Indiana Bat (*Myotis sodalis*) Biological Evaluation and Management Plan Proposed Bell Bend NPP Site Luzerne County, Pennsylvania

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Indiana Bat Biological Evaluation and Management Plan
For The
Proposed Bell Bend Nuclear Power Plant Site
Luzerne County, Pennsylvania

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BA - Biological Assessment

BBNPP - Bell Bend Nuclear Power Plant

BEMP - Biological Evaluation and Management Plan

BMPs - Best Management Practices

CFR - Code of Federal Regulations

COL - Combined License

CWS - Circulating Waste System

EIS - Environmental Impact Statement

ESA - Endangered Species Act

ESWEMS - Essential Service Water Emergency Makeup System

ESWS - Essential Service Water System

FERC - Federal Energy Regulatory Commission

NBCT - North Branch Canal Trail

NPDES - National Pollutant Discharge Elimination System

NRC - Nuclear Regulatory Commission

NUREG - NRC Regulatory Guidance – Documentation of technical, regulatory, or administrative information about NRC programs or activities prepared by a contractor.

PADEP - Pennsylvania Department of Environmental Protection

PDCNR - Pennsylvania Department of Conservation and Natural Resources

PFBC - Pennsylvania Fish and Boat Commission

PGC - Pennsylvania Game Commission

UniStar - UniStar Nuclear Energy, LLC

SACTI - Seasonal/Annual Cooling Tower Impact

SGL - State Game Lands

SSES - Susquehanna Steam Electric Station

USACE - U.S. Army Corps of Engineers

USEPA - U.S. Environmental Protection Agency

USEPR - U.S. Evolutionary Power Reactor

USFWS - U.S. Fish and Wildlife Service

RECORD OF REVISIONS

Revision	Date	Pages/Sections Changed	Brief Description
000	November, 2011	All	Initial Release

1. INTRODUCTION

1.1 Background

The Nuclear Regulatory Commission (NRC) is considering the combined license (COL) application of PPL Bell Bend, LLC (PPL) for the construction and operation of a new nuclear plant to be designated as the Bell Bend Nuclear Power Plant (BBNPP). BBNPP will be located in Salem Township, Luzerne County, Pennsylvania, adjacent to the existing Susquehanna Steam Electric Station (SSES) near the Susquehanna River. The BBNPP site is located approximately 5 miles (8 km) northeast of Berwick, Pennsylvania.

The NRC is the lead federal agency responsible for preparing an Environmental Impact Statement (EIS) in accordance with 10 CFR 51 for the construction and operation of the new unit that will be authorized by the COL. The decision to approve a license can only be made by the NRC upon the completion of the EIS. The U.S. Army Corps of Engineers (USACE) is serving as a cooperating agency in the development of the EIS with respect to the requirements of USACE regulations at 33 CFR 320 through 332, the Federal Clean Water Act Section 404(b)(1) Guidelines and the USACE public interest review process.

Under Section 7 of the Endangered Species Act (ESA), all federal agencies participate in the conservation and recovery of listed threatened and endangered species. Section 7(a) (2) of the Act requires that federal agencies ensure that any action they authorize, fund or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Furthermore, Section 7 provides guidance for the consultation process and federal interagency cooperation to conserve federally listed species and designated critical habitats, including the development of a Biological Assessment (BA). A BA may be necessary if the information available to the lead Federal agency and the U.S. Fish and Wildlife Service (USFWS) through the informal consultation process is insufficient to conclude that the proposed action is not likely to affect listed species or critical habitat that may be present in the Project Action Area.

As a part of the licensing process, the NRC requested comment, in a letter dated January 12, 2009, from the USFWS on the environmental scoping process and federally protected species within the area affected by the proposed construction of BBNPP. In response to the NRC request, the USFWS indicated in a letter dated July 10, 2009 that the BBNPP project is located in proximity to three known hibernacula for the federally–listed, endangered Indiana bat (*Myotis sodalis*) and the Indiana bat may be adversely affected by the clearing of forested areas that support foraging, roosting or fall swarming habitat (Appendix A). In this same letter, the USFWS recommended that PPL implement avoidance, minimization, and compensatory mitigation measures to avoid adverse effects to the species (USFWS, 2009).

This Biological Evaluation and Management Plan (BEMP) has been prepared to provide the NRC with baseline information for the development of a BA, which would determine whether there would likely be any adverse effects from the Project on this federally protected species. Appendix A provides the consultation record for the project. Appendix B provides the results of the site-specific Indiana bat mist net and roost tree surveys conducted for this project. Appendix C provides documentation of the commitments on the part of PPL to minimize and avoid impacts to Indiana bats and habitat and provide mitigation for unavoidable impacts associated with the BBNPP Project.

1.2 Purpose

The purpose of this BEMP is to assess potential effects of site preparation activities, the construction of support facilities, mitigation and restoration activities, and the construction, operation and maintenance of the BBNPP on the Indiana bat.

1.3 Proposed Action

PPL is planning to construct and operate the new BBNPP on property adjacent to the existing SSES Units 1 and 2. The purpose of the proposed new nuclear power plant is to generate electricity (baseload power) for sale. The construction and operation of BBNPP will be authorized by Federal action resulting in the issuance of a COL by the Nuclear Regulatory Commission under 10 CFR 52. BBNPP will be constructed based on the U.S. Evolutionary Power Reactor (U.S. EPR^{TM}) reactor design. Structures and facilities associated with the construction and operation of the plant will include the main power block buildings, cooling towers, switchyards and on-site transmission lines, a water treatment building, a wastewater retention pond, an emergency water makeup pond, water intake and discharge structures, water intake and discharge pipelines, storm water infiltration basins, plant access roads, a rail spur, temporary and permanent parking areas, construction laydown areas and various temporary and permanent ancillary facilities.

1.4 Affected Species

The USFWS has determined that the Indiana bat may be present in the area affected by the Project, because of the proximity of the project site to several hibernacula, and it is therefore likely that suitable habitat that exists within the BBNPP project area is used by this species (Turner et al., 2009). The Indiana bat is federally listed as endangered and listed in the Commonwealth of Pennsylvania as endangered.

2. CONSULTATIONS AND SITE SURVEYS

In December 2007, PPL requested an environmental review of the BBNPP site and vicinity for the presence of rare, threatened and endangered species from the USFWS, Pennsylvania Game

Commission (PGC), Pennsylvania Fish and Boat Commission (PFBC), and Pennsylvania Department of Conservation and Natural Resources (PDCNR). In the Commonwealth of Pennsylvania, jurisdiction for mammals, including the Indiana bat, falls under the purview of the PGC and the USFWS. Responses from all four agencies regarding the presence or absence of rare, threatened and endangered species within the vicinity of a project area are valid for one year.

In a letter dated January 18, 2008, the USFWS indicated that the BBNPP site was within the range of the Indiana bat (Appendix A) and requested that PPL provide additional information on forested areas that would be disturbed by the Project. The PGC, in a letter dated April 10, 2008, indicated that the BBNPP site was within the range of two species of special concern: small-footed myotis (*Myotis leibii*), which is state threatened, and northern myotis (*Myotis septentrionalis*), which is a state candidate species (Appendix A). The Indiana bat was not included by the PGC as a species of concern that may occur in the vicinity of the BBNPP site.

PPL provided the information requested by the USFWS on March 26, 2008 (Appendix A). In response, the USFWS requested in a communication dated April 21, 2008 (Appendix A) that a bat survey of the project area be completed between May 15th and August 15th and that any caves or mine openings on the site be identified.

As a result of this letter, a survey was completed to determine if the Indiana bat was present on the BBNPP site. This investigation was conducted by Dr. Karen Campbell, a USFWS-approved Qualified Indiana Bat Surveyor, between June 7 and July 11, 2008 following the USFWS Bat Mist Netting Guidelines. Study techniques included mist net sampling, acoustic (echolocation) monitoring using hand-held AnaBat ultrasonic detectors, and a survey for cave and mine openings that could indicate the potential presence of hibernacula on-site. The primary purpose of surveys conducted under these guidelines is to identify the presence or probable absence of maternity colonies.

No Indiana bats were collected by the mist net surveys and none were detected by acoustic monitoring. In addition, no potential hibernacula were identified within the BBNPP Project Boundary.

Although no Indiana bats were collected during the mist net survey, four northern myotis (*Myotis septentrionalis*), eight little brown bats (*Myotis lucifugus*), and four big brown bats (*Eptesicus fuscus*) were captured, tagged and released. Results of acoustic monitoring were consistent with the echolocation signatures for big brown bats and the *Myotis* species captured during mist netting. The little brown and big brown specimens included reproductively active females, and adult or juvenile males, while the northern myotis specimens were all adult males. These findings suggest that northern myotis use of the site may be limited to roosting only, while the other two bat species use the site for both roosting and maternity colonies (AREVA, 2010b). The

little brown bat (Kunz et al., 2010) and northern myotis (USFWS, 2011a) have the potential to be listed by the USFWS in the near future.

Results of the investigation were included as part of the COL application Environmental Report submitted to the NRC in October, 2008 (UniStar, 2010). As previously discussed, the NRC subsequently requested comment, in a letter dated January 12, 2009, from the USFWS on the environmental scoping process and federally protected species within the area affected by the proposed construction of BBNPP.

The USFWS indicated in its July 10, 2009 response to the NRC that the Service could not conclude that either summer habitat for males or maternity colonies would not be affected by the BBNPP Project, due to the mist netting survey area that was selected, and it should be assumed that suitable forested areas on the site could potentially be used by Indiana bats for fall foraging, roosting and swarming habitat, because BBNPP is located within 10 miles of a hibernaculum (Appendix A).

On February 9, 2010 a meeting was held at USFWS Offices in State College, PA with representatives of NRC, ACOE and USFWS. The original topic of the meeting was to discuss avoidance and minimization activities to protect the Indiana bat; USFWS also discussed the need to perform a Biological Assessment (BA) for Indiana Bats to fulfill ESA Section 7 requirements relative to documentation of potential significant impact to the Indiana Bat. Discussion with the agencies also included lead agency designation and the scope of the BA.

Representatives of the USFWS, NRC, USACE and PPL discussed the conclusions of the USFWS response letter on June 1, 2010 (Normandeau, 2010a). Following the discussion, the USFWS and USACE also inspected forested areas on the BBNPP site. As an outcome of the discussion, the NRC determined that it should prepare a BA for the Indiana Bat.

In September 2010, PPL requested environmental reviews for the presence of rare, threatened and endangered species from the USFWS, PGC, PFBC, and PDCNR for a study area encompassing the BBNPP Project Boundary and a surrounding 0.5 mile buffer. These environmental reviews were needed to cover the expanded project area and because agency responses for the initial project review were more than one year old and no longer valid.

The PGC, in a letter dated December 28, 2010 (Appendix A), responded that potential impacts to the Indiana bat may be associated with the Project. However, in contrast to the agency's April 21, 2008 response discussed above, no other potential species impacts were noted. Furthermore, PGC stated that it would defer to the USFWS on potential project impacts, since the Indiana bat is a federally-listed endangered species. No letter of response has been received yet from the USFWS.

3. PROJECT DESCRIPTION

The BBNPP Project Boundary encompasses 2,055 acres (831.6 hectares [ha]) of land in an area of open deciduous woodlands interspersed with grasslands, previously cultivated fields, and orchards that support a variety of habitats as well as the facilities for the existing SSES Units 1 and 2 (Figure 1). The limit of disturbance boundary associated with BBNPP encompasses 687 acres, of which 677 acres (274 ha) will actually be disturbed by site preparation and construction. Furthermore, 457 acres (185 ha) would be permanently dedicated to BBNPP and its supporting facilities and converted to structures, pavement, or other intensively-maintained exterior grounds, or from forested land to scrub/shrub vegetation within transmission line and vehicle, rail and utility bridge corridors (UniStar, 2010). Impacts to natural resources are expected to originate primarily from the site preparation activities and construction phase of the Project, but will also result from the operation and maintenance of the new unit.

Construction, operation and maintenance activities that could potentially affect the Indiana Bat are described below.

3.1 Construction

The area of construction disturbance within the BBNPP Project Boundary is illustrated in Figure 2. Of the total acreage to be disturbed, approximately 623 acres (252 ha) of impacts will occur to areas that are not currently developed. Clearing and grubbing will result in temporary and permanent conversions of various habitat types including forest, agricultural, wetland, and scrub/shrub habitats.

Approximately 369.4 acres (149.5 ha) of undeveloped land would be permanently converted to structures, pavement, or other intensively-maintained exterior grounds. These facilities will include the proposed power block, switchyards, cooling towers, Essential Service Water Emergency Makeup System (ESWEMS) Retention Pond, wastewater retention pond, water treatment building, permanent parking and laydown areas, access roads, rail spur, and Circulating Water System (CWS) Makeup Water Intake Structure.

Approximately 220.3 acres (89.2 ha) of undeveloped land would only be temporarily converted - to accommodate the concrete batch plant, temporary sedimentation pond, dredge dewatering basin, topsoil stockpiles and temporary offices, warehouses, parking and laydown areas. Temporary wetland losses associated with the installation of water intake and discharge pipelines will be 0.78 acres (0.32 ha). Acreage not containing permanent structures would be restored by grading and revegetating to the extent practicable and certain portions may be designated for wetland or other habitat mitigation.

Approximately 33.0 acres (13.4 ha) would be permanently converted to accommodate transmission lines and vehicle, rail and utility pipeline bridge corridors. These areas include both forested upland and forested wetland areas that will require forest clearing for transmission line

rights-of-way and bridges. Transmission line corridors and areas under and adjacent to bridges will be permanently maintained as scrub/shrub habitats following PPL vegetation management programs.

Wetlands comprise approximately 1.4 acres (0.57 ha) of permanently lost terrestrial habitat. Additionally, 742 linear feet (226 m) of stream channel outside of the wetlands areas will be permanently filled.

Construction of the surface water CWS Makeup Water Intake Structure and blowdown diffuser structure will involve very minor impacts of 0.6 acres (0.24 ha) and 0.7 acres (0.28 ha), respectively, within the Susquehanna River. The remaining disturbed area of approximately 0.1 acres (0.04 ha) will be temporarily disturbed, only, to accommodate cofferdams, necessary excavation work and other construction activities within the river.

Total temporary and permanent losses of forested cover will include 222.2 acres (89.9 ha) of upland deciduous forest and 11.3 acres (4.6 ha) of palustrine forested wetland. In addition to the cleared forested areas, approximately 2.8 acres (1.1 ha) of forest will be fragmented and isolated, effectively lost as viable Indiana bat habitat (Figure 3). Forest areas were determined not to be suitable Indiana bat habitat based on small size and physical separation (>1000 feet [305 meters]) from suitable habitat. The majority of both the upland and wetland forest cover that will be cleared is composed of well-developed overstory and understory strata. Other vegetation losses from both permanent and temporary disturbances will include approximately 63.4 acres (25.7 ha) of upland scrub/shrub vegetation; 168.2 acres (68.1 ha) of old field vegetation and former agricultural land including an abandoned orchard, 148.2 acres (60.0 ha) of agricultural land, and 7.2 acres (2.9 ha) of palustrine emergent vegetation**.**

3.1.1 Transmission System Modifications

Although certain sections of two off-site transmission lines will need to be reconductored to avoid network overloads during peak usage periods, no new off-site transmission corridors or other off-site land use would be required to connect the new reactor unit to the existing electrical grid (UniStar, 2010). Numerous breaker upgrades and associated modifications will be required at existing off-site substations and switchyards, but all of the modifications would be implemented within the existing substations and switchyards.

3.1.2 Wetland Mitigation Activities

A description of potential wetland mitigation activities that may be undertaken at the BBNPP site is presented below. Mitigation measures for the Indiana bat are discussed in Section 7.

Wetland mitigation in Pennsylvania is driven primarily by conditions established by the USACE and Pennsylvania Department of Environmental Protection (PADEP) in permits issued under Section 404 of the Clean Water Act and Chapter 105 Dam Safety and Waterway Management Regulations. Wetland mitigation follows a sequencing process requiring avoidance of wetland

impacts, minimization of unavoidable wetland impacts, and compensatory mitigation to offset impacts not able to be avoided or minimized. The proposed facilities have been sited and the proposed construction has been configured to avoid encroaching into wetlands to the extent possible.

Several measures will be taken to minimize unavoidable adverse effects to wetlands. The use of silt fences, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices will reduce the risk of sediment runoff into intact wetlands adjacent to disturbed areas, as well as wetlands located downstream of the project area. Infiltration beds will be constructed on the periphery of the power block, laydown, cooling tower, parking areas and switchyard areas to collect and treat surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. These and other BMPs will be important in minimizing the changes in hydrologic conditions from facility construction and operation.

Commonly used forms of compensatory wetland mitigation include restoration or enhancement of degraded wetlands, creating (constructing) wetlands in areas that are not wetland, and preserving areas of intact wetlands. The proposed wetland impacts would be permanent; hence, restoring the filled wetlands after completion of construction activities would not be possible.

Compensatory wetland and water body mitigation for the BBNPP site will include:

- Re-creating the same type of habitats as are lost.
- Creating wetlands in the same watershed as the permanently affected wetlands and aquatic features disturbed by BBNPP construction, and in most cases in the same sub-watershed.
- Replacing lost wetland habitat functions and values; selection and design of mitigation measures for BBNPP will rely upon a site-specific functions and values analysis, which identifies the important characteristics provided by those wetlands to be altered or lost as a result of BBNPP construction.
- Providing mitigation at a ratio of wetlands replaced to wetlands lost that is greater than the actual amount of sensitive resources affected to mitigate for temporal losses of functions and values during the period of mitigation area maturation.
- Enhancing existing unaffected habitats on the BBNPP site so as to improve the physical integrity, functions and values of riparian and wetland buffer zones.

While compensatory mitigation for BBNPP is designed to meet these guiding principles, the ultimate determination of the areal requirements for mitigation will be based upon the Project's unavoidable impacts. Construction of the BBNPP Project will permanently impact approximately 1.4 acres (0.57 ha) of wetlands. In addition, 7.9 acres (3.2 ha) of forested

wetlands located within proposed transmission line rights-of-way and vehicle, rail and utility pipeline bridge corridors will be permanently converted to scrub-shrub and emergent wetland types. This conversion will produce temporary and indirect impacts. Also, the installation of water intake and discharge pipelines will result in additional minor temporary wetland impacts of 0.78 acres (0.32 ha). The total mitigation provided for BBNPP will result in a substantially greater area of compensatory wetlands than that impacted by construction.

Restoration and rehabilitation of affected Waters of the Commonwealth and adjacent riparian buffer zones are also an integral component of the BBNPP mitigation plan. While direct impacts to waterways are limited, restoration and enhancement of degraded waterways on and near the BBNPP site will be included in the BBNPP mitigation design as actions to reduce impacts to streams and wetlands. In addition, a limited program of invasive species control, replanting of native tree and shrub species, installation of stabilization measures and incorporation of physical in-stream habitat enhancements will be proposed at waterways within the BBNPP Project Boundary. Reforestation of wetlands and riparian areas would be expected to benefit Indiana bats as these areas are primary foraging habitats.

In order to compensate for activities affecting wetlands and riparian zones and to provide habitat mitigation, forested habitat will be evaluated for permanent preservation within the watershed where BBNPP is located. Conservation and management of forested habitat, especially in riparian corridors, would be expected to benefit Indiana bat as they would provide forested migration corridors and potential foraging and roosting habitat.

A comprehensive 10-year monitoring and corrective action plan will be proposed for implementation following the construction of BBNPP mitigation features. The plan will ensure the original design goals are met, provide an active feedback mechanism allowing for identification and correction of areas of concern within the mitigation areas, and meet applicable regulatory agencies' requirements for annual reporting of the condition of the mitigation areas.

A specific wetlands mitigation plan has been developed and is provided in the Joint Permit Application filed with the USACE and DEP on June 29, 2011. Additional specific detail on project impacts, compliance with regulatory standards and mitigation is provided in this document.

3.2 Operation

BBNPP will produce approximately 1,600 megawatts of electricity that would be sold into the regional market. This facility will consist of a four loop, pressurized water reactor with a Reactor Coolant System composed of a reactor pressure vessel containing fuel assemblies; a pressurizer, including ancillary systems to maintain system pressure; a reactor coolant pump and a steam generator for each loop; associated piping, and related control and protection systems. Operation of this facility will be regulated by the NRC.

BBNPP will use closed-cycle, wet cooling systems. Two natural draft cooling towers will be used to dissipate heat from the CWS that serves the main steam turbine condenser. There will also be four smaller Essential Service Water System (ESWS) cooling towers to dissipate heat from the Component Cooling Water System heat exchangers and the heat exchangers of the Emergency Diesel Generators. Each of these four safety-related trains uses a two-cell mechanical draft cooling tower to dissipate heat. Makeup water for all of the cooling towers will be drawn from the North Branch of the Susquehanna River to replace losses from evaporation, blowdown, and drift. (UniStar, 2010)

Impacts from fogging, icing, shadowing, and drift deposition were modeled using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact (SACTI) prediction code. This code incorporates the modeling concepts which were endorsed by the NRC Standard Review Plans for Environmental Reviews for Nuclear Power Plants (NUREG-1555) (NRC, 1999). The model provides predictions of seasonal, monthly, and annual cooling tower impacts from mechanical or natural draft cooling towers. It predicts average plume length, rise, drift deposition, fogging, icing, and shadowing, providing results that have been validated with experimental data (UniStar, 2010). No ground-level fogging and icing would occur for the Bell Bend natural draft cooling towers, since ground-level impacts are not possible for plumes from tall natural draft cooling towers.

The maximum predicted salt deposition from the cooling towers is well below the NUREG-1555, Section 5.3.3.2 (NRC, 1999) significance level for possible vegetation damage of 8.9 pounds per acre per month (10 kg per ha per month) in all directions from the cooling tower during each season and annually. The maximum predicted salt deposition is less than 0.1 kg/ha per month. Therefore, no impacts to vegetation from the salt deposition would be expected for both on site and off site locations (UniStar, 2010).

Quantitative studies of vegetation and plant diseases were conducted for SSES from 1977 through 1994. Significant changes detected in plant community composition over this time were attributed to normal vegetation dynamics such as succession and animal interaction, and not to SSES operation (Ecology III, 1995). In addition, findings for plant diseases were similar for preoperational (1977-1982) and post-operational (1983-1994) study periods. No effects of salt drift from SSES were detected.

The principal noise sources associated with normal operation of the BBNPP cooling water system are the CWS and ESWS cooling towers. Noise generated from cooling towers is more specific to mechanical draft cooling towers, which use numerous fans to aid in heat dissipation. Noise levels from natural draft cooling towers (i.e. no use of fans) are expected to be insignificant. Noise surveys were conducted in the vicinity of SSES in February and March 2008 and June 2010, to measure ambient environmental community noise levels to establish a baseline noise level in the presence of the existing two-unit SSES. Measured ambient sound levels during operation of SSES could be attributed to normal, current environmental sources,

such as traffic noise, high wind and rain and were not related to the existing plant (UniStar, 2010).

Noise generated by the CWS and ESWS cooling towers is unlikely to have deleterious effects on wildlife. Wildlife is generally more sensitive to sudden and random noise events, which can induce a startle response similar to that induced by a predator, than to the steady continuous noise produced by operation of a cooling tower (USFWS, 1988).

The proposed cooling towers would not be expected to cause substantially elevated bird mortality due to collisions. Although infrequent bird collisions with the proposed cooling towers are possible, the overall mortality potentially resulting from bird collisions with cooling towers are reported to have only minor impacts on bird species populations (NRC, 1999).

There are no major sources of air pollution in the vicinity of the BBNPP site. Existing diesel generators and boilers at SSES Units 1 and 2 operate for limited periods. Diesel generators that are associated with BBNPP will also operate for limited periods. Interactions between pollutants emitted from these sources and the plumes from the cooling towers for SSES Units 1 and 2 are of sufficient distance and would not have a significant impact on air quality (UniStar, 2010).

The water intake for BBNPP will be located just downstream of the existing intake structure for SSES on the Susquehanna River. The discharge outfall will enter the River downstream of the existing SSES discharge system through a buried pipe that will be connected to a multi-port diffuser positioned perpendicular to the River flow. Because the discharge stream volume will be small relative to the volume of the River, concentrations of solids and chemicals used in cooling tower water treatment will rapidly dilute and approach ambient concentrations in the River after exiting the discharge pipe. The operation of BBNPP will comply with a PADEP-issued Nation Pollution Discharge Elimination System (NPDES) permit, and the applicable state water quality standards. All biocides or chemical additives in the discharge will be among those approved by the U.S. Environmental Protection Agency (USEPA) and the Commonwealth of Pennsylvania as safe for humans and the environment (UniStar, 2010).

The NPDES permit will also require a Post-Construction Stormwater Management (PCSM) Plan, which prevents or minimizes the discharge of potential pollutants with the storm water discharge, to reflect the addition of new paved areas and facilities and changes in drainage patterns. To help intercept surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats, storm water infiltration beds will be constructed on the periphery of the power block, laydown, cooling towers, parking areas and switchyard areas. These beds will be important in minimizing the changes in hydrologic conditions after construction is completed. Infiltration beds serve several storm water functions including volume reduction, groundwater recharge, control of peak runoff rates, and maintenance of water quality. Routing of runoff from the plant site through infiltration beds will help maintain the temperature of the water being discharged into the wetlands and minimize sediment transport to the wetlands.

Various types of waste would be generated by the operation of BBNPP. Wastes are classified as; non-hazardous waste, sanitary waste, hazardous waste, mixed waste, and nuclear waste. BBNPP will recycle, recover, or send off-site for disposal all solid waste other than spent fuel in accordance with applicable state and federal regulatory programs.

3.3 Maintenance

Grounds maintenance activities for areas within the immediate vicinity of the power block and CWS cooling towers will result in an intensively managed and permanently maintained landscape with limited vegetative cover. Other areas on-site that are adjacent to and/or occupied by transmission lines and switchyards, vehicle and rail access ways, storm water management facilities, utility pipeline corridors, and ancillary plant facilities will also be subject to ongoing maintenance activities that allow for only limited vegetative cover. These areas include both forested upland and wetland areas that will be cleared for transmission line rights-of-way and bridges. Transmission line corridors and areas under and adjacent to bridges that were previously forested will be permanently maintained as scrub/shrub habitat following PPL vegetative management programs.

In the Susquehanna River periodic sediment removal via dredging may be required to maintain the depth of the area immediately in front of the entrance to the BBNPP intake structure. Based on the current frequency of dredging at the SSES intake structure, it is anticipated that maintenance dredging at the BBNPP intake would take place approximately once every 5 to 10 years. There are no impacts to Indiana bat associated with this periodic sediment removal activity.

4. ACTION AREA

4.1 Background

The ESA Consultation Handbook defines the Action Area as encompassing all areas to be affected directly or indirectly by the Federal action and is not limited to the immediate area involved in the action (USFWS and NMFS, 1998). Direct effects are defined as the immediate effects resulting from the agency action on the species and/or its habitats, including the effects of interrelated actions and interdependent actions. Interrelated activities are part of, and justified by, the proposed action. Interdependent activities have no independent utility apart from the action under consultation. Indirect effects are caused by or result from the proposed action, are later in time, are reasonably certain to occur and may occur outside of the area directly affected by the action (USFWS and NMFS, 1998). In addition, the proposed Action includes conservation measures which will be taken to benefit the species under review. Therefore, the Action Area should include the vicinities in which these conservation measures will be implemented.

4.2 BBNPP Action Area

The BBNPP Action Area encompasses all lands that potentially serve as Indiana bat habitat which will be affected in some manner by the proposed Action through direct, interrelated, interdependent and indirect activities as described above. Direct effects will focus on the area of disturbance within the BBNPP Project Boundary where nearly all activities for construction of BBNPP facilities (Section 3.1) will take place, as well as a 200-foot buffer around the construction area to account for potential off-site construction related noise effects on Indiana bats (Section 6.0). Figure 2 identifies the Action Area with respect to direct effects.

Interrelated activities will consist of several off-site roadway intersection improvements to mitigate traffic congestion associated with the construction workforce and the delivery of construction materials, as well as the extension of potable water and sewer lines by the Pennsylvania American Water Company and the Berwick Area Joint Sewer Authority, respectively, to the BBNPP site (Figure 2). In addition, a suite of potential mitigation options for the Project is under consideration, as discussed in Section 7.0, and the Action Area with respect to interrelated activities includes Indiana bat conservation measures undertaken on any on-site and off-site lands.

Reforestation will take place on suitable BBNPP site lands following construction of the facility as well as on adjacent non-forested PPL-owned land (approximately 58 acres [23 ha] in total). Natural succession will be allowed to take place on dedicated on-site and off-site agricultural land (approximately 137 acres [48 ha] in total). Habitat conservation and management will conserve and enhance Indiana bat habitat and will be implemented on dedicated on-site and off-site parcels of forest (approximately 386 acres [156 ha] in total). Off-site land parcels for reforestation, natural succession, habitat conservation and management have been identified and are included in the Action Area.

At this time, there are no known or foreseeable interdependent activities that should be integrated into the Action Area, including the proposed Susquehanna to Roseland transmission line. The Susquehanna to Roseland project, as originally conceived, is intended to satisfy an increased demand for electric power and enhance the reliability of the electric grid in the northeastern portion of the PJM Interconnection region, and will be connected to SSES Units 1 and 2. Although the transmission line will also provide an outlet for electric power generated by BBNPP, it is being constructed independently of the BBNPP Project and its viability is not dependent upon the final outcome of the Project.

Indirect effects that are certain to occur will result from operation and maintenance of BBNPP facilities as discussed in Sections 3.2 and 3.3, respectively. However, as noted these activities will be confined largely to the project site.

4.2.1 Physical Conditions

As discussed in Section 3.0, the 2,055-acre (831.6-ha) BBNPP Project Boundary consists largely of deciduous forest and fallow agricultural land in various stages of secondary succession. Current land use supports a variety of habitats as well as facilities for the existing SSES Units 1 and 2 (Figure 1). Forested land comprises approximately 885 acres (358 ha) or 43 percent of the land cover and consists of uplands and wetlands cover types. Upland forest (772 acres [312 ha]) is dominated by red maple (*Acer rubrum*), and to a lesser degree by red oak (*Quercus rubra*), white oak (*Quercus alba*), and sweet birch (*Betula lenta*). Black cherry (*Prunus serotina*) and black oak (*Quercus velutina*) are also relatively common. Forested wetlands (113 acres [46 ha]) are also largely comprised of red maple and to a lesser degree pin oak (*Quercus palustris*), silver maple (*Acer saccharinum*), tulip poplar (*Liriodendron tulipfera*), and black locust (*Robinia pseudoacacia*). Black cherry, black walnut (*Juglans nigra*), and river birch (*Betula lenta*) are also relatively common (AREVA, 2010a).

Most of the mature trees on-site are between 40 and 70 years old, and the oldest trees are located primarily in wetlands, on steep slopes, or in generally inaccessible areas that were not farmed historically. Approximately 233.5 acres (94.5 ha) of forested land will be cleared for construction of the BBNPP, of which 222.2 acres (89.9 ha) are upland and 11.3 acres (4.6 ha) are wetland. In addition to the cleared forested areas, approximately 2.8 acres (1.1 ha) of forest will be fragmented and isolated, effectively lost as viable Indiana bat habitat (Figure 3). Additional minor temporary impacts to forested wetlands associated with the installation of water intake and blowdown pipelines are 0.78 acres (0.32 ha).

4.2.2 Biological Conditions

Detailed surveys were completed in October 2010 and July 2011 to characterize the forested areas that will be cleared for the BBNPP. The surveys focused on the suitability of the forest areas as roosting habitat for Indiana bats and specifically addressed roosting habitat for males during the summer and for both sexes during the time of fall swarming. Both the interior sections and edges of these forest areas were surveyed for potential roost trees (PRTs) and the results are presented in a report entitled *Indiana Bat Roost Tree Study Report for the Proposed Bell Bend Nuclear Power Plant Site Luzerne County, Pennsylvania*, which is included in Appendix B and summarized below.

The forested habitat on the BBNPP site was found to provide abundant foraging opportunities for bats in general, including the Indiana bat. Bats often forage over water and wetlands, and along forest edges. Standing water is present in most of the wetlands on the BBNPP site, depending on time of year and precipitation received. In normal years, many of the wetlands on the BBNPP site contain standing water year-round.

Forest Areas of approximately 2 acres (0.8 ha) or greater (18 of 33 total) that were proposed for clearing were surveyed for PRTs. Total forest area surveyed encompassed 46.2 acres (18.7 ha)

consisting of 41.7 upland acres (16.9 ha) and 4.5 wetland acres (1.8 ha). Out of the 255 PRTs in the combined interior forest survey area, 118 were live, 114 were dead, and 23 were partially dead. The average diameter-at-breast height (dbh) for all PRTs observed in the forest interior was 14 inches (36 centimeters). In regards to roost type, 252 PRTs offered potential roost sites in the form of exfoliating or defoliating bark, 13 PRTs had suitable crevices, and 5 PRTs had suitable cavities. PRTs may have more than one roost tree characteristic present.

Approximately 75,581 feet (23,035 meters) of forest edge along the forest areas were surveyed for the presence of PRTs. Out of the 286 PRTs identified, 192 were live, 77 were dead, and 17 were partially dead. Similar to forest interiors, the average dbh for PRTs observed on the forest edge was also 14 inches (36 centimeters). In regards to roost type, 285 PRTs offered potential roost sites in the form of exfoliating or defoliating bark, 4 PRTs had a crevice suitable for roosting, and 1 PRT had a cavity suitable for roosting.

PRT densities were compared to U.S. Department of the Interior (USDOI) standards for suitable Indiana bat summer habitat which recommend a minimum of 6 PRTs/acre (14.8 PRTs/ha) for interior forest and 1 PRT/500 feet (1 PRT/152 meters) for forest edges (USDOI, 2009). Interior forest as a whole, and when subdivided into wetlands and uplands, essentially met or exceeded the recommended 6 PRTs/acre (14.8 PRTs/ha) for suitable Indiana bat summer roosting habitat. Wetlands, averaging 8.1 PRTs/acre (19.9 PRTs/ha), exceeded the threshold, and interior forest as a whole (5.5 PRTs/acre [13.6 PRTs/ha]) and uplands (5.2 PRTs/acre [13.0 PRTs/ha]) were slightly below the threshold. Forest area edges also provide PRTs at densities suitable for Indiana bat summer roosting habitat. Forest edges as a whole, at 1.9 PRTs/500 feet (1.9 PRTs/152 meters) also exceeded the USDOI recommended 1 PRT/500 feet (1 PRT/152 meters). Detailed results by forest area are presented in the Indiana Bat Roost Tree Survey Report (Revision 2) provided in Appendix B.

PRT quality for the site was evaluated based on the density of “high,” “moderate,” or “low” roost trees as determined by the USFWS PRT ranking system (See Appendix B). Interior forest as a whole yielded an estimate of 1.7 high PRTs/acre (4.2 high PRTs/ha), 2.4 medium PRTs/acre (5.9 medium PRTs/ha), and 1.4 low PRTs/acre (3.5 low PRTs/ha). Subdividing the interior forest into wetlands and uplands indicated that wetlands provided higher densities of high PRTs (4.0 high PRTs/acre [9.9 high PRTs/ha] versus 1.4 high PRTs/acre [3.6 high PRTs/ha]), similar densities of medium PRTs (2.5 medium PRTs/acre [6.1 medium PRTs/ha] versus 2.4 medium PRTs/acre [5.9 medium PRTs/ha]) and similar densities of low PRTs (1.6 low PRTs/acre [3.9 low PRTs/ha] versus 1.4 low PRTs/acre [3.5 low PRTs/ha]). The forest edges as a whole yielded an estimate of 0.6 high PRTs/500 feet (0.6 high PRTs/152 meters), 0.8 medium PRTs/500 feet (0.8 medium PRTs/152 meters), and 0.5 low PRTs/500 feet (0.5 low PRTs/152 meters). Detailed results by forest area are presented in the report enclosed in Appendix B.

The roost tree study concluded that some of the surveyed interior forest and many of the surveyed forest edges provided densities of PRTs suitable for Indiana bat roosting habitat based on USDOI

criteria. Additionally, based on the USDOI and USFWS criteria, forested wetlands provide higher quality roosting habitat than forested uplands at the site. Forested wetlands had higher overall densities of interior forest PRTs and higher overall densities of high PRTs than upland forests.

5. SPECIES AND HABITAT DESCRIPTION

5.1 Range and Population Level

The historic range of the Indiana bat includes much of the eastern United States, extending west to Iowa and the Ozarks of eastern Oklahoma, north to Michigan, east to the Connecticut River Valley and northern New Jersey, and south to northern Alabama and Arkansas. The species has disappeared from, or greatly declined in, most of its former range in the northeastern United States (Nature Serve, 2010). Range-wide, the total population of Indiana bats was estimated to be about 417,000 in 2009. This population estimate is based on surveys of known over-wintering sites (hibernacula) where Indiana bats gather and roost communally (USFWS, 2011b).

The Indiana bat is found in low numbers throughout most of its range. The 2009 population estimate is less than half as many as when the species was listed as federally endangered in 1967. Fifty-two percent of the population occurs in Indiana, with less than one percent of the total population estimated to be present in Pennsylvania (USFWS, 2011b). Based on recent surveys conducted by PGC biologists, the USFWS estimates that about 1,000 Indiana bats hibernate in Pennsylvania. Nine Indiana bat summer maternity sites have been found in seven Pennsylvania counties and there have been mist-net captures in summer habitat in four counties (Butchkoski, 2010).

Winter hibernacula have been documented at 19 locations in ten Pennsylvania counties, including Luzerne County (Figure 4; Turner et al., 2009). Luzerne County has three known bat hibernacula within a 10-mile radius of the BBNPP site, the Glen Lyon Anthracite Mine, Dogtown Mines, and the Penn Wind Hazleton 09 site (Figure 5). All three of these hibernacula occur in abandoned anthracite mines and no interior bat counts have been possible due to safety concerns. Instead, the total population of all species combined is estimated based on fall swarming activity near the mine entrances (Turner et al., 2009). The total hibernating population for all bat species at the Glen Lyon hibernaculum is estimated at 50,000 to 100,000 individuals, and the Indiana bat component could range from dozens to more than 100 individuals (Normandeau 2010b). Unpublished information indicates that bat abundance at Glen Lyon mines has decreased substantially since the introduction of White-nose Syndrome (WNS). No population estimates are available for either the Dogtown Mines hibernaculum or the Penn Wind Hazleton 09 hibernaculum.

Indiana bat hibernacula are assigned priority numbers ranging from Priority 1 (highest) to Priority 4 (lowest) based on the number of Indiana bats present (USFWS, 2007). All three

hibernacula in the vicinity of the BBNPP site are designated as Priority 4 sites, which are least important to recovery and long-term conservation of Indiana bats, and have current or observed historic populations of fewer than 50 bats (Turner et al., 2009). However, the Glen Lyon hibernacula may qualify as a Priority 3 site, defined as having current or observed historic populations of 50 to 1,000 bats (Normandeau, 2010b).

Summer maternity sites for Indiana bats have been documented through mist netting or telemetry studies at nine locations in seven Pennsylvania counties, consisting of Adams, Armstrong, Berks, Bedford, Blair, Green and York counties (Butchkoski, 2010a; 2010b). Based on range-wide population estimates for the United States derived from winter hibernacula surveys, it is believed that only a fraction of the existing maternity colonies have been found as they are widely dispersed during the summer and difficult to locate. Although additional Indiana bat maternity colonies may exist in Pennsylvania and elsewhere, they appear to be relatively less common in the mid-eastern United States than in the Midwest, which is the more central portion of this species range (USFWS, 2007).

As discussed in Section 2, there are no hibernacula located on-site, and a survey following the USFWS Bat Mist Netting Guidelines (USFWS, 2007) conducted on the BBNPP site between June 7 and July 11, 2008 did not identify any Indiana bats on-site. Three other species, the northern myotis, little brown bat, and big brown bats were captured, tagged and released (AREVA, 2010b).

5.2 Threats

Significant threats to the Indiana bat include human induced disturbance and alterations at hibernation sites, loss of summer habitat, contaminants, and WNS. Wind power development also poses a threat, and vandalism and indiscriminant killing have also been a problem at some caves (Butchkoski, E., 2010; USFWS, 2010a).

Disturbance within over wintering caves causes bats to arouse, deplete their energy reserves, and potentially increases over-winter mortality. Sources of disturbance include informal recreational activities and commercialization of caves. Alteration of conditions at a hibernaculum can render it unsuitable for over-wintering bats or exclude bats from entering. Exclusion of bats can occur due to poorly designed barriers to human access or by gates installed for other reasons. Additionally, improperly constructed gates can alter the air flow, trap debris, and block the entrance by not allowing enough flight space. Altered exchange of air with the outside environment can cause significant changes in cave temperature and humidity and may cause the bats to abandon the cave. Changes in cave temperatures can also be induced by opening additional entrances. Improperly constructed gates may also subject the bats to severe predation as they attempt to pass through the gates (Nature Serve, 2010).

In response to these issues, most known, major over-wintering sites are currently protected in some way. Despite protection at over-wintering sites, populations continue to decrease in several portions of their range, suggesting that the species is being negatively affected by disturbance or loss of summer habitat. Loss and degradation of summer habitat and roost sites due to impoundment, stream channelization, housing development, clear cutting for agricultural use, mining, or incompatible forest management practices that result in a shortage of the microhabitats used for maternity roosts may be the primary factors in recent population declines (Nature Serve, 2010).

Pesticides and environmental contaminants may also affect all bats, including Indiana bats, through two mechanisms. In local areas, insects may not be plentiful because of pesticide use, reducing the food base of these species. Pesticide use may affect the quality as well as the quantity of the bats' food supply. Environmental contaminants may also have health consequences for bats, and they have the potential to absorb relatively high contaminant loads by eating contaminated insects, drinking contaminated water, or absorbing the chemicals while feeding in areas that have been recently treated (USFWS, 2010a).

WNS is an emerging threat to all species of hibernating bats, including the Indiana bat. WNS was first observed in February 2006, west of Albany, New York, and more than a million hibernating bats have died since then (USFWS, 2011c). Affected bats usually have white fungus on their muzzles and other parts of their bodies, and frequently lack adequate body fat to survive until spring. These bats may exhibit uncharacteristic behavior such as moving to cold parts of the hibernaculum, and flying during the day and during cold winter weather when the insects they feed upon are not available. Since the disease emerged in 2006, bats displaying the symptoms of WNS have been observed in and around caves and mines from Maine and New Hampshire south to North Carolina and Tennessee and in the Canadian provinces of Ontario, Quebec, New Brunswick and Nova Scotia. WNS is suspected in states as far west as Oklahoma, and has been confirmed in Pennsylvania (USFWS, 2011c). Ninety to 100 percent mortality has been documented in some hibernacula and there is an emerging consensus that the mode of transmissions is from bat to bat. This puts a highly colonial hibernator like the Indiana bat at particular risk (USFWS, 2010c).

Mortality due to collisions with wind turbines have been recorded for a wide variety of bat species in North America, including at least one Indiana bat (USFWS, 2010d). Collisions appear to happen primarily during the migration period (Arnett et al., 2008), and some populations of Indiana bats do migrate considerable distance between their summer habitats and their hibernacula. The reason that migrating bats appear to be more susceptible to collisions is unclear, but wind power developments located within migratory pathways, near hibernacula, or within summer habitat are believed to pose a potential threat to this species.

5.3 Species Description – Morphology and Behavior

The Indiana bat is a small insectivorous bat, with a very fine and fluffy, dull grayish chestnut pelage above and pinkish white under parts. The wing membranes and ears are blackish-brown and its total body length is 2.9 – 4.0 inches (75-102 mm); wingspan is 9.5 – 10.5 inches (241-267 mm). It is similar in appearance to other myotids and makes a similar call. The ecology of the Indiana bat is however, distinct.

The Indiana bat is a true hibernator, entering hibernation in the fall and surviving on stored fat until spring. In Pennsylvania, this species begins to enter hibernacula in mid-September, and begins hibernating by early November. Before going into hibernation, and again during the spring emergence, bats swarm around entrances to hibernation sites and rely on nearby surface habitat to forage for insects. Northern breeding populations may migrate south and in some cases, winter and summer habitats may be as much as 278 miles (480 km) apart. Migrants leave hibernation sites in late March and April. Females generally leave earlier than do males, with the greatest exodus in mid- to late April. Some males migrate while most remain in the general geographic vicinity of the hibernaculum throughout the summer (Nature Serve, 2010).

This species is notably gregarious during hibernation. In the center of its range, hibernating individuals characteristically form large, compact clusters of as many as 5,000 bats, averaging 500 to 1,000 individuals per cluster (Nature Serve, 2010). In Pennsylvania, where the population of Indiana bats is lower, this species often mixes with little brown bats (Butchkoski, E., 2010). Clusters form in the same area in a cave each year, with more than one cluster possible in a particular cave. Clustering may have certain benefits, including protecting the central individuals from temperature changes, reducing the sensitivity of most bats to external disturbance, or rapid arousal and escape from predators (Nature Serve, 2010).

Mating occurs in fall, when Indiana bats assemble at cave entrances at dusk and dawn in late August and September. This swarming behavior appears to facilitate breeding and reduce the chances of inbreeding in small summer colonies. Males arrive first at the swarming areas, and the number of bats and the proportion of females rises to a maximum in early September. Females store sperm through the winter, fertilization occurs in spring and a single pup is born in June-July. The rate of development in the young is dependent on weather, particularly the temperature, and mothers have been observed moving non-volant young to warmer roost spots. Typically, the young first fly at 25-37 days of age (Nature Serve, 2010).

Reproductive female Indiana bats migrate from the hibernacula to summer roosting habitat, and have shown strong site fidelity to their traditional summer roosting and foraging areas. They form maternity colonies after arriving at their summer range (late March to mid-May) and cluster in maternity roosts with suitable microclimates that facilitate roost temperatures favorable for prenatal and postnatal development. Maternity colonies most commonly consist of 60 to 100 adult females but may be larger, and may include females from more than one hibernaculum. Composition of

the colony is fluid with females moving between as many as 10 to 20 different maternity roost trees. The majority of female bats use one to three primary maternity roost trees, while the rest of the trees are alternate or secondary maternity roosts. These alternate or secondary roosts are intermittently used by small numbers of females throughout the summer, or on only a few days, or as temporary night roosts. Maternity colonies may occupy maternity roost trees for a number of years; however all maternity roost trees are ephemeral and become unusable by losing important structural characteristics such as bark, by falling to the ground, or due to competition with other animals. The use of alternate maternity roost trees is thought to be a behavioral mechanism that enables bats to evaluate new trees for use as future primary maternity roosts (USFWS, 2007).

The location of summer roosting habitat for non-reproductive female Indiana bats is less well known. They may remain close to their hibernaculum or migrate to summer habitat where they roost individually or in small numbers. Typically, non-reproductive females do not roost in colonies but may be present in the same trees as reproductive females. Males are most commonly found in the vicinity of their hibernaculum but may also disperse throughout the summer range and roost individually or in small groups (USFWS, 2007).

In an Indiana bat population, the observed rate of mortality between birth and weaning was about eight percent. Female survivorship in this same population was 76 percent for ages 1 to 6 years, and 66 percent for ages 6 to 10 years. Male survivorship was 70 percent for ages 1 to 6 years and 36 percent for ages 6 to 10 years. Maximum ages of banded individuals were 15 years for females and 14 years for males (Nature Serve, 2010).

5.4 Species Description – Habitat Requirements

Indiana bat hibernation sites have stringent requirements, including noticeable airflow and the lowest non-freezing temperatures possible. Only a small percentage of available hibernacula provide these temperatures. Indiana bat sites usually also have some standing or flowing water (Butchkoski, E., 2010; Nature Serve, 2010). Roost sites within caves may shift such that bats remain in the coldest area, and individuals may move from a location deeper in the cave to a site nearer the entrance as the cold season progresses. Relative humidity in occupied caves ranges from 66 to 95% and averages 87% throughout the year (Nature Serve, 2010).

In summer and fall, Indiana bats primarily use wooded or semi-wooded habitats, usually near water. Foraging is often focused on riparian areas, ponds, and wetlands, but also takes place in upland forests and fields. Flying insects are the Indiana bat's typical prey items, and diet composition reflects prey present in available foraging habitat (Nature Serve, 2010). Generally Indiana bats roost under the exfoliating bark of trees and occasionally in longitudinal crevices within trees. They rarely use cavities created by rot or woodpeckers, and are only infrequently found using man-made structures (USFWS, 2007). However, most studies of roost characteristics have focused on maternity roosts (described in detail below) and a more limited amount of data suggests that roost preferences may be less strict for males and non-reproductive females.

For maternity roosts (primary and alternate), females prefer dead or nearly dead trees, or dead parts of living trees such as dead trunks of trees with multiple trunks. They are occasionally found on living trees with loose, peeling bark; however, these trees are thought to be used primarily as alternate maternity roosts during exceptionally warm or wet weather. Typically, non-reproductive females do not roost in colonies but may be present in the same trees as reproductive females.

A wide variety of tree species are used for maternity roosts and use is primarily related to local availability of trees with suitable structure rather than a preference for a particular species. In addition, regional differences in maternity roost tree characteristics may result from influencing factors such as weather and altitude. Maternity roost trees are typically found in areas with high solar exposure such as openings within a forest, in a fence line, or along a wooded edge. Higher solar exposure creates warmer roosting sites and, thereby, facilitates faster prenatal and postnatal development of young bats. Female Indiana bats may use structurally suitable trees in more interior sections of forest as maternity roosts during exceptionally warm or wet weather (USFWS, 2007).

Maternity roost trees vary in size, although larger diameter trees are preferred and may provide advantages for thermoregulation, as well as more roosting spaces. The average range-wide diameter of primary maternity roost trees is 18 inches (45.7 cm) dbh. However, average diameters of primary and alternate maternity roost trees in several Midwestern states ranged from 16 to 24 inches (40.6 – 60.9 cm) dbh, and an alternate maternity roost tree in Pennsylvania had a diameter of only 11 inches. The minimum height of maternity roost trees is typically greater than 10 feet (3.0 m), although the absolute height of maternity roost trees is thought to be less important than height and position relative to surrounding trees, which can affect the amount of solar exposure received by a tree (USFWS, 2007).

Male Indiana bats are more flexible in their preferred summer roosting habitat. They roost in the same types of structurally suitable trees as females but not necessarily in areas with high solar exposure. In addition, male bats are more likely to roost in living trees and trees that are smaller. The average range wide diameter of male roost trees is 13 inches (33 cm) dbh (USFWS, 2007).

Beginning in the late summer and into the fall, Indiana bats return to the vicinity of their hibernacula and engage in swarming behavior, which peaks in September and early October. This behavior is characterized by large numbers of bats moving in and out of hibernacula at night but with few roosting inside during daylight hours. Instead, the bats tend to roost individually in surrounding forests. The characteristics of these roosting trees are not well known (USFWS, 2007).

5.5 Similar Species Description

Two bat species with habitat affinities similar to Indiana bat have the potential to be listed by the USFWS in the near future: little brown bat (Kunz et al., 2010) and northern myotis (USFWS,

2011a). Both species were captured during mist netting at BBNPP (see Section 2 and Appendix B).

Little brown bats are typically found mixed in summer roosts and among hibernating clusters with the less common Indiana bat. It is believed that the low statewide numbers of Indiana bats may cause them to use little brown bats as surrogate roosting partners. Based on these two species similar ecologies, biologists have used little brown bats as surrogates for Indiana bats to sample traveling behavior from roosts to foraging areas (Steele et al. 2010). However, primary foraging cores differ between the two species with little brown bats foraging on or adjacent to major bodies of water (rivers and lakes) and Indiana bats focusing on intermittent streams and dry forested hillsides (Butchkoski and Turner 2005).

Northern myotis are found throughout Pennsylvania but never in large numbers, even during hibernation. Forested upland areas appear to be the primary summer foraging habitat for this species containing larger and older trees with cavities and exfoliating bark, similar roost tree characteristics as those utilized by Indiana bat. It typically forages only 1-3 meters above the ground, flying among and above the understory shrubs. They frequently feed by gleaning, taking insects off the ground or vegetation and then carrying them to perches for consumption (Steele et al. 2010). This behavior is thought to allow them to eat larger prey than other *Myotis* species, and one study of diet analysis found that this species consumes more orthopterans and large beetles than little brown bats or Indiana bats (Lee and McCracken 2004).

6. EFFECTS OF PROJECT ACTIONS

6.1 Construction

The construction of BBNPP and all associated facilities will require the removal of 233.5 acres (94.5 ha) of forest, 222.2 acres (89.9 ha) of which are upland forest and 11.3 acres (4.6 ha) of which are forested wetlands. In addition to the cleared forested areas, approximately 2.8 acres (1.1 ha) of forest will be fragmented and isolated, effectively lost as viable Indiana bat habitat (Figure 3). With the exception of danger tree removal discussed below, tree clearing will occur from November 16th to March 31st only, when Indiana bats are hibernating, to avoid direct impacts (direct mortality) to bats that may be roosting on-site during the period of spring emergence through fall swarming. However, seasonal restrictions on tree clearing will not avoid the potential for an indirect but permanent impact on Indiana bats due to the loss of potential roost trees and foraging opportunities.

To the extent practicable, PPL has adopted design measures that are intended to avoid and minimize potential indirect impacts on Indiana bats due to habitat loss that may occur as a result of the construction of BBNPP. These measures include adjustments to the overall layout of the Project to minimize the project footprint, minimize habitat fragmentation, retain forested travel

corridors, and to avoid higher-value habitats. The effort to minimize habitat loss was focused on wetland and riparian areas, where roost trees are present in greater densities (AREVA, 2010a) and where Indiana bats also drink and often forage. Minimization of impacts to wetland and riparian areas included retaining a 50-foot (15.2-meter) buffer around Walker Run and its tributaries and adjacent wetlands. When impacts to streams and wetlands could not be avoided, silt fences, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices are proposed to reduce the risk of sediment runoff into intact wetlands and water bodies adjoining the areas of disturbance, as well as wetlands and water bodies located downstream of the project area. These BMPs will minimize the indirect effects on Indiana bats by reducing adverse impacts on aquatic insect populations and riparian and wetland foraging habitat.

