Salem/ Hope Creek Environmental Audit – Post-Audit Information

Question #: PSEG-3 **Category:** Threatened & Endangered Species

Statement of Question: Please provide the following documents that were made available during the Salem and HCGS License Renewal Environmental Audit.

A NMFS [(National Marine Fisheries)] BO [(Biological Opinion)] May 1993
B NMFS Incidental Take Statement 1999
C Sea Turtle Summary List
D Shortnose Sturgeon Summary List
E Sturgeon summary list
F Procedure EN-AA-601-001
G Procedure EN-AA-603
H Procedure EN-AA-603-0001
I Baywide Abundance Monitoring Program

Response: The documents requested are being provided.

List Attachments Provided:

A Letter from National Marine Fisheries Service (N. Foster) to NRC (C. Miller) regarding Biological Opinion under Section 7(a) of the Endangered Species Act regarding the Salem and Hope Creek Nuclear Generating Stations. May 14, 1993.

B Letter from National Marine Fisheries Service (H. Diaz-Soltero) to NRC (T. Essig) regarding removal of the sea turtle study requirement from the Incidental Take Statement (ITS) for the Salem and Hope Creek Nuclear Generating Stations NMFS Incidental Take Statement. January 21, 1999.

C PSEG. Tables of Sea Turtle Data (Loggerhead, Kemp's Ridley, and Green Sea Turtles). Undated.

D PSEG. Table of Shortnose Sturgeon Data. Undated.

E PSEG. Table of Atlantic Sturgeon Data. Undated.

F PSEG. "Biological Opinion Compliance." Procedure No. EN-AA-601-0001, Rev. 0. Undated.

RESULTS

ROW Spans, Area, and Length

Of the 3,041 spans included in the GIS layer, we characterized the vegetation in 1,059 spans using field surveys and 1,982 spans using aerial photography (Table 5.1). Although more spans were characterized using aerial photography, the length and area of ROW surveyed using field and aerial-photograph surveys was similar.

The greatest number of spans and total length and area of ROW are managed by ACE, followed by PSEG, and then JCP&L (Table 5.1). Although the number of spans that ACE manages is substantially greater than that of PSEG, the amount of ROW area managed by both is similar, indicating that ACE spans are much shorter and narrower than those of PSEG. Mean (± 1 SD) span area is 0.49 ± 0.61 ac for ACE, 4.04 ± 0.98 ac for PSEG, and 1.85 ± 1.24 ac for JCP&L. The amount of ROW area managed by JCP&L is much less than the other two companies (Table 5.1).

Table 5.1. The total number of spans, length, and area of Pinelands ROWs managed by each utility company and for which the existing vegetation was characterized using field surveys or aerial photographs. The percentage of the total is given for each.

Utility Company/ Survey Method	Number of Spans		Length of ROW(mi)		Area of ROW (ac)	
ACE	2,570	85%	149	64%	1,263	47%
PSEG	256	7%	54	23%	1,034	38%
JCP&L	215	8%	30	13%	397	15%
Survey Method						
Field	1,059	35%	116	50%	1,509	56%
Aerial Photo	1,982	65%	117	50%	1,186	44%
Total	3,041		233		2,695	

Characterizing Existing ROW Vegetation

Forest or topped trees were present at 166 spans. About 125 (75%) of these spans were managed by PSEG, 36 (22%) by ACE, and 5 (3%) by JCP&L. Forest was dominant or co-dominant at 85 of the 166 spans (Table 5.2). Most of these spans were managed by PSEG. Tree sprouts, shrub-oaks, and scrub-shrub together were dominant or co-dominant at 1,405 spans and shrubs were dominant or co-dominant at 302 spans. Herbaceous cover was dominant or co-dominant at 1,339 spans. Most of these spans were ACE spans and many were associated with salt marsh, NJDEP food plots, and the ROW adjacent to the Conrail railroad. Bare ground was dominant or co-dominant for 189 spans.

Vegetation-management Prescriptions

A total of 59 different vegetation-management prescriptions were applied to the 3,041 spans (Appendix). The 59 prescriptions represented various combinations of cutting, mowing, and timing restrictions. A total of 2,431 spans involved mowing, 866 spans involved cutting, and 529 spans involved a timing restriction. Six spans also involved a survey for a single threatened and endangered plant species.

Table 5.2. Number of spans (n) and area (acres) for each utility company in which various land-cover types were dominant or co-dominant for 233 miles of ROWs in the Pinelands. The percentage of the total number of spans for each cover type is given in parentheses. The total number of spans and acres given here exceeds the actual totals because a span can have more than one co-dominant cover type.

	ACE			JCP&L			PSEG			Total
Land-cover Type	n	%	area	n	%	area	n	%	area	n
Forest	8	(9)	2	1	(1)	2	76	(89)	274	85
Tree Sprouts	202	(60)	114	50	(15)	86	83	(25)	345	335
Shrub-oaks	28	(56)	32	2	(4)	6	20	(40)	93	50
Shrubs	240	(79)	172	25	(8)	81	37	(12)	149	302
Scrub-shrub	962	(94)	417	36	(4)	53	22	(2)	86	1020
Herbaceous	1203	(90)	431	94	(7)	139	42	(3)	192	1339
Bare Ground	163	(86)	48	23	(12)	52	3	(2)	12	189

Timing Restrictions

Wetlands. Wetland timing restrictions applied to 41 of the 529 spans that involved a timing restriction. Although the prescriptions varied slightly, all 41 prescriptions include cutting trees manually or mechanically from July 1 through October 31 (i.e., period of low water-table levels). The use of mats is also prescribed for these 41 spans. Mats are large flat wooden or fiberglass platforms placed on the ground to serve as a temporary access road for the operation of heavy equipment and to minimize soil disturbance, especially in wetlands. Wetland GIS data can be obtained from the most recent the New Jersey Department of Environmental Protection land-use/land-cover dataset (see GIS data sources at the end of Task 1).

Threatened and Endangered Species. Threatened and endangered plants and animals were associated with a total of 891 spans (Table 5.3). Fifteen animal species were associated with 559 spans and 27 plant species were associated with 417 spans. The same species record may be associated with more than one span and a span may contain multiple records of the same species or different species. The mean, minimum, and maximum number of species associated with a particular span was 1, 3, and 26 species.

The Pine Barrens treefrog (144 spans) and northern pine snake (92 spans) were associated with the greatest number of spans, whereas the frosted elfin (4 spans), northern harrier (4 spans), vesper sparrow (3 spans), and bobolink (2 spans) were associated with the fewest number of spans. Knieskern's beaked-rush (176 spans) and Pine Barrens reedgrass (146 spans) were associated with the greatest number of spans, whereas American mistletoe (5 spans), yellow fringed orchid (5 spans), small-headed beaked-rush (5 spans), and slender beaked-rush (3 spans) were associated with the fewest number of spans.

Timing restrictions for T&E species were included in the prescriptions of 488 of the 529 spans with a timing restriction (Appendix). Most of the T&E timing restrictions involved mowing prescriptions. T&E surveys were included as part of the prescription in a single case (American mistletoe, *Phoradendron leucarpum*), totaling six spans. A survey is required because mistletoe grows in the canopy of trees, the six spans are forested, and the prescription for these spans is to cut the forest. If mistletoe is determined to be present in any of those spans, the prescription calls for the utility company to submit a plan to the Pinelands Commission that thoroughly describes the actions to be taken to minimize harm to the plant.

Table 5.3. The number of spans associated with known occurrences of threatened and endangered plant and animal species. The same species record may be associated with more than one span and a span may contain multiple records of the same species or different species.

CommonName	Scientific Name	Number of Spans
Animals		
Bobolink	*Dolichonyx oryzivorus*	2
Vesper Sparrow	*Pooecetes gramineus*	3
Frosted Elfin	*Callophrys irus*	4
Northern Harrier	*Circus cyaneus*	4
Grasshopper Sparrow	*Ammodramus savannarum*	8
Red-shouldered Hawk	*Buteo lineatus*	9
Corn Snake	*Elaphe guttata guttata*	9
Cope's Gray Treefrog	*Hyla chrysoscelis*	17
Cooper's Hawk	*Accipiter cooperii*	25
Red-headed Woodpecker	*Melanerpes erythrocephalus*	25
Osprey	*Pandion haliaetus*	41
Timber Rattlesnake	*Crotalus horridus horridus*	42
Barred Owl	*Strix varia*	55
Northern Pine Snake	*Pituophis m. melanoleucus*	92
Pine Barrens Treefrog	*Hyla andersonii*	144
Plants		
Slender Beaked rush	*Rhynchospora inundata*	3
American Mistletoe	*Phoradendron leucarpum*	5
Yellow Fringed Orchid	*Platanthera ciliaris*	5
Small-head Beaked-rush	*Rhynchospora microcephala*	5
Bog Asphodel	*Narthecium americanum*	8
Pine Barren Bellwort	*Uvularia puberula var. nitida*	10
Narrow-leaf Primrose-willow	*Ludwigia linearis*	11
Awned Meadow-beauty	*Rhexia aristosa*	13
Reversed Bladderwort	*Utricularia resupinata*	13
Curly Grass Fern	*Schizaea pusilla*	14
Sandplain Flax	*Linum intercursum*	15
Stiff Tick Trefoil	*Desmodium strictum*	19
Canby's Lobelia	*Lobelia canbyi*	19
Little Ladies'-tresses	*Spiranthes tuberosa*	19
Wand-like Goldenrod	*Solidago stricta*	23
New Jersey Rush	*Juncus caesariensis*	29
Floatingheart	*Nymphoides cordata*	31
Pine Barren Rattlesnake-root	*Prenanthes autumnalis*	46
Slender Nut-rush	*Scleria minor*	56
Pine Barren Smoke Grass	*Muhlenbergia torreyana*	57
Pine Barren Boneset	*Eupatorium resinosum*	59
Barratt's Sedge	*Carex barrattii*	74
Swamp Pink	*Helonias bullata*	77
Pine Barren Gentian	*Gentiana autumnalis*	94
Elliptical Rushfoil	*Croton willdenowii*	117
Pine Barren Reedgrass	*Calamovilfa brevipilis*	146
Knieskern's Beaked-rush	*Rhynchospora knieskernii*	176
Total Number of Unique Spans with Animal Records		559
Total Number of Unique Spans with Plant Records		417
Total Number of Unique Spans with Plant or Animal Records		891

Vegetation-management and Maintenance Flexibility

Because of the specific nature of the vegetation-management prescriptions and the inability to include every possible scenario for every span, we incorporated some flexibility into the ROW plan regarding the implementation of the vegetation-management prescriptions and other ROW maintenance activities. Based on discussions with the utility company and NJBPU representatives, we identified the following eight topics in which flexibility was desirable.

Presence of Trees or Topped Trees. Individual large-diameter trees or topped trees may not have been noticed during field surveys because vegetation was tall in some spans and obscured the view of parts of the span. This was a problem particularly with some of the longer and wider spans managed by PSEG and JCP&L. Trees or topped trees may also have been missed because we relied on aerial-photograph interpretation for characterizing vegetation in many other spans. For safety and reliability reasons, utility companies should be permitted to cut these individual trees or topped trees even if the prescription for that span does not provide for cutting trees. For example, if some trees or topped trees are present within a span that was assigned a mowing prescription, the trees should be removed either manually or mechanically prior to the mowing operation. Utility companies should also be able to cut trees and branches along the ROW boundaries that grow to a point in which they are capable of falling on transmission lines. These danger trees should be cut manually or mechanically in uplands and manually in wetlands.

Woody Debris. To reduce woody debris that can prevent desired shrub and herbaceous vegetation from sprouting, all branches that result from cutting trees in uplands should be chipped into a vehicle on the access road and removed from the ROW. Logs in uplands should be chipped and removed or stacked on the ROW so that they do not interfere with future vegetation management. In wetlands, all branches and logs that result from cutting trees should be chipped into a vehicle on the access road and removed from the ROW. Woody debris that typically results from mowing should not have to be removed from the ROW unless the amount of debris is excessive and prevents shrub and herbaceous vegetation from sprouting.

Height Restrictions. Because part of the goal of the ROW project was to create and maintain relatively stable and sustainable early successional habitats that ensure transmission reliability and safety, many of the vegetation-management prescriptions are designed to encourage the establishment of stable shrub-dominated communities. Although most Pinelands shrub species remain relatively short, depending on the vegetation-height requirements established by the utility for a particular span, some shrubs may eventually become tall enough to pose safety and reliability concerns. If and when this occurs, utility companies should have the ability to cut the shrubs using whatever vegetation-management prescription was assigned to the span.

Timing Restrictions. The timing restrictions applied to spans associated with T&E records were conservative to provide maximum protection for the species. Because many mowing prescriptions contain a timing restriction, utility companies may have difficulty completing the prescribed mowing work within the allowed activity window. Therefore, only when necessary, utility companies should be permitted to mow up to 15 days before the beginning of the timing window and up to 15 days after the end of the timing window.

Span Boundaries. The span polygons in the GIS layer were not intended to represent the exact boundary of the easement owned by the utility company or the boundary of the ROW currently managed by the utility company. As mentioned in Task 1, the polygons provided a

means to represent the ROW spans geographically and to attach vegetation-management prescriptions. Because the existing managed ROW may extend beyond the span boundaries delineated in the GIS layer, the vegetation-management prescription associated with each span should be able to be applied to that span outside the GIS lines, but within the boundaries of the existing managed ROW. Although the existing managed ROW was usually discernable on an aerial photograph, it was most obvious when viewed from the ground. This ROW plan does not provide for vegetation management beyond existing managed-ROW boundaries.

Access-road Maintenance. ROW access roads require periodic maintenance to ensure that utility companies can access their ROWs for site visits, vegetation management, periodic transmission-line work, and emergency situations. To minimize disturbance outside the footprint of the existing access road, the access road should be filled or graded within the original width and elevation of the existing road. Clean fill composed of sand and gravel that is obtained from a local Pinelands source should be used to minimize the establishment of non-native species. Utility companies should be permitted to manage vegetation as needed within the boundaries of the existing access road using the vegetation-management prescription provided for that span. The construction of new access roads or permanent structures, such as culverts and bridges, are not covered under this ROW plan.

Emergency Situations. Utility companies often conduct ground and aerial inspections to determine imminent threats to transmission reliability, such as dead trees or trees leaning towards the transmission wires. Utility companies should be permitted to remove these danger trees as needed using manual or mechanical methods in uplands and manual methods in wetlands. Utility companies should also be permitted to clear vegetation when necessary to access the ROW for other emergency situations, such as pole failure and downed transmission lines.

Habitat Conversion. Utility companies should be able to propose additional vegetation-management prescriptions that are intended to establish a low-growth, characteristic Pinelands vegetation community in areas dominated by vegetation that is not characteristic of the region. To prevent coppice growth in spans with large-diameter trees that are prescribed to be cut, utility companies should be encouraged to harvest trees in uplands and wetlands using equipment that minimizes root and stump sprouting.

RECOMMENDATIONS

We recommend that the Pinelands Commission implement the New Jersey Pinelands Electric Transmission Right-of-way Maintenance Plan and that the three utility companies follow the plan. The ROW plan includes this report and the associated GIS layer, which contains a unique identifier for each span, the utility company responsible for the vegetation management, whether or not the span was characterized using field or aerial-photo surveys, data collected on the existing vegetation, the vegetation-management prescription, and the area of each span in acres. The 59 different vegetation-management prescriptions that apply to the 3,041 spans in the ROW span layer are given in Appendix. The GIS layer is available on the Commission's web site at www.state.nj.us/pinelands/.

The recommendations contained in this ROW plan represent a joint effort between representatives of the Pinelands Commission, Rutgers University, Atlantic City Electric (PHI), Jersey Central Power and Light, Public Service Enterprise Group, and the New Jersey Board of Public Utilities. Because one of the goals of the ROW project was to minimize the need for individual Pinelands Commission permit reviews, we recommend a notification and inspection

process be established in lieu of individual permit reviews. To keep reporting and record keeping to a minimum, utility companies should notify the Commission at the end of each year of the vegetation-management activities that were completed, indicating whether or not any timing restrictions were exceeded, access road or other maintenance was completed, and emergency situations occurred. Commission staff should conduct an annual inspection of the spans that were managed to verify that management and maintenance activities occurred according to the ROW plan.

Because the ROW plan was intended to be dynamic, the Executive Director should be able to approve relatively minor changes to the plan and a more formal process should be developed for more substantial changes to the plan. Finally, we recommend that a long-term monitoring program be established to evaluate the effectiveness of the various vegetation-management prescriptions and whether or not the goals of the project (see Introduction) have been met.

LITERATURE CITED

ANSI (American National Standards Institute). 2001. ANSI A300 (part 1)-2001 American National Standard for tree care operations standard practices (Pruning). ANSI, New York, New York, USA.

Beans, B. E., and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press, New Brunswick, New Jersey, USA.

Boeken, B. and C. D. Canham. 1995. Biotic and abiotic control of the dynamics of gray dogwood (*Cornus racemosa* Lam.) shrub thickets. Journal of Ecology 83(4)569-580 (3)295-300.

Bramble, W. C. and W. R. Byrnes. 1983. Thirty years of research on development of plant cover on an electric transmission right-of-way. Journal of Arboriculture 9:67-74.

Bramble W. C. and W. R. Byrnes. 1996. Integrated vegetation management of an electric utility right-of-way ecosystem. Down to Earth 51:29-34.

Bramble, W. C., W. R. Byrnes, R. J. Hutnik, S. A. Liscinsky. 1991. Prediction of cover types on rights-of-way after maintenance treatments. Journal of Arboriculture 17:38-43.

C. N. Utility Consulting, LLC. 2004. Utility Vegetation Management Final Report, March 2004, commissioned to support the federal investigation of the August 14, 2003 Northeast blackout. Federal Energy Regulatory Commission United State Government, 131 p.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79-31, Washington, DC, USA.

EEI (Edison Electric Institute). 2006. Memorandum of Understanding among the Edison Electric Institute and the U.S. Department of Agriculture Forest Service and the U. S. Department of the Interior Bureau of Land Management Fish and Wildlife Service National Park Service and the U.S. Environmental Protection Agency, 15 p.

ECI (Environmental Consultants, Inc.). 1989. Study of the impacts of vegetation management techniques on wetlands for utility rights-of-way in the Commonwealth of Massachusetts. Report to six utilities Southhampton PA 18966, 198 p.

Hough, M. Y. 1983. New Jersey Wild Plants. Harmony Press. Harmony, New Jersey, USA.

Johnstone, R. 1990. Vegetation Management: mowing to spraying. Journal of Arboriculture 16:186-189.

McLoughlin, K. T. 1997. Applications of integrated pest management to electric utility rights-of-way vegetation management in New York State. *In:* J. R. Williams, J. W. Goodrich-

Mahoney, J. R. Wisniewski, and J. Wisniewski (Eds). Proceedings of the 6th international symposium on environmental concerns in rights-of-way management, February 24-26, 1997, New Orleans, Louisiana, pp 118-126. Elsevier Science, Ltd., New York, New York, USA.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, New York, New York, USA.

NJDEP (New Jersey Department of Environmental Protection). 2004. Draft: No-harm/best management practices for wildlife habitat along utility-line right of ways. Division of Fish and Wildlife, Endangered and Nongame Species Program, updated November 29, 2004.

NJBPU (New Jersey Board of Public Utilities). 2006. Subchapter 8 Vegetation management (tree trimming) standards: 14:5-8.6 (e) (from Draft format published in the New Jersey Register November 22, 2005 Volume 37 under Public Utilities (in legal review as of this report July 17, 2006)).

Nickerson, N. H. 1992. Impacts of vegetation management techniques on wetlands in utility rights-of-way in Massachusetts. Journal of Arboriculture 18:102-107.

