

**ENDANGERED OR THREATENED WILDLIFE
HABITAT IMPACT ASSESSMENT FOR
BLOCK 505, LOTS 14 & 15
TOWNSHIP OF DOVER
BLOCK 44, LOTS 2, 3, 4 (PART), & 5
TOWNSHIP OF MANCHESTER
OCEAN COUNTY, NEW JERSEY**

Prepared for:

Jaylin Holdings, LLC
Dover Esplanade, Building 1
1027 Hooper Avenue
Toms River, New Jersey 08753
Attn: Jay Grunin, Esq.

Prepared by:

EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, New Jersey 07866
(973) 366-9500

Revised November 29, 2010

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION.....	1
II. NATURAL HERITAGE PROGRAM AND LANDSCAPE PROJECT.....	3
III. SPECIES HABITAT REQUIREMENTS	4
A. Northern Pine Snake.....	4
B. Corn Snake.....	6
C. Pine Barrens Treefrog.....	7
D. Barred Owl.....	8
E. Cooper's hawk.....	10
IV. 2005 PINE SNAKE INVESTIGATION	11
V. ASSESSMENT OF IMPACT	12
A. Northern Pine Snake.....	12
1. Reduced site plan.....	16
2. Preservation of the on-site pine snake hibernaculum	16
3. Wildlife corridor.....	16
4. Snake barrier wall.....	17
5. Field sweeps	18
6. Off-site mitigation parcels.....	19
7. Habitat enhancements.....	24
8. Compliance with DEP's HEM model.....	27
B. Corn Snake.....	29
C. Pine Barrens Treefrog.....	30
D. Barred Owl and Cooper's Hawk.....	31
VI. CONCLUSIONS.....	32
VII. REFERENCES.....	34

LIST OF FIGURES

	<u>Page</u>
Figure 1: USGS Site Location.....	2
Figure 2: Landscape Project.....	5
Figure 3: Preserved Open Space.....	15
Figure 4: Pine Snake Nests	26
Figure 5: Cross Section of Man-Made Snake Hibernaculum	28

APPENDIX A – Correspondence

APPENDIX B – Qualifications of Preparers

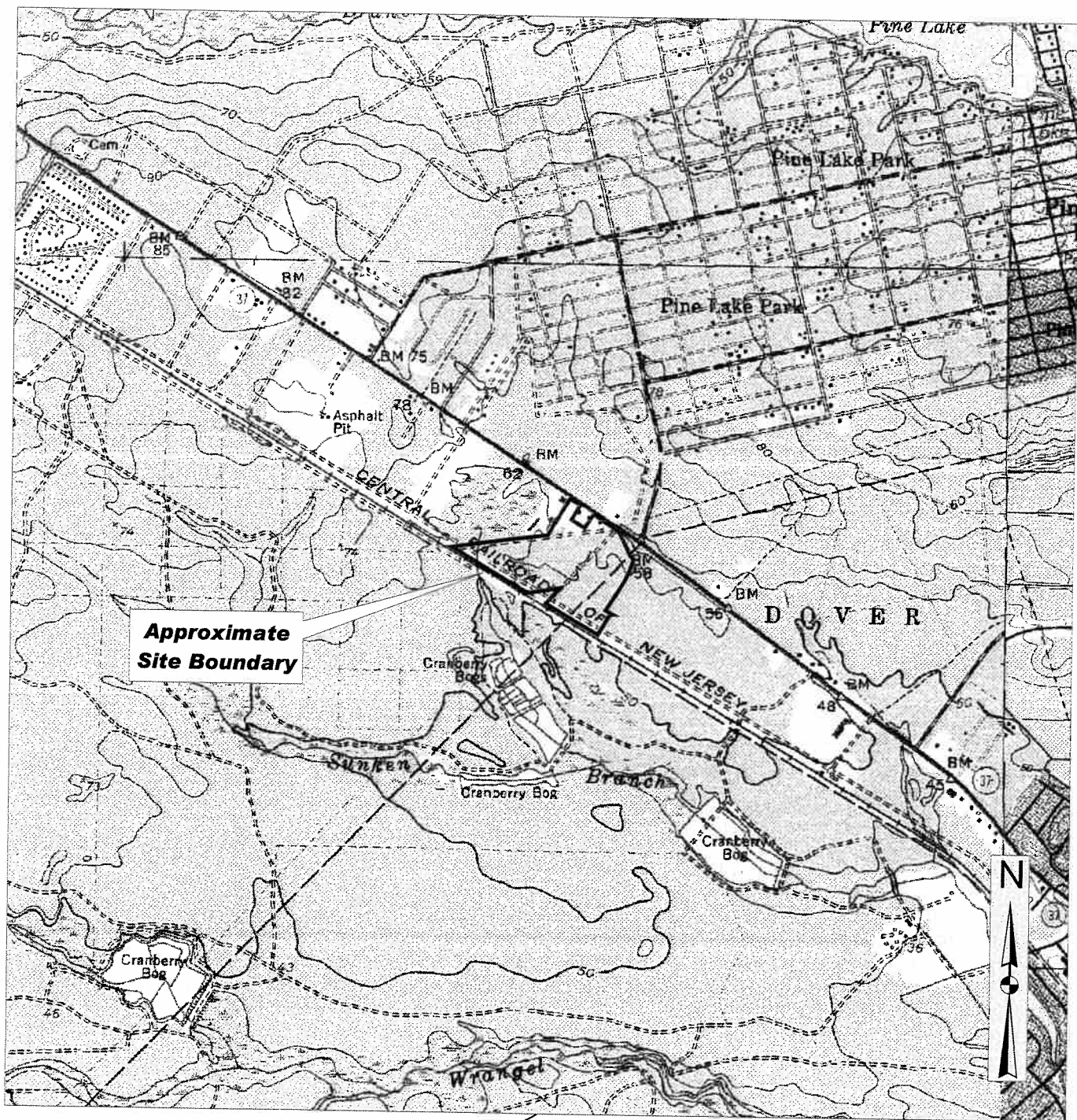
I. INTRODUCTION

Jaylin Holdings, LLC (the Applicant), of Toms River, New Jersey, is proposing to construct a commercial development consisting of a Walmart retail store on a portion of a 43±-acre site known as Block 505, Lots 14 and 15 in the Township of Toms River and Block 44, Lots 2, 3, 4 (part), and 5 in the Township of Manchester ("site", Figure 1). The site fronts New Jersey State Highway Route 37 and Northampton Boulevard. A Conrail railroad right-of-way forms the site's southwestern boundary. The site is vacant and is characterized by upland forest, forested wetlands, successional fields, and riparian lands associated with an on-site tributary to Sunken Branch. Sunken Branch is a tributary of Wrangle Brook within the Toms River drainage basin.

The proposed Walmart project consists of a 177,557 square-foot (SF) retail store with an associated 3,509 SF outdoor seasonal garden center. Additional project elements include parking fields (833 spaces), access roads, stormwater management basins, and a 4-foot high snake wall. The store and garden center are proposed in the southeastern portion of the site, within Toms River Township. The parking fields, access roads, and snake wall are proposed in the eastern half and northern portions of the site, largely within Toms River Township and partially within Manchester Township. Stormwater detention basins are proposed in the northeast, northwest, southeast, and central portions of the site.

Approximately 20.9 acres of the site will be preserved as open space. In addition, several off-site properties in Manchester Township are proposed as mitigation to compensate for the loss of habitat associated with the State-threatened northern pine snake (*Pituophis melanoleucus*). The proposed mitigation parcels are: Block 73, Lots 3 and 4 (11.6 acres), Block 73, Lots 31 and 32 (42.9 acres), Block 73, Lot 21 (15.8 acres), Block 75.01, Lot 3 (21.1 acres), Block 77, Lots 2, 4, 5 & 6 (89.3 acres), and Block 77, Lot 27 (11.3 acres). The off-site properties combined with the on-site open space will provide 212.9 acres of preserved lands. All of the off-site properties are associated with extensive areas of NJDEP-mapped pine snake habitat and are located adjacent to extensive areas of existing open space. Block 73, Lots 3 and 4 will be purchased for preservation only. Habitat enhancements are proposed on the remaining mitigation properties, together with the preserved portion of the site, which will benefit pine snake and other species. The habitat value gained through enhancements will surpass the habitat value lost post-construction according to the NJDEP Endangered and Nongame Species Program draft Conceptual Habitat Evaluation Method (HEM) for Northern Pine Snakes.

This report provides an Endangered or Threatened Wildlife Habitat Impact Assessment in support of the Coastal Area Facility Review Act (CAFRA) Statement of Compliance prepared for



0 2,000 4,000 6,000 Feet

SITE
LOCATION



State Plane Coordinates (New Jersey NAD 83)
556,800' E ; 420,900' N

FIGURE 1: USGS SITE LOCATION

Block 505, Lots 14 & 15 - Township of Toms River
Block 44, Lots 2, 3, part of 4 & 5 - Township of Manchester
Ocean County, New Jersey

Source: USDA, NRCS. 2001. Digital Raster Graph of Ocean County,
New Jersey.

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: 11/1/10
F:\Jobs\05\EN05-071\GIS\2010_projects
VAFRA_1010\USGS_NJ.mxd

the Walmart project, specifically addressing the Special Area policy at N.J.A.C. 7:7E-3.38 (Endangered or threatened wildlife or plant species habitats) of the Coastal Zone Management rules. As stated in N.J.A.C. 7:7E-3.38(b), “[d]evelopment of endangered or threatened wildlife or plant species habitat is prohibited **unless it can be demonstrated, through an Endangered or Threatened Wildlife or Plant Species Impact Assessment as described at N.J.A.C. 7:7E-3C.2, that endangered or threatened wildlife or plant species habitat would not directly or through secondary impacts on the relevant site or in the surrounding area be adversely affected.**” [emphasis added]. Pursuant to N.J.A.C. 7:7E-3C.2, the information included herein demonstrates that the proposed development will not directly, or through secondary impacts, adversely impact endangered or threatened wildlife species on the site or in the surrounding area. The report, prepared by EcolSciences, Inc., is in a format consistent with the standards of habitat impact assessments provided at N.J.A.C. 7:7E-3C.4. The following sections describe the areas mapped as endangered or threatened wildlife habitat on and in the vicinity of the site according to the Landscape Project, the habitat requirements of the pertinent endangered and threatened wildlife with appropriate literature citations, existing site conditions, wildlife observations, and an assessment of the likely effects of the proposed development on local threatened and endangered wildlife. The names and qualifications of all personnel who performed the impact assessment are included in Appendix B.

II. NATURAL HERITAGE PROGRAM AND LANDSCAPE PROJECT

Starting in July 2002, the Natural Heritage Program (NHP) adopted use of the Landscape Project to supplement endangered and threatened species data requests. The Landscape Project was developed by the NJDEP, Division of Fish & Wildlife, Endangered & Nongame Species Program (ENSP) as a wildlife habitat-mapping program that is used to identify and map critical habitats for endangered, threatened, and special concern wildlife. It has undergone multiple revisions since its initial release. Landscape Project Version 2.1 was released in 2008 and is the version currently used by the NHP for its data requests. The Landscape Project uses documented sightings of listed wildlife and, based on a species-specific model, designates areas of suitable habitat contiguous to the sighting as critical habitat. The critical wildlife habitats mapped by the Landscape Project consist of polygons within five basic categories: beach, grasslands, forest, forested wetlands, and emergent wetlands. Every polygon of each habitat type is ranked based on the status of a species record, if present, within or near a polygon. A Rank 5 polygon indicates at least one record of a Federally-endangered or threatened species whereas a Rank 1 polygon has no known species records, but meets other habitat-specific criteria. Rank 2, 3, and 4 critical habitats have at least one record of a special concern, State-threatened, and State-endangered species, respectively (Niles, *et al.*, 2004).

EcolSciences requested information from the NHP regarding rare species documented on and in the vicinity of the site. NHP's response letters (Appendix A) dated December 24, 2008 and January 9, 2009 state there are occurrences of the State-threatened northern pine snake (*Pituophis melanoleucus*) mapped on the site and within adjacent properties. In addition to pine snake, adjacent habitats (located south and west of the site) are also mapped for the State-endangered corn snake (*Elaphe guttata*) and the State-threatened barred owl (*Strix varia*), Cooper's hawk (*Accipiter cooperii*), and pine barrens treefrog (*Hyla andersonii*). Landscape Project mapping for the site and surrounding area is provided in Figure 2 and is consistent with the NHP response.

III. SPECIES HABITAT REQUIREMENTS

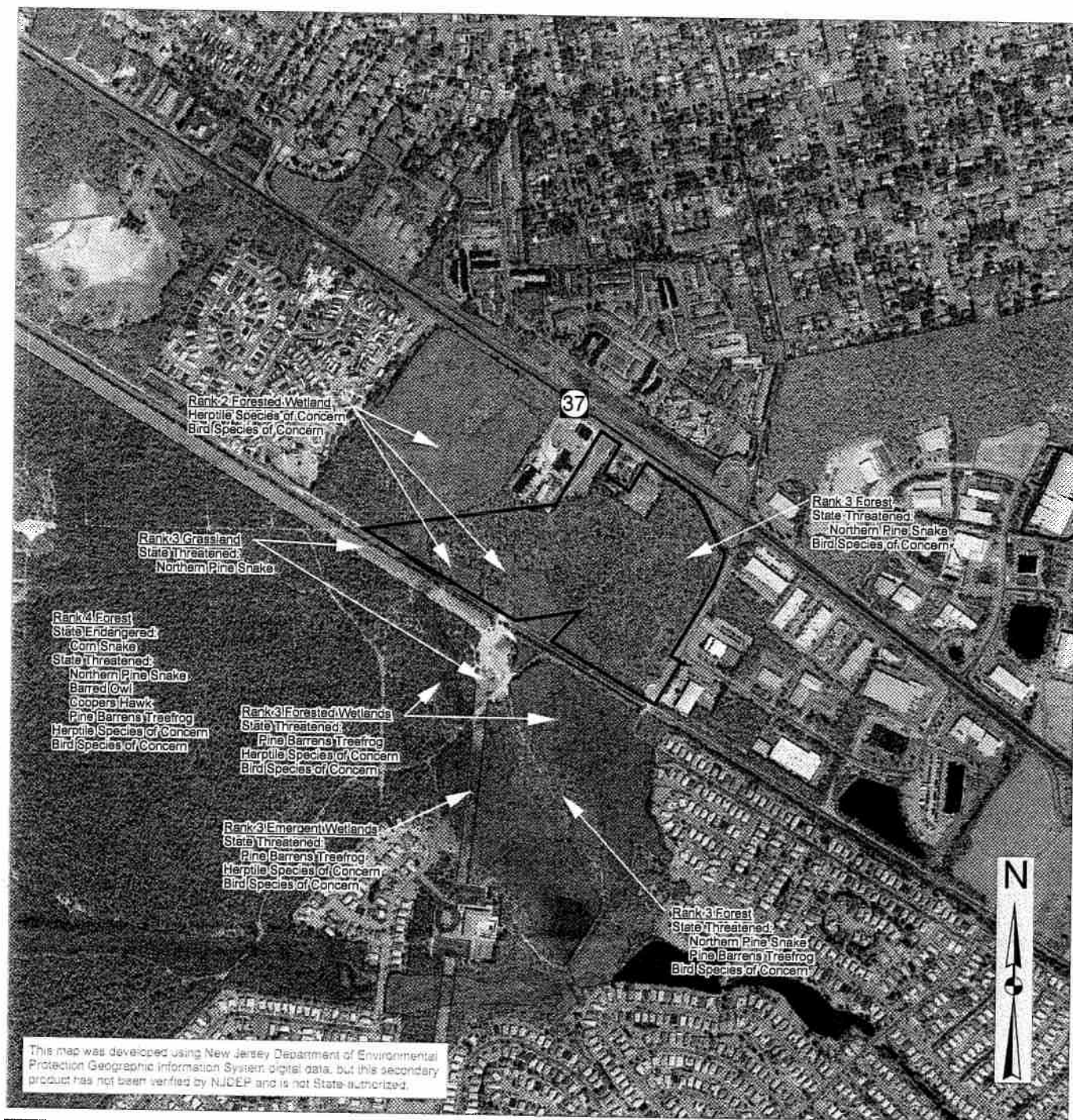
The following sections provide information on the distribution and habitat requirements of the species identified as occurring on or in the vicinity of the site by the NJDEP Landscape Project critical habitat maps.