The compensatory wetland and water body mitigation described in Section 3.1.2 is not expected to result in adverse direct impacts to the Indiana bat. Any tree removal associated with construction of compensatory wetlands will be conducted between November 16th and March 31st. The long term impacts of compensatory wetland and water body mitigation will be positive, as the overall wetland acreage in the vicinity of BBNPP will increase thereby providing Indiana bats with additional foraging opportunities. Reforestation and wetland creation and enhancement will be designed to provide Indiana bat habitat in the restored riparian corridor.

Additional minimization and avoidance measures include the following:

- The use of pesticides and herbicides will be avoided or minimized during construction and operation of BBNPP to avoid adverse effects to Indiana bats associated with ingestion of contaminated insects and reduction in local insect populations.

- The following policy will be followed during construction and operation within the BBNPP project boundary. It provides for the removal of trees that present a hazard to property and workers undertaking activities near forested areas and may be implemented at any time of the year. This policy is designed to comply with the Occupational Safety and Health Administration's (OSHA) "Danger Tree Rule" found at 29 CFR 1910.266(h)(1)(vi). Section 7 of the Endangered Species Act (ESA) also provides for removal of Danger Trees, and this policy is also meant to comply with the ESA. Implementation of this policy will only occur in the rare instance that removal needs to occur outside the November 16 to March 31 construction removal window.

  "Danger Trees" are defined as trees with significant defects and the potential to fall, causing harm to workers or property. "Defects" include a wide variety of symptoms not limited to damage cause by insects, lightning, ice/hail, overmaturity, disease, or from impacts with adjacent falling trees/limbs. Dead standing trees or partly dead trees which are stable and not exhibiting imminent danger of falling are not considered danger trees, and will not be managed as such.

Potential danger trees that are greater than 5"dbh within the project boundary will be evaluated as defined below. Potential danger trees that are less than 5"dbh may be immediately removed without evaluation. Evaluation criteria employed for danger trees greater than 5"dbh are contained in the 2008 United States Department of Agriculture Forest Service publication "Field Guide for Danger Tree Identification and Response," R6-NR-FP-PR-01-08.

Upon identification of danger tree(s) greater than 5"dbh requiring removal the tree(s) will be marked, documented with color photographs, and evaluated by a qualified individual (biologist) before being professionally felled and removed.

- If it is determined that an Indiana bat will be harmed by removal of the danger tree, the USFWS will be immediately consulted and notifications will be made to the NRC and PGC prior to removal.
- If it is determined that no Indiana bat will be harmed, the danger tree will be removed and a record of this determination maintained for 5 years.
- When removing a danger tree care will be taken to avoid damage to adjacent trees or other environmental resources. Mechanized land clearing equipment such as skidders will not be employed in danger tree removal.
- Records of routine vegetation management will be maintained for a period of 5 years.

Potential temporary impacts associated with construction of BBNPP consist of disturbance created by noise, visual impacts, and increased night-lighting during night construction. Noise will be generated by construction activities (i.e., movement of people, equipment, and vehicles on-site) and vehicles bringing people and supplies to and from the construction site. Noises that are sudden, loud, and occur unpredictably have the potential to have the greatest impacts. However, all noise is expected to attenuate below the 80 to 85 decibel (dBA) threshold at which wildlife behavior is most affected (as discussed in Section 4) within 158 feet (48 meters) of the active construction area**.** Noise impacts in the 200-foot (61-meter) buffer around the construction zone may deny Indiana bats use of that habitat during construction. However, this area is relatively small compared to the amount of habitat available in the vicinity of BBNPP.

Impacts which are perceived visually will be attenuated by the forest vegetation that surrounds the site. Lighting used during night construction may have a temporary positive impact on bat species that forage preferentially on the insects attracted by lights. However, lighting may also have a temporary negative impact on bat species that avoid light. No current research indicates if Indiana bats are included in either species group.

6.2 Operations

Impacts to the Indiana bat are anticipated to be small as a result of BBNPP operations. All operational activities will occur within the portion of the property that has been altered by construction, and bats are unlikely to be present due to the lack of suitable habitat, except as discussed in Section 6.3. Noise, cooling tower vapor plumes, miscellaneous air emissions, and cooling water and wastewater blowdown will emanate or be discharged from this disturbed area, and generated wastes, except for spent fuel, will be recycled, recovered, or sent offsite for disposal. However, these effects of plant operation will have no or minimal impact, as discussed in Section 3.2.

Any increases in the volume or concentrations of pollutants in storm water discharges from BBNPP will be minimized by implementation of BMPs described in the PCSM plan. The BMPs will minimize the indirect effects on Indiana bats by reducing adverse impacts on aquatic insect populations and riparian and wetland foraging habitat.

Other than denial of foraging habitat through their footprint accounted for above, the CWS cooling towers are unlikely to create disturbance or mortality of Indiana bats through collision with the towers. The cooling towers are large, immobile objects that should be avoidable by the bats, which are known to generally avoid stationary objects. Studies of bird and bat mortality attributable to collision with the cooling towers at the adjacent SSES between 1984 and 1986 found eight dead bats of three species and did not include Indiana bat (NRC, 1996).

Lighting used for safety and security purposes at night will be incrementally greater than the lighting present from SSES. This lighting may have a positive impact on bat species that forage preferentially on the insects attracted by lights. However, lighting may have a negative impact on bat species that avoid light. No current research indicates if Indiana bats are included in either species group.

No other activities that may disturb Indiana bats on the remainder of the property or in surrounding habitats will occur as a result of plant operations.

6.3 Maintenance

Impacts to the Indiana bat are anticipated to be small as a result of BBNPP maintenance activities. All maintenance activities will occur within the portion of the property that has been altered by construction and therefore provides no habitat for this species.

The use of pesticides and herbicides during BBNPP operations will be avoided or minimized as previously discussed in Section 6.1 as they may have direct adverse effects on Indiana bats through ingestion of contaminated insects and indirect adverse effects on Indiana bats by impacting insect populations.

With the exception discussed in Section 6.1, any tree clearing during the operation of BBNPP will occur from November 16th to March 31st only, when Indiana bats are hibernating, to avoid direct impacts (direct mortality) to bats that may be roosting on-site during the period of spring emergence through fall swarming.

The periodic dredging of river sediment will not impact the habitat of the Indiana Bat, and no other activities that may disturb Indiana bats on the remainder of the property or in surrounding habitats will occur as a result of plant maintenance.

7. PROPOSED INDIANA BAT MITIGATION

Indiana bat-specific mitigation actions are proposed to offset unavoidable impacts to this species as a result of construction and operation of the BBNPP. Development of the mitigation plan described here is based primarily on the following inputs:

- Written communication from USFWS to NRC in July 2009; A meeting held among state and federal agencies and PPL representatives on June 1, 2010; The Indiana Bat Range Wide Protection and Enhancement Plan (Range Wide PEP) for surface mining (USDOI, 2009); and
- A meeting held among state and federal agencies and PPL representatives on October 20, 2011.

The concept being proposed for Indiana bat compensatory mitigation for the BBNPP project is to provide viable Indiana bat habitat nearby the area of impact. In addition, due to similar habitat requirements and behavioral ecologies, these mitigation activities would be expected to provide viable habitat for little brown bat and northern myotis. To accomplish this, PPL proposes to create or conserve lands for potential Indiana bat habitat in two strategically located 1,500-foot (457-meter) wide riparian corridors on or adjacent to Walker Run and the North Branch of the Susquehanna River. These two corridors, located to the west and east of BBNPP respectively, will protect or create forested migration corridors, preferred foraging habitat, and potential roosting habitat. The created or conserved and subsequently managed habitat is both close to the area of impact and of similar quality to the affected habitat.

Proposed mitigation actions to compensate for Indiana bat habitat loss are presented below and include:

- Reforestation and Natural Succession;
- Habitat Conservation and Management; and
- Public Outreach.

The following additional mitigation measures were considered, but are not included in the proposed mitigation action:

- White-Nose Syndrome Research Funding;
- Hibernacula Gates; and
- Funding of the Indiana Bat Conservation Fund.

7.1 Reforestation and Natural Succession

Reforestation will involve planting select species of trees on designated land within the BBNPP Project Boundary that has been cleared during construction of BBNPP and/or on adjacent PPL-owned land that is not currently forested and is suitable for forest habitat. Lands potentially available for reforestation within the BBNPP Project Boundary as well as adjacent PPL-owned properties on the eastern side of the Susquehanna River are shown in Figure 6. Approximately 58 acres (24 ha) are proposed for reforestation within or adjacent to the BBNPP Project Boundary. The reforestation locations consist of land that will be temporarily impacted by BBNPP construction, and are not planned for current or future use, and active agricultural land to be converted to forest. Included in the 58 acres (24 ha) are approximately 10 acres (4 ha) on which forested wetland creation will occur as part of restoration of Walker Run. Only agricultural fields that are not classified as prime farmland[1] will be employed for reforestation.

In addition, natural succession will be allowed to occur on agricultural lands within the BBNPP Project Boundary as well as adjacent PPL-owned properties on the eastern side of the Susquehanna River as shown in Figure 6. Approximately 137 acres (55 ha) are proposed for natural succession within or adjacent to the BBNPP Project Boundary.

Reforestation areas were selected by identifying all available PPL-owned lands within a 500-foot (152-meter) corridor along Walker Run and the Susquehanna River, providing improved habitat connectivity along this north-south oriented riparian corridor. Natural succession areas were selected by identifying all available PPL-owned agricultural lands within a 1,500-foot (457-meter) corridor along the Susquehanna River. Forest preservation areas were selected from PPL-owned forested lands along a 1,500-foot (457-meter) corridor along Walker Run and the Susquehanna River. Once implemented, these mitigation measures are expected to provide forested migration corridors and potential Indiana bat foraging and roosting habitat of varying stages of succession.

[1] Prime farmland has the best combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods (NRCS, 2010).

As part of this mitigation plan, PPL commits to a combination of reforestation and natural succession of an area that is approximately 83% of the number of acres of forest cover that are to be cleared during construction of BBNPP. Not all disturbed areas are available for reforestation or natural succession since certain areas will remain open for security, safety or future use. Reforestation efforts will be planned and carried-out in consultation with the USFWS and PDCNR Bureau of Forestry. Additional sources of technical information that may be used in reforesting disturbed lands include the Forest Reclamation Advisories published by the Appalachian Regional Reforestation Initiative (USDOI, 2010). Site preparation and replanting will be based on a site specific planting plan developed based on guidance provided in the June 1, 2010 meeting with the USFWS and the USDOI's Range-wide Indiana Bat Protection and Enhancement Plan reforestation guidelines. The proposed specifications are listed below:

1) At least 70% of the total Indiana bat forested habitat to be affected must be reforested unless off-site mitigation measures are used. BBNPP proposes to use a combination of on-site and off-site reforestation, natural succession, habitat conservation and habitat management that will provide a greater than 2.4:1 ratio of habitat created and preserved to habitat lost.

2) Saplings, groundcover and other vegetation will be planted in conformance with detailed specifications prepared by an experienced forester or restoration professional. Saplings will also be planted in a non-uniform pattern that resembles natural tree distribution within a forest. The following specific USFWS requirements for replanting will be adopted:

    a. A minimum of six different species from the "Tree Species List for Indiana Bat Protection and Enhancement Plans" will be selected (species selection should be determined by site-specific characteristics such as soil moisture, sun exposure, etc. and seedling availability) (USDOI, 2009).

    b. A minimum of four species identified as "exfoliating bark species" will be planted and equal at least 40 per cent, or 160 live woody stems, of a minimum of 400 live woody stems per acre. Tree species should be planted at approximately equal rates. The remaining 60% of the minimum stems per acre may come from any of the tree categories in the species list with no more than 20% of the total consisting of one tree species.

    c. Black locust (*Robinia pseudoacacia*) will comprise no more than 50 stems per acre.

    d. Herbaceous ground cover will be native to the ecosystem, compatible with tree planting, non-invasive, slow-growing, and beneficial to wildlife.

3) Low compaction grading techniques will be used to increase the survival rate of planted trees.

4) Saplings will be protected from browsing by white-tailed deer (*Odocoileus virginianus*) and other wildlife using methods such as tree tubes or deer fencing (Curtis et al, 2001; Vercauteren et al., 2006).

5) Plantings may be done in stages over multiple consecutive growing seasons. PPL will contract ahead of time with local and regional nurseries (contract growing) to ensure that an adequate supply of the required species will be available for planting and, where feasible, enable locally adapted trees to be used as the seed source.

6) A long term monitoring and maintenance plan will be instituted to ensure that reforestation efforts, as well as natural recolonization, will be successful. Maintenance activities will include a program to control invasive exotic plants. Reforested lands will be inspected by a qualified professional (forester, restoration professional or botanist) yearly during the growing season to identify invasive non-native plants that have the potential to adversely affect the growth and development of planted and volunteer saplings through competition or other interactions. The inspector will make recommendations to PPL on species-specific control methods for known problem plants identified in these areas.

It is anticipated that to provide reforestation acceptable to these planting specifications, the cost will be a minimum of $10,000/acre.

7.2 Habitat Conservation and Management

Habitat conservation refers to the perpetual conservation of viable Indiana bat habitat via easement or deed restriction on or adjacent to the BBNPP site. Habitat management refers to the specific forest management practices to be implemented on dedicated parcels of existing on-site and off-site forest areas to conserve and maintain or enhance Indiana bat habitat. Habitat conservation and management is being proposed in conjunction with reforestation to further mitigate for the loss of habitat on site, since it may take many years for forested areas that have been cleared to provide habitat characteristics supporting Indiana bat life cycle requirements.

In its July 2009 letter to the NRC regarding the BBNPP Project (USFWS, 2009), USFWS indicated that "after reducing forest impacts via the avoidance and minimization measures, any remaining unavoidable impacts on forest should be offset by permanently protecting forest habitat off-site at a 1:1 compensations ratio." Additional details of land compensation requirements were provided in a June 1, 2010 meeting with the USFWS and in the USDOI's Range-wide Indiana Bat Protection and Enhancement Plan reforestation guidelines (USDOI, 2009).

PPL has identified 386 acres (156 ha) of currently forested land within the BBNPP Project Boundary and adjacent PPL-owned lands that are similar to the habitat that is being lost and suitable for habitat conservation and management. These areas were selected by identifying all available PPL-owned forested lands along a 1,500-foot (457-meter) corridor along Walker Run

and the Susquehanna River that in combination with areas selected for reforestation will provide potential Indiana bat foraging and roosting habitat of varying stages of succession.

Approximately 122 acres (49 ha) are proposed for conservation and management within the defined 1,500-foot (457-meter) corridor along Walker Run, and 264 acres (107 ha) within the defined 1,500-foot (457-meter) corridor along the Susquehanna River. All conservation and management is proposed upon existing PPL-owned lands (Figure 6). These conservation and management areas are designed to compensate for the 236.3 acres (95.6 ha) of total temporary and permanent losses of forested cover on the BBNPP project site by a ratio of greater than 1.6:1. The sum of reforestation, natural succession, and conservation and management areas compensate by a ratio of greater than 2.4:1.

PPL proposes to implement passive habitat management practices on all land proposed for habitat conservation and management following suggestedUSFWS forest management guidelines. These guidelines are appropriate to manage Indiana bat habitat that exists on the BBNPP project site and nearby PPL-owned (Figure 6). The implementation of these guidelines is not intended to result in the establishment of optimal habitat, but to maintain and enhance existing habitat that is suitable for Indiana bats. The guidelines consider the Indiana bat's needs for foraging and roosting habitat to survive and successfully reproduce.

The following forest management plan guidelines will be followed to conserve and enhance Indiana bat habitat within the forest conservation areas proposed in this mitigation plan:

1. Commercial timber harvesting shall not be permitted. Tree harvesting may be conducted to preserve or improve habitat in case of pest infestation or disease.

2. Tree cutting shall not occur between April 1st and November 15th except to protect human health and safety or comply with the FERC Standards of Transmission Reliability. This corresponds to the Indiana bat reproductive and spring/fall emergence and swarming seasons. Individual trees which represent a potential safety risk may be removed in accordance with the PPL Danger Tree Removal Policy.

3. No timber stand improvement activities shall be permitted within 100 feet of perennial streams or 50 feet of intermittent or ephemeral streams to provide riparian buffer zone protection.

4. Selective thinning may be undertaken to decrease canopy cover in densely stocked forested stands, but at least 60% of the canopy closure shall be retained.

5. All snags will be retained, except where they pose a safety hazard due to their location near a building, yard, road, or power line ROW. Trees with less than 10% live canopy shall be considered snags.

6. Shagbark hickory trees (*Carya ovata*) will not be harvested or manipulated unless the density of shagbark hickory exceeds 16 trees per acre. At least 16 live shagbark hickory greater than 11" dbh (diameter at breast height) per acre shall be maintained, if present. If there are no shagbark hickory trees greater than 11" dbh to retain and protect, then the 16 live shagbark hickory trees per acre must include the largest specimens in the stand.

7. The following species of trees in each forest stand will be identified, and protected, to enhance Indiana bat habitat. These trees have been identified as having relatively high value as potential Indiana bat roost trees:

   - shagbark hickory (*Carya ovata*)
   - mockernut hickory (*Carya tomentosa*)
   - other hickories (*Carya* spp.)
   - sugar maple (*Acer saccharum*)
   - green ash (*Fraxinus pennsylvanica*)
   - eastern cottonwood (*Populus deltoides*)
   - scarlet oak (*Quercus coccinea*)
   - white oak (*Quercus alba*)
   - slippery elm (*Ulmus rubra*)
   - black locust (*Robinia pseudoacacia*)
   - bitternut hickory (*Carya cordiformis*)
   - pignut hickory (*Carya glabra*)
   - silver maple (*Acer saccharinum*)
   - red maple (*Acer rubrum*)
   - white ash (*Fraxinus americana*)
   - northern red oak (*Quercus rubra*)
   - black oak (*Quercus velutina*)
   - chestnut oak (*Quercus prinus*)
   - American elm (*Ulmus americana*)

   This list is based on review of literature (Carter, 2003; Gardener, 1991; USDOI, 2009) and data on Indiana bat roosting requirements. Other species may be added as they are identified. Other tree species with exfoliating bark, crevices or cavities could also serve as potential roost trees.

8. In habitat management stands, PPL will maintain at least 3 live trees per acre greater than 20" dbh of the species listed above, where these species occur in the stand to be managed. An additional 6 live trees per acre greater than 11" dbh (of the species listed above) shall also be maintained.

   In areas of the stand where there are no trees greater than 20" dbh to retain, then 16 live trees per acre will be retained, and these will include the largest specimens of the preferred species (see list above) in the stand.

9. PPL will ensure that all PPL personnel and contractors working in or near forest conservation areas are made aware of the limits and restrictions of these forest management guidelines.

7.3 Public Outreach

A module on the life history, importance and protection of Indiana bats will be included in ongoing environmental education programs conducted by PPL naturalists at the Susquehanna

Riverlands Environmental Preserve. Information on WNS, as well as efforts by PPL to avoid, minimize and mitigate potential impacts to Indiana bat habitat within the BBNPP project area will be added to the existing year-round environmental education programs provided at the Susquehanna Energy Information Center. This program will seek to foster an appreciation among the general public for the environmental challenges facing both Indiana bats and bats in general, as well as programs to protect bats and conserve bat habitat.

7.4 Mitigation Measures Evaluated but Not Selected for Implementation

White-Nose Syndrome Research Funding

Because PPL is able to provide reforestation and habitat conservation and management that will compensate for cleared forested habitat at a ratio of greater than 2.4:1, no additional mitigation via funding of WNS research is proposed. However, information on Indiana bat life history, importance and threats (including WNS) will be included in the ongoing environmental education programs at PPL's Susquehanna Riverlands Environmental Information Center.

Hibernacula Gates

USFWS has recommended that PPL consider the installation of bat friendly gates on hibernacula that are known or likely to support Indiana bats (USFWS, 2009). There are no known Indiana bat hibernacula within 10 miles of the BBNPP site that are both not gated and suitable for gating. Therefore, PPL has eliminated this potential mitigation measure from consideration.

Indiana Bat Conservation Fund

The Indiana Bat Conservation Fund is a cooperative agreement between the USFWS and PGC to provide funds for acquisition of Indiana bat habitat to mitigate for losses to Indiana bat habitat that are not compensated through the direct acquisition of habitat for conservation by the applicant (USDOI, 2009). The funds are used to buy land in the area where the habitat loss occurs.

PPL will place in conservation an area of potential Indiana bat habitat (386 acres [156 ha]) that is greater than the amount of required habitat compensation determined by USFWS (234 acres [95 ha]) (see calculation in Table 1), therefore a contribution to the Indiana Bat Conservation Fund is not being proposed.

8. CUMULATIVE EFFECTS ANALYSIS

As defined in the Consultation Handbook (USFWS and NMFS, 1998) cumulative effects include "the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area" of the project under consideration. The analysis does not include future Federal actions unrelated to the proposed action, because they require separate consultation.

As discussed in Section 4, the BBNPP Action Area encompasses the area of disturbance within the BBNPP Project Boundary (where nearly all construction activities will take place), as well as a 200-foot (61-meter) buffer around the area of disturbance to account for potential construction-related noise effects on Indiana bats both within and outside the construction zone (Figure 2). Additionally, the Action Area includes several offsite roadway intersections which will be improved, the extension of potable water and sewer lines from US 11 to the BBNPP site, and areas where Indiana bat conservation measures will be undertaken on PPL-owned off-site lands.

State, tribal, local or private actions that are reasonably certain to occur for the above defined action areas are discussed in the following sections.

8.1 Area of Disturbance

Cumulative effects within the Action Area (BBNPP area of disturbance and surrounding 200-foot buffer plus mitigation areas) that are reasonably certain to occur are limited to development activities related to the Susquehanna Greenway Project. Several other effects that are unlikely to occur are also addressed in this section to ensure a comprehensive analysis. These additional effects encompass timber harvesting, surface mines and development of Marcellus shale natural gas resources on the small areas of adjacent private land that overlap with the construction noise buffer (Figure 2).

Susquehanna Greenway Project

The Susquehanna Greenway Project is an ambitious long-term plan to extend a greenway along the entire length of the river. A major focus of the greenway plan is the development of a network of recreation trails to link municipalities along the river corridor with parks and other recreational areas, historic sites and other points of interest. The goal is to provide economic and environmental benefits, as well as connect people to the culture, nature, and beauty of the Susquehanna River (SEDA-COG, 2009).

The North Branch Canal Trail (NBCT) is part of the larger greenway and is located along the Middle Susquehanna River in Montour and Columbia Counties. A demonstration project for the NBCT is currently underway for a 12-mile reach of the former canal towpath between Danville and Berwick which is located several miles south of the BBNPP area of disturbance. The canal and towpath also extend through the PPL Susquehanna Riverlands which already has an extensive trail system. The demonstration project was initiated in 2010 and has a planned completion date of 2016 (SEDA-COG, 2009).

PPL has a long history of providing and/or supporting recreational and other projects that benefit local communities within its service area. In support of the Susquehanna Greenway Project, PPL is already in the process of transferring 3,500 acres (1,414 ha) of company-owned land along the lower river in Lancaster County and York County to private conservation groups (Susquehanna Greenway Partnership, 2008). Therefore, there is a high likelihood that the NBCT will be

extended north through the PPL Susquehanna Riverlands in the near future. Impacts from this project will be small as existing PPL Susquehanna Riverlands recreational trails are well maintained and already suitable for this use. A short section of NBC will be restored near the BBNPP intake structure as part of the overall site mitigation. Necessary tree cutting for trail or other improvements, if necessary, will be minimized and conducted during the allowed November 16th through March 31st period when Indiana bats are hibernating. Cutting of potential roost trees as defined by USFWS (AREVA, 2010a) will be avoided if possible.

Timber Harvesting

Pennsylvania is a leading producer of forest products, particularly black cherry (*Prunus serotina*). Black cherry and other valuable timber species of marketable size are common within the BBNPP area of disturbance and, therefore, these trees are likely to be present on adjacent private lands that overlap with the construction noise buffer. The impact to Indiana bat habitat roosting habitat by selective timbering or even clear cutting of forests on these lands would be small as forested land within this area is very limited in size. Indiana bats could move to suitable roosting habitat in the much larger forested tracts surrounding the project site and located throughout the region.

Surface Mines

Quarries that produce gravel and larger river stone materials are common in the BBNPP locale due to past glacial activity, and the BBNPP area of disturbance includes two former surface mines. Adjacent private lands that overlap with the construction noise buffer could potentially be developed for this purpose. However, similar to timber harvesting, the impact of surface mines on Indiana bat habitat would be small due to the relatively limited overall size of these lands and the ability of the bats to move to suitable habitat surrounding the project site.

Natural Gas Development

The Marcellus shale formation underlies much of Pennsylvania and is the focus of intensive natural gas development activity including well drilling and pipeline construction. However, very little well drilling is occurring in Luzerne at this time and the few wells that have been installed are not located near any section of the BBNPP Action Area (PADEP, 2010). Additional gas well development in Luzerne County may be limited as recent test wells did not yield gas in commercially developable quantities (Hughes, 2010). Gas pipeline construction is likely to occur in Luzerne County but almost certainly will not occur within the Action Area.

Furthermore, no new intrastate natural gas transmission pipelines are known to be currently proposed in the immediate vicinity of the BBNPP area of disturbance, and there is no information regarding any potential upgrades to the existing pipeline that runs through the northeastern portion of the BBNPP Project Boundary. Intrastate gas pipelines, only, are considered in this cumulative effects analysis as interstate pipelines are regulated by the Federal

Energy Regulatory Commission (FERC) and would go through a separate project specific ESA Section 7 consultation process with USFWS. Therefore, the impact of Marcellus shale gas development is considered small at this time.

8.2 Intersection Improvements

The Action Area includes several off-site roadway intersections which will be improved to mitigate traffic congestion associated with the construction workforce and the delivery of construction materials. This effect will be insignificant as most improvements will occur within the existing roadway footprint and, therefore, will not impact Indiana bat habitat. There are no non-Federal actions that are likely to be associated with these highway improvements.

8.3 Potable Water and Sewer Lines

The extension of potable water and sewer lines by the Pennsylvania American Water Company and the Berwick Area Joint Sewer Authority, respectively, to the BBNPP site is also included within the BBNPP Action Area, and is enclosed by a 200-foot (61-meter) construction noise buffer along each side of the right-of-way corridor (Figure 2). The impacts from pipeline construction will be small as forest clearing necessary for this Project will be limited to a narrow right-of-way immediately adjacent to the western side of Confers Lane.

Cumulative effects associated with this part of the Action Area are limited to the potential for additional forest clearing resulting from an increased density of residential development within the noise buffer along Confers Lane, which could be facilitated by the new water and sewer lines. The impact from this effect would be small since most of the developable land along this reach of Confers Lane is already in residential use and largely cleared. Most of the undeveloped land consists of regulated wetland that is unsuitable for most residential uses.

8.4 Conservation Actions

<u>Reforestation, Natural Succession, and Habitat Conservation and Management Lands</u>

Reforestation will provide future Indiana bat habitat as compensation for lost Indiana bat habitat (Section 7.1) and will involve planting select species of trees on 10 acres (4 ha) of land within the BBNPP site that has been cleared during construction as well as on 48 acres (19 ha) of adjacent non-forested PPL-owned land (Figure 6). Natural succession will provide future Indiana bat habitat as compensation for lost Indiana bat habitat (Section 7.1) and will involve allowing 137 acres (55 ha) of PPL-owned agricultural lands to naturally convert to forest. Indiana Bat Habitat Conservation and Management will involve placing a conservation easement on 386 acres (156 ha) of PPL-owned on-site and off-site forest areas and implementing select Indiana bat specific forest management practices to conserve and enhance Indiana bat habitat (Section 7.2). No cumulative effects are expected from these activities. Reforestation and

habitat conservation and management will have a high and beneficial effect on Indiana bats as well as little brown bat and northern myotis.

9. CONCLUSION

In spite of the implementation of the avoidance and minimization measures described in Section 6, the construction of the BBNPP is likely to adversely affect the Indiana Bat due to the loss of potential roost trees and foraging habitat. Where possible, impacts to Indiana bats will be avoided and minimized. Mitigation will be provided for the unavoidable impacts to 236.3 acres (95.6 ha) of forested land that will be temporarily or permanently impacted within the BBNPP Action Area as detailed in Section 7.

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USFWS, 2009. Letter from David Densmore, U.S. Fish and Wildlife Service, to Chief, Rules and Directives Branch Division of Administrative Services, U.S. Nuclear Regulatory Commission, "Environmental scoping process and Federally protected species for BBNPP site, July 10, 2009.

USFWS, 2010a. U.S. Fish and Wildlife Service. Indiana Bat (*Myotis sodalis*) Fact Sheet. Region 7. Website: http://www.fws.gov/midwest/endangered/mammals/inba/inbafctsht.html, date accessed Dec 21, 2010.

USFWS, 2010b. U.S. Fish and Wildlife Service. A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats (Draft). October 21, 2010.

USFWS, 2010c. U.S. Fish and Wildlife Service Press Release. U.S. Fish and Wildlife Service and Wind Farm Owners Work Together**.** Website: http://www.fws.gov/midwest/News/release.cfm?rid=177 **,** date accessed, Dec 21, 2010.

USFWS, 2011a. U.S. Fish and Wildlife Service. 90-day Finding on a petition to list the eastern small-footed bat and northern long-eared myotis as threatened or endangered. Federal Register 76(125): 38095-38106. Wednesday, June 29, 2011. Docket No. FWS-R5-ES-2011-0024; MO 92210-0-0008.

USFWS, 2011b. U.S. Fish and Wildlife Service. 2009 Rangewide Population Estimate for the Indiana Bat (*Myotis sodalis*) by USFWS Region. Website*:* http://www.fws.gov/midwest/Endangered/mammals/inba/pdf/2009inbaRangewidePopJuly2011.pdf, revised July 14, 2011. Date accessed, September 21, 2011.

USFWS, 2011c. U.S. Fish and Wildlife Service. White-nose syndrome: Something is Killing our Bats. Website: http://www.fws.gov/WhiteNoseSyndrome/#map, updated September 12, 2011. Date accessed September 21, 2011.

USFWS, 2011d. U.S. Fish and Wildlife Service. Calculation Sheet for Indiana Bat habitat Compensation. Website: http://www.fws.gov/northeast/pafo/pdf/Indiana%20Bat%20Conservation%20Fund%20-%20Calculation%20Sheet.pdf, date accessed September 26, 2011.

USFWS and NMFS, 1998. U.S. Fish and Wildlife Service and National Marine Fisheries Service. Endangered Species Act Handbook. Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. March 1998 Final. U.S Department of the Interior, Washington, D.C.

USGS, 2009. U.S. Geological Survey. Investigating White-Nose Syndrome in Bats. Fact Sheet 2009-3058. July 2009. Website: http://www.nwhc.usgs.gov/publications/fact_sheets/pdfs/2009-3058_investigating_wns.pdf. date accessed, January 14, 2011.

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Figures

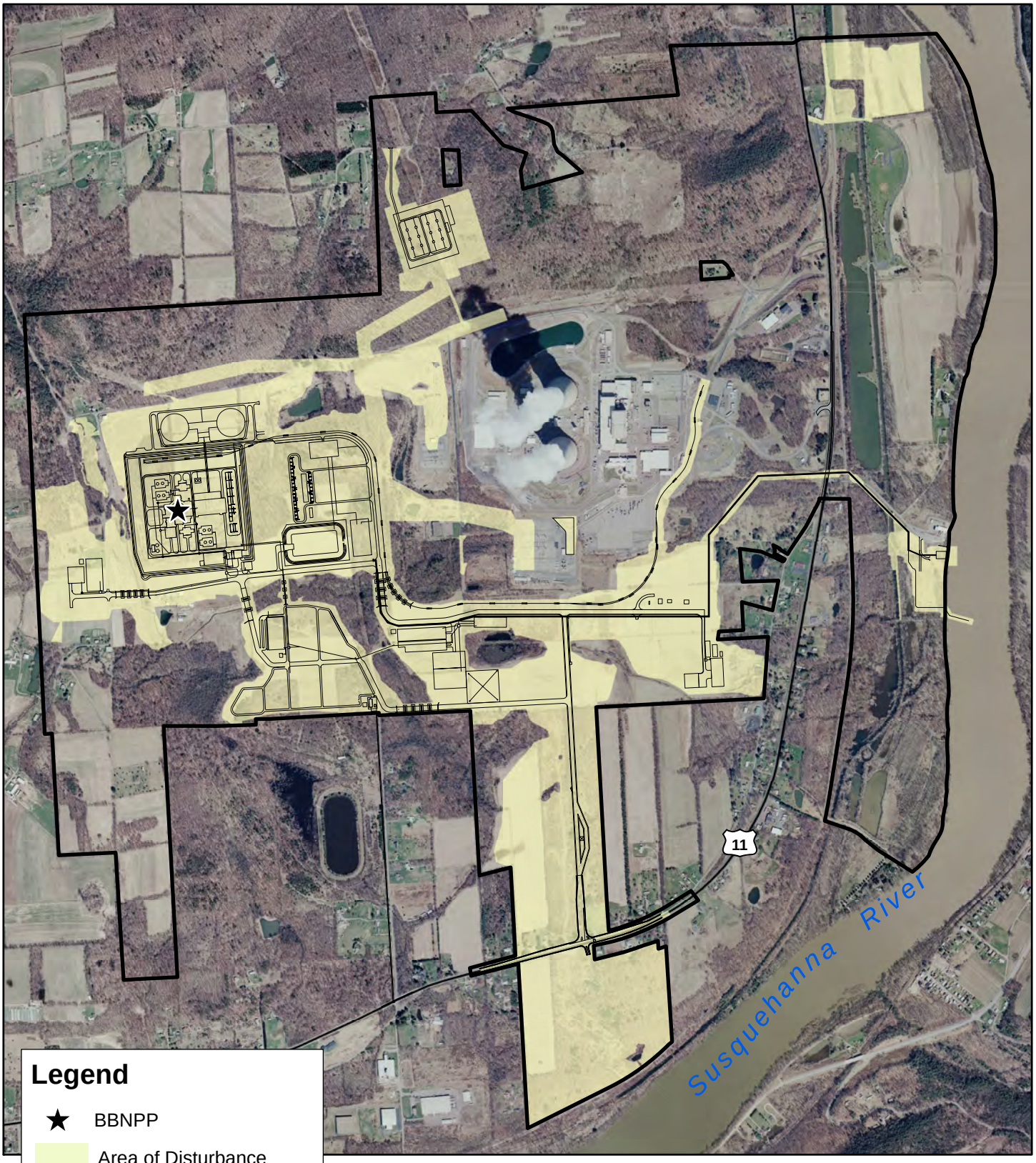


Figure 1.
BBNPP Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 1/11/11
prepared by: s.sherman
project: 22648.099

rev. date: 09/28/11
prepared for: c.roche
file name: Figure1.Site Map

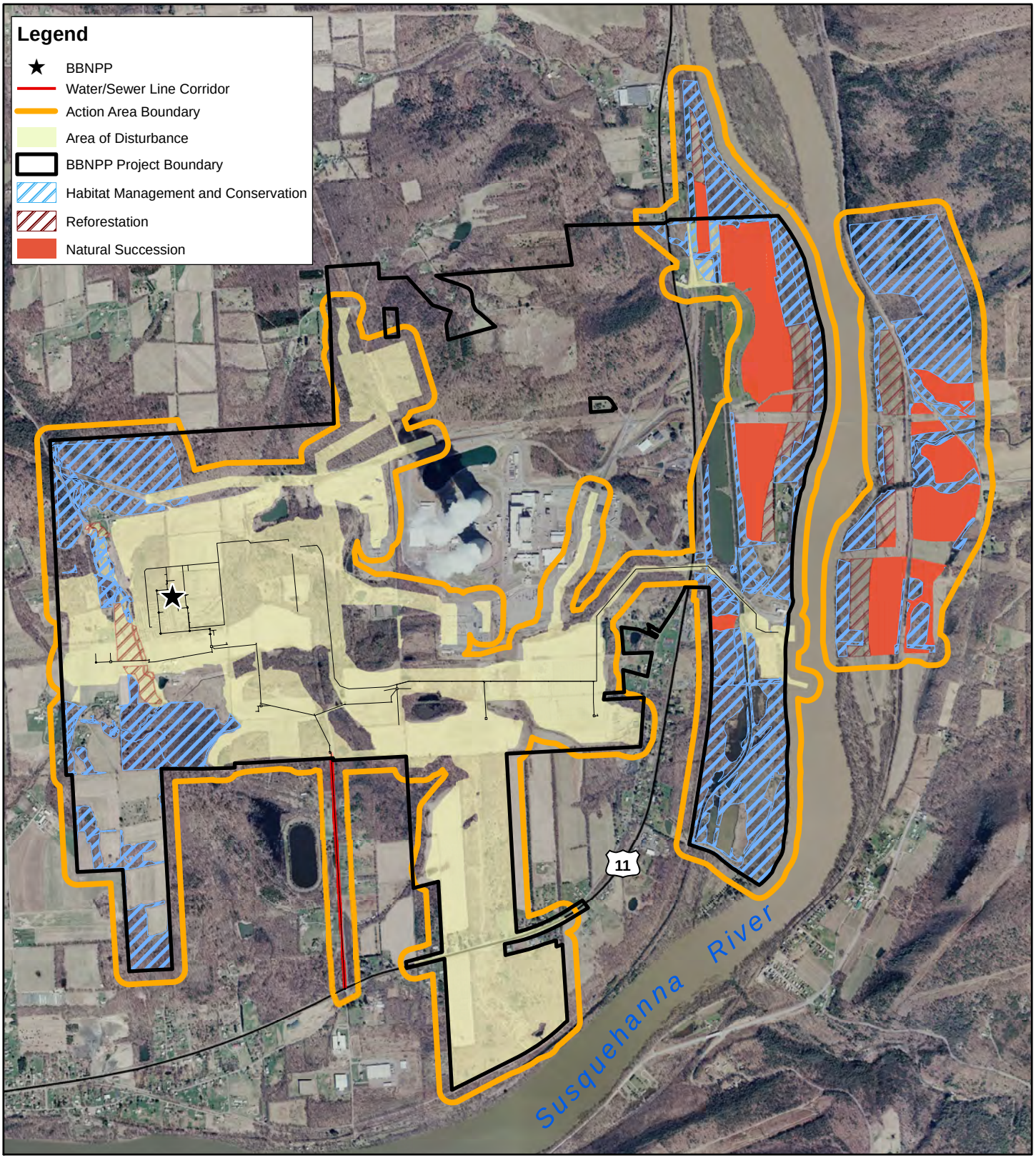


Figure 2.
BBNPP Action Area

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 1/10/11
prepared by: s.sherman
project: 22648.099

rev. date: 09/28/11, 10/28/11
prepared for: c. roche
file name: Figure 2_Action Area

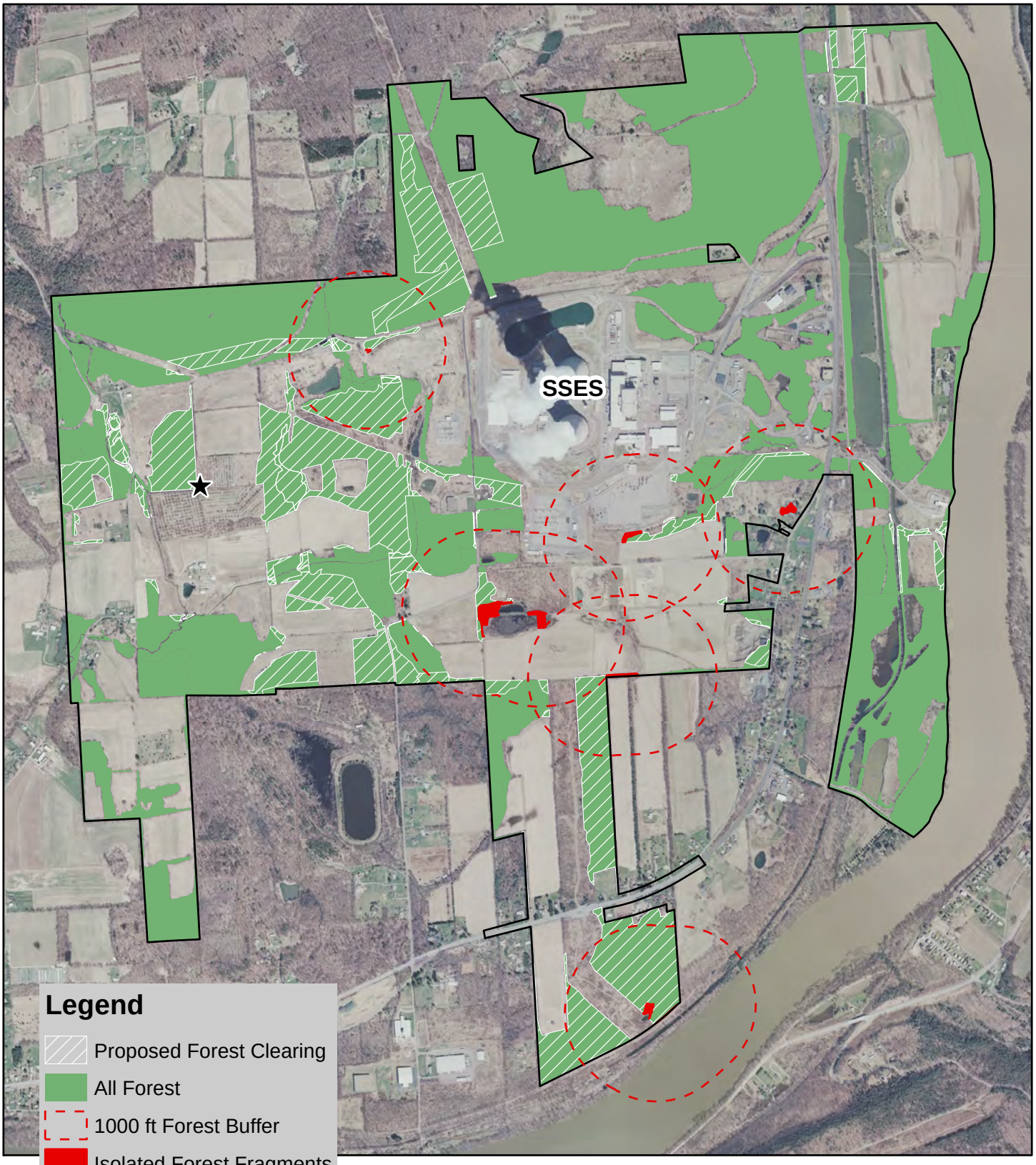
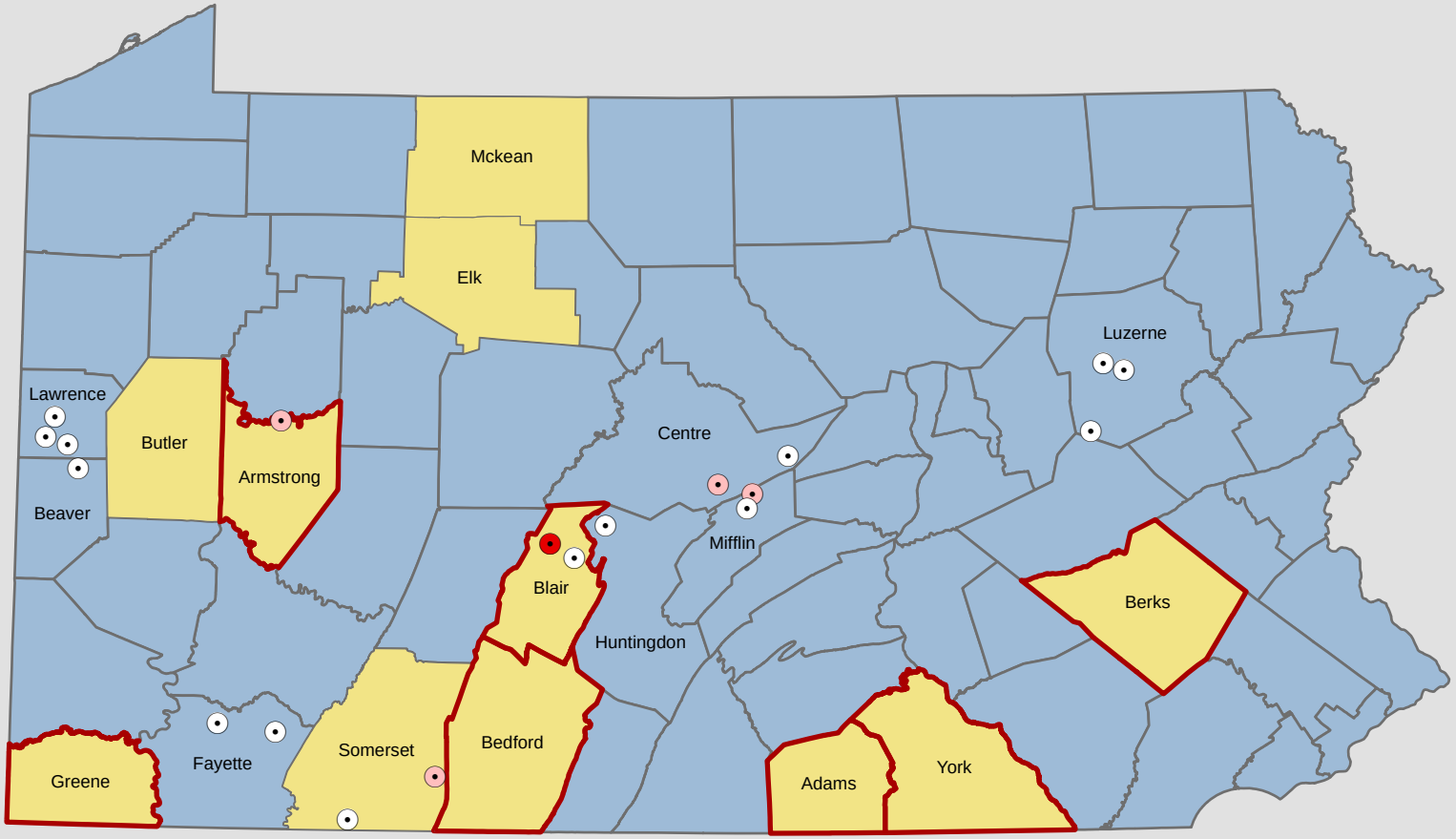


Figure 3.
BBNPP
Isolated Forest Fragments

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/07/11
prepared by: s.sherman
project: 22474.000

rev. date:
prepared for: c. roche
file name: Figure_Isolated_Forest_Fragments



Legend

- Priority 2 Hibernaculum
- Priority 3 Hibernaculum
- Priority 4 Hibernaculum
- Summer Live Captures
- Maternity Colonies

Sources:

Butchkoski, E. 2010. Indiana Bat (*Myotis sodalis*). Connecting You With Wildlife. Pennsylvania Game Commission, Harrisburg, Pennsylvania

Butchkoski, C. 2010. Indiana Bat (*Myotis sodalis*) Summer Roost investigations, 2009. Pennsylvania Game Commission, Harrisburg, Pennsylvania

Turner, G. and C. Butchkoski, 2009. Indiana Bat Hibernacula Surveys, 2009. Pennsylvania Game Commission, Harrisburg, Pennsylvania

Figure 4.
Indiana Bat
Pennsylvania Range

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike Bldg. A, Suite 101 Stowe, PA 19464

date: 12/02/10
project: 22648.099
prepared by: s.sherman

rev.date: 09/28/11
checked by: k.maurice
file name: IBAT_PA_Range

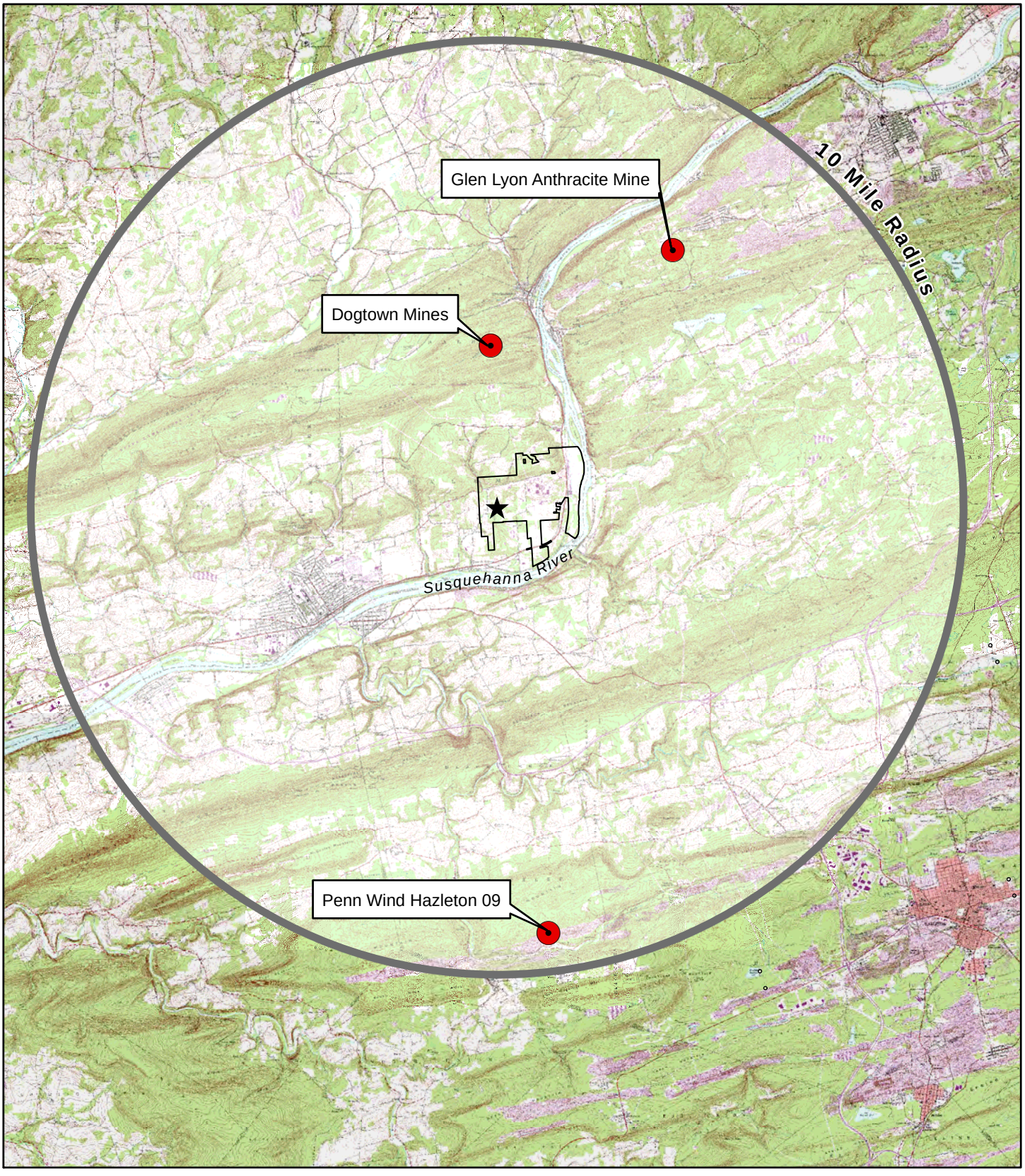


Figure 5.
BBNPP
Indiana Bat Hibernacula Sites
within 10 miles

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike Bldg. A, Suite 101 Stowe, PA 19464

date: 01/24/11
project: 22648.099
prepared by: s.sherman

rev.date: 09/28/11
checked by: k.maurice
file name: IBAT_within_10miles

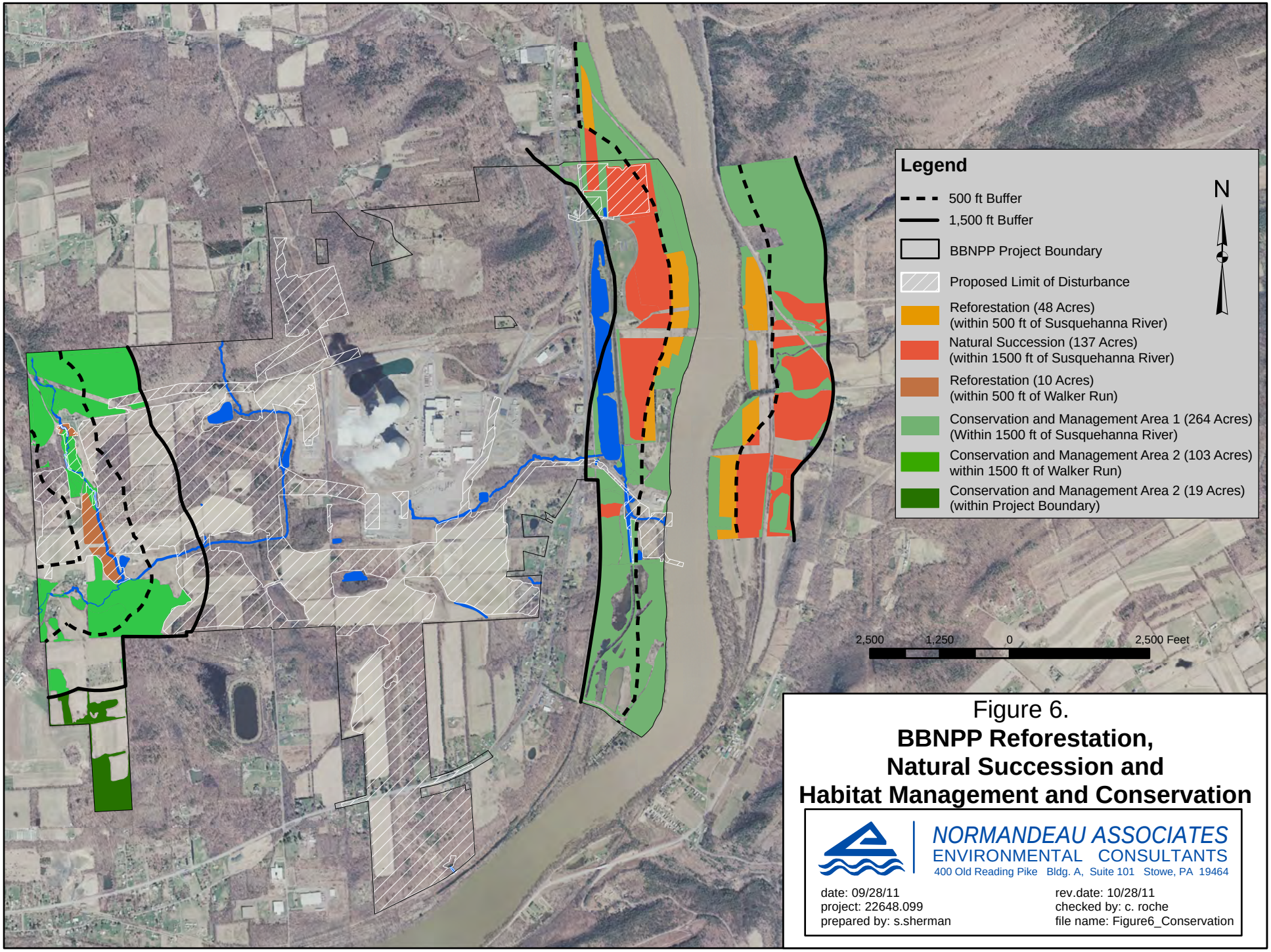


Figure 6.