Nowak, C. A., B. D. Ballard, E. O'Neill. 2002. Gray birch ecology on an electric powerline right-of-way in upstate New York. *In:* J. W. Goodrich-Mahoney, D. Mutrie, C. Guild (Eds). Proceedings of the 7th international symposium on environmental concerns in rights-of-way management, September 9-13, 2001, Calgary, Canada. Elsevier Science, Ltd., New York, New York, USA.

PHI (Pepco Holdings, Inc.). 2006. Reliability Centered Maintenance: Transmission Right-of-Way Vegetation Maintenance Program, 68 p.

Porteck, K. G., D. L. Ham, A. E. Miller. 1994. Comparison of alternative maintenance treatments for an electric transmission right-of-way on steep mountain terrain. Journal of Arboriculture 21:168-174.

Stone, W. 1911. The plants of southern New Jersey with special reference to the flora of the Pine Barrens and the geographic distribution of the species. N.J. State Museum Annual Report. 1910, 828 p.

Sulak, J. A., and J. J. Kielbaso. 2004. Vegetation management along transmission utility lines in the United States and Canada. Journal of Arboriculture 26:198-205.

United States - Canada Power System Outage Task Force. 2004. Final Report on the August 14, 2003 Blackout in the United Sates and Canada: Causes and Recommendations, 238 p.

Yahner, R. H., W. C. Bramble, and W. R. Byrnes. 2001a. Response of amphibian and reptile populations to vegetation maintenance of an electric transmission right-of-way. Journal of Arboriculture 27:215-220.

Yahner, R. H., W. C. Bramble, and W. R. Byrnes. 2001b. Effect of vegetation maintenance of an electric transmission right-of-way on reptile and amphibian populations. Journal of Arboriculture 27:24-28.

Yahner, R. H. and R. J. Hutnik. 2004. Integrated vegetation management on an electric transmission right-of-way in Pennsylvania, U.S. Journal of Arboriculture 30:295-300.

Yahner, R. H., R. J. Hutnik, and S. A. Liscinsky. 2002. Bird populations associated with an electric transmission right-of-way. Journal of Arboriculture 28:123-130.

Zampella, R. A. 1990. Gradient analysis and classification of pitch pine (Pinus rigida Mill.) lowland communities in the New Jersey Pinelands. PhD Dissertation, Rutgers, The State University of New Jersey, New Brunswick, New Jersey, USA.

Zampella, R. A., C. L. Dow, and J. F. Bunnell. 2001. Using reference sites and simple linear regression to estimate long-term water levels in Coastal Plain forests. Journal of the American Water Resources Association 37:1189-1201.

APPENDIX. Fifty-nine vegetation-management prescriptions and the number of spans with each prescription for the bulk-transmission-line rights-of-way in the Pinelands.

Vegetation-management Prescription	# of Spans
Cut topped trees manually or mechanically and mow from December 1 through April 30. Mow during subsequent management from December 1 through April 30.	1
Cut topped trees manually or mechanically and mow, but avoid mowing shrub patches. Mow during subsequent management, but avoid mowing shrub patches.	10
Cut topped trees manually or mechanically and mow. Mow during subsequent management.	10
Cut trees and topped trees manually or mechanically and mow from December 1 through April 30. Mow during subsequent management from December 1 through April 30.	2
Cut trees and topped trees manually or mechanically and mow from November 1 through January 31. Mow anytime during subsequent management.	1
Cut trees and topped trees manually or mechanically and mow. Mow during subsequent management.	27
Cut trees and topped trees manually or mechanically. Mow uplands and remove trees by hand in wetlands during subsequent management.	1
Cut trees from November 1 through January 31 and mow. Mow during subsequent management.	2
Cut trees manually and mow access road berm only from November 1 through March 31.	3
Cut trees manually anytime or mow from November 1 through March 31.	25
Cut trees manually anytime or mow trees from November 1 through March 31, avoid mowing shrub patches.	4
Cut trees manually because of high orv use. Do not mow.	2
Cut trees manually from November 1 through January 31 and mow. Mow anytime during subsequent management.	1
Cut trees manually from November 1 through January 31. Do not mow.	1
Cut trees manually from November 1 through March 31. Do not mow.	2
Cut trees manually or mechanically and mow from December 1 through April 30. Mow during subsequent management from December 1 through April 30.	2
Cut trees manually or mechanically and mow from November 1 through January 31. Mow anytime during subsequent management.	2
Cut trees manually or mechanically and mow from November 1 through March 31. Mow from November 1 through March 31 during subsequent management.	5
Cut trees manually or mechanically and mow. Mow during subsequent management.	36
Cut trees manually or mechanically anytime in uplands and using mats from July 1 through October 31 in wetlands. Mow in uplands and cut trees manually in wetlands during subsequent management.	4
Cut trees manually or mechanically around tower.	2
Cut trees manually or mechanically from November 1 through January 31 and mow. Mow during subsequent management.	4
Cut trees manually or mechanically using mats from July 1 through October 31. Leave shrubs intact. Cut trees manually during subsequent management. Do not mow.	31
Cut trees manually or mechanically. Do not mow.	4
Cut trees manually or mechanically. Leave shrubs intact. Mow during subsequent management.	1
Cut trees manually or mow trees only from November 1 through March 31, avoid mowing shrub patches.	1
Cut trees manually, but leave shrubs intact. Cut trees manually during subsequent management.	1
Cut trees manually, mow access road berm only.	7

APPENDIX. (continued)

Vegetation-management Prescription	# of Spans
Cut trees manually. Do not mow.	561
Cut trees manually. Mow access road berm only and mow from December 1 through April 30.	1
Cut trees only manually or mechanically, avoid mowing shrub patches.	5
Mow from December 1 through April 30, but avoid mowing shrub and herbaceous patches.	3
Mow from December 1 through April 30, but avoid mowing shrub patches.	10
Mow from December 1 through April 30.	146
Mow from December 1 through March 31, but avoid mowing shrub and herbaceous patches.	2
Mow from December 1 through March 31, but avoid mowing shrub patches.	5
Mow from December 1 through March 31.	88
Mow from December 1 to April 30.	1
Mow from July 1 through February 1.	1
Mow from November 1 through January 31.	12
Mow from November 1 through March 31 in uplands and remove trees by hand in wetlands.	2
Mow from November 1 through March 31, but avoid mowing shrub and herbaceous patches.	16
Mow from November 1 through March 31, but avoid mowing shrub patches.	4
Mow from November 1 through March 31.	126
Mow in uplands and cut trees manually from December 1 through March 31.	1
Mow in uplands and cut trees manually in wetlands from December 1 through April 30.	5
Mow in uplands and cut trees manually in wetlands from December 1 through March 31.	9
Mow in uplands and cut trees manually in wetlands from November 1 through March 31. Avoid mowing shrub patches.	1
Mow in uplands and cut trees manually in wetlands.	74
Mow in uplands, but avoid mowing shrub patches. Cut trees manually in wetlands.	4
Mow in uplands, mow access road berm, and cut trees manually in wetlands from November 1 through March 31.	1
Mow pasture as needed and cut trees manually in remainder of span.	1
Mow trees from December 1 through March 31, but avoid mowing shrub patches.	3
Mow west of road and cut trees manually east of road from December 1 through March 31.	1
Mow, but avoid mowing shrub and herbaceous patches.	16
Mow, but avoid mowing shrub patches.	82
Mow.	1,660
Mow. Cut trees manually during subsequent management.	2
Survey for Phoradendron leucarpum (American mistletoe). If present, develop a plan, if absent, cut trees manually or mechanically using mats from July 1 through October 31. Leave shrubs intact. Remove trees manually during subsequent management.	6
Total Number of Spans	3,041

PSE&G ENVIRONMENTAL COMPLIANCE MATRIX January 2010

Salem-New Freedom South

Ordered Span	Wetlands	Wetlands Buffer	Waterbody Name	Riparian Buffer	Plant of Concern	Combined Work Window	Federal Species - REDACT	State Species - REDACT	Comments	Year
01/01-01/02									No Maintenance	
01/02-01/03		150 Feet				Sept 1 to Dec 14			No Maintenance	
01/03-01/04	Exceptional	150 Feet		Category 1, HUC-14 Upstream - 300 Feet		Sept 1 to Dec 14			No Maintenance	
01/04-02/01	Exceptional	150 Feet	Uncoded Tributary	Category 1, HUC-14 Upstream - 300 Feet		Sept 1 to Dec 14			No Maintenance	
02/01-02/02	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
02/02-02/03	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
02/03-02/04	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
02/04-03/01	Exceptional	150 Feet	Hope Creek	Category 1 - 300 Feet		Sept 1 to Dec 14			State Owned Land	
03/01-03/02	Exceptional	150 Feet	Fishing Creek UNT	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
03/02-03/03	Exceptional	150 Feet	Fishing Creek UNT	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
03/03-04/01	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance, State Owned Land	
04/01-04/02	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			State Owned Land	
04/02-04/03	Exceptional	150 Feet		Category 1 - 300 Feet		Sept 1 to Dec 14			State Owned Land	2008
04/03-05/01	Exceptional	150 Feet		Category 1 - 300 Feet		Sept 1 to Dec 14			State Owned Land	2008
05/01-05/02	Exceptional	150 Feet	Uncoded Tributary	Category 1 - 300 Feet		Sept 1 to Dec 14			No Maintenance	
05/02-05/03	Exceptional	150 Feet	Uncoded Tributary	Acid Producing Soils - 150 Feet		Sept 1 to Dec 14				
05/03-06/01	Exceptional	150 Feet	Uncoded Tributary	Acid Producing Soils - 150 Feet		Sept 1 to Dec 14			100 % Wetland	
06/01- 6/02	Exceptional	150 Feet				Sept 1 to Dec 14			Wooded wetland adjacent to 6/1	
06/02-06/03	Intermediate	150 Feet		Acid Producing Soils - 150 Feet					Wooded wetland adjacent to 6/3	
06/03-06/04	Exceptional	150 Feet	Uncoded Tributary	Acid Producing Soils - 150 Feet						2006
06/04-07/01	Exceptional	150 Feet				Sept 1 to Dec 14				2006
07/01-07/02	Exceptional	150 Feet				Sept 1 to Dec 14				
07/02-07/03	Intermediate	50 Feet								2006
07/03-07/04	Intermediate	50 Feet								
07/04-08/01	Intermediate	50 Feet								
08/01-08/02	Intermediate	150 Feet							Small wetland area near 8/1, State Owned Land	2010
08/02-08/03	Exceptional	150 Feet		T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			State Owned Open Space / Wetland areas within span	
08/03-08/04	Exceptional	150 Feet	Canton Drain	T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			State Owned Open Space / Wetland on half of span toward 8/3	
08/04-09/01	Exceptional	150 Feet				Sept 1 to Dec 14			State Owned Open Space / Wetland around 8/4 and wooded areas around 9/1	2008
09/01-09/02	Exceptional	150 Feet				Sept 1 to Dec 14			State Owned Open Space / Limited access - no mowing in swamp pink flagged area	2008
09/02-09/03	Exceptional	150 Feet				Sept 1 to Dec 14			No mowing in swamp pink flagged area	2006
09/03-09/04	Exceptional	150 Feet				Sept 1 to Dec 14			No mowing in swamp pink flagged area	2006
09/04-10/01	Exceptional	150 Feet				Sept 1 to Dec 14			Small wetland near 10/1 only	2006
10/01-10/02	Exceptional	150 Feet	Stow Creek UNT	T&E Plant/Animal Critically Dependent - 150 Feet	Plant of Concern on Site	Sept 1 to Dec 14			No mowing in swamp pink flagged area	2006
10/02-10/03	Exceptional	150 Feet			Plant of Concern on Site	Sept 1 to Dec 14			No mowing in swamp pink flagged area	
10/03-10/04						Sept 1 to Dec 14				2006
10/04-11/01						Sept 1 to Dec 14				2008
11/01-11/02				T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			No mowing in swamp pink flagged area	2005
11/02-11/03						Sept 1 to Dec 14				2006
11/03-11/04	Exceptional	150 Feet	Stow Creek UNT	T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			No mowing in swamp pink flagged area	2005
11/04-12/01	Exceptional	150 Feet	Stow Creek UNT	T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			No mowing in swamp pink flagged area	2008
12/01-12/02	Exceptional	150 Feet		T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14				
12/02-12/03	Exceptional	150 Feet				Sept 1 to Dec 14				
12/03-12/04	Exceptional	150 Feet				Sept 1 to Dec 14				2008
12/04-12/05		150 Feet		T&E Plant/Animal Critically Dependent - 150 Feet		Sept 1 to Dec 14			No Maintenance	
12/05-13/01	Intermediate	150 Feet	Horse Run UNT	T&E Plant/Animal Critically Dependent - 150 Feet					Very small wetland near 13/1	2008
13/01-13/02	Intermediate	50 Feet	Horse Run UNT	T&E Plant/Animal Critically Dependent - 150 Feet					Small wetland areas associated with ditch within ravine	2008
13/02-13/03			Horse Run UNT	T&E Plant/Animal Critically Dependent - 150 Feet					Small wetland areas associated with ditch within ravine	2008
13/03-13/04									No Maintenance	
13/04-14/01										
14/01-14/02									No Maintenance	
14/02-14/03									No Maintenance	2008
14/03-14/04									No Maintenance	
14/04-15/01									No Maintenance	
15/01-15/02									No Maintenance	
15/02-15/03									No Maintenance	2008
15/03-15/04									No Maintenance	
15/04-15/05	Intermediate	50 Feet	Cohansey River UNT	T&E Plant/Animal Critically Dependent - 150 Feet					No Maintenance	2008
15/05-16/01	Exceptional	150 Feet	Cohansey River UNT	T&E Plant/Animal Critically Dependent - 150 Feet					No Maintenance	2008

Notes:
Bog Turtle is listed as a species under Federal and State Species. The timing restrictions are only calculated in the Federal work window.
If Bog turtle, swamp pink or small whorled pogonia is listed for a span, a field survey is required.
If a salamander or tree frog species is noted, avoid vernal ponds.
While plants communities of concern are listed, they have not been calculated into the given work windows. - Discuss with supervisor
No maintenance in areas flagged as swamp pink habitat
For Federal Listed Plant Species - Maintenance should be conducted in the late fall and winter - after plant growing season
Special Note: For spans with sensitive joint vetch - if maintenance is required - set mower at 6 inches and no herbicide use in the span

Delivery Projects & Construction
Public Service Electric and Gas Company
80 Park Plaza, T17, Newark, NJ 07102
tel: 973-430-7000

PSE&G

February 7, 2010

Ms. Linda Fisher
Division of Land Use Regulation
New Jersey Department of Environmental Protection
5 Station Plaza
501 East State Street
Trenton, New Jersey 08609

RE: PUBLIC SERVICE ELECTRIC AND GAS COMPANY (PSE&G)
FRESHWATER WETLANDS PERMIT NO. 000-02-0031.2
ENDANGERED SPECIES COMPLIANCE
DURING ELECTRIC TRANSMISSION RIGHTS-OF-WAY
VEGETATION MAINTENANCE ACTIVITIES

Dear Ms. Fisher:

Pursuant to your e-mail of January 14, 2010 Public Service Electric and Gas Company (PSE&G) has prepared this summary of past and present vegetation management practices.

Past PSE&G transmission Rights-of-Way (ROW) vegetation management practices were not a highly coordinated practice. Typically, cutting of trees was on as needed basis. PSE&G forestry managers would drive the transmission ROW and identify trees which had the potential to damage the transmission lines. During this time, trees were cut in the line and border zone based on need. During the building of Hope Creek Nuclear Power Plant (1982-1994) in order to construct the power plant, all excess funds were funneled into the construction of the plant. Little or no vegetation maintenance was conducted during this period.

After the construction of Hope Creek, maintenance returned to tree removal on an as needed basis. However, in 2002, PSE&G's vegetation maintenance became more structured. At this point, three regional forestry crew chiefs investigated each ROW within their areas to determine what areas needed to be maintained. Areas in critical need of maintenance were identified as Red Spans. Between 2002 and 2006 trees in both the border zone and wire zone were cut creating conditions where regrowth along these lines could be maintained using a hydro-ax. The majority of the vegetative maintenance was conducted between January 1 and June 1.

Each year, typically during the summer months, PSE&G would coordinate with the US Fish and Wildlife Service (USFWS) and New Jersey Department of Environmental Protection

(NJDEP) Endangered and Non-game Species Program (ENSP) for information concerning threatened and endangered species along the transmission ROWs. PSE&G identified Red Spans, first on paper USGS maps and eventually as GIS shape files for the USFWS and ENSP to identify potential threatened and endangered species habitat. This resulted in timing restrictions for spans identified as containing Indiana bat and bog turtles. In addition, the USFWS identified spans potentially containing swamp pink which were avoided to the maximum extent possible. This data was compiled into a span by span Environmental Compliance Matrix which was updated annually with the years planned maintenance.

In December 2006 the new BPU regulations went into effect. Starting in January 2007, PSE&G removed trees in the wire zone as per the BPU regulations to a height of not more than three (3) feet. PSE&G also followed the BPU regulations in the border zone and removed any tree that has the potential to grow greater than 15 feet in height at maturity. The regulations in the border zone have since been modified allowing trees up to 25 foot at maturity. This border zone height can change according to the height of the wire, topography or easement restrictions. In order to comply with the BPU regulations, PSE&G started utilizing the FeCon Mower which is more efficient then the Hydro-ax. Table 1 describes the differences between the Fecon Mower and the Hydro-ax.

Table 1
Differences in Mechanized Maintenance Equipment

Hydro-ax	FeCon
Cuts 6-10 inches above ground – creates trip and stab hazards for worker and people on ROW and complaints from property owners	Adjustable cutting height
First Cut - 80% of stump grow back	First cut – 50% stump grow back
Second Cut – close to 80% stump grow back	Second cut – 30% stump grow back
Requires significantly more herbicide	With use of a minimal amount of herbicide – FeCon can be phased out

In 2009, PSE&G met with the USFWS and ENSP and through a non-disclosure agreement, provided each agency with shape files for all of PSE&G's transmission lines. The agencies in turn, reviewed the entire transmission network and provided the locations and best management practices (BMPs) for each span. In addition, PSE&G has been working with the Pinelands Commission for specific BMPs for those spans under the Pinelands jurisdiction. PSE&G has compiled this data into a comprehensive Environmental Compliance Matrix which covers PSE&G's entire transmission network. The revised matrix has been modified to include Flood Hazard Area riparian zone information, stream classifications and Landscape Project mapped wetlands and transition areas. The field chiefs each have a copy of the Environmental Compliance Matrix. The field contractors are given a modified version of the matrix which lists the span, the work window and the how the span will be cut, either by hand or mechanized.

In spans containing bog turtle habitat, a USFWS certified bog turtle specialist conducts a Phase I bog turtle survey to determine if suitable habitat exists on the ROW. If suitable habitat is present a 200 foot area surrounding the habitat is flagged. No maintenance can occur within the flagged area unless accompanied by a USFWS certified bog turtle specialist, and then, only hand cutting is allowed. In addition, swamp pink, small whorled pogonia and bog asphonia areas identified by the USFWS will be assessed and flagged (200 feet around identified colonies) in the field by qualified botanists. No mechanized vegetation maintenance will be allowed in these areas and only hand cutting will be allowed.

To avoid impacts to threatened and endangered species along its ROWs, PSE&G has shifted it maintenance work window to more closely correspond to those times reflected in the NJDEP BMPs. In 2009, vegetation maintenance started on October 1 and will end on March 31. Spans with more restrictive timing constraints were cut within the identified work windows. For the maintenance season starting in 2010, vegetation maintenance will start on September 1 and extend through March 31 to allow for spans identified as bald eagle nesting and foraging habitat to be maintained. This species has a work window from September 1 to December 14 and when other species such as wood turtle are also present, some spans have a 30 day work window.

During the 2010 field assessment of those areas which need to be maintained, the three regional forestry crew chief will be taking note of which stream crossings have woody vegetation within the riparian zone to highlight where riparian zone/vegetation maintenance issues may occur.

