the purchasing power alternative was eliminated as a reasonable option.

4.2 Alternatives Requiring New Generation Capacity

Twelve alternative energy sources were initially evaluated based on the following criteria to determine viable substitutes to nuclear generation.

1. The alternative technology is developed, proven and available within the geographic area under consideration.
2. The alternative energy source can produce baseload generation capacity equal to the proposed BBNPP.
3. The environmental impacts are the same or less than the proposed BBNPP.
4. The cost of the alternative energy source does not make it economically impractical.

Alternative energy sources considered include: wind, geothermal, hydropower, solar power (concentrating systems and PV cells), wood waste, municipal solid waste, energy crops, petroleum liquids, fuel cells, coal, natural gas, and integrated gasification combined cycle (IGCC).

Most of the alternative energy sources were not considered feasible due to 1) land use constraints (hydropower), 2) land characteristics (wind and geothermal), 3) new and uncompetitive technology for baseload power generation (solar, municipal solid waste, fuel cells), 4) cost and environmental impacts (wood waste firing, energy crops), or 5) a combination of reasons.

Coal and natural gas facilities met the above criteria and therefore were considered in more detail. Although wind and solar could not supply adequate power generation individually, these technologies coupled with fossil fuel generation could produce adequate baseload power. Thus, this combination of sources was also evaluated in greater detail.

Coal-fired plants require more land than natural gas and nuclear power plants to provide adequate coal storage and waste management, in addition to the power block. Therefore, greater land use impacts are expected with a coal-fired plant affecting flora, fauna, and wetlands and Waters of the United States (WOUS).

Waste management environmental impacts are also greater for coal plants than natural gas plants. Waste from coal plants requires constant management to address the fly ash and scrubber sludge. Natural Gas plants create almost no waste. Waste impacts from a nuclear power plant are considered small because small quantities are generated under regulatory control.

Coal-fired plants have the greatest negative impacts on air quality. In addition, emissions can also cause greater adverse human health effects than natural gas, or nuclear emissions. The carbon footprint of a natural gas plant is about half of the footprint of conventional coal. Gas is a cleaner burning fossil fuel, however, human health and environmental impacts from emissions would be less than coal, but greater than a nuclear power plant.

Nuclear, natural gas, and coal plants will cause similar affects to aquatic resources. Closed cooling water systems help reduce impacts to aquatic resources. However, impingement and entrainment, as well as the discharge of cooling water, will cause the loss of some aquatic biota for all three types of plants. Any impacts to groundwater would be temporary, and limited to the construction period.

When solar and wind renewable resources are not available, a combination alternative involving a fossil fuel is theoretically needed so that baseload power can be consistently generated. The fossil fuel chosen for this analysis was natural gas because it has fewer environmental impacts than coal. The natural gas facility needs to be capable of producing the entire 1,600 MWe power load if the wind and solar components are unavailable to do so due to climate conditions. Wind and solar generation has a greater impact on land use than natural gas because of the large amount of land needed to support a large generating facility. In order to produce 1,600 MWe using solar power, upwards of 60,000 acres would be required. Wind requires 0.25 acres per 2MWe turbine, however, land surrounding the turbines can typically be used for other purposes, such as agriculture.

Potential locations (with enough acreage capable of supporting wind and solar facilities) are lacking transmission infrastructure to connect to the grid. Therefore, new transmission lines and substations would be required, further exacerbating land use impacts. With the exception of land use requirements, natural gas power facilities tend to have greater environmental impacts, than either solar or wind. The more renewable

resources that are available to displace the use of natural gas power, the closer the operational environmental impacts would be to a nuclear facility. Therefore, the environmental impacts are expected to be the same or greater than a nuclear plant when a combination of fuels is used, and greater when the renewable resources are not available.

In conclusion, alternatives mentioned such as: 1) natural gas fired generation, 2) coal-fired generation, and 3) the combination of renewable wind and solar energy production with gas production were all determined to have greater impact on the environment. Therefore, these alternatives are not considered environmentally practicable in comparison to the construction and operation of a nuclear power plant. As a result, these alternatives were eliminated from further consideration.

5. Alternative Sites Evaluation for a Nuclear Facility

PPL's PA for a new nuclear power plant is the Bell Bend site located adjacent to the existing Susquehanna Steam Electric Station in Salem Township, Luzerne County, Pennsylvania. Although Bell Bend is the preferred location, both the National Environmental Policy Act of 1969, and Section 404(b)(1) guidelines from the Clean Water Act (CWA) require PPL to perform an alternative sites analysis to determine if the preferred site is the best location for a nuclear power plant. A combination of processes and analyses were used to evaluate the most suitable alternative locations for siting a nuclear power plant, and to evaluate the alternative sites comparatively to the Bell Bend location.

5.1 Site Screening and Alternative Site Selection

Starting with a large region of interest (ROI), a systematic process was utilized to identify alternatively-selected sites, narrowing the search through the application of exclusionary, avoidance, and suitability criteria. The process was derived from NUREG-1555, and the Electric Power Research Institute (EPRI) Siting Guide, considered an industry standard. This alternative site selection process was developed for nuclear plants, in general, and not specifically for the Bell Bend project. The process is a table top exercise that is objective and repeatable, applying readily available data. In order to maintain a level playing field, alternative sites were evaluated based on data that was available for all sites. This was the case, even though more existing site data was available for those

sites that happened to be owned by PPL. The Alternative Site Evaluation Report, Revision 2, by Unistar (May 2011) details the site selection process has been separately filed with participating resource agencies.

During the first steps, the ROI was established to limit the search for suitable alternative sites.

The Pennsylvania, New Jersey Maryland Interconnection, LLC (PJM) classic market area (which includes portions of Pennsylvania, Maryland, New Jersey, and the entire state of Delaware) was chosen based upon the regional need for power, and the proposed project purpose. The ROI covers approximately 31,296 square miles providing adequate environmental diversity. Bodies of water available as sources of cooling water within the ROI include the Susquehanna River, Juniata River, Lehigh River, Patuxent River, Delaware River, Chesapeake Bay, Barnegat Bay, and the Atlantic Ocean.

An initial list of 8,301 sites within the ROI was generated from the U.S. DOE, state brownfield site databases, and PPL-owned lands (Unistar, 2011).

Candidate areas within the ROI were selected using a set of exclusionary criteria based on regulatory considerations and system requirements. These criteria are consistent with the site selection process in the NRC guidance document, "Environmental Standard Review Plan" (ESRP) and the EPRI Siting Guide. As also required in the Section 404(b)(1) guideline process, the exclusionary criteria eliminated sites based upon the cost and logistical considerations (including safety) for constructing a nuclear power plant at each specific location.

The exclusionary criteria process removed:

- dedicated land (national and state parks, tribal land),
- densely populated regions (greater than 300 persons per square mile),
- areas located greater than 30 miles from 345 kV or higher voltage transmission lines, and
- areas greater than 15 miles from a cooling water source capable of providing at least 50 million gallons per day.

While the ROI involved locations in a four state area and several river watersheds, the necessary exclusionary and de-selection criteria tended to screen out locations in the Chesapeake Bay and Delaware Bay areas (as well as potential sites within the Delaware River watershed). Proximity of population density centers, and the presence of Federal and State lands in these locations directed the location of the selection process to the middle portion of the Susquehanna River watershed. From this process, 356 candidate areas were derived (Unistar, 2011).

Fourteen potential sites remained after eliminating all locations with less than 420 acres, the minimum acreage needed to construct the EPR, as well as other de-selection criteria consistent with the EPRI siting guide, and ESRP. After further review, five (5) additional sites were determined to be not licensable based on practicability concerns such as: 1) additional population density criteria, 2) proximity to other commercial facilities, or 3) not viable due to water use constraints on the site (Unistar, 2011).

The remaining nine (9) candidate sites included:

- Bainbridge (MD),
- Conowingo (MD),
- Humboldt (PA),
- Martins Creek (NJ),
- Montour (PA),
- Peach Bottom (PA),
- Seedco (PA,)
- Wallenpaupack (PA), and
- Indian River (DE).

These nine sites were scored numerically based on a set of sixteen non-commercial criteria broken into additional sub-criteria. Criteria were used to determine sites with fewer significant impacts to the environment and the public interest. Each criterion was given a weighting factor based on relative importance to selecting a power plant site.

The sixteen criteria included land use, hydrology, terrestrial resources, aquatic biological resources, socioeconomics, environmental justice, historical and cultural resources, air quality, human health, postulated accidents, transport of radioactive material, transmission corridors, population, facility costs, geology, and wetlands.

The evaluation criteria used are functionally equivalent to the public interest items described in "33 CFR §320.4 General Policies for Evaluating Permit Applications" which include conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, recreation, water supply, water quality, energy needs, safety, food and fiber production and the general welfare of the people.

For detailed information about the scoring criteria and justification, see the Alternative Site Evaluation Report, Revision 2 (Unistar, 2011). Figure 5-1, extracted from the Alternative Sites Evaluation Report, shows the location of the candidate sites and is provided in Appendix A.

In 2009, a Delphi panel weighted each criterion and scored each site using "readily available reconnaissance level information." The amount of available information about each candidate site primarily depended on site ownership, and PPL access to the location. Therefore, only readily available data was used to acquire a level of detail that was achievable for all sites. This helped maintain consistent scoring process between sites. The information sources used included: 1) publicly available data, 2) information available from UniStar and Bell Bend/PPL files and personnel, and 3) GoogleEarth images. Site visits were conducted, as needed, for clarification.

At the conclusion of the scoring process, Montour, Humboldt, and Seedco scored the highest and were chosen as the three selected alternative sites.

Participating review agencies provided feedback to PPL regarding the site selection process in early 2010 resulting in further analysis of the nine candidate sites, and an additional site, the Beiler Site, which agency personnel believed had been inappropriately excluded. Additional concerns regarding the process included:

- participating review agency personnel were not part of the Delphi Panel.

- none of the chosen alternative sites were outside of the Susquehanna watershed,
- the low-scoring nature of the Martins Creek site,
- the low-weighting of water criteria, and
- re-scoring BBNPP based on additional known information.

Subsequently, the Delphi Panel reassembled in fall 2010. Furthermore, as requested, the Beiler Site was revisited. This resulted in a determination that the straight-line distance from the site to an adequate water source was greater than 15 miles, therefore exclusion of the site was consistent with the site-selection process. In addition, the Beiler Site scored sixth using the first-round Delphi panel methodology, and thus would have been originally dropped from further evaluation. The weighting and/or scoring of four (4) criteria (topography, water volume, schools, and transmission lines) was also examined and all nine sites were rescored based on the following changes:

- new topography scoring (criteria 1e in the ASER) was based on natural breaks on the sites,
- water volume scoring (criteria 2c in the ASER) was changed to a percent of the 7Q10 flow,
- school scoring (criteria 5e in the ASER) was changed to only include schools within a 25 mile radius, and
- transmission line distances (criteria 12 in the ASER) to adequate existing transmission lines were modified for consistency.

As a result of implementing the above mentioned criteria changes, the same three sites (Montour, Humboldt, and Seedco) still scored the highest. These changes are part of the ASER, Revision 2.

In its next step, PPL performed sensitivity analysis to determine whether changing various scoring and site analysis factors would produce a different outcome with respect to the alternative sites.

The sensitivity analysis consisted of four case studies. These studies are presented below.

Case 1: Case 1 involved a number of scoring changes to existing criteria including the result of BBNPP scoring adjustments based on detailed, site-specific information gained through studies performed for JPA permitting requirements. Case 1 included six scoring scenarios.

- **1a**: Score BBNPP based on the presence of EV wetlands
- **1b**: Score BBNPP based on the presence of threatened and endangered species habitat
- **1c**: Score BBNPP based on the presence of historical resources on the BBNPP site.
- **1d**: Score Montour and Martin's Creek sites based on a more thorough evaluation of site topography.
- **1e**: Revise the scoring of the transportation access on all sites based the proximity of either rail or barge access and not both.
- **1f**: The cumulative effect of scenarios 1a – 1e
- **1g**: The cumulative effect of scenarios 1d-1e

This study determined that the scoring changes did not change the standing of the top three sites (Montour, Seedco, Humboldt). However, scoring BBNPP based on additional detail will inevitably bias results against the preferred site. Based on scenarios 1a - 1c and 1f, BBNPP dropped somewhat in cumulative score and ranked 4th among the sites evaluated. It was further surmised that a more detailed level of evaluation of any site would almost certainly reveal issues that would lower their scoring.

For example, site visits and other knowledge of some of the alternative selected sites provide evidence that suggest that Humboldt may have "exceptional value" (EV) wetlands, the Montour site (and potentially others) may have Indiana bat habitat, and many sites could have cultural resource conflicts which generally cannot be identified until "shovel testing" is initiated. Alternative selected site scoring was meant to provide an initial determination of environmental preference based on a level playing field.

Based on these scenarios, the top three alternative sites were still Montour, Seedco, and Humboldt.

Case 2: Case 2 evaluated the result of weighting all 40 scoring sub-criteria equally. Case 2 includes three scenarios.

2a: Weight all criteria equally
2b: Cumulative effect of scenarios 2a and 1f
2c: Cumulative effect of scenarios 2a and 1g

Case 2 resulted in the same three alternative selected sites, and the conclusion that no site is environmentally preferred to Bell Bend.

Case 3: Case 3 evaluated the effects of adding additional public interest (from 33 CFR §320.4) and environmental criteria including forest cover, prime farmland, consistency with comprehensive plans, applicant owned lands, distance and route to water source, water availability and impact to other users, special designations, aesthetics, and recreation. Case 3 also evaluated three scenarios.

3a: Scoring effects of all the additional criteria
3b: Cumulative effect of scenarios 3a and 1f
3c: Cumulative effect of scenarios 3a and 1g

Case 3 resulted in the same conclusions as Case 2, with the exception that the Martins Creek site improved in scoring, ranking fourth among the alternative selected sites.

Case 4: In Case 4 a heavier weight was assigned to water volume and water availability criteria and trend lines were developed to see how heavier weights affected each sites score.

4a: Base weighting of criteria with water volume weighted as 9% vs. 3%
4b: Water criteria weighted 2x
4c: Water criteria weighted 4x
4d: Water criteria weighted 6x

Humboldt, Seedco, and Montour ranked as the top three sites and had a positive trend with greater weights on water volume and availability.

Martins Creek's score improved, ranking 4th. None of the sites were environmentally preferred to the BBNPP site.

In all but two of the sensitivity scenarios (excluding scenarios including 1a – 1c and 1f, where sites were evaluated with different degrees of information) the Bell Bend site ranked second, behind Humboldt. In the remaining scenarios Bell Bend ranked third behind Humboldt and Montour. The difference between the alternative sites scoring is slight, less than one standard deviation, and was therefore considered to be insignificant.

Based upon this analysis, the alternative selected sites were not considered environmentally preferable to the BBNPP site. Scoring criteria, rational, and justification are provided in the appendices of the ASER Report, Revision 2 (Unistar, 2011).

5.2 Evaluation of the Alternative Selected Sites

5.2.1 Summary of 404(b)(1) guidelines

Section 5.2 will describe and evaluate the top four alternative sites identified in Section 5.1. According to Section 404(b)(1) guidelines, "no discharge of dredged, or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem so long as the preferred alternative does not have any significant environmental consequences. The intent of this analysis is to satisfy these guidelines as stated in 40 CFR Subpart 230, clearly demonstrating that the Bell Bend Site is the LEDPA.