BBNPP Reforestation, Natural Succession and Habitat Management and Conservation

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike Bldg. A, Suite 101 Stowe, PA 19464

date: 09/28/11
project: 22648.099
prepared by: s.sherman

rev.date: 10/28/11
checked by: c. roche
file name: Figure6_Conservation

Tables

Table 1. Calculation of Compensation Acres for Indiana Bat Habitat on the BBNPP Project Site

Impact Type	Impact Acres (Hectares)	Multiplier[1]	Compensation Acres (Hectares)
Summer Habitat Loss[2]			
Known maternity habitat	0.0	2.0	0.0
Known non-maternity habitat	0.0	1.0	0.0
Non-forest habitat[3]	0.0	0.5	0.0
Swarming Habitat Loss[4]			
P2 or P3 Hibernaculum	0.0	1.5	0.0
P4 Hibernaculum	234 (95)	1.0	234 (95)
Overlapping Habitat Loss[5]			
Known maternity and swarming habitat occur together	Choose highest multiplier from above (maternity or swarming) appropriate for the impact, and add 1.0 to the multiplier		

*** Approximately 386 acres (156 ha) are compensated through habitat conservation and management which is greater than a 1.6:1 ratio of compensation to loss. Therefore no compensation in the form of an Indiana Bat Conservation Fund contribution is offered.**

[1] Multiplier assumes permanent habitat protection will occur in accordance with the *Indiana Bat Mitigation Guidance for Pennsylvania* (USFWS, 2010e).

[2] Loss of known summer habitat assumes such loss will occur when bats are NOT present (i.e., between November 16 and March 31).

[3] Non-forest habitat includes fields, shrublands, and other areas that can be used for foraging by Indiana bats.

[4] Swarming habitat is suitable habitat within a 10-mile radius of Indiana bat hibernacula. Loss of swarming habitat assumes such loss will occur when bats are NOT present (i.e., between November 16 and March 31).

[5] Loss of summer and swarming habitat assumes such loss will occur when bats are NOT present (i.e., between November 16 and March 31).

Appendix A

U.S. Fish and Wildlife Service Consultation

List of Enclosed Correspondence

1. Letter from Rod Krich, UniStar Nuclear Energy LLC, to David Densmore, USFWS, "Large Project Species of Special Concern Screen", December 21, 2007.

2. Letter from David Densmore, USFWS, to Rod Krich, UniStar Nuclear Energy LLC, "USFWS Project #2008-0518", January 18, 2008.

3. Letter from David Densmore, USFWS, to J. E. Price, UniStar Nuclear Energy LLC, "USFWS Project #2008-0518, Bell Bend Nuclear Power Plant", March 26, 2008.

4. Letter from David Densmore, USFWS, to J. E. Price, UniStar Nuclear Energy LLC, "USFWS Project #2008-0518", April 21, 2008.

5. Letter from David Densmore, USFWS, to Chief, Rules and Directives Branch Division of Administrative Services, U.S. Nuclear Regulatory Commission, "Environmental scoping process and Federally protected species for BBNPP site, July 10, 2009.

6. Letter from Terry L. Harpster, PPL Bell Bend LLC, to Pamela Shellenberger, USFWS, "Large Project Species of Special Concern Screen, September 20, 2010.

7. Letter from Terry L. Harpster, PPL Bell Bend LLC, to Carole Copeyon, USFWS, "Indiana Bat Roost Tree Survey Study Plan", September 27, 2010.

UniStar NUCLEAR

December 21, 2007

Mr. David Densmore
U. S. Fish and Wildlife Service
Endangered Species Biologist
315 South Allen Street, Suite 322
State College, PA 16801

SUBJECT: **Large Project Species of Special Concern Screen**
UniStar Nuclear Energy, LLC, Berwick, PA NPP-1 Project
Salem Township, Luzerne County, PA

Dear Mr. Densmore:

UniStar Nuclear Energy, LLC is conducting an environmental evaluation for an approximately 2.6 square mile (1,642 acres) project area on the Susquehanna Steam Electric Station (SSES) site and adjacent properties in Salem Township, Luzerne County, Pennsylvania (Figure 1). The project area boundaries encompass the entire footprint of possible disturbance for the construction and maintenance of additional electric generation facilities under consideration for the site.

UniStar Nuclear Energy, LLC wishes to screen the project area for species of special concern under jurisdiction of the U. S. Fish and Wildlife Service. Please provide all current and historical information concerning the occurrence of Federally-listed and proposed threatened and endangered species; designated and proposed critical habitats; and any other ecological resources of special concern within the project area. This information may be used in future consultations with your agency under Section 7 of the Endangered Species Act.

In addition, please provide this information for a 0.5-mile buffer surrounding the project area. This latter screen is requested for the purpose of evaluating environmental impacts and compliance with Pennsylvania Department of Environmental Protection regulations (e.g., 25 PA Code Chapter 105.17). A PNDI search form is attached for your use.

If you have any questions or need additional information please contact George Wrobel at (585) 771-3535.

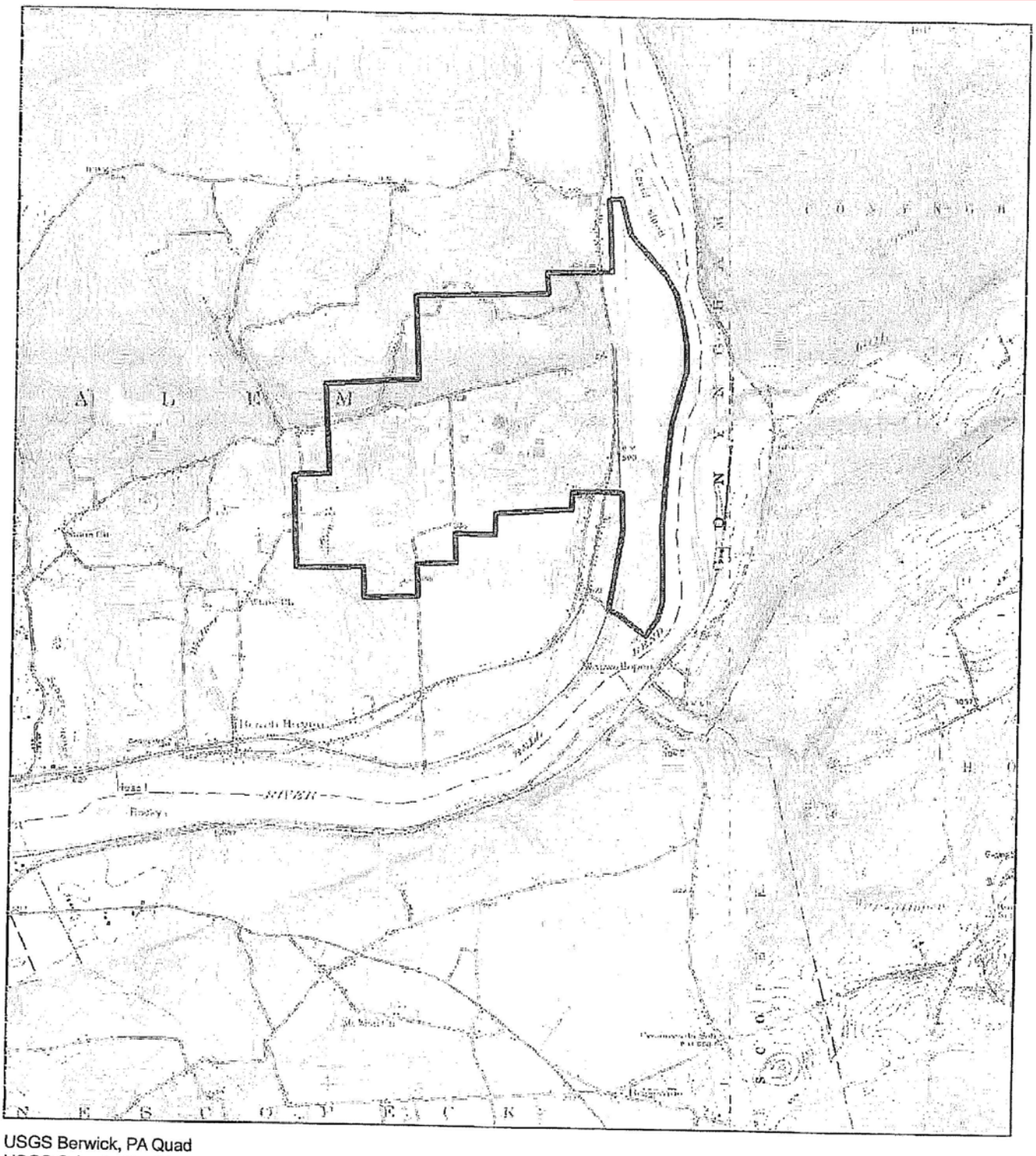
Thank you for your assistance.

Sincerely,

Rod Krich
Senior Vice President, Regulatory Affairs

Enclosures Site Location Map, Figure 1
PNDI Review Form

Illegible text within this figure is not pertinent to the technical objectives of this document.



USGS Berwick, PA Quad
USGS Sybertsville, PA Quad

1 0.5 0 1 Miles

Figure 1.
Berwick, PA NPP-1

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
[illegible] Reading Pike, Bldg A, Suite 101, Stowe, PA 19464

date: 12/17/07
project: 21159.000
prepared by: s.sherman

checked by: k.maurice
project name: Areva
file name: 21159_site_location

Pennsylvania Natural Diversity Inventory

Project Planning & Environmental Review Form

This form provides site information necessary to perform an Environmental Review for special concern species and resources listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat code or the Pennsylvania Game and Wildlife Code.

Applicant Information

Name ; UniStar Nuclear Energy, LLC
Address: 750 E. Pratt Street, 14th floor, Baltimore, MD 21202-3106
Phone Number: 410-470-5518 Fax Number: 585-771-3392

Contact Person Information - if different from applicant

Name: Mr. George Wrobel
Address: same
Phone Number: 585-771-3535 Fax Number: 585-771-3392

Project Information

Project Name: Berwick, PA NPP-1
Project Locations: Lat N 41d 05m 11.54s Lon W 76d 09m 53.66s
Municipality: Salem Township County: Luzerne
[X] Attach a copy of a U.S.G.S 7 1/2 Minute Quadrangle Map with Project Boundaries clearly marked.
U.S.G.S. Quad Name: Berwick, PA and Sybertsville, PA

Project Description

Proposed Project Activity (including All earth disturbance areas and current conditions)
The Berwick, PA NPP-1 Project involves development of a combined license application (COLA) to the U.S. Nuclear Regulatory Commission (NRC) for potential construction and operation of a new nuclear powered steam electric plant in the vicinity of the Susquehanna Steam Electric Station. In the event a decision is made to develop the plant, associated activities would involve land clearing, grubbing, grading/excavation, and construction of plant and support facilities and structures; landscaping; and subsequent operation and maintenance of plant facilities and grounds. Land use of areas potentially disturbed consists predominantly of active/former farmland and forest and, to roadways, and natural vegetation (e.g., shrub-scrub).

Total Acres of Property: **1,642** Acreage to be Impacted: **780 (approximately)**

1. Will the entire project occur in or on an existing building parking lot, driveway, road, maintained road shoulder, street, runway, paved area, railroad bed, or maintained lawn? Yes No X
2. Are there any waterways or waterbodies (intermittent or perennial rivers, streams, creeks, tributaries, lakes or ponds) in or near the project area, or on the land parcel? If so, how many feet away is the project? Yes X feet NO
3. Are wetlands located in or within 300 feet of the project area? Yes X No If No. is this the result of a wetland delineation?

If you have a "PNDI Project Environmental Review Receipt" with potential impacts,, please send a receipt copy, this completed form, and a USGS Quad Map to the agency/agencies noted on the receipt. If you are unable to generate a PNDI Receipt because you do not have Internet access, complete this form, attach USGS Quad Map, and send them to your local DEP or County Conservation District. For review of a "Large Project," please send form and map to all the agencies listed below. See page 2 for more information.

Dept. of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market St., PO Box 8552
Harrisburg, PA 17105
fax: 717-771-0271

PA Game Commission
Bureau of Land Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797
fax: 717-787-6957

PA Fish and Boat Commission
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 10828
fax: 814-359-5175

US Fish and Wildlife Service
Endangered Species Biologist
315 South Allen St., Suite 322
State College, PA 16801
no faxes please

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

January 18, 2008

Rod Krich
UniStar Nuclear Energy, LLC
750 East Pratt Street, 14th Floor
Baltimore, MD 21202-3106

RE: USFWS Project #2008-0518

Dear Mr. Krich:

This responds to your letter of December 21, 2007, requesting information about federally listed and proposed endangered and threatened species within the area affected by the proposed nuclear powered steam electric plant located in Luzerne County, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

The project is within the range of the Indiana bat (*Myotis sodalis*), a species that is federally listed as endangered. Indiana bats hibernate in caves and abandoned mines during the winter months (November through March), and use a variety of upland, wetland and riparian habitats during the spring, summer and fall. Indiana bats usually roost in dead or living trees with exfoliating bark, crevices or cavities. Female Indiana bats form nursery colonies under the exfoliating bark of dead or living trees, such as shagbark hickory, black birch, red oak, white oak, and sugar maple, in upland or riparian areas.

Land-clearing, especially of forested areas, may adversely affect Indiana bats by killing, injuring or harassing roosting bats, and by removing or reducing the quality of foraging and roosting habitat. To determine whether the proposed project will affect Indiana bats, we will need additional project information, including site plans and a detailed project description, that describe how much forest disturbance will occur (area, tree species, and size classes).

This response relates only to endangered or threatened species under our jurisdiction, based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing potential Service concerns under the Fish and Wildlife Coordination Act or other authorities.

To avoid potential delays in reviewing your project, please use the above-referenced USFWS project tracking number in any future correspondence regarding this project.

If you have any questions regarding this matter, please contact Pam Shellenberger of my staff at 814-234-4090.

Sincerely,

David Densmore
Supervisor

UniStar
NUCLEAR ENERGY

750 East Pratt Street, 14th Floor
Baltimore, MD 21202
(410) 470-5531

March 26, 2008

Mr. David Densmore
U.S. Fish and Wildlife Service
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, PA 16801-4850

Subject: USFWS Project #2008-0518
Bell Bend Nuclear Power Plant
PPL Nuclear Development, LLC
Salem Township, Luzerne County, PA

Dear Mr. Densmore:

This letter responds to your request for additional information concerning the Bell Bend Nuclear Plant project that was made in your letter dated January 18, 2008. You specifically asked for a site plan and detailed project description indicating the amount of forest disturbance that will occur including area, tree species and size classes. These items are addressed below.

Site Plans

The following site plans are enclosed for your review:

1. Site Utilization Plot Plan Rev 2 showing the preliminary site layout.

2. Forest Disturbance Exhibit showing the project boundary, forest disturbance, wetlands and selected other features overlain on PAMAP color aerial photography.

Project Description

The Bell Bend Nuclear Power Plant project area encompasses approximately 1.04 square miles (665 acres) on the PPL Susquehanna Steam Electric Station (SSES) site and adjacent properties in Salem Township, Luzerne County, Pennsylvania. Project area boundaries and the entire footprint of possible disturbance for the construction, operation and maintenance of a new nuclear powered steam electric plant are shown on the enclosed site plans. In the event a decision is made to develop the plant, most of the land within the foot print of disturbance will be cleared, grubbed, graded and/or excavated for the construction of the plant, support facilities and other structures.

Current land use of potentially disturbed areas consists predominantly of active farmland, former farmland that has succeeded to old field or scrub-shrub habitat and forest. Potential forest impacts resulting from all project construction activities are conservatively estimated to be 251 acres and were calculated using AutoCADD mapping software.

Environmental monitoring studies for the project area were initiated in 2007 and included the delineation of all wetlands onsite. The wetlands delineation study revealed that forested areas consist largely of upland and wetland mixed deciduous cover. Trees commonly found in wetland forest habitat include red maple (*Acer rubrum*), silver maple (*Acer saccharinum*) black gum (*Nyssa sylvatica*), pin oak (*Quercus rubra*) and river birch (*Betula nigra*).

Common upland trees include northern red oak (*Quercus rubra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), bitternut hickory (*Carya cordiformis*), black birch (*Betula lenta*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*) and red maple. Most canopy trees fall in the range of 6-inches to 18-inches in diameter breast height (dbh). However, an estimated 10-percent to 20-percent of the forest cover may exceed this range.

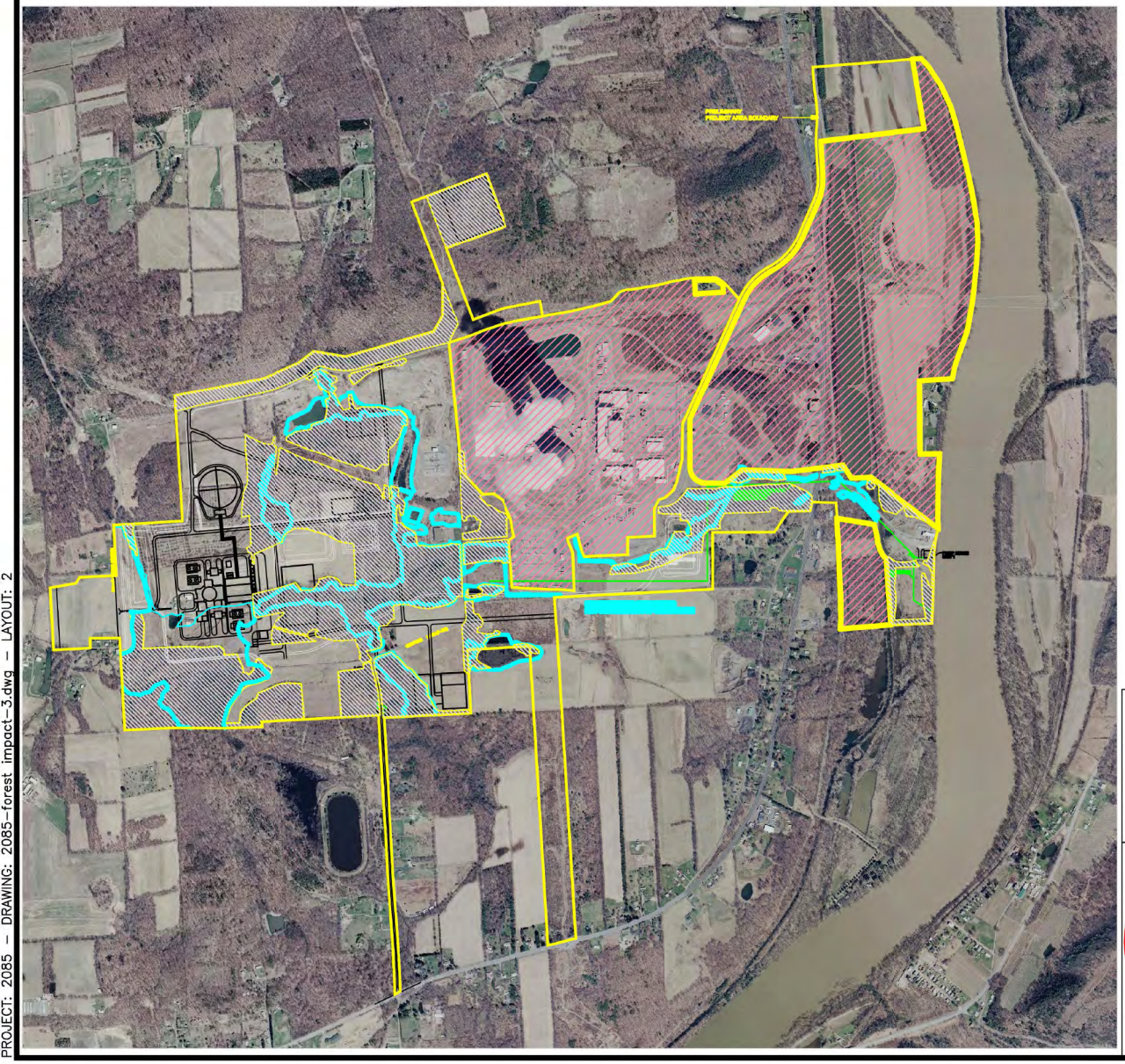
If you have any questions or need additional information please contact Jerome Fields at (610) 774-7889.

Thank you for your assistance.

Sincerely,

J. E. Price

Enclosures:
1) Site Utilization Plot Plan
2) Natural Features Plan



N

AREA TO BE RETAINED BY PPL SSES
(498 ACRES)

DELINEATED
WETLANDS BOUNDARY

PRELIMINARY
PROJECT AREA
BOUNDARY
(665 ACRES)

FOREST DISTURBANCE
(251 ACRES)

1500 750 0 1500 3000 4500

1 INCH = 1500 FEET

BELL BEND NPP

FOREST DISTURBANCE EXHIBIT

PREPARED FOR

UNISTAR NUCLEAR ENERGY SERVICES

SALEM TOWNSHIP - LUZERNE COUNTY - PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA REGISTERED DENNIS R PETERS SURVEYOR NO. 23626-E

PETERS CONSULTANTS, INC.
CONSULTING ENGINEERS & SURVEYORS
E-MAIL: info1@petersconsultants.com
www.petersconsultants.com
100 Robbins Avenue Berwick , Pa. 18603
1023 Mulberry Street Berwick , Pa. 18603
29 East Main Street Bloomsburg , Pa. 17815

Scale: 1"=1500'	Dwn By: DHS	File No.:2085
Date: 03/17/08	Ck. By: DRP	Sheet 1 of 1

PROJECT: 2085 – DRAWING: 2085-forest impact-3.dwg – LAYOUT: 2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

April 21, 2008

J. E. Price
UniStar Nuclear Energy
750 East Pratt Street
14th Floor
Baltimore, MD 21202

RE: USFWS Project #2008-0518

Dear Mr. Price:

This responds to your letter of March 26, 2008, which provided additional information about the Bell Bend Nuclear Plant project located in Luzerne County, Pennsylvania. The project is within the range of the Indiana bat (*Myotis sodalis*), a species that is federally listed as endangered. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

According to the additional information provided, which was requested by this office in a letter dated January 18, 2008, approximately 251 acres of forest habitat will be affected by the proposed project. Land-clearing, especially of forested areas, may adversely affect Indiana bats by killing, injuring or harassing roosting bats, and by removing or reducing the quality of foraging and roosting habitat. Therefore, due to the anticipated impacts of the project on forest habitat, and the project's proximity to a known Indiana bat hibernaculum, bat survey of the project area should be conducted between May 15 and August 15 by a qualified, Service-approved biologist (see enclosed list) using the enclosed *Indiana Bat Mist Netting Guidelines*. Survey results should be submitted to the Fish and Wildlife Service for review and concurrence.

In addition, if any natural caves or abandoned mines occur within the project area, it is possible that Indiana bats or other bat species may be using them during hibernation or potentially as summer roost sites. Entrances to these potential hibernacula could be intentionally or inadvertently closed or destroyed during activities such as land clearing, grading, fill disposal, mining, road construction or building construction. If bats are present within a cave or abandoned mine when this occurs, they will become trapped inside and perish. Even if bats are not present during the closure, they may be adversely affected when they return to their hibernaculum in the fall and find it closed. This will force them to expend energy looking for

another suitable hibernaculum during a time when it is crucial that they store up sufficient fat reserves for hibernation. Bats are at an increased risk of mortality when they enter hibernation with insufficient fat reserves, or are unable to locate a cave/mine with the suite of conditions (*e.g.*, temperature, humidity, air flow) necessary for successful hibernation.

In order to determine whether this project will affect any potential Indiana bat hibernacula, the project area should be surveyed for cave and mine openings. All openings should be accurately mapped using a GPS unit. If potentially unstable mines (*e.g.*, abandoned coal mines) occur in the project area, the openings of these mines should be evaluated using the enclosed *Protocol for Assessing Abandoned Mines/Caves for Bat Surveys*. The Pennsylvania Game Commission has developed this protocol to determine whether abandoned mines may serve as potentially suitable bat habitat. Following this initial mine opening assessment, a qualified bat surveyor (see enclosed list) should survey each potentially suitable opening, as well as the area in the immediate vicinity of these openings. Surveys should be carried out in accordance with the enclosed survey protocol. Please submit a copy of the survey results to the Service and the Pennsylvania Game Commission for review and concurrence.

If any caves or stable hard rock mines (*e.g.*, limestone mines) occur in the project area, they should be surveyed for hibernating bats during the winter. Interior winter hibernacula surveys should be coordinated with the Pennsylvania Game Commission. Survey results should be submitted to the Service for review and concurrence. If caves or hard rock mines cannot be safely entered, their openings should be surveyed as described above.

Survey results should be submitted to this office for review. Should Indiana bats be found during any survey, further consultation with the Service will be necessary, including the submission of detailed project plans, and an analysis of alternatives to avoid and minimize adverse effects.

Additionally, removal of trees and forested areas within the project area could result in the direct take of roosting Indiana bats, which could be injured or killed when trees are cut. Regardless of whether Indiana bats are captured during your mist net survey, we nonetheless recommend that any tree-cutting activities be carried out from November 16 to March 31, during which time bats are hibernating. Studies have found that forested areas located within five miles of hibernacula provide important foraging and roosting habitat for Indiana bats, especially during the fall and spring, when bats are building up their fat reserves prior to and after hibernation.

If any tree-cutting is necessary from April 1 to November 15, the following trees greater than or equal to five inches diameter breast height (d.b.h.) should not be cut or physically disturbed (*e.g.*, while harvesting any adjacent trees) in order to avoid killing or injuring roosting Indiana bats: 1) dead or dying trees and snags (including lightning struck trees) with exfoliating bark; 2) live trees (such as shagbark and shellbark hickory) which have exfoliating or defoliating bark in the trunk or branches; and 3) trees or snags that have characteristics typical of roost sites for Indiana bats (*i.e.*, have exfoliating or defoliating bark, or contain cracks, crevices, or holes that could be used by the species as a potential roost), especially trees with sun exposure to the trunk. Tree-clearing from November 16 to March 31 may proceed without these restrictions.

This response relates only to endangered or threatened species under our jurisdiction, based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing potential Service concerns under the Fish and Wildlife Coordination Act or other authorities.

To avoid potential delays in reviewing your project, please use the above-referenced USFWS project tracking number in any future correspondence regarding this project.

If you have any questions regarding this matter, please contact Pam Shellenberger of my staff at 814-234-4090.

Sincerely,

David Densmore
Supervisor

Enclosures

Federally Listed, Proposed, and Candidate Species in Pennsylvania

(revised August 15, 2007)

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MAMMALS			
Indiana bat	*Myotis sodalis*	E	Hibernacula: Armstrong, Beaver, Blair, Centre, Fayette, Huntingdon, Lawrence, Luzerne, Mifflin and Somerset Co. Maternity sites: Bedford, Berks and Blair Counties. Potential winter habitat state-wide in caves or abandoned mines. Potential summer habitat state-wide in forests or wooded areas.
BIRDS			
Piping plover	*Charadrius melodus*	E	Designated critical habitat on Presque Isle (Erie Co.). Migratory. No nesting in PA since 1950s, but recent colonization attempts at Presque Isle
REPTILES			
Bog turtle	*Clemmys (Glyptemys) muhlenbergii*	T	Adams, Berks, Bucks, Chester, Cumberland, Delaware, Franklin, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York Co. *Historically found in Crawford, Mercer and Philadelphia Co.*
Eastern massasauga rattlesnake	*Sistrurus catenatus catenatus*	C	Butler, Crawford, Mercer and Venango Co. *Historically found in Allegheny and Lawrence Co.*
MUSSELS			
Clubshell	*Pleurobema clava*	E	French Creek and Allegheny River (and some tributaries) in Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co.; Shenango River (Mercer and Crawford Co.) *Has not been found recently in 13 streams of historical occurrence in Butler, Beaver, Fayette, Greene, Indiana, Lawrence, and Westmoreland Co.*
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Delaware River (Pike and Wayne Co.). *Has not been found recently in streams of historical occurrence in the Delaware River watershed (Bucks, Carbon, Chester, Philadelphia Co.) or Susquehanna River watershed (Lancaster Co.)*
Northern riffleshell	*Epioblasma torulosa rangiana*	E	French Creek and Allegheny River (and some tributaries) in Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co. *Has not been found recently in streams of historical occurrence, including: Shenango River (Lawrence Co.), Conewango Creek (Warren Co.)*

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315 South Allen Street, Suite 322, State College, Pennsylvania 16801

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MUSSELS (continued)			
Rayed bean	*Villosa fabalis*	C	French Creek and Allegheny River (Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, Warren Co.); Cussewago Creek (Crawford Co.). *Has not been found recently in 5 streams of historical occurrence in Armstrong, Lawrence, Mercer and Warren Co.*
Sheepnose	*Plethobasus cyphyus*	C	Allegheny River (Forest and Venango Co.). *Has not been found recently in streams of historical occurrence, including: Allegheny River (Armstrong Co.), Beaver River (Lawrence Co.), Ohio River (Allegheny and Beaver Co.), and Monongahela River (Washington Co.)*
FISH			
Shortnose sturgeon[2]	*Acipenser brevirostrum*	E	Delaware River and other Atlantic coastal waters
PLANTS			
Northeastern bulrush	*Scirpus ancistrochaetus*	E	Adams, Bedford, Blair, Cambria, Carbon, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder, Tioga, and Union Co. *Historically found in Northampton Co.*
Small-whorled pogonia	*Isotria medeoloides*	T	Centre, Chester and Venango Co. *Historically found in Berks, Greene, Monroe, Montgomery and Philadelphia Co.*

[1] E = Endangered; T = Threatened; P = Proposed for listing; C = Candidate
[2] Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service

U.S. FISH AND WILDLIFE SERVICE
Pennsylvania Field Office

QUALIFIED INDIANA BAT SURVEYORS

The following list includes persons known by the U.S. Fish and Wildlife Service to have the skills and experience to conduct surveys for Indiana bats. Any individuals handling or conducting surveys for Indiana bats must first obtain a permit from the Pennsylvania Game Commission. All Indiana bat captures must be reported in writing to the Service and Commission within 72 hours. Indiana bat surveys should be overseen by a qualified surveyor, who should be present in the field at all times during the investigation. Mist-net surveys should be carried out in accordance with the Service's *Indiana Bat Mist Netting Guidelines*. If any Indiana bats are captured during mist-netting, a surveyor with bat telemetry experience should be prepared to place a transmitter on the bat(s) to identify roost trees and foraging habitat. Various sampling techniques, including mist-netting, Anabat detection, radio-telemetry, harp-trapping and hibernacula surveys, are used to detect and monitor bats. Some individuals on this list may not be qualified to conduct all types of sampling.

This information is not to be construed as an endorsement of individuals or firms by the Service or any of its employees. Persons not on this list, but who have documented experience in conducting scientific studies of, or successful searches for, Indiana bats may submit their qualifications to the Service for review. The submission must include documentation that the requestor has experience successfully locating and identifying Indiana bats in their hibernacula and their summer habitat. Additions to and deletions from this list are at the sole discretion of the Service. This list is subject to revision at any time without prior notice.

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INDIANA BAT MIST NETTING GUIDELINES

RATIONALE

A typical mist net survey is an attempt to determine presence or probable absence of the species, it does not provide sufficient data to determine population size or structure. Following these guidelines will standardize procedures for mist netting. It will help maximize the potential for capture of Indiana bats at a minimum acceptable level of effort. Although the capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence. Netting effort as extensive as outlined below usually is sufficient to capture Indiana bats. However, there have been instances in which additional effort was necessary to detect the presence of the species.

NETTING SEASON

May 15 - August 15

These dates define acceptable limits for documenting the presence of summer population of Indiana bats, especially maternity colonies. Several captures, including adult females and young of the year, indicate that a nursery colony is active in the area. Outside these dates, even when Indiana bats are caught, data should be carefully interpreted: If only a single bat is captured, it may be a transient or migratory individual.

EQUIPMENT

Mist nets - Use the finest, lowest visibility mesh commercially available:

1. In the past, this was 1 ply, 40 denier monofilament - denoted 40/1
2. Currently, monofilament is not available and the finest on the market is 2 ply, 50 denier nylon - denoted 50/2
3. Mesh of approximately 1 ½ (1 ¼ - 1 ¾) in (~38 mm)

Hardware - No specific hardware is required. There are many suitable systems of ropes and/or poles to hold the nets. See NET PLACEMENT below for minimum net heights, habitats, and other netting requirements that affect the choice of hardware. The system of Gardner, *et al.* (1989) has met the test of time.

NET PLACEMENT

Potential travel corridors such as streams or logging trails typically are the most effective places to net. Place the nets approximately perpendicular across the corridor. Nets should fill the corridor from side to side and from stream (or ground) level up to the overhanging canopy. A typical set is seven meters high consisting of three or more nets "stacked" on top one another and up to 20 m wide. (Different width nets may be purchased and used as the situation dictates.)

Occasionally it may be desirable to net where there is no good corridor. Take caution to get the nets up into the canopy. The typical equipment described in the section above may be inadequate for these situations, requiring innovation on the part of the observers.

RECOMMENDED NET SITE SPACING:

Stream corridors - one net site per km of stream.
Non-corridor land tracts - two net sites per square km of forested habitat
(= 1 net site for every 123 acres of forested habitat)

MINIMUM LEVEL OF EFFORT

Netting at each site should consist of:

At least four net-nights (unless bats are caught sooner) (one net set up for one night = one net-night)
A minimum of two net locations at each site (at least 30m apart, especially in linear habitat such as a stream corridor)
A minimum of two nights of netting
Sample Period: begin at sunset; net for at least 5 hr
Each net should be checked approximately every 20 min
No disturbance near the nets, other than to check nets and remove bats

WEATHER CONDITIONS

Severe weather adversely affects capture of bats. If Indiana bats are caught during weather extremes, it is probably because they are at the site and active despite inclement weather. On the other hand, if bats are not caught, it may be that there are bats at the site but they may be inactive due to the weather. Negative results combined with any of the following weather conditions throughout all or most of a sampling period are likely to require additional netting:

- Precipitation
- Temperatures below 10°C
- Strong winds (Use good judgement: moving nets are more likely to be detected by bats.)

MOONLIGHT

There is some evidence that small myotine bats avoid brightly lit areas, perhaps as predator avoidance. It is typically best to set nets under the canopy where they are out of the moon light, particularly when the moon is ½-full or greater.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

July 10, 2009

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Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Sir or Madam:

This responds to the U.S. Nuclear Regulatory Commission's (NRC) letter of January 12, 2009, requesting comments on the environmental scoping process and federally protected species within the area affected by the proposed construction and operation of the PPL Bell Bend, LLC (PPL), Bell Bend Nuclear Power Plant (BBNPP). The NRC is reviewing an application submitted by PPL for a combined license for construction and operation of one new nuclear power plant at the BBNPP site. As part of the review of this application, NRC staff are preparing the environmental impact statement (EIS) required by NRC's regulations on implementing the National Environmental Policy Act of 1969 (83 Stat. 852 as amended; 42 U.S.C. 4321 *et seq.*). The EIS will include an analysis of pertinent environmental matters including those involving endangered or threatened species, and impacts to fish and wildlife. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), Migratory Bird Treaty Act of 1918 (40 Stat. 755, as amended; 16 U.S.C. 703-712) (MBTA), Bald and Golden Eagle Protection Act (54 Stat. 250, as amended; 16 U.S.C. 668-668d) (Eagle Act), and Fish and Wildlife Coordination Act of 1934 (48 Stat. 401, as amended; 16 U.S.C. 661-667e).

The proposed BBNPP site consists of approximately 882 acres located along the Susquehanna River, five miles northeast of Berwick, in Luzerne County, Pennsylvania. The proposed site is adjacent to the existing Susquehanna Steam Electric Station (SSES). Current land cover consists of forest, agricultural, and wetland habitats. PPL has stated there is no need for new transmission lines or corridors to connect the new reactor unit to the existing electrical grid, since the new facility would make use of the existing 500 kV transmission line and the Susquehanna-Roseland Interconnection.

E-RIDS = ADM-03
Add = S. Imboden
(SXF)

SUNSI Review Complete
Template = ADM-013

According to the BBNPP Combined License Application Environmental Report documents, approximately 564 acres would be affected by construction of the project (351 acres would be permanently affected). The total loss of habitat, including permanent and temporary impacts, would consist of the following: 173.7 acres upland forest, 38.7 acres upland scrub/shrub, 179.8 acres old field/former agriculture, 134.4 acres agriculture, 22.2 acres palustrine forested wetlands, 0.7 acre palustrine scrub-shrub wetlands, and 14 acres palustrine emergent wetlands. Approximately 37 acres of wetland habitat would be permanently lost to filling. In addition, approximately 1,000 feet of Walker Run would be relocated to a new channel, and approximately 340 feet of stream channel would be permanently filled.

Federally Protected Species

A compilation of certain federal status species in Pennsylvania is enclosed for your information. The BBNPP site is located within the range of the federally-listed, endangered Indiana bat (*Myotis sodalis*) and the federally protected bald eagle (*Haliaeetus leucocephalus*).

Indiana Bat

The Indiana bat hibernates in caves and mines during the winter months (November through March), and uses a variety of upland, wetland and riparian habitats during the spring, summer and fall. Indiana bats usually roost in dead or living trees with exfoliating bark, or living or dead trees with crevices or cavities. Female Indiana bats form nursery colonies under the exfoliating bark of dead or living trees, such as shagbark hickory, in upland or riparian areas. However, a variety of tree species such as black birch, red and white oak, and sugar maple are also used.

The proposed project is near three known Indiana bat hibernacula. Specifically, the project is located three miles south of the Shickshinny hibernaculum, six miles south of the Glen Lyon hibernaculum, and eight miles north of a newly-discovered hibernaculum in Luzerne County. In general, Indiana bats roost and forage in forest habitat during the non-hibernating period. To a lesser extent, the foraging bats also use a variety of adjacent fields, meadows, emergent wetlands, riparian corridors and shrub-lands. From late August through mid-November, they concentrate their roosting and foraging activities within a 10-mile radius of their hibernacula (*e.g.*, caves, abandoned mines) to build up fat reserves to take them through the winter hibernating period, when food is not available. Fall telemetry work conducted in Pennsylvania in 2007 confirmed that Indiana bats forage within an approximate ten-mile radius of hibernacula.

According to the September, 2008 report entitled *A Field Survey of Terrestrial Fauna at the Proposed Bell Bend Nuclear Power Plant Site, Luzerne County, Pennsylvania*, by Normandeau Associates, the project area contains suitable spring, summer and fall habitat for Indiana bats (*e.g.*, trees with exfoliating bark and dead snags). Because of the proximity of the project site to several hibernacula, it is likely that the suitable habitat in the project area is used by Indiana bats associated with these hibernacula. Consequently, removal of individual trees or forest clearing within the project area could result in the direct take of roosting Indiana bats, which could be injured or killed when trees are cut. Land-clearing, especially of forested areas, may adversely affect Indiana bats by killing, injuring, or harassing roosting bats, and by removing or reducing the quality of foraging, roosting, or fall swarming habitat. Therefore, land-clearing associated

with the project may result in the death or injury of roosting Indiana bats if tree-cutting is conducted during the time of year when bats may be present. Due to the potential for Indiana bats to occur within the project area, we recommend that measures be implemented to avoid killing or injuring them. This can be accomplished by carrying out timber-cutting activities from November 15 to March 31, during which time bats are hibernating or concentrated near their hibernacula.

To determine whether the project would adversely affect Indiana bat maternity colonies or summer habitat for male Indiana bats, bat mist-net surveys were conducted by Dr. Karen Campbell, a Fish and Wildlife Service-approved surveyor, between June 7 and July 11, 2008, at four sites within the project area. During sampling, 16 bats of three species were captured: eight little brown (*Myotis lucifugus*), four big brown (*Eptesicus fuscus*), and four northern long-eared (*Myotis septentrionalis*). No Indiana bats were captured. Unfortunately, it appears that no mist-net sites were located within the large forested wetland at the southwestern corner of the project area, part of which would be permanently removed by the project. Consequently, we cannot conclude that Indiana bat maternity colonies or summer habitat for male Indiana bats would not be affected by the project. It is important to note that summer mist-net surveys do not provide any information about use of an area by Indiana bats in the fall, since suitable forest habitat within 10 miles of a hibernaculum is assumed to be used for fall foraging, roosting, and swarming.

According to the latest site plans, approximately 196 acres of forest habitat will be removed by this project. To reduce impacts to Indiana bats and their foraging, roosting, and swarming habitats, the applicant should implement the following avoidance, minimization, and compensation measures.

1. Seasonal restriction on tree-cutting. Any tree-clearing must be done between November 15 and March 31. This avoidance measure is necessary to avoid direct "take" of Indiana bats.

2. Configure the project to avoid and minimize impacts on forest habitat, particularly in and around wetlands and riparian areas.

3. Configure the project to avoid and minimize impacts on suitable roost trees.

4. Retain at least a 50-foot forested buffer on each side of streams and around wetlands.

5. Retain forested travel corridors.

6. Co-locate project features (*e.g.*, roads and utility lines) and cluster project features to reduce forest clearing.

7. Re-forest cleared areas with a native tree species, using at least six of the tree species listed in Appendix A. One of these species must be shagbark hickory. Species selection will be determined by site-specific characteristics (soil moisture, sun exposure, *etc.*) and availability. Trees should be planted at approximately equal rates. Monitor re-planted areas and conduct supplemental tree planting to ensure tree-stocking success is a minimum of 400 live woody stems per acre.

8. Avoid or minimize the use of pesticides and herbicides.

9. Install bat-friendly gates on hibernacula (*e.g.*, abandoned mine portals) that are known or likely to support Indiana bats, or large numbers of hibernating bats of any species.

10. After reducing forest impacts via the avoidance and minimization measures (see #1-6 above), any remaining unavoidable impacts on forest should be offset by permanently protecting forest habitat off-site at a 1:1 compensation ratio, in consultation with the Service.

Revised project plans should be submitted to the Service, documenting how the above avoidance and minimization measures have been incorporated into the project design and layout. If adverse effects to Indiana bats cannot be avoided, formal consultation between the Service and NRC may be necessary, pursuant to section 7 of the Endangered Species Act.

Bald Eagle

The EIS should also evaluate potential effects of the project on bald eagles. Although the bald eagle has been removed from the federal List of Endangered and Threatened Wildlife, it continues to be protected under the Eagle Act and the MBTA. Both acts protect bald eagles by prohibiting killing, selling or otherwise harming eagles, their nests or eggs. The Eagle Act also protects eagles from disturbance. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

On June 4, 2007, the Service released several important documents related to the protection of bald eagles under the Eagle Act, including 1) a final rule establishing a regulatory definition of "disturb"; 2) a final environmental assessment of the "disturb" regulation; 3) *National Bald Eagle Management Guidelines*; and 4) a proposed rule to establish a permit for the take of bald and golden eagles. The proposed rule would establish regulations for issuing permits to take bald and golden eagles where the take is associated with, and not the purpose of, otherwise lawful activities. A second permit type would provide for permits to take bald and golden eagle nests for safety emergencies (of humans or eagles). All of these documents can be found at http://www.fws.gov/migratorybirds/baldeagle.htm.

Bald eagle nests are located five miles upstream and ten miles downstream of the proposed BBNPP site. In addition, eagles are expanding their range in Pennsylvania, and could be found in previously undocumented locations along the Susquehanna River. Consequently, we recommend that the project be carefully evaluated in light of the *National Bald Eagle Management Guidelines* to determine whether or not bald eagles might be disturbed as a direct or indirect result of this project. If it appears that disturbance may occur, we recommend that PPL consider modifying their project consistent with the *Guidelines*. If PPL has questions about when and how to obtain a permit because they believe the proposed project will disturb bald eagles, and they are not able to implement measures to avoid disturbance, they should contact the Service's Migratory Bird Permit Program at 413-253-8643 or permitsr5mb@fws.gov.

Other Wildlife Impacts

We recommend that the EIS address additional potential impacts to fish, wildlife, and their habitats due to the proposed construction and operation of the BBNPP. We note the following wildlife resources and designations at the BBNPP site:

- Susquehanna Riverlands Important Bird Area: 247 documented bird species and 126 documented breeding birds. In particular, eight Federal Birds of Conservation Concern (USFWS 2008) have been documented within the project area: Peregrine falcon, wood thrush, blue-winged warbler, golden-winged warbler, prairie warbler, cerulean warbler, worm-eating warbler, and sedge wren.

- Wyoming Valley Important Mammal Area designation due to the site's proximity to Indiana bat hibernacula.

Forest habitat avoidance, minimization, and compensation measures for the Indiana bat, discussed above, will provide long-term benefits to many of these bird species as well as the Indiana bat and other bat species.

Wetland and Aquatic Impacts

As currently proposed, construction of the BBNPP would include permanently filling approximately 37 acres and temporarily affecting two acres of wetland habitat. In addition to evaluating direct impacts on wetlands, the EIS should evaluate potential indirect and secondary impacts of the proposed project on other wetlands and waters, including degradation of habitat and impacts to water quantity and quality (including thermal impacts) within and adjacent to the proposed development. We are especially concerned about the potential for the proposed site development plan to isolate wetland areas, cutting off their sources of water and interrupting habitat connectivity.

Clean Water Act regulations prohibit issuance of section 404 permits for discharges having less damaging, practicable alternatives. The EIS should rigorously and objectively evaluate all reasonable alternatives, including other forms of energy production and alternative sites. If impacts to wetlands are unavoidable, however, and have been minimized to the maximum extent

practicable, remaining impacts to the aquatic environment must be offset through appropriate compensatory measures. As part of the project evaluation, an inventory of potential compensation sites should be conducted.

Alternative Sites

As part of the EIS, three alternative sites for the proposed nuclear energy facility are being evaluated: the Sandy Bend Site, in Mifflin County, Pennsylvania; the Montour Site, in Montour County, Pennsylvania; and the Martins Creek Site, in Warren County, New Jersey. The following are preliminary comments for the Sandy Bend and Montour sites only. Preliminary comments for the Martins Creek Site have been provided by the Service's New Jersey Field Office in a letter addressed to Robert Schaaf, Chief, Environmental Projects Branch 3, NRC, dated March 13, 2009.

Sandy Bend Site

The Sandy Bend alternate site is located 2.5 miles northeast of McVeytown, along the Juniata River. The total size of the property is 420 acres, all of which would be affected by the project. The current land use has not been specified. However, aerial photography of the site indicates both open and forest habitat. You have indicated that wetlands are located within 300 feet of the project area, but the number of acres that would be affected has not been specified. The EIS should include a detailed evaluation of habitat impacts, including direct and indirect impacts on wetlands and waters, and degradation of habitat and water quantity and quality (including thermal impacts), within and adjacent to the proposed development at this site.

This site is within the range of two federally-listed, endangered species - the Indiana bat and northeastern bulrush (*Scirpus ancistrochaetus*). Development of this project area should be evaluated with respect to these species, based on the information provided below.

Depending on the anticipated impacts of the project on forest habitat, seasonal restrictions on forest removal and/or a bat mist-net survey may be warranted. Although it is not near any known Indiana bat hibernacula, the site may still contain suitable roosting and maternity habitat within the forested areas. We would need to know the extent of forest removal before making final recommendations. If mist-net surveys are needed, they should be conducted between May 15 and August 15 by a qualified, Service-approved biologist (see enclosed list) using the enclosed *Indiana Bat Mist Netting Guidelines*. Should Indiana bats or potential habitat be found during any surveys, further consultation with the Service will be necessary, including the submission of detailed project plans, and an analysis of alternatives to avoid and minimize adverse effects.

Although northeastern bulrush is not known to occur within the project area boundaries, potential habitat may occur this area. Potential habitat for northeastern bulrush could be affected if the project will directly or indirectly affect wetlands. The northeastern bulrush is typically found in ponds, wet depressions, shallow sinkholes, vernal ponds, small emergent wetlands, or beaver-influenced wetlands. These wetlands are often located in forested areas and characterized by seasonally variable water levels.

We recommend that the proposed site be surveyed for wetlands. If wetlands are present, a Service-approved botanist (see enclosed list), should conduct a thorough survey of the wetlands to determine the presence of northeastern bulrush before any permits are approved or earth-moving activities begin. Surveys for this species must be conducted between June 1 and September 30, when the flowering/fruiting culm is present. A survey report should be submitted to the Service for review and comment.

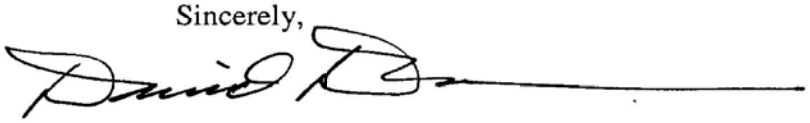
Montour Site

The Montour alternate site is located two miles northeast of Washingtonville, adjacent to the Montour Coal Fired Power Plant. The total size of the property is 2,500 acres; however, only 420 acres would be affected by the project. The current land use has not been specified. However, aerial photography of the site indicates mostly open areas with interspersed patches of forest. You have indicated that wetlands are located within 300 feet of the project area, but the number of acres that would be affected has not been specified. The EIS should include a detailed evaluation of habitat impacts, including direct and indirect impacts on wetlands and waters, and degradation of habitat and impacts to water quantity and quality (including thermal impacts), within and adjacent to the proposed development at this site.

This site is also within the range of the Indiana bat; therefore, development of this area should be evaluated with respect to this species. Depending on the anticipated impacts of the project on forest habitat, seasonal restrictions on forest removal and/or a bat mist-net survey may be warranted. Although the site is not close to any known Indiana bat hibernacula, the site may still contain suitable roosting and maternity habitat within the forested areas. We would need to know the extent of forest removal before making final recommendations. If mist-net surveys are needed, they should be conducted between May 15 and August 15 by a qualified, Service-approved biologist (see enclosed list) using the enclosed *Indiana Bat Mist Netting Guidelines*. Should Indiana bats or potential habitat be found during any surveys, further consultation with the Service will be necessary, including the submission of detailed project plans, and an analysis of alternatives to avoid and minimize adverse effects.

Thank you for the opportunity to comment on the BBNPP project. Please contact Cindy Tibbott of my staff at 814-234-4090 if you have any questions or require further assistance regarding this matter.