A. Northern Pine Snake

Northern pine snake range in New Jersey is restricted to southern portions of the state within the Pine Barrens region (Zappalorti, 1998). However, within this area, the species is distributed widely, with numerous sightings in Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Ocean Counties (Ocean County Planning Board, 1982).

Northern pine snakes are constrictors that forage aboveground or in subterranean rodent burrows. Adult pine snakes feed on warm-blooded prey such as mice, voles, chipmunks, other small rodents, small cottontail rabbits, birds and their eggs. Young pine snakes feed on fence lizards and small rodents (Ocean County Planning Board, 1982; Zappalorti and Johnson, 1978; Zappalorti, 1998).

Northern pine snake is typically found in open, pine-oak forests, often near the edge of both man-made and natural openings in the forest. Vegetation that serves as important indicators of forage areas, nesting sites, and basking areas includes scarlet oak, black oak, blackjack oak, pitch pine, short-leaf pine, Virginia scrub pine, highbush blueberry, lowbush blueberry, black huckleberry, greenbrier, common hairgrass, bracken fern, fake heather, and Pennsylvania sedge. EcolSciences has found that pine snakes are opportunistic in their use of habitats. They have been observed within dense brushland, wetlands, and in open areas associated with common land disturbances in the Pine Barrens, such as sand roads, sand pits, and fire breaks. Other studies have found pine snakes near railroad rights-of-way and areas that have been lumbered. Studies



Approximate site boundary

Critical Habitat

Emergent Wetlands

RANK

- 1 - Suitable habitat
- 2 - Special concern
- 3 - State threatened
- 4 - State endangered
- 5 - Federal T and E

Forested Wetlands

RANK

- 1 - Suitable habitat
- 2 - Special concern
- 3 - State threatened
- 4 - State endangered
- 5 - Federal T and E

Forest

RANK

- 1 - Suitable habitat
- 2 - Special concern
- 3 - State threatened
- 4 - State endangered
- 5 - Federal T and E

Grassland

RANK

- 1 - Suitable habitat
- 2 - Special concern
- 3 - State threatened
- 4 - State endangered
- 5 - Federal T and E

0 1,000 2,000 Feet

FIGURE 2: LANDSCAPE PROJECT

Block 505, Lots 14 & 15
Township of Toms River
Block 44, Lots 2, 3, part of 4 & 5
Township of Manchester
Ocean County, New Jersey

Sources:

NJDEP, DFW, ENSP. 2008. New Jersey's Landscape Project (Version 2.1).
State of NJ, OIT. 2008. NJ 2007/08 High Resolution Orthophotography.

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: 11/1/10
F:\Jobs\05\EN05-071\GIS\2010_projects
VAFRA_1010\LP2_1.mxd

conducted by EcolSciences often located pine snakes within or near ecotones, the interface between natural or man-made clearings and woodland.

Studies conducted by EcolSciences and others have found that pine snakes generally require high, dry areas for nest construction and winter dens. Studies by others indicate that the preferred soil types for the excavation of nesting burrows are Lakehurst sand, 0-3 percent slopes, Lakewood sand 0-5 percent slopes, and less frequently Woodmansie sand, 0-5 percent slopes (Ocean County Planning Board, 1982), however, EcolSciences has also monitored pine snakes where such soil types are uncommon or nonexistent. In these circumstances, pine snakes have been associated with Downer soils or old, excavated pits and areas of fill. Female pine snakes construct a nest chamber for egg laying, either burrowing in the sand or excavating chambers under objects such as railroad ties or logs. They often nest communally, seeking open sunny areas at elevations above forty feet. Burger and Zappalorti (1986) reported that clearings used for nesting by pine snakes were usually man-made. The man-made clearings seem to be crucial to the nesting ecology of pine snakes and may have improved nesting habitat for the snakes (Burger and Zappalorti, 1986). Plant species associated with pine snake nesting sites include blackjack oak, pitch pine, early lowbush blueberry, fake heather, and Pennsylvania sedge.

Pine snakes hibernate through the winter in communal or non-communal hibernacula consisting of stump holes, abandoned mammal burrows, and slash mounds (e.g., piles of cut trees, logs and stumps with a covering of sand) (Ocean County Planning Board, 1982; Zappalorti and Johnson, 1978; Zappalorti, 1998). During our numerous field studies, EcolSciences' staff have observed pine snakes using communal and non-communal dens within these habitats, including stump holes, abandoned mammal burrows, and old mounds of soil, lumber, and other debris.

B. Corn Snake

In New Jersey, the corn snake has a restricted distribution in the Pinelands, with historical sightings in Atlantic, Burlington, Ocean, and Cumberland counties (Ocean County Planning Board, 1982). They are currently known only from Burlington, Cumberland, and Ocean counties. None have been seen or confirmed in Atlantic County since 1938, and periodic surveys of suitable habitat in the county have been conducted without success (Zappalorti, 1998).

Corn snakes are constrictors that primarily forage in subterranean rodent burrows. Adult corn snakes feed on warm-blooded prey such as mice, voles, shrews, chipmunks, other small rodents, birds and their eggs. Hatchling corn snakes feed on soft-bodied insect larvae, small fence lizards, ground skinks, frogs, salamanders, and newborn rodents (Ocean County Planning Board, 1982; Zappalorti and Merli, 1980; Zappalorti, 1998).

The corn snake appears to prefer dry, terrestrial habitats and is found in pine-oak and oak-pine forests, open deciduous woodlands, rocky ledges, agricultural areas, abandoned fields, trash dumps, and old buildings. Vegetation that serves as important indicators of forage areas, nesting sites, and basking areas includes scarlet oak, black oak, blackjack oak, pitch pine, short-leaf pine, Virginia scrub pine, highbush blueberry, lowbush blueberry, greenbrier, common hairgrass, bracken fern, beach heather, and Pennsylvania sedge. Common land disturbances in the Pinelands, such as sand roads, fire breaks, railroad rights-of-way, lumbering, spoil banks from borrow pits or excavation, land clearing/air fields, and abandoned buildings have been found to support corn snakes (Ocean County Planning Board, 1982; Zappalorti and Merli, 1980; Zappalorti, 1998). Ecotones are also important areas, as corn snakes seem to show a preference for the "edge effect" (Zappalorti and Merli, 1980).

Corn snakes nest beneath logs, in stump holes, in ground cavities filled with leaf litter, and particularly in or under cavities associated with old railroad ties. Plant species associated with corn snake nesting sites include blackjack oak, pitch pine, highbush blueberry, greenbrier, bracken fern, beach heather, and Pennsylvania sedge (Ocean County Planning Board, 1982). They hibernate through the winter, below the frost line, in communal or non-communal hibernacula consisting of stump holes, abandoned mammal burrows, and slash mounds (e.g., piles of cut trees, logs and stumps with a covering of sand) (Zappalorti, 1979).

The corn snake requires generally high, dry areas for nest construction, egg-laying and hatching, basking, and foraging. Although sightings have been made at about 35 feet in elevation, corn snakes indicate a preference for areas with elevations ranging from 50-100 feet. Nesting activities are reported to be restricted to elevations greater than 50 feet (Zappalorti and Johnson, 1982). Studies indicate that corn snakes are restricted to Lakehurst and Lakewood sands (Ocean County Planning Board, 1982).

C. Pine Barrens Treefrog

In New Jersey, pine barrens treefrogs occur throughout the Pine Barrens in Ocean, Burlington, and Atlantic Counties. Smaller populations exist in Monmouth, Camden, Gloucester, Cumberland, and Cape May Counties. Historically, the species was present in Middlesex County (New Jersey State Museum, 1906) but is now believed to be extirpated from that county (NJDEP, 2008).

Pine barrens treefrog breeding habitat includes seepage bogs, cranberry bogs, small and ephemeral ponds, streams, Atlantic white cedar swamps, pitch pine lowlands and, occasionally,

disturbed wet habitats such as power and gas rights-of-way, borrow pits, and vehicle ruts (NJDEP, 2002). In many cases, but not all, pine barrens treefrog breeds in inundated habitats that dry up in mid-summer (Hulmes *et al.*, 1980). Plant species reported from Pine Barrens treefrog breeding sites include sphagnum moss, sundews, pitcher plants, orchids, Atlantic white cedar, pitch pine, mountain laurel, highbush blueberry, swamp azalea, sheep laurel, blackjack oak, sweetbay magnolia, greenbrier, maples, and sweet pepperbush. Based upon the literature, however, vegetative species structure, not composition, is one of the primary parameters determining the suitability of a wetland for colonization by the species. Freda and Morin (1984) have reported that the preferred pine barrens treefrog breeding habitat consists of open canopy, early successional shrub-herb bogs, seeps and sphagnum ponds that are influenced by fire and other disturbances that prevent the growth of trees and the aging of these habitats.

Another primary parameter determining the suitability of a wetland for colonization by pine barrens treefrog is water quality. While the Pine Barrens treefrog is generally restricted to clean water, low in nutrients and other dissolved ions, the water quality parameter that most clearly defines its distribution is pH. Pine barrens treefrogs are able to breed in water that is too acid for most other species of frogs. Although preferring to breed in water having a pH of 4.1 - 4.5 (NJDEP, 2008), the species is tolerant of pH as low as 3.7 (Freda and Morin, 1984; Freda and Dunson, 1986). A pH value less than 3.7 has been shown in laboratory experiments to significantly inhibit hatching success of the species, and pH values of 3.5 and below represent the lethal levels for frog embryos (Freda and Morin, 1984).

D. Barred Owl

The entire state is within the species range of the barred owl. The largest populations occur in the northern and southern parts of the State. Major populations occur along the Kittatinny Mountains in northwest New Jersey, within the Newark watershed in western Passaic County, within the Passaic River basin in Morris County, and in large swamp complexes in Cape May and Cumberland Counties (NJDEP, 2008).

Suitable barred owl habitats have been characterized as large tracts of hardwoods, softwoods, or mixed stands (Nicholls and Warner, 1972; Devereux and Mosher, 1984). Their home ranges typically include a combination of upland and wetland areas. Although some studies indicated an association between barred owl and water or forested wetland features (Bent, 1938), more detailed recent studies indicate that the species consistently uses suitable upland forested cover types more frequently than forested wetlands and lowlands (Nicholls and Warner, 1972; Fuller, 1979; Devereux and Mosher, 1984). Devereux and Mosher (1984) concluded that the relationship between barred owl and forested wetlands was a consequence of the mature vegetation left standing

associated with these habitats, and not a preference for forested wetlands. Forested wetlands are often inaccessible or too wet for timber harvesting: as a result, these sites often contain remnant stands of mature and old-growth forest. The large trees and mature nature of these forests provide suitable cover and nesting cavities for barred owl, thus attracting and supporting populations of the species.

In New Jersey, differences of habitat use by barred owls in the Coastal Plain and in the Highlands and Ridge and Valley physiographic provinces have been documented. In northern New Jersey, Bosakowski *et al.* (1987) reported preferential use of oak hardwood, northern hardwood and hemlock forests. The sightings all occurred within 100 meters (328 ft) of wetlands or waterbodies. Forest fragmentation has a negative influence on barred owl in northern New Jersey, with large, unbroken tracts of forest correlating with the known distribution of this species (Bosakowski, 1994). In southern New Jersey, barred owls inhabit Atlantic white cedar (*Chamaecyparis thyoides*) swamps, pitch pine (*Pinus rigida*) lowlands, and deciduous hardwood swamps (Laidig and Dobkin, 1992).

The U.S. Fish and Wildlife Service Habitat Suitability Index model for the barred owl is based upon characteristics required for breeding and summarizes the reproductive requirements for the species (Allen, 1987). Barred owl is a cavity-nesting species whose success requires an expansive forested area that contains large, mature and decaying trees that provide cavities suitable for security and reproduction. Nesting habitat in North America is described as mature wooded stands. Typical nesting trees are large (greater than 20 inches diameter) living or dead trees. Nesting cavities are generally found 9 meters (29 feet) or more above the ground. Nests have also been recorded in broken snags or in abandoned hawk nests (NJDEP, 1995). In New Jersey, Bosakowski *et al.* (1987) found three nests in large dead trees, including white oak, sugar maple, and black willow.

Nicholls and Warner (1972) used radio telemetry to determine that Minnesota barred owls used the following habitats, listed in order of preference: oak woods, mixed hardwoods and conifers, northern white cedar swamp, alder swamp, emergent marsh, and open field. Further analysis showed that the oak, mixed, and conifer forests were preferred over the other habitat classes listed. The oak woods featured little understory vegetation. The mixed and conifer stands also featured sparse understory vegetation. Other studies in northern areas (e.g., Michigan, Connecticut, New Hampshire, Virginia) have also confirmed barred owl use of similar habitat types (Smith, 1978; Elody, 1983; Hegdal and Colvin, 1988).

Published home ranges for the species are typically large, varying from 213 to 912 acres and from 677 to 1,256 acres in Minnesota (Nicholls and Warner, 1972; Fuller, 1979); from 291 to 697 acres in Michigan (Elody and Sloan, 1985); and, from 639 to 2,420 acres in Virginia (Hegdal and Colvin, 1988). Stokes notes an average territory size of approximately one square mile or 640 acres (Stokes, 1989).

E. Cooper's hawk

Cooper's hawk occurs statewide in New Jersey, except for within the most urbanized areas. Cooper's hawks are considered a partial migrant in New Jersey with the majority overwintering in the state and only the northernmost populations moving south in winter (Valent, 1997). At present, the State is considering delisting Cooper's hawk from the threatened species list due to a significant increase in the species' population.

Cooper's hawks inhabit a wide variety of woodland types and are somewhat tolerant of human disturbance and fragmentation. For nesting they favor extensive deciduous, coniferous and mixed forests, conifer plantations, and smaller woodlots (10-20 acres), and occasionally occur in suburban and urban habitats (Valent, 1997; Rosenfield and Bielefeldt, 1993). In northern New Jersey and other parts of the country, pine plantations appear to be favored nesting sites. The highest recorded densities have been recorded in this habitat in Wisconsin (Rosenfield et al, 1991; Wiggers and Kritz, 1991). In southern New Jersey, breeding habitats include large, remote red maple (*Acer rubrum*) or black gum (*Nyssa sylvatica*) swamps and, on occasion, Atlantic white cedar (*Chamaecyparis thyoides*) swamps. Within these sites, high-bush blueberry (*Vaccinium corymbosum*) and greenbrier (*Smilax rotundifolia*) typically dominate the shrub layer. Adjacent upland pine or mixed pine/oak forests provide an additional habitat buffer for nesting Cooper's hawks.

Forest edge habitat is an important component of their home range for breeding pairs and may serve as primary hunting sites (Valent, 1997; Rosenfield and Bielefeldt, 1993). Nest height averages 8-15 m (26-50 ft), the average diameter of the nest tree is 21-52 cm (8-20 in), and the average canopy closure is 64-95%. Their stick nests are generally built in a main crotch or on a horizontal limb against the trunk of a live tree, partly concealed and shaded by the canopy. They occasionally use the same nest but usually build a new nest in the same area (Valent, 1997; Rosenfield and Bielefeldt, 1993). In the breeding season, the home range is estimated at 400-1,800 ha (990-4,450 ac) (Rosenfield and Bielefeldt, 1993).

IV. 2005 PINE SNAKE INVESTIGATION

In 2005, EcolSciences was retained to conduct a survey for the State-threatened northern pine snake on the site. The survey was authorized via a NJDEP Scientific Collecting Permit (SC25108) and was carried out to demonstrate consistency with endangered and threatened species and critical habitat standards according to Coastal Zone Management Rules (N.J.A.C. 7:7E) as part of a CAFRA application for a proposed retail center. The pine snake survey involved a review of scientific literature pertaining to this species, review of the Landscape Project critical habitat mapping, mapping of potential pine snake habitat based on habitat delineation criteria devised by NJDEP ENSP, habitat analyses, and field survey. Results of this investigation were provided to NJDEP.