Impacts resulting from the development of the alternative selected sites are evaluated within the context of the following subparts from 40 CFR §230:

- Subpart C: Potential impacts on physical and chemical characteristics of the aquatic ecosystem
- Subpart D: Potential impacts on biological characteristics of the aquatic ecosystem
- Subpart E: Potential Impacts on Special Aquatic Sites
- Subpart F: Potential Impacts on Human Use Characteristics

Alternative selected sites were evaluated at a level of detail achievable for all sites. This helped maintain consistency between sites. The information sources used included publicly available data, information available from UniStar and PPL, Bell Bend files and personnel, and GoogleEarth images. Site visits were conducted, as needed, for clarification. Figure 5-1, extracted from the Alternative Sites Evaluation Report, shows the location of the alternative sites and is provided in appendix A.

The following sections include discussion supporting the ACOE requirement to make factual determinations as part of its Section 404(b)(1) guidelines review process.

5.2.2 Bell Bend Preferred Site (i.e. Preferred Alternative)

Site Suitability and Environmental Impacts

The Bell Bend site is a greenfield site, owned by the Applicant, located directly adjacent to an existing nuclear facility, the Susquehanna Steam Electric Station (SSES), in Salem Township, Luzerne County, Pennsylvania, approximately 5 miles northeast of Berwick, Pennsylvania. US Highway 11 is located south and east of the site. Land use in the area surrounding the BBNPP site is predominantly rural. The majority of the 420 acre site is wooded and undeveloped. At the time of this analysis a majority of the Bell Bend site was located in an Agricultural zoning district, with a much smaller portion zoned as Conservation District. Since this analysis was performed the entire site was rezoned in February 2011 as a Heavy Industrial District consistent with the areas to the north and east containing the existing nuclear power plant which is also zoned Heavy Industrial.

The anticipated area of construction is currently undeveloped and would require the construction of new roads to access the site. There is an existing rail line along the eastern boundary of SSES however upgrades would be required to access the BBNPP site. The BBNPP site is generally level with hills present in the northern portions of the site. The topography indicates a relief of 130 ft across the site, therefore, a balanced cut and fill design would be expected.

Walker Run also flows along the western boundary of the site. Walker Run is designated a cold water fishery (CWF), and is not impaired. It is anticipated that 28.8 acres of wetlands and 2,519 feet of streams (i.e. WOUS) could potentially be impacted on-site, based on a level of detail equivalent to what is available for the other Alternative

Selected Sites (see Table 1). It should be noted that the actual impacts proposed are significantly less due to more detailed site investigations, and the employment of extensive avoidance and minimization measures.

Twelve State and Federal threatened or endangered species could occur at the Bell Bend site. The Indiana Bat is the only federally listed species. Two state protected mussel species, the Green Floater and Yellow Lampmussel could potentially inhabit the NBSR within the vicinity of the proposed Bell Bend intake structure. For a detailed list of species and habitats at Bell Bend see Table 2.4.1 and Section 2.4, Ecology in the COLA ER Chapter 2.4.

Aesthetically, the proposed plumes from the BBNPP cooling towers would not introduce a new element to the visual landscape, given the existing presence of the Susquehanna Steam Electric Station (SSES). The Susquehanna Riverlands property, a recreation and educational facility partially located within the BBNPP project boundary (east of Route 11), will be minimally impacted by construction of the proposed intake structure and associated infrastructure. It is the only recreational area open to the public within the Bell Bend site. Access to the NBSR in the vicinity of the SSES intake structure is currently restricted; therefore, the BBNPP intake structure will not cause any additional impediments to recreational use of the NBSR such as boating or fishing.

Off-Site Suitability and Environmental Impacts

The BBNPP site is located less than one mile from the North Branch of the Susquehanna River (NBSR), the primary source of cooling water for the proposed nuclear power plant. The NBSR is a warm water fishery with no special quality designation. The reach adjacent to the site is impaired for fish consumption caused by PCBs and Mercury. The lowest 7-day average flow (7Q10) for the period of record (July 1999 to July 2009) for the river at the nearest USGS gage is approximately 505 million gallons per day (mgd). The maximum water withdrawal from the NBSR during normal operation is expected to be approximately 42 mgd. Streamflow in the NBSR at low flow is approximately 12 times the maximum project water withdrawal. Conceptual routes for intake and blowdown pipelines would extend for about 1.2 miles from the eastern border of the BBNPP to the NBSR. Use of the NBSR must be approved by the Susquehanna River Basin Commission (SRBC), and would be subject to SRBC specified mitigation.

The necessary new transmission line corridors would be limited to the BBNPP site. There are two existing Susquehanna 500 kV transmission lines available for possible interconnection. In addition, BBNPP would have access to the new 500 kV Susquehanna-Roseland project authorized by the PJM to improve regional reliability.

Due to the proximity of the site to the source water, wetland or stream impacts along the project water line route would be minimal.

In addition, no impacts from new transmission line corridors are expected because Bell Bend is in close proximity to existing and proposed infrastructure.

5.2.3 Martins Creek Alternative Selected Site

Site Suitability and Environmental Impacts

Martins Creek is a greenfield site owned by an affiliate of the Applicant that is located in a rural area on the Delaware River, approximately 2.5 mi. south of the town of Belvidere, Warren County, New Jersey. The site is located directly east, approximately 0.5 mi. across the Delaware River from the existing PPL-owned Martins Creek Power Plant located in Bangor, PA. The site consists of approximately 420 acres of agricultural land with some undeveloped forest land. The site is part of the Industrial Zone as defined by the 2005 Warren County Strategic Growth Plan. Lands to the north are a mix of industrial lands, agricultural fields, and residential subdivisions. Land to the east is dominated by undeveloped forest land, while land to the south is mostly agricultural. To the west, the property is bordered by South Foul Rift Road, and the Delaware River. There is approximately 160 ft of relief across the site; with the majority of the relief concentrated along the Delaware River; therefore a balanced cut and fill design would be expected.

The Buckhorn Creek flows through the site for approximately 3,254 lf. There are no NWI wetlands present within the site boundary. The site is located less than 0.5 miles from the nearest active rail line; therefore rail upgrades would cause little to no wetland or stream impacts. The site does not currently contain any development such as paved roads or buildings. The site does contain an existing 230 kV transmission line that travels north-south across the property which could be upgraded to 500 kV. It is

assumed that all 3,254 feet of stream (i.e. WOUS) on-site would be impacted by proposed site development (see Table 1).

There are 34 state and federal threatened or endangered species that could occur at the Martin's Creek Site. Of these species, 23 prefer wetland or aquatic habitats. For a detailed list of species and preferred habitats see Table 9.3-20 in the COLA ER Rev3.

It is likely that karst features may be present within 0.5 mi of the Martins Creek site. There are 658 sinkholes in Northhampton County directly across the river from this site. These karst features are not conducive to siting a nuclear power plant.

The cooling tower plume from the proposed nuclear power facility would likely be visible at a considerable distance; however, it would represent a limited alteration of the aesthetics in the area due to the existing Martins Creek oil/gas plant cooling towers located across the Delaware River from the proposed site.

The Martins Creek site is private property, and no recreational activities are permitted. Construction of a nuclear facility on this site could limit recreational activities such as boating and fishing on the Delaware River in the immediate vicinity of the intake facilities.

Off-Site Site Suitability and Environmental Impacts

The main source of water for a nuclear power plant at this site would be the main stem of the Delaware River. The Delaware River near the site is currently on the list of impairments for metals, as well as the pesticides dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE). The proposed water usage is estimated to be 42 mgd. The mean flow for the Delaware River throughout this reach is 2,440 mgd due to substantial upstream storage regulation during low flow periods. The 7Q10 for the river at the nearest USGS gage is approximately 704 mgd. Streamflow in the Delaware River at low flow is approximately 17 times the expected project water withdrawal.

Since 2000, this section of the Delaware River has had a special protection designation by the Federal government as a Wild and Scenic River. This designation could limit the Applicant's ability to utilize the River for consumptive water use and to discharge waste.

In addition, drought operations in the basin, that at times limits water diversions from the river by the state of New Jersey and New York City (NYC) could restrict the applicant's use of the River. Flows in the Delaware River are regulated by reservoir releases in the upper Delaware watershed. Use of the river would be subject to the approval of the Delaware River Basin Commission (DRBC) and would be subject to DRBC required mitigation.

There are limited areas of wetlands along the Delaware River within the Martins Creek site. Less than 0.5 miles of pipeline would be needed to convey water from the Delaware River to the proposed site; therefore no wetland or stream impacts are expected from pipeline construction. The water line route could impact 41 state and federal threatened or endangered species. Species potentially impacted by the intake at the Delaware River include the Dwarf Wedgemussel, Triangle Floater, Brook Floater, Eastern Pondmussel, and Queen Snake. For a detailed list of species and preferred habitats see Table 9.3-20 and 9.3-22 in the COLA ER rev3.

Transmission system upgrades would be needed to connect the Martins Creek site to the nearest 500 kV line. The nearest 500 kV transmission line is 16.7 miles away. Most transmission line corridors would pass through land that is primarily agricultural and forested. It is anticipated that 11.1 acres of wetlands and 2,431 feet of stream (i.e. WOUS) could be impacted in order to connect to the nearest existing 500 kV line (see Table 1). Wildlife habitat will also be impacted from transmission corridor creation. The Transmission line route, which includes Warren and Morris Counties, could impact 164 federal and state threatened and endangered species. For detailed information regarding the species and preferred habitat types see Tables 9.3-20 and 9.3-21 in the COLA ER rev3.

5.2.4 Montour Alternative Selected Site

Site Suitability and Environmental Impacts

The Montour site is a greenfield site, owned by an affiliate of the Applicant, in Anthony Township, Montour County, PA. The proposed plant would be located just north of the affiliate's coal-fired facility. The site is primarily agricultural or wooded and is located in a residential – agricultural zoning district. Land use in the area surrounding the site is predominantly rural. A majority of the area surrounding the site is wooded and

undeveloped, or used for agricultural purposes. The topography of the site is generally level in the southern portion and rises to the north. Topography indicates a relief across the site of approximately 132 ft, therefore, a balanced cut and fill design would be expected.

There are no mapped NWI wetlands within the Montour Site. The East Branch of the Chillisquaque Creek runs through the property for approximately 3,891 lf. The stream's use by aquatic organisms is impaired due to agricultural siltation. The nearest rail infrastructure is 1.4 miles from the site at the existing Montour Plant. Extensions and upgrades to rail infrastructure would be necessary. It is assumed that all 3,891 lf of the East Branch Chillisquaque Creek (i.e. WOUS) could be impacted by project construction (see Table 1).

Additional hydrological impacts on-site will result from the construction of an ultimate heat sink (UHS). The UHS is a water impoundment used to assure plant reliability and safety since the Montour site is remote from its closest suitable water supply, the West Branch of the Susquehanna River.

The Hooker's Orchid (*Platanthera hookeri*) is the only State and Federal threatened or endangered species that could occur within the Montour site (see Table 9.3-16 in the COLA ER rev3).

The cooling tower plume from the proposed nuclear power facility would likely be visible at a considerable distance; however, it would represent a limited alteration of the aesthetics in the area due to the existing Montour plant cooling towers located in close proximity. The Montour site is private property, and no recreational activities are permitted. Construction of a nuclear facility on this site could limit recreational activities such as boating and fishing on the West Branch of the Susquehanna River in the immediate vicinity of the intake facilities.

Off-Site Suitability and Environmental Impacts

The protected water use designation for the main stem of the West Branch Susquehanna River (WBSR) is warm water fishery with no special quality designation. The 7Q10 for the period of record (July 1999 to July 2009) for the nearest USGS gage is approximately 489 mgd. This WBSR streamflow is approximately 12 times the projected

maximum water withdrawal of 42 mgd. Use of the river would be subject to the approval of the SRBC and would be subject to SRBC required mitigation.

A conceptual water intake and blowdown route would extend west from the western border of the Montour site for approximately 12.3 mi paralleling a railroad line for the majority of the distance to the West Branch Susquehanna River. This pipeline could potentially impact approximately 1.3 ac of wetlands and 3,417 lf of stream (i.e. WOUS) (see Table 1). There are 13 State and Federal threatened and endangered species that could occur along the proposed water line route. For a detailed list of species and preferred habitat see Tables 9.3-16 and 9.3-18 in the COLA ER rev3. The Yellow Lampmussel is a state protected species that could be impacted from construction of the intake structure on the West Branch of the Susquehanna River.

It is anticipated that 0.7 mi of new transmission line would have to be constructed, and 15.5 mi of existing transmission corridor would need to be expanded to connect to the necessary 500-kV transmission system. New/expanded transmission corridor could impact approximately 4.1 ac of wetland and 2,321 lf of stream (i.e. WOUS) (see Table 1). There are 13 State and Federal threatened and endangered species that could occur along the proposed transmission line route. For a detailed list of species and preferred habitat see Tables 9.3-16 and 9.3-17 in the COLA ER rev3.

5.2.5 Humboldt Alternative Selected Site

Site Suitability and Environmental Impacts

The Humboldt Industrial Park is a brownfield site that is located west of the City of Hazelton in Luzerne County, Pennsylvania. This site is not owned by the Applicant. State Route 924 abuts a portion of the southern perimeter of the site. Land use within the site includes existing industrial park with active businesses. Land uses in the area surrounding the Humboldt site include undeveloped land to the north, the Humboldt Reservoir to the northeast, industrial park development to the south and east, and residential and private recreational development (Eagle Rock Resort and Country Club) to the west. The topography of the Humboldt Site is generally level across the eastern portion, but rises in elevation throughout the north and northwestern portions. The topography indicates a relief across the Humboldt site of approximately 230 ft; therefore

the cut and fill requirements for construction would likely be greater than BBNPP, Martins Creek, or the Montour sites.

There is existing road and rail access to the site. Therefore no wetland impacts are anticipated by construction of new roadways, or a rail spur.

Stony Creek bisects the site. Stony Creek is impaired for aquatic life due to metals and pH from abandoned mine drainage. There are five freshwater ponds on-site that total 3.8 ac. It is assumed that all 3.8 ac of the ponds (i.e. open water habitat), and 5,057 lf of stream (i.e. WOUS) could potentially be impacted by site development (see Table 1). The site is located approximately 10 mi from the North Branch of the Susquehanna River, the nearest sufficiently large source of water. The Protected Water Use Designation is warm water fishery with no special quality designation (The Pennsylvania Code, 2007).

Because the Humboldt site is remote from its closest suitable water supply, other hydrological impacts could be associated with the construction of a significant impoundment on the site to assure plant reliability, and for safety as an UHS. An impoundment with a surface area of approximately 6.4 acres and a depth of 25 feet would be required; however, the actual dimensions would be influenced by local geology and hydrology.

There are 15 State and Federal threatened and endangered species that could occur on the Humboldt site, including the Indiana Bat. Of these species 3 prefer wetland and aquatic habitats. For a detailed list of species and habitat types see Table 9.3-19 in the COLA ER rev3.

Aesthetically, the cooling towers and plume at the Humboldt site would be highly visible, and would not blend with the existing view shed. The Humboldt site is private property, and no recreational activities are permitted. Construction of a nuclear facility on this site could limit recreational activities such as boating and fishing on the Susquehanna River in the immediate vicinity of the intake facilities.