Sincerely,



David Densmore
Supervisor

Enclosures

References

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. (Online version available at http://www.fws.gov/migratorybirds/)

Federally Listed, Proposed, and Candidate Species in Pennsylvania

(revised November 19, 2008)

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MAMMALS			
Indiana bat	*Myotis sodalis*	E	Hibernacula: Armstrong, Beaver, Blair, Centre, Fayette, Huntingdon, Lawrence, Luzerne, Mifflin and Somerset Co. Maternity sites: Adams, Bedford, Berks, Blair, Greene, and York Counties. Potential winter habitat state-wide in caves or abandoned mines. Potential summer habitat state-wide in forests or wooded areas.
BIRDS			
Piping plover	*Charadrius melodus*	E	Designated critical habitat on Presque Isle (Erie Co.). Migratory. No nesting in PA since 1950s, but recent colonization attempts at Presque Isle
REPTILES			
Bog turtle	*Clemmys (Glyptemys) muhlenbergii*	T	Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York Co. *Historically found in Crawford, Mercer and Philadelphia Co.*
Eastern massasauga rattlesnake	*Sistrurus catenatus catenatus*	C	Butler, Crawford, Mercer and Venango Co. *Historically found in Allegheny and Lawrence Co.*
MUSSELS			
Clubshell	*Pleurobema clava*	E	French Creek and Allegheny River (and some tributaries) in Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co.; Shenango River (Mercer and Crawford Co.) *Has not been found recently in 13 streams of historical occurrence in Butler, Beaver, Fayette, Greene, Indiana, Lawrence, and Westmoreland Co.*
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Delaware River (Pike and Wayne Co.). *Has not been found recently in streams of historical occurrence in the Delaware River watershed (Bucks, Carbon, Chester, Philadelphia Co.) or Susquehanna River watershed (Lancaster Co.)*
Northern riffleshell	*Epioblasma torulosa rangiana*	E	French Creek and Allegheny River (and some tributaries) in Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co. *Has not been found recently in streams of historical occurrence, including: Shenango River (Lawrence Co.), Conewango Creek (Warren Co.)*

US Fish and Wildlife Service
315 South Allen Street, Suite 322, State College, Pennsylvania 16801

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MUSSELS (continued)			
Rayed bean	*Villosa fabalis*	C	French Creek and Allegheny River (Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, Warren Co.); Cussewago Creek (Crawford Co.). *Has not been found recently in 5 streams of historical occurrence in Armstrong, Lawrence, Mercer and Warren Co.*
Sheepnose	*Plethobasus cyphyus*	C	Allegheny River (Forest and Venango Co.). *Has not been found recently in streams of historical occurrence, including: Allegheny River (Armstrong Co.), Beaver River (Lawrence Co.), Ohio River (Allegheny and Beaver Co.), and Monongahela River (Washington Co.)*
FISH			
Atlantic sturgeon[2]	*Acipenser oxyrinchus oxyrinchus*	C	Delaware River and other Atlantic coastal waters
Shortnose sturgeon[2]	*Acipenser brevirostrum*	E	Delaware River and other Atlantic coastal waters
PLANTS			
Northeastern bulrush	*Scirpus ancistrochaetus*	E	Adams, Bedford, Blair, Cambria, Carbon, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder, Tioga, and Union Co. *Historically found in Northampton Co.*
Small-whorled pogonia	*Isotria medeoloides*	T	Centre, Chester and Venango Co. *Historically found in Berks, Greene, Monroe, Montgomery and Philadelphia Co.*

[1] E = Endangered; T = Threatened; P = Proposed for listing; C = Candidate
[2] Atlantic sturgeon and shortnose sturgeon are under the jurisdiction of the National Marine Fisheries Service

U.S. FISH AND WILDLIFE SERVICE
Pennsylvania Field Office

QUALIFIED INDIANA BAT SURVEYORS

The following list includes persons known by the U.S. Fish and Wildlife Service to have the skills and experience to conduct surveys for Indiana bats. Any individuals handling or conducting surveys for Indiana bats must first obtain a permit from the Pennsylvania Game Commission. All Indiana bat captures must be reported in writing to the Service and Commission within 72 hours. Indiana bat surveys should be overseen by a qualified surveyor, who should be present in the field at all times during the investigation. Mist-net surveys should be carried out in accordance with the Service's *Indiana Bat Mist Netting Guidelines*. If any Indiana bats are captured during mist-netting, a surveyor with bat telemetry experience should be prepared to place a transmitter on the bat(s) to identify roost trees and foraging habitat. Various sampling techniques, including mist-netting, Anabat detection, radio-telemetry, harp-trapping and hibernacula surveys, are used to detect and monitor bats. Some individuals on this list may not be qualified to conduct all types of sampling.

This information is not to be construed as an endorsement of individuals or firms by the Service or any of its employees. Persons not on this list, but who have documented experience in conducting scientific studies of, or successful searches for, Indiana bats may submit their qualifications to the Service for review. The submission must include documentation that the requestor has experience successfully locating and identifying Indiana bats in their hibernacula and their summer habitat. Additions to and deletions from this list are at the sole discretion of the Service. This list is subject to revision at any time without prior notice.

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INDIANA BAT MIST NETTING GUIDELINES

RATIONALE

A typical mist net survey is an attempt to determine presence or probable absence of the species, it does not provide sufficient data to determine population size or structure. Following these guidelines will standardize procedures for mist netting. It will help maximize the potential for capture of Indiana bats at a minimum acceptable level of effort. Although the capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence. Netting effort as extensive as outlined below usually is sufficient to capture Indiana bats. However, there have been instances in which additional effort was necessary to detect the presence of the species.

NETTING SEASON

May 15 - August 15

These dates define acceptable limits for documenting the presence of summer population of Indiana bats, especially maternity colonies. Several captures, including adult females and young of the year, indicate that a nursery colony is active in the area. Outside these dates, even when Indiana bats are caught, data should be carefully interpreted: If only a single bat is captured, it may be a transient or migratory individual.

EQUIPMENT

Mist nets - Use the finest, lowest visibility mesh commercially available:

1. In the past, this was 1 ply, 40 denier monofilament - denoted 40/1
2. Currently, monofilament is not available and the finest on the market is 2 ply, 50 denier nylon - denoted 50/2
3. Mesh of approximately 1 ½ (1 ¼ - 1 ¾) in (~38 mm)

Hardware - No specific hardware is required. There are many suitable systems of ropes and/or poles to hold the nets. See NET PLACEMENT below for minimum net heights, habitats, and other netting requirements that affect the choice of hardware. The system of Gardner, *et al.* (1989) has met the test of time.

NET PLACEMENT

Potential travel corridors such as streams or logging trails typically are the most effective places to net. Place the nets approximately perpendicular across the corridor. Nets should fill the corridor from side to side and from stream (or ground) level up to the overhanging canopy. A typical set is seven meters high consisting of three or more nets "stacked" on top one another and up to 20 m wide. (Different width nets may be purchased and used as the situation dictates.)

Occasionally it may be desirable to net where there is no good corridor. Take caution to get the nets up into the canopy. The typical equipment described in the section above may be inadequate for these situations, requiring innovation on the part of the observers.

RECOMMENDED NET SITE SPACING:

Stream corridors - one net site per km of stream.
Non-corridor land tracts - two net sites per square km of forested habitat
(= 1 net site for every 123 acres of forested habitat)

MINIMUM LEVEL OF EFFORT

Netting at each site should consist of:

- At least four net-nights (unless bats are caught sooner) (one net set up for one night = one net-night)
- A minimum of two net locations at each site (at least 30m apart, especially in linear habitat such as a stream corridor)
- A minimum of two nights of netting
- Sample Period: begin at sunset; net for at least 5 hr
- Each net should be checked approximately every 20 min
- No disturbance near the nets, other than to check nets and remove bats

WEATHER CONDITIONS

Severe weather adversely affects capture of bats. If Indiana bats are caught during weather extremes, it is probably because they are at the site and active despite inclement weather. On the other hand, if bats are not caught, it may be that there are bats at the site but they may be inactive due to the weather. Negative results combined with any of the following weather conditions throughout all or most of a sampling period are likely to require additional netting:

- Precipitation
- Temperatures below 10°C
- Strong winds (Use good judgement: moving nets are more likely to be detected by bats.)

MOONLIGHT

There is some evidence that small myotine bats avoid brightly lit areas, perhaps as predator avoidance. It is typically best to set nets under the canopy where they are out of the moon light, particularly when the moon is ½-full or greater.

U.S. FISH AND WILDLIFE SERVICE
Pennsylvania Field Office

QUALIFIED NORTHEASTERN BULRUSH SURVEYORS

The following list includes persons known by the U.S. Fish and Wildlife Service to have the skills and experience to conduct surveys for the northeastern bulrush (*Scirpus ancistrochaetus*). Observations of the northeastern bulrush at previously undocumented sites must be reported in writing to the Service within 48 hours. Northeastern bulrush surveys should be overseen by a qualified surveyor, who should be present in the field at all times during the investigation.

This information is not to be construed as an endorsement of individuals or firms by the Service or any of its employees. Persons not on this list, but who have documented experience in conducting scientific studies of, or successful searches for, the northeastern bulrush may submit their qualifications to the Service for review. The submission must include documentation that the requestor has experience successfully locating and identifying the northeastern bulrush and its habitat. Additions to and deletions from this list are at the sole discretion of the Service. This list is subject to revision at any time without prior notice.

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Department of Biology
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Pulaski, PA 16143
(412) 964-8770

Revised 01/14/2009

Appendix A

TREE SPECIES LIST FOR INDIANA BAT HABITAT RESTORATION

Acer rubrum	red maple
Acer saccharum	sugar maple
Carya cordiformis	bitternut hickory
Carya glabra	pignut hickory
Carya laciniosa	shellbark hickory
Carya ovata	shagbark hickory
Carya tomentosa	mockernut hickory
Fraxinus americana	white ash
Fraxinus nigra	black ash
Fraxinus pennsylvanica	green ash
Platanus occidentalis	sycamore
Populus deltoides	eastern cottonwood
Quercus alba	white oak
Quercus coccinea	scarlet oak
Quercus prinus	chestnut oak
Quercus rubra	northern red oak
Quercus velutina	black oak
Robinia pseudoacacia	black locust
Sassafras albidum	sassafras
Ulmus americana	American elm
Ulmus rubra	slippery elm

Planting plans should include at least six of the tree species listed above, one of which must be shagbark hickory. To promote diversity, no more than 15 percent of any one tree species shall be included in planting plans.

T. L. Harpster
VP-Bell Bend Project-Development

PPL Bell Bend, LLC
38 Bomboy Lane, Suite 2
Berwick, PA 18603
Tel. 570.802.8111 FAX 570.802.8119
tlharpster@pplweb.com

September 20, 2010

Ms. Pamela Shellenberger
U. S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322
State College, PA 16801

BELL BEND NUCLEAR POWER PLANT
LARGE PROJECT SPECIES
OF SPECIAL CONCERN SCREEN
SALEM TOWNSHIP, LUZERNE COUNTY, PA
BNP-2010-208 Docket No. 52-039

PPL Bell Bend, LLC is conducting an environmental evaluation for a potential nuclear power plant adjacent to the Susquehanna Steam Electric Station (SSES) site in Salem Township, Luzerne County, Pennsylvania. For screening purposes, the project area boundaries as shown on Figure 1 encompass the entire footprint of possible disturbance for the construction and maintenance of a nuclear power plant under consideration for the site, as well as the existing SSES site. The existing active SSES operating unit is within this boundary but will not be altered. This letter is a follow up to a similar letter sent March 26, 2008 and your agency's response dated April 21, 2008 with a reference USFWS Project #2008-0518.

Please note that the project team has initiated consultation with USFWS with respect to the project's impacts to Indiana bat at the proposed BBNPP.

PPL Bell Bend, LLC wishes to screen the entire area as shown on Figure 1 for species of special concern under jurisdiction of the U. S. Fish and Wildlife Service. Please provide all current and historical information concerning the occurrence of Federally-listed and proposed threatened and endangered species; designated and proposed critical habitats; and any other ecological resources of special concern within the project area. This information may be used in future consultations with your agency under Section 7 of the Endangered Species Act.

In addition, please provide this information for a 0.5-mile buffer surrounding the project area. This latter screen is requested for the purpose of evaluating environmental impacts and compliance with Pennsylvania Department of Environmental Protection regulations (e.g., 25 PA Code Chapter 105.17). A PNDI search form is attached for your use.

If you have any questions or need additional information, please contact Bradley Wise at 610.774.6508 or bawise@pplweb.com.

Thank you for your assistance.

Respectfully,

Terry L Harpster

TLH/dw

Enclosures 1) Site Location Map
2) PNDI Review Form

cc: Ms. Stacey Imboden
Senior Project Manager
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Ms. Jamie Davis
Office of Environmental Programs (3EA30)
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Tom Shervinskie
Pa Fish & Boat Commission
450 Robinson Lane
Bellefonte, PA 16823

Ms. Jennifer Kagel
United States Fish & Wildlife Service
Pennsylvania Field Office
315 S. Allen St. #322
State College, PA 16801

Mr. Eugene Trowbridge
Pa Dept Environmental Resources
Northeast Regional Office
2 Public Square
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Ms. Amy Elliott
U.S. Army Corps of Engineers - Baltimore District
State College Field Office
1631 South Atherton Street, Suite 102
State College, PA 16801

Ms. Paula B. Ballaron
Susquehanna River Basin Commission
1721 North Front Street
Harrisburg, PA 17102-0425

Mr. Thomas W. Beauduy
Susquehanna River Basin Commission
1721 North Front Street
Harrisburg, PA 17102-0425

bcc:

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R. Sgarro	rrsgarro@pplweb.com
D. Klinch	David.Klinch@constellation.com

Enclosure 1

Site Location Map

Controlled Document

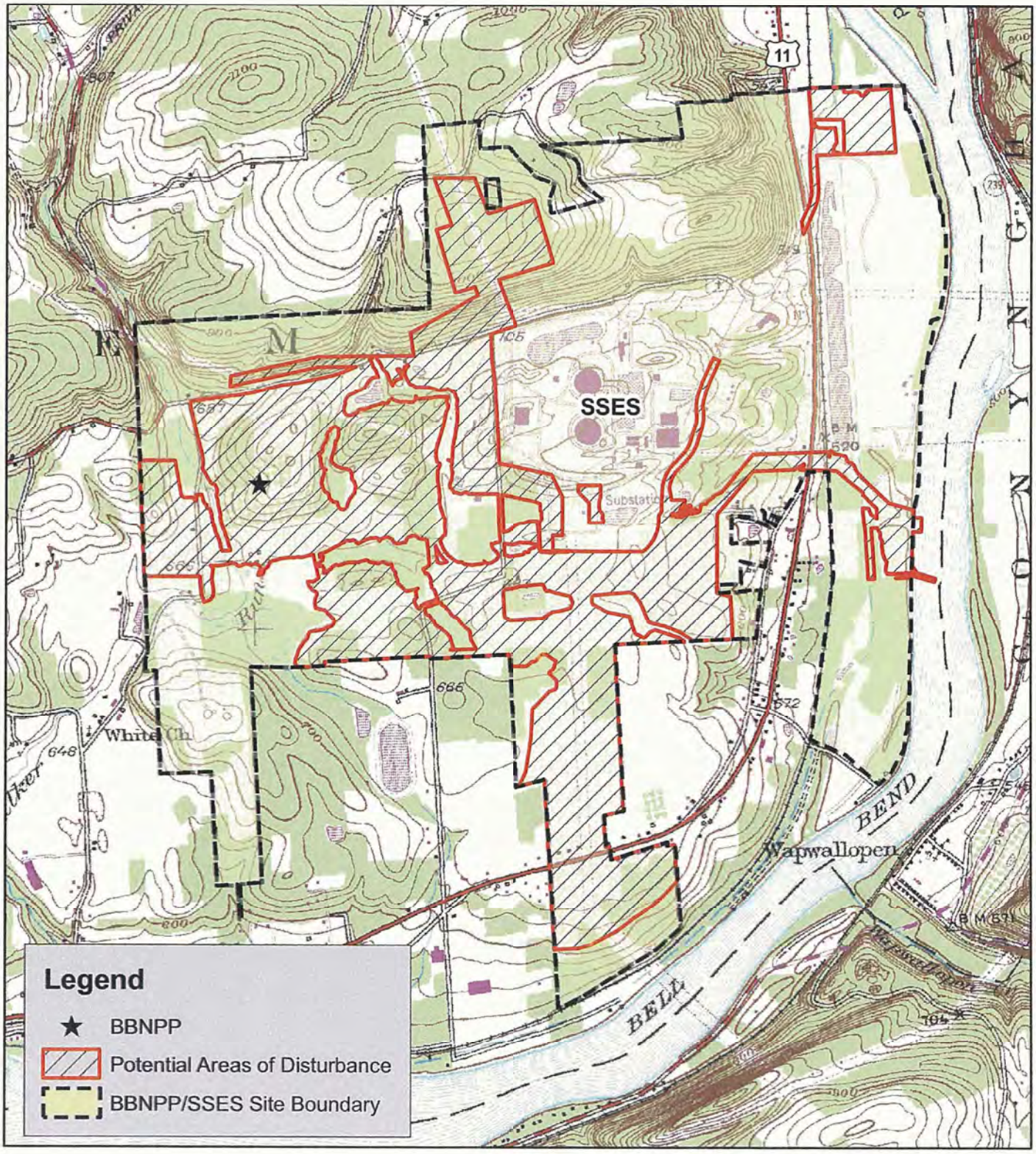

Figure 1.
Bell Bend NPP
Site Location Map

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 07/27/10
prepared by: s.sherman
project: 21766.004

rev. date:
prepared for: b.lees
file name: Figure1.BBNPP_Site_USGS

Enclosure 2

PNDI Review Form

Pennsylvania Natural Diversity Inventory

Project Planning & Environmental Review Form

This form provides site information necessary to perform an Environmental Review for special concern species and resources listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat code or the Pennsylvania Game and Wildlife Code.

Applicant Information

Name: PPL Bell Bend, LLC
Address: 38 Bomboy Lane, Suite 2, Berwick, PA 18603
Phone Number: 570.802.8100 Fax Number: 570.802.8119

Contact Person Information - if different from applicant

Name: Bradley A. Wise, Environmental Permitting Supervisor, PPL Bell Bend LLC
Address: Two North Ninth Street (GENPL4), Allentown, PA 18101-1179
Phone Number: (610) 774-6508 Fax Number: (610) 774-2618

Project Information

Project Name: Bell Bend Nuclear Power Plant Project
Project Locations: Lat N 41d 5m 20.7s Lon W 76d 9m 4.5s
Municipality: Salem Township County: Luzerne
[X] Attach a copy of a U.S.G.S 7 1/2 Minute Quadrangle Map with Project Boundaries clearly marked.
U.S.G.S. Quad Name: Berwick, PA

Project Description

Proposed Project Activity (including All earth disturbance areas and current conditions)
The Bell Bend Nuclear Power Plant Project involves development of a combined license application (COLA) to the U.S. Nuclear Regulatory Commission (NRC) for potential construction and operation of a new nuclear powered steam electric plant adjacent to the Susquehanna Steam Electric Station. In the event a decision is made to develop the plant, associated activities would involve land clearing, grubbing, grading/excavation, and construction of plant and suppport facilities and structures; landscaping; and subsequent operation and maintenance of plant facilities and grounds. Land use of areas potentially disturbed consists predominatly of active/former farmland and forest, to roadways, and natural vegetation (e.g., shrub-scrub).

Total Acres of Property: 1,700 Acreage to be Impacted: 700 acres **(approximately)**

1. Will the entire project occur in or on an existing building parking lot, driveway, road, maintained road shoulder, street, runway, paved area, railroad bed, or maintained lawn? Yes No X
2. Are there any waterways or waterbodies (intermittent or perennial rivers, streams, creeks, tributaries, lakes or ponds) in or near the project area, or on the land parcel? If so, how many feet away is the project? Yes X feet 0
3. Are wetlands located in or within 300 feet of the project area? Yes X No If No. is this the result of a wetland delineation?

If you have a "PNDI Project Environmental Review Receipt" with potential impacts,, please send a receipt copy, this completed form, and a USGS Quad Map to the agency/agencies noted on the receipt. If you are unable to generate a PNDI Receipt because you do not have Internet access, complete this form, attach USGS Quad Map, and send them to your local DEP or County Conservation District. For review of a "Large Project," please send form and map to all the agencies listed below. See page 2 for more information.

Dept. of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
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Harrisburg, PA 17105
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PA Game Commission
Bureau of Land Management
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PA Fish and Boat Commission
Natural Diversity Section
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September 27, 2010

Ms. Carole Copeyon
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BELL BEND NUCLEAR POWER PLANT
INDIANA BAT ROOST TREE SURVEY STUDY PLAN
BNP-2010-235 Docket No. 52-039

As part of the process for the development of an Environmental Impact Statement for the Bell Bend Nuclear Power Plant project, the U.S. Nuclear Regulatory Commission (NRC) has requested that the U.S. Fish & Wildlife Service (USFWS) perform a Biological Assessment / Biological Opinion regarding impacts on the Indiana Bat.

Attached please find PPL's Indiana Bat Roost Tree Survey Study Plan, which is being provided at your request in support of your assessment activities.

Please do not hesitate to contact myself or Brad Wise (610-774-6508) directly with any additional needs or questions.

Respectfully,

Terry L Harpster

TLH/dw

Enclosure: 1) Indiana Bat Roost Tree Survey Study Plan

cc: Ms. Stacey Imboden
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1721 North Front Street
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Mr. Thomas W. Beauduy
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1721 North Front Street
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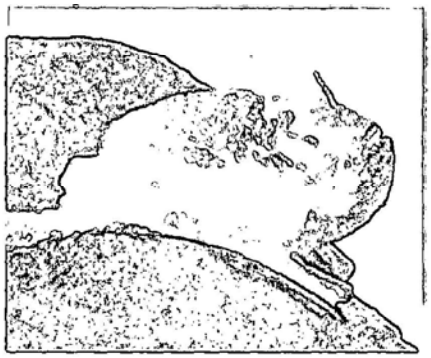
Enclosure 1

Indiana Bat Roost Tree Survey Study Plan

Indiana Bat (*Myotis sodalis*) Roost Tree Survey Study Plan Proposed Bell Bend NPP Site Luzerne County, Pennsylvania



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Submitted to:
AREVA NP, Inc.
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September 2010

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

INTRODUCTION

Normandeau Associates, Inc. (Normandeau) proposes to conduct a quantitative in-field survey for suitable Indiana bat (*Myotis sodalis*) roost trees within the forested areas proposed to be impacted by construction of the Bell Bend Nuclear Power Plant (BBNPP). The objective is to determine the density and quality of Indiana bat roosting habitat provided by these areas.

Neither the U.S. Fish and Wildlife Service (USFWS) nor the Pennsylvania Game Commission (PGC) has an official Indiana bat roost tree survey methodology. Therefore, our survey techniques will be based on this site-specific protocol. Each contiguous forest block proposed for clearing will be described with respect to species composition, age, structure and other measures used to judge habitat quality for Indiana bats as described under field measurements in the methodology section below. The habitat assessment will be based on density and quality of suitable roost trees and evaluation of forest stands.

SITE DESCRIPTION

BBNPP is proposed to be sited adjacent to the Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania. Potential areas of disturbance associated with BBNPP will extend across 703 acres (1.10 mile^2) within the 1,991-acre (3.1 mile^2) BBNPP Project Site (Figure 1). The site terrain is variable and ranges from steeply sloping hills in the north and west to the relatively level floodplain of the Susquehanna Riverlands in the east. The net topographic relief is approximately 560 feet. There are approximately 238 acres (228.45 upland verses 9.34 wetland) of forested habitat proposed to be impacted by construction of BBNPP that will be analyzed as part of this roost tree habitat evaluation.

INDIANA BAT SUMMER HABITAT

The following section is provided as background information for our survey plan and was summarized from The U.S. Fish and Wildlife Service Draft Recovery Plan For The Indiana Bat (USFWS 2007).

Female Summer Roosts

Reproductive female Indiana bats migrate from the hibernacula to summer roosting habitat, and have shown strong site fidelity to their traditional summer roosting and foraging areas. They form maternity colonies after arriving at their summer range (late March to mid-May) and cluster in maternity roosts with suitable microclimates that facilitate roost temperatures favorable for prenatal and postnatal development. Maternity colonies most commonly consist of 60 to 100 adult females but may be larger, and may include females from more than one hibernaculum. Composition of the colony is fluid with females moving between as many as 10 to 20 different maternity roost trees. The majority of female bats use one to three primary maternity roost trees, while the rest of the trees are alternate or secondary maternity roosts that are intermittently used by small numbers of females throughout the summer, or on only a few days, or as temporary night roosts.

Maternity colonies may occupy maternity roost trees for a number of years; however all maternity roost trees are ephemeral and become unusable by losing important structural characteristics such as bark, falling to the ground or due to competition with other animals. The use of alternate maternity roost trees is thought to be a behavioral mechanism that enables bats to evaluate new trees for use as future primary maternity roosts.

Summer roosting habitat for non-reproductive female Indiana bats is less well known. They may remain close to their hibernaculum or migrate to summer habitat where they roost individually or in small numbers.

Typically, non-reproductive females do not roost in colonies but may be present in the same trees as reproductive females.

Male Summer Roosts

Summer roosting habitat for male Indiana bats also is not well known. Males are most commonly found in the vicinity of their hibernaculum but may also disperse thought the summer range and roost individually or in small numbers.

Characteristics of Roost Trees

Indiana bats roost under the exfoliating bark of trees and occasionally in longitudinal crevices within trees; however, they rarely use cavities created by rot or woodpeckers. For maternity roosts (primary and alternate), females prefer dead or nearly dead trees, or dead parts of living trees such as dead trunks of trees with multiple trunks. They are occasionally found on living trees with lose peeling bark; however, these trees are thought to be used primarily as alternate maternity roosts during exceptionally warm or wet weather. A wide variety of tree species are used for maternity roosts and use is primarily related to local availability of trees with suitable structure rather than a preference for a particular species. In addition, regional differences in maternity roost tree characteristics may result from influencing factors such as weather and altitude.

Maternity roost trees are typically found in areas with high solar exposure such as openings within a forest, in a fence line, or along a wooded edge. Female Indiana bats may use structurally suitable trees in more interior sections of forest as maternity roosts during exceptionally warm or wet weather. Sizes of maternity roost trees vary, although larger diameter trees are preferred and may provide thermal advantages as well as more roosting spaces. The average range wide diameter of primary maternity roost trees is 18-inches. However, average diameters of primary and alternate maternity roost trees in several Midwestern states ranged from 16-inches to 24-inches, and an alternate maternity roost tree in Pennsylvania had a diameter of only 11-inches. The minimum height of maternity roost trees is typically greater than 10-feet, although the absolute height of maternity roost trees is thought to be less important than height and position relative to surrounding trees, which can affect the amount of solar exposure received by a tree.

Male Indiana bats are more flexible in their preferred summer roosting habitat. They roost in the same types of structurally suitable trees as females but not necessarily in areas with high solar exposure. In addition, male bats are more likely to roost in living trees and trees that are smaller since the average range wide diameter of male roost trees is 13-inches.

Based upon the research presented in USFWS 2007, female Indiana bat maternity roost trees (primary and alternate) are typically 11inches in diameter at breast height (dbh) or greater, 10 feet in height or greater, dead with exfoliating, peeling or lose bark, and/or crevices. Primary roosts are situated in areas with high solar exposure and receive direct sunlight for more than half the day. Alternate roost trees may have a lower level of solar exposure. Trees with less than 10% live canopy will be considered dead to be consistent with USFWS "Forest Management Practices for Conserving Indiana Bats".

Male Indiana bat roost trees will encompass live and dead trees that have exfoliating, peeling or lose bark, and/or crevices with a 5 inch or greater dbh, regardless of their solar exposure. The 5-inch dbh criterion is used for consistency with USFWS guidance regarding tree cutting within the range of the Indiana bat during its summer roosting period, which is currently followed on adjacent SSES properties.

SURVEY METHODOLOGY

Proposed forest clearing on the BBNPP site may result in the loss of potential Indiana bat foraging and roosting habitat, as well as changes to the thermal regime of the remaining forest habitat. Normandeau proposes to conduct a survey of contiguous forest blocks proposed for clearing at the BBNPP site to determine the distribution, density and quality of Indiana bat roost trees (Figure 2). Our survey is intended to estimate the quality of roosting habitat in the forest proposed for clearing, and is not intended to inventory all potential roost trees present at the BBNPP site. Normandeau will survey both the edges and interiors of these forest habitats for the presence and quality of roost trees as defined above.

Mist-net surveys have not documented summer/maternity colony use of the site, although mist-netting effort was lower than recommended. Roosting and foraging by bats in the fall is the primary focus because three Indiana bat hibernacula occur near the BBNPP site In addition, summer roosting by male Indiana bats is likely. Therefore, the roost tree assessment will focus on roosting habitat for Indiana bats during their active season (spring, summer, and fall).

Forest Edges

Normandeau biologists will inspect the onsite edges of all forested areas proposed for clearing and evaluate all potential roost trees within a distance of 50-feet of the forest edge. The 50-foot margin has been used in published scientific studies and represents a conservative boundary for identifying potential roost trees along a forest edge that are likely to receive increased solar radiation relative to trees located in more interior sections of a forest. The positions of potential roost trees will be located using a Global Positioning System (GPS) with a sub-meter level of accuracy. A single GPS location will be taken at the center of clumps or otherwise closely associated groups of suitable roost trees. Field measurements of roost tree characteristics as described below will be recorded in digital or hardcopy format.

Forest Interiors

Normandeau will survey all contiguous forest blocks of approximately 2 acres or greater (18 total) proposed for clearing for the quality and density of Indiana bat roosting habitat. Forest blocks will be surveyed at the rate of one 100-ft radius sample plot per 5 acres or fraction thereof. There are 10 forest blocks between 2 acres and 10 acres in size and some 8 forest blocks greater than 10 acres in size. Additional plots will be located within forest blocks to insure that our sampling is representative of all forest habitats present, particularly forested wetlands. Each forest block and will be evaluated for potential roost trees. We will also characterize the overall vegetation community according to species composition, age, structure and other measures of habitat quality for Indiana bats as described under field measurements below. The center of each interior forest plot will be located with a sub-meter level GPS and data will be recorded in digital or hardcopy format.

Field Measurements

All trees in surveyed areas will be evaluated for suitability as roosts. The following information will be recorded for each potential roost tree: 1) species, 2) dbh, 3) roost tree condition (live, dead, or partially dead), 4) type of roost structure(s) (bark, crevice, and/or cavity), 5) date, 6) surveyor, and 7) sampling location (GPS coordinates) . Field measurements are explained in more detail below. All measurements are for roost trees only, except in the forest interior plots where species identification and dbh will also be measured for the purpose of general categorization of the forest cover in each block.

1) Species identification: All trees will be identified to species. Dead trees and snags that are too far decayed for identification will be designated as unknown.

2) Diameter at breast height (dbh): The dbh of each roost tree be measured to the nearest inch using a Biltmore stick, diameter tape or similar measuring device. For the purpose of categorizing the general forest cover, the minimum, maximum and average dbh will be measured in a similar manner from representative sub-samples of the trees in each of the forest interior plots.

3) Roost Tree Condition: (Live, dead, or partially dead): Trees designated as live will be healthy in appearance and have more than 80% live canopy. Trees designated as dead will encompass snags and trees with less than 10% live canopy. Trees designated as partially dead will have 10-80% live canopy.

4) Type of roost structure: The type(s) of roost structure on the tree will be identified as bark (exfoliating or defoliating bark), crevice, or cavity.

5) Date: The date of the survey will be recorded as MMDDYYYY.

6) Surveyor: The name of the person who identified the tree to species, measured dbh and classified attributes 3-5 and 7 will be recorded. If more than one person contributes to the data, then a lead and assistants will be identified for each line of data.

7) Sampling location (GPS coordinates): The latitude and longitude of the base of each roost tree will be recorded using a sub-meter GPS. The datum and coordinate system will be chosen to coordinate with existing survey information for the BBNPP site.

Roost tree characterization

Trees will be categorized as having a "high", "moderate", or "low" potential for serving as a roost tree for Indiana bats.

High – Live, dead, and partially dead trees that are ≥16" dbh and have roost structure.
Medium – Live, dead, and partially dead trees that are 9 to 15" dbh and have roost structure.
Low – Live, dead, and partially dead trees that are 5 to 8" dbh and have roost structure.

DATA ANALYSIS AND REPORT

Normandeau will prepare a report that summarizes the study findings. Roost tree identity, dbh, attribute data and rank as described above will be tabulated and presented by forest block. Our report will include a written discussion of the on-site forest characteristics as they pertain to the quality of the roosting habitat, as well as tabular summaries of data for forest edges and interior forest plots, maps showing the locations of vegetation plots and potential roosting habitat, and representative photographs of forest edges, interior forest sample plots and suitable roost trees.

REFERENCES

Menzel, M.A., J. Menzel, T. Carter, W. Ford, J. Edwards. 2001. Review of the Forest Habitat Relationships of the Indiana bat (*Myotis sodalis*). U.S. Department of Agriculture Forest Service Northeastern Research Station General Technical Report NE-284. 21 pp.

Rommé, R.C., K. Tyrell, and V. Brack, Jr. 1995. Literature summary and habitat suitability index model: components of summer habitat for the Indiana bat, Myotis sodalis. Report submitted to the Nongame Program, Indiana Department of Natural Resources, Bloomington, IN. 43 pp.

USFWS, 2007. U.S. Fish and Wildlife Service. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp.

USFWS, undated. Forest Management Practices for Conserving Indiana Bats. 2pp.

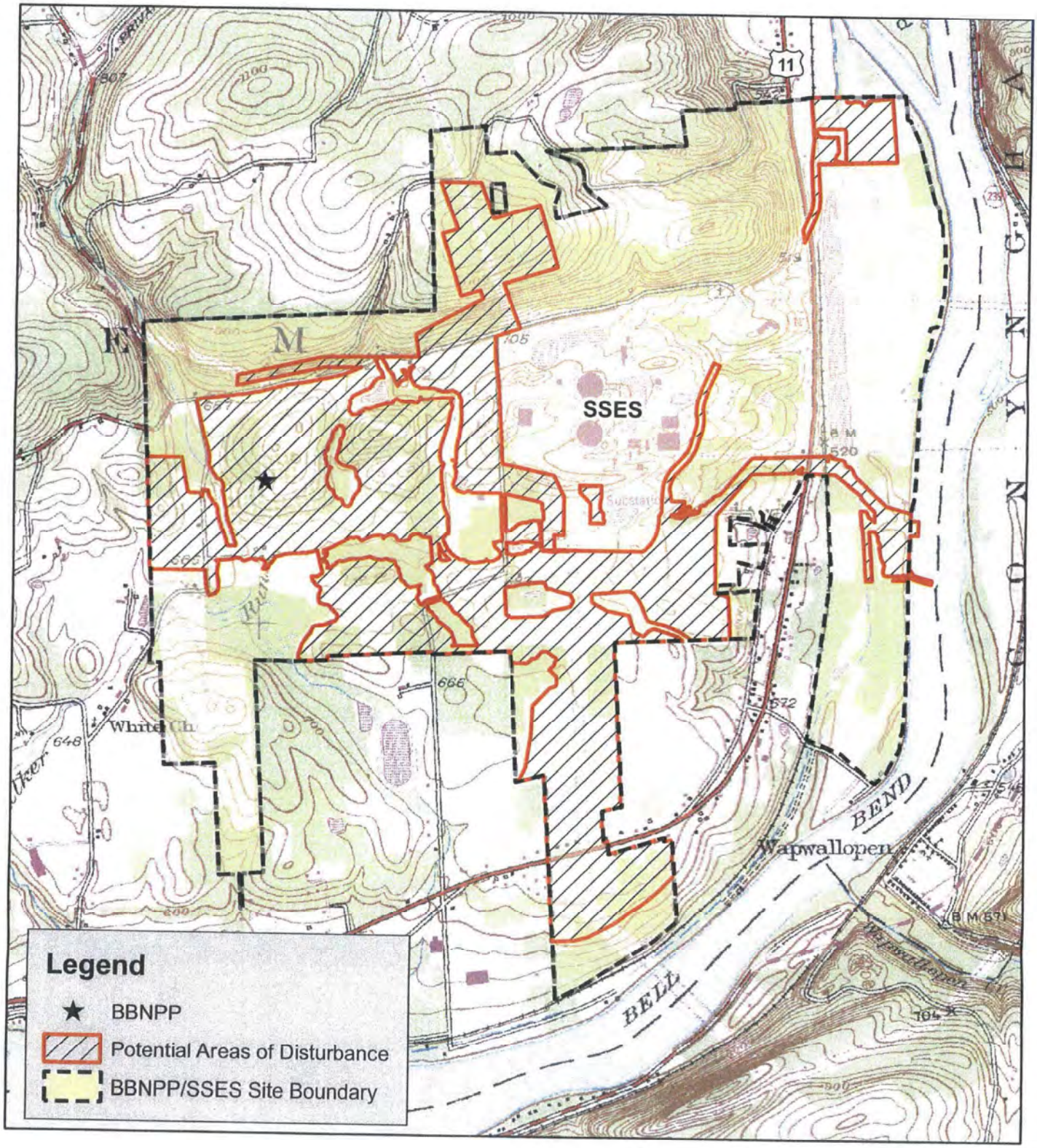


Figure 1.
Bell Bend NPP
Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 07/27/10
prepared by: s.sherman
project: 21766.004

rev. date:
prepared for: b.lees
file name: Figure1.BBNPP_Site_USGS

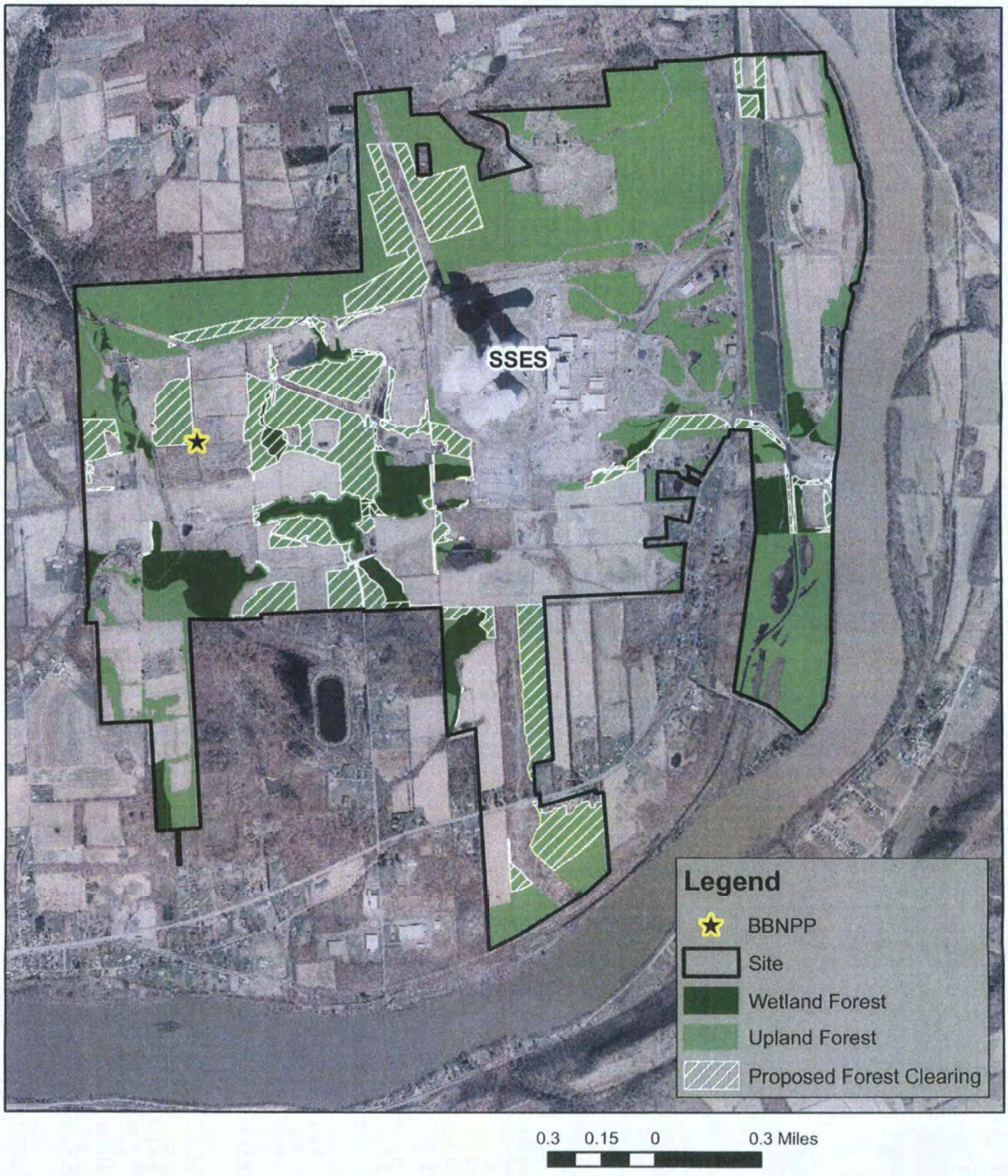


Figure 2.
BBNPP Proposed Forest Clearing

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 08/06/10
prepared by: s.sherman
project: 21931.000

rev. date:
prepared for: k.maurice
file name: Figure2.Proposed Forest Clearing

Pennsylvania Game Commission Consultation

November 2011

List of Enclosed Correspondence

1. Letter from Rod Krich, UniStar Nuclear Energy LLC, to James R. Leigey, PGC, "Large Project Species of Special concern Screen, December 21, 2007.

2. Letter from James R. Leigey, PGC to Rod Krich, UniStar Nuclear Energy LLC "PNDI Search Database Search", April 10, 2008.

3. Letter from Terry L. Harpster, PPL Bell bend LLC, to Tracey Librandi Mumma, PGC, "Bell bend Nuclear Power Plant Large Project Species of Special concern Screen", September 20, 2010.

4. Letter from Olivia A. Braun, PGC, to Bradley A. Wise, PPL Bell Bend LLC, "Bell Bend Nuclear Power Plant Project – Proposed Electrical Plant", December 28, 2010.

UniStar NUCLEAR

December 21, 2007

Mr. James R. Leigey
Pennsylvania Game Commission
Bureau of Land Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

SUBJECT: **Large Project Species of Special Concern Screen**
UniStar Nuclear Energy, LLC, Berwick, PA NPP-1 Project
Salem Township, Luzerne County, PA

Dear Mr. Leigey:

UniStar Nuclear Energy, LLC is conducting an environmental evaluation for an approximately 2.6 square mile (1,642 acres) project area on the Susquehanna Steam Electric Station (SSES) site and adjacent properties in Salem Township, Luzerne County, Pennsylvania (Figure 1). The project area boundaries encompass the entire footprint of possible disturbance for the construction and maintenance of additional electric generation facilities under consideration for the site.

UniStar Nuclear Energy, LLC wishes to screen the project area for species of special concern under jurisdiction of the Pennsylvania Game Commission. Please provide all current and historical information concerning the occurrence of rare, threatened and endangered species, as well as any other ecological resources of special concern within the project area. In addition, please provide this information for a 0.5-mile buffer surrounding the project area. This latter screen is requested for the purpose of evaluating environmental impacts and compliance with Pennsylvania Department of Environmental Protection regulations (e.g., 25 PA Code Chapter 105.17). A PNDI search form is attached for your use.

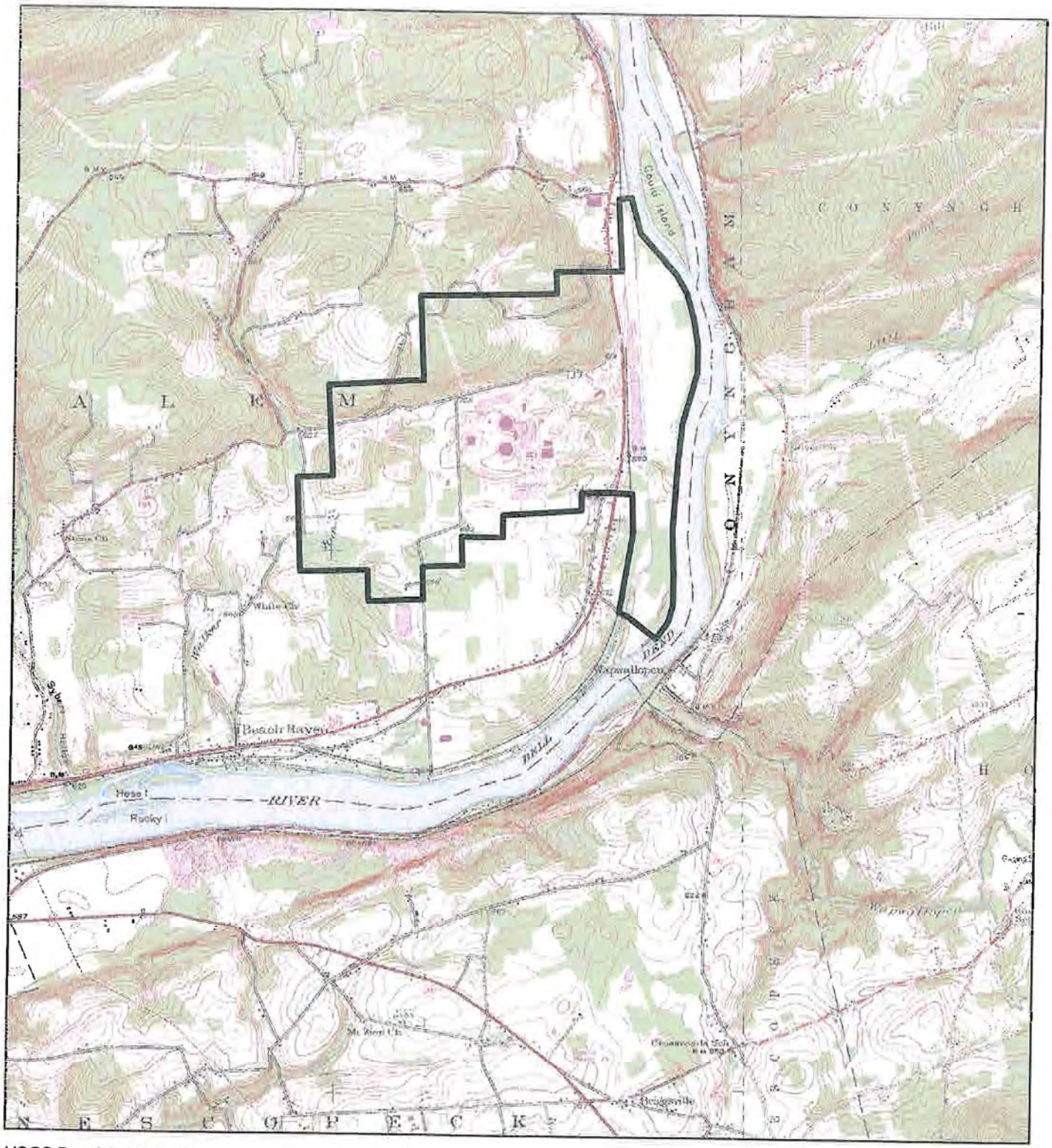
If you have any questions or need additional information please contact George Wrobel at (585) 771-3535.

Thank you for your assistance.

Sincerely,

Rod Krich
Senior Vice President, Regulatory Affairs

Enclosures Site Location Map, Figure 1
PNDI Review Form



USGS Berwick, PA Quad
USGS Sybertsville, PA Quad

1 0.5 0 1 Miles

Figure 1.
Berwick, PA NPP-1

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/17/07
project: 21159.000
prepared by: s.sherman

checked by: k.maurice
project name: Areva
file name: 21159_site_location

Pennsylvania Natural Diversity Inventory

Project Planning & Environmental Review Form

This form provides site information necessary to perform an Environmental Review for special concern species and resources listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat code or the Pennsylvania Game and Wildlife Code.

Applicant Information

Name ; UniStar Nuclear Energy, LLC
Address: 750 E. Pratt Street, 14th floor, Baltimore, MD 21202-3106
Phone Number: 410-470-5518 Fax Number: 585-771-3392

Contact Person Information - if different from applicant

Name: Mr. George Wrobel
Address: same
Phone Number: 585-771-3535 Fax Number: 585-771-3392

Project Information

Project Name: Berwick, PA NPP-1
Project Locations: Lat N 41d 05m 11.54s Lon W 76d 09m 53.66s
Municipality: Salem Township County: Luzerne
[X] Attach a copy of a U.S.G.S 7 1/2 Minute Quadrangle Map with Project Boundaries clearly marked.
U.S.G.S. Quad Name: Berwick, PA and Sybertsville, PA

Project Description

Proposed Project Activity (including All earth disturbance areas and current conditions)
The Berwick, PA NPP-1 Project involves development of a combined license application (COLA) to the U.S. Nuclear Regulatory Commission (NRC) for potential construction and operation of a new nuclear powered steam electric plant in the vicinity of the Susquehanna Steam Electric Station. In the event a decision is made to develop the plant, associated activities would involve land clearing, grubbing, grading/excavation, and construction of plant and support facilities and structures; landscaping; and subsequent operation and maintenance of plant facilities and grounds. Land use of areas potentially disturbed consists predominantly of active/former farmland and forest and, to roadways, and natural vegetation (e.g., shrub-scrub).

Total Acres of Property: **1,642** Acreage to be Impacted: **780 (approximately)**

1. Will the entire project occur in or on an existing building parking lot, driveway, road, maintained road shoulder, street, runway, paved area, railroad bed, or maintained lawn? Yes No X
2. Are there any waterways or waterbodies (intermittent or perennial rivers, streams, creeks, tributaries, lakes or ponds) in or near the project area, or on the land parcel? If so, how many feet away is the project? Yes X feet NO
3. Are wetlands located in or within 300 feet of the project area? Yes X No If No. is this the result of a wetland delineation?

If you have a "PNDI Project Environmental Review Receipt" with potential impacts,, please send a receipt copy, this completed form, and a USGS Quad Map to the agency/agencies noted on the receipt. If you are unable to generate a PNDI Receipt because you do not have Internet access, complete this form, attach USGS Quad Map, and send them to your local DEP or County Conservation District. For review of a "Large Project," please send form and map to all the agencies listed below. See page 2 for more information.

Dept. of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market St., PO Box 8552
Harrisburg, PA 17105
fax: 717-771-0271

PA Game Commission
Bureau of Land Management
2001 Elmerton Avenue
Harrisburg, PA 17110-9797
fax: 717-787-6957

PA Fish and Boat Commission
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 10828
fax: 814-359-5175

US Fish and Wildlife Service
Endangered Species Biologist
315 South Allen St., Suite 322
State College, PA 16801
no faxes please

FAX

PENNSYLVANIA GAME COMMISSION
BUREAU OF LAND MANAGEMENT
2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

WWW.PGC.STATE.PA.US

To: Jerry van Noordennen	From: Jim Leigey	Date: 4-11-08
Fax # (570) 802-8119	Phone # (717) 787-4250	Number of Pages: 2 Fax: (717) 787-6957

Remarks:

I am faxing you a copy of our response letter for the new electric generation project. A hard copy of the letter will be sent by regular mail to Rod Krich with UniStar Nuclear Energy.

Please contact me if you have any questions.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110-9797

April 10, 2008

Mr. Rod Krich
UniStar Nuclear Energy, LLC
750 E. Pratt Street, 14th Floor
Baltimore, MD 21202-3106

In re: PNDI Search Database Search
UniStar Nuclear Energy, LLC, Berwick, PA NPP-1 Project
Salem Township, Luzerne County, PA

Dear Mr. Krich:

This is in response to your fax dated December 21, 2007 regarding the potential impacts of the project on special concern species of birds or mammals recognized by the Pennsylvania Game Commission (PGC).

Our office review has determined that your project area is located in proximity to known bat hibernacula. If a new nuclear powered steam electric plant is developed on the proposed project area, bats of the following species of bats may be impacted: the Small-footed Myotis (*Myotis leibii*), the Northern Myotis (*Myotis septentrionalis*), the Little Brown (*Myotis lucifugas*), the Big Brown (*Eptesicus fuscus*), and the Pipistrelle (*Pipistrellus subflavus*). If a decision is made to develop the plant, the activities associated with the development, and subsequent operation and maintenance of the plant facilities and grounds should be coordinated with the PGC. This determination may be reconsidered if project plans change or extend beyond the present project area, or if additional information becomes available on state species.

If you have any questions, please contact me at (717) 787-4250. Please be advised that this determination is only valid for one year from the date of this letter.

Very truly yours,

James R. Leigey

James R. Leigey
Wildlife Impact Review Coordinator
Division of Environmental
Planning and Habitat Protection
Bureau of Wildlife Habitat Management

Cc: File

T. L. Harpster
VP-Bell Bend Project-Development

PPL Bell Bend, LLC
38 Bomboy Lane, Suite 2
Berwick, PA 18603
Tel. 570.802.8111 FAX 570.802.8119
tlharpster@pplweb.com

September 20, 2010

Ms. Tracey Librandi Mumma
Pennsylvania Game Commission
Bureau of Land Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

BELL BEND NUCLEAR POWER PLANT
LARGE PROJECT SPECIES
OF SPECIAL CONCERN SCREEN
SALEM TOWNSHIP, LUZERNE COUNTY, PA
BNP-2010-207 Docket No. 52-039

PPL Bell Bend, LLC is conducting an environmental evaluation for a potential nuclear power plant adjacent to the Susquehanna Steam Electric Station (SSES) site in Salem Township, Luzerne County, Pennsylvania. For screening purposes, the project area boundaries as shown on Figure 1 encompass the entire footprint of possible disturbance for the construction and maintenance of a nuclear power plant under consideration for the site, as well as the existing SSES site. The existing active SSES operating unit is within this boundary but will not be altered. This letter is a follow up to a similar letter sent December 21, 2007 and your response dated April 10, 2008.

PPL Bell Bend, LLC wishes to screen the entire area as shown on Figure 1 for species of special concern under jurisdiction of the Pennsylvania Game Commission. Please provide all current and historical information concerning the occurrence of rare, threatened and endangered species, as well as any other ecological resources of special concern within the project area. In addition, please provide this information for a 0.5-mile buffer surrounding the project area. This latter screen is requested for the purpose of evaluating environmental impacts and compliance with Pennsylvania Department of Environmental Protection regulations (e.g., 25 PA Code Chapter 105.17). A PNDI search form is attached for your use.

If you have any questions or need additional information, please contact Bradley Wise at 610.774.6508 or bawise@pplweb.com.

Thank you for your assistance.