The presence/absence of pine snakes was determined by use of an NJDEP-approved trapping program that employed drift fences in combination with funnel traps from May through November 2005. Traps and drift fences were built to specifications outlined within the report entitled "A Standardized Protocol for Sampling Rare Snakes in the New Jersey Pinelands: Critical Habitat Assessment, Survey Techniques, and Trapping Methods (2nd Draft)" prepared by Herpetological Associates on behalf of the Pinelands Preservation Alliance. The survey used 40 traps and seven drift fences at a collective length of approximately 3,200 feet. Traps were active for two periods, from May 7 through July 15 and again from August 31 through November 2, for a total of 134 days. In addition, approximately 35 man-hours were spent conducting weekly grid searches of the on-site habitats beyond the limits of the silt fences.

Two adult male pine snakes, identified as "Dover 1" and "Dover 2", were captured on-site on May 31 and June 15, 2005, respectively. Both pine snakes were implanted with radio transmitters and subsequently released at their points of capture in June 2005. The snakes were monitored every other day through November 2005 until they retired to their winter dens. Throughout summer and fall 2005, telemetry indicated that Dover 1's range included pine-oak woods occurring both on and off site. Dover 1 eventually entered a den and overwintered in the northeastern portion of the site. Upon release, Dover 2 left the site and maintained a territory primarily within the vast Heritage Minerals tract to the west. Dover 2 did not return to the site during the remainder of the 2005 survey season and overwintered at a bluff overlooking the long man-made pond on the Heritage Minerals tract, approximately one mile west of the site.

Both pine snakes were tracked on or in close proximity to developed areas. On August 3 and 5, Dover 1 was tracked to the front yard of a residence on Bahamia Drive in Holiday City approximately 1,400 feet southeast of the site. On July 11, Dover 2 was found in a clearing within

50 feet of a residence on Costa Mesa Drive, approximately 1,400 feet south of the site. From late July through mid-August, Dover 2's position was triangulated amid several residences located between Alexander Avenue and Bone Hill Road, south of the Conrail ROW, and approximately 1.25 miles northwest of the site.

In addition to the aforementioned pine snake observations, the pine snake field study provided the opportunity to observe other species of wildlife occurring on or near the site. The traps captured a total of 14 vertebrate species including 6 reptiles (5 snakes, 1 lizard), 2 amphibians, and 6 mammals. Observations included: northern pine snake, northern black racer, eastern hognose snake, southern ringneck snake, northern red-bellied snake, green frog, Fowler's toad, eastern fence lizard, masked shrew, short-tailed shrew, white-footed mouse, pine vole, eastern chipmunk, and opossum. During the duration of EcolSciences' field studies, no additional State-listed wildlife species were captured in traps or observed on the site, however, incidental observations by EcolSciences' staff did confirm the presence of pine barrens treefrog and a nesting pair of Cooper's hawks within the Landscape Project-mapped habitats located off-site.

V. ASSESSMENT OF IMPACT

The NHP and Landscape Project Version 2.1 indicate that one northern pine snake record occurs within the 110-acre forest polygon partially occupied by the site and that records of several threatened or endangered species (northern pine snake, corn snake, pine barrens treefrog, barred owl, and Cooper's hawk) occur within nearby forest polygons mapped south and west of the site. EcolSciences' 2005 field investigation confirmed the presence of two northern pine snakes on the site. Also, incidental observations by EcolSciences' staff confirmed the presence of pine barrens treefrog and a nesting pair of Cooper's hawks within Landscape Project-mapped habitats located off-site. This chapter of the report addresses the potential effect the proposed development will have on State-listed species and their mapped habitats identified in the vicinity by the NHP and Landscape Project.

A. Northern Pine Snake

The 43±acre project site is located within an 110±acre forest polygon mapped by the Landscape Project as containing one pine snake record (Landscape Project Version 2.1 does not yet reflect the addition of EcolSciences' two observations in 2005). However, the site occurs at the extreme northeastern edge of a vast area of mapped pine snake habitat. Landscape Project indicates a transmission line ROW southwest of the site and adjacent to the Conrail ROW mapped as grasslands with six pine snake records. A 7,025-acre forest polygon with 34 pine snake records occurs opposite the ROW and is bounded by the Conrail ROW to the north, Route 70 to the west, an

abandoned Penn Central railway ROW to the south and developed portions of Toms River Township to the east. The old Penn Central ROW is all that separates the 7,025-acre polygon from another 3,546-acre forest polygon with 46 pine snake records that extends southward to County Route 530. An additional 21,741±acre forest polygon with 36 pine snake records is located west of Route 70 in Manchester Township. Approximately 7,500 acres of these primarily forested areas are already protected as part of the Crossley Preserve (2,948 acres), Manchester Wildlife Management Area (3,362 acres), and Whiting WMA (1,190 acres). An additional 6,140-acre (approximate) portion of the adjacent Heritage Minerals tract will be preserved and will raise the total area of local open space noted here to approximately 13,640 acres.

The Conrail ROW separates the site from a large block of pine snake habitat located to the southwest. According to NJDEP Division of Fish and Wildlife's Species-Based Patch (SBP) pine snake habitat model (DFW, 2009), the area southwest of the site is part of a contiguous 10939-acre (17.1-square mile) SBP patch bound by a Conrail ROW to the north, State Highway 70 to the west, County Route 530 to the south, and the Garden State Parkway to the east. Another 4,428-acre (15.6-square mile) SBP patch occurs west of State Highway 70 and is bound by County Route 571 to the northeast, County Route 547 to the east, State Highway 70 to the south, and County Route 539 to the west.

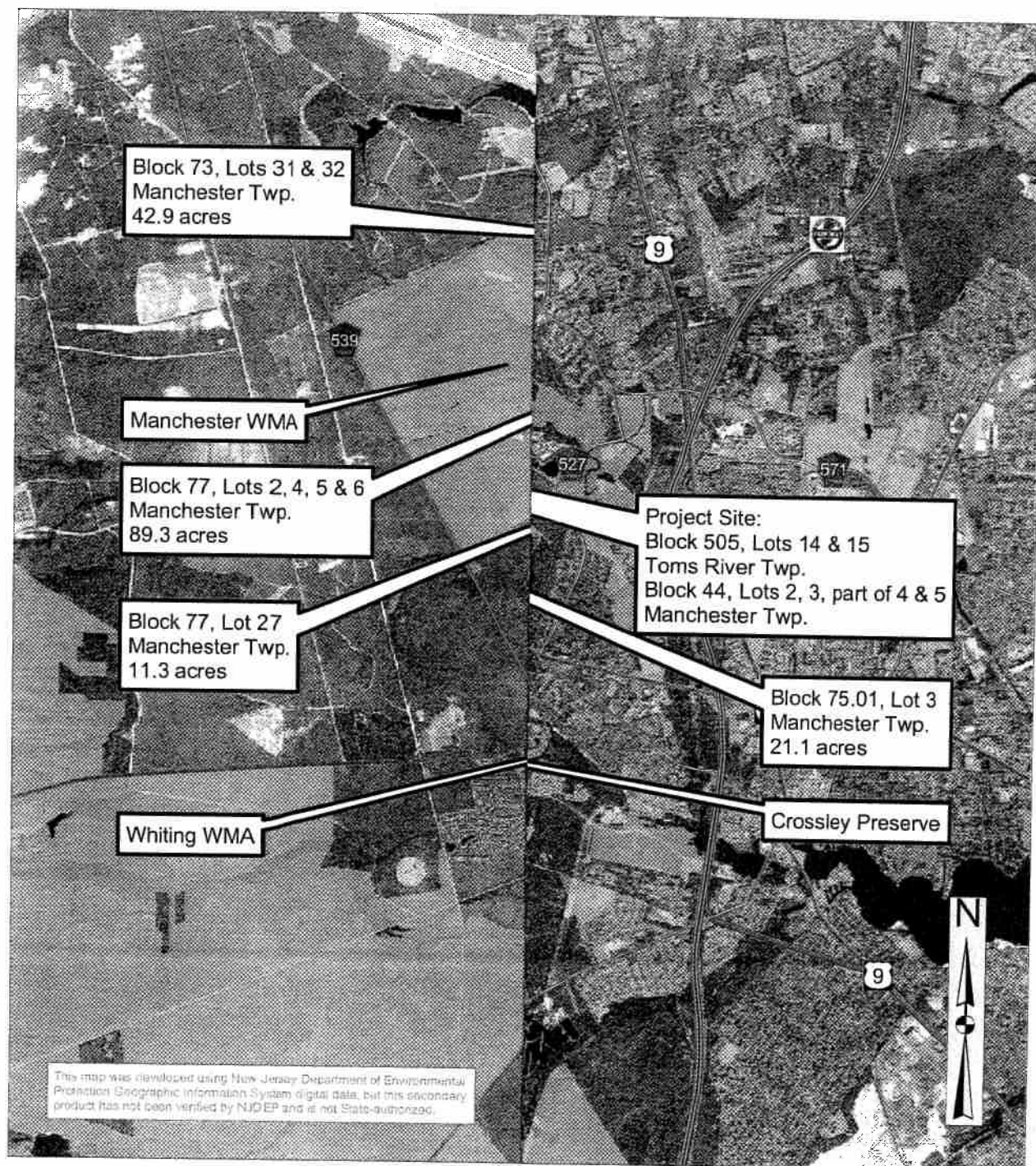
The site is partially bounded by wetlands and a Conrail railroad ROW to the southwest, commercial development to the northwest, State Highway 37 to the north, and Northampton Boulevard to the east. There is significant commercial development east of the site opposite Northampton Boulevard, and an extensive residential development lies southeast of the site opposite the Conrail ROW. The proposed development will be constructed within areas that are currently vegetated and generally characterized by pitch pine/oak forested uplands upon a substrate of Lakehurst and Lakewood sands. The majority of this vegetated community is valued as pine snake habitat according to NJDEP Division of Fish and Wildlife's Species-Based Patch (SBP) pine snake habitat model (DFW, 2009). Also, pine snake occurrences are often associated with Lakehurst and Lakewood sands. Site plan activities will impact this pine snake habitat. However, because the site plan proposes the development of only 14.9± acres of impervious coverage of the 43±acre site, and because the site is located in an outlying area of the mapped pine snake habitat, the project's relative impact on the locally available pine snake habitat is expected to be negligible.

The proposed project will result in minor impacts to an on-site isolated wetland located in the southern portion of the site. These on-site wetland impacts will be compensated for via the construction of a new on-site wetland at a ratio of 2:1 (see Wetland Mitigation Plan). The proposed activities will not result in any permanent impacts to the overall hydrology of the site or to adjacent

areas (see Stormwater Report). Any potential temporary adverse effects (such as erosion or sedimentation) to on-site wetlands and waters during construction activities will be minimized through strict adherence to the Soil Erosion and Sediment Control Plan, as approved by the Ocean County Soil Conservation District. In addition, according to DFW's SBP mapping methodology, much of the on-site wetland habitats are not valued as pine snake vegetative cover (DFW, 2009). Northern pine snakes generally require high, dry areas for nest construction, egg-laying and hatching, basking, and foraging. While they occasionally forage in lower elevations, they select only high, dry ground for nesting and hibernation (Zappalorti and Johnson, 1982). Thus, site plan activities occurring within wetlands will not adversely impact critical habitats for northern pine snake.

The proposed project is not expected to result in adverse impacts to populations of pine snake due to competitor, parasite, or predator species. The site is currently located near extensive existing commercial and residential development. Unimproved roads along and through the property are currently subject to unauthorized use of off-road vehicles and the dumping of household trash and construction debris. As such, the proposed activities are not anticipated to introduce new vectors of parasite transmission, competition, or predation to the area. In addition, EcolSciences has conducted numerous studies on pine snakes occurring in close proximity to human development. Many of these studies have involved the use of radio telemetry equipment, allowing EcolSciences to document the daily movements of individual pine snakes. At least 31 pine snakes have been monitored in this manner by EcolSciences. Based upon these direct field observations, EcolSciences is confident that the proposed development is typical of what pine snake populations elsewhere in the region are likely to encounter, and thus no unusual competitor, parasite, or predator interactions will result from the proposed activities.

In order to ensure that the proposed development does not adversely impact endangered or threatened wildlife species, the Applicant is proposing the preservation of 20.9 acres on-site and also the purchase and preservation of approximately 192 acres of off-site open space containing Landscape Project-mapped habitat for pine snake and other endangered and threatened species. The preserved on-site and off-site land provide key links to thousands of acres of protected land as part of Manchester WMA and future preserved space in the Heritage Minerals tract (Figure 3). In addition, numerous on-site and off-site habitat enhancement and preservation initiatives are proposed that will provide permanent benefits to the local pine snake population and minimize the human disturbance to their habitats. On-site initiatives include a significantly modified and reduced site plan, preservation of the on-site pine snake hibernaculum, preservation of a wildlife corridor linking on-site habitats to the off-site habitats, construction of a 3,319-foot long, 4-foot high snake barrier with a minimum 4" lip to minimize human-snake conflicts, selective tree thinning, blocked





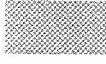

-  Heritage Minerals (preserved portion)
-  Other preserved open space
-  Applicant's preservation parcels
-  Approximate site boundary

FIGURE 3: OFF-SITE PRESERVATION AREAS

Relative to: Block 505, Lots 14 & 15
Township of Toms River
Block 44, Lots 2, 3, part of 4 & 5
Township of Manchester
Ocean County, New Jersey

Sources: State of NJ, OIT, 2003. NJ 2002 High Resolution Orthophotography.

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Date: 11/1/10

access, and field sweeps prior to major construction activities. Proposed measures on the mitigation parcels include the construction of artificial hibernacula, selective stand thinning, the creation of upland forest clearings for nesting, and scarifying the ground. The proposed mitigation measures are the result of input from both the NJDEP Endangered and Nongame Species Program and EcolSciences following a joint inspection of the sites. Each of the modifications demonstrates a concerted effort by the Applicant to actively address pine snake issues and to minimize on-site impacts to pine snake habitat. Details on each of these initiatives are provided below:

1. Reduced site plan

As compared to the previously proposed development plan submitted as part of the prior CAFRA Permit application, the current proposed development plan includes significant revisions resulting in a greatly diminished development footprint. The original site plan sought approval for a 208,433 SF store, a 19,554 SF garden center, and 1,198 parking spaces. The current plan requests approval for a 189,797 SF store (a 9% reduction), a 5,703 SF garden center (a 71% reduction), and 833 parking spaces (a 30% reduction). Overall impervious cover associated with the site plan has been reduced by 7.42 acres (a 33% reduction). In addition, the design of the northern access road has been modified substantially in order to follow the perimeter of the site and avoid, to the maximum extent practicable, undeveloped forest, in particular the area surrounding the confirmed winter hibernaculum (see below). Finally, the proposed footprint of Stormwater Basin #1, located in the center of the site, has been reduced to 1.56± acres and will be designed as a dry basin with a sand bottom and sides planted with native grasses so as to remain available for foraging by pine snakes.

2. Preservation of the on-site pine snake hibernaculum

A portion of the formerly proposed activities occurred within an area later determined to be a pine snake winter hibernaculum. Prior to the hibernaculum's discovery in 2005, previously proposed site plan activities were located within this area and would have resulted in the inadvertent destruction of this resource. As a result of the documented on-site hibernaculum, the Applicant has re-designed the northern portion the project and re-routed the access road to follow the site's northern boundary in order to circumvent this area of critical habitat. In addition, the Applicant proposes the creation of a permanently preserved 50-meter radius open space buffer surrounding the hibernaculum in order to further minimize human impacts.

3. Wildlife corridor

To provide freedom of movement for wildlife, including northern pine snake, the site plan proposes permanent preservation of 20.9±acres of on-site forested/vegetated open space to serve as a corridor linking the on-site habitats with the thousands of acres of other preserved habitats located

directly across the Conrail railroad ROW. This corridor will consist of undeveloped lands west and northwest of the development footprint and will extend to the northwestern and southwestern property boundaries. The Applicant has also purchased Block 75.01, Lot 3, a 21.1-acre parcel of undeveloped land immediately southwest of the site opposite the railroad ROW as part of this corridor. Block 75.01, Lot 3 is mapped as critical habitat according to Landscape Project 2.1 for pine snake and several other State-listed species. The Applicant intends to preserve this parcel in an undeveloped state for wildlife habitat. This corridor links the on-site habitat to Block 75.01, Lot 3, which connects to areas of the Heritage Minerals tract that will be preserved as open space. Within this preserved corridor, the Applicant proposes additional habitat enhancement initiatives, such as selective tree thinning on the development parcel and construction of three artificial hibernacula and selective tree thinning on Block 75.01, Lot 3. Additional parcels proposed for protection as part of this application will also serve to provide wildlife corridors for pine snake and other rare species as well as migratory birds by expanding areas within and adjacent to larger protected lands.