Off-Site Suitability and Environmental Impacts

The proposed maximum water withdrawal from the North Branch Susquehanna River is estimated to be 42 mgd. The 7Q10 for the period of record (July 1999 to July 2009 for the river at the nearest USGS gage is approximately 505 mgd. Therefore streamflow in the North Branch Susquehanna River at low flow would be approximately 12 times maximum water withdrawal at the Humboldt site. Use of the river as source water would be subject to the approval of the SRBC and would be subject to SRBC required mitigation.

To obtain water from the North Branch Susquehanna River, new water intake and discharge pipelines would need to be constructed. A conceptual 120-ft ROW for the water pipelines would extend northwest from the site 12.5 miles. The route would be comprised of new ROW until an existing transmission line would be intersected near Black Creek. The route would then follow existing transmission line corridors and local roads until it crossed I-80, from which point new ROW would need to be established to the Susquehanna River. The applicant would need to acquire the riverfront land in order to construct the intake structure and ancillary structures as well as additional land for the construction of the pipelines and ROW. It is estimated that 1.1 ac of wetland and 596 lf of stream (i.e. WOUS) could be impacted from water line routing (see Table 1).

There are 31 State and Federal threatened and endangered species that could occur along the water line route including the federally protected Indiana Bat. For a detailed list of species and preferred habitat types see Table 9.3-19 in the COLA ER rev3. The Yellow Lampmussel and Green Floater are two State protected mussel species that could be impacted by the intake structure at the NBSR.

To reach the nearest existing substation new transmission line corridors would need to be constructed, and existing corridors would need to be expanded. A conceptual route for the transmission line would extend east from the eastern boundary of the site for approximately 0.7 mi (new ROW) where 13.6 mi of existing 230 kV transmission ROW would be expanded, then travel north to reach the existing substation. It is estimated that 7.2 ac of wetland and 2,210 lf of stream (i.e. WOUS) would potentially be impacted by new and expanded corridors (see Table 1). There are 34 State and Federal threatened and endangered species that could occur along the transmission line route

including the federally protected Indiana Bat. For a detailed list of species and preferred habitat types see Table 9.3-19 in the COLA ER rev3.

5.2.6 Seedco Alternative Selected Site

Site Suitability and Environmental Impacts

The Seedco Industrial Park (Seedco Site) is a brownfield site that is located east/southeast of the community of Ranshaw and the City of Shamokin in Coal Township, Northumberland County, Pennsylvania. The site is not owned by the Applicant. The majority of the land on-site is forested with some of the southern and eastern areas containing abandoned mine lands formerly used as strip mines. The site is zoned as manufacturing. State Highway 61 is located less than one mi to the north of the site. Surrounding land uses include commercial development to the north, residential development to the northwest, and undeveloped lands to the east, south, and west. The site is located on a hill overlooking PA SR 901, with Shamokin Creek to the south. The Seedco site topography indicates a relief across the site of approximately 300 ft. therefore, the cut and fill requirements for construction would be substantial. The anticipated area of construction is currently undeveloped and would require the construction of new roads to access the site. There is an existing rail line along the western edge of the site. Extensions and/or upgrades would be required to access the site.

The Shamokin Creek runs along the southern boundary of the site. This creek is impaired for aquatic life due to metals from abandoned mine drainage. There are 3,790 lf of stream and 0.7 ac of wetland on-site. It is assumed that all waters on-site will be impacted by site development (see Table 1). Seedco lies approximately 15 miles southeast from the main branch of the Susquehanna River, the nearest sufficiently large source of water. This segment of the river has a protected Use Designation of warm water fishery with no special quality designation (The Pennsylvania Code, 2007).

Because the Seedco site is remote from its closest suitable water supply, the Susquehanna River, other hydrological impacts could be associated with the construction of a significant impoundment on the site to assure plant reliability, and for safety as an UHS. An impoundment with a surface area of approximately 6.4 acres and

a depth of 25 feet would be required; however, the actual dimensions would be influenced by local geology and hydrology.

There is one species onsite with the suggested status of PA threatened, Smartweed Dodder (*Cuscuta polygonorum*). This species prefers wetland habitats (See Table 9.3-18 in the COLA ER rev3).

Aesthetically, the cooling towers and plume the Seedco site would be highly visible and would not blend with the existing view shed. The Seedco site is private property and no recreational activities are permitted. Construction of a nuclear facility on this site could limit recreational activities such as boating and fishing on the Susquehanna River in the immediate vicinity of the intake facilities.

Off-Site Suitability and Environmental Impacts

The maximum estimated water withdrawal from the Susquehanna River of the proposed unit is estimated to be 42 mgd. The lowest 7Q10 for the period of record (July 1999 to July 2009) is approximately 1,389 mgd. Therefore streamflow in the Susquehanna River at low flow would be approximately 33 times the maximum water withdrawal at the Seedco site. Use of the River as source water would be subject to the approval of the SRBC and would be subject to SRBC required mitigation.

A conceptual route for the water pipelines would extend 14.3 mi north from the site. The first section of the pipeline route would be new ROW extending northeast to intersect with SR-0054 northwest of Mount Carmel. From there the route would follow SR-0054 and local roads north to the Susquehanna River between Danville and Catawissa. It would be necessary to acquire riverfront land sufficient for the intake and ancillary structures, as well as additional land for the construction of a pipeline. The pipeline corridor could potentially impact an estimated 0 ac of wetlands and 430.1 lf of stream (i.e. WOUS) (see Table 1). There are 18 State and Federal threatened or endangered species that could be affected by the proposed water transmission line. For a detailed list of species and preferred habitats see Tables 9.3-16 and 9.3-18 in the COLA ER rev3.

A conceptual transmission line route includes the construction of new ROW east/northeast from the eastern boundary of the Seedco site for approximately 9.4 miles.

This is where 14.8 mi of existing 230 kV ROW would potentially be expanded, then travel north/northwest to reach the closest potential substation location. The corridor would pass through land that is primarily agricultural and forest land. It is estimated that 4.5 ac of wetland and 2,040 lf of stream (i.e. WOUS) could be impacted by new and expanding corridors (see Table 1). There are 19 State and Federal threatened or endangered species that could be affected by the proposed water transmission line. For a detailed list of species and preferred habitats see Tables 9.3-17 and 9.3-18 in the COLA ER rev3. The proposed intake structure on the NBSR could impact two State protected mussel species, the Green Floater and Yellow Lampmussel.

5.2.7 Comparison of Alternative Selected Sites

To determine positive and negative differences between the alternative selected sites, reasonable characterizations of each site were performed relating to the project's purpose and need. The following evaluation factors, including the practicability of using the site for a nuclear power plant were noted: 1) site characteristics influencing construction, 2) additional infrastructure needs, 3) physical, chemical, and biological impacts to aquatic ecosystems, 4) Impacts to special aquatic sites, 5) impacts to terrestrial and aquatic protected species, and 6) potential impacts on human use characteristics.

In order to more accurately characterize impacts from each site, both on-site impacts and off-site impacts were examined. It should be noted that, although more detailed information is available for the Bell Bend site, the following comparisons are based solely on the level of detail available for all sites. Therefore, some of the reported impact quantities for the Bell Bend Site actually exceed what is proposed due to substantial on-site avoidance and minimization efforts.

A summary of site characteristics is provided in Table 2. Characteristics noted for the most favorable site(s) in each category are in bold font in the table.

Several impacts resulting from plant construction and operation will be similar regardless of plant location, and are not included in Table 2. Most impacts to human use characteristics are similar. Intake structures at each alternative selected site will create

recreational limitations within their immediate vicinity on each river. At Bell Bend, there are existing recreational access limitations resulting from the SSES intake structure. Furthermore, each site will likely have impacts to historical resources. Specific details regarding these historical resource impacts require detailed site evaluations beyond the scope of this assessment. None the sites will impact existing state or federal land.

Potential intake structure construction-related impacts to physical and chemical characteristics to the aquatic ecosystems will also be similar regardless of the site location (40 CFR Subpart C). Although nuclear power plant structures would occupy only a portion of the 420 acres, the construction process at each alternative site could potentially result in impacts on the entire area, such as vegetation removal, grading, and other earth disturbing activities. Aquatic impacts include loss of wetlands and temporary loss of habitat, and short-term degradation of water quality in isolated areas due to in-water and shoreline construction of the intake structure. Blowdown water will contain similar concentrations of pollutants (regardless of plant location) which will affect physical and chemical characteristics downstream of the discharge point. Changes to the aquatic habitat immediately adjacent to the blowdown discharge related to changes to water chemistry and thermal profile are expected to be similar between alternative locations, although the same discharge rate in a river with a higher flow rate would theoretically result in a lesser impact to the aquatic systems. Right-of-way widths are consistent between alternative selected sites. Water line widths are assumed to be 120 ft wide and will be reduced to 80 ft where the corridor crosses wetlands. Transmission corridors have been assumed to be 200 ft wide; however, narrower corridors are likely feasible in sensitive areas at all sites to assist in impact avoidance and minimization. Corridors for new access roads or railroad are assumed to be 120 ft wide.

Relief across all sites ranges from 130 ft at Bell Bend to 300 ft at Seedco. Forested cover ranges from 3% at Martin's Creek to 85% at Seedco and Humboldt. Based on land cover and an evaluation of threatened and endangered species, vegetation clearing and habitat impacts from tree removal are expected to be least on-site at Martins Creek, and the most at Seedco and Humboldt. Both Seedco and Humboldt are Brownfield sites, a positive characteristic for future site development. Humboldt also has developed roads, and an existing rail line on-site. A new nuclear facility at Humboldt, Seedco, or Montour would require the development of significant lengths of water and transmission corridors. Moreover, Martins Creek would also require only the expansion of 13.9 miles

of transmission corridor due to the proximity to its water source. Bell Bend would likely have minimal off-site impacts.

Based on site suitability criteria evaluated for the alternatives analysis Bell Bend, followed by Martins Creek and Humboldt, ranks as the most favorable sites (see Table 2).

The potential for State and Federal threatened and endangered species have been identified on-site at all alternative selected sites. The federally-listed endangered Indiana bat could utilize both the Bell Bend and Humbolt sites as well as be impacted by off-site utility corridors at Humboldt and Martins Creek. No impacts to Federal or State threatened or endangered aquatic species are predicted on-site at Montour. State and Federal terrestrial threatened and endangered species would not be impacted on-site at Seedco. Off-site impacts to State and Federal threatened and endangered species would be greatest at Martins Creek and least at Bell Bend. The intake structures for each alternative site in Pennsylvania may impact State protected mussel species including the Yellow Lampmussel and Green Floater. The Martins Creek intake structure could impact the federally endangered Dwarf Wedgemussel in addition to other State threatened and endangered species. See Table 2 for a numeric comparison of State and Federal threatened and endangered species both on- and off-site.

Water use would cause aquatic impacts at each alternative selected site, and the preferred site. Severity of impacts may be somewhat affected by the consumptive use at each plant in relationship to low flow. 7Q10 low flow at the expected point of withdrawal exceeds proposed water use by twelve times at Montour, Bell Bend and Humboldt, and by thirty-three times at Seedco. The only alternative selected site outside of the Susquehanna Watershed is Martins Creek, located within 0.5 mi of the Delaware River. The low flow (7Q10) at this site exceeds the estimated consumptive water use by seventeen times. This reach of the Delaware River is federally designated "wild and scenic" and has potential drought use restrictions (due to public water use of the Delaware River) that are not conducive to siting a nuclear power plant. Flows in the Delaware River are regulated by reservoir releases in the upper Delaware watershed. Based on the flow of the primary water source, and estimated consumptive use, Seedco will have the least affect on flow quantity, water quality, and aquatic biology of the water source. Seedco's intake would be located on the main stem of the Susquehanna River,

where the 7Q10 low flow would exceed consumptive use by approximately thirty-three (33) times. All sites would be subject to separate regulatory approval by the applicable river basin commission (SRBC or DRBC).

Stream (i.e. WOUS) and wetlands at each site were based on mapped NWI data, mapped perennial and intermittent waterways, and obvious drainage ways observed either through desktop surveys or site visits. The initial amount of wetlands and streams identified at the Bell Bend site was 28.8 ac and 2,519 lf, respectively. According to this evaluation Bell Bend has a greater quantity of wetlands, and a smaller amount of stream footage than any of the alternative selected sites. This could indicate the greatest potential for wetland impacts, and the least potential for on-site impacts to waters of the United States (WOUS). Bell Bend, however, is the closest in proximity to both its primary water source and nearest transmission substation, and based on this evaluation, no off-site wetland or stream impacts would result from these corridors. Humboldt, Montour, and Seedco are between 12.3 and 14.3 miles from their water source, and 14.3 to 24.2miles from the nearest 500 KV interconnection point. Martins Creek, while in close proximity to the Delaware River, is 16.7 miles from the nearest suitable transmission substation. Martins Creek and Montour are expected to have the least potential impacts to special aquatic sites on-site. Bell Bend is expected to have the least amount of off-site special aquatic site impacts (See Table 2).

A wetland delineation of Bell Bend later resulted in the identification of 159 ac of wetlands and 24,014 lf of stream (i.e. WOUS) within the project boundary (a larger area than the site boundary). Similar results would be expected at the four alternative selected sites. Additional wetland acreage and stream footage would likely be identified if a detailed delineation was performed at each alternative selected site. Depending on the location of the wetland and waterways, additional wetland impacts at each alternative site could result. Conversely, depending on detailed site layout and avoidance and minimization efforts, estimated wetland impacts could be reduced.

All of the sites, except Seedco, have streams at more central locations within the site. As stated above, additional wetlands not accounted for in Table 1 likely exist within the riparian corridors. Stream and wetland avoidance and minimization could possibly be more difficult on these sites. Even if impacts resulting from the placement of plant components can be avoided, it is unlikely that impacts from access roads or railroads

can be avoided. In addition, Montour, Humboldt and Seedco will require additional land and water resources for the construction of an UHS, since these sites are located a significant distance from their primary water source. Based on an analysis of these factors and a comparison of on- and off-site characteristics shown in Table 2, Bell Bend has the least impacts to special aquatic sites.

In addition to environmental and ecological impacts, human use characteristics were evaluated. Without site specific evaluations of cultural resources, impacts are assumed to be essentially similar. Consumptive water use and blowdown should not create impacts to recreational fisheries at any of the alternative selected sites. None of the sites are expected to create impacts to parks or sites of national or statewide importance. Bell Bend will have a small impact on the PPL-owned Susquehanna Riverlands Area. Sites with existing adjacent power plants will not have the aesthetic impacts of a site without the existing industry.

Bell Bend has human use advantages over the other sites including known public support of the project, and existing restrictions on the use of the NBSR surrounding the SSES facility. Overall, Bell Bend will have the least effect on human use characteristics.

A comparison of Bell Bend to the Alternative Selected Sites demonstrates that siting a nuclear power plant at Bell Bend is the least environmentally damaging practicable alternative (LEDPA) to achieve the project purpose. Table 2 demonstrates that Bell Bend has the least amount of impacts and the most suitable site characteristics within the four categories evaluated.

Furthermore, based upon the main tenant of the Section 404(b)(1) guidelines, that "no discharge of dredged, or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem so long as the preferred alternative does not have any significant environmental consequences" (40 CFR §230.10), it would appear that the Bell Bend site (i.e. PA) complies with the basic intentions of the guidelines.