Respectfully,

Terry L Harpster

TLH/dw

Enclosures 1) Site Location Map
2) PNDI Review Form

cc: Ms. Stacey Imboden
Senior Project Manager
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Ms. Jamie Davis
Office of Environmental Programs (3EA30)
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Tom Shervinskie
Pa Fish & Boat Commission
450 Robinson Lane
Bellefonte, PA 16823

Ms. Jennifer Kagel
United States Fish & Wildlife Service
Pennsylvania Field Office
315 S. Allen St. #322
State College, PA 16801

Mr. Eugene Trowbridge
Pa Dept Environmental Resources
Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18711

Ms. Amy Elliott
U.S. Army Corps of Engineers - Baltimore District
State College Field Office
1631 South Atherton Street, Suite 102
State College, PA 16801

Ms. Paula B. Ballaron
Susquehanna River Basin Commission
1721 North Front Street
Harrisburg, PA 17102-0425

Mr. Thomas W. Beauduy
Susquehanna River Basin Commission
1721 North Front Street
Harrisburg, PA 17102-0425

bcc:

B. A. Wise	bawise@pplweb.com
J. S. Fields	jsfields@pplweb.com
R. Sgarro	rrsgarro@pplweb.com
D. Klinch	David.Klinch@constellation.com

Enclosure 1

Site Location Map

Controlled Document

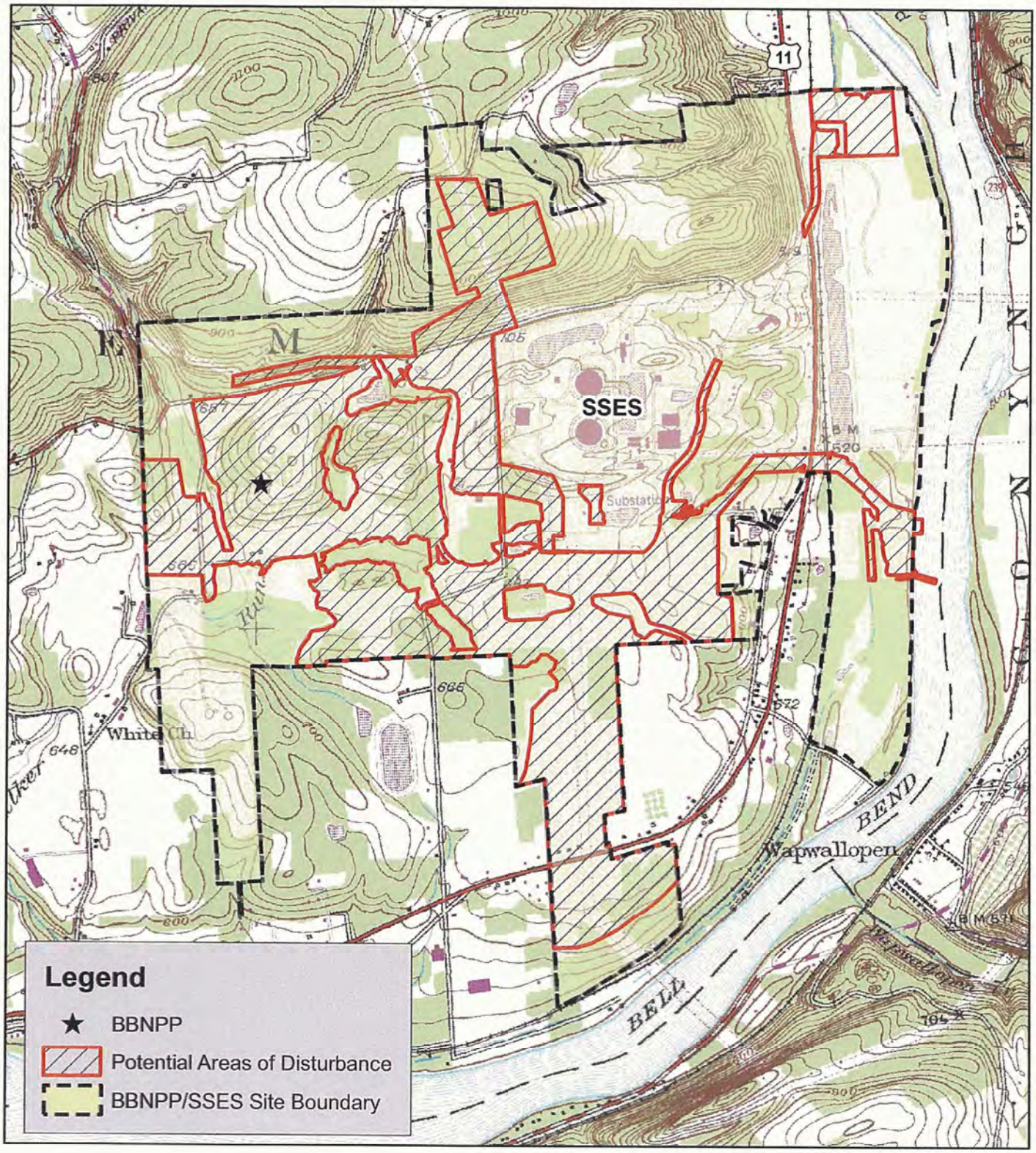


Figure 1.
Bell Bend NPP
Site Location Map

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 07/27/10
prepared by: s.sherman
project: 21766.004

rev. date:
prepared for: b.lees
file name: Figure1.BBNPP_Site_USGS

Enclosure 2

PNDI Review Form

Pennsylvania Natural Diversity Inventory

Project Planning & Environmental Review Form

This form provides site information necessary to perform an Environmental Review for special concern species and resources listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat code or the Pennsylvania Game and Wildlife Code.

Applicant Information

Name: PPL Bell Bend, LLC
Address: 38 Bomboy Lane, Suite 2, Berwick, PA 18603
Phone Number: 570.802.8100 Fax Number: 570.802.8119

Contact Person Information - if different from applicant

Name: Bradley A. Wise, Environmental Permitting Supervisor, PPL Bell Bend LLC
Address: Two North Ninth Street (GENPL4), Allentown, PA 18101-1179
Phone Number: (610) 774-6508 Fax Number: (610) 774-2618

Project Information

Project Name: Bell Bend Nuclear Power Plant Project
Project Locations: Lat N 41d 5m 20.7s Lon W 76d 9m 4.5s
Municipality: Salem Township County: Luzerne
[X] Attach a copy of a U.S.G.S 7 1/2 Minute Quadrangle Map with Project Boundaries clearly marked.
U.S.G.S. Quad Name: Berwick, PA

Project Description

Proposed Project Activity (including All earth disturbance areas and current conditions)
The Bell Bend Nuclear Power Plant Project involves development of a combined license application (COLA) to the U.S. Nuclear Regulatory Commission (NRC) for potential construction and operation of a new nuclear powered steam electric plant adjacent to the Susquehanna Steam Electric Station. In the event a decision is made to develop the plant, associated activities would involve land clearing, grubbing, grading/excavation, and construction of plant and suppport facilities and structures; landscaping; and subsequent operation and maintenance of plant facilities and grounds. Land use of areas potentially disturbed consists predominatly of active/former farmland and forest, to roadways, and natural vegetation (e.g., shrub-scrub).

Total Acres of Property: 1,700 Acreage to be Impacted: 700 acres **(approximately)**

1. Will the entire project occur in or on an existing building parking lot, driveway, road, maintained road shoulder, street, runway, paved area, railroad bed, or maintained lawn? Yes No X
2. Are there any waterways or waterbodies (intermittent or perennial rivers, streams, creeks, tributaries, lakes or ponds) in or near the project area, or on the land parcel? If so, how many feet away is the project? Yes X feet 0
3. Are wetlands located in or within 300 feet of the project area? Yes X No If No. is this the result of a wetland delineation?

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Natural Diversity Section
450 Robinson Lane
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COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

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December 28, 2010 **Large Project Review**

Mr. Bradley A. Wise
PPL Bell Bend, LLC
Two North Ninth Street (GENGL4)
Allentown, Pennsylvania 18101-1179

Re: Bell Bend Nuclear Power Plant Project – Proposed Electrical Plant
Salem Township, Luzerne County, Pennsylvania

Dear Mr. Wise,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number Bell Bend Nuclear Power Plant Project for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office, as well as PNDI data, and has determined that potential impacts to the following endangered species may be associated with your project:

Scientific Name	Common Name	PA Status	Federal Status
Myotis sodalis	Indiana Bat	ENDANGERED	ENDANGERED

Next Steps

Indiana bats are a federally listed endangered species under the jurisdiction of the U.S. Fish and Wildlife Service. As a result, our agency defers comments on potential impacts to Indiana bats to the U.S. Fish and Wildlife Service.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily

imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Olivia A. Braun
Environmental Planner
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3128
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Pennsylvania Natural Heritage Program

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cc: Pamela Shellenberger, U.S. Fish & Wildlife Service
Librandi Mumma, PGC
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Brauning, PGC
Butchkoski, PGC
Turner, PGC
Terry L. Harpster, PPL
File

Appendix B

Indiana Bat Mist Net Study

November 2011

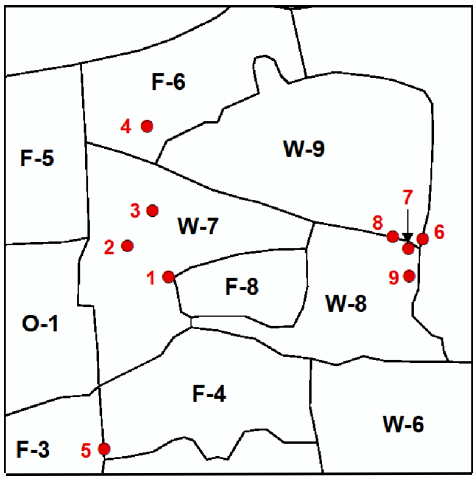
Report on Bell Bend Nuclear Power Plant Indiana Bat Mist Net Survey
Normandeau Project No. 21159.013

Protocol:
This survey was conducted from 6/7/08 to 7/11/08, comprising a total of 8 sampling nights as outlined below. A combination of mist nets were used on each of the sampling nights, including:

3 3-tier nets 9m (30') in height, at 6m (20') or 9m (30') widths
1 2-tier net 6m (20') in height, at 6m (20') or 9m (30') widths

Four (4) nets were set on all nights, for a total of 32 net-nights overall. Sampling was conducted at two main areas: along the road in W-7 and along the edge of the Beaver Pond adjacent to W-8, as shown on the following map. By the USFWS definition of two nets/site, two sites were sampled in W-7 for 5 nights, and two sites were sampled at the Beaver Pond at W-8/W-9, for 3 nights. Given low activity at net #4 in F-6, based upon no captures and very low acoustic indication of bat flight activity, net #4 in F-6 was replaced by net #5 in F-4 for 3 sampling nights. A total of 9 specific net sites were used, with the specific locations sampled on the nights indicated below:

Dates	Net#
6/7/08 6/8/08	**1** **2** **3** **4**
6/26/08 7/01/08 7/02/08	**1** **2** **3** **5**
7/8/08 7/10/08 7/11/08	**6** **7** **8** **9**



An effort was made to place nets following potential travel corridors along the road in W-7 and along the edge of the Beaver Pond (W-8/W-9), although bat activity was monitored acoustically at a number of other sites to gain a sense of overall activity. Many areas on the property are open and so not suitable for netting (e.g F-3, F-4, O-1, F-5, F-8, F-6), although acoustic monitoring also detected low levels of activity. The dense vegetation in other areas (e.g. W-7, W-8. W-9) restricted the ability to set nets, but it is expected that bat flight activity would also be low in these congested locations. There are no permanent or seasonal waterways in this part of the property, which made it difficult to predict potential foraging sites. There is a small pond adjacent to the trailer in F-3, and a larger pond in F-6, and although there is bat activity over these ponds, it is not possible to capture bats in such open locations. Acoustic monitoring of bat activity was conducted both at net sites, at the ponds, and along transects across the property, to both provide information about bat activity and to guide the placement of nets in areas more likely to result in captures.

Captures:
A total of sixteen (16) bats representing three (3) species were captured during the survey:

Species	*Sex*	*Number of bats*	*Reproductive Status*
Big Brown Bat (*Eptesicus fuscus*)	F	2	lactating
Big Brown Bat (*Eptesicus fuscus*)	M	1	juvenile
Big Brown Bat (*Eptesicus fuscus*)	F	1	juvenile
Little Brown Bat (*Myotis lucifugus*)	M	3	adult
Little Brown Bat (*Myotis lucifugus*)	F	1	pregnant
Little Brown Bat (*Myotis lucifugus*)	F	4	lactating
Northern Long-eared Bat (*Myotis septentrionalis*)	M	4	adult

Specific details showing date of capture and net locations are shown in Appendix 2.

Each of the captured bats was tagged with a permanent, aluminum wrist-band for future identification, and this number will be included in a separate report to be filed with PA Game Commission.

Acoustic monitoring:
Bat activity was monitored acoustically using hand-held AnaBat ultrasonic detectors (Titley Electronics). These instruments have a detection frequency range of 10 – 200 kHz, and sufficient sensitivity to monitor bat echolocation calls flying along the netting corridors as well as above the tree canopy. Acoustic monitoring occurred at 20-minute intervals at each of the net sites throughout each sampling night. Additionally, bat activity was monitored at the beginning and end of each sampling night along transects perpendicular to the ridge away from each net site. The activity at the ponds was monitored separately, to gain a better appreciation for overall bat activity on the property.

The capture data reflects the generally low level of bat activity detected in the areas sampled, which was fairly uniform at each of the net sites as well as along transects through the surrounding area. Bat activity was uniformly low along the road in W-7, starting a less than 1 bat pass per minute at dusk as the nets were set, and dropping off through the survey period each night to less than 4 – 5 passes per hour after midnight. Generally, activity was a bit higher by the Beaver Pond, starting at 4 – 5 bat passes per minute at dusk, dropping to 1-2 passes per minute around midnight and falling off afterwards to less than one pass per minute. Temperatures were typically hot and humid at dusk throughout the survey period (daytime averages over 85˚F), and remained elevated throughout the sampling each night, except for 7/10/08 when the temperature at midnight had dropped to 54˚F. There were no captures that night.

Most of the activity was recorded from bats flying below canopy level, lower than the 3-tier (9m) mist nets, so the acoustic monitoring represents a reasonable estimate of bat activity along the corridors sampled that resulted in the captures reported. The echolocation signals detected were consistent with *E. fuscus* as well as the *Myotis* species captured, but it is not possible to reliably distinguish between all *Myotis* species using acoustic methods. There was no indication of higher-flying species (like *L. borealis* or *L. cinereus*) which can readily be discriminated by their echolocation signatures.

Recommendations:
The capture of reproductively active (pregnant and lactating) females and juvenile bats suggests that this area supports maternity roosts of some bat species during the summer months. Although big brown bats (*E. fuscus*) and little brown bats (*M. lucifugus*) preferentially roost in human structures such as barns and attics, particularly when forming maternity colonies (Barbour and Davis, 1969), these bats can also form maternity roosts in tree cavities (Brigham, 1991; Fenton and Barclay, 1980). The capture of only adult male *Myotis septentrionalis*, which are tree-roosting species (Barbour and Davis, 1969), provides additional evidence for the existence of roost sites in the area surveyed, but not maternity colonies of females and young. While little brown bats tend to forage along the edges of wooded areas, *M. septentrionalis* is also known to forage in more cluttered forested areas, below the canopy but above the understory shrub layer (LaVal *et al*., 1977). Both little brown bats and big brown bats have been shown to forage preferentially in riparian areas (Kurta, 1982), as have endangered Indiana Bats (Murray and Kurta, 2004). The absence of significant bodies of water on this property, and the low level of bat activity detected over the ponds present on the property, suggests that even resident bats might seek other areas over which to forage.

The primary objective of this survey was to determine the extent of Indiana bat (*Myotis sodalis*) activity in this area, with particular attention to summer habitat for roosting and reproduction. Despite suitable habitat for both roosting and foraging, there were no Indiana Bats (*Myotis sodalis*) captured during this survey. While we might expect capture rates of Indiana bats to be low, as other studies (e.g. Callahan *et* al., 1997; Kurta *et al*., 1996) have shown that the bats roost singly or in small groups in hollow trees or underneath loose bark during the summer, there was potential for capture of Indiana Bats moving through the habitat if these bats were present in any reasonable number, as would be expected of resident bats.

The members of a maternity colony of Indiana bats typically roost in 10-20 trees each summer (Callahan *et al*., 1997; Kurta *et al*., 1996). Although some colonies restrict roosting to an area of only a few hectares, other Indiana bats use trees that are 8-9 km apart (Kurta *et al*., 1996). Radio-tracking studies of the Indiana Bat (Murray and Kurta, 2004) show that these bats do not fly over open fields but travel along wooded corridors, even though such behavior may increase commuting distance by over 50%. Given this variability, it is difficult to predict the movements of bats within any one colony, but the failure to capture any Indiana Bats despite suitable roosting and foraging areas does not provide evidence for their presence on the site.

Based upon these results, particularly the failure to capture any *M. sodalis*, it would seem that the clearing of trees proposed for the development of the Bell Bend Nuclear Power Plant project is unlikely to have a direct impact on the roosting or foraging activity of Indiana Bats in this area. There is so little wooded habitat on the property, that it seems likely that other areas surrounding the site would provide more adequate roosting and foraging habitat for tree-roosting species, including the Indiana Bat. The presence of trees of the appropriate size and species in which bats might roost does not preclude the potential for roost colonies of several species (see Barbour and Davis, 1969), including those species captured in this study, as well as the Indiana Bat, despite the absence of captures. Development of this property should proceed with this potential in mind, by conserving candidate roost trees whenever possible and removing

these trees when necessary during times outside the normal breeding season. Bats returning from hibernation typically resume residence in maternity roosts by late April, and most reproductive colonies have disbanded by late August, and so limiting the disturbance of the habitat to periods outside this breeding season will minimize the disruption of resident colonies.

Appendix 1: Details of bat captures

Capture date	**Net #**	**Species**	***Sex***	***Number of bats***	***Reproductive Status***
6/7/08	***2***	*M. lucifugus*	F	1	pregnant
	3	*M. lucifugus*	M	1	adult
	3	*M. septentrionalis*	M	1	adult
6/8/08	***1***	*M. septentrionalis*	M	1	adult
6/26/08	***2***	*M. lucifugus*	M	1	adult
7/1/08	***2***	*E. fuscus*	F	1	lactating
7/2/08	***1***	*E. fuscus*	F	1	lactating
	2	*M. septentrionalis*	M	1	adult
7/8/08	***7***	*E. fuscus*	M	1	juvenile
	7	*E. fuscus*	F	1	juvenile
	7	*M. lucifugus*	M	1	adult
	9	*M. lucifugus*	F	1	lactating
7/11/08	***7***	*M. lucifugus*	F	1	lactating
	7	*M. septentrionalis*	M	1	adult
	7	*M. lucifugus*	F	2	lactating

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Indiana Bat Roost Tree Survey Report

November 2011

Indiana Bat (*Myotis sodalis*) Roost Tree Survey Report Proposed Bell Bend NPP Site Luzerne County, Pennsylvania

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October 2011

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Indiana Bat Roost Tree Survey Report
For The
Proposed Bell Bend Nuclear Power Plant Site
Luzerne County, Pennsylvania

Prepared for:

AREVA NP, Inc.

Marlborough, MA

And

UniStar Nuclear Development, LLC

Prepared by:

Normandeau Associates, Inc.

Stowe, PA

October 2011

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RECORD OF REVISIONS

Revision	Date	Pages/Sections Changed	Brief Description
000	December 2010	All	Initial Release
001	January 2011	Pages 4, 7, 9, 10, Table 7, Figure 3 and Appendix D as detailed below.	Rev. 0 of document was revised to address owner acceptance review comments detailed below and in Comment Resolution #s: PPL-EPR-10-69-R0 and EA-EPR-10-669-R0.
001		Cover	Date
001		Title Page	Date
001		Page 4	3.0: citation added
001		Page 7	4.2.1: text revisions
001		Page 9	6.0: text revisions
001		Page 10	7.0: reference added
001		Table 7	Revised footnotes
001		Figure 3	Legend revised
001		Appendix D	Figures revised
002	September 2011	Cover	Date
002		Title Page	Date
002		Page i	TOC: Added headings regarding LOD changes, updated page numbers
002		Page ii	TOC: Added heading for new figure of LOD changes
002		Page 3	1.0: Text Revisions, updated area calculations
002		Page 5	Section 3.1: Added text on changes to Forest Interior Areas Based on LOD Boundary Revisions
002		Page 6	Section 3.2: Added text on changes to Forest Edges Based on LOD Boundary Revisions

Revision	Date	Pages/Sections Changed	Brief Description
002		Page 8-10	4.0: Text Revisions, updated area calculations and results based on 2011 survey
002		Page 11	5.0: Text Revisions, updated area calculations and results based on 2011 survey
002		Page 11	6.0: Text Revisions, updated results based on 2011 survey
002		Table 1	Changed title of table to reflect that these area calculations are from 2010 LOD boundary
002		Table 2	Created new table with new area calculations from 2011 survey and revised LOD boundary
002		Tables 3-8	Formerly Tables 2-7. Updated tables with new area calculations and results from 2011 survey
002		Figures 1 and 2	Updated figures with revised LOD boundary
002		Figure 3	Created new figure to reflect changes in forested cover within the revised LOD boundary.
002		Figures 4-6	Formerly Figures 3-5. Updated figures with results from 2011 survey
002		Appendices A, B, and C	Updated appendices with results from 2011 survey
002		Appendix D	Added revised LOD boundary and new sample plot and PRT locations to Forest Area maps

1.0 INTRODUCTION

1.1 STUDY OBJECTIVES

Normandeau Associates, Inc. (Normandeau) conducted a quantitative in-field survey of Indiana bat (*Myotis sodalis*) roost trees within the forested areas proposed for clearing at the Bell Bend Nuclear Power Plant (NPP) project site during 28 September through 20 October 2010 and 13 and 14 July 2011. The objective of this study was to determine the distribution, density, and quality of Indiana bat roosting habitat provided by these forest areas with a particular focus on roosting habitat for males during the summer and for both sexes during the time of fall swarming. Indiana bats are listed as an Endangered Species by the U.S. Fish and Wildlife Service (USFWS), which has jurisdiction over species of flora and fauna designated as listed, proposed, or candidate under the Federal Endangered Species Act (ESA). Indiana bats are also listed as Endangered by the Pennsylvania Game Commission (PGC), which has jurisdiction over birds and mammals classified as Threatened or Endangered under the Pennsylvania Game and Wildlife Code.

The USFWS has reviewed the Bell Bend NPP project for potential impacts to Federally-listed species of special concern through ongoing coordination with PPL Corporation (USFWS, 2009). As the project site is located within 10 miles of three known Indiana bat hibernacula, the agency has determined that proposed forest clearing necessary for project construction could result in the loss of potential Indiana bat foraging and roosting habitat.

1.2 SITE DESCRIPTION

As proposed, Bell Bend NPP will be sited adjacent to the Susquehanna Steam Electric Station (SSES) in Salem Township, Luzerne County, Pennsylvania. Potential areas of disturbance associated with Bell Bend NPP will extend across 687 acres (1.1 mile^2, 278 hectares [ha]) within the 2,055-acre (3.2 mile^2, 832 ha) Bell Bend NPP Project Boundary (Figure 1). The site terrain is variable and ranges from steeply sloping hills in the north and west to the relatively level floodplain of the Susquehanna Riverlands in the east. The net topographic relief is approximately 500 feet (152 m).

A total of approximately 623 acres (252 ha) of plant communities and other habitats will be impacted by construction of Bell Bend NPP of which 402.4 acres (162.8 ha) will be permanent impacts and 220.3 acres (89.2 ha) will be temporary impacts. Areas to be disturbed as a result of project construction activities are contained within a defined "Limit of Disturbance," (LOD) as presented on Figure 3. The LOD was used to define the area within which roost tree survey activities would be contained, and at the time of the 2010 survey the LOD depicted approximately 236 acres (96 ha) of forested habitat to be cleared, of which 227 acres (92 ha) were upland and 8.2 acres (3.3 ha) were wetland (Table 1). In 2011, the LOD boundary was revised and based on this updated boundary, 233.5 acres (94.5 ha) of forested habitat will be cleared, of which 222.2 acres (89.9 ha) are upland and 11.3 acres (4.6 ha) are wetland (Table 2). Figure 2 shows the new proposed forest clearing within the BBNPP boundary based on the revised LOD boundary. Figure 3 shows the changes to the surveyed areas based on the 2011 LOD boundary.

2.0 INDIANA BAT ROOSTING HABITAT

The following section provides background information for the survey plan and was summarized from the U.S. Fish and Wildlife Service Draft Recovery Plan for the Indiana Bat (USFWS, 2007).

2.1 SUMMER ROOSTS

Summer roosting habitat for male Indiana bats is not well known. Males are most commonly found in the vicinity of their hibernaculum but may also disperse throughout their summer range and roost individually or in small groups.

Reproductive female Indiana bats migrate from the hibernacula to summer roosting habitat, and have shown strong site fidelity to their traditional summer roosting and foraging areas. They form maternity colonies after arriving at their summer range (late March to mid-May) and cluster in maternity roosts with suitable microclimates, which facilitate roost temperatures favorable for prenatal and postnatal development. Maternity colonies most commonly consist of 60 to 100 adult females but may be larger, and may include females from more than one hibernaculum. Composition of the colony is fluid with females moving between as many as 10 to 20 different maternity roost trees. The majority of female bats use one to three primary maternity roost trees, while the rest of the trees are alternate or secondary maternity roosts that are intermittently used by small numbers of females throughout the summer, or on only a few days, or as temporary night roosts.

Maternity colonies may occupy maternity roost trees for a number of years; however all maternity roost trees are ephemeral and become unusable by losing important structural characteristics such as bark, or by falling to the ground, or due to competition with other animals. The use of alternate maternity roost trees is thought to be a behavioral mechanism that enables bats to evaluate new trees for use as future primary maternity roosts.

Summer roosting habitat for non-reproductive female Indiana bats is less well known. They may remain close to their hibernaculum or migrate to summer habitat where they roost individually or in small numbers. Typically, non-reproductive females do not roost in maternity colonies but may be present in the same trees as reproductive females.

2.2 FALL ROOSTS

Beginning in the late summer and into the fall, Indiana bats return to the vicinity of their hibernacula and engage in swarming behavior, which peaks in September and early October. This behavior is characterized by large numbers of bats moving in and out of hibernacula at night but with few roosting inside during daylight hours. Instead, the bats tend to roost individually in surrounding forests. Mating occurs during the swarming period and bats also feed heavily to build up fat reserves for hibernation. Indiana bats may travel considerable distances from their hibernacula to foraging areas based on the level of competition for food resources, with those from hibernacula with large numbers of Indiana and/or other bats most likely traveling furthest. Limited radio telemetry studies during fall swarming have shown Indiana bats traveling as far as 19 miles (31 km) in a single night in Indiana and up to 9 miles (14 km) over several weeks in Pennsylvania.

2.3 ROOST TREE CHARACTERISTICS

Indiana bats roost under the exfoliating bark of trees and occasionally in longitudinal crevices within trees but rarely use cavities created by rot or woodpeckers. For maternity roosts (primary and alternate), females prefer dead or nearly dead trees, or dead parts of living trees such as dead trunks of trees with multiple trunks. They are occasionally found on living trees with lose peeling bark; however, these trees are thought to be used primarily as alternate maternity roosts during exceptionally warm or wet weather. A wide variety of tree species are used for maternity roosts and use is primarily related to local availability of trees with suitable structure rather than a preference for a particular species. In addition, regional differences in maternity roost tree characteristics may result from influencing factors such as weather and altitude.

Maternity roost trees are typically found in areas with high solar exposure such as openings within a forest, in a fence line, or along a wooded edge. Higher solar exposure creates warmer roosting sites and, thereby, facilitates faster prenatal and postnatal development of young bats. Female Indiana bats may use structurally suitable trees in more interior sections of forest as maternity roosts during exceptionally warm or wet weather. Maternity roost trees vary in size, although larger diameter trees are preferred and may provide advantages for thermoregulation, as well as more roosting spaces. The average range-wide

diameter of primary maternity roost trees is 18 inches (46 cm). However, average diameters of primary and alternate maternity roost trees in several Midwestern states ranged from 16 inches (41 cm) to 24 inches (61 cm), and an alternate maternity roost tree in Pennsylvania had a diameter of only 11 inches (28 cm). The method of measuring the tree widths was not specific but is presumably diameter-at-breast height (dbh). The minimum height of maternity roost trees is typically greater than 10 feet (3 m), although the absolute height of maternity roost trees is thought to be less important than height and position relative to surrounding trees, which can affect the amount of solar exposure received by a tree.

Male Indiana bats are more flexible in their preferred summer roosting habitat. They roost in the same types of structurally suitable trees as females but not necessarily in areas with high solar exposure. In addition, male bats are more likely to roost in living trees and trees that are smaller, with a 13-inch (33 cm) average diameter range-wide.

3.0 SURVEY METHODOLOGY

Normandeau's survey was based on a study plan developed specifically for the Bell Bend NPP site, since neither the USFWS nor PGC have an official, standardized Indiana bat roost tree survey methodology. However, the USFWS provided considerable technical input to the study plan (PPL, 2010). This survey encompassed both the interior portions and edges of the Forest Areas proposed for clearing onsite. Forest Areas are defined as discrete or closely associated blocks of forest that are separated from other such areas by roads, lands formerly in agricultural use and developed properties (Figure 4). Using a sub-sampling procedure, each Forest Area was characterized by canopy cover and inventoried for potential roost trees (PRTs). Forest edges were inventoried for PRTs only. The information collected in the field was then used to determine the distribution, density, and quality of available roost trees for Indiana bats based on criteria specified by the USFWS and metrics available in the scientific literature (USDOI, 2009).

3.1 FOREST INTERIORS

Normandeau surveyed all contiguous Forest Areas in which approximately 2 acres (0.8 ha) or greater (18 total) were proposed for clearing to quantify potential Indiana bat roosting habitat (Figure 4). There were nine Forest Areas between 2 acres (0.8 ha) and 10 acres (4 ha) in size and eight Forest Areas greater than 10 acres (4 ha) in size. A small portion of Forest Area 26 was also surveyed even though it was smaller than 2 acres (0.8 ha) since temporary impacts to forested wetlands were anticipated. In total, eighteen Forest Areas were surveyed when Forest Area 26 was included. Forest areas were surveyed at the rate of one 100-ft (30 m) radius (0.72 acres, 0.29 ha) sample plot per 5 acres (2 ha), or fraction thereof, using a stratified random sampling procedure. ESRI ArcMap software was used to randomly locate plots across each impacted forest polygon. An internal 100-ft (30 m) edge buffer was applied to each Forest Area polygon to ensure that all plots fell entirely within each polygon, and each polygon was filled with randomly located plots to enable stratification for different forest communities, age classes or other features that could affect roost tree abundance. The sequence in which the plots were surveyed was also randomly ordered by the ArcMap software. When necessary, additional non-random plots were located within the forest areas to ensure that sampling was representative of all forest habitats present, particularly forested wetlands. Using sub-meter level global positioning system (GPS) units, Normandeau's field survey teams navigated to the forest plots, which were then inventoried for PRTs and characterized by species composition, species dominance, diameter (minimum, maximum and average), number of snags and stubs (See Section 3.3). PRT locations were taken with a sub-meter GPS and all data was recorded in digital format using a GPS data dictionary.

In early 2010, the BBNPP Project Boundary and LOD were slightly enlarged to accommodate on-site fill placement without impacting wetlands. These boundary changes enlarged the BBNPP site by adding lands contiguous to the previous BBNPP boundaries. As a result of these changes, additional roost tree survey activities were required to ensure that Forest Areas at BBNPP were consistently investigated and characterized; these additional surveys were completed in July, 2011.

Review of the newly defined boundaries (Figure 3) demonstrates that some of the previously surveyed Forest Areas are now outside of the LOD, and that new areas of proposed disturbance have been added to the LOD. These new additions represented approximately 37 acres (15 ha) of forest, and included large Forest Area totaling 22.1 acres (9 ha) within Forest Areas 15 and 16. These two areas were the focus of the supplemental survey activities completed in 2011. The remainder of the newly added forest consists of small, scattered forest patches not meeting the defined standard for survey. To complete the supplemental survey, two additional 100-ft [30 m] radius sample plots were surveyed in Forest Area 15, and three additional sample plots were surveyed in Forest Area 16.

It should be noted that data collected on Forest Areas that are no longer within the LOD continued to be presented in this survey report. The rational for retaining this information is that the forest no longer within the LOD is very similar in structure and species composition to the new forest added to the LOD, and is representative of habitat within and adjacent to the BBNPP.

3.2 FOREST EDGES

Normandeau biologists also inventoried all the edges of the Forest Areas proposed for clearing for all PRTs within a distance of approximately 50-feet (15 m) of the forest edge. The 50-foot (15 m) margin has been used in published scientific studies (Callahan et al., 1997) and represents a conservative boundary for identifying suitable roost trees along forest edges that are likely to receive increased solar radiation relative to trees located in forest interior habitats. Locations and data for these PRTs were recorded with a GPS as noted above.

As described in Section 3.1, changes to the Project Boundary and LOD in early 2010 necessitated supplemental roost tree survey activities to ensure comprehensive evaluation of forested areas affected by BBNPP construction. Significant new forest edges were incorporated into the revised LOD associated with Forest Areas 15 and 16, and these edges were surveyed using identical methods to those employed in the 2010 survey. Accordingly, 1,007 feet (306.9 m) and 1,895 feet (577.6 m) of forest edges were evaluated at Forest Areas 15 and 16 respectively.

As done with the forest interior PRT survey, data from forest edges surveyed in 2010 that now fall outside of the LOD continue to be presented in this report. As visible on Figure 3, forest edges no longer within the LOD are very close to the LOD and exhibit similar forest structure and composition; consequently this data remains germane to this survey.

3.3 FIELD MEASUREMENTS

3.3.1 FOREST COVER

Characterization of the forest cover for each survey-plot encompassed the following information: 1) species composition, 2) dominant species, 3) diameter-at-breast-height (dbh) - maximum, minimum and average, 4) number of snags, 5) number of stubs, 6) date, 7) surveyor, 8) sampling location. Forest cover field measurements are explained in more detail below.

1) Species composition: All trees in the plot were identified to species and a list of species was compiled.

2) Dominant species: Dominance was determined based on a visual assessment of the number and relative dbh of stems, and overall canopy cover of each tree species.

3) Diameter-at-breast-height (dbh): The maximum, minimum and average dbh was determined by measuring a representative subsample of trees with a Biltmore stick. Typically, dbh is measured at a height of 4.5 feet (1.4 m) on the uphill side of a tree.

4) Number of snags: Snags were defined as dead trees that still have branches and an overall tree-like form. This count was for snags within each forest area that were not structurally suitable as roost trees and, therefore, did not qualify as PRTs.

5) Number of stubs: Stubs were defined as the remaining trunks of long dead trees that were still standing but generally lacked branches and no longer had a tree-like form. This count was for stubs within each forest area that were not structurally suitable as roost trees and, therefore, did not qualify as PRTs.

6) Date: The date of the survey was recorded as MMDDYYYY.

7) Surveyor: The name of the person who identified the tree to species, measured dbh, and determined the number of snags and stubs was recorded. If more than one person contributed to the data, then a lead and assistant(s) were identified for each line of data.

8) Sampling location: The latitude and longitude near the center of each forest plot was recorded using a sub-meter GPS.

3.3.2 POTENTIAL ROOST TREES

All trees in the survey- plots were evaluated for suitability as roosts for Indiana bats using criteria specified for this study by the USFWS. A tree was designated as a PRT if it had a 5 inch (13 cm) or greater dbh and suitable roost structure in the form of exfoliating or defoliating bark, crevices and/or cavities. The following information was recorded for each PRT: 1) species, 2) diameter-at-breast-height, 3) roost tree condition (live, dead, or partially dead), 4) type of roost structure(s) (bark, crevice, and/or cavity), 5) date, 6) surveyor, 7) sampling location (GPS coordinates), and 8) roost tree potential (high, medium or low). PRT field measurements are explained in more detail below.

1) Species identification: All trees were identified to species. Dead trees and snags that were too far decayed for identification were designated as unknown.

2) Diameter-at-breast-height (dbh): The dbh of each roost tree was measured to the nearest inch using a Biltmore stick.

3) Roost tree condition (live, dead, or partially dead): Trees designated as live were healthy in appearance and had more than 80% live canopy. Trees designated as partially dead had 10-80% live canopy. Trees designated as dead encompassed snags and trees with less than 10% live canopy.

4) Type of roost structure: The type(s) of roost structure on the tree were identified as bark (exfoliating or defoliating bark), longitudinal crevices within the trunk and large branches, and/or internal cavities that were accessible by bats through above ground openings but not easily accessed by potential predators at ground level.

5) Date: The date of the survey was recorded as MMDDYYYY.

6) Surveyor: The name of the person who identified the tree to species, measured dbh, and classified roost tree condition; type of roost structure(s) and roost tree potential was recorded. If more than one person contributed to the data, then a lead and assistant(s) were identified for each line of data.

7) Sampling location: The latitude and longitude at the base of each roost tree was recorded using a sub-meter GPS. A single GPS location was taken at the center of clumps or otherwise closely associated groups of suitable roost trees; however, the trees were inventoried separately.

8) Roost tree potential - Trees were categorized as having a "high," "moderate," or "low" potential for serving as a roost tree for Indiana bats:

   High – Live, dead, and partially dead trees that are ≥16" (41 cm) dbh and have roost structure.

   Medium – Live, dead, and partially dead trees that are 9" (23 cm) to 15" (38 m) dbh and have roost structure.

   Low – Live, dead, and partially dead trees that are 5" (13 cm) to 8" (20 cm) dbh and have roost structure.

9) Setting: The location (edge or interior) in which the tree was located.

4.0 RESULTS

4.1 FOREST COVER CHARACTERIZATION

The forest cover totaling 46.2 acres (18.7 ha), of which 41.7 acres (16.9 ha) are upland and 4.5 acres (1.8 ha) are wetland, was characterized using the sub-sampling methodology described in Section 3.1. Results are presented here by forest plot (Table A-1). The majority of the upland forest cover was dominated by red maple (*Acer rubrum*) with red oak (*Quercus rubra*), white oak (*Quercus alba*), and sweet birch (*Betula lenta*) being less common dominant tree species. Red maple was also the most common subdominant tree species in upland forest plots with white oak, black cherry (*Prunus serotina*), and black oak (*Quercus velutina*) being less common subdominants. The majority of the wetland forest cover was dominated by red maple with pin oak (*Quercus palustris*), silver maple (*Acer saccharinum*), tulip poplar (*Liriodendron tulipfera*), and black locust (*Robinia pseudoacacia*) being less common dominant tree species. Pin oak was the most common subdominant tree species in wetlands followed by red maple, black cherry, black walnut (*Juglans nigra*), and river birch (*Betula lenta*). See Table A-1 for a complete list of dominant and subdominant tree species by upland and wetland forest cover plots. Other species that were commonly observed in the overstory are listed in Table 3.

A review of available archival aerial photographs for the vicinity of the Bell Bend NPP project area indicates that in 1939 most of the Forest Areas surveyed for this study had limited or no forest cover (PDCNR, 2010). However, by 1959 many of these areas had forest cover and by 1969 most but not all were vegetated by forest. Therefore, many of the mature trees onsite are at least 40 years old and some are 70 years or more in age. Our field survey indicated that the larger and older trees primarily occurred in wetlands, on steep slopes, or in generally inaccessible areas that were not historically tilled.

Across all eighteen Forest Areas surveyed (Figure 4), the minimum dbh ranged from 3 inches (8 cm) to 8 inches (20 cm) and the maximum dbh ranged from 10 inches (25 cm) to 60 inches (152 cm) (Table 4). The average number of PRTs was 14, the average number of snags was eight, and the average number of stubs was 18. For this survey, snags and stubs (defined in Section 3.3) do not qualify as PRTs due to a lack of suitable roosting structure. However, they may have been PRTs in the past and illustrate the ephemeral nature of Indiana bat roost trees.

The average maximum dbh across all Forest Area survey plots was 21 inches (53 cm) with 31 of 69 plots (45 percent) having a maximum dbh greater than 20 inches (51 cm) (Table A-1). The average minimum dbh across all plots was 4 inches (10 cm). The average number of PRTs across all plots was four. Snags

and stubs were relatively common, with only five of the 69 plots (7 percent) having no stubs or snags and 56 plots (81 percent) having more than one stub/snag.

When survey plots were separated into upland and wetland, the average minimum dbh was 4 inches (10 cm) for both upland and wetland plots. The average maximum dbh was larger across all wetland plots than upland plots (26 inches [66 cm] vs. 20 inches [51 cm]). The average number of PRTs for all upland plots and wetland plots was four and three, respectively. Snags and stubs were more common in upland plots than wetland plots, with only three of the 58 upland plots (5 percent) having no stubs or snags and two of the 11 wetland plots (18 percent) having no stubs or snags. In addition, only five of 11 wetland plots (45 percent) had more than a single stub/snag as opposed to 51 of 58 upland plots (88 percent) (Table A-1).

4.2 POTENTIAL ROOST TREES

4.2.1 INTERIOR FOREST

A total of 46.2 acres (18.7 ha) of forest was surveyed for PRTs (41.7 upland acres [16.9 ha], 4.5 wetland acres [1.8 ha]). Out of the 255 PRTs in the interior forest survey area, 118 were live, 114 were dead, and 23 were partially dead (Table 5). The average dbh for all PRTs observed in the forest interior was 14 inches (36 cm) (Table C-1). In regards to roost type, 252 PRTs offered potential roost sites in the form of exfoliating or defoliating bark, 13 PRTs had suitable crevices, and 5 PRTs had suitable cavities. A summary of interior forest PRTs by Forest Area survey plot is provided in Table B-1 and a comprehensive list of all PRTs (interior forest and edge) with individual PRT identification numbers is provided in Table C-1. The locations of survey plots, interior forest PRTs and forest edge PRTs for each surveyed Forest Area are shown in the figures enclosed in Appendix D. Photographs of representative PRTs are provided in Appendix E.

PRT densities were evaluated for the site as a whole and by surveyed Forest Area against U.S. Department of the Interior (USDOI) standards for suitable Indiana bat summer habitat which recommend a minimum of 6 PRTs/acre (14.8 PRTs/ha) for interior forest. The 255 PRTs identified within the interior forest area yielded an estimated 5.5 PRTs/acre (13.6 PRTs/ha) and five of the 18 Forest Areas provided greater than 6 PRTs/acre (14.8 PRTs/ha) (Table 6). Within the upland plots, 219 PRTs were identified, yielding an estimated 5.2 PRTs/acre (13.0 PRTs/ha) and within the wetland plots, 36 PRTs were identified, yielding an estimated 8.1 PRTs/acre (19.9 PRTs/ha).

PRT quality for the surveyed area as a whole and by surveyed Forest Area was evaluated based on the density of “high,” “moderate,” or “low” roost trees as determined by the USFWS PRT ranking system. Seventy-eight PRTs were determined to be of high roost potential with 111 being of medium potential and 66 considered PRTs of low potential. As a whole, the interior forest portion yielded an estimate of 1.7 high PRTs/acre (4.2 high PRTs/ha), 2.4 medium PRTs/acre (5.9 medium PRTs/ha), and 1.4 low PRTs/acre (3.5 low PRTs/ha) (Table 6). Forest Areas 7, 8 and 9 had the highest numbers of high potential roost trees with 12, 11 and 27, respectively. However when analyzed by high PRTs/acre, Forest Areas 8, 10 and 11 were highest with 3.5 high PRTs/acre (8.7 high PRTs/ha), 3.9 high PRTs/acre (9.7 medium PRTs/ha) and 4.1 high PRTs/acre (10.0 low PRTs/ha), respectively.

When broken into uplands and wetlands, 60 PRTs were determined to be of high potential in the surveyed uplands with 100 being of medium potential, and 59 were considered PRTs of low potential (Table 6). The surveyed uplands portions yielded an estimate of 1.4 high PRTs/acre (3.6 high PRTs/ha), 2.4 medium PRTs/acre (5.9 medium PRTs/ha), and 1.4 low PRTs/acre (3.5 low PRTs/ha). Eighteen PRTs were determined to be of high roost potential in the surveyed wetlands with 11 being of medium potential and 7 considered PRTs of low potential. The surveyed wetlands portions yielded an estimate of 4.0 high PRTs/acre (9.9 high PRTs/ha), 2.5 medium PRTs/acre (6.1 medium PRTs/ha), and 1.6 low PRTs/acre (3.9 low PRTs/ha).

4.2.2 FOREST EDGE

Approximately 75,581ft (23,035 m) of forest edge were surveyed for the presence of PRTs. Out of the 286 PRTs identified, 192 were live, 77 were dead, and 17 were partially dead (Table 7). The average dbh for PRTs observed on the forest edge was 14 inches (36 cm) (Table C-1). In regards to roost type, 295 PRTs offered potential roost sites in the form of exfoliating or defoliating bark, 4 PRT had a crevice suitable for roosting, and 1 PRT had a cavity suitable for roosting.

PRT densities were evaluated for the site as a whole and by surveyed Forest Area edges against USDOI standards for suitable Indiana bat summer habitat which recommend a minimum of 1 PRT/500 ft (1 PRT/152 m) along forest edges. The 286 PRTs observed along the forest edge yielded 1.9 PRTs/500 ft (1.9 PRTs/152 m) with 13 of the 18 Forest Areas providing greater than 1 PRTs/500 ft (1 PRTs/152 m) (Table 8). Potential roost trees located along edges were most common in Forest Area 1 and 5 with 8.0 PRTs/500 ft (8.0 PRTs/152 m) and 5.3 PRTs/500 ft (5.3 PRTs/152 m), respectively. PRTs were absent or below 1 PRTs/500 ft in Forest Area 12, 15, 17, 25 and 29 (Table 8).

PRT quality for the surveyed area as a whole and by surveyed Forest Area edges was evaluated based on the density of “high,” “moderate,” or “low” roost trees as determined by the USFWS PRT ranking system. Ninety-two PRTs were determined to be of high roost potential with 121 being of medium potential and 73 considered PRTs of low potential (Table 7). The forest edges as a whole yielded an estimate of 0.6 high PRTs/500 ft (0.6 high PRTs/152 m), 0.8 medium PRTs/500 ft (0.8 medium PRTs/152 m), and 0.5 low PRTs/500 ft (0.5 low PRTs/152 m) (Table 8). Forest Areas 9, 10 and 18 had the highest numbers of high potential roost trees with 26, 10 and 19, respectively. However when analyzed by high potential PRTs/500 ft (high potential PRTs/152 m), Forest Areas 11, 16 and 18 were highest with 1.2 high PRTs/500 ft (1.2 high PRTs/152 m), 1.3 high PRTs/500 ft (1.3 high PRTs/152 m), 3.1 high PRTs/500 ft (3.1 high PRTs/152 m), respectively.

5.0 DISCUSSION

5.1 HABITAT QUALITY

The forested habitat on the Bell Bend NPP site provides abundant foraging opportunities for bats in general, including the Indiana bat. Bats often forage over water and wetlands, and along forest edges. Standing water is present in most of the wetlands on the Bell Bend NPP site, depending on time of year and precipitation received. In normal years, many of the wetlands on the Bell Bend NPP site hold water year-round. Wetlands make a small portion of the Forest Areas to be impacted (11.3 wetland acres [4.6 ha] out of approximately 233.5 forested acres [94.5 ha]). The majority of forested areas to be impacted are uplands.

5.1.1 RELATIVE ABUNDANCE OF PRTS IN FOREST INTERIOR AND EDGE

Interior forest areas surveyed for this study as a whole, and when subdivided into wetlands and uplands essentially met or exceeded the recommended 6 PRTs/acre (14.8 PRTs/ha) for suitable Indiana bat summer roosting habitat (USDOI, 2009). Wetlands at 8.1 PRTs/acre (19.9 PRTs/ha) exceeded the threshold, and interior forest as a whole (5.5 PRTs/acre [13.6 PRTs/ha]) and uplands (5.2 PRTs/acre [13.0 PRTs/ha]) were just slightly below the threshold (Figure 5). Analysis by Forest Area illustrated the patchy nature of PRT distribution (Figure 6). Five Forest Areas (1, 8, 9, 10, and 12) ranged from 6.6 PRTs/acre (16.1 PRTs/ha) to 19.4 PRTs/acre (48.3 PRTs/ha) and exceeded the threshold while Forest Area 11 was slightly below the threshold at 5.5 PRTs/acre (13.3 PRTs/ha) (Table 6). The remaining Forest Areas provided moderate to low PRT densities at 4.7 PRTs/ acre (11.6 PRTs/ha) to 0.7 PRTs/acre (1.7 PRTs/ha).

Surveyed Forest Area edges also provide PRTs at densities suitable for Indiana bat summer roosting habitat. At 1.9 PRTs/500 ft (1.9 PRTs/152 m), the surveyed forest edge as a whole exceeds the USDOI

recommended 1 PRT/500 ft (1 PRT/152 m). When analyzed by Forest Area, 13 of the 18 forest areas (1, 3, 5, 7, 8, 9, 10, 11, 13, 14, 16, 18, and 26) at 1.1 PRTS/500 ft (1.1 PRTs/152 m) to 8.0 PRTs/500 ft (8.0 PRTs/152 m) exceeded the USDOI threshold (Table 8). Potential roost trees were most common along edges in Forest Area 1 and 5 with 8.0 PRTs/500 ft (8.0 PRTs/152 m) and 5.3 PRTs/500 ft (5.3 PRTs/152 m), respectively. PRTs were absent or below 1 PRTs/500 ft (1 PRTs/152 m) in Forest Area 12, 15, 17, 25 and 29, only, which ranged from 0 PRTs/500 ft (0 PRTs/152 m) to 0.7 PRTs/500 ft (0.7 PRTs/152 m).

5.1.2 RELATIVE ABUNDANCE OF HIGH PRTS IN FOREST INTERIOR AND EDGE

Alternatively, the concentration of high potential, PRTs as specified by the USFWS, may be used to determine the surveyed Forest Areas that may serve as the most suitable summer habitat for Indiana bats. The surveyed interior forest as a whole yielded an estimate of 1.7 high PRTs/acre (4.2 high PRTs/ha), 2.4 medium PRTs/acre (5.9 medium PRTs/ha), and 1.4 low PRTs/acre (3.6 low PRTs/ha). Forest Areas 8, 10 and 11 had the greatest densities of high PRTs/acre at 3.5 high PRTs/acre (8.7 high PRTs/ha), 3.9 high PRTs/acre (9.7 medium PRTs/ha) and 4.1 high PRTs/acre (10.0 low PRTs/ha), respectively (Figure 6).

Subdividing the interior forest into wetlands and uplands indicated that wetlands provided higher densities of high PRTs (4.0 high PRTs/acre [9.9 high PRTs/ha] vs. 1.4 high PRTs/acre [3.6 high PRTs/ha]), similar densities of medium PRTs (2.5 medium PRTs/acre [6.1 medium PRTs/ha] vs. 2.4 medium PRTs/acre [5.9 medium PRTs/ha]) and similar densities of low PRTs (1.6 low PRTs/acre [3.9 low PRTs/ha] vs. 1.4 low PRTs/acre [3.5 low PRTs/ha]).

The surveyed Forest Area edges as a whole yielded an estimate of 0.6 high PRTs/500 ft (0.6 high PRTs/152 m), 0.8 medium PRTs/500 ft (0.8 medium PRTs/152 m), and 0.5 low PRTs/500 ft (0.5 low PRTs/152 m). Forest Areas 11, 16 and 18 had the greatest densities of high PRTs/acre (high PRTs/152 m) with 1.2 high PRTs/500 ft (1.2 high PRTs/152 m), 1.3 high PRTs/500 ft (1.3 high PRTs/152 m), 3.1 high PRTs/500 ft (3.1 high PRTs/152 m), respectively.

6.0 CONCLUSIONS

Some of the interior forest and many of the forest edges surveyed for this study provided densities of PRTs suitable for Indiana bat roosting habitat based on USDOI criteria. For interior forest, five Forest Areas (1, 8, 9, 10, and 12) exceeded the USDOI recommended threshold of 6 PRTs/acre (14.8 PRTs/ha). Forest Area 11 was just slightly below the threshold and the remaining Forest Areas (3, 5, 7, 13, 14, 15, 16, 17, 18, 25 and 26) were below the threshold. For forest edges, 13 of the 18 Forest Areas (1, 3, 5, 7, 8, 9, 10, 11, 13, 14, 16, 18, and 26) exceeded the USDOI recommended threshold of 1 PRT/500 ft (1 PRT/152 m). PRTs were absent or below the threshold along the edges of Forest Area 12, 15, 17, 25 and 29.

Additionally, based on the USDOI and USFWS criteria, forested wetlands provided higher quality roosting habitat than forested uplands at the site. Forested wetlands had higher overall densities of interior forest PRTs and higher overall densities of high PRTs than upland forests.

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TABLES

Table 1. Summary of Proposed Upland and Wetland Forest Clearing Impacts Within the Bell Bend NPP Project Site (2010 LOD Boundary).[1]

Forest	Pre-construction Size		Post-construction Size		Total Forest Impact [3]		Uplands Forest Impact [3]		Wetlands Forest Impact [3, 4]		Number of Survey Plots [5]		
Area [2]	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Uplands	Wetlands	Total
1	53.45	21.63	48.95	19.81	4.50	1.82	4.50	1.82	NI	NI	1	0	1
2	16.31	6.60	16.24	6.57	0.07	0.03	0.07	0.03	NI	NI	0	0	0
3	32.65	13.21	13.27	5.37	19.39	7.85	19.39	7.85	NI	NI	4	0	4
4	5.39	2.18	5.39	2.18	NI	NI	NI	NI	NI	NI	0	0	0
5	60.69	24.56	52.76	21.35	7.92	3.21	7.92	3.21	NI	NI	2	0	2
6	8.47	3.43	8.47	3.43	NI	NI	NI	NI	NI	NI	0	0	0
7	59.12	23.92	32.14	13.01	26.97	10.92	26.97	10.92	NI	NI	6	0	6
8	20.72	8.38	3.58	1.45	17.14	6.94	16.16	6.54	0.99	0.40	3	2	5
9	85.80	34.72	30.20	12.26	55.60	22.46	50.03	20.21	5.57	2.25	10	4	14
10	14.45	5.84	5.85	2.37	8.60	3.47	8.52	3.45	0.08	0.03	2	2	4
11	5.16	2.09	2.84	1.15	2.32	0.94	2.31	0.94	0.01	0.00	1	1	2
12	17.05	6.90	5.09	2.07	11.96	4.83	10.82	4.37	1.14	0.46	2	1	3
13	16.49	6.67	13.31	5.39	3.18	1.29	3.18	1.29	NI	NI	1	0	1
14	21.63	8.75	0	0	21.63	8.75	21.63	8.75	NI	NI	5	0	5
15	26.00	10.52	9.12	3.69	16.89	6.83	16.89	6.83	NI	NI	4	0	4
16	15.04	6.09	13.02	5.27	2.02	0.82	2.02	0.82	NI	NI	1	0	1
17	194.41	78.54	172.82	69.80	21.59	8.74	21.59	8.74	NI	NI	5	0	5
18	17.80	7.19	13.19	5.33	4.61	1.86	4.61	1.86	NI	NI	2	0	2
19	4.14	1.68	4.14	1.68	NI	NI	NI	NI	NI	NI	0	0	0
20	2.37	0.96	2.37	0.96	NI	NI	NI	NI	NI	NI	0	0	0
21	14.71	5.95	14.71	5.95	NI	NI	NI	NI	NI	NI	0	0	0

Table 1. Continued.