PSE&G is also adopting the BPU Integrated Vegetation Management which incorporates BPU Border Zone allowances.

PSE&G contractors receive a work order sheet which identifies the spans, work window, if there are restrictions such as threatened and endangered species habitat flagged, how the span is to be cut and if a certified biologist needs to be on site during the maintenance activity. PSE&G is looking into marking towers in the field or using GPS equipment on each mower to identify span specific constraints and maintenance procedures.

As to the expansion of existing ROWs, I have had discussions with the PSE&G field maintenance chief concerning cutting areas not previously cut. He has indicated that most of the ROWs which have transmission lines on them are cut to the full extent of the ROW. The most notable exception is the Bushkill Line which has had minimal maintenance for a number of years. PSE&G is not planning on widening this ROW to its full 150 foot width at this time. We are currently evaluating those areas which will need to be widened and if there are wetland areas within these areas, PSE&G will be applying for an Individual Freshwater Wetlands Permit to cut the ROWs back out to their full extent.

A comparison of the past and present vegetation maintenance practices is provided in Table 2.

Table 2
Comparison of Past and Present Practices

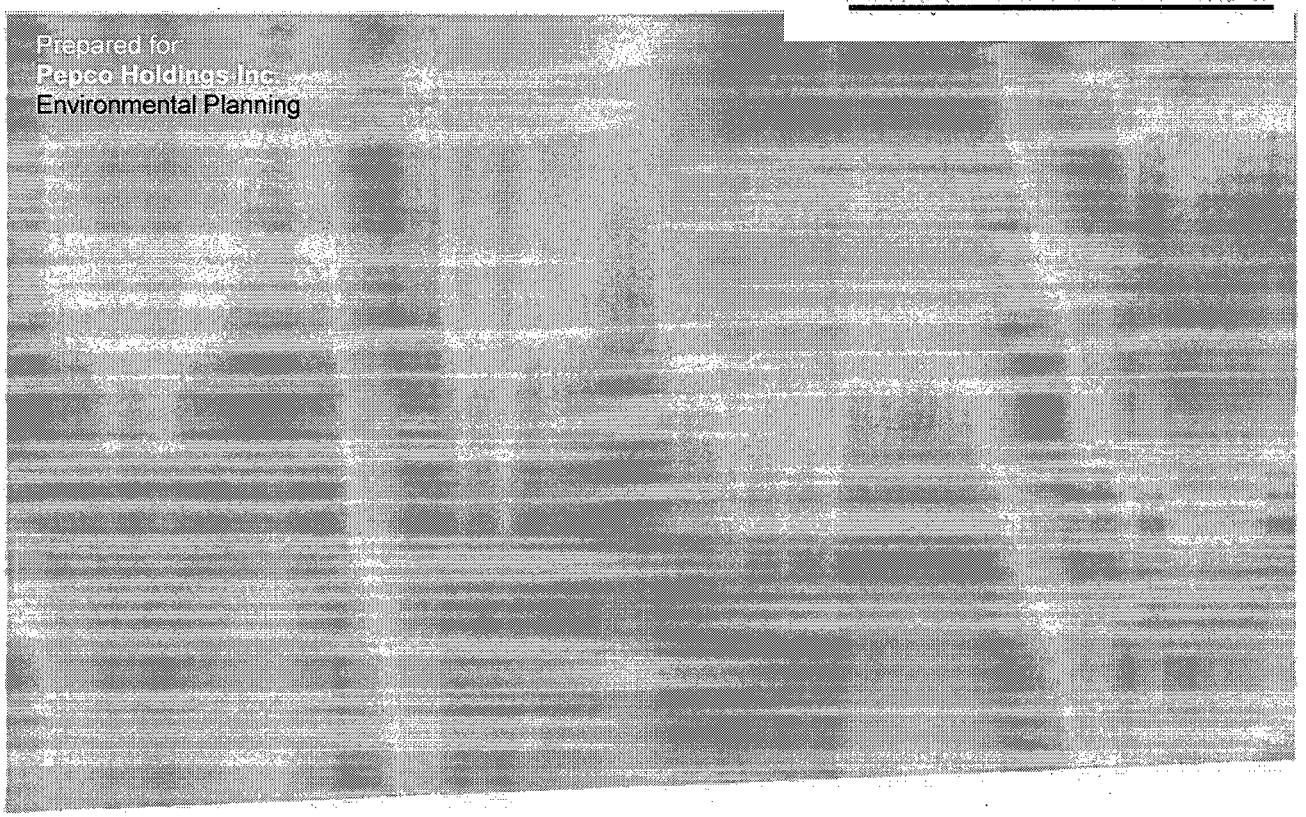
Past Practices	Present Practices
Pre 2002 – tree removal on an as needed basis	Coordinated woody vegetation removal in compliance with the BPU regulations
Large areas of small dbh woody vegetation using a hydro-ax. Left 6 to 10 inch tall stumps and allowed for significant regrowth. Needed to return bi-annually to control regrowth. Required judicious use of herbicides.	Large areas of small dbh woody vegetation using a FeCon mower. Less regrowth, adjustable height mower head. Mower height set at 1 inch in uplands, 3 inches in uplands with identified threatened and endangered species and 6 inches in wetlands. Uses minimal volume of herbicides.
Crew chiefs assess entire line for Red Spans and areas in need of maintenance annually.	Crew chiefs assess entire line for Red Spans and areas in need of maintenance annually. In addition, the crew chiefs are identifying riparian zones within the ROW which have woody vegetation.
Contact USFWS and NJDEP ENGP for threatened and endangered species information on Red Spans. Developed annual Environmental Compliance Matrix which was distributed to the crew chiefs.	Contacted USFWS & NJDEP ENGP for threatened and endangered species information for the entire transmission line network. Developed Environmental Compliance Matrix which will be distributed to the crew chiefs. This matrix can be updated quickly through agency contact for new potential habitat within the ROWs. In addition, Pineland BMPs are included in the matrix.
Maintenance window between January 1 and June 1 which conflicted with many of the threatened and endangered species work windows.	Maintenance window between September/October 1 and March 31, avoids most of the threatened and endangered species work windows. Species outside of this time period – maintenance scheduled to fall within work window. For spans with bog turtle, swamp pink, and specific endangered plants, certified specialists conduct survey and flag 200 foot area around the endangered species. No maintenance is allowed in bog turtle habitat unless USFWS certified specialist present. Only hand cutting in these areas allowed. All flags removed at end of maintenance.
Field contractors given a list of the spans that need to be cut with general specifications of cutting methods	Field contractors given a list of the spans that need to be cut with specific specifications of cutting method and time period.

I hope this brief synopsis of PSE&G vegetation maintenance activities and the measures we have incorporated to prevent impacts to wetlands and threatened and endangered species answers the questions posed in your e-mail. If you need additional information or want to meet to discuss these issues further, please call me at (973) 430-5228.

Sincerely:
Public Service Electric & Gas

David W. Grossmueller, Ph.D.
Senior Permitting Specialist

NON-PSEG



Environmental Permitting Manual
Final

Prepared by:

ENSR | AECOM

20 New England Avenue
Piscataway, NJ 08854
732-981-0200

September 2006
Document No.: 01855-043

Pepco Holdings Inc pepco delmarva power atlantic city electric

Prepared for:
PHI Power Delivery
Delaware

Environmental Permitting Manual
Final

Prepared By

Reviewed By

ENSR Corporation
September 2006
Document No.: 01855-043

Pepco Holdings Inc pepco delmarva power atlantic city electric

Contents

List of Tables

List of Figures

1.0 Introduction

This chapter describes the objectives, content and layout and intended uses and users of the manual.

1.1 Objective

The construction and maintenance of electric delivery, gas delivery and distributed generation infrastructure require a number of environmental permits to comply with applicable Federal, State and local regulations.

Pepco Holdings, Inc. (PHI) is the parent company of the public utility company which includes Delmarva Power Region (DP), Atlantic City Electric Region (ACE) and the Potomac Electric Power Company (PEPCO). The combined service areas of PHI include Delaware, Maryland, New Jersey, Virginia and the District of Columbia. PHI Power Delivery Environmental Planning has identified the need to provide concise permitting information to multi – departmental team members involved in such projects.

To this end, this manual is intended to provide concise, yet comprehensive, information about requirements to facilitate the planning and environmental permitting of projects undertaken by PHI within the current service territory. This manual is not intended as legal advice. Because regulatory programs and policies are subject to frequent change and addition, the manual user should always consult directly with regulatory agencies to confirm any information contained herein.

1.2 Content and Layout

This manual will specifically focus on the environmental permitting requirements for typical project activities (described in Chapter 2) within the company's operating territory. The manual includes environmental permit requirements for all media (water, air, land, waste) including requirements for cultural resources, endangered species, and waste management and hazardous material transportation. The Manual includes detailed information for the various Federal, State and regional approvals that may be required for various project types and activities. Potentially required local approvals are identified, however, details are not provided, as such details are best obtained from the local authorities.

Chapter 2 provides a description of projects and activities addressed in the manual, as well as useful summary information and matrices to facilitate manual use. Links within the document and / or websites are provided which allow the user to identify potential permit activities by project type or activity, and then link to the more detailed or other related information contained in other sections of the manual.

Chapter 3 summarizes specific information and permit requirements for the District of Columbia, Delaware, Maryland, New Jersey and Virginia. Regional, county and local agencies that may require permitting such as Regional Soil Conservation Districts are also incorporated into the State specific permit requirements including which Projects or aspects of each project are regulated by citing specific regulations and permit requirements such as allowable impacts, drawings required and specific application needs. Each summary contains links to regulatory agencies, forms and regulation for reference purposes. Other applicable local or regional permit requirements that may be required are identified in each permit summary (Figure 1). Potential issues and additional information/surveys that may be required are also noted in Chapter 3.

Chapter 4 provides specific information and permit requirements for the various Federal agencies including those related to Coastal Zone Consistency, water permits, endangered species, fisheries, natural gas and aviation standards. Similar to Chapter 3, this includes which Projects or aspects of each project are Federally regulated by citing specific regulations and permit requirements such as allowable impacts, drawings required, specific application needs and potential issues. Links are also provided to regulatory agencies for additional reference purposes. Comprehensive permit information is provided in an annotated summary table.

Several appendices provide additional supporting information including:

Appendix A: Abbreviations and acronyms

Appendix B: Regulatory agency contact information

Appendix C: Common Study and Data Collection Needs

The permitting manual is made available in an electronic PDF format. This software is a free download by Adobe Acrobat which enables easy search criteria and the ability to hyperlink sections within the manual as well as internet websites.

Figure 1. Example Permit Summary Format

PERMIT SUMMARY: State – Permit Name (Regulatory citation)
Statement of purpose • Describes the purpose of the regulations
Regulated activities and project types • Activities: Identifies specific activities that may require a permit (provides reference to activities by activity # (See Chapter 2) • Project Types: Identifies specific project types that may require a permit (provides reference to project types by project type # (See Chapter 2)
Statutory and regulatory citations • Provides citations (and links where available) for enabling/authorizing legislation as well as applicable regulations.
Published reference materials/instructions • Identifies and provides website links (where possible) to published reference materials and instructions.
Agency and agency contact information • Lead Agency: identifies the lead agency, and provides links to applicable contact information • Other Agencies: identifies other agencies that may be involved or have input on regulatory approval
Permit validity duration/renewal • Identifies the permit term, and duration for extensions or renewals. Also identifies deadlines for renewals and extensions.
Forms required • Identifies forms required for permit application and provides website links to online forms.
Basic application contents • Describes basic application materials including reference to forms, plans and supporting documentation that may be required.
Typical supporting data/study needs • Provides a list of typical data/study (i.e. – T&E studies, cultural resource studies, wetlands delineation, SAV)needs including the timeframe for studies
Fees and penalties: • Fees: Provides typical permitting fees or information used for fee calculation • Penalties: Provides information regarding potential penalties and fines for permit violation.
Public Participation/comment/notifications • Describes public participation/comment and public notification requirements associated with the permit.
Permitting timeframe • Application Preparation: Describes typical time to prepare permit applications as well as typical times for agency review/processing and public comment. • Typical Agency Processing: Describes typical time for agency review/processing and public comment.
Permit condition requirements • Summarizes typical permit conditions to be implemented during and post construction (i.e. – timing restrictions, construction oversight, implementation of BMPs, as built certification, mitigation, other studies)
Important considerations and common pitfalls • Describes important considerations and common pitfalls that may affect permit approvals or impact project schedule (e.g., changes in design, drawings, administrative completeness, etc.).
Other approvals that may be required • Identifies other approvals and comments that may be required for projects or activities requiring the above described permit
Critical path information • Identifies critical path information such as route location, certain design information, construction methodology, in service date, right of way, land acquisition, access or other factor that may affect project schedule and the timing of permit application

1.3 Intended Users

Projects undertaken by PHI involve representatives from a number of departments including: Community Relations, Construction Management, Distribution and / or Substation Engineering,

Environmental Planning, Forestry, Gas Delivery, GIS, Legal, Real Estate, Right-of-Way (R/W), Regulatory Affairs, System Planning, Transmission and any other PHI employee.

1.4 Intended Uses and Limitations

1.4.1 Intended Uses

This manual is intended to serve as a planning tool and reference for PHI staff, intended to aid in streamlining the environmental permitting process, including project planning, design, construction and post construction. Actual uses may vary by user and project type.

This manual may be used to identify potentially required permits and permit requirements to facilitate permitting undertaken by PHI staff or by outside consultants. The manual may be used to address environmental permitting considerations into project planning, budgeting, scheduling, engineering design, construction, and operation/maintenance.

1.4.2 Limitations

The manual is intended to provide guidance as to likely permit requirements, and to provide useful information regarding permits that may be required. This manual does not constitute legal advice, and may not include all permits potentially required for any given project. Significant efforts have been made to make this manual as complete and accurate as possible. However, users should always confirm information contained herein with the applicable regulatory authorities.

Because no two projects are alike in their environmental setting and design, permit requirements will vary by individual project. Similar projects may require different permits depending on the State in which the project is undertaken, and the unique environmental setting of that particular project.

Regulations and regulatory requirements and policies are subject to change, and should be verified with the appropriate regulatory agency before initiating permitting efforts. The information contained herein reflects requirements at the time of preparation (through February 2006) of this manual.

1.5 Updating Information

Given the every changing nature of regulations and the regulatory environment, a permitting manual such as this one must be considered a "living" document. PHI Environmental Planning should provide updates or addenda to the manual to address future regulatory changes as well as additional information as it becomes available.

This manual has been formatted so as to allow users to attach comments. Users are encouraged to flag items which they believe are incorrect or outdated, and provide corrected information or links where available. Users should attach comments to provide notes as to lessons learned regarding a specific permit that may benefit PHI projects in the future. These notes may then be used when completing periodic updates of the manual. A blank permit summary form has also been provided so that as additional permits may be identified, permit summary information can be readily added to the manual.

2.0 Permitting Overview

This chapter provides an overview of the permitting process, regulated project types and activities, and summarizes permit requirements by project type and activity through a series of matrices organized by State and Federal agency. This chapter concludes with a discussion of general permit strategies and tips for successful project permitting.

2.1 Permitting Process Overview

The environmental permitting process for PHI projects is often complex and requires input from a number of departments. The permitting process can have a significant impact on project design, construction methods, schedule and cost, as wells as on future operation and maintenance. As such, it is useful to describe the general permitting process in the context of overall project implementation, and the roles of various departments in the process.

Figure 2 illustrates the overall process, including major activities and involvement by staff of various departments. Key participants include Project Family Coordinator (PFC), Environmental Planning, Real Estate & R/W, System Planning, Engineering, Community Relations, Legal, Forestry, Construction Management/Field Groups, GIS, and System Operations. There are several phases in the overall environmental permitting process including:

- Project Planning
- Project Design
- Project Permitting
- Construction
- Post Construction

Key aspects of each of these phases are described below. While presented in a linear manner, the project process is often iterative.

2.1.1 Project Planning

Once System Planning identifies the project need, scope, in-service date and evaluates alternatives, a number of other departments become involved in the planning process. At this stage, a Project Family Coordinator and / or Engineering Lead may be assigned, as appropriate. The Engineering Lead may also serve as Project Manager for some small projects. If possible, GIS and / or Environmental Planning can develop maps showing the proposed route and alternatives, as well as associated environmental data (e.g., wetlands, threatened & endangered species, water ways, etc.), if available. Environmental Planning completes an initial study including, site visits and a review of GIS data to evaluate potential environmental issues and permit needs for the project and alternatives. Engineering evaluates alternatives from an engineering design, reliability and cost perspective. Regulatory Affairs and Community Relations assists in the site selection and alternative selection based on knowledge and needs of local municipalities. Real Estate and Right of Way evaluate land acquisition and / or easement status and needs. Others including Forestry, and Construction Management also evaluate project relative to their areas of responsibility and provide input to all aspects of the planning process.

When notified of a project, Environmental Planning distributes the Environmental Questionnaire to all relevant departments for completion and input. As appropriate, Community Relations may meet with local officials to get an early read on potential concerns. After gathering initial information, a

determination can be made as to whether the project must be approved through any regulatory agencies (i.e., the Board of Public Utilities (BPU)) or locally. Once the Environmental Questionnaires are completed Environmental Planning will identify potential permitting/mitigation needs including a preliminary schedule for permit application preparation and approval process. Early identification of permit requirements and preliminary schedule are critical given the significant impact permitting can have on route selection, design, construction schedule, and in-service dates. It may be necessary to modify the preferred route, site or project design or construction method to reduce or eliminate environmental impacts, as well as, permit requirements or potential obstacles to meet the target in-service dates.

The culmination of the planning process is the selection of a preferred route or site which meets objectives of cost, system needs while considering community concerns.

Summary

Actions and Products: Key actions and products from this phase include:

- System Planning assesses project need, scope and in-service date;
- GIS maps for environmental analysis, land acquisition, right of way selection, and engineering design;
- Environmental Planning coordinates completion of environmental questionnaire, evaluates available environmental data in GIS for potential permitting and study needs;
- All participants identify permit requirements and known critical flaws or obstacles to the permitting process;
- Right of Way evaluates easements and rights along existing and / or proposed project corridors; and,
- Real Estate evaluates potential land acquisitions or owned land that can be used for the project.

Important Considerations: Key considerations in the project planning phase include:

- Project need, cost and critical in-service dates;
- Engineering feasibility and constraints;
- Construction methodology, techniques and schedule;
- Environmental constraints that may impact project schedule or impose significant constraints on design or construction;
- System Operations and PJM outage schedule; and,
- Local support/opposition or other issues

Outcome: Key outcomes in the planning phase include:

- Preferred and alternative routes/sites selected

2.1.2 Project Design

Process design begins once the route/site has been selected and in-service dates have been established. Engineering and / or Environmental proceeds with site survey, base mapping and preliminary layout design. During this same period, Environmental Planning completes agency consultation and begins environmental studies (e.g., threatened and endangered (T&E) species,

cultural resources and wetland delineation). Real Estate makes contact with local agencies (Zoning, Planning Board, Building) and begins the process of acquiring new/additional land, ROW, construction lay down areas and/or owner access agreements.

Environmental Planning will make an impact assessment using the preliminary design information and results of the environmental studies. Environmental identifies issues that may significantly increase project cost, permit requirements, permit timeline, or potential construction restrictions. As appropriate, Environmental updates permitting needs and schedule, and will work with Engineering to determine if changes in route or project design are warranted to minimize impacts. Additional field studies are completed as necessary based on changes in route or site. Environmental Planning will also identify likely mitigation requirements, and Real Estate may identify potential sites for mitigation projects.

Pre-application meeting with environmental agencies may occur during this time period for larger, more complex projects. However, smaller, less complex projects may not require a pre-application meeting.

During this same period, Legal determines if BPU or Certificate of Public Convenience and Necessity (CPCN) approvals are needed. In addition, Community Relations continues to meet with local officials. At the end of this phase, Systems Operation schedules preliminary outage.