4. Snake barrier wall

The site plan includes the construction of a 3,319 -foot long, 4-foot high wall designed to act as a wildlife barrier between the undeveloped areas and the buildings, access road, paved parking areas, and nearby public roadways. The wall is proposed to allow northern pine snakes unimpeded access to contiguous foraging areas and to an on-site winter den while preventing them from inadvertently utilizing or becoming trapped within the developed portions of the site, thus minimizing human-snake conflicts such as roadkills. The wall begins as a retaining wall in the southern portion of the site, proceeds northeast along the boundary of Stormwater Basin #1 and the developed parking areas, turns east to proceed around the pine snake hibernaculum buffer, then turns west along the boundary of the proposed northern access road before ending along the northwestern property boundary of Lot 2 within the preserved wildlife corridor.

EcolSciences' literature review and extensive pine snake trapping experience confirms the effectiveness of physical barriers at influencing pine snake movements. Typically referred to as drift fencing, vertical surfaces such as wire mesh and contractor silt fencing have been used routinely for decades to direct snakes and other ground-dwelling species (primarily herptiles) towards collection devices such as funnel traps, pitfalls, and cover boards. When properly deployed, drift fencing is high enough to limit the target species from easily climbing the barrier, thus forcing the animal to proceed in a direction parallel to it. Current New Jersey trapping protocols for drift fence arrays designed for large snakes, including northern pine snake, require fencing that is approximately 32 inches above ground level with a lower end that is buried at least 4 inches deep to prevent specimens from burrowing underneath. Using this configuration,

EcolSciences has trapped numerous northern pine snakes and other species on many sites in southern New Jersey, including the project site.

In addition to trapping, drift fences have also been utilized in monitoring studies or as a mitigation technique along roadways and developments in order to prevent road mortality or to direct migrating snakes towards their hibernacula or foraging areas while avoiding human disturbance. Often, temporary or permanent drift fences are deployed in conjunction with culverts placed under the roadway in order to prevent overland movement across roads while still allowing access to habitats on the other side. The success of these drift fence projects is often evidenced by improved trapping results, target-species use of installed culverts, and the directing of the target species away from exclusionary zones. Results appear to be influenced by the height, length, and upkeep of the fencing system or the size and complexity of the property on which they are deployed. The proposed plan utilizes a masonry wall "drift fence" to contain pine snakes within undeveloped areas and to direct them away from roads and development. The proposed wall will be approximately 50 percent taller than the recommended height of trapline drift fencing and will contain an overhanging cap that will further prevent snakes from scaling the wall (see site plan detail sheet). In addition, because it will be a permanently installed structure with no potential for tears, EcolSciences is confident that the wall, as proposed, will equal or surpass the effectiveness of temporary drift fencing at directing the snakes away from problem areas and that it will require less ongoing maintenance to remain effective.

5. Field sweeps

The site plan proposes temporary silt fencing around all proposed disturbances. The Applicant proposes field sweeps of the fenced development by qualified environmental professionals who have experience with northern pine snake prior to any phases of construction involving the potential for adverse impacts (such as clearing, grading, or paving) to individual herptile specimens, including pine snake. Subject to NJDEP approval, it is the Applicant's intention that any herptile species that are encountered, including northern pine snake, would be captured, recorded, and immediately released within the preserved open space (wildlife corridor) located outside of the fenced areas. In addition, construction and site personnel will be given instructions, (including photos of listed wildlife species) on steps to take if pine snakes or other listed wildlife species are encountered on the construction site during their activities. Personnel will be required to cease work within the immediate area pending notification to the Applicant and/or their environmental contractor. If the specimen is still present upon their arrival, the Applicant's environmental contractor will capture, record, and release it into the preserved forest area or, if the specimen's presence is undetermined, the environmental contractor will conduct a field sweep of the area to confirm that the specimen is no longer present before nearby site work may continue.

6. Off-site mitigation parcels

To mitigate for impacts to documented northern pine snake habitat, the Applicant's proposal includes the purchase and preservation as open space of several properties in the Township of Manchester totaling 192 acres that contain suitable pine snake habitat and/or habitat for numerous other threatened and endangered species and that will provide additional protected land adjacent to and within the preserved lands of Manchester Wildlife Management Area and those portions of the Heritage Minerals tract that will be preserved (Figure 3). These proposed mitigation parcels are:

Block 75.01, Lot 3 – 21.1 acres

Block 77, Lots 2, 4, 5, & 6 – 89.3 acres

Block 77, Lot 27 - 11.3 acres

Block 73, Lots 31 & 32 – 42.9 acres

Block 73, Lot 21- 15.8 acres

Block 73, Lots 3 & 4 – 11.6 acres

In order to assess the parcels, EcolSciences reviewed the NJDEP Landscape Project (Version 2.1) mapping for any local records of northern pine snake (or other listed species) and the Division of Fish and Wildlife's Species-Based Patch (SBP) pine snake habitat model. All of the proposed mitigation parcels are part of extensive Landscape Project forest polygons with multiple pine snake records. Almost all of Block 75.01, Lot 3, located immediately southwest of the project site, is part of a contiguous 10,939-acre (17.1-square mile) SBP patch bound by a Conrail ROW to the north, State Highway 70 to the west, County Route 530 to the south, and the Garden State Parkway to the east. Portions of the remaining mitigation parcels are all part of a 4,428-acre (15.6-square mile) SBP patch bound by County Route 571 to the northeast, County Route 647 to the east, State Highway 70 to the south, and County Route 539 to the west.

A discussion of each parcel is provided below:

Block 75.01, Lot 3:

This 21.1-acre parcel is located approximately 1,500 feet southwest of State Highway 37 and west of Manchester Township's boundary with Toms River Township. It is bound to the north by a Conrail railroad ROW and to the west by a portion of the Heritage Minerals property that will be preserved as open space. Based on local threatened and endangered wildlife records, DFW's SBP habitat modeling, observations made during the 2005 trapping/telemetry study, and EcolSciences' recent field inspection, the 21.1-acre parcel provides habitat for the State-threatened northern pine snake. The parcel includes upland pine and pine/oak forests, sand roads, and a vegetated right-of-

way, and these areas provide the habitat characteristics preferred by northern pine snake. Because the parcel is adjacent to approximately 6,140 acres to be preserved as part of the Heritage Minerals Site settlement that is contiguous to preserved lands associated with Crossley Preserve and the Whiting Wildlife Management Area, the parcel also offers an excellent opportunity to protect additional contiguous pine snake habitat. Perhaps most importantly is that during EcolSciences' 2005 radio tracking studies for the proposed development site, northern pine snake was found to utilize this parcel. Telemetry data showed that one of the tracked snakes utilized the parcel on at least one occasion (June 24th), and both snakes utilized habitats in close proximity to the parcel. Because tracking was conducted only every other day, it is possible that both snakes made additional crossings of this parcel during their movements.

Block 77, Lots 2, 4, 5 and 6:

This 89.29-acre parcel is located on Horicon Road (Beckerville Road), approximately one-half mile northwest of State Highway 70. A portion of the Heritage Minerals tract that will be preserved is located adjacent to this parcel to the south and east. It occurs in the south-central portion of a 21,741±-acre (34±-square mile) Rank 4 forest polygon bounded by County Route 571 to the northeast, County Route 547 to the east, State Highway 70 to the south, County Route 539 to the west, and County Route 528 to the north. A portion of the parcel also occurs within a 396±-acre (0.62±-square mile) Rank 3 forested wetland polygon associated with Old Hurricane Brook. The forest polygon is Rank 4 based on two records of the State-endangered red-shouldered hawk (*Buteo lineatus*). Other listed species within the forest polygon include 36 records of the State-threatened northern pine snake, 15 records of the State-threatened pine barrens treefrog, 4 records of the State-threatened Cooper's hawk, and 22 records of the State-threatened barred owl. The forested wetland polygon is Rank 3 based on single records of the State-threatened barred owl and pine barrens treefrog. Other documented species in both polygons include bird and herptile species of special concern. The majority of the area, within Lots 4, 5, and 6, is characterized as a mixed grassland/shrubland community occupying the site of a former farmstead. Open areas are dominated by various herbs including switchgrass, broomsedge, grease grass, and orchard grass, while the shrublands and forest fringes are dominated by black cherry with scattered occurrences of pitch pine, eastern red cedar, black locust, red maple, black walnut, and bigtooth aspen. The southwest corner of Lot 6 and the majority of Lot 2 are characterized as coniferous or mixed forest dominated by pitch pine, scrub oak, black gum, red maple, sweet pepperbush, highbush blueberry, inkberry, and greenbrier. Wetlands have been previously delineated within large portions of the forested areas, however, some upland areas are found in the forests immediately adjacent to the former farmstead, as well as in the northeastern portion of Lot 2. Uplands adjacent to the farmstead are dominated by pitch pine, black cherry, and various oaks, while uplands at the northeastern portion of Lot 2 are dominated by pitch pine. Upland portions of the parcel are generally level, with

infrequent piles of concrete, dirt, wood or other debris remaining from the former farmstead. Several vehicle tracks or mowed access paths are located in the farmstead areas and several sand roads are located in the southwest and northeast corners of the parcel. No standing structures were observed during the field inspection. Direct evidence of the former cultivated fields, including fence lines and residual soil rows, is most evident in the northern portion of the parcel along Horicon Road. Within wetland portions of the parcel, several areas of standing water were noted. Some of these areas were natural depressions in the topography that were characterized by shallow water and dense shrub cover, while others were man-made linear drainage features that were cut through the wetlands and characterized by deeper waters.

The DFW's SBP pine snake habitat modeling indicates much of the forested portions of the site are valued as habitat for this species. According to the model, the absence of appropriate habitat over much of the central portion of the parcel can be attributed to the lack of proper land cover and suitable soils, however, EcolSciences has frequently observed pine snakes using sites similar in nature to this parcel. Because the parcel is adjacent to approximately 6,140 acres to be preserved as part of the Heritage Minerals Site settlement as well as preserved lands associated with Manchester Wildlife Management Area, the parcel also offers an excellent opportunity to protect additional contiguous pine snake habitat. The proximity of the parcel to large undisturbed forested areas with documented pine snake records suggests that a population of northern pine snake is found in the area and that pine snake may potentially utilize portions of the parcel. The parcel provides a variety of habitat types including upland forests, upland successional fields, and forested wetlands. While the wetlands are unlikely to be heavily utilized by pine snake, the upland forests in the southwest and northeast portions of the parcel provide suitable habitat and the successional areas adjacent to the forests provide potentially suitable ancillary foraging habitat. These ancillary habitats, the late successional fields and early successional grasslands associated with the former farmstead, are likely to contain large populations of rodents and birds and thus may potentially provide seasonal foraging opportunities for any locally present pine snake population.

It is important to note that during EcolSciences' field investigation, only limited concrete rubble, soil piles, wood or other debris was observed within this parcel. These types of structural habitat components are often utilized by pine snake for resting, nesting or for use as hibernacula and, when natural soils are not ideal for burrowing, their absence may limit the utilization of the parcel by this species. These piles should remain in the event of any future enhancements. Because the soils in the western two thirds of the parcel are not the preferred "sugar" sand units such as Lakehurst and Lakewood soils types, it is likely that the proposed pine snake habitat enhancement measures would improve existing habitats for this species.

Block 77, Lot 27:

This 11.3-acre parcel is located on the east side of Beckerville Road, north of its intersection with State Highway 70. Portions of Manchester Wildlife Management Area and Heritage Minerals open space border this parcel to the north and south, respectively. The majority of the surveyed area is characterized as uplands, although wetlands associated with South Hurricane Branch and its tributaries are also located on and adjacent to this lot. Within the upland area, the community is dominated by pitch pine, scrub oak, black huckleberry, lowbush blueberry, inkberry, bearberry, and teaberry. Much of the central portion of the lot consists of exposed sandy barrens. The lot is generally level to gently sloping. Several vehicle tracks and paths are located in the area, primarily north of and in the eastern portions of Lot 27. Infrequent piles of wood or construction debris are located at several locations along these paths, and several elevated wooden hunting stands were observed within forested areas. The piles here could provide refuge for snakes.

Landscape Project (Version 2.1) mapping for this parcel and surrounding area indicates forest and forested wetland critical habitat polygons overlap the site. The site occurs within the same Landscape Project polygons as the Block 77, Lots 2, 4, 5, and 6 that is also offered as mitigation and is located in the southern part of a 21,741±-acre (34±-square mile) Rank 4 forest polygon bounded by County Route 571 to the northeast, County Route 547 to the east, State Highway 70 to the south, County Route 539 to the west, and County Route 528 to the north. A portion of the site also occurs within a 396±-acre (0.62±-square mile) Rank 3 forested wetland polygon associated with Hurricane Brook. The Rank 4 forest polygon is based on two records of the State-endangered red-shouldered hawk (*Buteo lineatus*). Other listed species within the forest polygon include 36 records of the State-threatened northern pine snake, 15 records of the State-threatened Pine Barrens treefrog (*Hyla andersonii*), 4 records of the State-threatened Cooper's hawk (*Accipiter cooperii*), and 22 records of the State-threatened barred owl (*Strix varia*). The Rank 3 forested wetland polygon is based on single records of the State-threatened barred owl and pine barrens treefrog. Other documented species in both polygons include bird and herptile species of special concern.

According to the DFW SBP pine snake habitat model, the uplands of Lot 27 are valued as pine snake habitat. The absence of appropriate habitat within the easternmost portion of the Lot 27 (the portion containing wetlands) can be attributed to the lack of ideal land cover. Although such wetland areas are not valued for pine snake in the DFW model, please note that EcolSciences has, on occasion, observed pine snakes using wetland habitats on sites that are located within larger areas comprising suitable habitat, thus the presence of wetlands does not in and of itself preclude some level of use by pine snakes.

The site is located within a large and relatively undisturbed forested area with numerous documented pine snake records, confirming that a population of northern pine snake is found in the area and suggesting that pine snake are likely to utilize portions of the site. The site provides a variety of habitat types including upland forests and forested wetlands, as well as man-made sand roads and former clearings. During EcolSciences field investigation, very little man-made debris or evidence of artificial soil movement (piles) was observed. Such structural habitat components are often utilized by pine snake for resting, nesting or for use as hibernacula and, when natural soils are not ideal for burrowing, their absence may limit the utilization of the site by this species. However, because the soils across the majority of these lots are the preferred “sugar” sand units such as Lakehurst and Lakewood soils types, it is likely that natural denning and nesting opportunities are plentiful and that constructed pine snake habitat enhancement measures including the creation of soil piles, buried woody debris, and hibernacula are not required to improve the existing site conditions for this species, rather, the parcel may benefit more broadly from vegetative management such as selective tree thinning to create and maintain a mosaic of open and wooded areas.

EcolSciences' site inspection and literature review confirms the presence of suitable habitats for the State-threatened northern pine snake, barred owl, Cooper's Hawk, and pine barrens treefrog and the State-endangered red-shouldered hawk and potentially for the State-endangered corn snake and timber rattlesnake on and adjacent to the subject property. EcolSciences' site inspection also confirmed the presence of the State-endangered red-shouldered hawk and the State-threatened Cooper's hawk on or immediately adjacent to the this property.

Block 73, Lots 31 & 32

This 42.9-acre parcel is located between separated portions of the Manchester Wildlife Management Area. A portion of the Heritage Minerals tract that will be preserved is located adjacent to these lots to the north and south. The bulk of the acreage is characterized by forested wetlands associated with South Ruckels Branch and Blacks Branch. The wetlands along South Ruckels Branch are dominated by Atlantic white cedar while those along Black Branch are dominated by red maple. An upland fringe consists of a mixed forest with variable understory.