Forest Area [2]	Pre-construction Size		Post-construction Size		Total Forest Impact [3]		Uplands Forest Impact [3]		Wetlands Forest Impact [3, 4]		Number of Survey Plots [5]		
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Uplands	Wetlands	Total
22	17.11	6.93	17.11	6.93	NI	NI	NI	NI	NI	NI	0	0	0
23	5.32	2.15	5.32	2.15	NI	NI	NI	NI	NI	NI	0	0	0
24	9.62	3.89	9.61	3.89	0.01	0.00	0.01	0.00	NI	NI	0	0	0
25	19.14	7.75	11.71	4.74	7.43	3.01	7.43	3.01	NI	NI	2	0	2
26	29.67	11.99	28.37	11.46	1.30	0.53	1.30	0.53	0 [6]	0	1	0	1
27	19.07	7.70	19.07	7.70	NI	NI	NI	NI	NI	NI	0	0	0
28	0.33	0.13	0.33	0.13	NI	NI	NI	NI	NI	NI	0	0	0
29	49.12	18.19	46.73	17.22	2.39	0.97	1.98	0.79	0.41 [6]	0.16	1	1	2
30	2.09	0.85	2.09	0.85	NI	NI	NI	NI	NI	NI	0	0	0
31	0.11	0.05	0.04	0.02	0.07	0.03	0.07	0.03	NI	NI	0	0	0
32	1.86	0.75	1.86	0.75	NI	NI	NI	NI	NI	NI	0	0	0
33	0.88	0.36	0.88	0.36	NI	NI	NI	NI	NI	NI	0	0	0
Total =	846.17	340.55	610.58	245.27	235.58	95.28	227.39	91.99	8.20	3.30	53	11	64

[1] Based on Sargent & Lundy Limit of Disturbance drawing SK-12198-421-001, rev. 1, 4/14/10; BBNPP NRC Environmental Report - Section 2.4.1, Plant Communities Map, Figure 2.4.1-2, rev. 2, 10/01/2010; and BBNPP Wetlands Delineation and Exceptional Values Analysis Report (rev. 5, November 2010).

[2] See Figure 3. Bell Bend NPP Forest Areas.

[3] No impact = NI and 0.00 indicates that impacts were less than 1/100 of an acre/hectare.

[4] Wetlands data is based on BBNPP NRC Environmental Report - Section 2.4.1, Plant Communities Map, Figure 2.4.1-2 (rev. 2, 10/01/2010), and BBNPP Wetlands Delineation and Exceptional Values Analysis Report (rev. 5, November 2010).

[5] Wetland forest areas proposed for clearing were surveyed in their entirety except for Forest Area 9.

[6] Temporary forested wetlands impacts associated with pipelines in Forest Areas 26 and 29 are currently unknown.

Table 2. Summary of Proposed Upland and Wetland Forest Clearing Impacts Within the Bell Bend NPP Project Site (2011 LOD Boundary).[1]

Forest	Pre-construction Size		Post-construction Size		Total Forest Impact [3]		Uplands Forest Impact [3]		Wetlands Forest Impact [3, 4]		Number of Survey Plots		
Area [2]	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Uplands	Wetlands	Total
1	60.33	24.41	55.29	22.37	5.04	2.04	5.04	2.04	0.00	0.00	1	0	1
2	18.15	7.34	18.01	7.28	0.14	0.06	0.14	0.06	NI	NI	0	0	0
3	34.79	14.08	12.02	4.86	22.77	9.22	21.28	8.61	1.50	0.61	4	0	4
4	6.60	2.67	6.60	2.67	NI	NI	NI	NI	NI	NI	0	0	0
5	57.02	23.08	49.82	20.16	7.20	2.92	6.76	2.74	0.45	0.18	2	0	2
6	10.09	4.08	10.09	4.08	NI	NI	NI	NI	NI	NI	0	0	0
7	58.12	23.52	36.89	14.93	21.23	8.59	21.23	8.59	NI	NI	6	0	6
8	20.69	8.37	5.55	2.24	15.14	6.13	14.47	5.86	0.67	0.27	3	2	5
9	85.81	34.73	29.52	11.95	56.29	22.78	49.89	20.19	6.40	2.59	10	4	14
10	13.45	5.44	9.97	4.04	3.47	1.40	3.39	1.37	0.08	0.03	1	2	3
11	5.16	2.09	2.88	1.17	2.28	0.92	2.28	0.92	NI	NI	1	1	2
12	17.09	6.92	6.48	2.63	10.61	4.29	9.57	3.87	1.04	0.42	2	1	3
13	17.51	7.09	15.24	6.17	2.27	0.92	2.27	0.92	NI	NI	1	0	1
14	22.30	9.02	0.27	0.10	22.03	8.92	22.03	8.92	NI	NI	5	0	5
15	26.09	10.56	0.34	0.14	25.75	10.42	25.75	10.42	NI	NI	6	0	6
16	16.69	6.76	0.49	0.20	16.21	6.56	16.21	6.56	NI	NI	4	0	4
17	198.06	80.15	189.03	76.49	9.04	3.66	9.04	3.66	NI	NI	1	0	1
18	33.19	13.43	28.49	11.53	4.70	1.90	4.70	1.90	NI	NI	2	0	2
19	4.08	1.65	4.08	1.65	NI	NI	NI	NI	NI	NI	0	0	0
20	2.47	1.00	2.47	1.00	NI	NI	NI	NI	NI	NI	0	0	0
21	14.71	5.95	14.71	5.95	NI	NI	NI	NI	NI	NI	0	0	0

Table 2. Continued.

Forest Area [2]	Pre-construction Size		Post-construction Size		Total Forest Impact [3]		Uplands Forest Impact [3]		Wetlands Forest Impact [3, 4]		Number of Survey Plots		
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Uplands	Wetlands	Total
22	17.38	7.03	17.38	7.03	NI	NI	NI	NI	NI	NI	0	0	0
23	5.31	2.15	5.31	2.15	0.00	0.00	0.00	0.00	NI	NI	0	0	0
24	9.84	3.98	9.84	3.98	0.01	0.00	0.01	0.00	NI	NI	0	0	0
25	19.10	7.73	14.47	5.86	4.63	1.87	4.63	1.87	0.00	0.00	1	0	1
26	31.51	12.75	31.31	12.67	0.20	0.08	NI	NI	0.20	0.08	0	0	0
27	22.90	9.27	22.90	9.27	NI	NI	NI	NI	NI	NI	0	0	0
28	0.33	0.13	0.33	0.13	NI	NI	NI	NI	NI	NI	0	0	0
29	49.08	19.86	46.22	18.71	2.85	1.15	1.84	0.74	1.01	0.41	1	1	2
30	2.54	1.03	2.53	1.02	0.02	0.01	0.02	0.01	NI	NI	0	0	0
31	0.33	0.14	0.19	0.08	0.15	0.06	0.15	0.06	NI	NI	0	0	0
32	1.62	0.66	1.43	0.58	0.19	0.08	0.19	0.08	NI	NI	0	0	0
33	2.73	1.11	1.41	0.58	1.32	0.53	1.32	0.53	NI	NI	0	0	0
Total =	885.08	358.18	651.55	263.65	233.53	94.51	222.18	89.92	11.34	4.59	51	11	62

[1] Based on Pennoni Associates Limit of Disturbance drawing, rev. 2, 8/25/11; BBNPP NRC Environmental Report - Section 2.4.1, Plant Communities Map, Figure 2.4.1-2, rev. 5, 9/2011; and BBNPP Wetlands Delineation and Exceptional Values Analysis Report (rev. 7, September 2011).

[2] See Figure 3. Bell Bend NPP Forest Areas.

[3] No impact = NI and 0.00 indicates that impacts were less than 1/100 of an acre/hectare.

[4] Wetlands data is based on BBNPP NRC Environmental Report - Section 2.4.1, Plant Communities Map, Figure 2.4.1-2 (rev. 5, 9/2011), and BBNPP Wetlands Delineation and Exceptional Values Analysis Report (rev. 7, September 2011).

Table 3. Trees Observed in Forest Areas at the Bell Bend NPP Project Site.

Scientific Name	Common Name
Acer saccharinum	silver maple
Acer rubrum	red maple
Ailanthus altissima	tree-of-heaven
Betula alleghaniensis	yellow birch
Betula lenta	sweet birch
Betula nigra	river birch
Betula populifolia	gray birch
Carya cordiformis	bitternut hickory
Carya ovata	shagbark hickory
Carya tomentosa	mockernut hickory
Celtis occidentalis	hackberry
Cornus florida	flowering dogwood
Fagus grandifolia	American beech
Fraxinus americana	white ash
Fraxinus pennsylvanica	green ash
Juglans nigra	black walnut
Juniperus virginiana	eastern red cedar
Liriodendron tulipifera	yellow poplar
Malus spp.	apples
Nyssa sylvatica	black gum
Pinus resinosa	red pine
Pinus strobus	eastern white pine
Pinus sylvestris	Scots pine
Platanus occidentalis	American sycamore
Populus deltoides	eastern cottonwood
Populus tremuloides	quaking aspen
Prunus serotina	black cherry
Quercus alba	white oak
Quercus bicolor	swamp white oak
Quercus palustris	pin oak
Quercus rubra	northern red oak
Quercus velutina	black oak
Robinia pseudoacacia	black locust
Sassafras albidum	sassafras
Tilia americana	American basswood
Tsuga canadensis	eastern hemlock
Ulmus rubra	slippery elm

Table 4. Characteristics of Forest Cover Areas Proposed for Clearing at the Bell Bend NPP Project Site.

Forest Area Number	Dominant Tree Species	Subdominant Tree Species	Maximum DBH[1] Range		Minimum DBH[1] Range		Average DBH[1] Range		Number of PRTs[2]	Number of Snags[3]	Number of Stubs[4]
			Inches	Centimeters	Inches	Centimeters	Inches	Centimeters			
1	Red oak	Mockernut hickory	20	51	3	8	12	30	14	6	19
3	Red maple	none	15 to 30	38 to 76	3	8	10 to 12	25 to 30	8	14	27
5	White oak, Red pine	none	10 to 14	25 to 36	3	8	8 to 9	20 to 23	1	8	32
7	White oak, Red oak, Red maple	Red oak, White oak, Black oak, Black cherry	17 to 30	43 to 76	3 to 4	8 to 10	10 to 14	25 to 36	20	14	37
8	Shagbark hickory, Red maple, Sweet birch, Black locust	White oak, Red maple, Black walnut	11 to 16	28 to 41	3 to 6	8 to 15	7 to 12	18 to 30	38	22	16
9	Red maple, White oak, Red oak, Sweet birch, Mockernut hickory, Red pine, Tulip poplar	Red maple, Red oak, Pin oak, Black cherry	12 to 60	30 to 152	3 to 8	8 to 20	6 to 23	15 to 58	80	21	50
10	Red oak, Red maple, Pin oak	Red maple, Black cherry	23 to 33	58 to 84	4 to 6	10 to 15	9 to 15	23 to 38	10	3	9
11	White pine, Pin oak	none	11 to 23	28 to 58	3 to 5	8 to 13	6 to 14	15 to 36	4	1	3
12	Black oak, Red maple, Sweet birch	Pin oak, Black oak	14 to 28	36 to 71	3 to 4	8 to 10	9 to 13	23 to 33	17	2	20
13	Sweet birch	none	22	56	5	13	12	30	2	0	2
14	Red maple	none	11 to 18	28 to 46	3 to 4	8 to 10	8 to 10	20 to 25	17	5	8
15	Quaking aspen, Sassafras, Red maple, Black oak	Red maple, Scots pine	10 to 21	25 to 53	3 to 7	8 to 18	7 to 10	18 to 25	12	13	31
16	Red oak, Black oak, Black cherry	Red maple, Scots pine, Mockernut hickory	15 to 26	38 to 66	4 to 6	10 to 15	9 to 12	23 to 30	9	6	12
17	Red maple	none	16 to 24	41 to 61	3 to 4	8 to 10	10 to 12	25 to 30	10	12	37
18	White pine, Silver maple	none	12 to 17	30 to 43	4 to 7	10 to 18	10 to 11	25 to 28	5	7	0
25	White oak, Black cherry	none	16 to 40	41 to 102	3 to 4	8 to 10	10 to 12	25 to 30	5	2	6
26	White oak	Red maple	18	46	5	13	12	30	2	1	2
29	Red oak, Silver maple	River birch	17 to 42	43 to 107	3 to 5	8 to 13	10 to 15	25 to 38	1	2	15
							Cumulative Forest Area Totals		**255**	**139**	**326**
							Cumulative Forest Area Averages		**14**	**8**	**18**

[1]DBH = Diameter at breast height

[2]PRTs = Potential Roost Trees

[3]Number of snags = snags that didn't qualify as roost trees

[4]Number of stubs = stubs that didn't qualify as roost trees

Table 5. Indiana Bat (*Myotis sodalis*) Potential Roost Trees in the Interior Forest Areas at the Bell Bend NPP Project Site.

Forest Area Survey Plot Number	Tree Species	DBH Range [1] Inches	DBH Range [1] Centimeters	Condition Live	Condition PD [2]	Condition Dead	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential Low	Roost Potential Medium	Roost Potential High
1	Red oak, White oak, Black oak, Shagbark hickory, Unknown	7 to 16	18 to 41	3	0	11	14	0	0	5	8	1
3	Black cherry, Red maple, White pine	9 to 21	23 to 53	2	4	2	8	0	0	0	7	1
5	Shagbark hickory	8	20	1	0	0	1	0	0	1	0	0
7	Red maple, White oak, Red oak, Black walnut, Red pine, Black cherry, Sassafras, Unknown	7 to 32	18 to 81	9	4	7	19	2	2	2	6	12
8	Red maple, Shagbark hickory, White ash, Black cherry, White oak, Scots pine, Sweet birch, Black locust, American basswood	6 to 25	15 to 64	24	2	12	38	4	1	7	20	11
9	Red maple, White ash, Black cherry, Red pine, Shagbark hickory, White oak, Pin oak, River	5 to 60	13 to 152	48	8	24	79	5	1	17	36	27
10	Shagbark hickory, White oak, Red oak, Red maple, Black gum, Unknown	7 to 28	18 to 71	7	1	2	9	1	1	0	4	6
11	White pine, White oak, Unknown	14 to 36	36 to 91	2	0	2	4	1	0	0	1	3
12	Shagbark hickory, White oak, White pine, Unknown	6 to 28	15 to 71	9	0	8	17	0	0	1	11	5
13	Sweet birch, Unknown	20 to 23	51 to 58	1	0	1	2	0	0	0	0	2
14	Red maple, Unknown	6 to 13	15 to 33	2	0	15	17	0	0	12	5	0
15	Red maple, Red pine, Quaking aspen, Sassafras	6 to 13	15 to 33	0	4	8	12	0	0	4	8	0
16	Red maple, Black oak	7 to 34	18 to 86	3	0	6	9	0	0	5	0	4
17	Red maple, Bigtooth aspen, Unknown	6 to 13	15 to 33	1	0	9	10	0	0	8	2	0
18	White pine, Silver maple	7 to 21	18 to 53	2	0	3	5	0	0	2	0	3
25	White oak, Black cherry, Unknown	7 to 40	18 to 102	3	0	2	5	0	0	1	3	1
26	Shagbark hickory, White oak, Black cherry, Black locust, Unknown	40 to 46	102 to 117	1	0	1	2	0	0	0	0	2
29	Unknown	15	38	0	0	1	1	0	0	0	0	1
	Cumulative Forest Area Totals			**118**	**23**	**114**	**252**	**13**	**5**	**66**	**111**	**78**

Notes:

[1] DBH = Diameter at breast height

[2] PD = Partially dead

Table 6. Density[2] of Interior Forest Indiana Bat (*Myotis sodalis*) Potential Roost Trees by Forest Area at the BBNPP Project Site.

	Area Surveyed		All PRTs[1]			High PRTs[1]			Medium PRTs[1]			Low PRTs[1]		
Forest Area	Acres	Hectares	Number	PRTs/Acre	PRTs/Hectare	Number	PRTs/Acre	PRTs/Hectare	Number	PRTs/Acre	PRTs/Hectare	Number	PRTs/Acre	PRTs/Hectare
1	0.72	0.29	14	19.4	48.3	1	1.4	3.4	8	11.1	27.6	5	6.9	17.2
3	2.88	1.17	8	2.8	6.8	1	0.3	0.9	7	2.4	6.0	0	0.0	0.0
5	1.44	0.58	1	0.7	1.7	0	0.0	0.0	0	0.0	0.0	1	0.7	1.7
7	4.32	1.75	20	4.6	11.4	12	2.8	6.9	6	1.4	3.4	2	0.5	1.1
8	3.15	1.27	38	12.1	29.9	11	3.5	8.7	20	6.3	15.7	7	2.2	5.5
9	9.15	3.70	80	8.7	21.6	27	3.0	7.3	36	3.9	9.7	17	1.9	4.6
10	1.52	0.62	10	6.6	16.1	6	3.9	9.7	4	2.6	6.5	0	0.0	0.0
11	0.73	0.30	4	5.5	13.3	3	4.1	10.0	1	1.4	3.3	0	0.0	0.0
12	2.47	1.00	17	6.9	17.0	5	2.0	5.0	11	4.5	11.0	1	0.4	1.0
13	0.72	0.28	2	2.8	7.1	2	2.8	7.1	0	0.0	0.0	0	0.0	0.0
14	3.60	1.46	17	4.7	11.6	0	0.0	0.0	5	1.4	3.4	12	3.3	8.2
15	4.32	1.75	12	2.8	6.9	0	0.0	0.0	8	1.9	4.6	4	0.9	2.3
16	2.88	1.17	9	3.1	7.7	4	1.4	3.4	0	0.0	0.0	5	1.7	4.3
17	3.60	1.46	10	2.8	6.8	0	0.0	0.0	2	0.6	1.4	8	2.2	5.5
18	1.44	0.58	5	3.5	8.6	3	2.1	5.2	0	0.0	0.0	2	1.4	3.4
25	1.44	0.58	5	3.5	8.6	1	0.7	1.7	3	2.1	5.2	1	0.7	1.7
26	0.72	0.29	2	2.8	6.9	2	2.8	6.9	0	0.0	0.0	0	0.0	0.0
29	1.13	0.46	1	0.9	2.2	1	0.9	2.2	0	0.0	0.0	0	0.0	0.0
Interior Forest Totals	**46.23**	**18.71**	**255**	N/A	N/A	**78**	N/A	N/A	**111**	N/A	N/A	**66**	N/A	N/A
Wetlands Totals	**4.47**	**1.81**	**36**	N/A	N/A	**18**	N/A	N/A	**11**	N/A	N/A	**7**	N/A	N/A
Uplands Totals	**41.76**	**16.90**	**219**	N/A	N/A	**60**	N/A	N/A	**100**	N/A	N/A	**59**	N/A	N/A
Interior Forest PRT[1] Density[2]	N/A	N/A	N/A	**5.5**	**13.6**	N/A	**1.7**	**4.2**	N/A	**2.4**	**5.9**	N/A	**1.4**	**3.5**
Wetlands PRT[1] Density[2]	N/A	N/A	N/A	**8.1**	**19.9**	N/A	**4.0**	**9.9**	N/A	**2.5**	**6.1**	N/A	**1.6**	**3.9**
Uplands PRT[1] Density[2]	N/A	N/A	N/A	**5.2**	**13.0**	N/A	**1.4**	**3.6**	N/A	**2.4**	**5.9**	N/A	**1.4**	**3.5**

[1]PRTs = Potential Roost Trees

[2]Density = Number of PRTs/acre (PRTs/hectare) surveyed

Table 7. Indiana Bat (*Myotis sodalis*) Potential Roost Trees along the Forest Area Edges at the Bell Bend NPP Project Site.

Forest Area		DBH Range [1]		Condition			Roost Type			Roost Potential		
Number	Tree Species	Inches	Centimeters	Live	PD[2]	Dead	Bark	Crevice	Cavity	Low	Medium	High
1	Shagbark hickory, Red maple, Sweet birch, Unknown	5 to 13	13 to 33	4	0	5	9	0	0	5	4	0
3	Shagbark hickory, Red maple, Black cherry, Red oak, Unknown	5 to 30	13 to 76	13	1	11	25	0	0	9	15	1
5	Shagbark hickory, Red maple, Black cherry, Unknown	5 to 14	13 to 36	15	0	6	21	0	0	12	9	0
7	Shagbark hickory, White pine, Red maple, White oak, Red oak, Unknown	8 to 53	20 to 135	8	0	9	17	0	0	2	7	8
8	Shagbark hickory, White oak, Red maple, White pine, Unknown	6 to 29	15 to 74	10	0	6	16	0	0	5	6	5
9	Shagbark hickory, Red oak, Black cherry, White pine, Red maple, White oak, Black oak, Unknown	5 to 45	13 to 114	77	7	10	93	1	0	25	43	26
10	Shagbark hickory, White oak, Red maple, White pine, Unknown	6 to 28	15 to 71	14	0	5	19	0	0	3	6	10
11	White oak, Red oak, Unknown	12 to 49	31 to 125	7	0	1	8	0	0	0	3	5
12	Black cherry, Red maple, White oak	7 to 19	18 to 48	4	0	2	6	0	0	2	2	2
13	Red maple, Shagbark hickory, Sweet birch	9 to 22	23 to 56	1	1	1	3	0	0	0	2	1
14	Red maple, Black cherry, Shagbark hickory, Unknown	6 to 20	15 to 51	8	1	6	15	0	0	5	8	2
15	Black oak, American sycamore, Red maple, Black cherry, Red oak, River birch	8 to 31	20 to 79	4	1	1	6	1	0	1	3	2
16	Red maple, River birch, Sassafras, Black cherry, Bigtooth aspen, Black locust, Pin oak	9 to 35	23 to 90	5	3	9	17	2	1	2	6	9
17	Red maple	9	23	0	1	0	1	0	0	0	1	0
18	Silver maple, Red maple, Unknown	6 to 48	15 to 122	16	2	2	20	0	0	1	0	19
25	Red maple, White oak, Unknown	7 to 32	18 to 81	1	0	3	4	0	0	1	2	1
26	Shagbark hickory, White oak	11 to 36	28 to 91	5	0	0	5	0	0	0	4	1
29	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Cumulative Forest Area Totals			**192**	**17**	**77**	**295**	**4**	**1**	**73**	**121**	**92**

Notes

[1]DBH = Diameter at breast height

[2]PD = Partially dead

N/A = Not Applicable

Table 8. Density[1] of Forest Edge Indiana Bat (*Myotis sodalis*) Potential Roost Trees by Forest Area at the Bell Bend NPP Project Site.

	Distance Surveyed[2]		All PRTs[3]			High PRTs[3]			Medium PRTs[3]			Low PRTs[3]		
Forest Area	Feet	Meters	Number	PRTs/500 ft	PRTs/152 m	Number	PRTs/500 ft	PRTs/152 m	Number	PRTs/500 ft	PRTs/152 m	Number	PRTs/500 ft	PRTs/152 m
1	564	172	9	8.0	8.0	0	0.0	0.0	4	3.5	3.5	5	4.4	4.4
3	6,666	2,032	25	1.9	1.9	1	0.1	0.1	15	1.1	1.1	9	0.7	0.7
5	1,970	600	21	5.3	5.3	0	0.0	0.0	9	2.3	2.3	12	3.0	3.0
7	4,203	1,281	17	2.0	2.0	8	1.0	0.9	7	0.8	0.8	2	0.2	0.2
8	5,418	1,651	16	1.5	1.5	5	0.5	0.5	6	0.6	0.6	5	0.5	0.5
9	16,669	5,081	94	2.8	2.8	26	0.8	0.8	43	1.3	1.3	25	0.7	0.7
10	6,724	2,049	19	1.4	1.4	10	0.7	0.7	6	0.4	0.4	3	0.2	0.2
11	2,140	652	8	1.9	1.9	5	1.2	1.2	3	0.7	0.7	0	0.0	0.0
12	4,061	1,238	6	0.7	0.7	2	0.2	0.2	2	0.2	0.2	2	0.2	0.2
13	1,387	423	3	1.1	1.1	1	0.4	0.4	2	0.7	0.7	0	0.0	0.0
14	6,040	1,841	15	1.2	1.2	2	0.2	0.2	8	0.7	0.7	5	0.4	0.4
15	4,542	1,384	6	0.7	0.7	2	0.2	0.2	3	0.3	0.3	1	0.1	0.1
16	3,518	1,072	17	2.4	2.4	9	1.3	1.3	6	0.9	0.9	2	0.3	0.3
17	1,595	486	1	0.3	0.3	0	0.0	0.0	1	0.3	0.3	0	0.0	0.0
18	3,101	945	20	3.2	3.2	19	3.1	3.1	0	0.0	0.0	1	0.2	0.2
25	4,043	1,232	4	0.5	0.5	1	0.1	0.1	2	0.2	0.2	1	0.1	0.1
26	665	203	5	3.8	3.7	1	0.8	0.7	4	3.0	3.0	0	0.0	0.0
29	2,275	693	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Forest Edge Totals	**75581**	**23035**	**286**	N/A	N/A	**92**	N/A	N/A	**121**	N/A	N/A	**73**	N/A	N/A
Forest Edge PRT[1] Density	N/A	N/A	N/A	**1.9**	**1.9**	N/A	**0.6**	**0.6**	N/A	**0.8**	**0.8**	N/A	**0.5**	**0.5**

[1]Density = Number of PRTs/500 ft (PRTs/152 m) surveyed.

[2]Linear feet (linear meters) surveyed along the edge of the forest area.

[3]PRTs = Potential Roost Trees

FIGURES

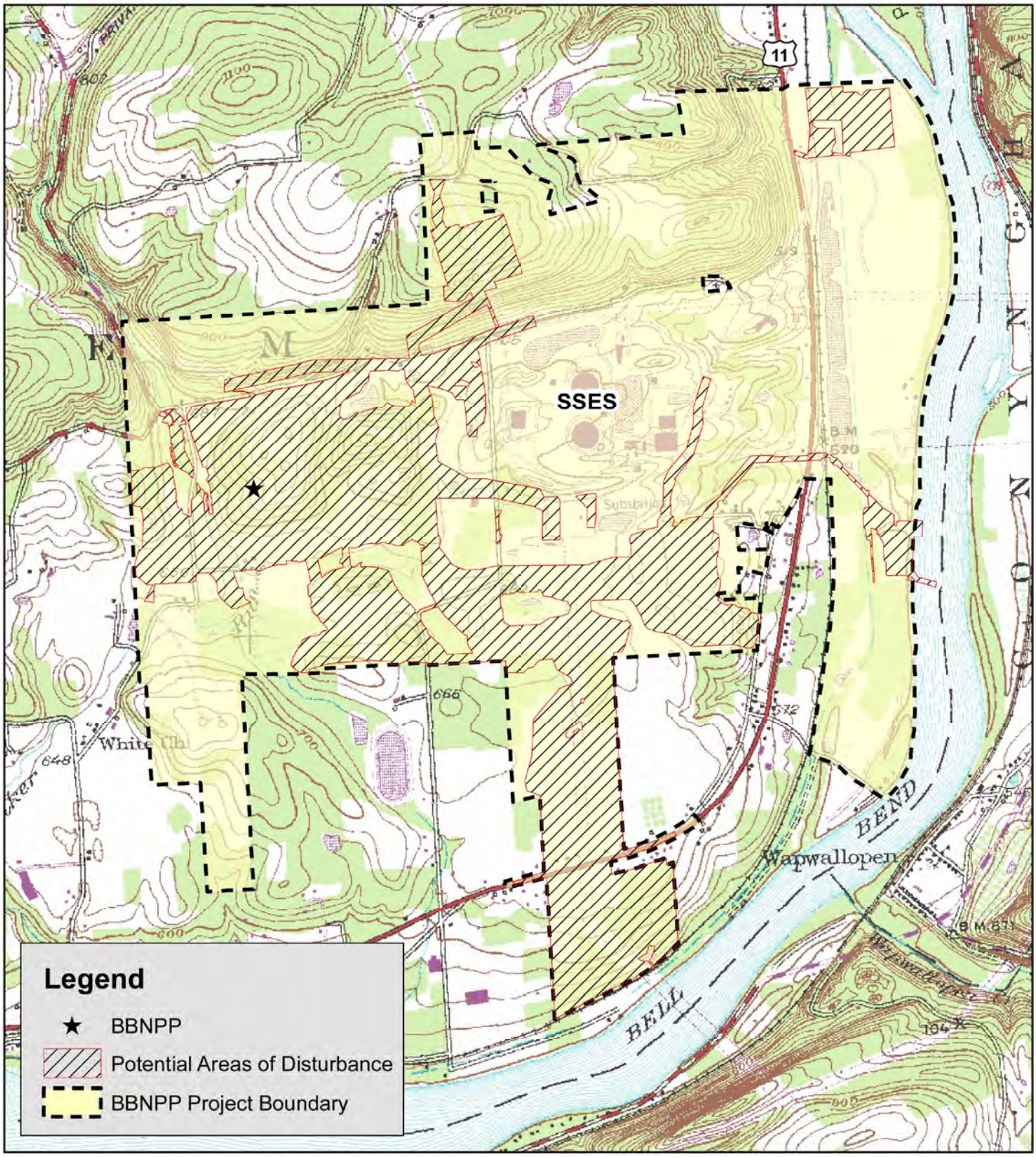


Figure 1.
Bell Bend NPP
Site Location Map

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/14/10
prepared by: s.sherman
project: 22474.000

rev. date: 09/13/11
prepared for: c. roche
file name: Figure1._Roost_Tree_Report

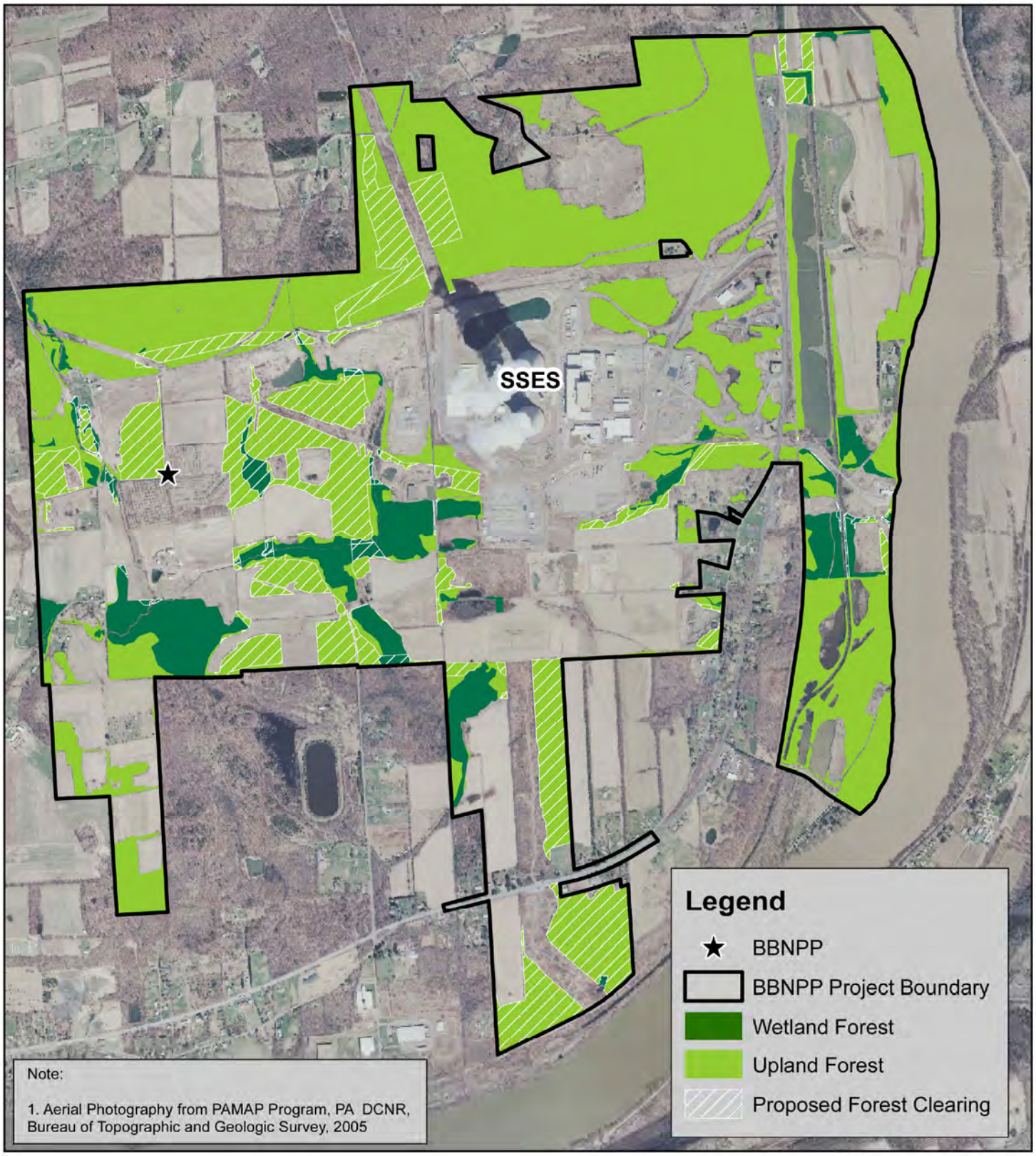


Figure 2.
Bell Bend NPP
Proposed Forest Clearing

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/12/10
prepared by: s.sherman
project: 22474.000

rev. date: 09/13/11
prepared for: c. roche
file name: Figure2.Proposed Forest Clearing

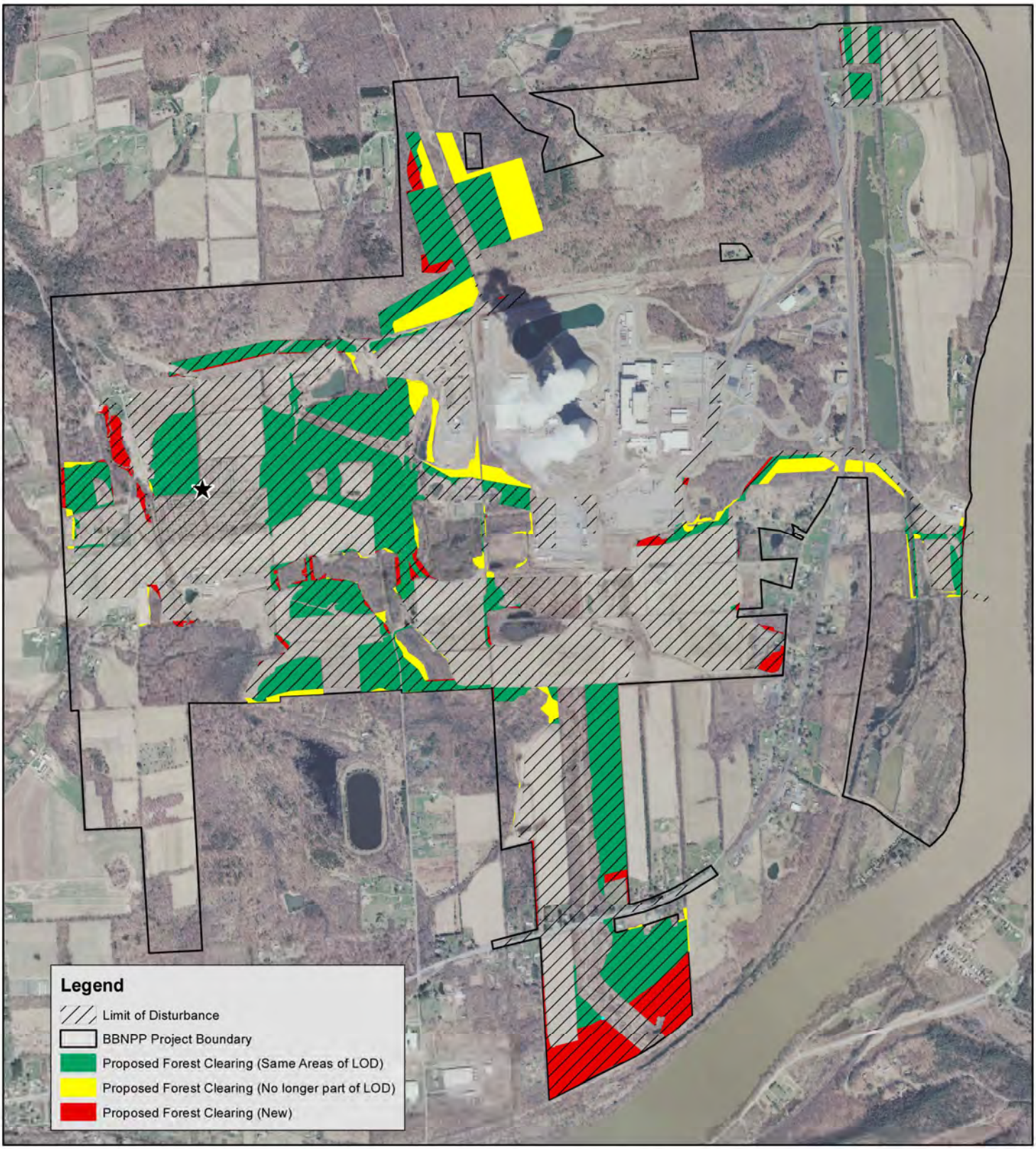


Figure 3.

Changes to Surveyed Areas with Respect to Revised LOD Boundary.

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 09/22/11
prepared by: s.sherman
project: 22474.000

rev. date:
prepared for: c.roche
file name: Impact_Changes

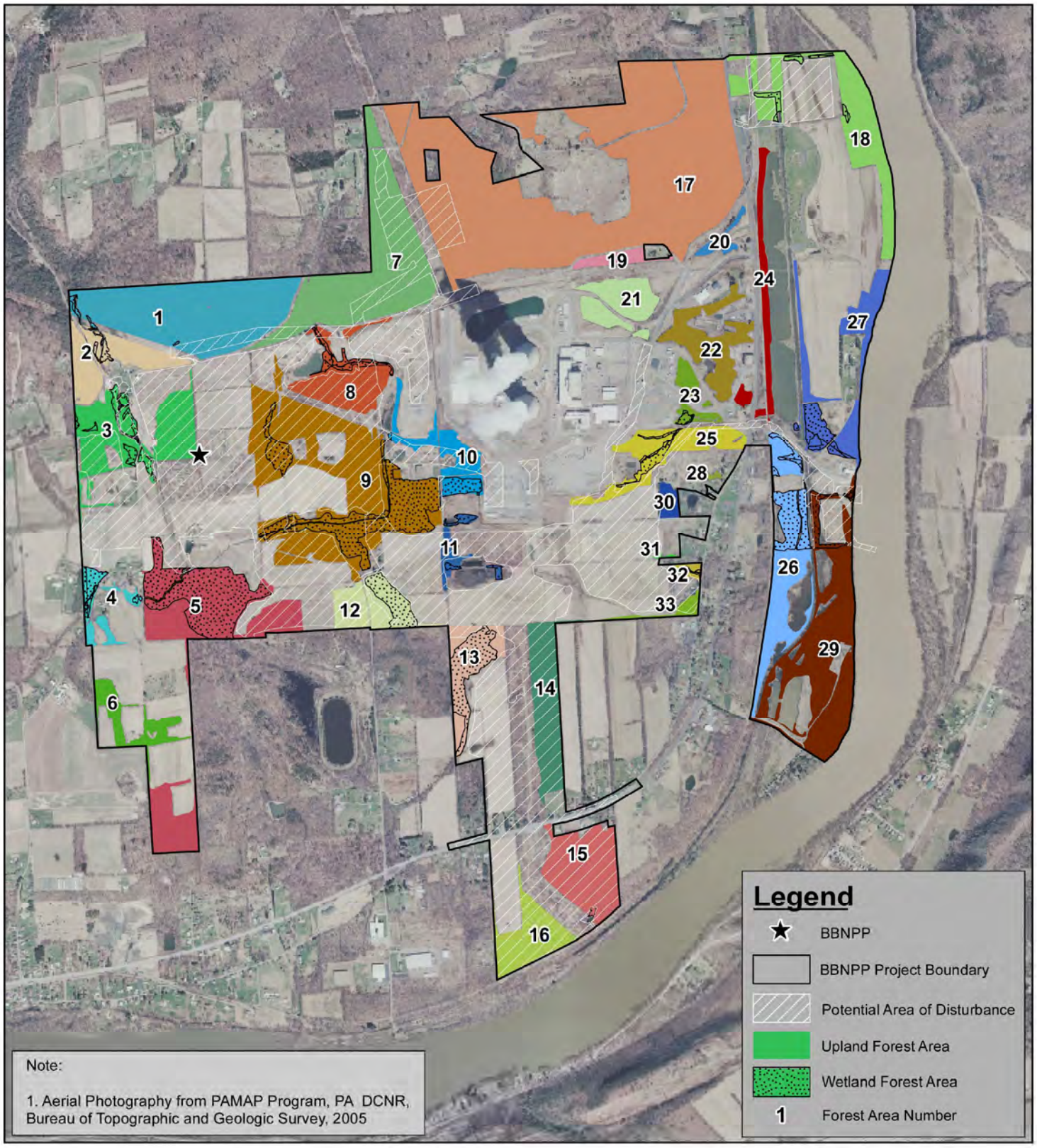


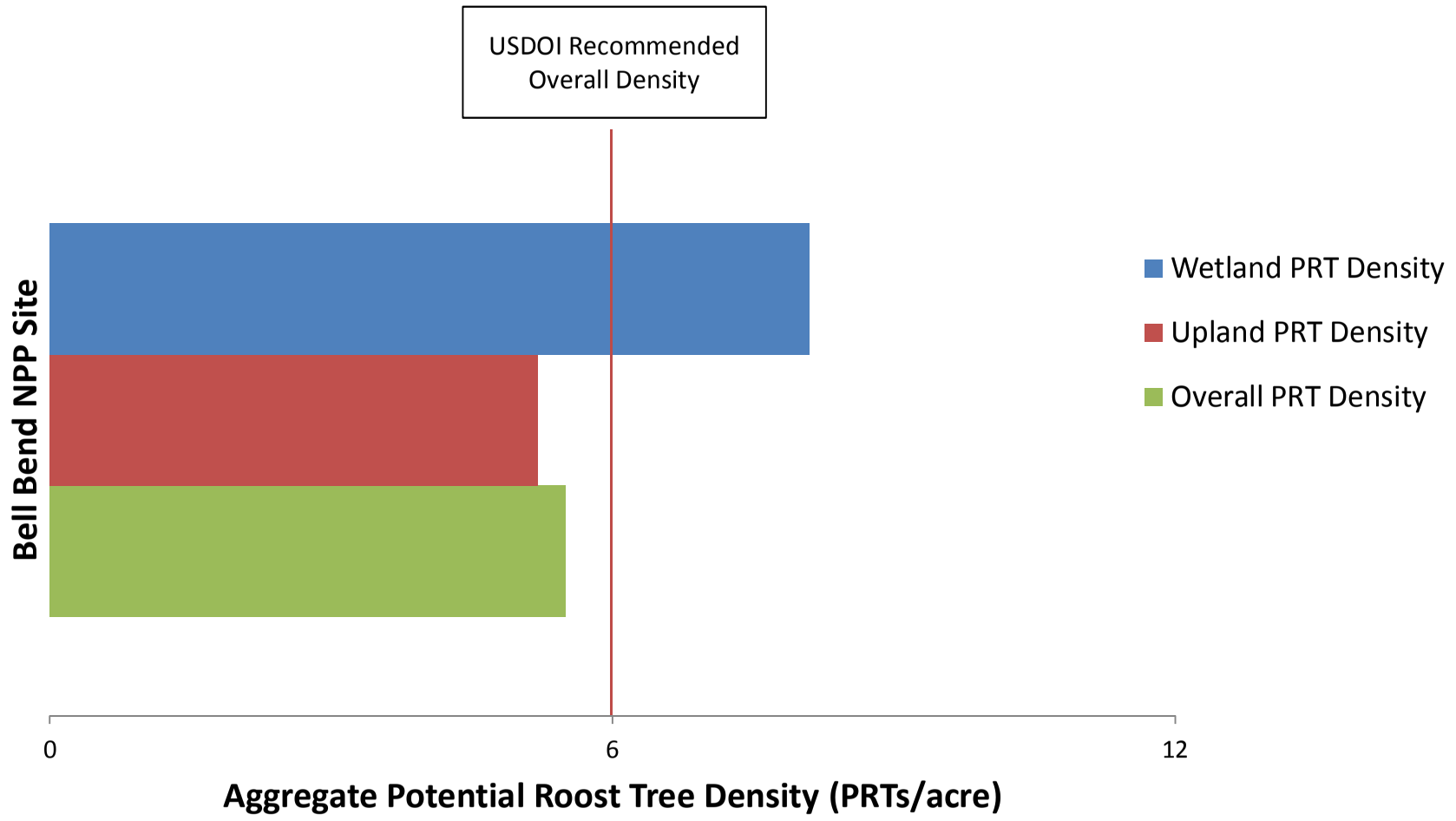
Figure 4.
Bell Bend NPP
Forest Areas

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/13/10
prepared by: s.sherman
project: 22474.000

rev. date: 09/13/11
prepared for: c. roche
file name: Figure4.Forest Areas

Figure 5. Overall Study Area, Wetland and Upland Interior Forest Potential Roost Tree (PRT) Densities for the Bell Bend NPP Project Site



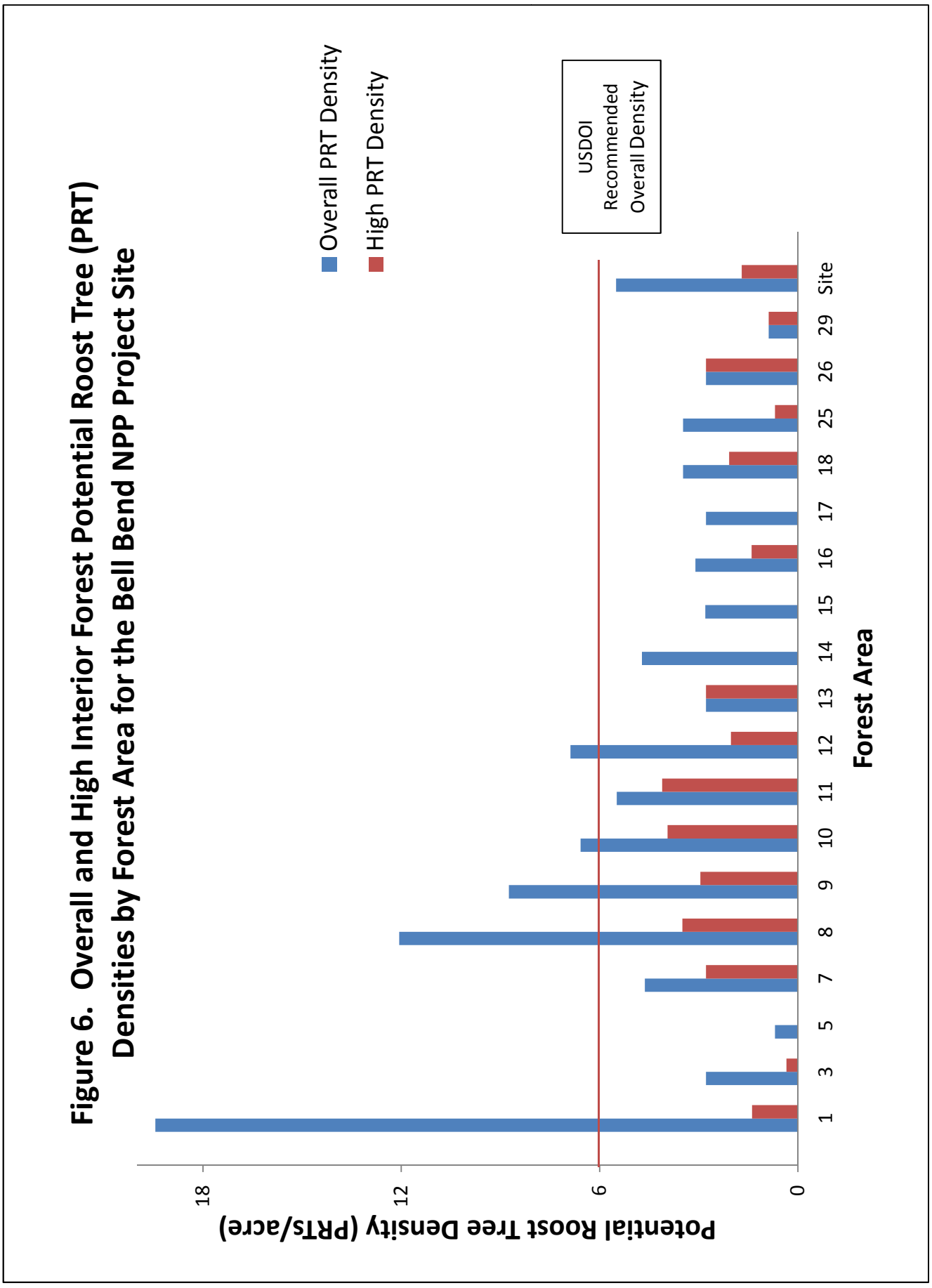


Figure 6. Overall and High Interior Forest Potential Roost Tree (PRT) Densities by Forest Area for the Bell Bend NPP Project Site

APPENDIX A

Characteristics of Forest Areas

Table A-1. Characteristics of Forest Areas at the Bell Bend NPP Project Site.

Forest Area Survey Plot Number	Setting	Tree Species		Diameter at Breast Height (DBH)			Number of PRTs[1]	Number of Snags[2]	Number of Stubs[3]
		Dominant	Subdominant	Maximum Inches (cm)	Minimum Inches (cm)	Average Inches (cm)			
1-1	Upland	Red oak	Mockernut hickory	20 (51)	3 (8)	12 (30)	14	6	19
3-1	Upland	Red maple	none	15 (38)	4 (10)	10 (25)	4	5	8
3-2	Upland	Red maple	none	30 (76)	4 (10)	12 (30)	1	5	7
3-3	Upland	Red maple	none	21 (53)	4 (10)	11 (28)	1	2	6
3-5	Upland	Red maple	none	17 (43)	4 (10)	11 (28)	2	2	6
5-1	Upland	White oak	none	10 (25)	3 (8)	8 (20)	1	7	21
5-4	Upland	Red pine	none	14 (36)	3 (8)	9 (23)	0	1	11
7-1	Upland	White oak	Red oak	30 (76)	4 (10)	14 (36)	4	1	4
7-2	Upland	Red oak	Black oak	26 (66)	4 (10)	13 (33)	2	1	4
7-3	Upland	Red maple	none	17 (43)	3 (8)	10 (25)	4	4	13
7-4	Upland	White oak	Black cherry	30 (76)	3 (8)	13 (33)	3	2	5
7-7	Upland	Red maple	none	20 (51)	4 (10)	10 (25)	2	3	6
7-8	Upland	Red maple	White oak	26 (66)	4 (10)	14 (36)	5	3	5
8-1	Upland	Shagbark hickory	none	16 (41)	3 (8)	10 (25)	21	1	3
8-2	Upland	Red maple	White oak	20 (51)	4 (10)	10 (25)	4	3	8
8-3	Upland	Sweet birch	Red maple	15 (38)	3 (8)	9 (23)	1	4	4
8a	Wetland	Black locust	Black walnut	11 (28)	3 (8)	7 (18)	1	1	0
8b	Wetland	Red maple	none	28 (71)	6 (15)	12 (30)	11	13	1
9-1	Upland	Red maple	none	13 (33)	3 (8)	6 (15)	2	0	0
9-2	Upland	White oak	none	24 (61)	3 (8)	11 (28)	7	1	5
9-3	Upland	Red oak	Red maple	16 (41)	4 (10)	10 (25)	4	1	7
9-4	Upland	Red pine	none	21 (53)	5 (13)	11 (28)	5	2	8
9-5	Upland	Mockernut hickory	Red oak	32 (81)	4 (10)	11 (28)	11	3	4
9-6	Upland	Mockernut hickory	none	20 (51)	3 (8)	11 (28)	1	6	3
9-7	Upland	White oak	none	21 (53)	3 (8)	11 (28)	1	2	2

Table A-1. Characteristics of Forest Areas at the Bell Bend NPP Project Site.