Summary

Actions and Products: Key actions and products from this phase include:

- Real Estate and / or ROW obtain options for land, new/additional ROW, owner access agreements and construction lay down areas;
- Engineering hires contractor for survey and base mapping and contractor completes survey and mapping;
- Engineering completes preliminary layout design;
- Environmental Planning acquires consultants and completes environmental studies or other investigations;
- Environmental Planning updates permitting needs and schedule based on results of studies and preliminary design;
- Environmental Planning identifies potential obstacles to environmental approvals and works with Engineering to determine if change in route/site or design is appropriate;
- Regulatory Affairs and Legal determines if BPU, CPCN, Federal, state, regional, county and / or local approvals are needed;
- Engineering, Construction Management and Systems Operation schedule preliminary outage; and,
- Forestry conducts evaluation of proposed project right of way and determines clearing needs.

Important Considerations: Key considerations in the project design phase include:

- Environmental Planning and Engineering may identify opportunities to minimize environmental impacts throughout the design process;
- Environmental studies may identify additional constraints that must be addressed in project design, and which may require changes to selected route or site selection. Such

constraints may also affect project cost, permitting and construction schedule, as well as, all subsequent activities;

- Coordination between all departments can provide an opportunity to minimize environmental impacts and streamline permit requirements through the design process;
- Construction Management will be consulted regarding construction methods, materials, and access to ensure that information developed by Engineering and Environmental Planning for the permit applications is accurate and feasible. In addition, Environmental Planning should discuss any potential timing restrictions or special construction methods that may be required with Construction Management;
- Some environmental studies may have seasonal requirements, which may extend the time frame for completing studies. In cases where this would result in significant delays to the project, design and permitting may continue with best available information, with the expectation that surveys will be completed as soon as possible during subsequent phases. Delay in completing surveys may delay agency action on permit applications; and,
- Systems Operation should schedule preliminary outage with an understanding of potential permitting or engineering constraints and contingencies, such as timing restrictions.

Outcome: Key outcomes in the process design phase include:

- Preliminary route and design addressing all stakeholders issues
- Completion of environmental studies
- Preliminary outages are scheduled.

2.1.3 Project Permitting

The permitting process includes Federal and state environmental permitting, local/municipal permitting, as well as BPU and CPCN.

The first step in the permitting phase of the project, is finalizing layout and design, right of way, construction lay down areas, land acquisition, site plans, access and construction methods. Using this final design information, Environmental Planning finalizes permit application packages. It is possible, that minor adjustments in design may be requested by agencies. Environmental Planning files applications with the appropriate agencies and public notifications are completed and the state and federal environmental agency review process begins. Agencies may request additional information, route, design or construction modifications, as well as, additional environmental studies. The timeframe for review varies considerably by agency and permit type. Some have regulatory timeframes for the review process, although these are often extended as agencies request additional information. However, some agencies are not required to review the permits within any specified timeframe.

Filings of all Federal, state and local permit applications occur during this time period. If applicable, the BPU or other regulatory filings also occur during this phase.

Summary

Actions and Products: Key actions and products from this phase include:

- All departments finalizes the route, design, layout, site plans, lay down areas, access and construction methods;

- Real Estate finalizes acquisition of land, obtains property owner permission for construction or easement certification and obtains adjacent property owner list for permitting;
- Forestry determines whether required clearing falls under routine maintenance; and applies for clearing permits and proceeds with clearing if determined to be routine maintenance;
- Environmental Planning finalizes environmental permit applications and files with appropriate agencies. Additional studies are completed as required. Environmental Planning works with Engineering to address design changes required as result of permitting process. Upon receipt of permits, summaries are distributed to all parties describing permit conditions and any other pertinent information;
- Engineering obtains DCA permit and Real Estate obtains local permits;
- Regulatory Affairs and / or Legal applies for BPU or CPCN approvals as needed;
- Systems Operation sets preliminary outage schedule; and,
- GIS incorporates new data, and proposed project layout into GIS.

Important Considerations: Key considerations in the project permitting phase include

- Based on comments received by regulatory agencies, additional studies may be required by reviewing agencies. Environmental Planning works with Engineering to address design changes required as result of permitting process;
- BPU/CPCN and local approval processes may impact design/layout, and may result in changes to plans that affect environmental permitting;
- Permit information regarding building materials, construction methods, actions to minimize or avoid environmental impact, and other information presented in permit application, as well as, the final permit conditions are binding on the project construction;
- Construction Management will incorporate permit conditions and restrictions into the bid package to inform contractors and minimize out of scope add-ons during the construction process; and,
- Systems Operation should set the outage schedule based on the construction schedule associated with timing restrictions or special construction methods that may be imposed by agencies.

Outcome: Key outcomes in the project permitting phase include:

- Environmental permits, local and BPU/CPCN and / or other approvals are obtained.
- Permit requirements are communicated to members of project team

2.1.4 Construction

As the required permits and approvals are obtained, copies are provided to the PFC, and PFC distributes permits to Engineering, Forestry, and Construction Management. A pre-construction meeting is organized by the PFC and Engineering leads with Environmental, Construction Management ROW, Real Estate and Forestry to review environmental permit conditions and permit requirements for the construction phase.

If permit conditions in any of the permits are deemed unacceptable by the above departments, then an Administrative Hearing can be requested by Legal to appeal the permit conditions. However, there may be a delay in the project schedule from requesting an Administrative Hearing. This

decision to appeal needs to be evaluated as permits are received, rather than waiting until all permits are in hand.

If permit conditions are acceptable, Environmental Planning submits the permit acceptance notification form, and Real Estate records the permit. Proof of recording is submitted to the agencies, if required, by Environmental Planning. If not already conducted, maintenance clearing may be completed at this stage to facilitate construction. If mitigation (e.g., wetland mitigation) is required, the mitigation process should be started prior to initiation of project construction in the impacted resource areas

Once permit conditions have been accepted, Environmental Planning provides information to Engineering for preparation of the bid package. Construction Management finalizes the bid package, incorporating additional restrictions from other departments (e.g., Real Estate or others). Upon award of bid, construction management is required to have the contractor sign off on the permit "Work Commencement / Compliance Certification" document. Construction Management finalizes any necessary outages, and informs Environmental Planning of the anticipated construction start date. Environmental Planning submits Construction Notification and Work Commencement / Compliance Certification document to agencies, as may be required. Community Relations notifies municipalities of the start of construction.

Construction commences with a Pre-Construction meeting involving Construction Management, Field Teams, Environmental Planning, Engineering, the construction contractors, as well as, any other necessary representative. Construction Management is responsible for monitoring the adherence to permit requirements and to notify the PFC or Engineering Lead of the need for variances. The Engineering Lead or PFC consults with the appropriate departments (e.g., Environmental Planning) to approve, deny or seek regulatory approval for variances. Depending on the complexity, visibility, and environmental sensitivity of the project, Environmental Planning may arrange for environmental contractors to provide monitors for support of the Construction Management staff in minimizing impacts and complying with permit conditions.

Construction is completed, including demobilization of construction equipment, site cleanup, and restoration of disturbed areas. Work completion certifications are completed by the contractor and Construction Management for submission by Environmental Planning to the regulatory agencies.

Summary

Actions and Products: Key actions and products from the construction phase include:

- Permits are recorded by Real Estate, and construction notice is issued by Environmental Planning as appropriate;
- Final permits are distributed to involved departments, and reviewed for acceptability. Administrative hearings are requested if conditions are not acceptable;
- Environmental mitigation work commences;
- Forestry completes right of way clearing;
- Bid packages are prepared, the project is bid, and an award is made for construction;
- Construction Management finalizes any necessary outages;
- Construction commences with a pre-construction field meeting;
- Construction Management, field teams and environmental observers monitoring project for conformance with environmental permits;

- The appropriate departments reviews and approves variances with input from other departments as necessary;
- Construction is completed and disturbed areas are restored; and.
- Completion certifications are submitted to agencies.

Important Considerations: Key considerations in the construction phase include

- Evaluating environmental permit conditions and determining their effect on the project schedule and methods;
- Potential project delays for requesting Administrative Hearings for permits with conditions that are not acceptable. To reduce the potential for delay, permits should be reviewed and acted on as they arrive, rather than waiting for all permits to be issued;
- Project schedule may dictate that the project is bid prior to receipt of all final permits. In this case, unanticipated permit conditions may result in construction add-ons. To the extent possible, the bid package should incorporate anticipated permit conditions that may affect construction cost;
- Construction Management monitors adherence to permit requirements and bid specifications, and notifies the appropriate department of any changes for their review and approval. Some changes may directly relate to environmental permit conditions or may indirectly affect the potential environmental impacts of the project. Environmental Planning and other departments should be consulted when approving or denying variances; and,
- Mitigation work is completed or underway.

Outcome: Key outcomes in the construction phase include:

- Construction is completed with no violations of permit conditions, on time and on budget.

2.1.5 Post Construction

The PFC coordinates a post-construction project review with all departments. Construction Management completes the project and contractors or Engineering signs-off on as built drawings with PE certification. GIS incorporates final layout into GIS. Environmental submits as-built drawings to agencies and conducts mitigation monitoring and other post construction requirements, as necessary. Engineering closes out the project, and Forestry complies with permit requirements for routine maintenance and clearing. Others applicable departments take on management and operations, including compliance with other environmental requirements, at other facilities.

Summary

Actions and Products: Key actions and products from this phase include:

- The PFC coordinates a post-construction project review;
- Construction Management or contractor prepares as-built drawings;
- GIS incorporate as built drawings into GIS;
- Forestry takes on responsibility for future maintenance clearing and any related permit conditions; and,
- Environmental Planning submits as-built drawings to agencies, and conducts post construction mitigation activities, as necessary.

Important Considerations: Key considerations in the post construction phase include:

- Some permit conditions may apply to long term maintenance and operations and must budgeted and communicated to those responsible for post-construction operations.

Outcome: Key outcomes in the post construction phase include:

- *Post-construction activities are completed.*
- Mitigation requirements are fulfilled or ongoing until complete.

2.2 Regulated Projects and Activities

A wide range of project types and associated activities undertaken by PHI may require environmental permits. Typical types of project and activities addressed in this manual are described below.

2.2.1 Project Types

The following provides a description of the types of projects addressed in this environmental permitting manual. The descriptions are intended to document the typical scope and activities associated with such projects that may affect environmental permit requirements. Specific projects may include activities not identified in these general project descriptions. Activities are described in the next section.

1. **Construction of transmission and distribution electrical system infrastructure (overhead)** - includes construction of new transmission/distribution system, as well as replacement or upgrade involving pole installation and removal. Activities for pole installation may include clearing of vegetation for new right-of-way (ROW), work in wetlands or in / over waterways, matting or other land disturbance for pole installation. Installation techniques may include direct imbedding, foundation placement, barge installation or helicopter installation. Project may include underground and/or submarine components. Underground and submarine cable installations are addressed separately. Work at substations is addressed separately.

2. **Construction of transmission and distribution electrical system infrastructure (underground)** - includes construction of new underground transmission/distribution system, as well as replacement or upgrade involving installation and removal of underground cable. Activities for installation may include clearing of vegetation for new right-of-way (ROW), trenching, matting, directional drilling, manholes, duct banks, work in or near wetlands, under waterways or other impacts. Project may include aboveground and/or submarine components.

3. **Construction of transmission and distribution electrical system infrastructure (submarine)** - includes construction of new submarine transmission/ distribution system, as well as replacement or upgrade involving installation and removal of submarine cable. Activities for installation may include upland/wetland disturbance for equipment access and installation, plowing, trenching, directional drilling, and disturbance of subaqueous substrate. Project may include aboveground and/or underground components.

4. **Installation/replacement of poles** - includes removal of existing poles and installation of new poles of varying sizes and types. Activities may also include foundation construction and in-water pole installation. Generally involves localized disturbance at the pole site and

temporary impacts associated with access and / or construction. Installation may result in minimal excavation/fill.

5. **Maintenance of electric transmission and distribution systems (overhead and underground)** - includes routine maintenance, repair and upgrade (e.g., reconductoring, replacement of insulators, replacement of transformers) associated with transmission and distribution lines which may involve minimal land disturbance. Refer to integrated vegetation management plan for maintenance activities requiring excavation or and to pole removal/installation for maintenance/repair activities involving such activities.

6. **Vegetation Management** - includes clearing and trimming of vegetation within the ROW as part of a construction project or routine maintenance.

7. **Construction and expansion of substations** - includes site preparation (clearing, grubbing, grading, and minimal excavation) paving or placement of gravel, construction of foundations, enclosures/buildings for equipment, access road(s), secondary containment, storm water management facilities and installation of equipment. Activities may also include expansion of existing substations outside of existing cleared areas / fence lines that will result in construction activities.

8. **Upgrades and maintenance of substations** - includes upgrading and maintenance of equipment at existing substations. Routine maintenance may include lawn care, landscaping, vegetation maintenance, weed control, fence repair/replacement, repair/maintenance of access road, lighting system repair and replacement, and repair/replacement of equipment. Refer to construction of substations for expansion of existing substations.

9. **Installation of communication towers** - includes installation of towers as well as construction of associated facilities/buildings and installation of equipment. Activities include site preparation (clearing, grubbing, grading, and minimal excavation) and construction of the foundation, access road, buildings, and tower. Total area within fence line is typically less than 0.2 acres.

10. **Maintenance of communication towers** - includes routine maintenance such as lawn care, landscaping, weed control, fence repair/replacement, repair/maintenance of access road, lighting system repair and replacement, weatherproofing existing towers, repair and improvement of grounding systems, antenna alignment checks and realignment, inspection work, and sweep testing, among others. Maintenance activities typically do not involve land disturbing activities.

11. **Installation/replacement of fiber optic cable** - includes installation or replacement of fiber optic cable as well as huts, associated equipment and joint use facilities/equipment. May include installation on new or existing poles/towers (replacing ground wire on transmission/distribution lines), as well as subsurface/submarine installation in conduits. Overhead installation in sensitive environmental areas is typically done with minimal impact by walking in equipment and climbing structures for installation. Subsurface installation may be accomplished by trenching or directional boring. Typical regenerator/ amplification stations consist of three to eight; 350 to 400 square foot pre-cast concrete buildings lined up side by side on a concrete pad. The buildings will be located within a 0.75 to 1-acre fenced area. The facility requires commercial electric power and periodic maintenance. A diesel generator is typically installed for emergency back-up power.

12. **Maintenance of fiber optic cable** - includes routine maintenance activities for fiber optic cable as well as huts, associated equipment and joint use facilities/equipment. Does not include land disturbing activities. See fiber optic cable installation/replacement for such activities.

13. **Installation and upgrades of emergency generators** - involves installation/construction of generators, typically 10 - 50 MW and rarely greater than 150 MW, to supply electricity to a specific facility or localized area during short term interruptions in electric services. Diesel fired reciprocating engines are common, though some may be kerosene or natural gas fired. Actual hours of operation are usually limited. Both mobile and fixed location units are addressed. Activities for fixed locations may include construction of fuel storage tanks, water tower or tank, concrete pad or foundation, exhaust equipment, interconnections, and switching gear as well as access roads/drives. Mobil generators are self contained units on tractor trailer platforms that can be moved to a facility based on need. These generators typically operate for several months.

14. **Maintenance and operation of emergency generators** - involves routine maintenance and operation of emergency generators. Operations include firing as part of required monitoring as well as operation during interruptions in electrical services. Maintenance may include routine maintenance and repair of generating equipment and interconnect lines as well as in-kind replacement (e.g., no increase in emissions, change of fuels, etc.) of such equipment. Activities may also include opacity readings, vegetation maintenance within the fence line and repair and maintenance of access roads/drives.

15. **Installation, modification and upgrades of peaking units** - involves installation/construction of generators, typically 10 - 50 MW and rarely greater than 150 MW, to produce extra electricity during peak load times for distributed generation. Activities may include construction of fuel storage tanks, water tower or tank, concrete pad or foundation, exhaust equipment, interconnections to the transmission or distribution system, and switching gear as well as access roads/drives. Peaking units may be co-located at substations or electric generation stations, or other facilities.

16. **Maintenance and operation of peaking units** - involves routine maintenance and operation of peaking units for distributed generation. Operations include firing as part of required monitoring as well as operation during peak load periods. Maintenance may include routine maintenance of generating equipment and interconnect lines as well as in-kind replacement and repair of such equipment. Activities may also include vegetation maintenance within the fence line and repair and maintenance of access roads/drives.

17. **Installation and upgrades of water tanks/towers** - includes construction and upgrade of water towers and tanks including tank/tower, foundations, and associated facilities/equipment as well as access roads/drives. Water towers/tanks are typically associated with peaking units or other existing facilities.

18. **Maintenance of water towers** - may include vegetation maintenance within the fence line, painting, repair/replacement of valves and other equipment, tank/tower repair or replacement, corrosion control, maintenance and repair of drives and access roads.

19. **Construction and upgrade of transmission and distribution lines for gas delivery** - involves construction of pipelines for the transmission and distribution of natural gas. Typically involves land disturbing activities for new pipeline installation and/or replacement or upgrade of existing pipeline; may include vegetation clearing and grading for new right-of-way, trenching and construction lay down. Also includes construction of compressor

stations. Water crossings may be completed either by "open cut" techniques or by horizontal directional drill, horizontal bore or jacking. Also includes installation/construction of valves and special fittings and hydrostatic testing of new and replaced pipelines.

20. **Maintenance and operation of pipelines for gas delivery** - consists of checking depth of pipe in roadways and at stream crossings, addressing any soil erosion or shallow cover, controlling brush, replacing line markers, painting and operating block valves, leak surveys, pigging, checking the effectiveness of the corrosion control system, and replacement/addition of corrosion control measures.. Activities include maintenance, repair or replacement of the damaged segments, valves or other equipment. Activities may also include vegetation maintenance within the ROW and repair and maintenance of access roads/drives.

21. **Construction and expansion of gate stations** - includes construction of the unmanned facility that provides natural gas supply to local communities. The facility consists of various equipment to control delivery pressure, add odorant for safety purposes, and measure quantities of the gas transferred from the transmission system to the local utility's distribution network. May include land disturbance including clearing, grubbing, and grading. Activities include construction of the foundation, interconnections, fence installation, access roads/drives and installation of associated equipment and equipment buildings.

22. **Upgrades and maintenance of gate stations** - Includes equipment maintenance, repair, replacement and upgrade. Also includes vegetation maintenance within the fence line, repair and maintenance of access roads, repair and maintenance of buildings and structures.

23. **Construction upgrades and maintenance of regulator stations** - includes construction of regulator stations that control natural gas pressure within the distribution system. The facility consists of equipment to regulate delivery pressure and associated controls and equipment enclosures. Regulator stations may also be associated with equipment to add odorant for safety purposes and for metering. May include land disturbance such as clearing, grubbing, and grading. Activities include construction of the foundation, interconnections, access drives/roads and installation of associated equipment and equipment buildings. Land area for regulator stations is typically less than 1 acre.

24. **Upgrades and maintenance of regulator stations** - Includes equipment maintenance, repair, replacement and upgrade. Also includes vegetation maintenance within the fence line, repair and maintenance of access roads, repair and maintenance of buildings and structures.

25. **Installation of aboveground and underground storage tanks** - involves construction/installation of new aboveground and underground storage tanks including foundations, secondary containment, pipes, delivery systems, leak detection and monitoring equipment. Also include relocation of existing tanks. Tanks may be associated with peaking units or other existing facilities. Larger tanks may have special requirements not addressed in this manual.

26. **Maintenance of aboveground and underground storage tanks** - involves repair or replacement of secondary containment, painting, corrosion control, repair or upgrade of pipes, and repair of existing tanks.

27. **Removal of aboveground and underground storage tanks** - involves removal of tanks and associated equipment, containment, foundations and potentially contaminated soils or materials. Activities may include excavation and removal of tanks, foundations, containment structures as well as removal and transport of residual product, cleaning of tanks for transport, and disposal of hazardous waste.