The parcel is part of the same Landscape Project mapped 34±-square mile forest polygon that coincides with Block 77, Lots 2, 4, 5, and 6 and Block 77, Lot 27 with multiple records of pine snake, pine barrens treefrog, red-shouldered hawk, Cooper's hawk, and barred owl. Barred owl and pine barrens tree frog also value the extensive forested wetlands mapped here. The DFW SBP pine snake habitat model values the upland portions of this parcel and the white cedar dominated wetlands.

Block 73, Lot 21

Block 73, Lot 21 is located approximately one mile east and downstream of the aforementioned Block 73, Lots 31 and 32 along South Ruckels Branch. As with the latter property, much of the central portion of this parcel consists of Atlantic white cedar and mixed wetlands associated with this waterbody. Pitch pine dominated forest characterizes the southern and northern portions of the parcel. Successional fields are located immediately east of the parcel. A portion of the Heritage Minerals tract that will be preserved borders this parcel to the north and west.

The Landscape Project maps Block 73, Lot 21 within the same forest and forested wetland polygons as Block 73, Lots 31 and 32 that are valued by pine snake, pine barrens treefrog, red-shouldered hawk, Cooper's hawk, and barred owl. The DFW SBP pine snake habitat model values the entire upland area of the site as well as the white cedar dominated wetlands.

Block 73, Lots 3 & 4

Block 73, Lots 3 and 4 are located east of and downstream of Block 73, Lots 21, 32, and 33 along Blacks Branch. This parcel is 350 feet west and upstream of Horicon Lake in Lakehurst Borough and 250 feet northwest of State Highway 70. A portion of the Heritage Minerals tract that will be preserved brackets the parcel to the north, west, and south. The entire parcel consists of wetlands (Atlantic white cedar wetlands, coniferous wooded wetlands, coniferous scrub-shrub wetlands, and mixed wooded wetlands).

The same Landscape Project forest and forested wetland polygons that coincide with Block 73, Lots 21, 32, and 33 also intersect Block 73, Lots 3 and 4. As such, the on-site habitat is valued for the same threatened and endangered species (pine snake, pine barrens treefrog, red-shouldered hawk, Cooper's hawk, and barred owl). The DFW SBP pine snake habitat model values the Atlantic white cedar wetlands, coniferous wooded wetlands, and coniferous scrub-shrub wetlands.

7. Habitat enhancements

The Applicant proposes numerous habitat enhancements on 20.9 acres on the project site that will be preserved and 180.4 acres associated with several mitigation parcels located in Manchester Township. An additional 11.6 acres (Block 73, Lots 3 and 4) will be purchased for preservation only. As previously noted, each of the mitigation parcels are located amid extensive areas mapped as pine snake habitat according to the Landscape Project and Species-Based Patch habitat model. Also, each of the parcels are located adjacent to vast areas of existing open space and, in the case of most of the Heritage Minerals tract, future open space. The enhancements are proposed to offset the loss of northern pine snake habitat on the site and provide lasting improvements that will benefit this and other species.

Several habitat enhancements have been discussed with DEP including the construction of artificial hibernacula (described in greater detail below), selective tree thinning, blocked access, the creation of upland forest clearings for nesting, and scarifying the ground. The table below indicates the enhancements proposed for the project site and proposed mitigation parcels.

Block, Lot	Proposed Enhancements
Project Site (Block 505, Lots 14 &15, Toms River Twp, Block 44, Lots 2, 3, part of 4 & 5, Manchester Twp)	Selective tree thinning, block trail access
Proposed mitigation (all Manchester Twp)	
Block 75.01, Lot 3	Selective tree thinning, create three forest openings, construct three artificial hibernacula
Block 73, Lots 31 & 32	Create two one-acre clearings in uplands
Block 73, Lot 21	Selective tree thinning and the creation of two one-acre clearings in uplands
Block 77, Lot 27	Selective tree thinning and the creation of two forest openings.
Block 77, Lots 2, 4, 5 & 6	Selective tree thinning, cut deciduous trees and replace with pines and native grasses, scarify one acre of ground, introduce 100 cubic yards of sand

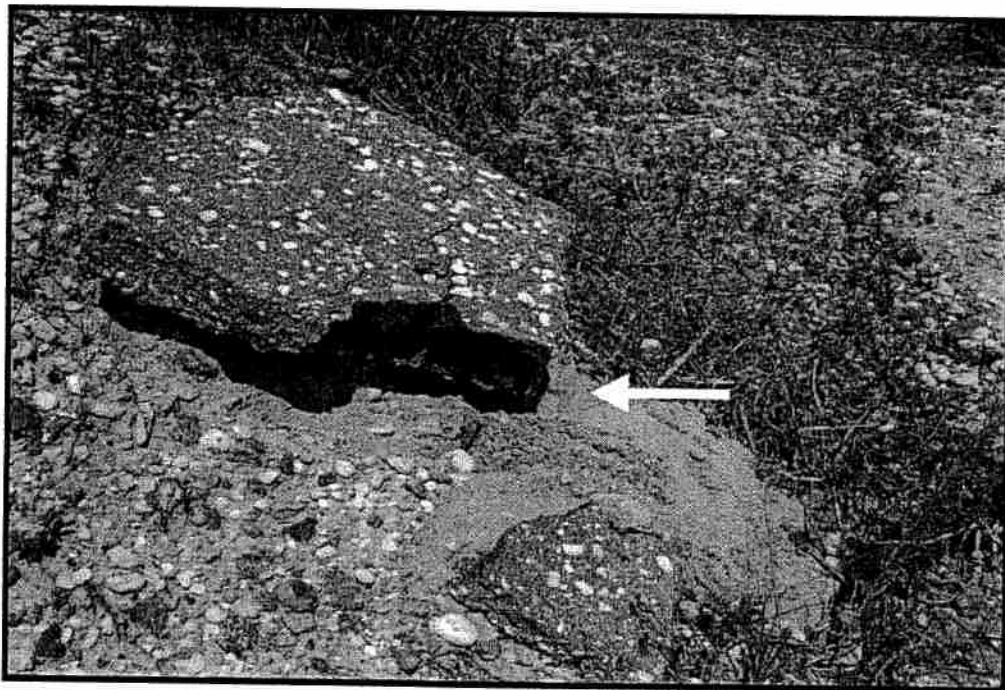
The proposed on-site artificial hibernacula will augment the available overwintering habitat available to northern pine snake. Pine snakes hibernate through the winter in communal or non-communal hibernacula consisting of stump holes, abandoned mammal burrows, and slash mounds (e.g., piles of cut trees, logs and stumps with a covering of sand) (Ocean County Planning Board, 1982; Zappalorti and Johnson, 1978; Zappalorti, 1998). Ecolsciences' staff have located numerous winter hibernacula during the course of its field studies, including one on the site, and have confirmed use of communal and non-communal dens within these habitats, including stump holes, abandoned mammal burrows, and old mounds of soil, lumber, and other debris. In addition, EcolSciences' staff has observed, on several occasions, female pine snakes using man-made habitats to construct nest chambers for egg laying (Figure 4). Finally, during EcolSciences' field studies, man-made habitats such as soil, stump, slash, timber, and other debris piles as well as discarded tires, other refuse, and old foundations were found and have been observed to be preferred foraging, resting, and basking habitat for northern pine snake.

The hibernacula will be constructed of soils and woody debris obtained from grading and clearing activities elsewhere on the site. Through the use of such natural materials, the constructed hibernacula will blend into their surroundings and will mimic, as closely as possible, both native

Figure 4 Pine Snake Nests



File photograph of a northern pine snake's nest site located by EcolSciences within a man-made soil pile.



File photograph of a northern pine snake's nest site located by EcolSciences within a man-made soil/asphalt debris pile.



EcolSciences, Inc.
Environmental Management and Regulatory Compliance

and altered habitats that pine snake are documented to use, and that have been observed by EcolSciences in use, for hibernation purposes. The constructed hibernacula will include the excavation, in upland areas, of a pit that will be backfilled with sandy soils, stumps, and other woody debris. At ground level, the pit will be covered loosely with logs and a mixture of stumps and other woody debris before being covered with additional sandy soils. Herbaceous grasses can be planted on the mound or they can be left bare for native herbs to colonize. As the natural materials weather from water, decay, insect, or animal activity, natural cavities and chambers will develop, at various depths, allowing pine snakes the ability to locate specific zones (based on temperature, humidity, position below the frost line, etc) within a hibernaculum in order to meet their overwintering needs. This design, based on EcolSciences' field observations of actual pine snake hibernacula and nesting areas as well as diagrams from other pine snake experts (Figure 5), is simple to construct and is low maintenance.

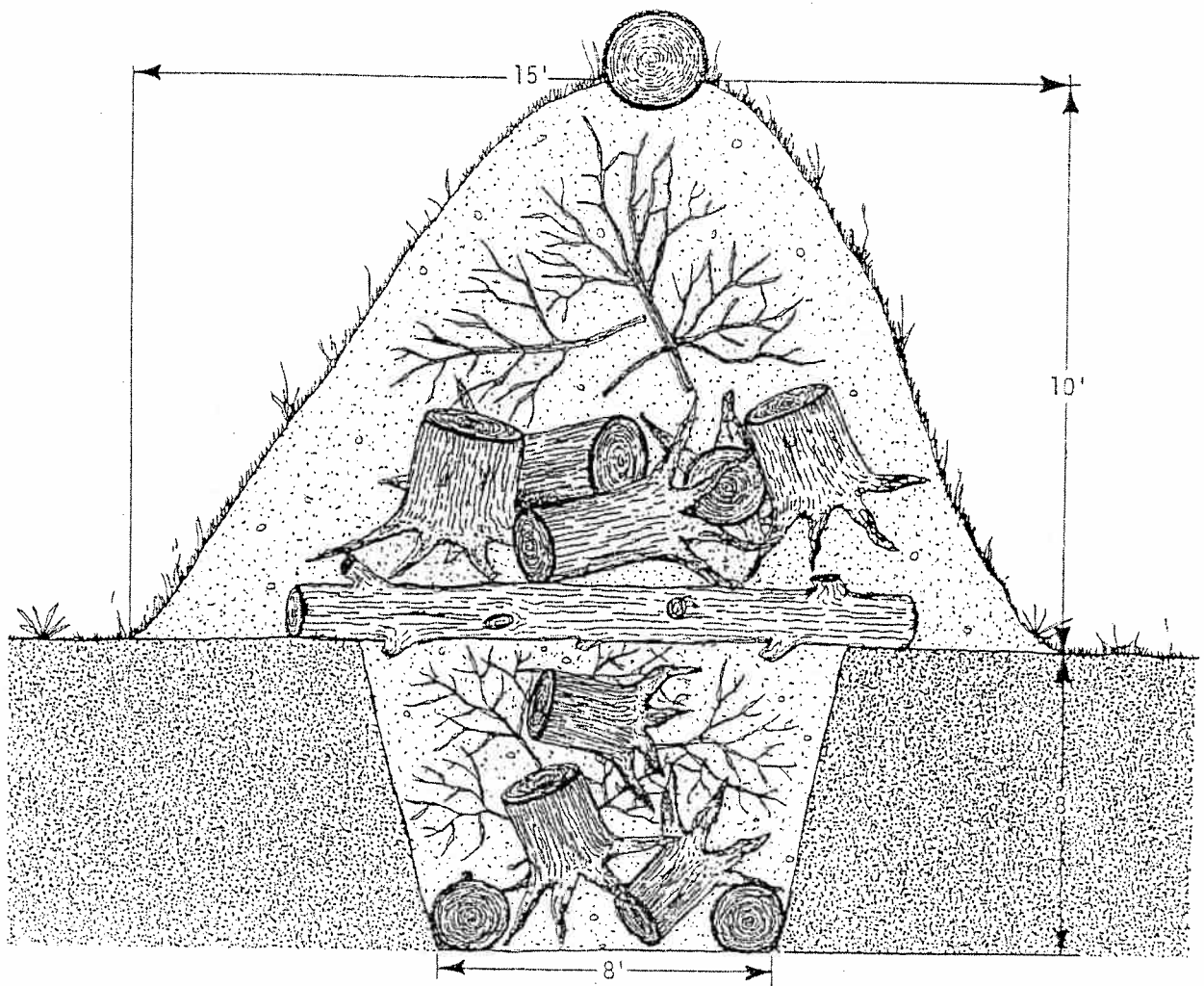
8. Compliance with DEP's HEM model

In order to provide appropriate compensation (no net loss of pine snake habitat), NJDEP ENSP has recently developed a draft conceptual Habitat Evaluation Method (HEM) for northern pine snakes that quantifies the habitat value of a given property through assessments conducted at both the desktop and in the field. In this circumstance, it was also used to determine the expected habitat value lost on-site following construction as well as the likely gains through enhancements on the preserved portion of the site and the proposed mitigation parcels. NJDEP and EcolSciences performed the HEM fieldwork together at the project site and mitigation parcels in August 2010 while conducting the desktop exercise independently. A meeting held later found the total habitat values that EcolSciences and NJDEP independently arrived at were remarkably similar for the project site and mitigation parcels, indicating that the draft HEM is a reliable means to assess pine snake habitat. The ensuing dialogue and recalculations concluded that with adequate enhancements (as noted in the previous section), the habitat values of the mitigation parcels and the preserved portion of the project site could be sufficiently raised to exceed the value lost on the project site as shown in the table below. The habitat value lost shown here is an average of EcolSciences' and DEP's mean Collective Point Scores multiplied by the area (in hectares).

Project Site : Block 505, Lots 14 &15, Toms River Twp, Block 44, Lots 2, 3, p/o 4 & 5, Manchester Twp	Habitat value lost = -51.8
Proposed mitigation (all Manchester Twp)	Enhancement habitat value
Project Site	+4.3
Block 75.01, Lot 3	+12.5
Block 73, Lots 31 & 32	+2.0
Block 73, Lot 21	+6.0
Block 77, Lot 27	+5.6
Block 77, Lots 2, 4, 5 & 6	+24.2
	Habitat value gained = +54.6

Figure 5 Cross Section of Man-Made Snake Hibernaculum

CROSS SECTION OF MAN-MADE SNAKE HIBERNACULUM



SOURCE: HERPETOLOGICAL ASSOCIATES, INC.

EcolSciences provides a full account of the HEM, as applied to the project site and mitigation parcels, in a separate report entitled *Analysis of Conceptual Habitat Evaluation Method for Northern Pine Snakes Applied to Block 505, Lots 14 and 15, Township of Toms River and Block 44, Lots 2, 3, 4 (part), and 5, Township of Manchester, and Associated Mitigation Parcels*. The report provides HEM methodology and results, figures illustrating DFW's SBP pine snake habitat model and soils for the project site and mitigation parcels, and a description of the proposed habitat enhancements with figures indicating their locations.

B. Corn Snake

The NHP and Landscape Project do not map any occurrences of corn snake on the site and no corn snakes were captured or observed on the site during EcolSciences' 2005 pine snake trapping study. Thus, the site plan activities do not occur within known corn snake habitats. The NHP and Landscape Project do list and map occurrences of corn snake in the extensive forest polygon located southwest of the site opposite the Conrail ROW. . Within New Jersey, corn snakes utilize upland habitats similar in structure to those inhabited by northern pine snake, with particular emphasis on openings or land disturbances such as railroad rights-of-way. Sand roads, fire breaks, lumbering, spoil banks from borrow pits or excavation, land clearing/air fields, and abandoned buildings have also been found to support corn snakes (Ocean County Planning Board, 1982; Zappalorti and Merli, 1980; Zappalorti, 1998). Ecotones are also important areas, as corn snakes seem to show a preference for the "edge effect" (Zappalorti and Merli, 1980). Many of the preferred habitat components are present within the documented off-site corn snake habitat, but because site plan activities occur wholly within areas north of the railroad right-of-way, no impact to these off-site corn snake habitats will occur.

Although no mapped corn snake habitat occurs on the site, the previously discussed off-site habitat enhancement and preservation initiatives targeted towards northern pine snake will also provide permanent benefits to the local corn snake population. These initiatives include the aforementioned purchase (and preservation as open space) of off-site properties including a 21.1-acre parcel containing mapped corn snake habitat, as well as the construction of artificial hibernacula. Because corn snake utilize similar habitats as northern pine snake, the preservation of these properties as open space will benefit both species. The enhancements are designed to provide specific structural habitat features that may be relatively scarce under natural conditions, and the addition of such will positively influence available foraging opportunities, hibernacula sites, and nesting areas with respect to corn snake.