As impacts to special aquatic sites cannot be completely avoided at any of the alternative selected sites, all selected sites considered would potentially have discharges resulting from intake structure construction and blowdown discharge. Although initial evaluations reveal the presence of more wetlands on-site at Bell Bend, there will be no

impacts resulting from off-site activities. The alternative selected sites will likely have large off-site impacts to wetlands and streams. All of the sites will potentially impact state or federally protected aquatic species. It is also likely that detailed site evaluations will result in addition stream and wetland acreage at each of the alternative selected sites.

If the impacts to the wetlands and streams within the Bell Bend site are avoided and minimized to the greatest extent practicable, based on this evaluation, it can be assumed that the alternative selected sites will have the same, or greater aquatic impacts than Bell Bend based on: 1) large off-site impacts, 2) the location of streams within the sites, and 3) the likely presence of additional wetlands.

Actual proposed impacts at Bell Bend based on a thorough avoidance and minimization process are included in Table 1.

Table 1. Comparison of Alternative Site Wetland and Stream Impacts

	BBNPP (as proposed)		**BBNPP[1]**		**Humboldt**		**Montour**		**Seedco**		**Martins Creek**	
Property Acreage	2,055 ac[11]		975 ac		3,796 ac		3,538 ac		1,061 ac		542.9 ac	
Site Acreage[2]			420 ac		~420 ac		~420 ac		~420 ac		~420ac	
NWI Wetlands - Site	159.0 ac[12]		28.8 ac		3.8ac		0 ac		0.7 ac		0 ac	
Streams – Site[3]	24,014 lf[12]		2,519 lf		5,057 lf		3,891 lf		3,790 lf		3,254 lf	
Wetlands Impacted - Site[4]	**11.09[9]ac**		**28.8 ac**		**3.8 ac**		**0 ac**		**0.7 ac**		**0 ac**	
Streams Affected – Site[5]	**742[9] lf**		**2,519 lf**		**5,057 lf**		**3,891 lf**		**3,790 lf**		**3,254 lf**	
Offsite Wetlands/ Waterways Affected by ROWs[6]	Wetlands (ac)	Streams (lf)	Wetlands (ac)	Streams (lf)	Wetlands (ac)	Streams (lf)	Wetlands (ac)	Streams (lf)	Wetlands (ac)	Streams (lf)	Wetlands (ac)	Streams (lf)
Water Line ROW[7]	0	0	0	0	1.1	596.3	1.3	3,417	0	430.1	0	0
Transmission Line ROW[8]	0	0	0	0	7.2	2,210	4.1	2,321	4.5	2,040	11.1	2,431
Railroad Spur/Improvements[7,10]	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	208	0	0
Access roadways[7,10]	N/A	N/A	N/A	N/A	N/A	N/A	0.5	246	0	120	N/A	N/A
Total Offsite Impacts	**0**	**0**	**0**	**0**	**8.3**	**2,806.3**	**5.9**	**5,984**	**4.5**	**2,798.1**	**11.1**	**2,431**

[1]This column provides data primarily for the approximate 420 acre EPR Site for consistent comparison with the alternative sites and, therefore, some data in this table will be different from quantities of affected acreage stated in the ER.

[2] "Site" includes the 420 acre parcel selected for EPR development

[3]Describes streams within the site. Includes both mapped perennial and intermittent waterways and obvious drainage ways observed during site inspections or interpreted from desktop mapping.

[4]An assumption has been made that any wetlands within the 420 acre site would be affected by construction.

[5]An assumption has been made that any streams within the 420 acre site would be affected by construction.

[6]An assumption has been made that any wetlands or streams within the ROWs or interconnects would be affected by construction. Impacts associated with ROW construction and some in water construction activities are temporary in nature.

[7]For the purpose of this evaluation it has been assumed that any water line ROW would require a 120' width for construction to allow installation of 2-60" pipes, except that the width of the ROW would be reduced to 80' when crossing streams and wetlands. The same width corridor was assumed for the road and railroad access.

[8]For new transmission line construction or reconductoring of existing circuits to accommodate the EPR, a 200' wide cleared ROW is assumed to be required.

[9]From BBNPP JPA Section J, Enclosure D3, wetland impacts including permanent, temporary, and indirect.

[10]N/A (Not Applicable) because there is existing road or railroad access to the site.

[11]This is the actual project boundary acreage.

[12]This is the total length of stream and acreage of wetlands within the 2,055 acre project boundary as delineated by Normandeau Associates (10/10/11). The area within the limit of disturbance is substantially less.

Table 2. Comparison of Alternative Site Characteristics

	Characteristic	BBNPP	Humboldt	Montour	Seedco	Martins Creek
Site Suitability (Practicability)	**Site Type**	Greenfield	**Brownfield**	Greenfield	**Brownfield**	Greenfield
	Relief Across Site	**130 ft**	230 ft	**132 ft**	300 ft	160 ft
	Site Forest Cover	40%	85%	24%	85%	**3%**
	Existing Infrastructure	Railroad – 0 mi No roads on-site	**Railroad – 0 mi** **Roads on site**	Railroad – 1.4 mi No roads on-site	Railroad – 0 mi No roads on-site	Railroad – 0.5 mi. No roads on-site
	New/Expanded Transmission Line Distance	**0.8 mi.**	14.3 mi.	16.2 mi.	24.2 mi.	16.7 mi.
	Water Route Distance	1.2 mi.	12.5 mi.	12.3 mi.	14.3 mi.	**0.5 mi.**
	Preferred Site Based on Site Suitability	**X**	**X**			**X**
40 CFR §230 Sub-Part D: Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (and additional threatened, endangered, or protected species)[1]	**On-site: Aquatic State and Federal T&E Species that "could occur"**	2	3	**0**	1	9
	On-site Terrestrial State and Federal T&E Species that "could occur"	10	12	1	**0**	25
	Off-site: Impacts to State and Federal T&E species that "could occur" along proposed Water Line corridor	**0**	31	13	18	41
	Off-site: Impacts to State and Federal T&E Species that "could occur" along proposed Transmission Line corridor	**0**	34	13	19	164
	Preferred Site Based on Biological Impacts	**X**				
40 CFR §230 Sub-Part E: Potential Impacts on Special Aquatic Sites	**UHS Required**	**No**	Yes	Yes	Yes	**No**
	Water Availability at Low Flow	12x plant consumptive use	12x plant consumptive use	12x normal plant consumptive use	**33x plant consumptive use**	17x normal plant consumptive use

	Characteristic	BBNPP	Humboldt	Montour	Seedco	Martins Creek
40 CFR §230 Sub-Part E: Potential Impacts on Special Aquatic Sites	**Impacted Wetlands On-Site**	28.8 ac	3.8 ac	**0 ac**	0.7 ac	**0 ac**
	Impacted Wetlands Off-Site	**0 ac**	8.3 ac	5.9 ac	4.5 ac	11.1 ac
	Impacted Streams On-Site	**2,519 lf**	5,057 lf	3,891 lf	3,790 lf	3,254
	Impacted Streams Off-Site	**0 lf**	2,806.3 lf	5,984 lf	2,798.1 lf	2,431 lf
	Preferred Site Based on Impacts to Special Aquatic Sites	**X**				
Sub-Part F: Potential Impacts on Human Use Characteristics	**Aesthetics (cooling towers)**	**Existing adjacent power plant and cooling towers**	No existing cooling towers	**Existing adjacent power plant and cooling towers**	No existing power plant or cooling towers	**Existing adjacent power plant and cooling towers**
	Water Related Recreation	**No additional impacts**	Small impact to Susquehanna River	Small Impact to West Branch Susquehanna River	Small impact to Susquehanna River	Small impact to Delaware River
	Recreational and Commercial Fisheries	**None**	Small impacts from water line ROW stream crossings	Small impacts from water line ROW stream crossings	Small impacts from water line ROW stream crossings	Small impacts from water line ROW stream crossings
	Parks, national and historical monuments, wilderness areas, research sites, etc.	Small impact to Riverlands Property	**None**	**None**	**None**	**None**
	Public Support for Facility	**Yes**	Unknown	Unknown	Unknown	Unknown
	Preferred Site Based on Potential Impacts on Human Use Characteristics	**X**				
	Number of Criteria Listed as Preferred	**4**	**1**	**0**	**0**	**1**
	LEDPA Based on 40CFR§230 Criteria	**X**				

[1] These numbers were developed using Tables 9.3-16 – 9.3-22 in the COLA ER rev3. Only Federal and State threatened or endangered species that "could occur" in the specified area were counted. Species occurring in multiple counties along each off-site utility corridor were only counted once.

5.3 Evaluation of the Preferred Alternative

In addition to ranking high in environmental, public interest, and safety criteria, the BBNPP site is also advantageous because it neighbors the existing SSES nuclear facility. This permits the sharing of certain security and infrastructure requirements. This advantage is not available at other sites. The knowledge acquired during the design of SSES, as well as the ongoing environmental monitoring for permitting requirements, has been a valuable component of the BBNPP planning process. Portions of the BBNPP site were previously altered by SSES plant and intake structure construction, as well as the development of a public education and recreation area at the Susquehanna Riverlands Property. These site alterations changed topography and flow patterns within portions of the BBNPP site boundary. In addition to prior impacts, the proposed BBNPP and SSES will be able to share infrastructure which aids in the reduction of additional land use impacts within the BBNPP project boundary. The plants will share access roads, railroad spur, one switchyard, training facility, and an offsite emergency control center. SSES also has an existing Emergency Management Plan which BBNPP will also utilize. The proximity to existing 500kV transmission lines and switchyards utilized by SSES reduces the impacts from construction of the BBNPP transmission system. These impacts will be minimal and will be limited to the extent of the project boundary since no new 500kV corridors or widening of existing transmission corridors will be required. There is added value, both environmentally and economically, to locating the plants in close proximity to each other.

The site selection process resulted in the Bell Bend location being chosen as the preferred alternative (PA) to construct and operate a nuclear power generating facility for the commercial sale of 1,600 MWe of electricity.

In terms of jurisdictional resources, a relatively small percentage of these features occur on the BBNPP site, however, some of these resources are labeled as being of exceptional function and value, considered the most highly protected wetland systems in Pennsylvania. The Applicant, however, has taken the appropriate steps to comply with the Section 404(b)(1) requirements through extensive reduction in potential impact through the implementation of avoidance and minimization strategies and appropriate compensatory mitigation.

In addition, from a practicability standpoint, the Applicant has also evaluated the costs, existing technologies, and logistics as they relate specifically to the overall project purpose.

The Applicant, although experiencing time and financial hardship, was able to minimize the overall impact to jurisdictional and environmental resources through proper implementation of practical engineering, conceptual design, and effective logistical planning. Particular project aspects pertaining to avoidance, minimization, and mitigation are presented in greater detail in Section 6 below.

6. On-Site Avoidance and Minimization Introduction

Once the determination was made that the proposed Bell Bend site was the LEDPA, PPL investigated numerous options to avoid direct, indirect and reasonably foreseeable cumulative environmental impacts. This was accomplished through choosing plant components with fewer environmental impacts and siting the components in a way to avoid land use impacts to flora, fauna, wetlands, and streams while still accomplishing the goal of producing 1,600 MWe of baseload power.

Many ecological studies were completed evaluating flora and fauna as well as water resources within the BBNPP project boundary. Flora and fauna were inventoried and threatened, endangered, and species of special concern were identified and studied to determine if they were present on-site. A geomorphic study was performed on Walker Run as well as habitat assessments including macroinvertebrate sampling, fish sampling, substrate embeddedness studies, water quality, and pressure transducer monitoring. A wetland functions and values assessment was also performed to document important characteristics of the wetlands within the BBNPP project boundary. An aquatics study was undertaken to evaluate the potential affects to consumptive water use as well as water quality and affects to aquatic species resulting from BBNPP operation. Cultural resource assessments were also completed within the BBNPP site and all clearances will be obtained prior to construction. Understanding the existing attributes of the BBNPP site improved the effectiveness of the avoidance and minimization process.

6.1 Alternative Plant and Transmission Systems

Choosing plant components with the fewest impacts was part of the avoidance and minimization process. Various heat dissipation systems and water supplies were evaluated as part of this process as well as transmission systems.

Seven (7) types of heat dissipation systems were considered using the following evaluation criteria: aesthetics, public perception, space requirements, environmental effects, noise impacts, fog and drift, water requirements, capital and operating costs, and legislative restrictions. Cooling ponds and spray ponds, a hybrid plume abatement cooling tower, and dry cooling system were all considered not feasible due to combinations of the following reasons; large sizing requirements and subsequent land use impacts, significantly higher water demands for adequate cooling, high construction and operation and maintenance costs, as well as a reduction in plant efficiency by as much as 25% (dry cooling system only). Only mechanical draft and natural draft cooling towers were considered feasible and further evaluated. Both types were evaluated under different weather conditions and with different tower profiles. Environmental impacts were small to moderate for all options. Two (2) natural draft cooling towers were chosen as the final heat dissipation system after an evaluation of the economics, siting, and risk associated with tower technology and vendor capability. Use of closed-cycle cooling systems at BBNPP will significantly reduce environmental impacts compared to power plants that operate open-cycle (once-through) cooling. In addition, BBNPP will incorporate design criteria to limit intake approach velocities to less than 0.5 ft/sec.

Water supply sources for the makeup water needed to operate BBNPP were evaluated. Considerations included routing of the pipeline to the source location, water quantity, water quality and water reliability, and environmental impacts. Groundwater and municipal water sources were evaluated as well as the NBSR. The local municipal water supplier, Pennsylvania American Water Company, will supply BBNPP with potable water, however their well fields are not adequate to supply the quantity of water needed for cooling purposes. Hydrogeologic studies revealed that 470 wells producing water at 60 gallons per minute would be needed to meet water cooling needs. The number of wells and the area needed to drill the wells without interference was too great and therefore the NBSR was the only feasible option. The Susquehanna River's low flow water availability is twelve (12) times greater than the water needs of the BBNP based

on the nearest USGS stream gage records. Approvals from the Susquehanna River Basin Commission will be required for the withdrawal of cooling water from the river.

Due to the proximity to existing 500kV transmission lines and switchyards the impacts to wetlands and WOUS from construction of the BBNPP transmission system will be minimal and will be limited to the extent of the project boundary. In addition a new 500kV transmission line is planned from SSES to a substation in NJ. This project is part of the PJM regional Transmission Expansion Plan for Grid Reliability and will be constructed separately from the BBNPP. Transmission system components planned as part of BBNPP construction include:

- One new switchyard ,
- An expansion of the existing SSES Switchyard No. 1,
- Two new 500 kV circuits connecting the the Bell Bend Plant switchyard to the two switchyards above and
- A relocation of the existing 230 kV transmission lines.

No new transmission corridors or widening of existing offsite transmission corridors will be required to connect BBNPP to the existing transmission system. No additional transmission alternatives were considered since impacts from additions and changes to the existing system will be minimal.

6.2 On-site Avoidance

Since the initiation of the planning and design of BBNPP, PPL has advanced numerous iterations of the layout and design of BBNPP with the goal of avoiding the wetlands and stream features. Pre-application meetings with regulatory agencies and input regarding proposed wetland and stream impacts and required avoidance and minimization measures were considered carefully in the design effort for BBNPP.