28. **Construction of on-shore LNG storage facility** - includes construction of new or expansion of existing LNG storage facilities. Activities may include land disturbing activities such as clearing, grubbing, and grading for construction of foundations and storage tanks, interconnection to distribution systems, and associated regulation, metering and monitoring equipment. LNG tanks are double-walled, large tanks (typically >70,000 gallons) with low storage pressure (> 5 psig), a low aspect ratio (height to width), and a domed roof. This manual does not address regasification facilities or marine terminals which may have additional permitting requirements.

2.2.2 Activities

The following provides a description of the types of activities addressed as part of this environmental permitting manual. Projects described in Section 2.2.1 may include a number of these activities which may affect environmental permit requirements.

1. **Site grading and other land disturbance (uplands)** – involves clearing, grubbing, excavation or fill of any land outside of wetlands and waterways.

2. **Land disturbance in or near waterways or wetlands** - involves clearing, grubbing, excavation or fill of any land in or near (within 300 feet) of wetlands and waterways.

3. **Temporary wetland disturbance** – involves temporary disturbance associated with equipment access, matting for equipment access, or other construction activities which is restored to pre-disturbance conditions on completion of construction.

4. **Vegetation clearing** – includes clearing of vegetation as part of a construction project or routine R/W or site maintenance.

5. **Construction or Development** - involves the construction, relocation, or enlargement of the footprint of development of any building or structure (including utility poles) and all site preparation including clearing, grubbing, grading, excavation or filling.

6. **Dredge/fill of wetlands or navigable waters** – includes excavation or filling in wetlands or navigable waters.

7. **Construction in or near tidal waters** – includes any construction activities which occur in or near (typically within 500 feet) of tidal waters.

8. **Surface water and groundwater withdrawal** – involves withdrawal of water from surface water or groundwater resources for construction dewatering or as part of facility operations which depending on magnitude and duration may require environmental permits and approvals.

9. **Wastewater discharge** – includes the discharge of process wastewater and non-contact cooling water from facilities which may be regulated by local, state or federal agencies.

10. **Stormwater discharge** – includes stormwater discharges associated with construction activities and/or industrial operations at a facility which may be regulated by local, state or federal agencies.

11. **Transportation of hazardous materials and waste** – includes the transportation of hazardous waste (e.g., used oil), DOT hazardous materials (e.g., fuels, PCB oil), or solid waste, by truck, pipeline, railcar, barge or other means.

12. **Storage, use, handling of hazardous materials or waste** – involves the storage use and handling of hazardous materials or waste (as defined by state or federal regulation) at a facility or construction site.

13. **Site remediation** – involves the removal of contaminated soils or other clean up of contamination on a site.

14. **Routine operation and maintenance of a facility** - involves routine operation and maintenance of a facility.

2.3 Potentially Applicable Regulations and Permits

More than a dozen major statutes or laws form the legal basis for the programs of the Environmental Protection Agency (EPA), and associated state programs. This section provides an introduction to major environmental regulation which may affect PHI projects via state or federal permitting. Detailed information about specific state and federal regulations and permits are provided in Chapters 3 and 4, respectively. Each state has organized its regulatory programs differently, and the reader should refer to the state specific regulatory programs provided in Chapter 3 for additional information. The intent of this section is to provide the reader with a broad understanding of major environmental regulatory programs and objectives from among the myriad of environmental regulations which may affect PHI projects. The reader may use matrices included in Sections 2.4 and 2.5 of this Chapter to identify specific permits that may be required for a given project or activity. The sections below introduce the major environmental regulations:

2.3.1 Clean Air Act (Section 110 and Title V, 42 U.S.C. 7401 et seq.)

The 1990 Clean Air Act (Section 110 and Title V, 42 U.S.C. 7401 et seq.) is a federal law through which EPA sets limits on how much of a pollutant can be in the air anywhere in the United States, though states may adopt more stringent requirements. States are required to develop state implementation plans (SIPs) that explain how they will implement the Clean Air Act. The SIP is a collection of the regulations implemented by the states. Air quality regulations and associated permits may be required for emissions from emergency generators, peaking units, and some wastewater treatment and petroleum storage facilities. EPA is also proposing new emission standards for non-road diesel engines used in construction, agricultural and industrial operations. The Agency is also proposing a more than 99-percent reduction in the sulfur content in fuel used by these engines. Major permits and their purpose include:

- Acid Rain - to reduce SO2 emissions by allocating a limited number of marketable allowances, primarily to existing power plants, and by requiring plants, including new plants that were not allocated allowances, to hold or obtain allowances to offset their annual actual SO2 emissions; Permit required for operation.
- Prevention of Significant Deterioration (PSD) Air Permit - to demonstrate that the project will incorporate Best Available Control Technology (BACT); evaluate existing ambient air quality; demonstrate that the project will not cause or significantly contribute to a violation of the NAAQS or PSD increments; determine the impact of the proposed project on soils,

vegetation and visibility at Class I areas; and determine the air quality impacts resulting from indirect growth associated with the project. Permits are required to construct and operate the facility in compliance with applicable air quality regulations.

- New Source Review (NSR) – to ensure that new major sources will not worsen existing pollutant levels or impede the State's efforts to achieve compliance where the state or portions of the state are designated as non-attainment areas for one or more pollutants.
- Title V Permit to Operate - an operating permit intended to combine, into a single document, all the State and federal air quality requirements applicable to a company. Title V does not impose new substantive requirements above and beyond the State requirements.

Air permits may be required for emergency generators and distributed generation projects. However, these permits are not addressed in detail within the state specific permit summaries. Such permit summaries may be added in future versions of this manual.

2.3.2 Risk Management Planning (Clean Air Act section 112(r) et seq.) and Chemical Accident Prevention Provisions (part 68 of Title 40 of the CFR)

The risk management planning requirements of CAA section 112(r) complement and support the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). Under the new CAA requirements, stationary sources (facilities) must identify and assess their chemical hazards and carry out certain activities designed to reduce the likelihood and severity of accidental chemical releases. The CAA Section 112(r) requires owners and operators of facilities to have an approved risk management program if they handle, use, manufacture, store or have the capability of generating an extraordinarily hazardous substance (EHS) listed in the Code of Federal Regulations (CFR) at 40 CFR 68.130 in an amount above the "threshold quantity" specified for that substance. The rule applies to a wide variety of facilities that handle, manufacture, store, or use toxic substances, including chlorine and ammonia and highly flammable substances such as propane (flammable substances used solely as fuel or sold by retailers are not covered). Risk Management Plans are required to protect the off-site community by preventing catastrophic accidental releases of EHSs and include elements such as standard operating procedures, safety reviews, preventative maintenance, operator training, accident investigation, risk assessment, emergency response, and management of change. These Toxic Catastrophe Prevention Act (TCPA) requirements are implemented at the state level.

2.3.3 Clean Water Act (Federal Water Pollution Control Act Amendments of 1972 as amended in 1977)

The Federal Water Pollution Control Act Amendments of 1972 as amended in 1977 became commonly known as the Clean Water Act. The Clean Water Act (CWA) is the cornerstone of surface water quality and wetland protection in the United States. The CWA does not deal directly with ground water or with water quantity issues. The CWA gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters and made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. Key provisions of the Act are described below:

2.3.3.1 Water Quality Certification, Section 401 of the CWA (33 U.S.C. 1341)

Section 401 of the CWA (33 U.S.C. 1341) requires state review of federal actions to ensure consistency with state water quality standards.

2.3.3.2 National Pollutant Discharge Elimination System Section 402 (33 U.S.C. 1342)

Section 402 (33 U.S.C. 1342) established the National Pollution Discharge Elimination System (NPDES) program which regulates wastewater and stormwater discharges to the waters of the United States.

Major permits and approvals associated with the CWA include:

- Stormwater Discharge Permit for Construction Activities
- Stormwater Discharge Permit for Industrial Activities
- Wastewater Discharge permit
- Underground Injection Control (UIC) permit
- Significant Industrial User/Indirect Discharge Pretreatment Permit
- Treatment Works Approval

2.3.3.3 Dredge and Fill Section 404 (33 U.S.C. 1344)

Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. This statute with state laws and regulations serve as the primary mechanism governing the protection of freshwater and coastal wetlands.

2.3.4 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C.9601 to 9675 et seq.)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Superfund, was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA:

- established prohibitions and requirements concerning closed and abandoned hazardous waste sites;
- provided for liability of persons responsible for releases of hazardous waste at these sites; and
- established a trust fund to provide for cleanup when no responsible party could be identified.

2.3.5 Emergency Planning & Community Right to Know Act (42 U.S.C. 11001 et seq.)

Emergency Planning & Community Right to Know Act (42 U.S.C. 11001 et seq.), also known as Title III of SARA, was enacted as the national legislation on community safety. This law was designated to help local communities protect public health, safety, and the environment from chemical hazards.

EPCRA Section 313 requires facilities covered under Toxic Release Inventory (TRI) to report on-site releases, off-site transfers, and on-site waste management activities related to their use of certain toxic chemicals. This information is compiled and made available to the public.

2.3.6 Endangered Species Act (7 U.S.C. 136; 16 U.S.C. 460 et seq.)

The Endangered Species Act (7 U.S.C. 136; 16 U.S.C. 460 et seq.) enacted in 1973 provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. The law prohibits any action, administrative or real, that results in a "taking" of a listed species, or adversely affects habitat. Most states have similar protection programs, and may include state specific lists of additional protected species.

Consultation and review is required for various state and federal permits to protect certain plant and animal (endangered and threatened wildlife) populations. Impact or potential impact to T&E species may require an Incidental Take Permit, development of a conservation plan, or other requirements.

2.3.7 The Oil Pollution Act (OPA) of 1990 (33 U.S.C. 2702 to 2761)

The Oil Pollution Act (OPA) of 1990 (33 U.S.C. 2702 to 2761) streamlined and strengthened EPA's ability to prevent and respond to catastrophic oil spills. A trust fund financed by a tax on oil is available to clean up spills when the responsible party is incapable or unwilling to do so. The OPA requires oil storage facilities and vessels to submit to the Federal government a Facility Response Plan detailing how they will respond to large discharges.

SPCC plans are required by the federal Oil Pollution Prevent regulations (40 CFR 112) revised in 2002. Spill Prevention, Control, and Countermeasure (SPCC) Plan - to prevent discharges from occurring, to reduce effects on environment should they occur, and to address what the facility will do if a discharge does occur. In addition to the federal SPCC requirements, states have similar programs which may include additional requirements (e.g., Discharge Prevention, Containment and Countermeasure (DPCC), Discharge Cleanup and Removal (DCR) Plans).

2.3.8 Pollution Prevention Act of 1990 (42 U.S.C. 13101 and 13102 et seq.)

The Pollution Prevention Act of 1990 (42 U.S.C. 13101 and 13102, s/s et seq.) established a national policy that:

- pollution should be prevented or reduced at the source whenever feasible;
- pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible;
- pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and
- disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

Pollution prevention, also known as P2, offers a proactive approach to environmental management by eliminating pollution prior to recycling, treatment, or disposal. Examples of P2 measures include equipment and process modifications, changes in product design, substitution of raw materials, improved housekeeping, preventative maintenance, employee training, and inventory control.

Many states now require certain industries to develop and implement Pollution Prevention plans. Pollution Prevention Plans are aimed at eliminating pollution prior to recycling, treatment, or disposal to the extent possible.

2.3.9 Resource Conservation and Recovery Act (RCRA)(42 U.S.C. s/s 6901 et seq.)

Resource Conservation and Recovery Act (RCRA)(42 U.S.C. s/s 6901 et seq.) gave EPA the authority to control hazardous waste including the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA Subpart D encourages environmentally sound solid waste management.

Federal regulation requires facilities to notify agencies of your intent to generate, transport, store or dispose of any RCRA regulated hazardous waste. Facilities that generate hazardous waste are subject to waste accumulation, manifesting, and record keeping standards. Facilities generally must obtain a permit either from EPA or from a delegated State agency if they store hazardous wastes for more than 90 days before treatment or disposal.

RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.101) governing the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA treatment, storage, and disposal facilities.

RCRA (40 CFR Part 279) also imposes management requirements affecting the storage, transportation, burning, processing, and re-refining of the used oil.

Subtitle I of RCRA (40 CFR Part 280) regulates underground storage tanks containing petroleum and hazardous substances. Subtitle I regulations include tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs.

RCRA contains standards for all units used to store, treat, or dispose of hazardous waste, including tanks and containers. Tanks and containers used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA.

Storage Tank Installation and Operation Permits – to ensure that fuel storage tanks are constructed an operated in a manner consistent with the National Fire Protection Association Code 30 and 30A.

Solid waste management is primarily regulated at the state and local level, although via RCRA Subpart D, EPA has established regulations related to the design and operation of solid waste disposal facilities. Most states require a permit to construct operate modify or close a regulated waste disposal facility, or to transport regulated waste (including tree stumps and vegetation).

2.3.10 Rivers & Harbors Appropriation Act of 1899, Sections 9 and 10 (33 U.S.C. 403)

Rivers & Harbors Appropriation Act of 1899, Section 10 (33 U.S.C. 403) established a program to regulate activities affecting navigation in United States waters, including wetlands. This law, along with Section 404 of the CWA, forms the basis for wetland regulation in the U.S. In addition, this Act requires prior approval for placement of structures in or obstruction of navigable waters to avoid impact to navigation associated with construction activities or placement of structures within navigable waters.

2.3.11 Toxic Substances Control Act (TSCA) (15 U.S.C. s/s 2601 et seq.)

The Toxic Substances Control Act (TSCA) (15 U.S.C. s/s 2601 et seq.) of 1976 gave EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. EPA screens these chemicals and can require reporting or testing of those that may pose an

environmental or human-health hazard. The TSCA authorizes EPA to regulate asbestos, lead and radon.

2.3.12 Coastal Zone Management Act of 1972 (16 U.S.C. s/s 1451 et seq. as amended through P.L. 104-150, The Coastal Zone Protection Act of 1996

The Coastal Zone Management Act established a voluntary national program within the Department of Commerce to encourage coastal States to develop and implement coastal zone management plans. In order to be eligible for Federal approval and associated funding for implementation, each State's plan was required to define boundaries of the coastal zone, to identify uses of the area to be regulated by the State, the mechanism (criteria, standards or regulations) for controlling such uses, and broad guidelines for priorities of uses within the coastal zone. The Act serves as the basis for coastal zone management and review regulations in coastal states.

2.3.13 Transportation and Navigation (including land, sea and air navigation)

2.3.13.1 Hazardous Materials Certificate of Registration (49 U.S.C. 5108; 49 CFR Section 107.601-620)

Section 107 is intended to protect human health, safety and the environmental associated with the transportation of hazardous materials. Requires registration for transportation of hazardous materials above threshold quantities.

2.3.13.2 Federal Aviation Administration (FAA) (49 U.S.C. 106(g), 40103, 40113–40114, 44502, 44701, 44718, 46101–46102, 46104; 14 CFR Subchapter E, Part 77)

FAA regulations require review and approval of stacks heights or other structures (greater than 200 ft) including communications towers, and some transmission poles depending on height and proximity to airports.

2.3.14 Cross-Media and Other Programs

In addition to media specific regulatory programs, there are a number of environmental regulations which are more broadly focused. The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4347) is the basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy.

2.3.14.1 Natural Gas Act (NGA) (15 U.S.C. 717 et. seq.)

The Natural Gas Act (NGA) of 1938 was the first instance of direct Federal regulation of the natural gas industry. Section 3 of the NGA requires Federal approval by the Department of Energy for the import and export of natural gas, including liquefied natural gas (LNG), and approval by Federal Energy Regulatory Commission (FERC) for the siting, construction, and operation of onshore LNG import and export facilities. The NGA requires issuance of a certificate of public necessity and convenience from Commission and ensure compliance with applicable regulations. The NGA does not apply to local distribution of natural gas. An amendment to the NGA is currently proposed (109th Congress, 1st Session, S. 684) to provide additional requirements for the siting, construction, or operation of liquefied natural gas import facilities.

2.3.14.2 National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4347)

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4347) is the basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for

carrying out the policy. Environmental Assessments (EAs) and Environmental Impact Statements (EISs) may be required for federal actions including issuance of federal permits (e.g., Section 404 Dredge and Fill permit) to assess the likelihood of impacts from alternative courses of action.

2.3.14.3 National Historic Preservation Act (36 CFR, Part 63)

The National Historic Preservation Act requires review for projects involving federal action (e.g., federal funding, issuance of federal permit) to ensure that historic properties (including archeological resources) are given consideration during project planning and execution. States may also impose similar requirements for other state permits.

2.3.15 State and Local

As noted previously, the above mentioned federal regulations serve as the basis for individual state regulatory programs, and many federal regulations are implemented by the states. Water supply and allocation are regulated at the state and regional level. Likewise other land use management and planning decisions including site plan approval are regulated at the state, regional and local levels. Specific regulatory programs and permit requirements for each of the states are described in Chapter 3.

2.4 Potential Permit Requirements by Project Type

Permit requirements are summarized by project type in Table 1. This summary table may be used to quickly identify potential permit requirements for a given project type. Links are provided to more detailed information in Chapters 3 and 4. Not all permits identified as potentially required may be required depending on the scope and setting of a specific project. Users should review permit requirements by activity as a cross check to information provided by project, and also review detailed permit information in Chapters 3 and 4 to confirm applicability to the given project. Links to state specific sections of Table 1 are provided below:

- District of Columbia
- Delaware
- Maryland
- New Jersey
- Virginia
- Federal

2.5 Potential Permit Requirements by Activity

Permit requirements are summarized by Activity in Table 2. This summary table may be used to quickly identify potential permit requirements for a given activity. Links to more detailed information are provided in Chapters 3 and 4. Not all permits identified as potentially required may be required depending on the scope and setting of a specific project. Users should review permit requirements by project type as a cross check to information provided by activity, and also review detailed permit information in Chapters 3 and 4 to confirm applicability to the given project. Table 2 may also be useful in evaluating potential permit requirements for projects which do not fall within the scope of typical projects described in Section 2.2. Click on the link below to go to the state specific or federal permit matrix. Links to state specific sections of Table 2 are provided below:

- District of Columbia
- Delaware

- Maryland
- New Jersey
- Virginia
- Federal

2.6 Permitting Strategy and Tips for Successful Project Permitting

In acquiring environmental permits, there are two realities that should kept in mind from project conception (1) no matter how negligible the resulting impacts are, the regulating agency will need to be convinced that impacts have been avoided and/or minimized to the greatest extent possible; and (2) no matter what best management practices (BMP) are proposed, the agencies may ask for more. This will tend to result in additional information requests and plan changes by the agencies prior to permit approval. Ultimately, this costs time and money, and may have significant negative impact on project schedules. Measures can be taken to minimize or avoid these changes, including:

The early bird gets the worm. Obtaining State and Federal land use permits can be timely. Aside from typical additional information requests, permitting departments are often under staffed and can be held up. Also, for numerous permits, there is no law that states when a permit must be approved or denied. In any instance, it may help to lump permits together that are connected to approval deadlines.

Know the regulations (the black, white and the gray areas). After determining the project location, determine what permits are required. Then, get the regulating agencies involved (together) early with a pre-application meeting. Have the agencies determine what permits they believe are necessary, be ready for a debate if needed. If possible, agree on terms agreeable to all representative agencies present. One common set of requirements will save precious time and money. (As well as lighten the load for client's review).

Put it in writing. Send a summary letter to the agencies detailing permits determined to be required and specific actions to be taken for the project. All meetings should be followed up in a similar matter. This keeps a written record of proceedings and reiterates the findings to both parties. This letter and others to follow may be incorporated into a permit application, correspondence section.