Because the proposed project will only result in minor impacts to an on-site isolated wetland that is not corn snake habitat, it will not impact the hydrology of off-site areas (See Stormwater

Report). In addition, no activities are proposed within the on-site portions of the riparian zone or flood hazard area adjacent to the unnamed tributary of Sunken Branch, and any potential temporary adverse effects (such as erosion or sedimentation) to on-site or off-site wetlands and waters during construction activities will be avoided through strict adherence to the Soil Erosion and Sediment Control Plan, as approved by the Ocean County Conservation District. Thus, the project will not have an impact on the water quality or hydrology of any of the downstream waters and wetlands located on properties containing mapped corn snake habitat.

The proposed site plan activities are restricted to areas outside of documented corn snake habitat and are not expected to result in adverse impacts to populations of corn snake due to competitor, parasite, or predator species. The site is currently located near significant existing commercial and residential development. Unimproved roads along and through the property are currently subject to unauthorized use for recreation by off-road vehicles and for the dumping of household trash and construction debris. As such, the proposed activities are not anticipated to introduce new vectors of parasite transmission, competition, or predation to the area.

C. Pine Barrens Treefrog

The Letter of Interpretation (LOI) issued by NJDEP identified the on-site wetlands as intermediate resource value, indicating that they are not critical habitat for any State-listed wildlife species. The NHP and Landscape Project do not map any occurrences of pine barrens treefrog on the site, and no pine barrens treefrogs were captured or observed on the site during EcolSciences' 2005 pine snake trapping study. In addition, in correspondence dated March 21, 2005, Mr. Dave Golden of the ENSP agreed that the site is not a suitable habitat for wetland endangered and threatened species. Thus, the site plan activities do not occur within pine barrens treefrog habitats.

Because the proposed site plan activities are restricted to areas outside of documented pine barrens treefrog habitat, they are not expected to result in adverse impacts to populations of pine barrens treefrog due to competitor, parasite, or predator species. The site is currently located near significant existing commercial and residential development. Unimproved roads along and through the property are currently subject to unauthorized use for recreation by off-road vehicles and for the dumping of household trash and construction debris. As such, the proposed activities are not anticipated to introduce new vectors of parasite transmission, competition, or predation to the area.

The NHP and Landscape Project do list occurrences of pine barrens treefrog within several Rank 3 forested wetlands located across the Conrail railroad ROW south and southwest of the site. These mapped habitats are within wetlands that drain to or are adjacent to an unnamed tributary of Sunken Branch. Because the proposed project will only result in minor impacts to an on-site

isolated wetland that is not pine barrens treefrog habitat, it will not impact the hydrology of the off-site areas (See Stormwater Report). In addition, no activities are proposed within the on-site portions of the riparian zone or flood hazard area adjacent to the unnamed tributary of Sunken Branch, and any potential temporary adverse effects (such as erosion or sedimentation) to on-site or off-site wetlands and waters during construction activities will be avoided through strict adherence to the Soil Erosion and Sediment Control Plan, as approved by the Ocean County Soil Conservation District. Thus, the project will not have an impact on the water quality or hydrology of any of the downstream waters and wetlands mapped by the Landscape Project as pine barrens treefrog habitat.

Finally, although no mapped pine barrens treefrog habitat occurs on the site, the aforementioned purchase and preservation as open space of off-site properties will permanently protect areas containing documented pine barrens treefrog habitat. The preservation of these parcels increases the permanently protected areas available to pine barrens treefrogs in the vicinity of the project.

D. Barred Owl and Cooper's Hawk

The NHP and Landscape Project do not map any occurrences of barred owl or Cooper's hawk on the site, and no barred owl or Cooper's hawk were observed on the site during EcolSciences' 2005 pine snake trapping study. In addition, the LOI issued by NJDEP identified the on-site wetlands as intermediate resource value, indicating that wetlands on the site are not critical habitat for any State-listed wildlife species. Thus, the site plan activities do not occur within documented critical habitats for barred owl and Cooper's hawk.

Because the proposed project will only result in minor impacts to an on-site isolated wetland that is not barred owl or Cooper's hawk habitat, it will not impact the hydrology of off-site areas (See Stormwater Report). In addition, no activities are proposed within the on-site portions of the riparian zone or flood hazard area adjacent to the unnamed tributary of Sunken Branch, and any potential temporary adverse effects (such as erosion or sedimentation) to on-site or off-site wetlands and waters during construction activities will be avoided through strict adherence to the Soil Erosion and Sediment Control Plan, as approved by the Ocean County Soil Conservation District. Thus, the project will not have an impact on the water quality or hydrology of any of the downstream waters and wetlands that may be mapped by the Landscape Project as barred owl or Cooper's hawk habitats.

The proposed site plan activities are restricted to areas outside of documented barred owl and Cooper's hawk habitat and are not expected to result in adverse impacts to populations of these species due to competitor, parasite, or predator species. The site is currently located near significant

existing commercial and residential development. Unimproved roads along and through the property are currently subject to unauthorized use for recreation by off-road vehicles and for the dumping of household trash and construction debris. As such, the proposed activities are not anticipated to introduce new vectors of parasite transmission, competition, or predation to the area.

The NHP and Landscape Project do list occurrences of barred owl and Cooper's hawk within several Rank 3 and 4 forest areas and Rank 3 forested wetlands located across the Conrail railroad ROW south and southwest of the site. These mapped habitats are associated with the 7,025-acre area of undeveloped forest bounded by the Conrail railroad ROW to the north, Route 70 to the west, a Penn Central railway ROW to the south and developed portions of Toms River Township to the east as well as a vast tract of additional forested lands located across Route 70. Thousands of acres within this area are already protected as part of the Crossley Preserve and Whiting Wildlife Management Area. An additional 6,140± acres of the Heritage Minerals tract will be preserved as open space. Both of these species often rely upon the presence of large tracts of forest containing mature trees in which to construct their nests. As such, although no mapped barred owl and Cooper's hawk occurs on the site, the aforementioned purchase and preservation as open space of off-site properties will permanently protect areas containing documented barred owl and Cooper's hawk habitats. The proposed mitigation parcels contain areas that are mapped for these species and it is expected that the proposed mitigation will provide significant additional protection in the vicinity of the project.

VI. CONCLUSIONS

The Applicant is proposing the construction of a retail development on a portion of a 43± acre site known as Block 505, Lots 14 and 15 in the Township of Toms River and Block 44, Lots 2, 3, 4 (part), and 5 in the Township of Manchester. The current proposed development is based on a highly modified and reduced version of a prior site plan and has been developed to minimize impacts to endangered and threatened species and to preserve or enhance critical wildlife habitats on and off-site. Based on nearby records of northern pine snake and a coincidence of appropriate vegetative land cover, the site is mapped as habitat for northern pine snake by the Landscape Project, as are nearby parcels located to the south and west. In addition, other State-listed wildlife, including corn snake, pine barrens treefrog, barred owl, and Cooper's hawk are also documented off-site. EcolSciences conducted an assessment of the potential impacts to the mapped habitats and listed species located on and adjacent to the site. A 2005 field study conducted by EcolSciences, Inc. confirmed the presence of pine snake habitat on the site and documented two adult male pine snakes and one pine snake winter hibernaculum on the site. No other State-listed species were observed on-site during EcolSciences' field study. Based on the presence of mapped critical

habitats, NJDEP comments, and the results of the 2005 field study, the Applicant is proposing numerous measures to ensure that the proposed development will not directly, or through secondary impacts, adversely impact endangered or threatened wildlife species on the site or in the surrounding area. These measures include:

- A 9% reduction from the originally proposed building, a 71% reduction from the originally proposed garden center, a 30% reduction from the originally proposed parking lots, and a 33% reduction in overall proposed impervious cover.
- Preservation of the on-site pine snake hibernaculum and 50-meter buffer.
- Construction of a 3,319-foot long, 4-foot high wall to minimize human-snake conflicts.
- Preservation of 20.9-acres of on-site open space linking on-site habitats to the off-site habitats, including off-site parcels purchased by the Applicant, resulting in 212.9 acres of pine snake and/or other rare species habitats which will be maintained by the Applicant as open space.
- Purchase and preservation of several off-site mitigation parcels totaling 192 acres of open space containing mapped habitat for pine snake and numerous other endangered and threatened species, which connects the project site to approximately 13,660 acres of lands protected through the Crossley Preserve, Manchester WMA, Whiting WMA, and Heritage Minerals settlement.
- Habitat enhancements including selective tree thinning, blocked access, the construction of artificial hibernacula, the creation of upland forest clearings for nesting, and scarifying the ground.
- The habitat value gained via the proposed enhancements to the mitigation parcels and the preserved portion of the project site will exceed the value lost on the project site post-construction according to the Endangered and Nongame Species Program's draft Conceptual Habitat Evaluation Method (HEM) for Northern Pine Snake.

It is expected that the combination of these measures will significantly enhance the northern pine snake habitat in the vicinity of the site and provide permanent ancillary benefits to other State-listed species that are documented nearby. The project will preserve, to the maximum extent feasible, the vegetation and soils upon which these species are mapped, will minimize human disturbance within critical wildlife habitats, will not disrupt the overall hydrology of the site or adjacent areas, and will not result in any adverse impacts to the State-listed species via an influence on competitors, parasites, or predators.

VII. REFERENCES

- Allen, A.W., 1987. Habitat suitability index models: Barred Owl. U.S. Fish and Wild. Serv. Biol. Rep. 82(10.143). 17pp.
- Beans, B.E. and Niles, L., editors. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press, New Brunswick.
- Bent, A.C. 1938. Life histories of North American birds of prey: Part 2. U.S. National Museum Bull. 170. Smithsonian Institution, Washington, D.C.
- Bosakowski, T.R. Speiser, and J. Benzinger. 1987. Distribution, density, and habitat relationships of the Barred Owl in northern New Jersey. In: proceedings of symposium, biology, and conservation of northern forest owls, Winnipeg, Manitoba. USDA Forest Service General Technical Report RM-142.
- Bosakowski, T. 1994. Landsat Reveals Negative Effect of Forest Fragmentation on Barred Owl Distribution. Records of New Jersey Birds 20(3): 66-70.
- Burger, J. and Zappalorti, R.T. 1986. Nest Site Selection by Pine Snakes (*Pituophis melanoleucus*) in the New Jersey Pine Barrens. Copeia, (No. 1): 116-121.
- Devereux, J.G. and J.A. Mosher. 1984. Nesting habitats of the Barred Owl in western Maryland. Maryland Birdlife. 38(4): 124-126.
- Elody, B.J. 1983. Techniques for capturing, marking, monitoring, and habitat analysis for the barred owl in the upper peninsula of Michigan. M.S. Thesis, Michigan Technological University, Houghton. 103 pp.
- Elody, B.J. and L.F. Sloan, 1985. Movements and habitat use of Barred Owls in the Huron Mountains of Marquette County Michigan, as determined by radio telemetry. Jack-pine Warbler 63: 3-8.
- Freda, J. and P.J. Morin. 1984. Adult Home Range of the Pine Barrens Tree Frog (*Hyla andersonii*) and the Physical, Chemical, and Ecological Characteristics of the Preferred Breeding Ponds. Rutgers University Center for Coastal and Environmental Studies.
- Freda, J. and W.A. Dunson. 1986. Effects of Low pH and other Chemical Variables on the Local Distribution of Amphibians. Copeia, No. 2. pp. 454-466.
- Fuller, M.R. 1979. Spatiotemporal ecology of four sympatric raptor species. PhD. Dissertation. University of Minnesota, St. Paul. 396 pp.

- Hegdal, P.L. and B.A. Colvin. 1988.** Potential hazard to eastern screech owls and other raptors of brodifacoum bait used for vole control in orchards. *Environmental Toxicology and Chemistry*. 7: 245-260.
- Laidig, K.J. and D. Dobkin, 1992.** Habitat overlap and population persistence of barred owls and great horned owls in southern New Jersey. Unpublished report to NJDEPE, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program. 33 pp.
- New Jersey Department of Environmental Protection (NJDEP). 2008.** Protocols for the establishment of exceptional resource value wetlands pursuant to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*) based on documentation of state or federal endangered or threatened species.
- NJDEP, 2004.** Rules on Coastal Zone Management. N.J.A.C. 7:7E-1.1 *et seq.*
- New Jersey Division of Fish and Wildlife. 2009.** Status Assessment of the Northern Pine Snake (*Pituophis m. melanoleucus*) in New Jersey: An Evaluation of Trends and Threats. New Jersey Department of Environmental Protection, Trenton, NJ. 53 pp.
- NJDEP, Division of Fish and Wildlife (DFW), Endangered & Nongame Species Program (ENSP). 2008.** The Landscape Project, Version 2.1.
- NJDEP, DFW, ENSP. 2010.** Conceptual Habitat Evaluation Method for Northern Pine Snakes (Draft). Dated August 25, 2010.
- NJDEP, DFW, ENSP, undated.** Northern Pine Snake Habitat Enhancement and Mapping. www.state.nj/dep/fgw/pinesnak.htm
- New Jersey State Museum. 1906.** Amphibians and Reptiles of New Jersey.
- Nicholls, R.H. and M.R. Warner. 1972.** Barred Owl habitat use as determined by radio telemetry. *Journal of Wildlife Management* 48(4): 213-244.
- Niles, L.J., M. Valent, P. Winkler and P. Woerner. 2004.** New Jersey's Landscape Project, Version 2.0. NJDEP, DFW, ENSP. 56 pp.
- Ocean County Planning Board. 1982.** Critical habitat requirements of two threatened species in the Davenport Basin, Ocean County, New Jersey: With recommendations for land use.
- Rosenfield, R.N., J. Bielefeldt, R.K. Anderson, and J. M. Papp. 1991.** Status Reports: accipiters. Pp. 42-49 in Proc. Midwest Raptor Management Symposium and Workshop. Natl. Wildl. Fed., Washington, D.C.
- Rosenfield, R.N. and J. Bielefeldt. 1993.** Cooper's Hawk. *The Birds of North America*, No. 75. 24 pp.

- Smith, C.F. 1978.** Distributional ecology of barred and great horned owls in relation to human distribution. M.S. Thesis, University of Conn., Storrs. 104 pp.
- State of New Jersey, Office of Information Technology. 2003.** NJ 2002 High Resolution Orthophotography.
- Valent, M. 1997.** Cooper's Hawk (*Accipiter cooperii*). Presented in Threatened and Endangered Species in New Jersey: Regulations, Identification and Assessment. May 19-20, 1997. Rutgers University, New Brunswick.
- Wiggers, E.P. and K.J. Kritz. 1991.** Comparison of nesting habitat of coexisting Sharp-shinned and Cooper's hawks in Missouri. *Wilson Bull.* 103: 568-577.
- Zappalorti, R.T. and E.W. Johnson. 1978.** The status and distribution of the northern pine snake, *Pituophis melanoleucus melanoleucus*, and the corn snake, *Elaphe guttata guttata*, in New Jersey. Unpublished report to NJDEP, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program by Herpetological Associates. 36 pp.
- Zappalorti, R.T. and E.W. Johnson. 1982.** Additional updated locality and distribution records of endangered and threatened herptiles in New Jersey, Fifth Supplement. Unpublished report to NJDEP, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program by Herpetological Associates. pp. 55-68.
- Zappalorti, R.T. 1998.** Ecology and habitat use of the corn snake (*Elaphe guttata*) and pine snake (*Pituophis melanoleucus*) in the Pine Barrens of southern New Jersey. Unpublished report to NJDEP, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program by Herpetological Associates. 16 pp.