Details of how impacts were reduced to the maximum practicable extent are provided below. This information clearly demonstrates the project's compliance with Section 404(b)(1) guidelines, primarily to "avoid, minimize, mitigate" proposed project impacts.

The present BBNPP layout represents the results of this process. This design clearly shows on-site avoidance of impact to existing natural resources as less than two acres

of permanent impact to wetlands, 742 feet of impact to streams (i.e. WOUS), and less than ten (10) acres of wetlands proposed to be converted, in kind, for ROW maintenance. In attempting to meet the intent of the Section 404(b)(1) guidelines, the current proposed level of impact is considered to represent the most significant minimization of impact to wetland and streams (i.e. WOUS) that can be achieved while still fulfilling the project's overall purpose.

Initial BBNPP concepts assessing possible layouts of the U.S. EPR and supporting development noted potential impacts to wetlands and streams (i.e. WOUS), totaling over 100 acres. Early communication and feedback from regulatory agencies and in-depth analysis of the BBNPP Plot Plan allowed for incorporation of numerous design elements to avoid impacts to wetlands. Minimization to on-site resources was achieved through more effective site planning as direct impacts were reduced to approximately 60 acres, and then ultimately to 33 acres in subsequent revisions in 2008 and 2009. In addition, each of these revisions included substantial (up to 50 acres) of temporary wetland impacts, and over 1,000 linear feet of stream impacts. Wetland impact plans of four previous layouts are provided in Appendix A (Figures 1-4). They represent conceptual changes to the plot plan achieved between June 2008 and August 2009.

Substantial design modifications were completed and analyzed in association with each major reduction in wetland and stream impacts, including removal of a proposed stormwater basin impacting Walker Run and adjacent forested wetlands. Designation of Walker Run as a wild trout stream by the Pennsylvania Fish and Boat Commission (PAFBC) gave adjacent wetlands an "Exceptional Value," (EV) rating. An effort to avoid impacts to EV wetlands drove additional consideration of project design leading to major redesign of plant layout in late 2009.

In late 2009 the Applicant, with agency input, made the decision that wetland impacts were still unacceptably large, and that an additional conceptual change could further reduce the wetland impacts resulting from infrastructure placement. It was determined that for the purpose of reducing impacts to streams, wetlands, and riparian buffer areas, BBNPP would be moved substantially north (approximately 1000 feet north and 300 feet west) to an area with fewer wetlands. This major design change is referred to as the "Plot Plan Change," or PPC, and allowed for the preparation of a revised site footprint with less than 10 acres of total wetland impact, but at higher cost and with substantial

additional cut and fill required. The PPC adjustment required PPL to obtain additional properties to support the siting of the project, and great effort was put into the relocated design to avoid wetlands and other sensitive resources on-site. Once the power block location was determined, there were few alternatives for the placement of the supporting structures such as the cooling towers and ESWEMS pond. These large structures are safety-related and must be located in close proximity to the power block for security purposes.

The location of the Cooling Towers and ESWEMS pond do not result in any direct wetland impacts, and no environmentally preferable locations were identified in the PPC process. In an effort to comply with Section 404(b)(1) guidelines, the adoption of the PPC design by PPL required an expenditure of several million dollars in redesign and supporting analyses, and also represented a delay to the overall project design, licensing, and permitting schedule. Figures 5 and 6 in Appendix A show two wetland impact drawings post plot plan change. The final wetland impact plan representing maximum avoidance and minimization is provided in Enclosure D1 and D2, Section J of this JPA.

On-site avoidance was also used to determine the location of the BBNPP Intake Structure. The starting points in determining where the BBNPP Intake Structure should be located were the BBNPP power block location, the location of the Susquehanna Steam Electric Station (SSES) and its associated intake structure, and the proximity of the Susquehanna River. The BBNPP power block is west and slightly south of the SSES. The SSES Intake Structure is located on the west bank of the North Branch of the Susquehanna River east and slightly south of the SSES.

The Susquehanna River, typically known as a wide-shallow river, is particularly deep in front of the SSES Intake. The Susquehanna River bed elevations in this stretch range from elevation 473 to 484 feet.

Normal water level is typically elevation 495 feet with design basis low water level at 484 feet and highest water level recorded as 517 feet. At normal water level, the Susquehanna River water depth ranges from 11 to 22 feet. Ecology III has estimated that the pool of water in front of the SSES Intake Structure contains close to 100,000,000 gallons of water even at the design basis low water level. The deeper section of the large pool of water extends about 700 feet above to 1800 feet below the

existing SSES Intake Structure. The advantages of an intake structure in this section of the river include less impact to the river from dredging, as well as less impact to aquatic habitat and aquatic life. Historical sampling at the SSES intake structure has shown small impacts from impingement and entrainment.

It was desirable to site the BBNPP Intake Structure on land already owned by PPL. The only contiguous land owned by PPL between the river and the BBNPP site (without impacting Lake Took-A-While and the Riverlands Recreational Area) was the land surrounding the existing SSES pipe lines and electrical duct banks. The existing SSES pipe lines and electrical duct banks skirt just south of Lake-Took-Awhile and the Riverlands Recreational Area. To parallel the BBNPP pipe lines and electrical duct banks with the existing SSES pipe lines would avoid any impact to Lake Took-A-While and the Riverlands Recreational Area. In addition, this location would mostly disturb land that had been previously disturbed, and would assure installation feasibility since the SSES installation had already proven successful.

The first option was to place the BBNPP Intake Structure north of the existing SSES intake structure. This placement increased the length of various pipe lines and electrical duct. From this location, the BBNPP pipe lines and electrical duct would have to cross over or under the existing SSES lines. Interferences also include, an existing 230kV transmission line right-of-way, as well as known archeological sites on the west bank Susquehanna River above the SSES Intake. In addition the potential existed for impact to the Riverlands Recreational Facility, and it was desirable to avoid this impact. For these reasons the BBNPP Intake Structure was not located north of SSES.

The next option was to place the BBNPP Intake Structure south of the existing SSES Intake. There were two (2) immediate interferences identified including, a sewage treatment plant outfall from the SSES sewage treatment plant, and the SSES blowdown line. The sewage treatment outfall could be relocated, or abandoned in place if SSES should contract for off-site processing like BBNPP. This should not be considered a major obstacle. The large 42" blowdown line enters the Susquehanna River about 580 feet below the SSES Intake Structure. The line runs west of the SSES Intake Structure, and then cuts across at a diagonal until it enters the Susquehanna River. This line supports both SSES units, and is never taken out-of-service. Line relocation was not

viewed as option due to the impact on the Susquehanna units. This line must remain in its current location.

Locating the BBNPP Intake Structure downstream of the SSES blowdown line would increase impacts from installing pipe, electrical duct banks, and roads to wetlands that parallel much of the west bank of the NBSR. In addition, it is desirable to locate both the BBNPP Intake Structure and the blowdown line within the deep pool of water discussed above. Locating the Intake structure south of the SSES blowdown line would eliminate this possibility. Lastly, this would greatly increase the length of the lines and electrical duct banks going back to BBNPP. As outlined above, this would be a large cost impact. This option was not viewed as favorable.

Locating BBNPP Intake Structure above the SSES blowdown line is a tight fit due to the way the SSES blowdown line cuts diagonally to the NBSR. The maximum distance between the two intake structures (without interfering with the SSES blowdown line) is about 300 feet centerline-to-centerline. Locating the BBNPP Intake Structure close to the SSES Intake Structure assures that many of the reasons for locating the SSES Intake Structure discussed above would also apply to the BBNPP Intake Structure. This is the most favorable location for the BBNPP Intake Structure.

Further evidence of on-site avoidance is noted as additional wetlands impacts were avoided when locating construction laydown areas. Laydown areas will be used for the purposes of modular assembly, component storage and preparation, parking, and stockpiling of raw materials supporting construction activities. These laydown areas, or "yards," were selected based upon land availability and proximity to BBNPP, and prioritized to avoid lands with streams, wetlands, and heavily forested areas. The results of this siting process resulted in a majority of laydown yard acreage consisting of previously developed or altered lands, which both reduces their impact to the environment, and allows them to be more readily developed than previously undisturbed lands. There are three laydown yards associated with the BBNPP project that contain jurisdictional wetlands within their boundaries. The initial siting of the laydown areas potentially could have resulted in wetland impacts. Subsequent revisions to the proposed configuration were made in an effort to avoid all wetland impacts associated with the laydown areas.

In the spirit of achieving compliance with Section 404(b)(1) guidelines, and based upon the proposed configuration, no wetlands are proposed to be filled or directly altered to accommodate the laydown areas associated with the BBNPP construction. Specific actions will be taken to minimize or prevent any unintentional wetland impacts.

6.3 Minimization

While the PPC and careful siting of the BBNPP intake structure reduced wetland impacts substantially, wetland impacts could not be avoided entirely due to topography and siting requirements of plant components. However, every effort has been made via multiple revisions of BBNPP design to meet Section 404(b)(1) guidelines specifically pertaining to avoidance and/or minimization of wetland impacts. Adjustments were made to decrease the size of the required temporary and permanent facilities and to maximize the amount of undisturbed vegetation. Substantial measures taken to minimize impacts after avoidance planning was completed resulted in the impacts currently proposed in the preferred alternative (PA), in which direct impacts have been further reduced from approximately 10 acres to less than 2 acres, the majority of which is associated with the cooling water intake system (CWIS). This process included the following post-avoidance minimization measures:

- Preservation of a 50' buffer zone around wetlands for most of the Walker Run watershed to preserve existing riparian zone and undeveloped lands adjacent to wetlands. This measure is expected to significantly reduce indirect impacts to wetland and streams on the BBNPP Site.

- Fencing of EV wetlands with a silt fence/fiber log barrier and an orange high visibility snow fence installed around the perimeter. Should the use of a siltation and erosion control barrier along with snow fencing be inadequate to provide suitable protection in a high traffic area, wood chips will be used to create a protective berm around the wetland.

- Construction of several bridges accessing the BBNPP site with lengths greater than the minimum requirement to achieve the necessary span. This extension of bridge length allows for the landings of the bridges to avoid EV wetlands, 50 ft forested wetland buffers, and stream impacts (including the 100-year floodplain) altogether, reducing total impacts to only those associated with support pilings.

- Alignment of structures and features associated with the CWIS to the smallest acceptable size to reduce impacts in this area.
- Location of laydown areas on previously disturbed sites.
- Fencing wetlands located within temporary laydown areas during construction activities.
- Co-location of buildings and reconfiguration of roadways of minimal acceptable width.
- Adoption of low impact development (LID) practices, including siting stormwater discharges outside of wetlands and within heavily vegetated buffer areas, reduction in impervious surfaces.
- Use of numerous retaining walls to reduce side slope areas and create "useable" uplands.
- Use of a gas insulated, rather than air insulated, switchyard to take advantage of a much smaller (60% size reduction) footprint at substantially higher cost to PPL.
- A coffer dam will be used to dewater the area impacted by intake structure construction reducing sedimentation and turbidity in the Susquehanna River.
- E&S Plans meet 25 Pa Code Chapter 102 requirements and will reduce water quality impacts to surface waters.
- Use of subsurface infiltration beds to reduce the area required for surface stormwater basins and to regulate temperature and water quality entering wetlands and streams; this measure is also expected to reduce indirect impacts and degradation of wetlands at BBNPP.

In conclusion, the conceptual design and layout of BBNPP has been optimized through multiple design iterations with the clear intent of complying with Section 404(b)(1) guidelines, particularly in the avoidance and minimization of potential project impacts to wetlands and waters of the United States at BBNPP. The preferred alternative (as presented throughout this documentation) best represents the Applicant's site design in achieving the least possible impact to jurisdictional resources.

Compensatory mitigation measures designed to offset unavoidable impacts are described in the mitigation section (Section R) of this JPA.

7. Public Benefits

Public benefits, independent of the applicant's benefits, are numerous. The public benefits locally, regionally, and nationally from additional baseload power as well as specifically, nuclear generation.

The local economy, particularly within Luzerne and Columbia Counties, will be positively affected by project implementation. Job creation and increased tax revenues will be advantageous to people living in Luzerne County and surrounding areas.

Regionally, the additional baseload power generated will address projected demand, and therefore, will positively affect the price the public pays for electric use. Without additional baseload power, projected energy supply issues could affect economic growth within areas of need. If growth exceeds power supply, rolling blackouts and brownouts could be used to meet demand. Neither option is favorable. If PPL took no-action to meet growth demands, PPLEU's ability to supply low cost, reliable power would be greatly inhibited negatively affecting public interest.

The use of nuclear power decreases the reliance on carbon intensive fuels which will improve air quality regionally and will decrease the emission of greenhouse gases. The use of nuclear power also supports national policy to reduce fossil fuel dependence.

8. Conclusion

Through this alternatives analysis process, a wide range of off-site and on-site alternatives were evaluated against the proposed Bell Bend Nuclear Power Plant facility in an effort to comply with Section 404(b)(1) guidelines. None of the alternatives evaluated compared favorably to the Bell Bend facility based on assessments which considered:

- the need for additional baseload power within the eastern PJM region to maintain a consistent and cost-effective power supply for the general public;
- the inability to supply the designated amount of baseload power through non-generation alternatives such as conservation programs or purchasing power;
- the cost, technological, and logistical advantages of nuclear power over alternate energy sources both environmentally and economically;

- determination of Alternative Sites based on weighted numeric ranking of environmental, public interest, and safety related criteria, a sensitivity analysis, and specific consideration 33 CFR §320.4 criteria;
- determination of the LEDPA based on an evaluation of 40CFR, part 230 guidelines;
- environmental impacts from alternative plant and transmission systems;
- stream and wetland locations to avoid and minimize impacts resulting from plot plan development;
- infrastructure designs and low impact development techniques that could minimize wetland and stream impacts resulting from plant construction and operation; and,
- public benefits

Upon conducting this full study of alternatives, and applying this evaluation process utilizing Section 404(b)(1) guidelines, the Applicant has concluded that the Bell Bend Nuclear Power Plant, as shown on the enclosed site plans, represents the LEDPA. This has been concluded based upon a thorough evaluation of all known alternatives, and a diligence effort to avoid and minimize potential project impacts to jurisdictional resources.

In conclusion, the proposed activity at BBNPP site represents the most practicable alternative resulting in the least possible impacts to wetlands, streams, and public interest.