Stop the snowball effect. Often the applicant will want save time by completing tasks before they may be required. This tends to result in additional, potential unwarranted expenditures. A typical response from consulting agencies such as US Fish and Wildlife Service or State Historic Preservation Office will prescribe which, if any surveys are required. Often threatened or endangered species and critical habitats are mapped by the state, or will be initially identified during routine wetlands surveys. If a seasonal survey window is approaching and is likely to be required, complete the survey. Otherwise, wait until required. For example, historic resource surveys do not have a time restriction and archaeological surveys are only restricted by frozen ground. For simple projects, these surveys are often undertaken prior to agency consultation and may not be required.

Keep it simple. New projects may be lengthy, but expect existing projects to be simple. The requirements for a new transmission line project will not be the same for a maintenance pole replacement project. Keep in mind that this area is previously disturbed and maintained.

Put your second best foot forward. As stated previously, the agency will want fewer impacts than the most stringent construction methods will allow. Therefore, in preparing a compliance statement, state the dirty construction methods and minimize best management practices. Then, compare the construction methods proposed, with these minimal requirements. For a recent

example, compare gravel to construction matting. Installing a temporary gravel access road through wetlands is in compliance; however, is not looked favorably upon by the agencies. Construction matting is the preferable alternative. Minimized impacts by using the alternative should be stated clearly in the application as going above the basic requirements.

Keep in touch. After about a month, an application will be assigned a reviewer. The consultants should introduce themselves and share contact information. Often a simple phone call can clear potential confusion and express need without being over bearing. Reviewers' desks are backlogged with applications, each more urgent than the next. A friendly voice can sometimes put an application on the top of the pile; while the reverse may send it to the bottom.

3.0 State, Regional and Local Permit Requirements

This section provides a summary of potentially applicable environmental permits by state and for the District of Columbia. Also included are summaries for major regional programs such as those implemented by the Chesapeake Bay program, Susquehanna River Basin Commission, Delaware River Basin Commission, and the New Jersey Pinelands Commission. Local permit requirements are addressed in general in Section 3.3, and are listed within the state and regional permit summaries under Other Potential Approvals. Local authorities, agencies and boards should be contacted directly for details regarding local permit requirements for a given project. Federal permits are addressed in Chapter 4.

3.1 State Permits

State environmental permit requirements are summarized by state in a series of Permit Summaries. Permit summaries have been developed using information available from the regulations and other online sources at the time of development. Differences in level of detail among individual permit summaries reflect differences in available information between states, and among various state permit programs. Permit programs and requirements are subject to frequent change, and information contained in this section should be verified with the appropriate regulatory agencies. These summaries are maintained as separate files given the large number of pages associated with these summaries. Under each state heading below, are a list of permits for which summaries are available, and the respective page number for that summary. The state tables of contents below are hyperlinked. As such, you can click on the permit name, and you will be forwarded to the appropriate location in that permit summary file.

3.1.1 District of Columbia

Environmental Impact Statements (DC Law 8-36)

Underground Storage Tanks (DC Code § 8-113.02 et seq.)

Public Utility Environmental Impact Statements (DC Code § 34-26)

Historic Preservation Office Consultation (D.C. Code § 6-1101; D.C. Law 2-144)

3.1.2 Delaware

Aboveground Storage Tanks: Registration (7 Del. Code §60 and §74A)

Accidental Release Prevention (7 Del. Code §77)

Beach Preservation and Shoreline Construction (7 Del. Code 68)

Coastal Zone Act Permit (7 Del. Code §70)

Endangered and Nongame Species Program (7 Del. Code §601-604)

Erosion and Sediment Control (7 Del. Code §40)7

Facilities Permit (7 Del. Code §6003)

Hazardous Waste Permit (7 Del. Code §6301; DRGHW, Part 122)

Hazardous Waste Transportation Permit (7 Del. Code §6301; DRGHW, Part 263 Subpart E)

Solid Waste Transportation Permit (7 Del. Code §60)

Surface Water Discharge (7 Del. Code §6010)

Surface Water Discharge: Industrial Stormwater General Permit (7 Del. Code §6010)

Underground Storage Tanks: Installation or Retrofit (7 Del. Code §60 and §74)

Underground Storage Tanks: Removal and Abandonment (7 Del. Code §60 and §74)

Water Allocation Permits (7 Del. Code §60)

Well Construction, Completion and Abandonment Permits (7 Del. Code §6010a)

Wetlands and Subaqueous Lands Permit (7 Del Code §66; 7 Del. Code §7212)

3.1.3 Maryland

Certificate of Public Convenience and Necessity - CPCN (COMAR 20.79.01 through 20.79.04)

Chesapeake Bay Critical Area Law (COMAR §27.01 through 27.03)

Coastal Zone Consistency / Coastal Zone Management Program (Section 307 of the Federal Coastal Zone Management Act of 1972)

Commercial/Industrial Access Permit (COMAR 11.04.05)

Controlled Hazardous Substances Facilities (COMAR 26.13.07)

Erosion and Sediment Control Plan Approval (COMAR 26.17.01)

General Stormwater Permit for Construction Activity (COMAR 26.08.04)

Ground Water Discharge Permit (Industrial) (COMAR 26.08.01through 26.08.04 and 26.08.07)

Historic and Archeological Preservation Consultation (Article 83B § 5-617 and 5-618 of the Maryland Annotated Code)

Industrial Stormwater General Discharge Permit (COMAR 26.08.04.09)

Nongame and Endangered Species Conservation Act (NESCA) Consultation (COMAR 08.01.08)

Non-Tidal Wetlands and Waterways Individual Permit (COMAR 26.23)

Oil Operations Permit (Underground and Above Ground Storage Tanks: UST and AST) (COMAR 26.10.01.07)

State Programmatic General Permit (MDSPGP) and Regional Letter of Authorization (RLOA) (COMAR 26.23)

Stormwater Management Plans (COMAR 26.17.02)

Surface Water Discharge Permit (Industrial) (COMAR 26.08)

Susquehanna River Basin Surface and Groundwater Withdrawal Approval (18 CFR § 803.44)

The Maryland Forest Conservation Act (COMAR 08.19.04 et seq.)

Tidal Wetlands Permit (COMAR 26.24)

Water Appropriation and Use Permit (COMAR 26.17.06)

Waterway and 100-year Floodplain (COMAR 26.17.04)

Well Construction Permit (COMAR 26.04.04)

3.1.4 New Jersey

Coastal Area Facility Review Act (CAFRA) (N.J.A.C. 7:7E; N.J.A.C. 7:7)

Coastal Wetlands Permit (N.J.A.C. 7:7)

Conditionally Exempt Small Quantity Generators (CESQG) NJX Program (N.J.A.C. 7:26G et seq.)

Construction Stormwater General Permit (N.J.A.C. 7:14A) and Soil Erosion and Sediment Control Plan (SESCP) (N.J.A.C. 16:25A)

Delaware River Basin Commission Approval

Discharge, Prevention, Containment and Countermeasure (DPCC) and Discharge Cleanup and Removal (DCR) (N.J.A.C. 7:1E et seq.)

Endangered and Nongame Species Program Consultation (N.J.A.C. 7:5C)

Freshwater Wetlands General Permits (N.J.A.C. 7:7A)

Freshwater Wetlands Individual Permit (N.J.A.C. 7:7A)

Freshwater Wetlands Letter of Interpretation (N.J.A.C. 7:7A)

Freshwater Wetlands Transition Area Waiver (N.J.A.C. 7:7A)

Green Acres Diversion Application (N.J.A.C. 7:36-21)

Historic Preservation/Cultural Resources Consultation (N.J.A.C. 7:4)

Industrial Stormwater General and Individual Permits (N.J.A.C. 7:14A)

New Jersey Solid and Hazardous Waste Transporter Permit (N.J.A.C. 7:26-3 et seq.; N.J.A.C. 7:26G-1 et seq.)

NJPDES Groundwater Discharge Permit (N.J.A.C. 7:14A)

NJPDES Surface Water Discharge Permit (Wastewater) (N.J.A.C. 7:14A)

Pinelands Commission (N.J.S.A 13 :18A-1 et seq)

Significant Industrial User (N.J.A.C. 7:14A-21 et seq.)

Stream Encroachment (N.J.A.C. 7:13)

Tidelands License (N.J.S.A. 12:3)

Toxic Catastrophe Prevention Act, (N.J.S.A. 13:1K-19 et seq.)

Treatment Works Approval (N.J.A.C. 7:14A-23 et seq.)

Underground Storage Tanks (UST) Closure (N.J.A.C. 7:14B)

Underground Storage Tanks (UST) Registration (N.J.A.C. 7:14B)

Underground Storage Tanks (UST) Repair, Installation and Modification Permit (N.J.A.C. 7:14B)

Water Allocation Permit and Use Registration (N.J.A.C. 7:19)

Water Lowering-Water Diversion Permit (N.J.S.A. 23:5-29)

Water Quality Management Plan Consistency Review or Amendment (N.J.A.C. 7:15)

Waterfront Development Permit (N.J.A.C. 7:7 and N.J.A.C. 7:7E)

Well Construction, Maintenance and Abandonment (N.J.S.A. 58:4A-4.1; N.J.A.C. 7:9D et seq.)

3.1.5 Virginia

Chesapeake Bay Program - Coastal Lands Management (9 VAC 10-20-10 et seq.)

Erosion/Sediment Control (VA Code 5-10.1-500-4; 4 VAC 30-50)

Ground Water Withdrawal (GWW) Permit (9 VAC 25-610)

Hazardous Waste Management Facility Permit (VAC 20-60 et seq)

Hazardous Waste Transporter Permit (9 VAC 20-60-263 and 9 VAC 20-60-420 through 9 VAC 20-60-500)

Non-Tidal Wetlands – Virginia Water Protection (VWP) Individual Permits (9 VAC 25-210 et seq.)

Petroleum Program – Aboveground Storage Tank (AST) (9 VAC 25-91-10 et seq.)

Petroleum Program – Underground Storage Tank (UST) (9 VAC 25-580-10 et seq.)

Solid Waste Management Permit (9 VAC 20-80 et seq.)

State Program Wetland (non-tidal) General Permit (SPGP-01)

Surface Water Withdrawal (SWW) Permit (9 VAC 25-220-10 et seq.)

Threatened & Endangered Species Permit (Code of Virginia §29.1-568)

Tidal Wetlands Joint Permit Application (JPA) (§§ 28.2-1200, 1300 & 1400 et seq.)

Virginia Department of Historic Resources (Virginia Code §10.1-2200 thru 10.1-2215)

Virginia Pollutant Discharge Elimination System (VPDES) General Permit – Construction Activity Stormwater Discharges (VSMP)(4 VAC 50-60-380 and 390)

Virginia Pollutant Discharge Elimination System (VPDES) Stormwater Associated with Industrial Activities General Permit (9 VAC 25-31-10)

Virginia Pollutant Discharge Elimination System (VPDES) Wastewater (9 VAC 25-31-10)

Virginia Water Protection (VWP) General Permit WP1 (Non-tidal areas only) (9 VAC 25-670)

Virginia Water Protection (VWP) General Permit WP2 (for Facilities and Activities of Utility and Public Service Companies Regulated by the Federal Energy Commission or the State Corporation Commission and Other Utility Line Activities - Nontidal areas only) (9 VAC 25-670)

Virginia Water Protection (VWP) General Permit WP4 (for Impacts from Development and Certain Mining Activities) (9 VAC 25-670)

Well Construction Permit (Virginia Code §§ 32.1-12 et seq.)

3.2 Interstate Agencies

Major interstate agency environmental permit requirements have been included within the state specific permit summaries.

Chesapeake Bay Commission Permits are addressed separately in the Virginia and Maryland Permit Summaries.

The permit summary for the Delaware River Basic Commission Approval is contained in the New Jersey Permit Summaries, but may apply to projects in New Jersey and Delaware.

The permit summary for the Susquehanna River Basin Commission Water Withdrawal Approval is contained in the Maryland Permit Summaries.

Other federal, state, regional and local agencies may also be afforded an opportunity to review and comment on permit applications. As appropriate, involvement by such agencies has been noted in the individual permit summaries.

3.3 Local Permits

Local permits may include site plan approval, zoning, and planning approvals. Local permitting and approval processes are not detailed in this manual. Local (municipal or county) agencies or boards have been identified where such agencies or boards are responsible for the implementation of state or regional permitting programs.

4.0 Federal Permit/Approvals Requirements

This section provides a summary of potentially applicable Federal permits that may be required in addition to other applicable state, regional or local permits.

Clean Water Act – Water Quality Certification - Section 401 (33 USC 1341)

Federal Aviation Act (49 CFR Part 77)

National Environmental Policy Act (NEPA)

National Marine Fisheries Service (NMFS) Consultation

National Park Service (NPS) Consultation for Wild and Scenic Rivers (16 U.S.C. 1271-1287)

Natural Gas Act, Section 7 and Natural Gas Policy Act, Section 311 (FERC)

NPDES Permit for Wastewater and Stormwater Discharge - Section 402 (33 USC§ 1342)

Oil Spill Prevention Control and Countermeasure Plan - SPCC (40 CFR, Part 112)

Rivers and Harbors Act – Navigable Waters Section 10 (33 USC 403)

Rivers and Harbors Act - Section 9 (33 USC 401 et seq.)

US Fish and Wildlife Service Consultation under Endangered Species Act, Section 7 (16 U.S.C. 1531-1543)

US Fish and Wildlife Service Consultation under the Migratory Bird Treaty Act (16 U.S.C. 703-212), and the Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d, June 8, 1940, as amended 1959, 1962, 1972, and 1978)

APPENDICES - Permitting Resources

Appendix A - Abbreviations and Acronyms

Appendix B - Agency Contact Information

Appendix C - Common Study and Data Collection Needs

Appendix A: Acronyms and Abbreviations

Acronyms and Abbreviations

AST Aboveground Storage Tank

ACM Annotated Code of Maryland

BAT Best Available Technology

Btu British thermal unit

CAFRA Coastal Area Facility Review Act

CESQG Conditionally Exempt Small Quality Generators

CFR Code of Federal Regulations

CMP Comprehensive Management Plan

COE U.S. Army Corps of Engineers

COMAR Code of Maryland Regulations

CPCN Certificate of Public Convenience and Necessity

DA Department of the Army

DCR Discharge Cleanup and Removal

DEP Department of Environmental Protection

DGW Discharge to Groundwater

DNREC Department of Natural Resources and Environmental Control

DOE U.S. Department of Energy

DPCC Discharge, Prevention, Containment and Countermeasure

DRB Delaware River Basin

DRBC Delaware River Basin Commission

ECRA Environmental Cleanup Responsibility Act

EHIS Environmental & Health Impact Statement

EIN Employee Identification Number

EIS Environmental impact statement

ELM Environmental Licensing Manual

EPA U.S. Environmental Protection Agency

FAA Federal Aviation Administration

FEMA Federal Emergency Management Association

FHWA Federal Highway Administration

FNSI Finding of No Significant Impact

FUA Fuel Use Act

GITWA General Industry Treatment Works Approval

GVW Gross Vehicle Weight

ICC Interstate Commerce Commission

IRS Internal Revenue Service

ISRA Industrial Site Recovery Act

kV kilovolt

LURP Land Use Regulation Program

MACT Maximum Achievable Control Technology

MDE Maryland Department of the Environment

MD-DNR Maryland Department of Natural Resources

MRC Marine Resources Commission

MW megawatt

N/A Not Applicable

NEPA National Environmental Policy Act

NESHAPS National Emission Standards for Hazardous Air Pollutants

NFPA National Fire Protection Association

N.J.A.C. New Jersey Administrative Code

NJDEP New Jersey Department of Environmental Protection

N.J.S.A. New Jersey State Act

NOI Notice of Intent

NPDES National Pollutant Discharge Elimination System

NSR New Source Review

ODCP Virginia Oil Discharge Contingency Plan

PADEP Pennsylvania Department of Environmental Protection

PMHC Pennsylvania Museum and Historic Commission

PNDI Pennsylvania Natural Diversity Index

POTW Publicly Owned Treatment Works

PPC Pennsylvania Pollution Prevention Control Plan

PSC Public Service Commission

PSD Prevention of Significant Deterioration

RCRA Resource Conservation and Recovery Act

SCC State Corporation Commission

SE&SC Soil Erosion and Sediment Control Plan

SIU Significant Indirect User

SPCC Oil Spill Prevention Control and Countermeasure Plan

TCPA Toxic Chemicals Prevention Act

TSD Treatment Storage Disposal

TXS Toxic Substances

USBC Virginia Uniform State Building Code

USC Uniform State Code

U.S.C.A. United States Code Annotated

USCG United States Coast Guard

USDOT United States Department of Environmental Protection

USEPA United States Environmental Protection Agency

USFWS U.S. Fish and Wildlife Service

USGS United States Geological Service

UST Underground Storage Tank

VAC Virginia Annotated Code

VADEQ Virginia Department of Environmental Quality

VOC Volatile Organic Compound

WCB Water Control Board

WQMP Water Quality Management Plan

Appendix B: Agency Contact Information

District of Columbia Permitting Agency Contact Information

District of Columbia, Department of Consumer and Regulatory Affairs

Dept. of Consumer & Regulatory Affairs
Government of the District of Columbia
941 North Capitol Street NE
Washington, DC 20002
(202) 442-4400
Fax: (202) 442-9445
dcra@dc.gov

District of Columbia Public Service Commission

1333 H Street, NW Suite 200, West Tower
Washington, DC 20005
(202) 626-5100
Fax: (202) 393-1389

Office of the Mayor

John A. Wilson Building
1350 Pennsylvania Avenue, NW, Suite 600
Washington, DC 20004
(202) 727-2980
Fax: (202) 727-0505

Office of Planning

Government of the District of Columbia
801 North Capitol Street NE Suite 4000
Washington, DC 20002
(202) 442-7600

D.C. State Historic Preservation Officer

(202) 442-8818

Historic Preservation Review Board

(202) 442-8818

Advisory Council on Historic Preservation

1100 Pennsylvania Avenue NW, Suite 809
Old Post Office Building
Washington, DC 20004
(202) 606-8503
achp@achp.gov

Department of Health

825 North Capitol Street, NE
Washington, DC 20002
(202) 671-5000
Fax: (202) 442-4788

Environmental Health Administration
51 N Street, NE
Washington, DC 20002
(202) 535-2500

DC Underground Storage Tanks Management
51 N Street, NE, 3rd Floor
Washington, DC 20002
(202) 535-2525

Department of Public Works
2000 14th Street, NW, 6th Floor
Washington, DC 20009
(202) 673-6833
Fax: (202) 671-0642

District Department of Transportation
2000 14th Street, NW, 6th Floor
Washington, DC 20009
(202) 671-2700

Water and Sewer Authority
5000 Overlook Avenue, SW
Washington, DC 20032
(202) 787-2000
Fax: (202) 787-2210

DE Permitting Agency Contact Information

Delaware Department of Natural Resources and Environmental Control

Delaware Department of Natural Resources and Environmental Control Phone List

Division of Air and Waste Management

Accidental Release Prevention Program
715 Grantham Lane
New Castle, DE 19720
(302) 323-4542

Hazardous Waste Management Branch or Solid Waste Branch
89 Kings Highway
Dover, Delaware 19901
(302) 739-3689

Underground Storage Tank Branch
391 Lukens Drive New Castle
Delaware 19720-2774
Phone: (302) 395-2500

Aboveground Storage Tank Branch
391 Lukens Drive New Castle
Delaware 19720-2774
(302) 395-2500

Division of Soil and Water Conservation
89 Kings Highway
Dover, DE 19901
(302) 739-9921

Sediment & Stormwater Program
89 Kings Highway
Dover, DE 19901
(302) 739-9921

Shoreline & Waterway Management Section (no link available)
89 Kings Highway
Dover, DE 19901
(302) 739-4411
Fax: (302) 739-6724

Delaware Coastal Management Section
89 Kings Highway
Dover, DE 19901
Phone: (302) 739-WAVE
Fax: (302) 739-2048

Delaware National Estuarine Research Reserve
818 Kitts Hummock Road
Dover, DE 19901
(302) 739-3436