APPENDIX A

Correspondence

EcolSciences, Inc.
Environmental Management & Regulatory Compliance



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

MARK N. MAURIELLO
Acting Commissioner

January 9, 2009

Scott McDonnell
EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, NJ 07866

Re: BN05-071 (Block 44, Lots 2 - 5; Block 505, Lots 14 & 15)

Dear Mr. McDonnell:

Thank you for your data request regarding rare species information for the above referenced project site in Manchester and Toms River Townships, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 in the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Brank
carpenter frog	<i>Rana virgatipes</i>		SC	G5	S3
great blue heron	<i>Ardea herodias</i>		SC/S	G5	S3B,S4N
northern pine snake	<i>Pituophis melanoleucus melanoleucus</i>		T	G4T4	S2

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within one mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within one mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Brank
barred owl	<i>Strix varia</i>		T/T	G5	S2B,S2N
Cooper's hawk	<i>Accipiter cooperii</i>		T/S	G5	S2B,S4N
corn snake	<i>Elaphe guttata guttata</i>		E	G5T5	S1
dotted skipper	<i>Hesperia attalus slossonae</i>			G3G4T3	S3
eastern box turtle	<i>Terrapene carolina carolina</i>		SC	G5T5	S3
eastern king snake	<i>Lampropeltis g. getula</i>		U	G5T5	S3
Fowler's toad	<i>Bufo woodhousii fowleri</i>		SC	G5	S3
least tern	<i>Sterna antillarum</i>		E	G4	S1B,S1N
pine barrens treefrog	<i>Hyla andersonii</i>		T	G4	S2

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on the site or for rare plant species covered by the Flood Hazard Area Control Act rule within one mile of the site.

A list of rare plant species and ecological communities that have been documented from Ocean County can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, <http://www.state.nj.us/dep/gis/depsplash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292 9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
NHP File No. 09-3907483



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE

Governor

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

MARK N. MAURIELLO

Acting Commissioner

January 9, 2009

Scott McDonnell
EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, NJ 07866

Re: EN05-071 (Block 75.01, Lot 3)

Dear Mr. McDonnell:

Thank you for your data request regarding rare species information for the above referenced project site in Manchester Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 in the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Strank
barred owl	<i>Strix varia</i>		T/T	G5	S2B,S2N
carpenter frog	<i>Rana virgatipes</i>		SC	G5	S3
Cooper's hawk	<i>Accipiter cooperii</i>		T/S	G5	S2B,S4N
corn snake	<i>Elaphe guttata guttata</i>		E	G5T5	S1
dotted skipper	<i>Hesperia attalus slossonae</i>			G3G4T3	S3
eastern box turtle	<i>Terrapene carolina carolina</i>		SC	G5T5	S3
eastern king snake	<i>Lampropeltis g. getula</i>		U	G5T5	S3
great blue heron	<i>Ardea herodias</i>		SC/S	G5	S3B,S4N
northern pine snake	<i>Pituophis melanoleucus melanoleucus</i>		T	G4T4	S2
pine barrens treefrog	<i>Hyla andersonii</i>		T	G4	S2

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within one mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within one mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Strank
Fowler's toad	<i>Bufo woodhousii fowleri</i>		SC	G5	S3
least tern	<i>Sterna antillarum</i>		E	G4	S1B,S1N

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on the site or for rare plant species covered by the Flood Hazard Area Control Act rule within one mile of the site.

A list of rare plant species and ecological communities that have been documented from Ocean County can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, <http://www.state.nj.us/dep/gis/depsplash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292 9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
NHP File No. 09-3907483



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

MARK N. MAURIELLO
Acting Commissioner

December 24, 2008

Scott McDonnell
EcolSciences, Inc.
75 Fleetwood Drive, Suite 250
Rockaway, NJ 07866

Re: EN05-071 (Block 77, Lots 2, 4, 5, 6)

Dear Mr. McDonnell:

Thank you for your data request regarding rare species information for the above referenced project site in Manchester Township, Ocean County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 in the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
barred owl	<i>Strix varia</i>		T/T	G5	S2B,S2N
black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>		SC/S	G5	S3B
blackburnian warbler	<i>Dendroica fusca</i>			G5	S2B
black-throated green warbler	<i>Dendroica virens</i>		S/S	G5	S3B
brown thrasher	<i>Toxostoma rufum</i>		SC/S	G5	S3B,S4N
cerulean warbler	<i>Dendroica cerulea</i>		S/S	G4	S3B,S3N
common nighthawk	<i>Chordeiles minor</i>		SC/SC	G5	S3B,S3N
Cooper's hawk	<i>Accipiter cooperii</i>		T/S	G5	S2B,S4N
dotted skipper	<i>Hesperia attalus slossonae</i>			G3G4T3	S3
eastern box turtle	<i>Terrepen carolina carolina</i>		SC	G5T5	S3
eastern king snake	<i>Lampropeltis g. getulia</i>		U	G5T5	S3
Fowler's toad	<i>Bufo woodhousli fowleri</i>		SC	G5	S3
great blue heron	<i>Ardea herodias</i>		SC/S	G5	S3B,S4N
least flycatcher	<i>Empidonax minimus</i>		S/S	G5	S3B
northern pine snake	<i>Pituophis melanoleucus melanoleucus</i>		T	G4T4	S2
pine barrens treefrog	<i>Hyla andersonii</i>		T	G4	S2
red-shouldered hawk	<i>Buteo lineatus</i>		E/T	G5	S1B,S2N
whip-poor-will	<i>Caprimulgus vociferus</i>			G5	S4B
wood thrush	<i>Hylocichla mustelina</i>		SC/S	G5	S3B
worm-eating warbler	<i>Helmitheros vermivorus</i>		S/S	G5	S3B

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within one mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within one mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Strank
corn snake	<i>Euphis guttata guttata</i>		E	G5T5	S1
least tern	<i>Sterna antillarum</i>		E	G4	S1B,S1N

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on the site or for rare plant species covered by the Flood Hazard Area Control Act rule within one mile of the site.

A list of rare plant species and ecological communities that have been documented from Ocean County can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpccodes_2008.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, <http://www.state.nj.us/dep/gis/dep splash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292 9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Robert J. Cartica
NHP File No. 08-4007413

APPENDIX B

Qualifications of Preparers

EcolSciences, Inc.
Environmental Management & Regulatory Compliance

ECOLSCIENCES, INC.

CORPORATE HISTORY

EcolSciences, Inc., was founded in 1973 in response to the growing need for responsible environmental planning, as mandated by NEPA, The National Environmental Policy Act. EcolSciences specializes in performing environmental investigations relating to permit acquisition and regulatory compliance, demonstration of "due diligence", waste management, impact analysis, mitigation and remediation. EcolSciences' strength is a proficiency in current environmental and waste management laws, regulations, and policies, coupled with a practical problem-solving approach to analyzing the environmental consequences of projects.

During its thirty-three years, EcolSciences has successfully completed more than 10,000 studies for private, quasi-public and public clients. EcolSciences has represented many of the country's leading industries, corporations, developers, and financial institutions including AT&T, American Cyanamid Company, Lucent Technologies, Merck, Johnson & Johnson, Hartz Mountain Industries, Exxon, K. Hovnanian Companies, Roseland Property Company, Trammell Crow Company, Principal Real Estate Investors, PNC Bank, The Bank of New York, and JP Morgan Chase. Among the many utilities that EcolSciences has served are Jersey Central Power & Light, New Jersey Natural Gas Company, Verizon Wireless, Sprint, Elizabethtown Gas Company, Essex and Hudson County Improvement Authorities, Ocean County Utilities Authority, and numerous municipal utilities authorities. Representative government agency clients include the U.S. Environmental Protection Agency, New York City Economic Development Corporation, New York City Department of Design and Construction, and New York City Department of Sanitation.

EcolSciences' interdisciplinary staff of environmental engineers, geologists, biologists and scientists has extensive experience in a diversity of studies related to biological assessment and toxic and hazardous materials management. EcolSciences has performed environmental assessments and has acquired appropriate permits and approvals under a wide variety of federal, state, regional, and local jurisdictions. These include, but are not limited to: federal Section 404 and Section 10 authorizations; New York SEQRA and CEQR approvals; New Jersey CAFRA, Waterfront Development, and Freshwater Wetlands Protection Act permits (both general and individual); NJ Pinelands Commission certifications; Hackensack Meadowlands Development Commission (HMDC) approvals; and Delaware & Raritan Canal Commission

approvals. EcolSciences' senior staff is experienced in the delivery of expert testimony; senior staff of the firm have testified in public hearings, Administrative Law proceedings, and county, regional and municipal planning boards.

Since the promulgation of the New Jersey Environmental Cleanup Responsibility Act (ECRA) and its successor, the Industrial Site Recovery Act (ISRA), EcolSciences has been involved in the implementation of the entire ECRA/ISRA program for its industrial clients. More recently, as the demonstration of "due diligence" has become a lending industry standard, EcolSciences has completed numerous Phase I environmental audits per ASTM E1527-05 and AAI and follow-up Phase II studies to clarify the level of environmental risk and liability associated with past and current practices at a particular site or facility. These audits typically include such activities as hazardous materials inventories, building and site inspections, subsurface soil investigations, groundwater monitoring, tank testing, asbestos bulk sampling, development of remediation plans and supervision of cleanup activities. The firm and technical staff members are also certified by the NJDEP for the performance of underground storage tank installation, closure, and subsurface evaluation. All work is conducted under the supervision of a licensed professional engineer.

The biological staff of EcolSciences has conducted over 4,000 wetland delineations and environmental assessments throughout the eastern and central portions of the United States. Our staff is skilled in all technical aspects of wetland identification and delineation methodologies established by the ACOE, USFWS, EPA and SCS; the assessment of wetland functions and values using techniques such as HEP, WET, and IVA; the assessment of development-related wetland impacts, the acquisition of wetland permits, and the development and implementation of mitigation plans. Key members of our staff are certified as Professional Wetland Scientists and provisionally certified by the ACOE. Additionally, EcolSciences' biologists routinely perform specialized studies related to federally- and state-listed threatened and endangered plant and animal species, wildlife habitat surveys, and the assessment of development-related impacts. Three of EcolSciences' biologists are USFWS Qualified bog turtle surveyors and two are NJDEP Qualified Ornithologists.

EcolSciences is a multi-disciplinary firm that has the experience and capabilities to provide a full range of environmental services. Studies are conducted in a manner that emphasizes the balance of environmental, engineering and cost factors. This approach provides the information necessary for sound and practical project decisions.

DAVID P. MOSKOWITZ

EDUCATION:

*B.A., 1984 - Environmental Studies
George Washington University, Washington, D.C.*

*M.S. 2000 - Environmental Policy Studies
New Jersey Institute of Technology, Newark, N.J.*

*Ph.D. Program – Ecology and Evolution
Rutgers University, New Brunswick, N.J.*

PROFESSIONAL AFFILIATIONS:

*Society of Wetland Scientists
Association of Field Ornithologists
ASTM Environmental Committee (1998-2002)
Dragonfly Society of the Americas*

PROFESSIONAL CERTIFICATIONS:

*Professional Wetland Scientist - SWS
Certified Wetland Delineator - Corps of Engineers
USEPA Wetland Delineation - WTI
Qualified Ornithologist - NJDEP
Qualified Bog Turtle Surveyor, NY/NJ - USFWS*

OTHER:

*Wetland Journal Technical Review Board (2000-2002)
SWS Certification Review Panel (1998-2001)
Poricy Park Board of Directors (1999-2002)
East Brunswick Environmental Commission
USFWS N.J. Breeding Bird Survey Coordinator (1995-1997)
Identification of Sedges and Rushes - Rutgers University
Field Identification of Raptors - University of Maine
Identification of Adult Dragonflies - University of Maine
Identification of Larval Dragonflies - University of Maine
Systematics & Conservation of Lepidoptera - University of Maine
Identification of Microlepidoptera – University of Maine*

EXPERIENCE:

Mr. Moskowitz is a Senior Vice President with EcolSciences, Inc. During the past 20 years, Mr. Moskowitz has conducted more than 4,000 environmental studies for a wide range of clients including government agencies, and the development, legal, engineering and financial professions. These studies have focused on wetland and wildlife issues including delineations, mitigation, field surveys and regulatory compliance as well as Phase I, Phase II and Brownfields Redevelopment. Mr. Moskowitz has also provided expert testimony before numerous municipal boards and the New Jersey Meadowlands Commission and has been qualified as an expert in Superior Court of New Jersey, New Jersey Office of Administrative Law, New Jersey Condemnation Commission, and the Morris County Board of Taxation. Mr. Moskowitz has published more than two-dozen technical and popular papers on wildlife, wetland, and threatened and endangered species related topics and has lectured widely on numerous environmental topics.



EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Wetland Studies

Directed and participated in more than 3,000 field studies in NJ, NY, PA, MD and CT evaluating all aspects of wetland ecology. Representative experience includes:

- The evaluation of more than 10,000 acres in the New Jersey Highlands.
- The evaluation of more than 7,500 acres in the complex red soils of the New Jersey Piedmont.
- The evaluation of nearly 3,000 acres on Staten Island, New York.

Brownfields and Site Investigation Studies

Principal in charge of numerous Phase I Environmental Assessments, historic pesticide investigations and remedial activities, hazardous waste investigations and brownfields redevelopment projects.

Wetland Mitigation Studies

Numerous mitigation plans have been prepared to remedy regulatory violations of various State and Federal wetland laws, and to compensate for wetland losses resulting from permitted wetland fills. Two examples of the wide variety of studies include:

- Preparation of mitigation plans and specifications for the remediation of wetlands and shorelines of the Freshkills Sanitary Landfill, Staten Island, New York.
- Design and implementation of a 13-acre wetland restoration project in Morris County, New Jersey utilizing air conditioning condensation as a hydrologic supplement.

Threatened and Endangered Species Studies

Designed, directed and participated in numerous field studies for rare plant and animal species including Bog Turtle, Bald Eagle, Wood Turtle, Northern Pine Snake, Long-eared owl, Blue Spotted Salamander, Long Tailed Salamander, Pine Barrens Tree Frog, Great Blue Heron, Coopers Hawk, Grasshopper Sparrow, Savannah Sparrow, Upland Sandpiper, Barred Owl, Swamp Pink, Knieskern's Beaked Rush, Curly Grass Fern and Barrett's Sedge.

Ornithological Studies

Numerous studies conducted throughout the northeast designed to evaluate and census individual species, avian communities and habitats, to assess potential impacts upon the species and habitats associated with land development proposals, and to comply with State and Federal Wildlife regulations. Two examples of the wide variety of studies include:

- Long-eared owl habitat evaluation, pellet analysis and management plan in Somerset County, New Jersey.



- Two-year avian census, habitat evaluation and regulatory assessment for the proposed redevelopment of Flushing Airport in Queens, New York by the New York City Economic Development Corporation. Breeding, wintering and migratory utilization of the site was comprehensively evaluated and barn owl pellet analysis was conducted to augment small mammal population studies.

Commercial/Residential/Industrial Studies

More than 3,000 properties have been evaluated throughout NJ, NY, PA, and CT to assess potential environmental impacts from proposed development and to insure regulatory compliance with various Local, State and Federal environmental laws. Tasks have included wetland delineation, permit acquisition and mitigation planning.

Corridor Studies

Designed, directed and participated in ecological studies and regulatory assessments for more than 350 linear miles of road corridors, gas and electric transmission right of ways and sewer and water alignments. Studies have been performed for the New Jersey Turnpike Authority, New Jersey DOT, Jersey Central Power and Light, New Jersey Natural Gas, and numerous local governments.

Special Environmental Studies

A wide range of ecological studies have been conducted for various private clients, the USEPA and other government agencies. Representative studies include:

- Bird, mammal, dragonfly, damselfly, butterfly and floral surveys for the proposed Catskill/Delaware Water Treatment Facility in Westchester County, New York.
- Habitat assessments for Pine Barrens Tree Frog and River Otter in New Jersey.
- An avifaunal study of a 500-acre proposed incinerator ash landfill site in New York, conducted for a county agency, to evaluate FAA concerns about bird strike hazards to aircraft passing over the site, resulting in the preparation of a Bird Deterrent Plan.
- Biological studies of the impacts of Folcroft Landfill upon ecological communities of Tinicum National Environmental Center, Philadelphia, PA for the USEPA, Region III.
- Red-Headed Woodpecker evaluation of two central New Jersey properties.