9. References

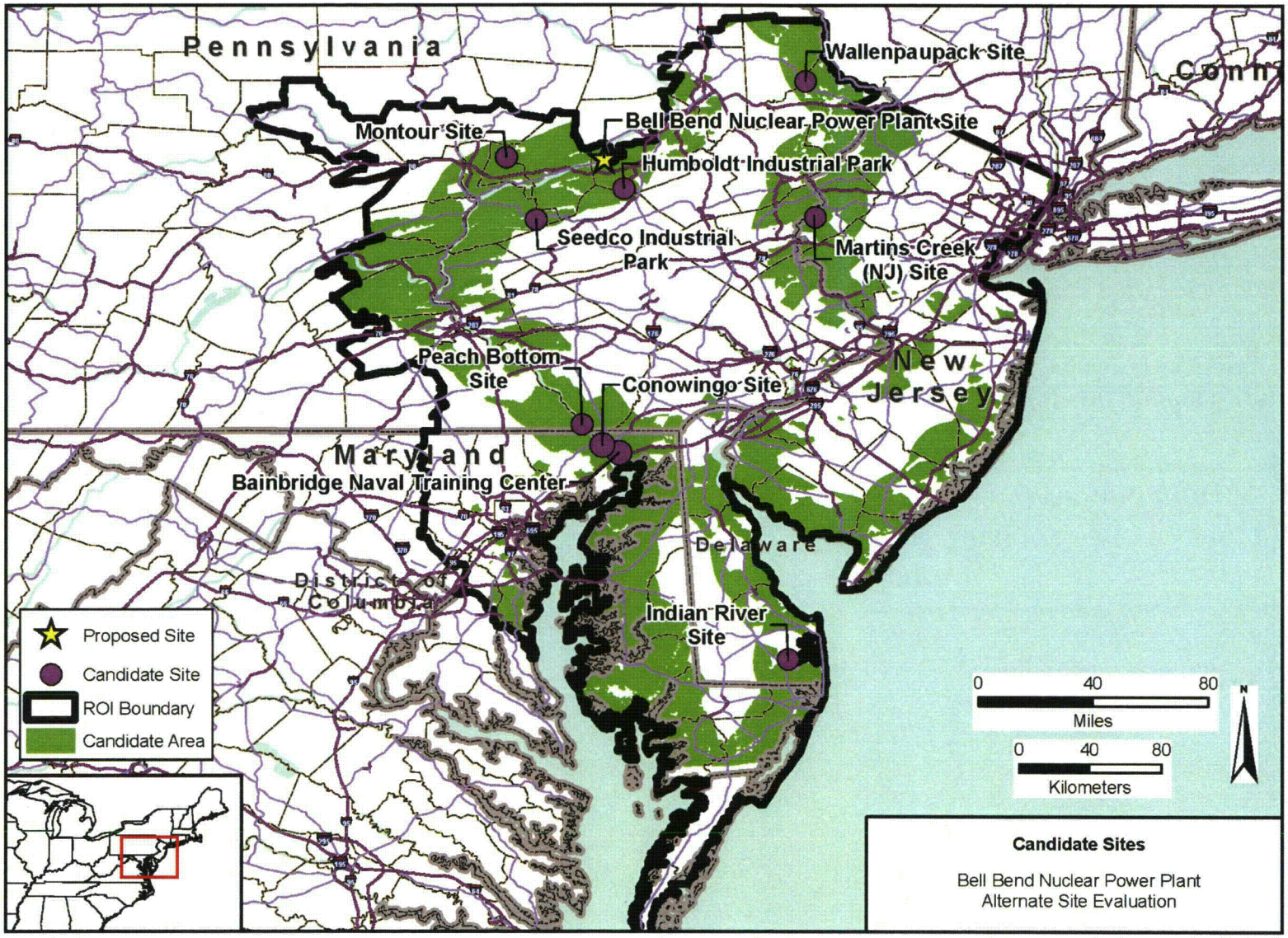
Alternative Site Evaluation Report. Revision 2, May 2011. Unistar

PJM Inside Lines. 31 July 2006. PJM Interconnection

Assessment of Demand Response and Advanced Metering, Staff Report. 2007. Federal Energy Regulatory Commission

Appendix A

Figure 5-1
Candidate Sites



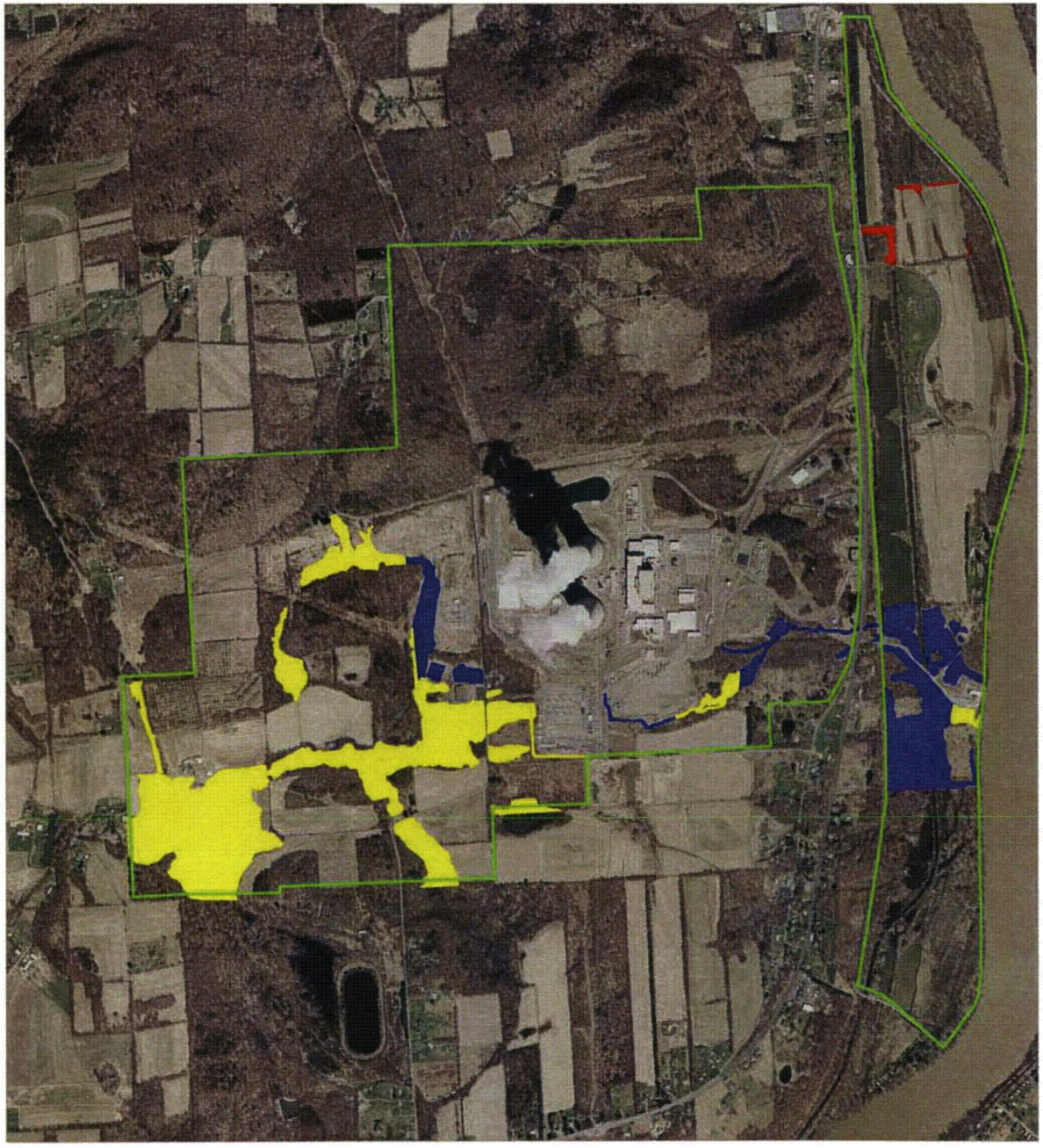


Figure 1.
June 2008 Wetland Impact Plan
Permanent Wetland Impacts = 99 acres

	Wetland Impact Type	Acres
	Temporary Impact	1.5
	Permanent Impact	98.9
	No Impact	40.7

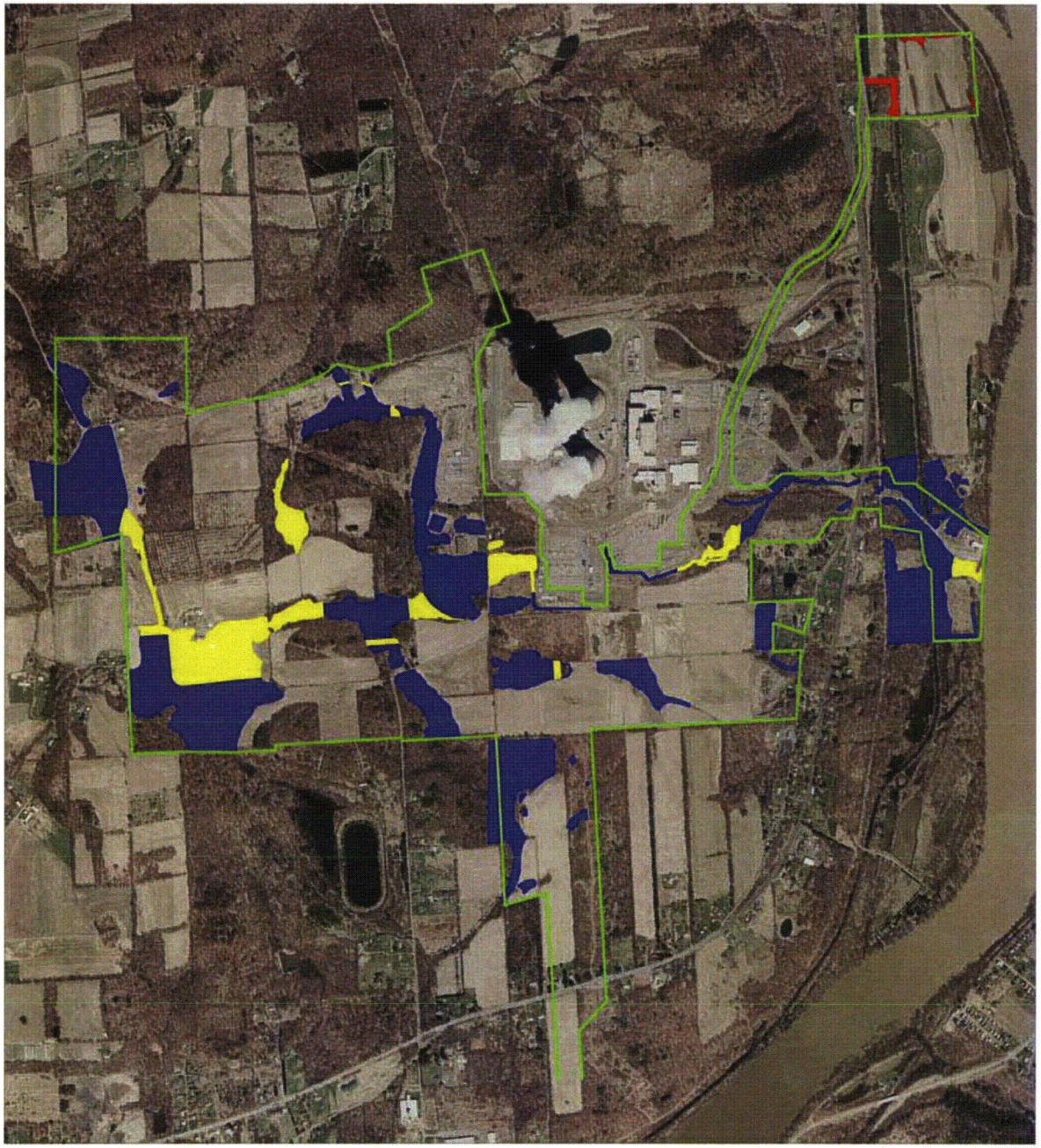


Figure 2.
September 2008 Wetland Impact Plan
Permanent Wetland Impacts = 36 acres

	Wetland Impact Type	Acres
	Temporary Impact	1.5
	Permanent Impact	36.1
	No Impact	158.4

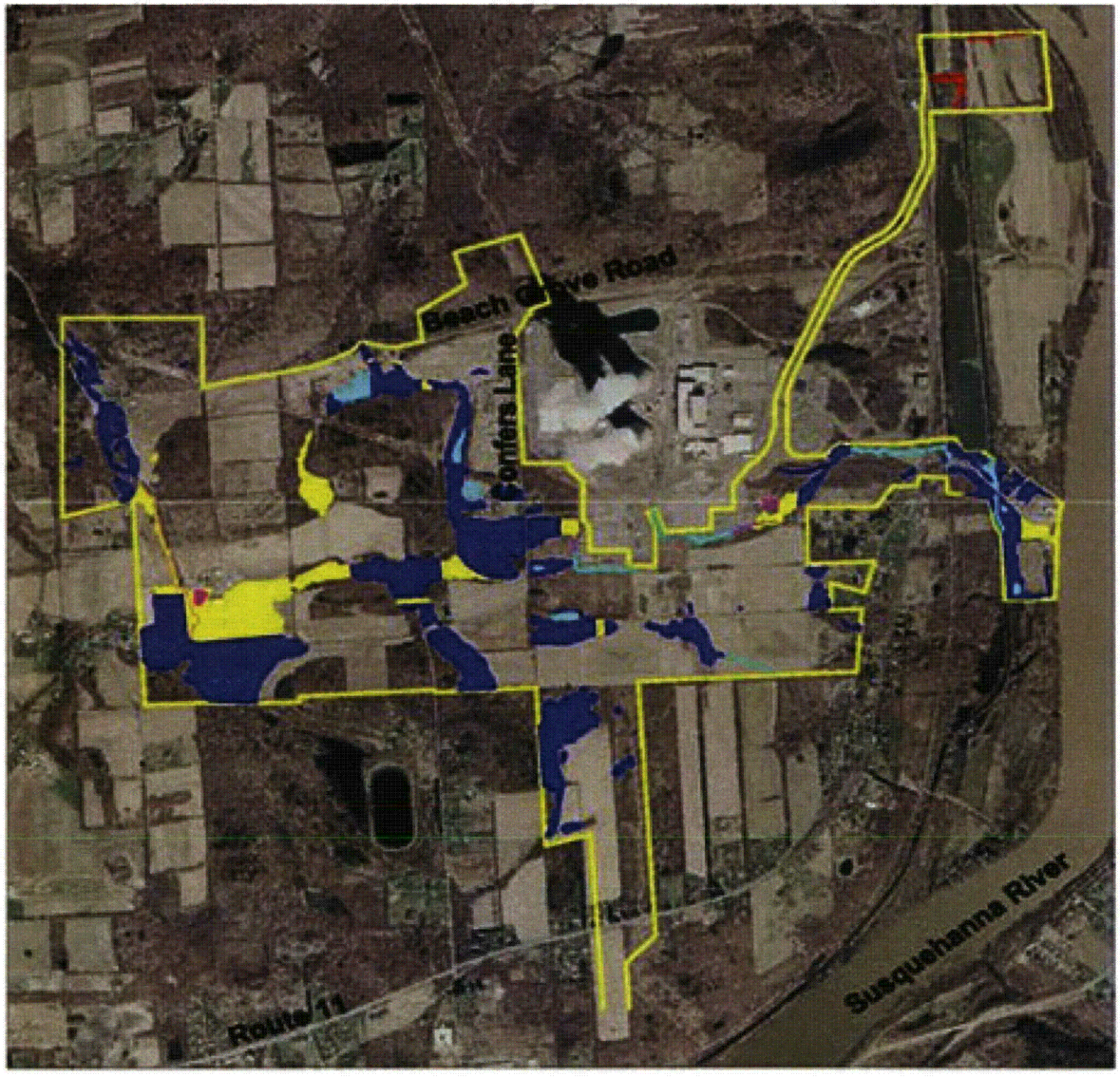


Figure 3.
April 2009 Wetland Impact Plan
Permanent Wetland Impacts = 33 acres

	Wetland Impact Type	Acres
	Temporary Impact	1
	Permanent Impact	33
	No Impact	110
	Stream/Waterbody Impact Type	**Acres**
	Temporary Impact	0.25
	Permanent Impact	1.00
	No Impact	6.80