Division of Water Resources
89 Kings Highway
Dover, DE19901
(302) 739-9950

Water Supply Section
89 Kings Highway
PO Box 1401
Dover, DE 19903
(302) 739-9945

Surface Water Discharges Section
NPDES Storm Water Program
89 Kings Highway
Dover, DE 19901
(302) 739-9946

Ground Water Discharges Section
89 Kings Highway
Dover, DE 19901
(302) 739-9948

Wetlands and Subaqueous Lands Section
89 Kings Highway
Dover, DE 19901
(302) 739-9943

Division of Fish and Wildlife
4876 Hay Point Landing Road
Smyrna, DE 19977
(302) 653-2880 or 2881
Fax: (302) 653-3431

Delaware Natural Heritage Program
4876 Hay Point Landing Road
Smyrna, DE 19977
(302) 653-2880 or 2881
Fax: (302) 653-3431

Delaware State Historic Preservation Office
15 The Green
Dover, DE 19901
Phone: (302)739-5685
Fax: (302)739-5660

Delaware Department of Transportation

Highway Operations Field Services
800 Bay Road
P.O. Box 778
Dover, DE 19903
(302) 739-4327
Delegated Area: DelDot Construction

County Governmental Departments

New Castle County Department of Land Use
Site Management Division
87 Reads Way
Corporate Commons
New Castle, DE 19720
Plan Review: (302) 395-5477
Inspections: (302) 395-5475
Delegated Area: All Unincorporated Areas of New Castle County

New Castle Conservation District
6 Peoples Plaza
Newark, DE 19702
(302) 834-3533
Delegated Area: All Incorporated Areas of New Castle County (except Newark, Wilmington and Middletown)

Kent Conservation District
800 Bay Road
Suite 2
Dover, DE 19901
(302) 741-2600 Ext.3

Sussex Conservation District
21 Shortly Road
Georgetown, DE 19947
(302) 856-7219

Municipal Governmental Departments

City of Newark
Public Works Department
220 Elkton Road
P.O. Box 390
Newark, DE 19713-2839
(302) 366-7040

City of Wilmington
Dept. of Licensing and Inspections
800 North French St
Wilmington, DE 19801
(302) 571-4363

Town of Middletown
216 N. Broad Street
Middletown, DE 19709
Plan Review: (302) 378-1171
Inspections: (302) 378-5141

Maryland Permitting Agency Contact Information

Maryland Department of the Environment

1800 Washington Blvd.
Baltimore, MD 21230
410- 537-3345

Maryland Department of the Environment - Permitting Assistance E-mail

Maryland Department of the Environment - Telephone Directory

General Permits and Technical Support
410-537-3634

Water Management Administration
Regulatory Services Coordination Office
1800 Washington Boulevard, Suite 430
Baltimore, MD 21230-1708

Sediment and Stormwater Program
410-537-3563

Responsible Person Training & Certification Program for Erosion/Sediment Control
410-537-3543

Compliance Program
410-537-3510

Wetlands and Waterways
410-537-3837

Wastewater Permits Division
Ed Stone
410-537-3323

Groundwater Permits Division
410-537-3662

Water Supply Program
Phone: (410) 537-3591

Hazardous Waste Program
Phone: (410) 537-3345

Oil Control Program
1800 Washington Blvd.
Baltimore, MD 21230
Phone: (410) 537-3386

Maryland Department of the Natural Resources

580 Taylor Avenue
Tawes State Office Building
Annapolis, MD 21401
1-877-620-8DNR (8367)
Maryland Department of Natural Resources - Telephone Directory

Coastal Zone Management Program
Tawes State Office Bldg., E-2
580 Taylor Avenue
Annapolis, MD 21401
410-260-8984

MD Critical Area Commission
1804 West Street, Suite 100
Annapolis, MD 21401
410- 260-3460

Project Evaluation Division
General Project Questions: site plans, subdivisions, variances, violations, etc.
410- 260-3479

Program Implementation Division
General Program Questions: amendments to local programs, growth allocations, Critical Area map issues, etc.
Jurisdictions: Dorchester County, Cambridge, Secretary, St. Mary's County, Leonardtown, St. 410-260-3480

General Questions on the Critical Area Law and Criteria, questions regarding administrative functions of the Commission and procedural issues, etc.
410-260-3462

Jurisdictions: Queen Anne's County, Centreville, Church Hill, Queen Anne, Queenstown, Worcester County, Snow Hill, Ocean City
410-260-3477

Jurisdictions: Baltimore County, Calvert County, Charles County, Indian Head, Somerset County, Crisfield, Princess Anne, Talbot County, Easton, St. Michael's, Oxford, Wicomico County/Salisbury, Fruitland, Mardela Springs, Sharptown
410- 260-3482

Jurisdictions: Anne Arundel County, Highland Beach, Prince George's County, Kent County, Betterton, Chestertown, Millington, Rock Hall, Vienna
410-260-3478

Jurisdictions: Chesapeake Beach, North Beach, Cecil County, Charlestown, Chesapeake City, Elkton, North East, Perryville, Port Deposit, MNCPPC
410-260-3475

Jurisdictions: Annapolis, Baltimore City, Caroline County, Denton, Federalsburg, Greensboro, Hillsboro, Harford County, Aberdeen, Havre de Grace, WSSC
410-260-3483

Fisheries Service
410-260-8280

Forest Service

Western Region
Garrett, Allegany, Washington and Frederick Counties
MD DNR - Forest Service
3 Pershing Street Room 101
Cumberland, MD 21502
301-777-2137

Central Region
Montgomery, Howard, Baltimore, Harford, Carroll and Cecil Counties
MD DNR - Forest Service
2 South Bond Street
Bel Air, MD 21014
410-836-4551

Southern Region
Anne Arundel, Prince George's, Calvert, Charles and St. Mary's Counties
Southern Region FCA Coordinator
MD DNR - Forest Service
580 Taylor Avenue E-1
Annapolis, MD 21401
410-260-8531

Eastern Region
Kent, Queen Anne's, Caroline, Talbot, Dorchester, Somerset, Wicomico and Worcester Counties
MD DNR - Forest Service
201 Baptist Street #22
Salisbury, MD 21801

Natural Heritage Program

Send review requests to:
Lori Byrne
DNR Wildlife & Heritage Service
580 Taylor Ave.
Tawes Office Bldg E-1
Annapolis MD 21401
Phone: 410-260-8573
Toll-Free in Maryland: 1-877-620-8DNR, Ext. 8573
Or fax to the attention of Lori Byrne at 410-260-8596.

Power Plant Research Program

Tawes State Office Building
Annapolis, Maryland 21401
(410) 260-8660

Maryland Department of Transportation

State Highway Administration
Engineering Access Permits Division – Mail Stop C-302
P.O. Box 717
Baltimore, MD 21203
410-545-5600

State Highway Districts
P.O. Box 2679
660 West Road
Salisbury MD 21802
410-677-4082

P.O. Box 299
615 Morganec Road
Chestertown MD 21620
410-810-3275

9300 Kenilworth Ave.
Greenbelt MD 20770
301-513-7350

2323 W. Joppa Road
Brooklandville MD 21022
410-321-2841

138 Defense Highway
Annapolis MD 21401
410-841-1039

1251 Vocke Road
La Vale MD 21502
301-729-8439

5111 Buckeystown Pike
Frederick MD 21704
301-624-8116

Board of Public Works
80 Calvert Street
Louis L. Goldstein Treasury Building
Annapolis, MD 21401
410-260-7791

Maryland Department of Agriculture
50 Harry S. Truman Parkway
Annapolis, MD 21401
410-841-5700

Maryland Department of Health and Mental Hygiene
201 West Preston Street
Baltimore, Maryland 21201
1-877-463-3464

Maryland Department of State Planning

301 W. Preston Street Suite 1101
Baltimore, MD 21201-2305
1-877-767-6272

Maryland Historical Trust

100 Community Place
Crownsville, Maryland 21032-2023
410-514-7600

Project Review:
Jonathan Sager, Preservation Officer, at (410) 514-7636 or Andrew Lewis, Preservation Officer, at (410) 514-7630.

Maryland Public Service Commission

William Donald Schaefer Tower
6 Saint Paul Street, 16th Floor
Baltimore, Maryland 21202-6806

Local Planning and Zoning

Annapolis 410-263-7961	Charles Cty 301-645-0653	St. Mary's Cty 301-475-4200
Anne Arundel Cty 410-222-7441	Indian Head 301-743-5511	Leonardtown 301-475-9791
Baltimore City 410-396-8361	Chesapeake Beach 301-855-8398	Somerset Cty 410-651-1424
Baltimore Cty 410-887-3980	Dorchester Cty 410-228-3234	Crisfield 410-968-1333
Calvert Cty 535-1600 ext. 2338	Cambridge 410-228-1955	Princess Anne 410-651-1818
Caroline Cty 410-479-2230	Secretary 410-943-3113	Talbot Cty 410-770-8030
Denton 410-479-3625	Harford Cty 410-879-2000 ext. 103	Easton 410-822-2525
Federalsburg 410-754-8173	Havre de Grace 410-939-1800	Oxford 410-226-5122
Greensboro 410-482-6222	Kent Cty 410-778-7473	St. Michael's 410-745-9535
Hillsboro 410-364-5760	Betterton 410-348-5522	Vienna 410-376-3442 Monday 6:30 - 9 p.m. only
Cecil Cty 410-996-5220	Chestertown 410-778-0500	Wicomico Cty/Salisbury 410-548-4860
Charlestown 410-287-6173	Millington 410-928-3880	Fruitland 410-548-2800
Chesapeake City 410-885-5298	Rock Hall 410-639-7611	Mardela Springs 410-742-7988
Elkton 410-398-4999	North Beach 301-855-6681	Sharptown 410-883-3767
North East 410-287-5801	Prince George's Cty 301-883-5919	Worcester Cty 410-632-1200
Perryville 410-642-6066	Queen Anne's Cty 410-758-1255	Snow Hill 410-632-2080
Port Deposit 410-378-2122	Centreville 410-758-1224	Ocean City 410-289-8855
	Church Hill 410-758-3740	
	Queen Anne 410-364-5667	
	Queenstown 410-827-7646	

MD County Health Departments

MD Soil Conservation Districts

NJ Permitting Agency Contact Information

New Jersey Department of Environmental Protection

State of New Jersey Employee Telephone Directory

Compliance & Enforcement

Environmental Regulation
401 East State Street
PO Box 423
Trenton, NJ 08625-0423
609-292-2795

Division of Environmental Safety and Health (see individual bureau links)

Bureau of Discharge Prevention
Station Plaza 4
22 S. Clinton Ave. - 3rd Fl.
Trenton, New Jersey 08625

Engineering Review Section (609) 292-1690
Field Verification Section (609) 984-7573
Toxic Catastrophe Prevention Act Program (TCPA)
TCPA Risk Assessment Section (609) 984-7573
TCPA Technical Support Section (609) 292-1690

Division of Water Quality
401 East State Street
PO Box 029
Trenton, NJ 08625-0029

Bureau of Nonpoint Pollution Control
(609) 633-7021 or (609) 292-0407

Bureau of Point Source Permitting
Region 1 (609) 633-3869
Region 2 (609) 292-4860

Bureau of Permit Management
(609) 984-4428

Land Use Management (see individual bureau or program links)

Division of Land Use Regulation
501 E. Sate Street, 2nd Floor
PO Box 439
Trenton, NJ 08609
Reception: (609) 292-1235 or (609) 292-0060
Application Support: (609) 777-0456

Bureau of Coastal Regulation
(609) 633-2289

Contacts per county:
Essex: (609) 633-6754
Morris, Bergen: (609) 633-9277
Middlesex, Hudson, Somerset, Union: (609) 633-6754
Hunterdon, Mercer, Passaic, Sussex, Warren: (609) 777-0454
Cumberland, Camden, Salem, Gloucester: (609) 984-0762
Atlantic, Burlington, Cape May, Monmouth, Ocean: (609) 984-0288 or (609) 292-8262

Stream encroachment
Ocean, Camden, Monmouth, Gloucester, Burlington, Salem, Atlantic, Cumberland, Cape May: (609) 984-0162
Hunterdon, Mercer, Middlesex , Union, Sussex, Warren, Bergen, Passaic, Morris, Union, Essex, Hudson: (609) 984-0194

Bureau of Tidelands Management
(609) 292-2573

Division of Water Resources, Bureau of Water Allocation
PO Box 426
Trenton, NJ 08625
(609) 292-2957

Division of Watershed Management
401 East State Street
P.O. Box 418
Trenton, NJ 08625-0418
Phone: (609) 984-0058
Lawrence J. Baier, Director

Bureau of Watershed Regulation
Bureau of Watershed Regulation
Phone: (609) 984-6888
Terry Pilawski, Chief

Natural and Historic Resources (see individual bureau and program links)

Division of Fish and Wildlife

Bureau of Freshwater Fisheries
PO Box 394
Lebanon, NJ 08833
(609) 236-2118

Endangered and Nongame Species Program
PO Box 404
501 East State Street, 3rd Floor
Trenton, NJ 08625-0400
609-292-9400

Green Acres Program, Legal Services & Stewardship Bureau
501 East State Street
Station Plaza Building 5, Ground Floor
Trenton, NJ
(609) 984-0500 or (609) 984-0631

Division of Parks and Forestry

Historic Preservation Office
PO Box 404
Trenton, NJ 08625-0404
(609) 292-2023

New Jersey Historical Commission
The New Jersey Historical Commission
NJ Department of State
PO Box 305
Trenton, NJ 08625-0305
Telephone: 609-292-6062
FAX:: 609-633-8168
Email: njhc@sos.state.nj.us

New Jersey State Museum
Archaeology/Ethnology Bureau
(609) 292-8594
Lorraine Williams
Curator
lorraine.williams@sos.state.nj.us

Cultural History Bureau
(609) 292-5421
James Turk
Curator
james.turk@sos.state.nj.us

New Jersey Division of Archives and Records Management
State Archives
225 West State Street-Level 2
P.O. Box 307
Trenton, NJ 08625-0307
609.292.6260 (general information)
609.396.2454 (reference fax)
609.633.8334 (administrative office)
609.292.9105 (administrative fax)

State Records Center
(Location of Division Administration, Records Management & Micrographics)
2300 Stuyvesant Ave.
P.O. Box 307
Trenton, NJ 08625-0307
609.530.3200 (general information)
609.530.3267 (administrative office)
609.530.6121 (fax)

Office of Natural Resource Restoration

Division of Science, Research & Technology

Office of Dredging and Sediment Technology
PO Box 028
Trenton, NJ 08625-0028
Barnegat Bay and north including the NY Harbor
(609) 292-9203
Little Egg Harbor and south including the Delaware River
(609) 292-9342

Site Remediation and Waste Management Program

Bureau of Underground Storage Tank Management
401 East State Street
P.O. Box 433
Trenton, NJ 08625
609/292-8761

Bureau of Field Operations
401 East State Street
CN 435
Trenton, NJ 08625-0435
(609) 584-4150 for the Bureau of Southern Field Operations or (973) 631-6401 for the Bureau of Northern Field Operations

UST Program, Registration and Billing Unit
PO Box 028
Trenton, NJ 08625
609/633-1464

Division of Solid & Hazardous Waste
401 East State St.
PO Box 414
Trenton, NJ 08625-0414

Bureau of Solid Waste
(609) 984-2080

Bureau of Hazardous Waste Regulation
(609) 633-1418

New Jersey Pinelands Commission
15 Springfield Road
PO Box 7
New Lisbon, NJ 08064
609-894-7300

NJDEP Bureau of Risk Management

Registration and Billing Unit at (609) 633-1464

Bureau of Discharge Prevention

(609) 633-0610

Chief:	Iclal Atay	iclal.atay@dep.state.nj.us
Staff:	Nancy McHugh	nancy.mchugh@dep.state.nj.us

Engineering Review Section (609) 292-1690

Section Chief	Beth Reddy	beth.reddy@dep.state.nj.us
Staff:	Mira Desai	mira.desai@dep.state.nj.us
	Audrey Dorofy	audrey.dorofy@dep.state.nj.us
	Yefim Kantor	yefim.kantor@dep.state.nj.us
	Chris Lucien	chris.lucien@dep.state.nj.us
	Christopher Barry	chris.barry@dep.state.nj.us
	Philip Polios	philip.polios@dep.state.nj.us
	Erdal Gurten	erdal.gurten@dep.state.nj.us
	Roy Soong	roy.soong@dep.state.nj.us

Field Verification Section (609) 984-7573

Supervisor:	Priit Pals	priit.pals@dep.state.nj.us
Staff:	Arthur Robinson	arthur.robinson@dep.state.nj.us
	Jim Horsley	jim.horsley@dep.state.nj.us
	Walter Nedick	walt.nedick@dep.state.nj.us
	Gary Sobin	gary.sobin@dep.state.nj.us
	Stafford Stewart	stafford.stewart@dep.state.nj.us
	Sunday Ogunsola	sunday.ogunsola@dep.state.nj.us

TCPA Risk Assessment Section (609) 984-7573

Acting Section Chief:	Paul Komosinsky	paul.komosinsky@dep.state.nj.us
Staff:	Ezikpe Akuma, PhD., P.E.	ezikpe.akuma@dep.state.nj.us
	Patrick Costello	pat.costello@dep.state.nj.us
	John Notta	john.notta@dep.state.nj.us
	Asit Ray	asit.ray@dep.state.nj.us
	Victor Kuzmicz	victor.kuzmicz@dep.state.nj.us

TCPA Technical Support Section (609) 292-1690

Supervisor:	Carl Ochs	carl.ochs@dep.state.nj.us
Staff:	Sanjeev Sharma	sanjeev.sharma@dep.state.nj.us
	Alfred Drabnis	alfred.drabnis@dep.state.nj.us

NJ Bureau of Pretreatment and Residuals
Chief: Mary Jo Aiello
401 E. State St.
P.O. Box 029
Trenton, NJ 08625-0029

Phone: (609) 633-3823
FAX: (609) 984-7938

NJDEP Bureau of WSA- Well Permitting and Regulations Section

Section Chief Pat Bono
Address: 401 East State Street
P. O. Box 426
Trenton, New Jersey 08625-0426

Telephone: (609)-292-2957
Fax: (609)-633-1231
Secretary Natalie Ashwood

NJ Office of State Planning

Virginia Permitting Agency Contact Information

Virginia Department of Environmental Quality

629 East Main Street
P.O. Box 10009
Richmond, VA 23240-0009
(804) 698-4000 or toll free in Virginia 1-800-592-5482

Water Division
Post Office Box 10009
Richmond, VA 23240
(804) 698-4375

State Water Control Board
DEQ Central Office
629 East Main Street
Richmond, VA 23219

Office of Wetlands and Water Protection/Compliance, Virginia Water Protection Permit Program
(804-698-4047).