Forest Area Survey Plot Number	Setting	Tree Species		Diameter at Breast Height (DBH)			Number of PRTs[1]	Number of Snags[2]	Number of Stubs[3]
		Dominant	Subdominant	Maximum Inches (cm)	Minimum Inches (cm)	Average Inches (cm)			
9-8	Upland	Red maple	none	26 (66)	4 (10)	12 (30)	4	2	8
9-9	Upland	Sweet birch	Red maple, Black Cherry	17 (43)	5 (13)	10 (25)	7	1	5
9-10	Upland	White oak	none	22 (56)	4 (10)	10 (25)	22	1	4
9-29	Wetland	Red maple	Pin oak	60 (152)	8 (20)	23 (58)	14	1	1
9-30	Wetland	Tulip poplar	none	35 (89)	3 (8)	15 (38)	2	0	3
9b	Wetland	Red maple	none	25 (64)	3 (8)	9 (23)	0	1	0
9d	Wetland	Red maple	none	12 (30)	3 (8)	8 (20)	0	0	0
10-1	Upland	Red oak	none	23 (58)	4 (10)	11 (28)	4	1	2
10-2	Upland	Red maple	none	30 (76)	5 (13)	13 (33)	4	1	5
10a	Wetland	Red maple	Black cherry	33 (84)	4 (10)	9 (23)	1	0	2
10b	Wetland	Pin oak	Red maple	29 (74)	6 (15)	15 (38)	1	1	0
11-1	Upland	White pine	none	23 (58)	5 (13)	14 (36)	4	1	3
11	Wetland	Pin oak	none	11 (28)	3 (8)	6 (15)	0	0	0
12-1	Upland	Black oak	Pin oak	14 (36)	4 (10)	9 (23)	4	1	7
12-2	Upland	Sweet birch	Black oak	28 (71)	4 (10)	11 (28)	7	1	12
12	Wetland	Red maple	Pin oak	28 (71)	3 (8)	13 (33)	6	0	1
13-1	Upland	Sweet birch	none	22 (56)	5 (13)	12 (30)	2	0	2
14-1	Upland	Red maple	none	12 (30)	4 (10)	8 (20)	0	1	0
14-2	Upland	Red maple	none	14 (36)	3 (8)	9 (23)	0	1	0
14-3	Upland	Red maple	none	11 (28)	4 (10)	8 (20)	0	0	0
14-4	Upland	Red maple	none	14 (36)	4 (10)	9 (23)	12	2	4
14-5	Upland	Red maple	none	18 (46)	4 (10)	10 (25)	5	1	4
15-1	Upland	Quaking aspen	Red maple	15 (38)	5 (13)	10 (25)	5	2	7
15-2	Upland	Sassafras	Red maple	14 (36)	4 (10)	10 (25)	0	3	6
15-3	Upland	Red maple	none	10 (25)	3 (8)	7 (18)	4	2	6

Table A-1. Characteristics of Forest Areas at the Bell Bend NPP Project Site.

Forest Area Survey Plot Number	Setting	Tree Species		Diameter at Breast Height (DBH)			Number of PRTs[1]	Number of Snags[2]	Number of Stubs[3]
		Dominant	Subdominant	Maximum Inches (cm)	Minimum Inches (cm)	Average Inches (cm)			
15-4	Upland	Red maple	none	21 (53)	4 (10)	10 (25)	3	3	9
15-12	Upland	Black oak	none	18 (46)	7 (18)	12 (30)	0	1	0
15-14	Upland	Black oak	Scots pine	17 (43)	5 (13)	11 (28)	0	2	3
16-1	Upland	Red oak	none	15 (38)	4 (10)	9 (23)	4	4	3
16-3	Upland	Black oak	Mockernut hickory	26 (66)	5 (13)	12 (30)	4	1	4
16-4	Upland	Black oak	Scots pine	17 (43)	6 (15)	11 (28)	0	0	0
16-5	Upland	Black oak, Black cherry	Red maple	18 (46)	6 (15)	11 (28)	1	1	5
17-1	Upland	Red maple	none	24 (61)	3 (8)	11 (28)	4	8	4
17-2	Upland	Red maple	none	20 (51)	4 (10)	10 (25)	3	0	9
17-3	Upland	Red maple	none	23 (58)	4 (10)	10 (25)	2	1	11
17-4	Upland	Red maple	none	22 (56)	4 (10)	12 (30)	0	0	9
17-5	Upland	Red maple	none	16 (41)	4 (10)	10 (25)	1	3	4
18-1	Upland	White pine	none	12 (30)	7 (18)	10 (25)	1	5	0
18-3	Upland	Silver maple	none	17 (43)	4 (10)	11 (28)	4	2	0
25-2	Upland	White oak	none	40 (102)	4 (10)	12 (30)	1	0	1
25-3	Upland	Black cherry	none	16 (41)	3 (8)	10 (25)	4	2	5
26-1	Upland	White oak	Red maple	18 (46)	5 (13)	12 (30)	2	1	2
29-1	Upland	Red oak	none	42 (107)	5 (13)	15 (38)	1	1	8
29	Wetland	Silver maple	River birch	17 (43)	3 (8)	10 (25)	0	1	7
						Cumulative Survey Plot Totals	**255**	**139**	**326**
						Cumulative Wetland Survey Plot Totals	**36**	**18**	**15**
						Cumulative Upland Survey Plots Totals	**219**	**121**	**311**

Max DBH[1] Inches (cm)	Min DBH[1] Inches (cm)	PRTs[2]	Snags	Stubs

Table A-1. Characteristics of Forest Areas at the Bell Bend NPP Project Site.

Forest Area Survey Plot Number	Setting	Tree Species: Dominant	Tree Species: Subdominant	Diameter at Breast Height (DBH): Maximum Inches (cm)	Diameter at Breast Height (DBH): Minimum Inches (cm)	Diameter at Breast Height (DBH): Average Inches (cm)	Number of PRTs[1]	Number of Snags[2]	Number of Stubs[3]
Cumulative Survey Plot Averages				**21 (53)**	**4 (10)**	**4**	**2**	**5**	
Cumulative Wetland Survey Plot Averages				**26 (66)**	**4 (10)**	**3**	**2**	**1**	
Cumulative Survey Upland Survey Plot Averages				**20 (51)**	**4 (10)**	**4**	**2**	**5**	

[1]DBH = Diameter at breast height

[2]PRTs = Potential Roost Trees

[3]Number of snags = snags that didn't qualify as roost trees

[4]Number of stubs = stubs that didn't qualify as roost trees

APPENDIX B

Potential Roost Trees by Forest Area

Table B-1. Indiana Bat (*Myotis sodalis*) Potential Roost Trees within the Interior Forest Areas at the Bell Bend NPP Site.

Forest Area - Survey Plot Number	Setting	Tree Species	DBH[1] Range		Condition			Roost Type			Roost Potential		
			Inches	Centimeters	Live	PD[2]	Dead	Bark	Crevice	Cavity	Low	Medium	High
1-1	Upland	Red oak, White oak, Black oak, Shagbark hickory, Unknown	7 to 16	18 to 41	3	0	11	14	0	0	5	8	1
3-1	Upland	Black cherry, Red maple, White pine	10 to 14	25 to 36	1	1	2	4	0	0	0	4	0
3-2	Upland	Black cherry	13	33	0	1	0	1	0	0	0	1	0
3-3	Upland	Black cherry	21	53	1	0	0	1	0	0	0	0	1
3-5	Upland	Red maple	9 to 10	23 to 25	0	2	0	2	0	0	0	2	0
5-1	Upland	Shagbark hickory	8	20	1	0	0	1	0	0	1	0	0
5-4	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7-1	Upland	Red maple, White oak	11 to 30	28 to 76	4	0	0	3	1	0	0	1	3
7-2	Upland	Black walnut, Red oak	15 to 18	38 to 46	1	1	0	2	0	0	0	1	1
7-3	Upland	Red maple, Red pine	10 to 32	25 to 81	1	1	2	4	0	0	0	2	2
7-4	Upland	Black cherry, Black walnut, Unknown	15 to 26	38 to 66	0	2	1	3	0	2	0	1	2
7-7	Upland	Red maple, Sassafras	7 to 20	18 to 51	1	0	1	2	1	0	1	0	1
7-8	Upland	White oak, Sassafras, Unknown	7 to 26	18 to 66	2	0	3	5	0	0	1	1	3
8-1	Upland	Shagbark hickory, White ash, Black cherry, White oak	8 to 24	20 to 61	21	0	0	21	0	0	1	14	6
8-2	Upland	Scots pine, Red maple	7 to 15	18 to 38	0	1	3	4	0	0	2	2	0
8-3	Upland	Sweet birch	15	38	0	0	1	1	0	1	0	1	0
8a	Wetland	Black locust	6	15	0	0	1	0	1	0	1	0	0
8b	Wetland	Red maple, Sweet birch, White ash, Shagbark hickory, American basswood	6 to 25	15 to 64	3	1	7	12	3	0	3	3	5
9-1	Upland	Shagbark hickory	9	23	2	0	0	2	0	0	0	2	0

Table B-1. Indiana Bat (*Myotis sodalis*) Potential Roost Trees within the Interior Forest Areas at the Bell Bend NPP Site.

Forest Area - Survey Plot Number	Setting	Tree Species	DBH[1] Range		Condition			Roost Type			Roost Potential		
			Inches	Centimeters	Live	PD[2]	Dead	Bark	Crevice	Cavity	Low	Medium	High
9-2	Upland	Shagbark hickory, White oak, Red Maple, Unknown	10 to 24	25 to 61	5	0	2	7	1	0	0	3	4
9-3	Upland	Red maple, Black cherry, Unknown	7 to 15	18 to 38	0	2	2	4	0	0	3	1	0
9-4	Upland	Red maple, White ash, Black cherry, Red pine, Shagbark hickory	6 to 10	15 to 25	1	1	3	5	0	0	3	2	0
9-5	Upland	Shagbark hickory, White oak, Unknown	8 to 36	20 to 91	10	0	1	11	0	0	1	7	3
9-6	Upland	Black cherry	20	18	0	1	0	1	0	0	1	0	0
9-7	Upland	White oak	21	53	1	0	0	1	0	0	1	0	0
9-8	Upland	Red maple, Pin oak	7 to 24	18 to 61	1	1	2	4	0	0	2	0	2
9-9	Upland	Black cherry, Red maple, Shagbark hickory, Red pine, White oak	9 to 23	23 to 58	3	1	3	7	1	0	0	3	4
9-10	Upland	Red maple, White oak, Shagbark hickory, Unknown	6 to 22	15 to 56	14	1	7	22	0	0	4	12	6
9-29	Wetland	Red maple, Black cherry, Pin oak, River birch	5 to 60	13 to 152	11	1	2	13	3	1	2	4	8
9-30	Wetland	Red maple	9 to 11	23 to 28	0	0	2	2	0	0	0	2	0
9b	Wetland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9d	Wetland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10-1	Upland	Shagbark hickory, White oak	7 to 13	18 to 33	4	0	0	4	0	0	1	3	0
10-2	Upland	Red oak, Unknown	12 to 24	30 to 61	2	0	2	4	0	0	0	1	3
10a	Wetland	Red maple	33	84	0	1	0	1	1	0	0	0	1
10b	Wetland	Black gum	28	71	1	0	0	0	0	1	0	0	1
11-1	Upland	White pine, White oak, Unknown	14 to 36	36 to 91	2	0	2	4	1	0	0	1	3

Table B-1. Indiana Bat (*Myotis sodalis*) Potential Roost Trees within the Interior Forest Areas at the Bell Bend NPP Site.

Forest Area - Survey Plot Number	Setting	Tree Species	DBH[1] Range		Condition			Roost Type			Roost Potential		
			Inches	Centimeters	Live	PD[2]	Dead	Bark	Crevice	Cavity	Low	Medium	High
11	Wetland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12-1	Upland	White pine, Unknown	12 to 13	30 to 33	0	0	4	4	0	0	0	4	0
12-2	Upland	Shagbark hickory, White oak, Unknown	9 to 28	23 to 71	3	0	4	7	0	0	0	5	2
12	Wetland	Shagbark hickory	6 to 21	15 to 53	6	0	0	6	0	0	1	2	3
13-1	Upland	Sweet birch, Unknown	20 to 23	51 to 58	1	0	1	2	0	0	0	0	2
14-1	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-2	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-3	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14-4	Upland	Red maple, Unknown	6 to 13	15 to 33	2	0	10	12	0	0	7	5	0
14-5	Upland	Red maple	7	18	0	0	5	5	0	0	5	0	0
15-1	Upland	Red pine, Quaking aspen, Sassafras	6 to 11	15 to 28	0	0	5	5	0	0	3	2	0
15-2	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-3	Upland	Red maple, Quaking aspen	9 to 11	23 to 28	0	1	3	4	0	0	0	4	0
15-4	Upland	Red maple	7 to 13	18 to 33	0	3	0	3	0	0	1	2	0
15-12	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15-14	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-1	Upland	Red maple, Black oak	7 to 8	18 to 20	0	0	4	4	0	0	4	0	0
16-3	Upland	Pin oak, Black oak	7 to 26	18 to 66	2	0	2	4	0	0	1	0	3
16-4	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16-5	Upland	Pin oak	34	86	1	0	0	1	0	0	0	0	1
17-1	Upland	Red maple, Unknown	6 to 13	15 to 33	1	0	3	4	0	0	3	1	0
17-2	Upland	Red maple	6 to 7	15 to 18	0	0	3	3	0	0	3	0	0
17-3	Upland	Red maple, Bigtooth aspen	6 to 8	15 to 20	0	0	2	2	0	0	2	0	0
17-4	Upland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17-5	Upland	Unknown	12	30	0	0	1	1	0	0	0	1	0

Table B-1. Indiana Bat (*Myotis sodalis*) Potential Roost Trees within the Interior Forest Areas at the Bell Bend NPP Site.

Forest Area - Survey Plot Number	Setting	Tree Species	DBH[1] Range		Condition			Roost Type			Roost Potential		
			Inches	Centimeters	Live	PD[2]	Dead	Bark	Crevice	Cavity	Low	Medium	High
18-1	Upland	White pine	7	18	0	0	1	1	0	0	1	0	0
18-3	Upland	Silver maple	7 to 21	18 to 53	2	0	2	4	0	0	1	0	3
25-2	Upland	White oak	40	102	1	0	0	1	0	0	0	0	1
25-3	Upland	Black cherry, Unknown	7 to 13	18 to 33	2	0	2	4	0	0	1	3	0
26-1	Upland	Black locust, Unknown	40 to 46	102 to 117	1	0	1	2	0	0	0	0	2
29-1	Upland	Unknown	15	38	0	0	1	1	0	0	0	0	1
29	Wetland	No potential roost trees found	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Cumulative Survey Plot Totals			**118**	**23**	**114**	**252**	**13**	**5**	**66**	**111**	**78**
		Cumulative Wetland Survey Plot Totals			**21**	**3**	**12**	**34**	**8**	**2**	**7**	**11**	**18**
		Cumulative Upland Survey Plot Totals			**97**	**20**	**102**	**218**	**5**	**3**	**59**	**100**	**60**

[1]DBH = Diameter at breast height

[2]PD = Partially dead

APPENDIX C

Comprehensive List of Potential Roost Trees

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
1	1	Interior Upland	Red oak	7	18	Dead	yes	no	no	Low	-76.164194410	41.093752309	10/6/2010
2	1	Interior Upland	Red oak	7	18	Dead	yes	no	no	Low	-76.164161593	41.093808025	10/6/2010
3	1	Interior Upland	Red oak	9	23	Dead	yes	no	no	Medium	-76.164177113	41.094014816	10/6/2010
4	1	Interior Upland	Red oak	15	38	Dead	yes	no	no	Medium	-76.164148850	41.094036442	10/6/2010
5	1	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.164643137	41.093821423	10/6/2010
6	1	Interior Upland	White oak	12	30	Live	yes	no	no	Medium	-76.164529982	41.093864568	10/6/2010
7	1	Interior Upland	Black oak	11	28	Dead	yes	no	no	Medium	-76.164492893	41.093897978	10/6/2010
8	1	Interior Upland	Unknown	7	18	Dead	yes	no	no	Low	-76.164380903	41.093862641	10/6/2010
9	1	Interior Upland	Red oak	8	20	Dead	yes	no	no	Low	-76.164212008	41.093948912	10/6/2010
10	1	Interior Upland	Red oak	11	28	Dead	yes	no	no	Medium	-76.164245718	41.093897586	10/6/2010
11	1	Interior Upland	Unknown	10	25	Dead	yes	no	no	Medium	-76.164337407	41.093699451	10/6/2010
12	1	Interior Upland	Red oak	8	20	Dead	yes	no	no	Low	-76.164414857	41.093748860	10/6/2010
13	1	Interior Upland	White oak	16	41	Live	yes	no	no	High	-76.164507910	41.093745692	10/6/2010
14	1	Interior Upland	Black oak	10	25	Dead	yes	no	no	Medium	-76.164744226	41.093796118	10/6/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
15	1	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.166601572	41.093426001	10/18/2010
16	1	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.166219586	41.093310683	10/18/2010
17a	1	Edge	Unknown	8	20	Dead	yes	no	no	Low	-76.166239605	41.093354395	10/18/2010
17b	1	Edge	Unknown	8	20	Dead	yes	no	no	Low	-76.166239605	41.093354395	10/18/2010
18	1	Edge	Red maple	5	13	Dead	yes	no	no	Low	-76.162693206	41.093892166	10/18/2010
19	1	Edge	Red maple	7	18	Dead	yes	no	no	Low	-76.162746268	41.093973968	10/18/2010
20	1	Edge	Red maple	13	33	Live	yes	no	no	Medium	-76.162372397	41.094030193	10/18/2010
21	1	Edge	Red maple	8	20	Live	yes	no	no	Low	-76.162058387	41.094146488	10/18/2010
22	1	Edge	Red maple	10	25	Dead	yes	no	no	Medium	-76.162054612	41.094192573	10/18/2010
23	3	Interior Upland	Black cherry	14	36	Live	yes	no	no	Medium	-76.166559877	41.091029027	10/6/2010
24	3	Interior Upland	Red maple	13	33	Dead	yes	no	no	Medium	-76.166786841	41.090869215	10/6/2010
25	3	Interior Upland	White pine	15	38	Dead	yes	no	no	Medium	-76.166837178	41.090850929	10/6/2010
26	3	Interior Upland	Black cherry	10	25	Partially Dead	yes	no	no	Medium	-76.166819996	41.091171848	10/6/2010
27	3	Interior Upland	Black cherry	13	33	Partially Dead	yes	no	no	Medium	-76.166416121	41.090290121	10/6/2010
28	3	Interior Upland	Black cherry	21	53	Live	yes	no	no	High	-76.171158463	41.089976932	10/6/2010
29	3	Interior Upland	Red maple	10	25	Partially Dead	yes	no	no	Medium	-76.167504186	41.090390429	10/6/2010
30	3	Upland	Red maple	9	23	Dead	yes	no	no	Medium	-76.166971136	41.090420109	10/6/2010
31	3	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.171719841	41.088607582	10/18/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
32	3	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.171534580	41.088464176	10/18/2010
33	3	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.171406704	41.088522280	10/18/2010
34	3	Edge	Shagbark hickory	30	76	Live	yes	no	no	High	-76.171333965	41.088559158	10/18/2010
35	3	Edge	Black cherry	9	23	Partially Dead	yes	no	no	Medium	-76.171324939	41.088650000	10/18/2010
36	3	Edge	Red maple	11	28	Live	yes	no	no	Medium	-76.170884642	41.088644234	10/18/2010
37	3	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.170904431	41.088706664	10/18/2010
38	3	Edge	Red oak	10	25	Dead	yes	no	no	Medium	-76.170975122	41.088942575	10/18/2010
39	3	Edge	Black cherry	8	20	Dead	yes	no	no	Low	-76.170912611	41.089050386	10/18/2010
40	3	Edge	Black cherry	9	23	Live	yes	no	no	Medium	-76.170924901	41.089064843	10/18/2010
41	3	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.170942045	41.089183273	10/18/2010
42	3	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.170938746	41.089520189	10/18/2010
43	3	Edge	Red maple	8	20	Dead	yes	no	no	Low	-76.168376002	41.089488831	10/18/2010
44	3	Edge	Red maple	7	18	Dead	yes	no	no	Low	-76.167407790	41.091602002	10/18/2010
45	3	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.166305364	41.091631754	10/18/2010
46	3	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.166321240	41.091357078	10/18/2010
47	3	Edge	Unknown	11	28	Dead	yes	no	no	Medium	-76.166366924	41.091266491	10/18/2010
48	3	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.166316384	41.091213411	10/18/2010
49	3	Edge	Red maple	5	13	Dead	yes	no	no	Low	-76.166348574	41.091194639	10/18/2010
50	3	Edge	Red maple	7	18	Dead	yes	no	no	Low	-76.166373642	41.091142893	10/18/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
51	3	Edge	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.166242327	41.090956991	10/18/2010
52a	3	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.166861985	41.089035751	10/18/2010
52b	3	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.166861985	41.089035751	10/18/2010
52c	3	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.166861985	41.089035751	10/18/2010
53	3	Edge	Red maple	9	23	Dead	yes	no	no	Medium	-76.167657463	41.089167396	10/18/2010
54	5	Interior Upland	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.162508415	41.082682229	10/7/2010
55	5	Edge	Unknown	13	33	Dead	yes	no	no	Medium	-76.162132951	41.083101476	10/19/2010
56	5	Edge	Black cherry	6	15	Dead	yes	no	no	Low	-76.162534080	41.082914593	10/19/2010
57	5	Edge	Black cherry	6	15	Dead	yes	no	no	Low	-76.162610706	41.082806874	10/19/2010
58	5	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.162707749	41.082747583	10/19/2010
59	5	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.163678957	41.081881723	10/19/2010
60	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.163779211	41.081876271	10/19/2010
61	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.161118942	41.083177012	10/19/2010
62	5	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.160992503	41.083309609	10/19/2010
63	5	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.160847375	41.083255075	10/19/2010
64	5	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.160825557	41.083238960	10/19/2010
65	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.160849600	41.083116518	10/19/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
66	5	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.160774072	41.083046680	10/19/2010
67	5	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.160854503	41.082925434	10/19/2010
68	5	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.160762108	41.082823863	10/19/2010
69	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.160779594	41.082697023	10/19/2010
70	5	Edge	Red maple	5	13	Dead	yes	no	no	Low	-76.160778990	41.082619953	10/19/2010
71	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.160749648	41.082611707	10/19/2010
72	5	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.160765384	41.082551534	10/19/2010
73	5	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.160845305	41.082546908	10/19/2010
74	5	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.160809640	41.082378393	10/19/2010
75	5	Edge	Shagbark hickory	12	30	Dead	yes	no	no	Medium	-76.160879065	41.082224918	10/19/2010
76	7	Interior Upland	Red maple	11	28	Live	no	yes	no	Medium	-76.156942285	41.095006775	10/7/2010
77	7	Interior Upland	White oak	22	56	Live	yes	no	no	High	-76.156872818	41.095032511	10/7/2010
78	7	Interior Upland	White oak	30	76	Live	yes	no	no	High	-76.156869697	41.095035700	10/7/2010
79	7	Interior Upland	White oak	30	76	Live	yes	no	no	High	-76.156841437	41.095115375	10/7/2010
80	7	Interior Upland	Black walnut	18	46	Partially Dead	yes	no	no	High	-76.155551478	41.095690990	10/7/2010
81	7	Interior Upland	Red oak	15	38	Live	yes	no	no	Medium	-76.155412182	41.095358790	10/7/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
82	7	Interior Upland	Red maple	13	33	Dead	yes	no	no	Medium	-76.155305849	41.097305263	10/7/2010
83	7	Interior Upland	Red maple	10	25	Partially Dead	yes	no	no	Medium	-76.155319182	41.097383251	10/7/2010
84	7	Interior Upland	Red maple	32	81	Live	yes	no	no	High	-76.155193912	41.097476801	10/7/2010
85	7	Interior Upland	Red pine	18	46	Dead	yes	no	no	High	-76.154955602	41.097218638	10/7/2010
86	7	Interior Upland	Unknown	15	38	Dead	yes	no	yes	Medium	-76.161253302	41.094103723	10/7/2010
87	7	Interior Upland	Black cherry	26	66	Partially Dead	yes	no	no	High	-76.161218820	41.094155846	10/7/2010
88	7	Interior Upland	Black walnut	18	46	Dead	yes	no	yes	High	-76.161398391	41.094097005	10/7/2010
89	7	Interior Upland	Red maple	20	51	Live	yes	yes	no	High	-76.154946773	41.098579788	10/8/2010
90	7	Interior Upland	Sassafras	7	18	Dead	yes	no	no	Low	-76.154892503	41.098425676	10/8/2010
91	7	Interior Upland	Unknown	7	18	Dead	yes	no	no	Low	-76.156263487	41.101291507	10/11/2010
92	7	Interior Upland	White oak	26	66	Live	yes	no	no	High	-76.156030315	41.101311224	10/11/2010
93	7	Interior Upland	Unknown	20	51	Dead	yes	no	no	High	-76.155919604	41.101244831	10/11/2010
94	7	Interior Upland	White oak	21	53	Live	yes	no	no	High	-76.155885930	41.101244480	10/11/2010
95	7	Upland	Sassafras	12	30	Dead	yes	no	no	Medium	-76.155760368	41.101056148	10/11/2010
96	7	Edge	White pine	14	36	Dead	yes	no	no	Medium	-76.156357950	41.094784324	10/20/2010
97	7	Edge	Unknown	12	30	Dead	yes	no	no	Medium	-76.156323352	41.094676732	10/20/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
98	7	Edge	White pine	11	28	Dead	yes	no	no	Medium	-76.155993132	41.094877919	10/20/2010
99	7	Edge	Unknown	8	20	Dead	yes	no	no	Low	-76.153644529	41.095531438	10/20/2010
100	7	Edge	Red maple	11	28	Dead	yes	no	no	Medium	-76.153749081	41.096044657	10/20/2010
101	7	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.153768202	41.096087090	10/20/2010
102	7	Edge	Red maple	13	33	Dead	yes	no	no	Medium	-76.153566049	41.096243438	10/20/2010
103	7	Edge	Unknown	16	41	Dead	yes	no	no	High	-76.153727298	41.096435292	10/20/2010
104	7	Edge	White oak	25	64	Live	yes	no	no	High	-76.153887192	41.097073381	10/20/2010
105	7	Edge	White oak	10	25	Live	yes	no	no	Medium	-76.154170486	41.097589964	10/20/2010
106a	7	Edge	White oak	21	53	Live	yes	no	no	High	-76.154335087	41.097635624	10/20/2010
106b	7	Edge	White oak	21	53	Live	yes	no	no	High	-76.154335087	41.097635624	10/20/2010
107	7	Edge	White oak	19	48	Live	yes	no	no	High	-76.154318395	41.097699577	10/20/2010
108	7	Edge	White oak	53	135	Live	yes	no	no	High	-76.154430028	41.097793925	10/20/2010
109	7	Edge	Red oak	42	107	Live	yes	no	no	High	-76.154430897	41.097939691	10/20/2010
110	7	Edge	Unknown	26	66	Dead	yes	no	no	High	-76.154996062	41.099189250	10/20/2010
111	7	Edge	Red maple	14	36	Dead	yes	no	no	Medium	-76.154992427	41.099211063	10/20/2010
112	8	Interior Upland	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.156212839	41.092365684	10/11/2010
113	8	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.156126022	41.092344350	10/11/2010
114	8	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.156122358	41.092325657	10/11/2010
115	8	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.156050913	41.092261216	10/11/2010
116	8	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.156192453	41.092218616	10/11/2010
117	8	Interior Upland	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.156209973	41.092191146	10/11/2010
118	8	Interior Upland	Shagbark hickory	16	41	Live	yes	no	no	High	-76.156190983	41.092187351	10/11/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
119	8	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.156115727	41.092153625	10/11/2010
120	8	Interior Upland	Black cherry	12	30	Live	yes	no	no	Medium	-76.156118619	41.092237725	10/11/2010
121	8	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.156387571	41.092168602	10/11/2010
122	8	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.156451406	41.092276997	10/11/2010
123a	8	Interior Upland	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.156414079	41.092228126	10/11/2010
123b	8	Interior Upland	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.156414079	41.092228126	10/11/2010
124	8	Interior Upland	Shagbark hickory	18	46	Live	yes	no	no	High	-76.156473504	41.092232642	10/11/2010
125	8	Interior Upland	Shagbark hickory	19	48	Live	yes	no	no	High	-76.156518635	41.092307378	10/11/2010
126	8	Interior Upland	White oak	20	51	Live	yes	no	no	High	-76.156490486	41.092406233	10/11/2010
127	8	Interior Upland	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.156511261	41.092311191	10/11/2010
128	8	Interior Upland	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.156519308	41.092459115	10/11/2010
129	8	Interior Upland	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.156520734	41.092510633	10/11/2010
130	8	Interior Upland	White ash	21	53	Live	yes	no	no	High	-76.156207302	41.092562880	10/11/2010
131	8	Interior Upland	White oak	24	61	Live	yes	no	no	High	-76.156345913	41.092306704	10/11/2010
132	8	Interior Upland	Scots pine	15	38	Partially Dead	yes	no	no	Medium	-76.159358659	41.091639737	10/11/2010
133	8	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.158983185	41.091390030	10/11/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
134	8	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.159017774	41.091399279	10/11/2010
135	8	Interior Upland	Scotch pine	12	30	Dead	yes	no	no	Medium	-76.158971824	41.091528283	10/11/2010
136	8	Interior Upland	Sweet birch	15	38	Dead	yes	no	yes	Medium	-76.157903337	41.091832361	10/11/2010
137	8	Interior Wetland	Black locust	6	15	Dead	no	yes	no	Low	-76.159620377	41.094200536	9/29/2010
138	8	Interior Wetland	Shagbark hickory	18	46	Live	yes	no	no	High	-76.157088137	41.092880696	9/29/2010
139	8	Interior Wetland	American basswood	25	64	Partially Dead	no	yes	no	High	-76.156962020	41.092878929	9/29/2010
140	8	Interior Wetland	White ash	17	43	Dead	yes	no	yes	High	-76.156345174	41.092752969	9/29/2010
141	8	Interior Wetland	White ash	6	15	Dead	yes	no	no	Low	-76.155752724	41.092611747	9/29/2010
142	8	Interior Wetland	White ash	7	18	Dead	yes	no	no	Low	-76.155755394	41.092724023	9/29/2010
143	8	Interior Wetland	Red maple	11	28	Dead	yes	no	no	Medium	-76.157091340	41.092806785	9/29/2010
144	8	Interior Wetland	Red maple	21	53	Live	yes	no	no	High	-76.156915805	41.092734610	9/29/2010
145	8	Interior Wetland	American basswood	8	20	Dead	yes	no	no	Low	-76.156071939	41.092772757	10/6/2010
146	8	Interior Wetland	Red maple	12	30	Dead	no	yes	no	Medium	-76.156942996	41.092714820	9/29/2010
147	8	Interior Wetland	Red maple	11	28	Dead	yes	no	no	Medium	-76.157233952	41.092788704	9/29/2010
148	8	Interior Wetland	Sweet birch	22	56	Live	yes	no	no	High	-76.157385144	41.092821818	9/29/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
149	8	Edge	Shagbark hickory	15	38	Live	yes	no	no	Medium	-76.156111729	41.092097276	10/11/2010
150	8	Edge	Unknown	29	74	Dead	yes	no	no	High	-76.156150932	41.090421543	10/19/2010
151	8	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.156171368	41.090412551	10/19/2010
152	8	Edge	Shagbark hickory	20	51	Live	yes	no	no	High	-76.156686320	41.091465059	10/19/2010
153	8	Edge	White oak	28	71	Live	yes	no	no	High	-76.157648188	41.090938140	10/19/2010
154	8	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.157670691	41.090956235	10/19/2010
155	8	Edge	White oak	20	51	Live	yes	no	no	High	-76.157841753	41.091048801	10/19/2010
156	8	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.157809652	41.091060135	10/19/2010
157	8	Edge	Red maple	8	20	Dead	yes	no	no	Low	-76.158756472	41.091293738	10/19/2010
158	8	Edge	White pine	11	28	Dead	yes	no	no	Medium	-76.159691912	41.091579456	10/19/2010
159	8	Edge	Red maple	13	33	Live	yes	no	no	Medium	-76.159934744	41.091650384	10/19/2010
160	8	Edge	Unknown	6	15	Dead	yes	no	no	Low	-76.160517309	41.091773053	10/19/2010
161	8	Edge	Unknown	13	33	Dead	yes	no	no	Medium	-76.160805498	41.091901422	10/19/2010
162	8	Edge	Unknown	14	36	Dead	yes	no	no	Medium	-76.160678077	41.091958110	10/19/2010
163	8	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.160491119	41.092004880	10/19/2010
164	8	Edge	White oak	27	69	Live	yes	no	no	High	-76.160188860	41.092043404	10/19/2010
165a	9	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.159759849	41.089223423	10/12/2010
165b	9	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.159759849	41.089223423	10/12/2010
166	9	Interior Upland	Unknown	10	25	Dead	yes	no	no	Medium	-76.159524086	41.090677240	10/12/2010
167	9	Interior Upland	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.159280741	41.090797268	10/12/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
168	9	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.159520670	41.090337916	10/12/2010
169	9	Interior Upland	Shagbark hickory	17	43	Live	yes	no	no	High	-76.159527227	41.090350208	10/12/2010
170	9	Interior Upland	Shagbark hickory	16	41	Live	yes	no	no	High	-76.159532984	41.090375902	10/12/2010
171	9	Interior Upland	Red maple	16	41	Dead	yes	no	no	High	-76.159463866	41.090431555	10/12/2010
172	9	Interior Upland	White oak	24	61	Live	yes	yes	no	High	-76.159453555	41.090556989	10/12/2010
173	9	Interior Upland	Unknown	8	20	Dead	yes	no	no	Low	-76.161195812	41.085585809	10/12/2010
174	9	Interior Upland	Red maple	7	18	Partially Dead	yes	no	no	Low	-76.160881691	41.085650707	10/12/2010
175	9	Interior Upland	Unknown	7	18	Dead	yes	no	no	Low	-76.160895870	41.085700596	10/12/2010
176	9	Interior Upland	Black cherry	15	38	Partially Dead	yes	no	no	Medium	-76.161013633	41.085710319	10/12/2010
177	9	Interior Upland	Red pine	7	18	Dead	yes	no	no	Low	-76.160381696	41.090934727	10/12/2010
178	9	Interior Upland	Red maple	6	15	Dead	yes	no	no	Low	-76.160404302	41.090949908	10/12/2010
179	9	Interior Upland	White ash	10	25	Dead	yes	no	no	Medium	-76.160052561	41.090600125	10/12/2010
180	9	Interior Upland	Black cherry	9	23	Partially Dead	yes	no	no	Medium	-76.160358926	41.090545551	10/12/2010
181	9	Interior Upland	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.160261124	41.090721005	10/12/2010
182	9	Interior Upland	Unknown	15	38	Dead	yes	no	no	Medium	-76.157796286	41.088413752	10/12/2010
183	9	Interior Upland	Shagbark hickory	19	48	Live	yes	no	no	High	-76.158107344	41.088412969	10/12/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
184a	9	Interior Upland	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.158107855	41.088486184	10/12/2010
184b	9	Interior Upland	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.158107855	41.088486184	10/12/2010
185	9	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.157856121	41.088615117	10/12/2010
186	9	Interior Upland	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.157859581	41.088590394	10/12/2010
187	9	Interior Upland	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.157786270	41.088606577	10/12/2010
188	9	Interior Upland	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.157764696	41.088680722	10/12/2010
189	9	Interior Upland	White oak	16	41	Live	yes	no	no	High	-76.157709275	41.088560127	10/12/2010
190	9	Interior Upland	White oak	14	36	Live	yes	no	no	Medium	-76.157745388	41.088544284	10/12/2010
191	9	Interior Upland	White oak	36	91	Live	yes	no	no	High	-76.157691483	41.088600532	10/12/2010
192	9	Interior Upland	Black cherry	20	51	Partially Dead	yes	no	no	High	-76.161233256	41.084961022	10/11/2010
193	9	Interior Upland	White oak	21	53	Live	yes	no	no	High	-76.162741275	41.090491493	10/12/2010
194	9	Interior Upland	Red maple	24	61	Live	yes	no	no	High	-76.156815113	41.085664949	10/12/2010
195	9	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.156883708	41.085653524	10/12/2010
196	9	Interior Upland	Pin oak	8	20	Dead	yes	no	no	Low	-76.156744275	41.085654768	10/12/2010
197	9	Interior Upland	Pin oak	18	46	Partially Dead	yes	no	no	High	-76.156832990	41.085516733	10/12/2010
198	9	Interior Upland	Black cherry	18	46	Dead	yes	no	no	High	-76.162947537	41.088630064	10/12/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
199	9	Interior Upland	Red pine	17	43	Dead	yes	yes	no	High	-76.162805577	41.088603142	10/12/2010
200	9	Interior Upland	White oak	23	58	Live	yes	no	no	High	-76.162943124	41.088678388	10/12/2010
201	9	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.162921814	41.088833144	10/12/2010
202	9	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.162947216	41.088874389	10/12/2010
203	9	Interior Upland	Black cherry	10	25	Dead	yes	no	no	Medium	-76.162749478	41.088996925	10/12/2010
204	9	Interior Upland	Red maple	18	46	Partially Dead	yes	no	no	High	-76.162413019	41.088849133	10/12/2010
205	9	Interior Upland	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.157605481	41.090082467	10/12/2010
206	9	Interior Upland	Unknown	12	30	Dead	yes	no	no	Medium	-76.157640096	41.090040552	10/12/2010
207	9	Interior Upland	White oak	21	53	Live	yes	no	no	High	-76.157748901	41.089985983	10/12/2010
208	9	Interior Upland	Red maple	11	28	Dead	yes	no	no	Medium	-76.157747252	41.089976839	10/12/2010
209	9	Interior Upland	Red maple	8	20	Partially Dead	yes	no	no	Low	-76.157794966	41.089899395	10/12/2010
210	9	Interior Upland	Red maple	9	23	Dead	yes	no	no	Medium	-76.157862323	41.089924401	10/12/2010
211	9	Interior Upland	White oak	20	51	Live	yes	no	no	High	-76.157873132	41.090002500	10/12/2010
212	9	Interior Upland	Red maple	12	30	Dead	yes	no	no	Medium	-76.157853076	41.090073707	10/12/2010
213	9	Interior Upland	Unknown	9	23	Dead	yes	no	no	Medium	-76.157785999	41.090131673	10/12/2010
214	9	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.157665414	41.090175072	10/12/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
215	9	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.157630329	41.090251251	10/12/2010
216	9	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.157651398	41.090259166	10/12/2010
217	9	Interior Upland	Shagbark hickory	6	15	Live	yes	no	no	High	-76.157572129	41.090236342	10/12/2010
218	9	Interior Upland	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.157590004	41.090220317	10/12/2010
219	9	Interior Upland	White oak	21	53	Live	yes	no	no	High	-76.157483793	41.090168101	10/12/2010
220	9	Interior Upland	Unknown	8	20	Dead	yes	no	no	Low	-76.157567659	41.090122101	10/12/2010
221	9	Interior Upland	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.157530903	41.090088657	10/12/2010
222	9	Interior Upland	White oak	20	51	Live	yes	no	no	High	-76.157419863	41.090051377	10/12/2010
223	9	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.157360266	41.090038044	10/12/2010
224	9	Interior Upland	White oak	14	36	Live	yes	no	no	Medium	-76.157391562	41.090113014	10/12/2010
225	9	Interior Upland	White oak	22	56	Live	yes	no	no	High	-76.157260331	41.090075194	10/12/2010
226	9	Interior Upland	Unknown	11	28	Dead	yes	no	no	Medium	-76.157378253	41.089795665	10/12/2010
227	9	Interior Wetland	Red maple	17	43	Live	yes	no	yes	High	-76.157070962	41.086518163	10/7/2010
228	9	Interior Wetland	Black cherry	9	23	Live	yes	no	no	Medium	-76.156968040	41.086671464	10/7/2010
229	9	Interior Wetland	Black cherry	5	13	Dead	yes	no	no	Low	-76.156993142	41.086588947	10/7/2010
230	9	Interior Wetland	River birch	8	20	Live	yes	no	no	Low	-76.156988952	41.086739694	10/7/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
231	9	Interior Wetland	River birch	12	30	Live	yes	no	no	Medium	-76.156908785	41.086708593	10/7/2010
232	9	Interior Wetland	River birch	12	30	Live	yes	no	no	Medium	-76.156786939	41.086749143	10/8/2010
233	9	Interior Wetland	River birch	18	46	Live	yes	no	no	High	-76.156805226	41.086749635	10/8/2010
234	9	Interior Wetland	Red maple	56	142	Live	yes	no	no	High	-76.156906217	41.086510591	10/8/2010
235	9	Interior Wetland	Red maple	35	89	Live	yes	no	no	High	-76.156878064	41.086555165	10/8/2010
236	9	Interior Wetland	Pin oak	60	152	Live	yes	no	no	High	-76.156765679	41.086377815	10/8/2010
237	9	Interior Wetland	Red maple	23	58	Partially Dead	yes	yes	no	High	-76.156923650	41.086303825	10/8/2010
238	9	Interior Wetland	Red maple	16	41	Live	no	yes	no	High	-76.156924767	41.086283546	10/8/2010
239	9	Interior Wetland	Red maple	40	102	Live	yes	yes	no	High	-76.156662635	41.086110366	10/8/2010
240	9	Interior Wetland	Red maple	11	28	Dead	yes	no	no	Medium	-76.156891642	41.086153839	10/8/2010
241	9	Interior Wetland	Red maple	9	23	Dead	yes	no	no	Medium	-76.161757423	41.089110265	10/15/2010
242	9	Wetland	Red maple	11	28	Dead	yes	no	no	Medium	-76.161683493	41.089054155	10/15/2010
243	9	Edge	Black cherry	18	46	Partially Dead	yes	no	no	High	-76.158098455	41.087249976	10/19/2010
244	9	Edge	Black cherry	12	30	Dead	yes	no	no	Medium	-76.158147575	41.088028548	10/19/2010
245	9	Edge	Red oak	16	41	Partially Dead	no	yes	no	High	-76.158168628	41.088257278	10/19/2010
246	9	Edge	White oak	17	43	Live	yes	no	no	High	-76.158270949	41.088337660	10/19/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1]		Condition	Roost Type			Roost Potential	Longitude	Latitude	Date Observed
				in	cm		Bark	Crevice	Cavity				
247	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.158264909	41.088411334	10/19/2010
248	9	Edge	Shagbark hickory	17	43	Live	yes	no	no	High	-76.158099501	41.088918386	10/19/2010
249	9	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.158154678	41.088893542	10/19/2010
250	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.158120376	41.089063390	10/19/2010
251	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.158162118	41.089094163	10/19/2010
252a	9	Edge	Black cherry	16	41	Live	yes	no	no	High	-76.158212575	41.089121062	10/19/2010
252b	9	Edge	Black cherry	16	41	Live	yes	no	no	High	-76.158212575	41.089121062	10/19/2010
253	9	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.158120909	41.089293973	10/19/2010
254	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.158076563	41.089419319	10/19/2010
255	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.158113625	41.089599862	10/19/2010
256	9	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.158058810	41.089679770	10/19/2010
257a	9	Edge	White oak	14	36	Live	yes	no	no	Medium	-76.157985249	41.090009317	10/19/2010
257b	9	Edge	White oak	14	36	Live	yes	no	no	Medium	-76.157985249	41.090009317	10/19/2010
258	9	Edge	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.158048328	41.090018597	10/19/2010
259	9	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.157971353	41.090254556	10/19/2010
260	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.158132216	41.090134442	10/19/2010
261	9	Edge	White oak	17	43	Live	yes	no	no	High	-76.157877957	41.090297330	10/19/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
262	9	Edge	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.157856052	41.090310861	10/19/2010
263	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.159955092	41.090997576	10/19/2010
264	9	Edge	Red maple	10	25	Partially Dead	yes	no	no	Medium	-76.160616974	41.091151563	10/19/2010
265	9	Edge	White oak	22	56	Live	yes	no	no	High	-76.161373042	41.089758112	10/19/2010
266	9	Edge	White oak	28	71	Live	yes	no	no	High	-76.161286020	41.089700188	10/19/2010
267a	9	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.160268994	41.088851152	10/19/2010
267b	9	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.160268994	41.088851152	10/19/2010
267c	9	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.160268994	41.088851152	10/19/2010
268a	9	Edge	White oak	15	38	Live	yes	no	no	Medium	-76.160256876	41.088820630	10/19/2010
268b	9	Edge	White oak	15	38	Live	yes	no	no	Medium	-76.160256876	41.088820630	10/19/2010
269	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.159754787	41.088801775	10/19/2010
270	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.159728887	41.088795260	10/19/2010
271	9	Edge	White oak	45	114	Live	yes	no	no	High	-76.159566473	41.088716599	10/19/2010
272	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.159589673	41.088787343	10/19/2010
273	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.159263674	41.088757348	10/19/2010
274	9	Edge	Unknown	6	15	Dead	yes	no	no	Low	-76.158947418	41.088445435	10/19/2010
275	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.158781723	41.088460146	10/19/2010
276	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.158667464	41.088538387	10/19/2010
277	9	Edge	Shagbark hickory	15	38	Live	yes	no	no	Medium	-76.162501544	41.088134311	10/20/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
278	9	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.162841032	41.088099113	10/20/2010
279	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.162875900	41.088156869	10/20/2010
280	9	Edge	White oak	24	61	Live	yes	no	no	High	-76.162885416	41.088201737	10/20/2010
281	9	Edge	Shagbark hickory	22	56	Live	yes	no	no	High	-76.162950167	41.089021665	10/20/2010
282	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.162949039	41.089063800	10/20/2010
283	9	Edge	Shagbark hickory	15	38	Live	yes	no	no	Medium	-76.162953102	41.089205172	10/20/2010
284	9	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.162953334	41.089232987	10/20/2010
285	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.162956000	41.089258452	10/20/2010
286	9	Edge	Shagbark hickory	15	38	Live	yes	no	no	Medium	-76.163049169	41.089301270	10/20/2010
287	9	Edge	Shagbark hickory	16	41	Live	yes	no	no	High	-76.163003243	41.089328324	10/20/2010
288	9	Edge	Unknown	15	38	Live	yes	no	no	Medium	-76.162968922	41.089434672	10/20/2010
289	9	Edge	White oak	21	53	Live	yes	no	no	High	-76.163089748	41.091196817	10/20/2010
290	9	Edge	White oak	26	66	Live	yes	no	no	High	-76.163107760	41.091428776	10/20/2010
291	9	Edge	White oak	30	76	Live	yes	no	no	High	-76.163090132	41.091470838	10/20/2010
292a	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.163101738	41.091487163	10/20/2010
292b	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.163101738	41.091487163	10/20/2010
293	9	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.163078695	41.091563903	10/20/2010
294	9	Edge	Unknown	11	28	Dead	yes	no	no	Medium	-76.162864947	41.091811193	10/20/2010
295	9	Edge	White pine	11	28	Dead	yes	no	no	Medium	-76.162519076	41.091575226	10/20/2010
296	9	Edge	Red maple	14	36	Dead	yes	no	no	Medium	-76.162791590	41.085789594	10/19/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1]		Condition	Roost Type			Roost Potential	Longitude	Latitude	Date Observed
				in	cm		Bark	Crevice	Cavity				
297	9	Edge	Shagbark hickory	16	41	Live	yes	no	no	High	-76.162736184	41.085752048	10/19/2010
299	9	Edge	Shagbark hickory	21	53	Live	yes	no	no	High	-76.162729890	41.085743468	10/19/2010
300	9	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.162728453	41.085814788	10/19/2010
301	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.161987736	41.085880895	10/19/2010
302	9	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.161728976	41.085818772	10/19/2010
303	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.161688754	41.085850988	10/19/2010
304	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.161544882	41.085884574	10/19/2010
305	9	Edge	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.161562107	41.085839296	10/19/2010
306	9	Edge	hickory	13	33	Live	yes	no	no	Medium	-76.161418954	41.085859263	10/19/2010
307	9	Edge	Unknown	21	53	Dead	yes	no	no	High	-76.161423414	41.085926452	10/19/2010
308a	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.161323091	41.085861610	10/19/2010
308b	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.161323091	41.085861610	10/19/2010
309	9	Edge	Shagbark hickory	16	41	Live	yes	no	no	High	-76.161329589	41.085847727	10/19/2010
310	9	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.161226282	41.085861355	10/19/2010
311	9	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.161206302	41.085872165	10/19/2010
312	9	Edge	hickory	5	13	Live	yes	no	no	Low	-76.161269911	41.085932669	10/19/2010
313	9	Edge	Black oak	5	13	Dead	yes	no	no	Low	-76.160439172	41.085106051	10/19/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
314	9	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.159748480	41.085139837	10/19/2010
315	9	Edge	Unknown	14	36	Dead	yes	no	no	Medium	-76.157857973	41.084862159	10/19/2010
316	9	Edge	Unknown	10	25	Dead	yes	no	no	Medium	-76.160694848	41.084858574	10/19/2010
317a	9	Edge	Black cherry	6	15	Partially Dead	yes	no	no	Low	-76.160821284	41.084881401	10/19/2010
317b	9	Edge	Black cherry	6	15	Partially Dead	yes	no	no	Low	-76.160821284	41.084881401	10/19/2010
317c	9	Edge	Black cherry	6	15	Partially Dead	yes	no	no	Low	-76.160821284	41.084881401	10/19/2010
318	9	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.162811736	41.085910667	10/19/2010
319	9	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.162733576	41.085917099	10/19/2010
320	9	Edge	Shagbark hickory	26	66	Live	yes	no	no	High	-76.162781794	41.086007481	10/19/2010
321	9	Edge	Shagbark hickory	18	46	Live	yes	no	no	High	-76.162820105	41.086005186	10/19/2010
322	9	Edge	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.162815638	41.086050809	10/19/2010
323	9	Edge	White oak	34	86	Live	yes	no	no	High	-76.162799696	41.086133067	10/19/2010
324	9	Edge	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.162824239	41.086474665	10/19/2010
325	9	Edge	Black cherry	18	46	Live	yes	no	no	High	-76.162545221	41.086530589	10/19/2010
326	9	Edge	Black cherry	16	41	Live	yes	no	no	High	-76.162095420	41.086568987	10/19/2010
331	9	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.159548272	41.086861547	10/19/2010
335	9	Edge	Black cherry	26	66	Partially Dead	yes	no	no	High	-76.158103006	41.087240735	10/19/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
336	10	Interior Upland	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.154572980	41.089618379	10/13/2010
337	10	Interior Upland	Shagbark hickory	7	18	Live	yes	no	no	Low	-76.154492526	41.089610914	10/13/2010
338	10	Interior Upland	White oak	13	33	Live	yes	no	no	Medium	-76.154976508	41.089643721	10/13/2010
339	10	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.154780505	41.089643819	10/13/2010
340	10	Interior Upland	Red oak	20	51	Live	yes	no	no	High	-76.152786980	41.089642881	10/13/2010
341	10	Interior Upland	Red oak	12	30	Dead	yes	no	no	Medium	-76.152469855	41.089497028	10/13/2010
342	10	Interior Upland	Red oak	24	61	Live	yes	no	no	High	-76.152528178	41.089469301	10/13/2010
343	10	Interior Upland	Unknown	17	43	Dead	yes	no	no	High	-76.153050736	41.089385874	10/13/2010
344	10	Interior Wetland	Red maple	33	84	Partially Dead	yes	yes	no	High	-76.155793559	41.089930584	10/1/2010
346	10	Wetland	Black gum	28	71	Live	no	no	yes	High	-76.153144269	41.087506861	10/7/2010
347	10	Edge	Unknown	9	23	Dead	yes	no	no	Medium	-76.153498454	41.089488119	10/20/2010
348	10	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.153702443	41.089658099	10/20/2010
349	10	Edge	White oak	20	51	Live	yes	no	no	High	-76.153700702	41.089672401	10/20/2010
350	10	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.154019956	41.089615528	10/20/2010
351	10	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.154147506	41.089655707	10/20/2010
352	10	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.154010211	41.089682358	10/20/2010
353	10	Edge	Red maple	16	41	Dead	yes	no	no	High	-76.152528936	41.089022645	10/20/2010
354	10	Edge	Unknown	12	30	Dead	yes	no	no	Medium	-76.152314883	41.088690557	10/20/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
355	10	Edge	White oak	21	53	Live	yes	no	no	High	-76.151153415	41.088734844	10/20/2010
356	10	Edge	White oak	19	48	Live	yes	no	no	High	-76.151100900	41.088735060	10/20/2010
357	10	Edge	Unknown	6	15	Dead	yes	no	no	Low	-76.151493284	41.089165067	10/20/2010
358	10	Edge	White oak	18	46	Live	yes	no	no	High	-76.151626639	41.089205950	10/20/2010
359	10	Edge	White oak	21	53	Live	yes	no	no	High	-76.152163110	41.089391099	10/20/2010
360	10	Edge	White oak	14	36	Live	yes	no	no	Medium	-76.152175131	41.089439237	10/20/2010
361	10	Edge	White pine	6	15	Dead	yes	no	no	Low	-76.152164106	41.089447320	10/20/2010
362	10	Edge	White oak	23	58	Live	yes	no	no	High	-76.152096500	41.089463710	10/20/2010
363	10	Edge	White oak	18	46	Live	yes	no	no	High	-76.152185309	41.089487910	10/20/2010
364	10	Edge	White oak	26	66	Live	yes	no	no	High	-76.152238120	41.089490468	10/20/2010
365	10	Edge	White oak	28	71	Live	yes	no	no	High	-76.152206035	41.089553859	10/20/2010
366	11	Interior Upland	Unknown	14	36	Dead	yes	no	no	Medium	-76.152786436	41.085395315	10/13/2010
367	11	Interior Upland	White pine	28	71	Dead	yes	yes	no	High	-76.152493439	41.085409262	10/13/2010
368	11	Interior Upland	White oak	27	69	Live	yes	no	no	High	-76.152713237	41.085106941	10/13/2010
369	11	Upland	White oak	36	91	Live	yes	no	no	High	-76.152595860	41.085154236	10/13/2010
370	11	Edge	Unknown	16	41	Dead	yes	no	no	High	-76.152375950	41.085459057	10/20/2010
371	11	Edge	Red oak	49	124	Live	yes	no	no	High	-76.152760442	41.085874933	10/20/2010
372	11	Edge	White oak	18	46	Live	yes	no	no	High	-76.152835715	41.085929912	10/20/2010
373	11	Edge	White oak	14	36	Live	yes	no	no	Medium	-76.152895884	41.085807087	10/20/2010
374	11	Edge	White oak	20	51	Live	yes	no	no	High	-76.153060434	41.085941870	10/20/2010
375	11	Edge	White oak	17	43	Live	yes	no	no	High	-76.153041403	41.085925096	10/20/2010
376	11	Edge	White oak	12	30	Live	yes	no	no	Medium	-76.153007328	41.085899138	10/20/2010
377	11	Edge	White oak	14	36	Live	yes	no	no	Medium	-76.153039647	41.085892591	10/20/2010
378	12	Interior Upland	White pine	13	33	Dead	yes	no	no	Medium	-76.157640088	41.083241177	10/13/2010
379a	12	Interior Upland	Unknown	12	30	Dead	yes	no	no	Medium	-76.158116392	41.083017679	10/13/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
379b	12	Interior Upland	Unknown	12	30	Dead	yes	no	no	Medium	-76.158116392	41.083017679	10/13/2010
380	12	Interior Upland	White pine	13	33	Dead	yes	no	no	Medium	-76.158186971	41.083084656	10/13/2010
381	12	Interior Upland	White oak	28	71	Live	yes	no	no	High	-76.156507564	41.082754573	10/13/2010
382	12	Interior Upland	Unknown	12	30	Dead	yes	no	no	Medium	-76.156530756	41.082776156	10/13/2010
383	12	Interior Upland	Unknown	9	23	Dead	yes	no	no	Medium	-76.156677673	41.082876841	10/13/2010
384	12	Interior Upland	White oak	13	33	Live	yes	no	no	Medium	-76.156706940	41.082977781	10/13/2010
385	12	Interior Upland	Shagbark hickory	14	36	Dead	yes	no	no	Medium	-76.156669465	41.083025212	10/13/2010
386	12	Interior Upland	Shagbark hickory	10	25	Live	yes	no	no	Medium	-76.156617536	41.082911465	10/13/2010
387	12	Interior Upland	Shagbark hickory	16	41	Dead	yes	no	no	High	-76.156234074	41.082715572	10/13/2010
388	12	Interior Wetland	Shagbark hickory	15	38	Live	yes	no	no	Medium	-76.155922139	41.082211828	10/15/2010
389	12	Interior Wetland	Shagbark hickory	6	15	Live	yes	no	no	Low	-76.155462912	41.082289767	10/15/2010
390	12	Interior Wetland	Shagbark hickory	20	51	Live	yes	no	no	High	-76.155106030	41.082368044	10/15/2010
391	12	Interior Wetland	Shagbark hickory	18	46	Live	yes	no	no	High	-76.155016693	41.082263703	10/15/2010
392	12	Interior Wetland	Shagbark hickory	21	53	Live	yes	no	no	High	-76.154937122	41.082167604	10/15/2010
393	12	Interior Wetland	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.154848102	41.082210842	10/15/2010
394	12	Edge	Black cherry	9	23	Live	yes	no	no	Medium	-76.158025741	41.083714944	10/20/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
395	12	Edge	Red maple	7	18	Dead	yes	no	no	Low	-76.158275702	41.083642543	10/20/2010
396	12	Edge	Red maple	12	30	Dead	yes	no	no	Medium	-76.158753815	41.083148268	10/20/2010
397	12	Edge	Black cherry	8	20	Live	yes	no	no	Low	-76.158778028	41.082868459	10/20/2010
398	12	Edge	Black cherry	19	48	Live	yes	no	no	High	-76.157411461	41.083580446	10/20/2010
399	12	Edge	White oak	18	46	Live	yes	no	no	High	-76.157450746	41.083617008	10/20/2010
400	13	Upland Interior	Sweet birch	20	51	Live	yes	no	no	High	-76.151877493	41.081893579	10/13/2010
401	13	Upland	Unknown	23	58	Dead	yes	no	no	High	-76.151654211	41.082101472	10/13/2010
402	13	Edge	Red maple	9	23	Dead	yes	no	no	Medium	-76.150092430	41.081157902	10/20/2010
403	13	Edge	Shagbark hickory	22	56	Live	yes	no	no	High	-76.150400020	41.081852831	10/20/2010
404	13	Edge	Sweet birch	12	30	Partially Dead	yes	no	no	Medium	-76.150337030	41.082062560	10/20/2010
405	14	Upland Interior	Unknown	6	15	Dead	yes	no	no	Low	-76.147629647	41.079909038	10/13/2010
406	14	Upland Interior	Red maple	7	18	Dead	yes	no	no	Low	-76.147561672	41.079864090	10/13/2010
407	14	Upland Interior	Red maple	7	18	Dead	yes	no	no	Low	-76.147493813	41.079984770	10/13/2010
408	14	Upland Interior	Red maple	13	33	Dead	yes	no	no	Medium	-76.147434320	41.080054220	10/13/2010
409	14	Upland Interior	Red maple	9	23	Dead	yes	no	no	Medium	-76.147465532	41.080068706	10/13/2010
410a	14	Upland Interior	Red maple	11	28	Dead	yes	no	no	Medium	-76.147527680	41.080049802	10/13/2010
410b	14	Upland Interior	Red maple	11	28	Dead	yes	no	no	Medium	-76.147527680	41.080049802	10/13/2010
410c	14	Upland	Red maple	11	28	Dead	yes	no	no	Medium	-76.147527680	41.080049802	10/13/2010