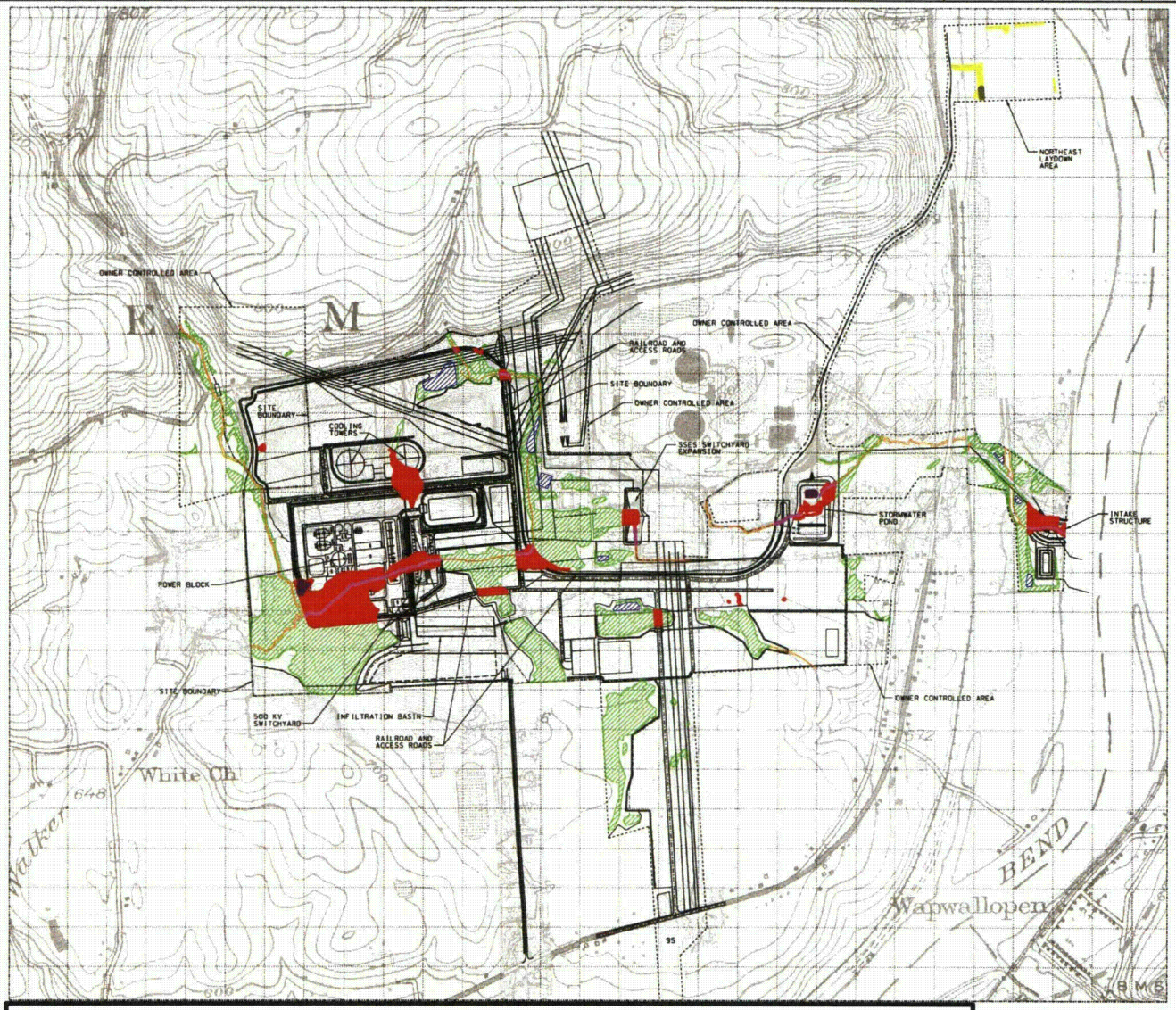
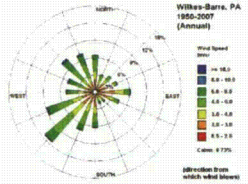


Figure 4. August 2009 Wetland Impact Plan; Permanent Wetland Impacts = 26 acres



WETLANDS LEGEND

NON-IMPACTED WETLANDS (113.9 ACRES)	NON-IMPACTED WATER BODIES (4.8 ACRES)	NON-IMPACTED STREAM CHANNEL (5.0 ACRES) LENGTH = 15,390 LF
IMPACTED WETLANDS (26.0 ACRES)	IMPACTED WATER BODIES (0.75 ACRES)	IMPACTED STREAM CHANNEL (1.6 ACRES) LENGTH = 3,715 LF
TEMPORARY IMPACTED WETLANDS (1.0 ACRE)	TEMPORARY IMPACTED WATER BODIES (0.25 ACRES)	TEMPORARY IMPACTED STREAM CHANNEL (N/A)
TOTAL = 140.5 ACRES	TOTAL = 5.6 ACRES	TOTAL = 6.0 ACRES

NOT FOR CONSTRUCTION

NON-SAFETY RELATED

NOTES

1. BACKGROUND TOPOGRAPHIC MAPPING WAS PRODUCED BY PETERS CONSULTANTS, INC., 100 ROBBINS AVE., BERWICK, PA 18603, IN NOV. 2007. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88).
2. AREA WITHIN THE SITE BOUNDARY 424 ACRES
   OWNER CONTROLLED AREA NOT PART OF THE SITE BOUNDARY 458 ACRES
   TOTAL AREA WITHIN THE SITE BOUNDARY AND OWNER CONTROLLED AREA 882 ACRES
3. WETLAND MAPPING PROVIDED BY NORMANDEAU ASSOCIATES, INC.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

PLANT NORTH
8.33°
TRUE NORTH

500' 0 500' 1000'
GRAPHIC SCALE

FILENAME: I:\2198-004-CSK-0001.DGN

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
5	04/17/2009	ND/ALS	R. COOK		FOR RECORD - REVISED WETLANDS & REMOVED TEXT CALLOUTS
6	05/06/2009	ND/ALS	R. COOK		FOR RECORD - REVISED WETLANDS TO MATCH NORMANDEAU, LTD DRAWING
7	08/14/2009	ND/ALS	R. COOK		FOR RECORD - REVISED WETLANDS TO MATCH NORMANDEAU, LTD DRAWING
8	08/19/2009	ND/ALS	R. COOK		DELETED STORMWATER POND NO.1, ADDED INFILTRATION BASIN AND GROUNDWATER POND, ADDED CULVERTS TO INFILTRATION BASIN, ADDED DREDGE POND, REVISED AREAS WEST & SOUTH OF POWERBLOCK DUE TO FENCE LINE

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
0	07/21/2008	ND/ALS	R. COOK		CONCEPTUAL DESIGN FOR USE
1	07/22/2008	ND/ALS	R. COOK		CONCEPTUAL DESIGN FOR USE
2	07/25/2008	ND/ALS	R. COOK		CONCEPTUAL DESIGN FOR USE - ADDED SEWER TO DRAIN WETLANDS WEST OF CONIFERS LANE WEST
3	09/04/2008	ND/ALS	R. COOK		CONCEPTUAL DESIGN FOR USE - UPDATED AREA OF SITE BOUNDARY AND PROJECT BOUNDARY, ADDED WAREHOUSE
4	10/10/2008	ND/ALS	R. COOK		FOR RECORD - NON SAFETY RELATED

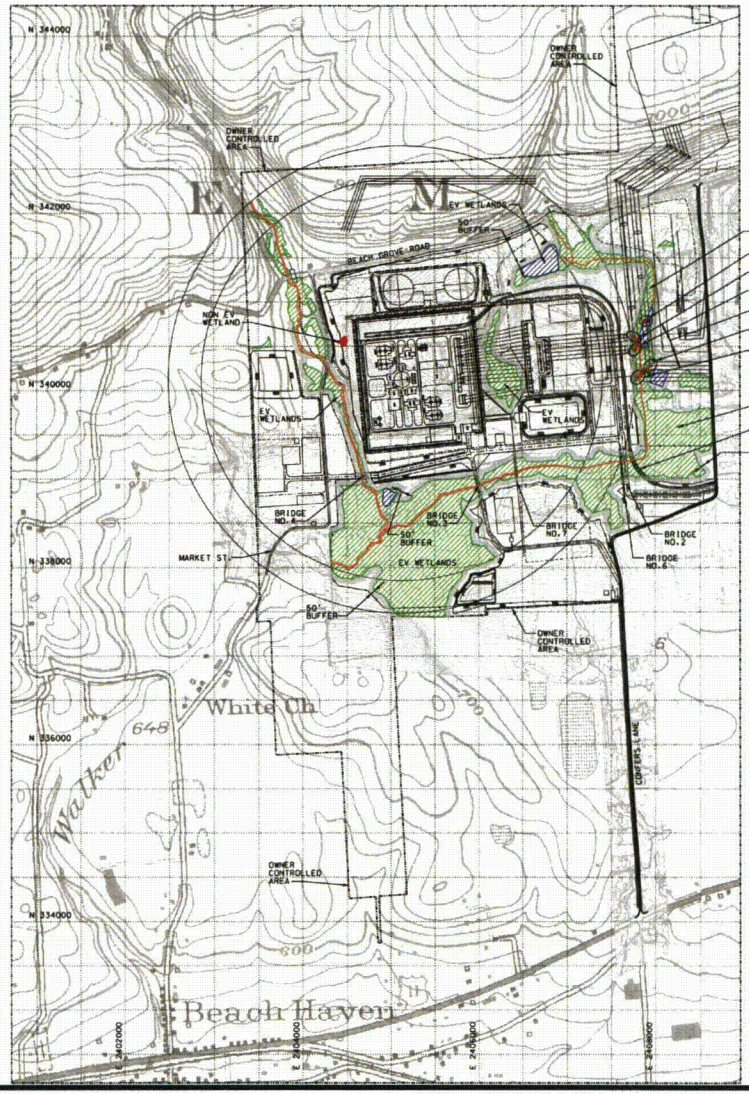
SCALE	1"=500'
PROJECT NUMBER	12198-004

WETLAND IMPACT PLAN CURRENT DESIGN

BELL BEND NUCLEAR POWER PLANT UNISTAR NUCLEAR PENNSYLVANIA

Sargent & Lundy

DRAWING NO.	REV.
12198-004-CSK-0001	8
SHEET	OF



WETLANDS LEGEND

NON-IMPACTED WETLANDS (88.816 ACRES)	NON-IMPACTED WATER BODIES (3.717 ACRES)	NON-IMPACTED STREAM CHANNEL (3.32 ACRES) LENGTH = 11,965 LF
* IMPACTED WETLANDS (0.304 ACRES)	IMPACTED WATER BODIES (0.003 ACRES)	IMPACTED STREAM CHANNEL (0.0 ACRES)
TEMPORARY IMPACTED WETLANDS (0.0 ACRES)	TEMPORARY IMPACTED WATER BODIES (0.0 ACRES)	TEMPORARY IMPACTED STREAM CHANNEL (0.0 ACRES)
TOTAL = 89.12 ACRES	TOTAL = 3.72 ACRES	TOTAL = 3.32 ACRES

* EV WETLANDS IMPACTED BY TRANSMISSION TOWERS ARE APPROXIMATELY 0.017 ACRES

BRIDGE NUMBER		LENGTH (APPROX)	WIDTH	EV WETLANDS AREA PERMANENTLY IMPACTED BY FOUNDATIONS
1	ROAD BRIDGE	575 FT	60'	0.048 ACRES (SEE DWG SK-12198-400-011)
2	ROAD BRIDGE	400 FT	60'	0.032 ACRES
3	ROAD BRIDGE	350 FT	48'	0.020 ACRES
4	ROAD BRIDGE	180 FT	48'	0.007 ACRES
5	RAILROAD BRIDGE	500 FT	30'	0.023 ACRES
6	PIPE BRIDGE	400 FT	30'	0.023 ACRES
7	PIPE BRIDGE	350 FT	20'	0.014 ACRES
				TOTAL = 0.167 ACRES

TRANSMISSION TOWERS	NUMBER OF TOWERS	EV WETLANDS AREA PERMANENTLY IMPACTED BY FOUNDATIONS
SET 1 ANGLE TOWER	3	0.004 ACRES
SET 2 ANGLE TOWER	3	0.004 ACRES
SET 3 ANGLE TOWER	3	0.004 ACRES
SET 4 ANGLE TOWER	3	0.004 ACRES
SET 1 TANGENT STRUCTURE	3	0.004 ACRES
		TOTAL = 0.02 ACRES

LEGEND NOTES

1. THE AREA PERMANENTLY IMPACTED BY ONE BRIDGE FOUNDATION IS CALCULATED AS BRIDGE WIDTH PLUS 10' TIMES 5' OF WIDTH. ONE FOUNDATION IS REQUIRED EVERY 80 LINEAR FEET (PLUS/MINUS).
2. THE AREA PERMANENTLY IMPACTED BY TRANSMISSION TOWER FOUNDATIONS IS CALCULATED AS 4 FOUNDATIONS TIMES (4 FT X 4 FT) = 64 SQUARE FEET OF FOUNDATIONS PER TOWER. AT PRESENT, ONLY PORTIONS OF THE FOUR ANGLE STRUCTURES AND ONE TANGENT STRUCTURE ARE IN THE WETLANDS. TO BE CONSERVATIVE, ALL ANGLE STRUCTURES FOR EACH LINE WERE ASSUMED TO BE IN THE WETLANDS.

NOT FOR CONSTRUCTION

NON-SAFETY RELATED

NOTES

1. BACKGROUND TOPOGRAPHIC MAPPING WAS PRODUCED BY PETERS CONSULTANTS, INC. 100 ROBBINS AVE., BERWICK, PA 18603, IN NOV. 2007. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88').