Publications/Articles

- Moskowitz, D.P., 1996. Swamp Pink: A Federally-Listed Threatened Species. *Wetland Journal* 8(3): 14-16.
- Moskowitz, D., Auffenorde, T. and M. Kovacs, (1997). Vegetation and Surrounding Landscape Characteristics of Long-Eared Owl (*Asio otus*) Winter Roosts in Central New Jersey. *Records of New Jersey Birds*. (23)1: 2-6.
- Moskowitz, D.P., 1997. Wetland Restoration Using Non-Contact Cooling Water and Stormwater Runoff as a Supplemental Hydrologic Source. *Wetland Journal* 9(1): 17-20.
- Moskowitz, D.P., 1997. Hine's Emerald Dragonfly (*Somatochlora hineana*): The First Federally Endangered Dragonfly. *Wetland Journal* (9)3: 12-14.
- Moskowitz, D.P., 1997/98. Fall Migrant Landbird Observations at Sea. *Records of New Jersey Birds*. (23)4: 95.
- Moskowitz, D.P., 1998. Build a Wetland Garden. *Water Gardening Magazine*. (2)6: 58-60.
- Moskowitz, D.P., 1998. Tips Offered on Negotiating N.J.'s Mining, Dredging Rules. *Mine Regulation Reporter*. 11(4): 86-87.
- Moskowitz, D.P., 1998. Vegetation Change in a Forested Wetland after a Bird Roost. *Northeastern Naturalist*. 5(1): 61-66.
- Moskowitz, D.P., 1998. A Wetland Delineation Primer for the Professional Land Surveyor. *Professional Surveyor Magazine*. 18(1): 22-28.
- Moskowitz, D.P. and D.M. Bell., 1998. *Archilestes Grandis* (Great Spreadwing) in Central New Jersey, with Notes on Water Quality. *Bulletin of American Odonatology*. 5(3): 49-54.
- Moskowitz, D.P., 1999. The Pine Barrens Treefrog (*Hyla Andersonii*): An Ecologist's Dream. *Wetland Journal* 11(4): 8-13.
- Moskowitz, D.P., 2000. A Comparison of Field-Delineated Wetlands to the New Jersey Freshwater Wetland Maps. M.S. thesis - New Jersey Institute of Technology.
- Moskowitz, D.P., 2000. Old Maps and Wetland Regulation. *Professional Surveyor Magazine*. 20(6): 22-30.
- Moskowitz, D.P. and T.A. Auffenorde., 2000. Persistence of Skunk Cabbage (*Symplocarpus foetidus* [L.] Nutt.) in a Drained Wetland. *Wetland Journal* 12(3): 23-29.
- Moskowitz, D., 2000. A New County Record for *Archilestes Grandis* in New York with Notes on Habitat and Water Quality. *ARGIA* 12(4): 7-8.



- Moskowitz, D.P., 2000. Habitat Notes on a Winter Saw-whet Owl (*Aegolius acadicus*) Roost in Central New Jersey. Records of New Jersey Birds. 26(4): 138-139.
- Moskowitz, D., 2000. Book Review: Dragonflies through Binoculars - A Field Guide to Dragonflies of North America. Wetland Journal 12(4): 41.
- Poricy Park Citizens Committee. 2001. A Checklist and Guide to the Butterflies of Poricy Park. Pamphlet.
- Moskowitz, D. P. 2001. First Record of the Queen Butterfly (*Danaus gilippus* Cramer) in New Jersey. News of the Lepidopterists' Society 43(3): 72, 74.
- Moskowitz, D., J. Moskowitz, S. Moskowitz and H. Moskowitz. 2001. Notes on a large dragonfly and butterfly migration in New Jersey. Northeastern Naturalist 8(4): 483-490.
- Moskowitz, D. P. 2002. An unusual interaction between a banded hairstreak butterfly (*Satyrium calanus*) Lycaenidae and a stink bug (*Banasa dimidiata*) Pentatomidae. Entomological News 113:(3) 183-186.
- Moskowitz, D. P. 2002. Was there an invasion of the Queen butterfly (*Danaus gilippus* Cramer) in the northeastern United States in 2001? News of the Lepidopterists' Society 44(2): 66-67.
- Newgard, L. and D. Moskowitz. Bog turtle: It's small, secretive, rare, and it's in our hiking region Trailwalker 29(4): p. 5.
- Moskowitz, D.P. and C. Westphal. 2002. Notes on the larval diet of the Painted Lichen moth *Hypoprepia fucosa*: Hubner (Arctiidae:Lithosiinae). Journal of the Lepidopterist's Society 56 (4): 289-290.
- Moskowitz, D. P. and T. M. Auffenorde. 2003. Bird Use at Two Simulated-Tree Cellular Towers in New Jersey. Records of New Jersey Birds. 28(4): p. 88-91.
- Moskowitz, D.P. 2003. The Queen Dilemma in the Northeastern United States. New York State Butterfly Records 2002. New York Chapter, North American Butterfly Association. p. 49-51.
- Moskowitz, D.P., Kovacs, M. and J. Tesauro 2003. *Glyptemys* (*Clemmys*) *muhlenbergii* (Bog Turtle). Abnormal Coloration. Herpetological Review. 34(3): p. 240.
- Moskowitz, D.P. 2004. The Queen (*Danaus gilippus* Cramer) Dilemma in the Northeastern United States. News of the Lepidopterist's Society. 45(2): 62-63.
- Moskowitz, D.P. 2004. A new late flight record for *Lestes* congener in North America. ARGIA 15(4):22-23.



MICHAEL KOVACS

EDUCATION: *B.S., 1979 - Natural Resource Management
Rutgers University, New Jersey*

AREAS OF EXPERTISE: *Aquatic, Wetlands, and Terrestrial Ecology
Threatened and Endangered Species
Wetlands Construction and Restoration
Environmental Impact Assessment and Mitigation Planning
Project Management*

CERTIFICATIONS: *Professional Wetland Scientist (SWS)
Qualified Bog Turtle Surveyor in New York & New Jersey (USFWS)
Wetland Construction and Restoration (WTI)
Qualified Ornithologist (NJDEP)
Habitat Evaluation Procedure (USFWS)
Health and Safety for Hazardous Waste Site Investigation Personnel
(NJ/NY HMWTC)*

PROFESSIONAL ASSOCIATIONS: *Society of Wetland Scientists
American Fisheries Society
Association of Field Ornithologists
New Jersey Audubon Society*

EXPERIENCE:

Mr. Kovacs is a **Vice President** with EcolSciences, Inc. with over 27 years experience in the environmental consulting field. His areas of expertise lie in the inventory and evaluation of terrestrial, aquatic, and wetland systems, and with the assessment and mitigation of impacts associated with major development. Mr. Kovacs has directed and has participated in a wide variety of comprehensive ecological field studies providing a high degree of competence in sampling protocols and procedures as well as in the identification and ecology of aquatic/terrestrial vertebrate and invertebrate animal species, particularly threatened and endangered species. Elements of Mr. Kovacs' wetlands-related projects include: the delineation of wetlands through an analysis of soils, hydrology, vegetation and aerial photography; the characterization of wetland type; the evaluation of associated functions and values; assessment of development-related impacts; impact mitigation; wetlands construction and restoration; and permit acquisition. A summary of Mr. Kovacs' relevant project experience includes:

Threatened and Endangered Species Studies

- Numerous field surveys of Federally- and State-listed threatened and endangered species in NJ, NY and PA. Surveyed species included, but were not limited to: Swamp Pink, Knieskern's Beaked-rush, Blue-spotted Salamander, Long-tailed Salamander, Pine Barrens Treefrog, Cope's Gray Treefrog, Wood Turtle, Bog Turtle, Timber Rattlesnake, Northern



EcolSciences, Inc.
Environmental Management & Regulatory Compliance

Pine Snake, Corn Snake, Cooper's Hawk, Red-shouldered Hawk, Bald Eagle, Peregrine Falcon, Barred Owl, Long-eared Owl, Red-headed Woodpecker, Bobolink, Grasshopper Sparrow, Vesper Sparrow, Savannah Sparrow, and American Bittern.

- A multi-year comprehensive survey of T&E plants and animals on a 1,000± acre site in Ocean County including trapping and radio-telemetry studies of Northern Pine Snake and surveys for the Federally-listed plant Knieskern's Beaked-rush.
- An inventory of various T&E species and other wildlife within a 2,000± acre site in Cumberland County, New Jersey for a sand mining concern.
- A survey of Timber Rattlesnake within the 2,300± acre Tuxedo Reserve site in Orange County, New York.
- An evaluation of eight NJ Superfund sites for the potential occurrence of the Federally-threatened plant species, Swamp Pink and Knieskern's Beaked-rush, for the USEPA, Region II.

Avifaunal and Other Wildlife Studies

- Intensive avifaunal field and literature studies associated with the preparation and implementation of a Bird Deterrent Plan required by the Federal Aviation Administration for a proposed ash-bypass landfill in Onondaga County, NY.
- Wintering/migratory bird field studies for the proposed redevelopment of Flushing Airport by the NYC Economic Development Corp. (formerly Ports and Trade).
- Seasonal wildlife field surveys associated with a SEQRA EIS for the Bloomingdale Park Eastern Recreational Facilities Program proposed by the NYC Department of Design and Construction.

Landfill Studies

- Aquatic/terrestrial field and literature studies associated with the preparation of a wetlands/shoreline remediation plan for the Fresh Kills Sanitary Landfill in NY.
- Biological studies of the impacts of Folcroft Landfill upon ecological communities of Tinicum National Environmental Center, Philadelphia, PA for the USEPA, Region III.
- Wetland and wildlife studies for the construction of a resource recovery facility and ash landfill for the Hudson County Improvement Authority.



Mining Studies

- Evaluation of the impacts of peat extraction on the functions and values of peatlands in the Pocono Mountain area of PA for the USEPA, Region III.
- Baseline environmental studies conducted for a proposed copper/zinc mine and associated NPDES permit in northern ME for the Superior Mining Company.
- Baseline aquatic surveys of two estuarine marsh systems proposed for phosphate mining for North Carolina Phosphate Company.
- Wetland impact assessment through photo-interpretation for a proposed phosphate mining project in FL for Farmland Industries, Inc.

Transmission Routing Studies

- Environmental inventory, impact assessment and mitigative planning for a power transmission line through CAFRA and Pinelands areas and for a transmission line in Newton, NJ for Jersey Central Power and Light Company.
- Environmental inventory, impact assessment and wetland permitting for a natural gas transmission line through Gloucester County, NJ for South Jersey Gas Company.

Oil Refinery and Port Studies

- Baseline ecological studies for a proposed oil refinery and port in North Carolina for the Brunswick Energy Company.

Special USEPA Studies

- Field studies and report preparation for the Advance Identification of Wetlands along Moshannon Creek near Philipsburg, PA for the USEPA, Region III.
- Field studies and report preparation for the Advance Identification of Wetlands along Bog Run near Quakertown, PA for the USEPA, Region III.
- A Status and Trends Analysis of Wetlands of Orange and Rockland Counties, NY through photointerpretation and ground-truthing for USEPA, Region II.



- An evaluation of wetlands creation for stormwater treatment within a proposed regional sedimentation pond in the Lickinghole Creek Watershed in VA for USEPA, Region III.
- An evaluation of the U.S. Army Corps' Nationwide Permitting process through study of headwater stream systems in northern NJ conducted for the USEPA, Region II.
- Preparation of a draft Advance Identification of Wetlands Technical Procedures Handbook for the USEPA, Region III.

Wetlands Mitigation Studies

- Preparation of a draft manual for USEPA, Region III entitled Creation of Wetland Banks for Mitigation of Impacts from Superfund Sites in New Castle County, DE.
- Preparation of Phase I and Phase II reports for USEPA Headquarters concerning the appropriateness of wetlands mitigation planning at Superfund sites.
- Preparation of wetland mitigation plans and specifications in conjunction with permits issued by the U.S. Army Corps of Engineers and various State agencies.
- Preparation of mitigation plans and specifications for the remediation of wetlands and shoreline areas of the Fresh Kills Sanitary Landfill, Staten Island, NY.

Wastewater Facility Studies

- Preparation of CAFRA EIS's and Freshwater Wetlands Permit applications for Ocean County Utilities Authority's Crestwood Interceptor, Ortley Beach-Alternate Bay Crossing, Toms River Crossing Relief Interceptor and Mill Creek Relief Interceptor projects.
- An evaluation of the State of Ohio's environmental plans and specification requirements for 201 facilities construction for the USEPA, Region V.
- Environmental compliance inspection of 201 facilities construction for the Manasquan River Regional Sewerage Authority and Ocean County Utilities Authority.
- Wastewater facilities planning for Atlantic Highlands/Highlands Sewerage Authority, Bayshore Regional Sewerage Authority, Long Branch Sewerage Authority, Tri-Borough Sewerage Authority, and Tri-Municipal Sewerage Commission.



Commercial/Industrial/Residential Studies

- Wetlands delineation, impact assessment, permit acquisition and mitigation planning for more than 1,500 development projects in NY, NJ, PA, CT, ME and NH.
- Preparation of NJ CAFRA, Waterfront Development, and Stream Encroachment EIS's and NY SEQRA and CEQR EIS's.
- Preparation of EIS's for major developments for use in submissions to municipalities and the provision of expert testimony.



SCOTT E. MCDONNELL

EDUCATION:

*B.S. Ecology & Natural Resources, May 2007, with Honors
Rutgers University, New Brunswick, New Jersey*

*B.S. Environmental & Business Economics, May 1998
Rutgers University, New Brunswick, New Jersey*

*Environmental Geomatics Certificate, May 2007
Rutgers University, New Brunswick, New Jersey*

AREAS OF EXPERTISE:

*Wetland Delineation and Permitting
Threatened and Endangered Species Surveys
Wildlife Habitat Assessment
Geographic Information Systems*

PROFESSIONAL CERTIFICATIONS:

*Rutgers University Office of Continuing Professional Education
Wetland Delineation Certificate Series (2007)*

EXPERIENCE:

Mr. McDonnell is an Environmental Scientist with EcolSciences, Inc. His responsibilities include: the implementation and documentation of wildlife habitat assessments and species surveys, the delineation of wetlands based on the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, the preparation of applications for Letters of Interpretation, Statewide General Permits, and Transition Area Waivers in accordance with the New Jersey Freshwater Wetlands Protection Act, and the use of Geographic Information Systems (GIS) in its capacity as an instrument of environmental analysis.

Prior to joining EcolSciences, Inc., Mr. McDonnell was employed as a Supply Chain Analyst and Senior Planner at Givaudan Fragrances Corporation and as a Manufacturing Planner at Sankyo Pharma. A summary of Mr. McDonnell's relevant experience includes:

- Performed wetland delineations based on the Federal Manual three-parameter approach using indicators of hydrophytic vegetation, hydric soils, and wetland hydrology.
- Assisted in numerous field surveys and habitat evaluations for the Federally-threatened and State-endangered bog turtle (*Glyptemys muhlenbergii*), State-endangered blue-spotted salamander (*Ambystoma laterale*), State-endangered



EcolSciences, Inc.
Environmental Management & Regulatory Compliance

southern gray treefrog (*Hyla chrysoscelis*), State-endangered timber rattlesnake (*Crotalus horridus*), State-threatened wood turtle (*Glyptemys insculpta*) and State-threatened pine barrens treefrog (*Hyla andersonii*).

- Conducted species-specific surveys, approved by New Jersey Department of Environmental Protection (NJDEP) and New Jersey Pinelands Commission, for the State-threatened northern pine snake (*Pituophis melanoleucus melanoleucus*) on proposed development properties in the Counties of Atlantic, Burlington, Cape May and Ocean, New Jersey. Such studies employed drift fences, funnel traps, grid searches and radio telemetry equipment.
- Conducted vernal habitat surveys in accordance with survey protocols developed by NJDEP and New York Department of Environmental Conservation (NYDEC). Pertinent information was gathered on hydrology, vegetation, observed reptile and amphibian species, and weather conditions.
- Conducted call surveys for the State-endangered red-shouldered hawk (*Buteo lineatus*), State-threatened red-headed woodpecker (*Melanerpes erythrocephalus*), barred owl (*Strix varia*) and Cooper's hawk (*Accipiter cooperii*) on proposed development properties in Counties of Atlantic, Burlington, Essex, Gloucester, Morris, Ocean and Sussex, New Jersey.
- Conducted surveys for rare plants including the Federally-threatened and State-threatened small whorled pogonia (*Isotria medeoloides*) and the NJ Pinelands Commission listed little ladies' tresses (*Spiranthes tuberosa*).