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Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
411a	14	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.147669604	41.080052629	10/13/2010
411b	14	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.147669604	41.080052629	10/13/2010
411c	14	Interior Upland	Red maple	8	20	Live	yes	no	no	Low	-76.147669604	41.080052629	10/13/2010
411d	14	Interior Upland	Red maple	8	20	Live	yes	no	no	Low	-76.147669604	41.080052629	10/13/2010
412	14	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.147467061	41.081113897	10/13/2010
413a	14	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.147820630	41.081375206	10/13/2010
413b	14	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.147820630	41.081375206	10/13/2010
413c	14	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.147820630	41.081375206	10/13/2010
413d	14	Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.147820630	41.081375206	10/13/2010
414	14	Edge	Red maple	8	20	Dead	yes	no	no	Low	-76.148346400	41.079073199	10/20/2010
415	14	Edge	Red maple	6	15	Dead	yes	no	no	Low	-76.148462596	41.079500654	10/20/2010
416	14	Edge	Red maple	8	20	Partially Dead	yes	no	no	Low	-76.148446707	41.079512294	10/20/2010
417	14	Edge	Black cherry	9	23	Dead	yes	no	no	Medium	-76.148611654	41.080654842	10/20/2010
418	14	Edge	Unknown	8	20	Dead	yes	no	no	Low	-76.148529527	41.080740455	10/20/2010
419	14	Edge	Red maple	11	28	Dead	yes	no	no	Medium	-76.148546550	41.080976483	10/20/2010
420	14	Edge	Red maple	20	51	Live	yes	no	no	High	-76.147893121	41.082220343	10/20/2010
421	14	Edge	Shagbark hickory	14	36	Live	yes	no	no	Medium	-76.147793541	41.082147923	10/20/2010
422	14	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.147657960	41.082182821	10/20/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
423	14	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.147646812	41.082202758	10/20/2010
424	14	Edge	Shagbark hickory	18	46	Live	yes	no	no	High	-76.147277234	41.081860914	10/20/2010
425	14	Edge	Shagbark hickory	8	20	Live	yes	no	no	Low	-76.147287500	41.081684066	10/20/2010
426	14	Edge	Shagbark hickory	9	23	Live	yes	no	no	Medium	-76.147301014	41.081664680	10/20/2010
427	14	Edge	Red maple	9	23	Dead	yes	no	no	Medium	-76.147322205	41.081211514	10/20/2010
428	14	Edge	Shagbark hickory	13	33	Live	yes	no	no	Medium	-76.147264747	41.081135036	10/20/2010
429	15	Interior Upland	Red pine	6	15	Dead	yes	no	no	Low	-76.146098852	41.072727790	10/13/2010
430	15	Interior Upland	Quaking aspen	10	25	Dead	yes	no	no	Medium	-76.146261157	41.072574359	10/13/2010
431	15	Interior Upland	Red pine	6	15	Dead	yes	no	no	Low	-76.147054547	41.071870739	10/13/2010
432	15	Interior Upland	Sassafras	7	18	Dead	yes	no	no	Low	-76.147212596	41.072359476	10/13/2010
433	15	Interior Upland	Quaking aspen	11	28	Dead	yes	no	no	Medium	-76.147196685	41.072224372	10/13/2010
434	15	Interior Upland	Red maple	11	28	Partially Dead	yes	no	no	Medium	-76.147338496	41.073281938	10/13/2010
435	15	Interior Upland	Quaking aspen	11	28	Dead	yes	no	no	Medium	-76.147061297	41.073062105	10/13/2010
436	15	Interior Upland	Red maple	9	23	Dead	yes	no	no	Medium	-76.147068259	41.073114861	10/13/2010
437	15	Interior Upland	Red maple	10	25	Dead	yes	no	no	Medium	-76.147115876	41.073004973	10/13/2010
438a	15	Interior Upland	Red maple	13	33	Partially Dead	yes	no	no	Medium	-76.147732173	41.072317618	10/13/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
4638b	15	Interior Upland	Red maple	13	33	Partially Dead	yes	no	no	Medium	-76.147732173	41.072317618	10/13/2010
439	15	Interior Upland	Red maple	7	18	Partially Dead	yes	no	no	Low	-76.147820445	41.072295883	10/13/2010
499	15	Edge	Black oak	8	20	Dead	yes	no	no	Low	-76.14437078	41.07255624	7/13/2011
500	15	Edge	American sycamore	11	28	Live	yes	no	no	Medium	-76.14545751	41.07028226	7/14/2011
501	15	Edge	Red maple	11	28	Partially Dead	yes	yes	no	Medium	-76.14529554	41.07040717	7/14/2011
502	15	Edge	Black cherry	19	48	Live	yes	no	no	High	-76.1452139	41.07050118	7/14/2011
503	15	Edge	Red oak	31	79	Live	yes	no	no	High	-76.14586967	41.0706686	7/14/2011
504	15	Edge	River birch	15	38	Live	yes	no	no	Medium	-76.14603137	41.07068584	7/14/2011
440a	16	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.149145499	41.070487375	10/14/2010
440b	16	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.149145499	41.070487375	10/14/2010
440c	16	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.149145499	41.070487375	10/14/2010
441	16	Interior Upland	Black oak	7	18	Dead	yes	no	no	Low	-76.148836141	41.070735929	10/14/2010
512	16	Interior Upland	Pin oak	34	86	Live	yes	no	no	High	-76.15021918	41.06970755	7/14/2011
513	16	Interior Upland	Black oak	7	18	Dead	yes	no	no	Low	-76.14948191	41.0693843	7/14/2011
514	16	Interior Upland	Pin oak	26	66	Live	yes	no	no	High	-76.14935571	41.069573	7/14/2011
515	16	Interior Upland	Pin oak	24	61	Dead	yes	no	no	High	-76.14944895	41.06958881	7/14/2011
516	16	Interior Upland	Pin oak	18	46	Live	yes	no	no	High	-76.14954177	41.06941774	7/14/2011
442	16	Edge	Red maple	9	23	Dead	yes	no	no	Medium	-76.149188375	41.071182461	10/20/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
443	16	Edge	Red maple	6	15	Dead	yes	no	yes	Low	-76.149182210	41.071237066	10/20/2010
444	16	Edge	Red maple	10	25	Dead	yes	no	no	Medium	-76.149299437	41.071333577	10/20/2010
445	16	Edge	Red maple	7	18	Dead	yes	no	no	Low	-76.149229329	41.071296371	10/20/2010
505	16	Edge	River birch	28	71	Dead	yes	no	no	High	-76.14857254	41.06884736	7/14/2011
506	16	Edge	Sassafras	32	81	Live	yes	yes	no	High	-76.14873427	41.06875031	7/14/2011
507	16	Edge	Black cherry	24	61	Live	yes	no	no	High	-76.1490073	41.06866859	7/14/2011
508	16	Edge	Red maple	24	61	Dead	yes	yes	no	High	-76.14909531	41.07003401	7/14/2011
509	16	Edge	Red maple	9	23	Partially Dead	yes	no	no	Medium	-76.14909011	41.07004764	7/14/2011
510	16	Edge	Black cherry	22	56	Live	yes	no	no	High	-76.14940777	41.06986685	7/14/2011
511	16	Edge	Bigtooth aspen	9	23	Dead	yes	no	no	Medium	-76.14947187	41.06971834	7/14/2011
517	16	Edge	River birch	20	51	Dead	yes	no	no	High	-76.14922399	41.06865338	7/14/2011
518	16	Edge	River birch	28	71	Dead	yes	no	no	High	-76.14912438	41.06865819	7/14/2011
519	16	Edge	River birch	26	66	Live	yes	no	no	High	-76.14919887	41.06870042	7/14/2011
520	16	Edge	Black locust	15	38	Partially Dead	yes	no	no	Medium	-76.15020528	41.06812299	7/14/2011
521	16	Edge	Black locust	14	36	Partially Dead	yes	no	no	Medium	-76.15069452	41.06799665	7/14/2011
522	16	Edge	Pin oak	35	89	Live	yes	no	no	High	-76.15068241	41.06801803	7/14/2011
446	17	Interior Upland	Red maple	13	33	Live	yes	no	no	Medium	-76.154424382	41.100616790	10/14/2010
447	17	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.154326841	41.100737827	10/14/2010
448	17	Interior Upland	Red maple	6	15	Dead	yes	no	no	Low	-76.154318359	41.100801085	10/14/2010
449	17	Interior Upland	Unknown	7	18	Dead	yes	no	no	Low	-76.154570097	41.100799277	10/14/2010
450	17	Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.152232989	41.099134977	10/14/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
451	17	Interior Upland	Red maple	6	15	Dead	yes	no	no	Low	-76.152458076	41.098933033	10/14/2010
452	17	Interior Upland	Red maple	7	18	Dead	yes	no	no	Low	-76.152662255	41.098986520	10/14/2010
453	17	Interior Upland	Red maple	8	20	Dead	yes	no	no	Low	-76.151938164	41.099754197	10/14/2010
454	17	Interior Upland	Bigtooth aspen	6	15	Dead	yes	no	no	Low	-76.152103226	41.099761910	10/14/2010
455	17	Interior Upland	Unknown	12	30	Dead	yes	no	no	Medium	-76.154284576	41.100362610	10/14/2010
456	17	Edge	Red maple	9	23	Partially Dead	yes	no	no	Medium	-76.154266237	41.099873225	10/20/2010
457	18	Interior Upland	White pine	7	18	Dead	yes	no	no	Low	-76.136236638	41.103897218	10/14/2010
458	18	Interior Upland	Silver maple	19	48	Dead	yes	no	no	High	-76.135494411	41.102560232	10/14/2010
459	18	Interior Upland	Silver maple	7	18	Dead	yes	no	no	Low	-76.135446502	41.102685457	10/14/2010
460a	18	Interior Upland	Silver maple	21	53	Live	yes	no	no	High	-76.135396257	41.102693512	10/14/2010
460b	18	Upland	maple	21	53	Live	yes	no	no	High	-76.135396257	41.102693512	10/14/2010
461	18	Edge	Red maple	6	15	Dead	yes	no	no	Low	-76.135315193	41.102256453	10/20/2010
462	18	Edge	Silver maple	28	71	Live	yes	no	no	High	-76.135566036	41.102300686	10/20/2010
463	18	Edge	Silver maple	38	97	Live	yes	no	no	High	-76.135610265	41.102347523	10/20/2010
464	18	Edge	Silver maple	20	51	Live	yes	no	no	High	-76.135658191	41.102272128	10/20/2010
465	18	Edge	Silver maple	24	61	Live	yes	no	no	High	-76.135220278	41.103421131	10/20/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
466	18	Edge	Silver maple	25	64	Live	yes	no	no	High	-76.135221312	41.103448600	10/20/2010
467	18	Edge	Unknown	17	43	Dead	yes	no	no	High	-76.135208493	41.103678562	10/20/2010
468	18	Edge	Silver maple	48	122	Live	yes	no	no	High	-76.135270297	41.103710227	10/20/2010
469	18	Edge	Silver maple	72	183	Live	yes	no	no	High	-76.135288652	41.104167528	10/20/2010
470	18	Edge	Silver maple	34	86	Partially Dead	yes	no	no	High	-76.134980919	41.104174116	10/20/2010
471	18	Edge	Silver maple	34	86	Live	yes	no	no	High	-76.134953620	41.103905198	10/20/2010
472	18	Edge	Silver maple	24	61	Partially Dead	yes	no	no	High	-76.134947805	41.103847828	10/20/2010
473a	18	Edge	Silver maple	22	56	Live	yes	no	no	High	-76.134928907	41.103721191	10/20/2010
473b	18	Edge	Silver maple	22	56	Live	yes	no	no	High	-76.134928907	41.103721191	10/20/2010
473c	18	Edge	Silver maple	22	56	Live	yes	no	no	High	-76.134928907	41.103721191	10/20/2010
474	18	Edge	Silver maple	38	97	Live	yes	no	no	High	-76.134973255	41.103450313	10/20/2010
475a	18	Edge	Silver maple	20	51	Live	yes	no	no	High	-76.134966781	41.103458126	10/20/2010
475b	18	Edge	Silver maple	20	51	Live	yes	no	no	High	-76.134966781	41.103458126	10/20/2010
476a	18	Edge	Silver maple	20	51	Live	yes	no	no	High	-76.134949552	41.103418173	10/20/2010
476b	18	Edge	maple	20	51	Live	yes	no	no	High	-76.134949552	41.103418173	10/20/2010
477	25	Interior Upland	White oak	40	102	Live	yes	no	no	High	-76.144232457	41.087402276	10/14/2010

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
478	25	Interior Upland	Unknown	7	18	Dead	yes	no	no	Low	-76.139209637	41.089627747	10/14/2010
479	25	Interior Upland	Black cherry	9	23	Dead	yes	no	no	Medium	-76.139199117	41.089657504	10/14/2010
480a	25	Interior Upland	Black cherry	13	33	Live	yes	no	no	Medium	-76.139021236	41.089538947	10/14/2010
480b	25	Interior Upland	Black cherry	13	33	Live	yes	no	no	Medium	-76.139021236	41.089538947	10/14/2010
481	25	Edge	White oak	32	81	Live	yes	no	no	High	-76.144179634	41.087686115	10/14/2010
482	25	Edge	Red maple	12	30	Dead	yes	no	no	Medium	-76.137504946	41.089634926	10/20/2010
483	25	Edge	Unknown	14	36	Dead	yes	no	no	Medium	-76.137446216	41.089524336	10/20/2010
484	25	Edge	Unknown	7	18	Dead	yes	no	no	Low	-76.138184894	41.089694779	10/20/2010
485	26	Interior Upland	Unknown	40	102	Dead	yes	no	no	High	-76.136188465	41.089703873	10/15/2010
486	26	Interior Upland	Black locust	46	117	Live	yes	no	no	High	-76.136583866	41.089628458	10/15/2010
491	26	Edge	White oak	36	91	Live	yes	no	no	High	-76.135062380	41.089366425	10/15/2010
494	26	Edge	Shagbark hickory	12	30	Live	yes	no	no	Medium	-76.135371755	41.089518917	10/15/2010
495	26	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.135387590	41.089503029	10/15/2010
496	26	Edge	Shagbark hickory	11	28	Live	yes	no	no	Medium	-76.135253697	41.089502253	10/15/2010
497	26	Edge	White oak	15	38	Live	yes	no	no	Medium	-76.135110910	41.089388847	10/15/2010
498	29	Interior Upland	Unknown	15	38	Dead	yes	no	no	High	-76.131758842	41.085952360	10/15/2010

	in (cm)
Average DBH[1] of all PRTs[2]	**14 (36)**
Average DBH[1] of all PRTs[2] in the Interior Forest	**14 (36)**
Average DBH[1] of all PRTs[2] in the Interior Wetlands	**18 (46)**

Table C-1. Comprehensive List of Indiana Bat (*Myotis sodalis*) Potential Roost Trees at the Bell Bend NPP Project Site.

Identification Number	Forest Area Number	Setting	Tree Species	DBH[1] in	DBH[1] cm	Condition	Roost Type Bark	Roost Type Crevice	Roost Type Cavity	Roost Potential	Longitude	Latitude	Date Observed
Average DBH[1] of all PRTs[2] in the Interior Uplands						**13 (33)**							
Average DBH[1] of all PRTs[2] in the Forest Edge						**14 (36)**							

[1]DBH = Diameter at breast height: in = inches; cm = centimeters

[2]PRTs = Potential Roost Trees

APPENDIX D

Forest Area Maps

Figure D-1.
BBNPP Forest Area 1
Potential Roost Tree Locations

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/29/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area1_UP_AppendixFig_Rev

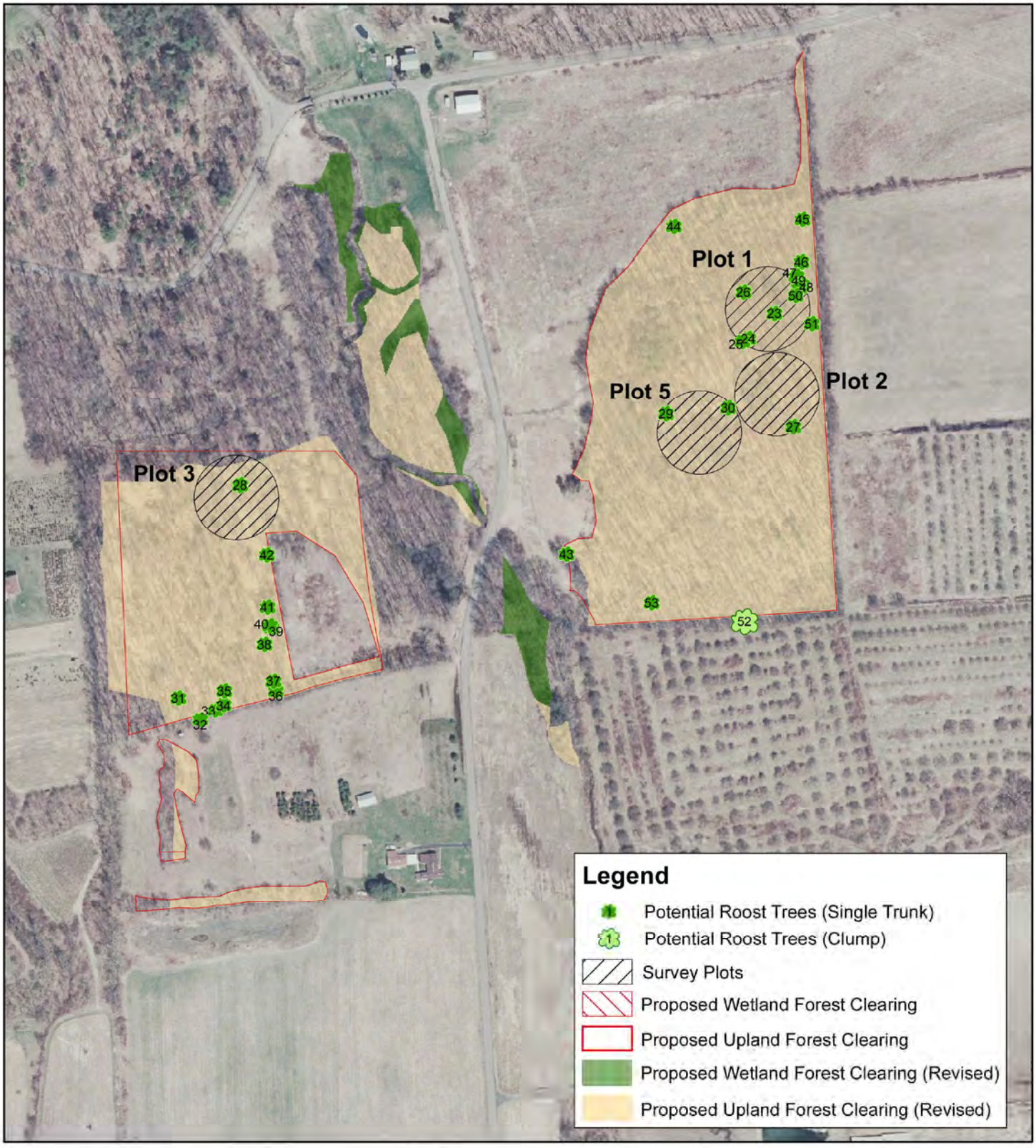

Figure D-2.
BBNPP Forest Area 3
Potential Roost Tree Locations

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/13/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area3_UP_AppendixFig_Rev

Figure D-3.
BBNPP Forest Area 5
Potential Roost Tree Locations

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prepared by: s.sherman
project: 22474.000

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prepared for: c.roche
file name: Area5_UP_AppendixFig_Rev

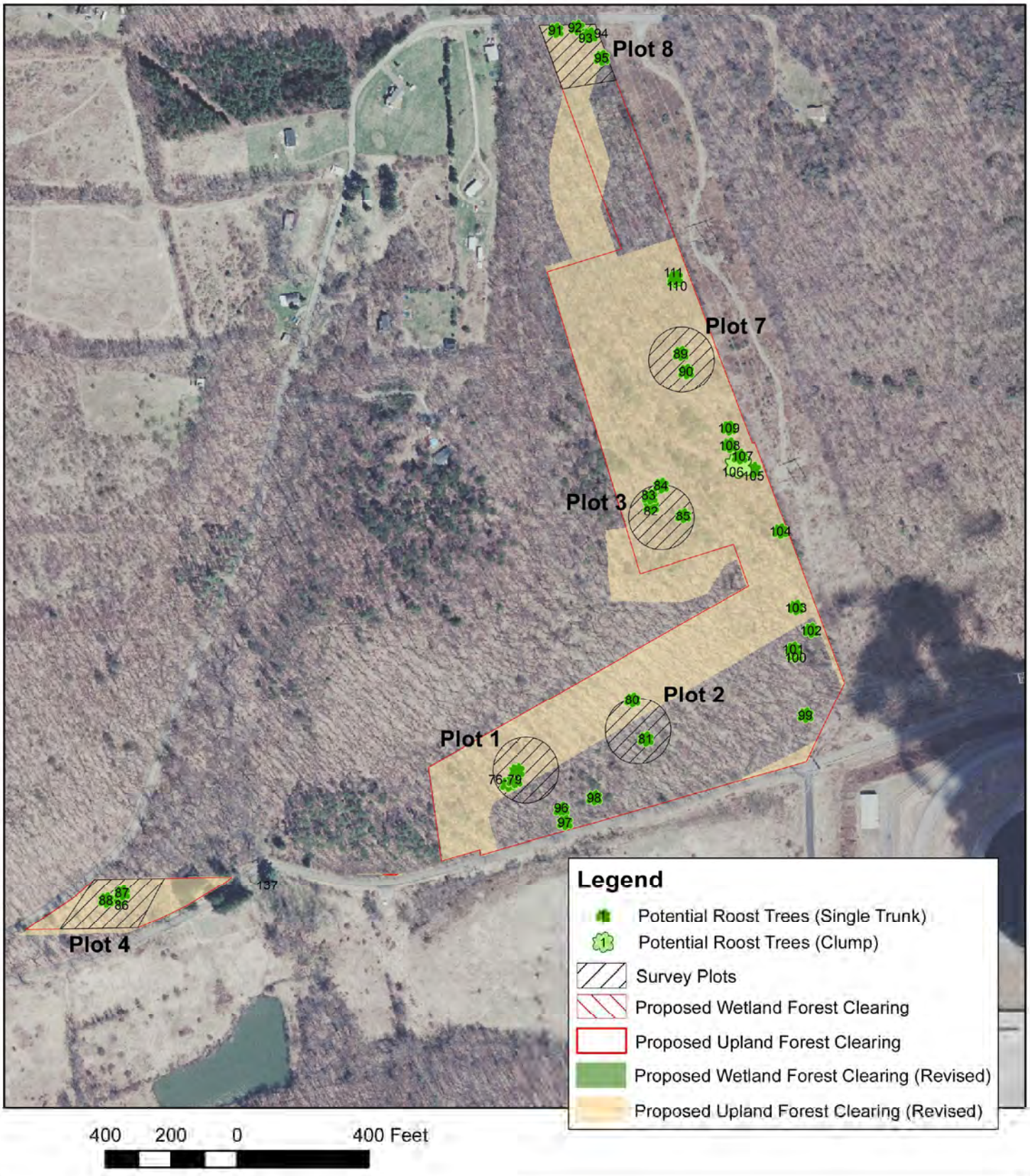

Figure D-4.
BBNPP Forest Area 7
Potential Roost Tree Locations

N

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400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/29/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area7_UP_AppendixFig_Rev

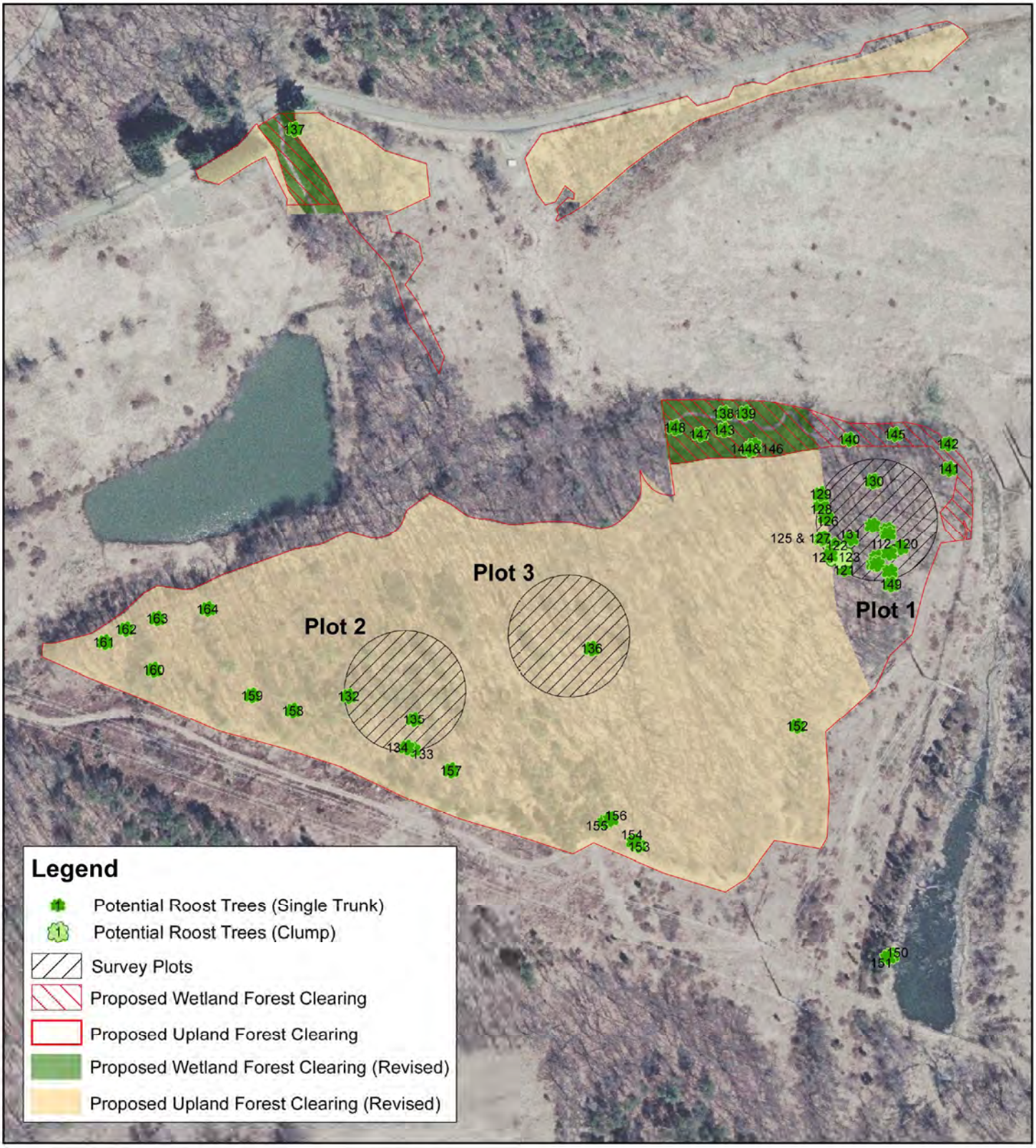

Figure D-5.
BBNPP Forest Area 8
Potential Roost Tree Locations

NORMANDEAU ASSOCIATES
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400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/29/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area8_PFOandUP_AppendixFig_Rev

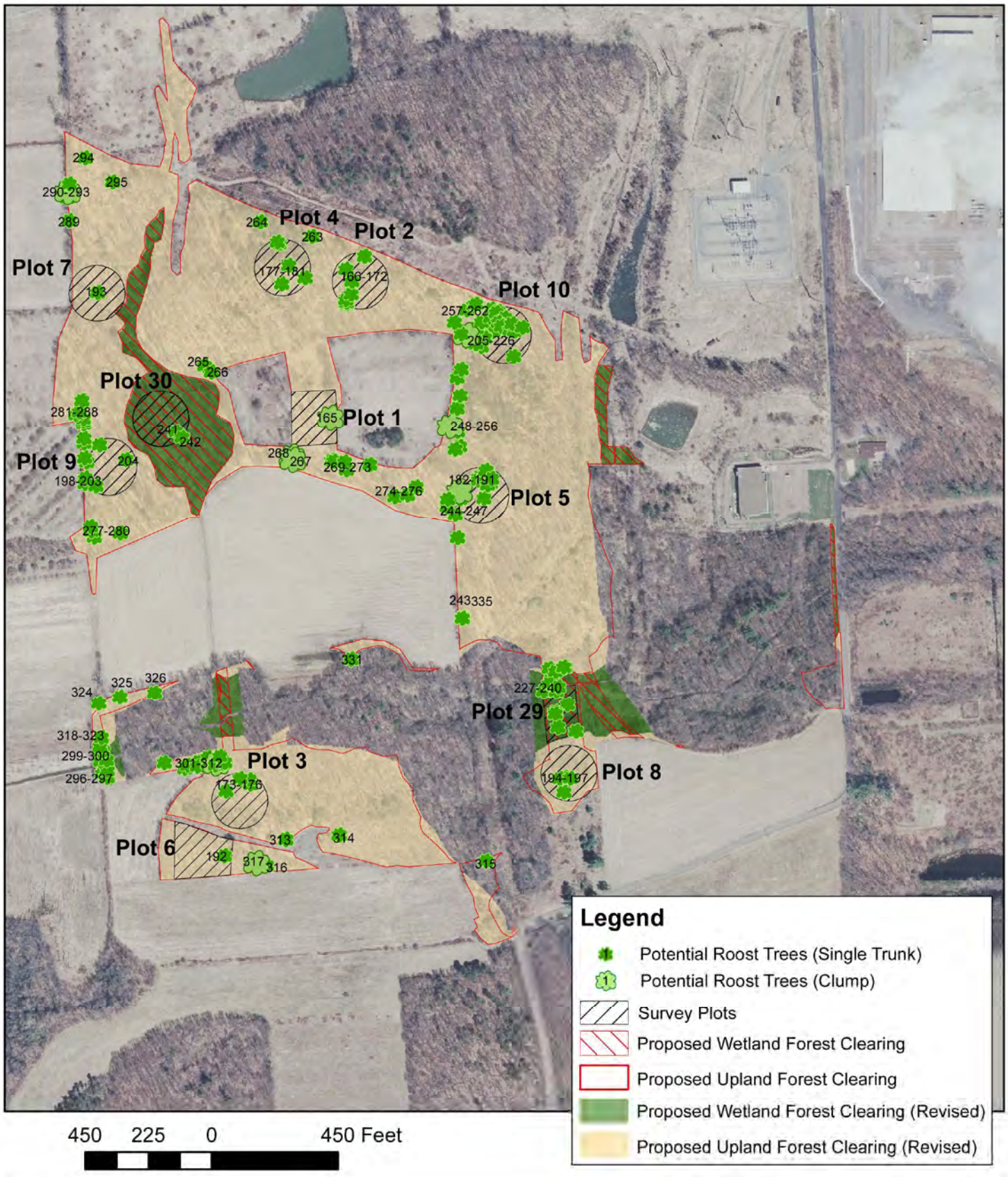

Figure D-6.
BBNPP Forest Area 9
Potential Roost Tree Locations

N

NORMANDEAU ASSOCIATES
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400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/13/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area9_PFOandUP_AppendixFig_Rev

Figure D-7.
BBNPP Forest Area 10
Potential Roost Tree Locations

N

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date: 12/13/10
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project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area10_PFOandUP_AppendixFig_Rev

Figure D-8.
BBNPP Forest Area 11
Potential Roost Tree Locations

N

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project: 22474.000

rev. date: 01/09/11, 09/14/11
prepared for: c. roche
file name: Area11_PFOandUP_AppendixFig_Rev

Figure D-9.
BBNPP Forest Area 12
Potential Roost Tree Locations

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 12/13/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/14/11
prepared for: c.roche
file name: Area12_PFOandUP_AppendixFig_Rev

Figure D-10.
BBNPP Forest Area 13
Potential Roost Tree Locations

N

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400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/29/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c. roche
file name: Area13_UP_AppendixFig_Rev

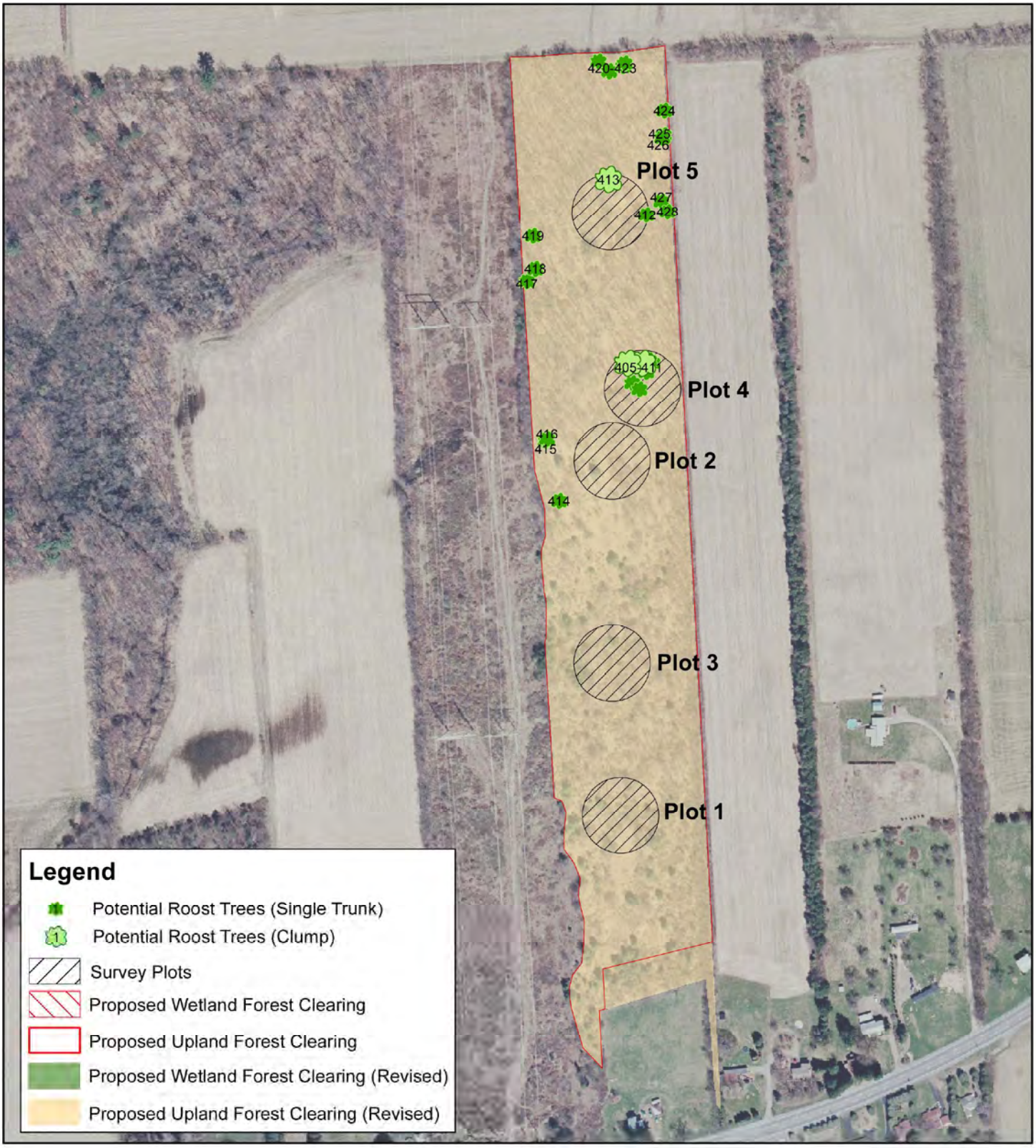

Figure D-11.
BBNPP Forest Area 14
Potential Roost Tree Locations

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike, Bldg A, Suite 101 Stowe, PA 19464

date: 11/29/10
prepared by: s.sherman
project: 22474.000

rev. date: 01/09/11, 09/15/11
prepared for: c.roche
file name: Area14_UP_AppendixFig_Rev

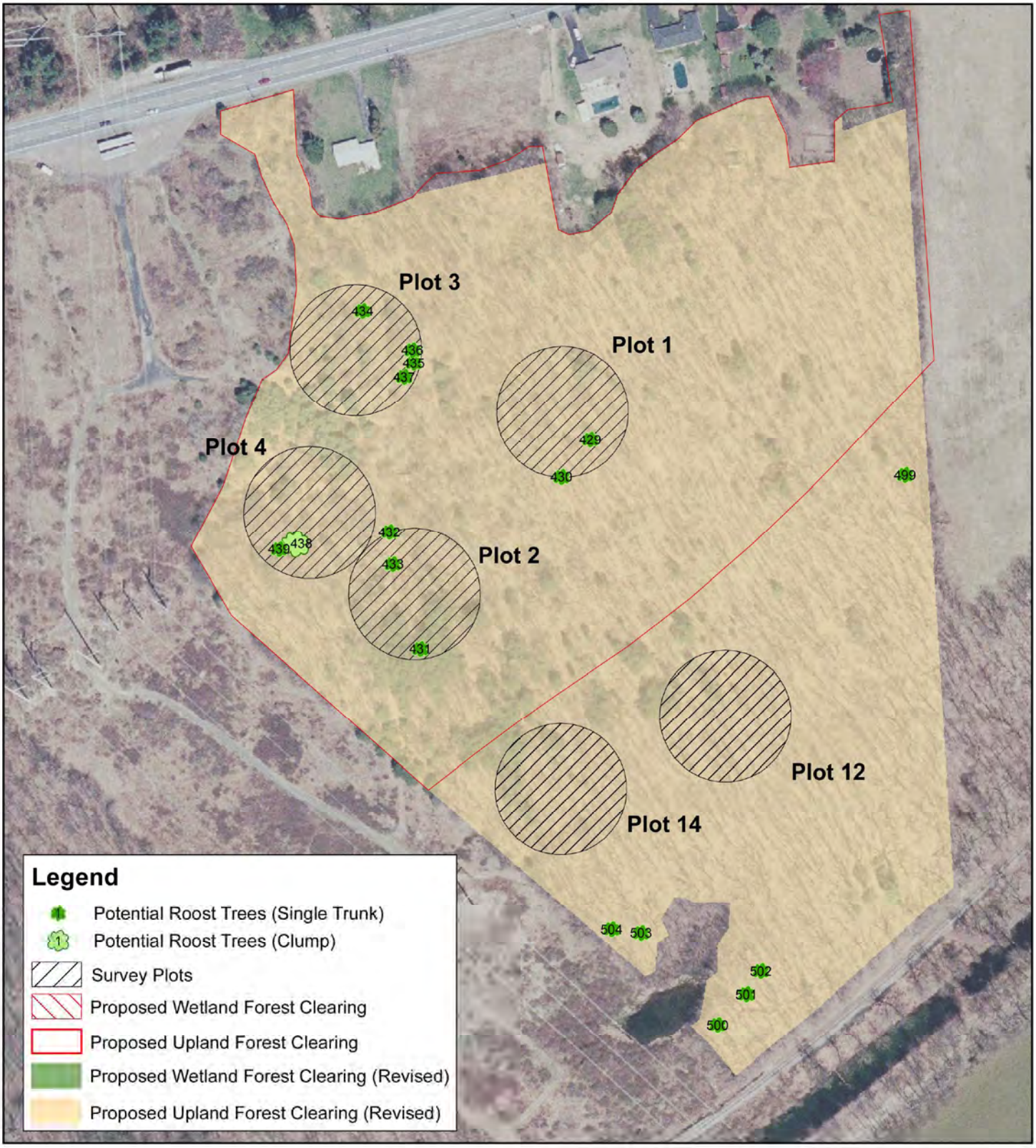

Figure D-12.
BBNPP Forest Area 15
Potential Roost Tree Locations

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date: 11/29/10
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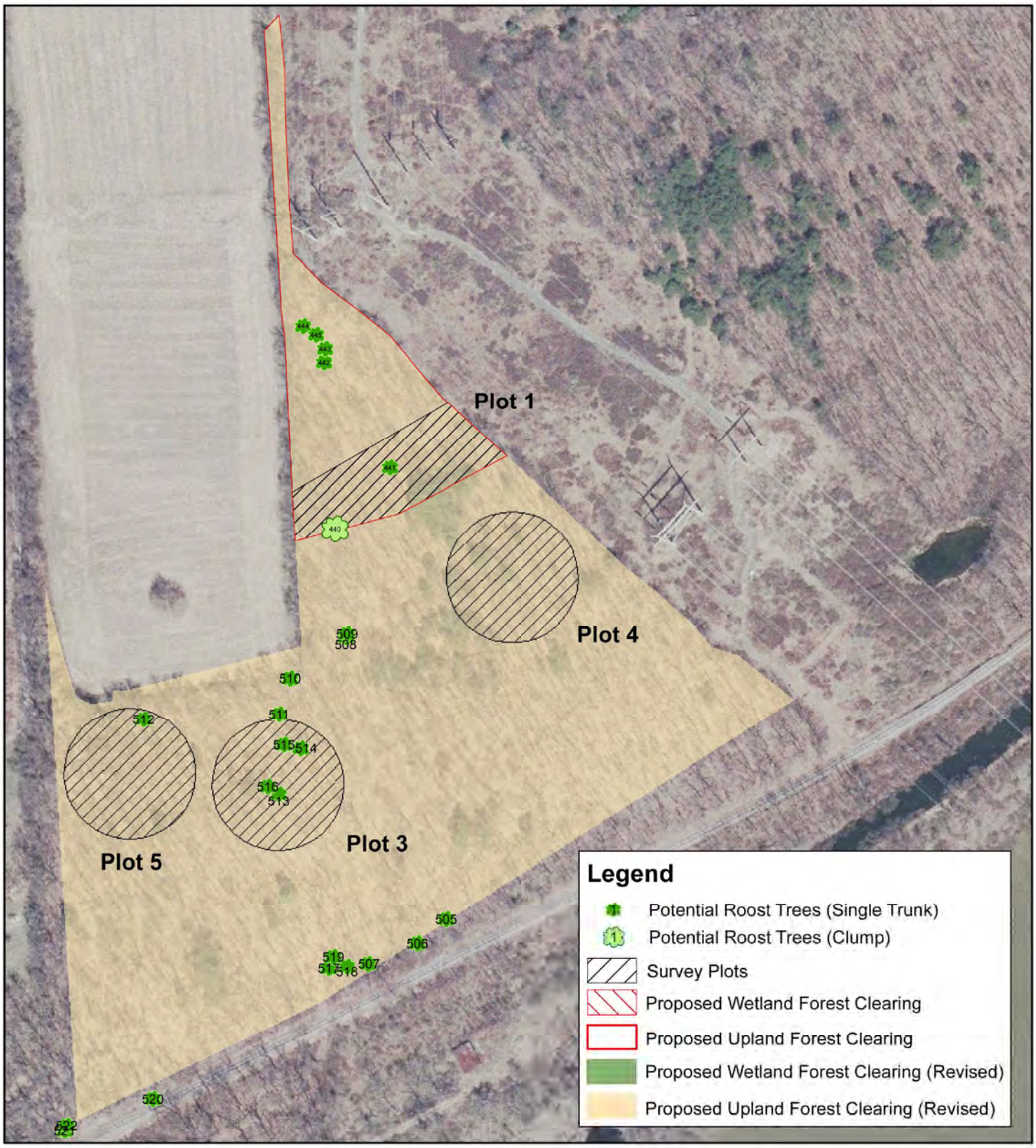

Figure D-13.
BBNPP Forest Area 16
Potential Roost Tree Locations

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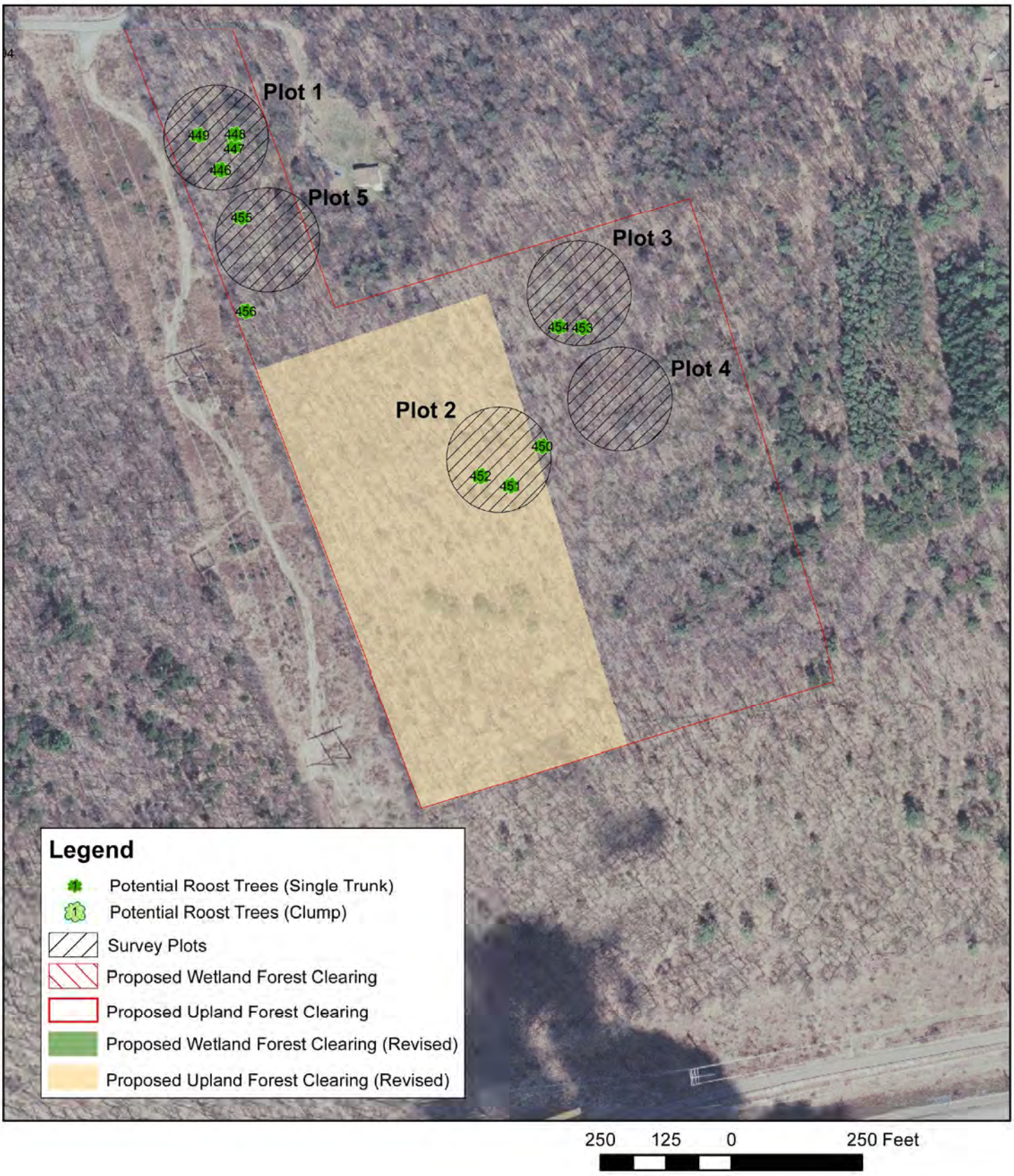

Figure D-14.
BBNPP Forest Area 17
Potential Roost Tree Locations

N

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Figure D-15.
BBNPP Forest Area 18
Potential Roost Tree Locations

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file name: Area18_UP_AppendixFig_Rev

Figure D-16.
BBNPP Forest Area 25
Potential Roost Tree Locations

N

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Figure D-17.
BBNPP Forest Area 26
Potential Roost Tree Locations

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Figure D-18.
BBNPP Forest Area 29
Potential Roost Tree Locations

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APPENDIX E

Photographs

Photo 1. Forest Area 1 – Upland oak-hickory forest showing young, healthy trees characteristic of early successional forest onsite.

Photo 2. Forest Area 3 – Upland forest edge with black cherry (*Prunus serotina*) and shagbark hickory (*Carya ovata*). Shagbark hickories exhibit suitable roost tree characteristics.

Photo 3. Forest Area 3 - Close-up of shagbark hickories exhibiting suitable roost tree characteristics. Both trees are live with naturally exfoliating bark. Tree in center is considered a clump as it has two trunks, each with suitable roost tree characteristics.

Photo 4. Forest Area 9 – Typical snag with suitable roost tree characteristics. Stub lacking suitable roost tree characteristics is visible to the right.

Photo 5. Forest Area 9 – Close-up of snag with exfoliating bark visible. Stub to right is lacking in suitable bark characteristics and has been heavily excavated by woodpeckers.

Photo 6. Forest Area 13 – This live shagbark hickory was considered a roost tree with high potential as it was greater than 16 inches dbh and had a large percentage of exfoliating bark.

Photo 7. Forest Area 13 – Close-up of shagbark hickory with a high potential for use as a roost tree and with exfoliating bark visible.