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

PLANT NORTH 5.32° TRUE NORTH

500' 0 500' 1000'
GRAPHIC SCALE

Figure 5a. November 2009 Wetland Impact Plan, Sheet 1; Permanent Wetland Impacts = 4 acres

DRAWING RELEASE RECORD					
REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
0	11-09-2009	ND/ALS	R. COOK	———	FOR CLIENT COMMENTS

DRAWING RELEASE RECORD					
REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE

FILENAME: sk-12198-400-010-01.dgn

SCALE: 1"=500'
PROJECT NUMBER: 12198-415

WETLAND IMPACT PLAN
WEST OF CONFERS LANE
(EV WETLANDS)
SHEET 1
BELL BEND NUCLEAR POWER PLANT
UNISTAR NUCLEAR
PENNSYLVANIA

Sargent & Lundy

DRAWING NO. SK-12198-400-010 REV. 0
SHEET 1 OF 2

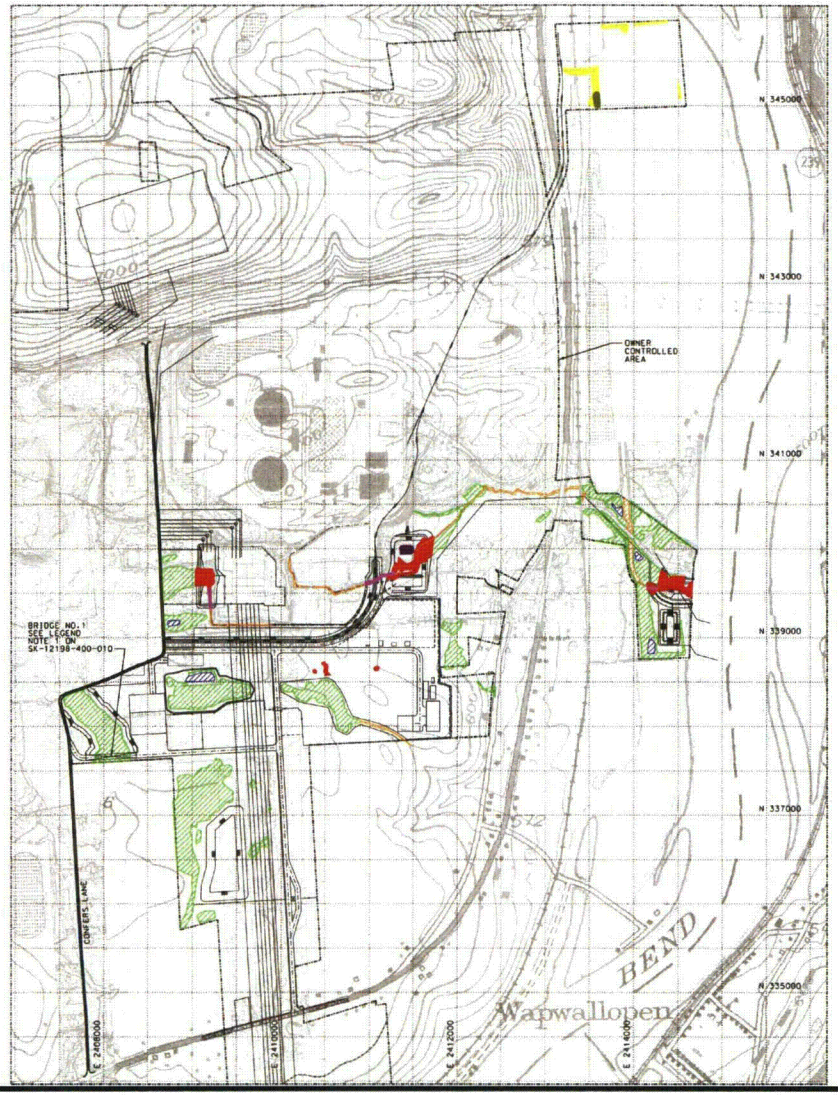


Figure 5b. November 2009 Wetland Impact Plan, Sheet 2; Permanent Wetland Impacts = 4 acres

WETLANDS LEGEND

NON-IMPACTED WETLANDS (46.14 ACRES)	NON-IMPACTED WATER BODIES (1.3 ACRES)	NON-IMPACTED STREAM CHANNEL (2.42 ACRES) LENGTH = 5941 LF
* IMPACTED WETLANDS (4.02 ACRES)	IMPACTED WATER BODIES (0.26 ACRES)	IMPACTED STREAM CHANNEL (0.26 ACRES)
TEMPORARY IMPACTED WETLANDS (1.3 ACRES)	TEMPORARY IMPACTED WATER BODIES (0.22 ACRES)	TEMPORARY IMPACTED STREAM CHANNEL (0.0 ACRES)
TOTAL = 51.46 ACRES	TOTAL = 1.80 ACRES	TOTAL = 2.68 ACRES

* WETLAND IMPACTED BY BRIDGE NO.1 IS 0.048 ACRES (SEE SK-12198-400-010)

NOT FOR CONSTRUCTION

NON-SAFETY RELATED

NOTES

1. BACKGROUND TOPOGRAPHIC MAPPING WAS PRODUCED BY PETERS CONSULTANTS, INC. 100 ROBBINS AVE. BERWICK, PA 18603, IN NOV. 2007. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88).

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

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PLANT NORTH 5.13° TRUE NORTH

500' 0 500' 1000'
GRAPHIC SCALE

FILENAME: sk-12198-400-010-02.dgn

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
0	11-09-2009	ND/ALS	R. COOK	———	FOR CLIENT COMMENTS

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE

SCALE: 1"=500'

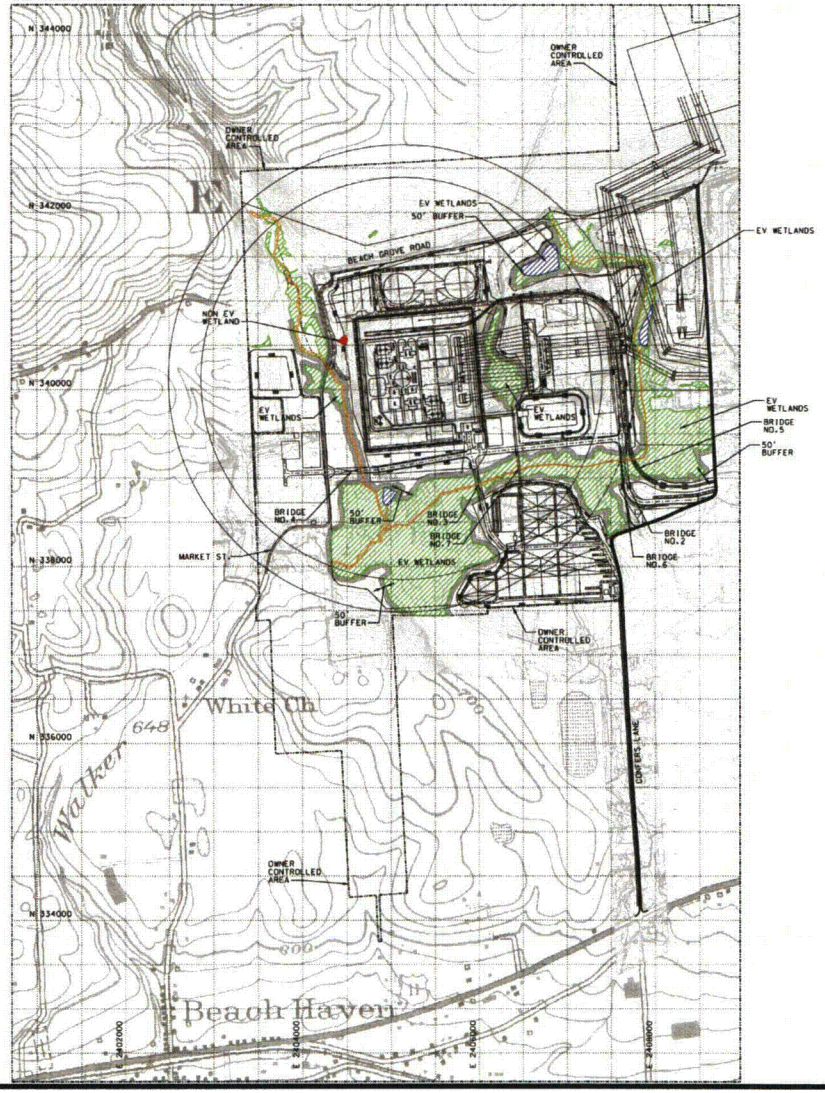
PROJECT NUMBER: 12198-415

WETLAND IMPACT PLAN
EAST OF CONFERS LANE
(NON EV WETLANDS)
SHEET 2
BELL BEND NUCLEAR POWER PLANT
UNISTAR NUCLEAR
PENNSYLVANIA

Bechtel Corporation

DRAWING NO. SK-12198-400-010 REV. 0

SHEET 2 OF 2



WETLANDS LEGEND

NON-IMPACTED WETLANDS (86.81 ACRES)	NON-IMPACTED WATER BODIES (3.19 ACRES)	NON-IMPACTED STREAM CHANNEL (3.56 ACRES) LENGTH = 13,250 LF
IMPACTED WETLANDS (0.45 ACRES)	IMPACTED WATER BODIES (0.0 ACRES)	IMPACTED STREAM CHANNEL (0.0 ACRES)
TEMPORARY IMPACTED WETLANDS (0.0 ACRES)	TEMPORARY IMPACTED WATER BODIES (0.0 ACRES)	TEMPORARY IMPACTED STREAM CHANNEL (0.0 ACRES)
TOTAL = 87.06 ACRES	TOTAL = 3.19 ACRES	TOTAL = 3.56 ACRES

50' BUFFER ZONE ADJACENT TO EACH EV WETLAND

BRIDGE NUMBER		LENGTH (APPROX)	WIDTH	EV WETLANDS AREA PERMANENTLY IMPACTED BY FOUNDATIONS
1	ROAD BRIDGE	575 FT	60'	0.048 ACRES (SEE DWG SK-12198-400-010, SHEET 2. AREA INCLUDED ON SHEET 2.)
2	ROAD BRIDGE	400 FT	60'	0.032 ACRES
3	ROAD BRIDGE	350 FT	48'	0.020 ACRES
4	ROAD BRIDGE	400 FT	48'	0.023 ACRES
5	RAILROAD BRIDGE	500 FT	30'	0.023 ACRES
6	PIPE BRIDGE	400 FT	30'	0.023 ACRES
7	PIPE BRIDGE	350 FT	20'	0.014 ACRES
				TOTAL = 0.183 ACRES

NOT FOR CONSTRUCTION

NON-SAFETY RELATED

LEGEND NOTES

1. THE AREA PERMANENTLY IMPACTED BY ONE BRIDGE FOUNDATION IS CALCULATED AS BRIDGE WIDTH PLUS 10' TIMES 3' OF WIDTH. ONE FOUNDATION IS REQUIRED EVERY 80 LINEAR FEET (PLUS/MINUS).
2. THE IMPACTED WETLANDS AREA HAS BEEN ROUNDED UP TO 0.45 ACRES TO BE CONSERVATIVE BECAUSE FINAL DESIGN IS NOT COMPLETED ON BRIDGES. ACTUAL IMPACTED AREA IS 0.253 ACRES.

NOTES

1. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 5' CONTOURS WAS PRODUCED BY PETERS CONSULTANTS, INC. 100 ROBBINS AVE., BERWICK, PA 18603. IN NOV. 2007. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88).
2. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 10' CONTOURS PROVIDED BY NORMANDEAU ASSOCIATES, INC. DATED 01-26-2010. AREVA DOC. # 38-7003126-000. FROM PASDA WEBSITE. PAMAP PROGRAM. PADOC AND NR. BTGS. 2006.
3. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 20' CONTOURS FROM BERWICK USGS QUADRANGLE MAP. 1:24000.
4. LOCATIONS OF WETLANDS, STREAMS, WATERBODIES PREPARED BY NORMANDEAU ASSOCIATES, INC. DATED 02/02/2009. AREVA DOC. # 38-7002904-001.
5. EQUIPMENT LAYOUT IS BASED ON THE SUPP DRAWING SK-12198-400-001 REV.2 DATED 01-12-2010.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

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PRELIMINARY

GRAPHIC SCALE 500' 0 500' 1000'

PLANT NORTH 5.33° TRUE NORTH

Figure 6a. February 2010 Wetland Impact Plan, Sheet 1; Permanent Wetland Impacts = 2 acres

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
0	11-09-2009	ND/ALS	R. COX		FOR CLIENT COMMENTS
1	02-03-2010	ND/ALS	D. DAHLBERG		FOR DAR
2	02-05-2010	ND/ALS	D. DAHLBERG		CONCEPTUAL DESIGN FOR USE

DRAWING RELEASE RECORD

FILENAME: sk-12198-400-010-01.dgn

SCALE	1"=500'
PROJECT NUMBER	12198-415

WETLAND IMPACT PLAN
WEST OF CONFERS LANE
(EV WETLANDS)
SHEET 1
BELL BEND NUCLEAR POWER PLANT
UNISTAR NUCLEAR
PENNSYLVANIA

Sargent & Lundy

DRAWING NO. SK-12198-400-010 REV. 2

SHEET 1 OF 2

WETLANDS LEGEND

NON-IMPACTED WETLANDS (49.63 ACRES)	NON-IMPACTED WATER BODIES (1.92 ACRES)	NON-IMPACTED STREAM CHANNEL (2.14 ACRES) LENGTH = 5410 LF
* IMPACTED WETLANDS (1.55 ACRES)	IMPACTED WATER BODIES (0.00 ACRES)	IMPACTED STREAM CHANNEL (0.16 ACRES) LENGTH = 700 LF
TEMPORARY IMPACTED WETLANDS (0.00 ACRES)	TEMPORARY IMPACTED WATER BODIES (0.00 ACRES)	TEMPORARY IMPACTED STREAM CHANNEL (0.0 ACRES)
TOTAL = 51.18 ACRES	TOTAL = 1.92 ACRES	TOTAL = 2.30 ACRES

* WETLAND IMPACTED BY BRIDGE NO.1 IS 0.048 ACRES (SEE SK-12198-400-010, SHEET 1)

NOT FOR CONSTRUCTION

NON-SAFETY RELATED

NOTES

1. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 5' CONTOURS WAS PRODUCED BY PETERS CONSULTANTS, INC., 100 ROBBINS AVE., BERWICK, PA 18603, IN NOV. 2007. THE HORIZONTAL COORDINATE SYSTEM SHOWN ON THIS DRAWING IS PENNSYLVANIA'S STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD 83). THE VERTICAL CONTOURS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD 88).
2. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 10' CONTOURS PROVIDED BY NORMANDEAU ASSOCIATES, INC. DATED 01-26-2010. AREVA DOC. # 38-7003126-000. FROM PASDA WEBSITE. PAMAP PROGRAM. PADOC AND NR. BTGS. 2006.
3. BACKGROUND TOPOGRAPHIC MAPPING SHOWING 20' CONTOURS FROM BERWICK USGS QUADRANGLE MAP. 1:24000.
4. LOCATIONS OF WETLANDS, STREAMS, WATERBODIES PREPARED BY NORMANDEAU ASSOCIATES, INC. DATED 02/02/2009. AREVA DOC. # 38-7002904-001.
5. EQUIPMENT LAYOUT IS BASED ON THE SUPP DRAWING SK-12198-400-001 REV.2 DATED 01-12-2010.
6. ORANGE CONSTRUCTION FENCE SHALL BE PLACED AROUND EACH WETLAND IN ADDITION TO THE STANDARD SILT FENCE / STRAWBALES.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

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PRELIMINARY

PLANT NORTH 5.33° TRUE NORTH

500' 0 500' 1000'
GRAPHIC SCALE

Figure 6b. February 2010 Wetland Impact Plan, Sheet 2; Permanent Wetland Impacts = 2 acres

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE
0	11-09-2009	ND/ALS	R. COOK	———	FOR CLIENT COMMENTS
1	02-03-2010	ND/ALS	D. DAHLBERG	———	FOR DAR
2	02-05-2010	ND/ALS	D. DAHLBERG	———	CONCEPTUAL DESIGN FOR USE

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE

FILENAME: sk-12198-400-010-02.dgn

SCALE: 1"=500'

PROJECT NUMBER: 12198-415

WETLAND IMPACT PLAN EAST OF CONFERS LANE (NON EV WETLANDS) SHEET 2

BELL BEND NUCLEAR POWER PLANT
UNISTAR NUCLEAR
PENNSYLVANIA

Sargent & Lundy

DRAWING NO. SK-12198-400-010 REV. 2

SHEET 2 OF 2