Waste Division
629 East Main Street
Richmond, VA 23219
(804) 698-4421

Office of Spill Response and Remediation
PO Box 10009
Richmond, VA 23240-0009

Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Curt Linderman, Water Permits Manager
Phone: (804) 527-5020

Southwest Regional Office
355 Deadmore St.
P.O. Box 1688, Abingdon, VA 24210
(276) 676-4800
Allen Newman, Water Permits Manager

West Central Regional Office
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6700
Kip Foster, Water Permits Manager

South Central Regional Office
7705 Timberlake Road
Lynchburg, VA 24502
(434) 582-5120
Robert Goode, Water Permits Manager

Valley Regional Office
4411 Early Road
P.O. Box 3000
Harrisonburg, VA 22801
(540) 574-7800
Keith Fowler, Planning and Permit Support Manager

Northern Virginia Regional Office
13901 Crown Court
Woodbridge, VA 22193
(703) 583-3800
Joan Crowther, Environmental Manager

Tidewater Regional Office (this is in PHI's service territory)
5636 Southern Boulevard
Virginia Beach, VA 23462
(757) 518-2000
Bert Parolari, Virginia Water Protection Program Manager

Virginia Coastal Planning District Commission

Accomack-Northampton PDC
Jim McGowan: 757/ 787-2936 or anpdcjmcg@co.northampton.va.us

Crater PDC
Victor Liu: 804/ 861-1667 or vliu@cpd.state.va.us

Hampton Roads PDC
John Carlock: 757/ 420-8300 or **jcarlock@hrpdc.org**

Northern Virginia Regional Commission
Katherine Mull: 703/ 642-0700 or **kmull@nvpdc.state.va.us**

Rappahannock Area Development Commission
Steve Manster: 703/ 373-2890 or **smanster@fampo.state.va.us**

Northern Neck PDC
Stuart McKenzie: 804/ 333-1900 or **smckenzie@nnpdc17.state.va.us**

Middle Peninsula PDC
Lewie Lawrence: 804/ 758-2311 or **mppdc@inna.net**

Richmond Regional PDC
Jackie Stewart: 804/ 367-6001 or jstewart@richmondregional.org

Virginia Department of Conservation and Recreation

203 Governor Street, Suite 213
Richmond, VA 23219-2094
(804) 786-1712

Division of Natural Heritage
217 Governor Street
Richmond, Virginia 23219
(804) 786-7951
Fax (804) 371-2674

Division of Soil and Water Conservation
203 Governor Street, Suite 206
Richmond, Virginia 23219
(804) 786-1712

Storm Water Management Program
203 Governor Street, Suite 206
Richmond, Virginia 23219
(804) 786-1712

Chesapeake Bay Local Assistance Department
101 North 14th Street, 17th Floor
Richmond, VA 23219
(800) CHESBAY

Storm Water Management Program Director
Mr. Lee Hill
(804) 786-3998
e-mail: Lee.Hill@dcr.virginia.gov

MS4 Program Manager
Mr. Doug Fritz
(804) 371-7330
e-mail: Doug.Fritz@dcr.virginia.gov

Storm Water Enforcement Manager
Ms. Anne Crosier
(804)225-2549
e-mail: Anne.Crosier@dcr.virginia.gov

Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221
(804) 367-2323

Capital Regional Preservation Office (serving Central and Southside Virginia)
2801 Kensington Avenue
Richmond, VA 23221
(804) 367-2323 ext 133
Contact: Ann Andrus, Acting Director

Roanoke Regional Preservation Office (serving Southwest Virginia and Lower Piedmont)
1030 Penmar Avenue, SE
Roanoke, VA 24013
(540) 857-7585
Contact: John Kern, Director

Tidewater Regional Preservation Office (serving Eastern Virginia and the Northern Neck)
14415 Old Courthouse Way, 2nd Floor
Newport News, VA 23608
(757) 886-2807
Contact: Randolph Turner, Director

Winchester Regional Preservation Office (serving the Shenandoah Valley and Northern Virginia)
107 North Kent Street, Suite 203
Winchester, VA 22601
(540) 722-3427
Contact: David Edwards, Director

Local Tidewater Government Contacts

Local Wetlands Board (Link to USACE Norfolk District which provides local contacts and links for wetlands)

Virginia Marine Resources Commission
2600 Washington Avenue, Third Floor
Newport News, VA 23607
(757) 247-2200

Virginia Department of Game & Inland Fisheries
4010 West Broad Street
Richmond, VA 23230
(804) 367-1000

Virginia Department of Health
P.O. Box 2448
Richmond, Virginia 23218-2448
109 Governor Street
Richmond, Virginia 23219

Virginia Department of Agriculture and Consumer Services
1100 Bank Street
Richmond, Virginia 23219
(804) 786-2373

Regional Permitting Agency Contact Information

Delaware River Basin Commission

P.O. Box 7360
West Trenton, NJ 08628-0360
(609)883-9500
Fax (609)883-9522

Susquehanna River Basin Commission

1721 North Front Street
Harrisburg, PA 17102
717- 238-0423

Chesapeake Bay Commission (CBC)

See Maryland and Virginia Contact information for the:

VA Chesapeake Bay Local Assistance Department

MD Critical Area Commission

Federal Permitting Agency Contact Information

National Marine Fisheries service

NMFS Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930-2298
(978) 281-9300
FAX: (978) 281-9333

NMFS Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026
Phone: (508) 495-2000
Fax: (508) 495-2258

National Park Service

Northeast Region
Regional Director Mary Bomar
U.S. Custom House
200 Chestnut St., Fifth Floor
Philadelphia, PA 19106
(215) 597-7013

US Army Corps of Engineers

US Army Corp of Engineers Norfolk District
803 Front Street
Norfolk, VA 23510-1096
(757) 201-7652

US Army Corp of Engineers - Philadelphia District
John Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107
(215) 656-6728

US Army Corp of Engineers - Baltimore District
PO Box 1715
Baltimore, MD 21203-1715
410-962-3670

US Environmental Protection Agency

US Environmental Protection Agency - Office of Wastes
1200 Pennsylvania Avenue, NW
Washington, DC 20460

US Environmental Protection Agency - Region III
1650 Arch Street
Philadelphia, PA 19103-2029
(215) 814-5000
Fax: (215) 814-5103

Solid Waste Region 3

US Environmental Protection Agency- Region II
290 Broadway
New York, NY 10007-1866
Phone: 212-637-3000

US Fish and Wildlife Service

US Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, Virginia 23061
(804) 693-6694
Fax (804) 693-9032

Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Federal Aviation Administration Eastern Regional Office
1 Aviation Plaza
Jamaica, NY 11434-4809

U.S. Coast Guard Office of Bridge Administration
2100 Second Street, SW, Room 3500
Washington, DC 20593-0001
(202) 267-0368
fax (202) 267-4046

Appendix C: Common Study and Data Collection Needs

Common Supporting Studies

The following provides a brief summary of common supporting studies that may be required for various permit applications. This is not intended to be all inclusive, but to provide information on those types of studies commonly required for majority of projects. Review permit specific requirements and consultation with the regulatory agency is generally required to determine specific data or study needs, and the scope of any required studies.

Alternatives analysis - An analysis of alternatives is required for a range of environmental permits. Such analysis may include evaluation of a no action alternative as well as alternative site locations or routes (for linear projects), alternative design, and alternative construction methods. Alternative analyses can range from simple desktop analyses to highly complex analyses (e.g., those that might involve more detailed field evaluation and ranking of alternative sites). Use of GIS data can greatly facilitate the analysis of alternatives as well as presentation of analysis results. Typically alternatives are compared based on the type and magnitude of potential impacts to various regulated resources, uses or values (e.g., to water quality, threatened and endangered species, wetlands, public lands, visual, noise, traffic, socio-economics) as well as other impacts associated with reliability, safety, and cost. Not all regulatory programs recognize cost as a determining factor in selecting the least impacting alternative.

The cost to complete alternatives analyses can range considerably from ~$5,000 to >$50,000 depending on the types of impacts evaluated, the number of alternatives evaluated, the availability of information to support the alternatives analysis, and the level of detail required to satisfy the regulatory requirements. The timeframe to complete such analysis may range from one to two weeks, to two or more months.

Cultural/historic resource studies - Many projects require cultural resource or historic preservation studies. Typically the state HPO consults with federal agencies under Section 106 of the National Historic Preservation Act for federally funded, licensed or permitted projects. At the state level, the regulations usually requires that actions by state, county, or local governments, which may impact a property listed in the Register of Historic Places, be reviewed and evaluated through the HPO.

State and federal cultural resource consultations are a multiphase evaluation starting with general research and, potentially, resulting in full archaeological excavation and capture. Consultation begins with a letter request to the applicable agencies requesting input regarding potential cultural/historical resource issues for the project area. In most cases, a Phase 1A cultural resource assessment is required. Phase IA investigations are intended to gather information concerning the environmental/physical setting of a specific project area as well as its cultural setting and the potential occurrence of historic structures and/or archaeological resources. It is the interrelationship of the physical environment and cultural/historical setting that provides the basis for the sensitivity assessment. Certain areas

with a high potential for archaeological resources may be recommended for Phase 1B analysis. The Phase 1B study includes appropriate field investigations to provide a systematic, on-site field inspection designed to assess archaeologically sensitive areas and environmental characteristics relevant to site locations and formation processes. Phase 1B investigations may include systematic surface survey (often used for previously plowed areas), subsurface testing (e.g., at specific intervals along a linear path) and/or remote sensing.

Initial consultation inquiries can be completed within a day or two. Phase 1A assessment costs will vary depending on the area of interest; typical costs range from $10,000 - $30,000. Depending on the size of the project study area, Phase 1A assessment can be completed within one to two months. Phase 1B costs are typically determined after completion of the Phase 1A assessment. Similarly, Phase 2 and 3 assessments, if required, may vary considerably in price depending on the scale and type of issues requiring further investigation.

Essential Fish Habitat (EFH) assessment - Typically, Essential Fish Habitat (EFH) assessments are required where projects are associated with and have the potential to affect marine or estuarine environments necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson Stevens Act, 16 U.S.C. 1801 et seq.; see also EFH Interim Final Rule, 62 FR 66531). The EFH assessment typically includes an introduction, references, and the following sections: 1) description, distribution, and use of essential fish habitats and existing conditions; 2) environmental consequences to essential fish habitat; 3) managed species distribution, existing conditions, and use of essential fish habitat; 4) environmental consequences to managed species; and 5) cumulative impacts. In some instances where project setting and characteristics are unlikely to have significant impact on EFH, it may be possible to produce a simplified EFH assessment to meet regulatory review requirements. Such a determination can only be made after consultation with the National Marine Fisheries Service (NMFS).

The cost to complete an EFH assessment typically range from $5,000 to >$10,000. Cost varies depending on the scope and magnitude of activities that may affect EFH, and may be considerably greater if field investigations are required. An EFH assessment can typically be completed within one to two months of receipt of all necessary information regarding project area and activities.

Mitigation plan - Mitigation plans may be required to mitigate for impacts to wetlands and or protected species habitat. Mitigation plans may range from simple commitments for financial mitigation to complex plans for design and construction of mitigation wetlands.

The cost range for mitigation plans typically falls between $5,000 and $15,000, but can be significantly greater where complex or large scale mitigation is required. A simple mitigation plan with conceptual design plans typically can usually be completed two to three months of receipt of the required information to support design. Selection of mitigation sites and

negotiations with agencies can be time consuming and development is costly (upwards of $50,000 per acre). Monitoring of mitigation efforts is typically required annually for three to five years post construction.

Site plan preparation - Many permit applications require submittal of site plans illustrating existing and proposed conditions (including property boundaries, structures, roads, utilities, topography, vegetation, filling, grading, excavation, clearing, roads, sewers, landscaping and lighting, soil erosion and sediment control devices, construction access and lay down areas). Other information such as coastal and freshwater wetlands, mean high water line, spring high water line, limit of tidelands or other similar types of information may also be required for certain permit applications. Some regulatory agencies specify maximum scale for plans (1" = 200' is a commonly required scale) and maximum interval for topographic contours (e.g., 1 - 2 foot contours are typical). Plans typically must be sealed by a professional engineer and/or licensed land surveyor. Some states may require sealing by individuals licensed to practice in that particular state. Development of plans to meet the combined requirements of multiple permits can minimize issues with tracking and revisions across multiple plan versions submitted to various agencies.

The time and cost required for site plan preparation is dependent on the type of project, area involved, and the complexity of design required.

Submerged aquatic vegetation mapping - In water construction activities in the coastal environment may require mapping of submerged aquatic vegetation or other tidal resources. Mapping must occur during the growing season, and ideally would occur during peak growth periods. As seasonal succession is common to some submerged aquatic vegetation species, timing of surveys should aim to target periods when the full complement of species are likely to be present. Methods may vary from a simple visual survey, to diver based visual or quantitative surveys. Remote sensing (e.g., hyperspectral aerial mapping) may also be used with groundtruthing to map SAV in large areas.

Typically mapping and associated reporting can be completed within one to two months. Depending on the size of the area to be surveyed and the methods used, the cost may range from $5,000 to $50,000.

Threatened and endangered species surveys - Field surveys may be required where consultation with state and federal officials indicates the potential presence of protected species and/or their habitats that may be affected by a project. Field surveys may include studies to document presence/absence of a protected species or presence/absence of suitable habitat for protected species at a certain location. The scope of such surveys is highly dependent on the species of concern. Surveys for protected plant species often must be completed during the flowering or fruiting period, significantly restricting the time period during which surveys can be completed, and often times precluding surveying for all species at one time. Similarly, surveys for presence/absence of protected animal species may also require survey during certain time periods (daylight, night, dusk/dawn) and/or during different

seasons. In some instances, recognized experts are required to conduct or oversee these evaluations.

The scope, cost and schedule for threatened and endangered species surveys are project specific, and may vary widely depending on the number of species or habitat types to be surveyed, individual species characteristics, and the size of the area to be surveyed.

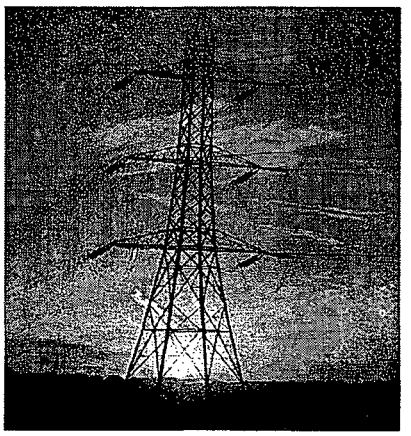
Wetland delineation - If wetlands are present on the project site or along the coastal areas, it is necessary to delineate and map wetland boundaries. In some cases, the required delineation methods may differ between state and federal agencies. It is common to delineate either both state and federal lines, or the most conservative of the two. Wetland flags must be shown on site plans for many permit applications. As such, a suitable base survey plan is required. Wetland boundaries can be mapped by the wetland consultant using a Trimble ProXR GPS unit, or flags can be picked up by a separately contracted land surveyor. Costs for delineations vary widely depending on accessibility, the nature of the wetland (disturbed, highly dendritic). Typical costs for delineation are in the range of $1,500-$2,000 per linear mile (assuming a 60 ft ROW) or per 5 acres for individual sites. Impact evaluations include permanent and temporary impacts and impacts to buffer zones whose width may vary according to the assessed value of the waterbody involved (e.g., wetlands harboring endangered species are often given broader buffer zones).

Soil Erosion and Sediment Control - Projects involving land disturbance may require the development of a Soil Erosion and Sediment Control Plan (SESCP). The requirement for a SESCP is usually triggered by the area of disturbance exceeding a specified threshold level (e.g., greater than 5,000 sf in New Jersey, or more than 1 acre for the NPDES stormwater construction general permit requirements). Local regulations also in some cases require development of an SESCP. Depending on the jurisdiction plans may require review and approval by local boards/agencies, the county or regional Soil Conservation District (SCD), and/or a state regulatory agency. The SESCP must typically be developed under the direction and sealed and signed by a Licensed Professional Engineer. The SESCP usually must contain a presentation of existing site conditions (including grades), proposed soil disturbance activities, proposed final grading plan, construction sequence, soil erosion and sediment control measures, and notes. In a number of jurisdictions the regulatory requirement for the SESCP has been combined with the application process for coverage under the NPDES stormwater general permit for construction activities. The cost for development of the SESCP will vary depending on the size and complexity of the project, with cost typically ranging from $5,000 to $10,000.

NON-PSEG

PHI
Pepco Holdings Inc

Atlantic City Electric
Delmarva Power and Light
Potomac Electric Power Company



Pepco Holdings, Inc.
Transmission Vegetation Management Program
for
Pepco, Atlantic City Electric, and Delmarva Power & Light

Revision: 2.0
Effective Date: March 5, 2008
Prepared by: PHI System Forester
Signature: _____
Approved by: Vice President, Asset Management
Approval Date: March 5, 2008

Version History

Revision: 2.0	Date: 3/5/2008	Action: Annual review.	Change(s): Provided clarifications on clearances and ROW width and selective mowing. Updated Aerial Inspection Specification.
Revision: 1.0	Date: 6/15/2007	Action: Approved by William M. Gausman	Initial version documenting existing procedures and practices.

Table of Contents

Introduction

The Pepco Holdings, Inc. (PHI) transmission system consists of the transmission systems of three PHI operating companies (Companies):

Potomac Electric Power Company (Pepco)
Atlantic City Electric Company (ACE)
Delmarva Power and Light (DPL)

As the holding company for the separate transmission owners, PHI is responsible for developing and implementing its Transmission Vegetation Management Program (TVMP), as required by NERC Standard FAC-003-1 Transmission Vegetation Management Program (the Standard). See Appendix A for a copy of the current standard.

The vegetation under PHI's transmission lines is inspected and maintained on a regular basis, as per requirement R1.1 of the Standard. Contractors are engaged to obtain the required clearances between the conductors and vegetation on the rights-of-way, as per requirement R1.2 of the Standard, using a number of methods. These methods are evaluated for safety and environmental impact. Because of the variety in terrain, differences in soils and land use and vegetation type, an Integrated Vegetation Management (IVM) approach is used, which includes both mechanical and chemical control methods. This approach requires qualified and trained personnel, as per requirement R1.3 of the Standard. In some cases, where the preferred, standard approach is not possible, special methods are employed, such as hand cutting, mechanical mowing and increased frequency, as per requirement R1.4 of the Standard.

This maintenance is performed each year according to a scheduled workplan as per requirement R2 of the Standard, and reports are submitted on a quarterly basis to the Regional Reliability Organization, Reliability*First*, as per requirement R3 of the Standard,

for all vegetation-caused outages on the applicable part of the system (the 230 kV and 500 kV lines).

In addition to meeting the requirements for system reliability, PHI manages its power lines with concern for the environment. Good vegetation management results in the growth of favorable, low-growing, non-woody vegetation which serves as food sources and shelter for many animals, such as song birds, quail, wild turkey, deer, rabbits and pollinators. The Companies work with the various State and Federal Natural Resource agencies to identify and protect areas containing rare plants and animals under the power lines.

Objectives

The main objective of the TVMP is to avoid vegetation-caused outages to the PHI transmission system by maintaining the rights-of-way so as to achieve at all times and under all expected conditions an acceptable clearance between the conductors and the vegetation on or off the right-of-way. In addition, effective right-of-way management can include inspection for and mitigation of other right-of-way-based causes of outages such as encroachment, vandalism, and incompatible use. This objective meets requirement R1 of NERC Standard FAC-003-1 to develop a TVMP.

Practices and Approved Procedures

Aerial Inspection

PHI's transmission right-of-way aerial inspection program consists of a helicopter patrol of all transmission lines twice a year, once at the start of the growing season and a second inspection during the dormant season. A forestry qualified observer is present on all inspection patrols and makes note of all potential vegetation hazards or potential conflicts that need to be addressed. The inspection flies over each circuit individually, looking for any unusual activities or conditions such as potential vegetation that could cause reliability issues, encroachments, erosion, illegal use, or trespass. The program is able to adjust the scheduled flight patrols to changing conditions such as a late spring or extended growing season to pick the optimal time for inspection. The plan is also flexible to accommodate additional flight patrols or ground inspections if an area has been subject to fire, disease, extended drought or recent adjacent logging activity.

As result of the aerial inspection, follow-up action items are developed to address any identified unusual conditions such as potential vegetation that could cause reliability issues. These action items are prioritized. Any identified potential problematic vegetation from inspections is corrected.

This program meets requirement R1.1 of NERC Standard FAC-003-1 for the TVMP to have an appropriate inspection program.

Clearances

PHI's TVMP is designed to maintain the proper clearances at all times except where easement and/or statutory/regulatory restrictions exist. This is accomplished through a combination of regularly scheduled maintenance as well as spot treatment as indicated from the semi-annual inspections. The next paragraph below explains how such a program is capable of maintaining the standard clearance under normal circumstances. In addition, the subsequent paragraphs address how clearances are maintained in the light of special local circumstances that may require special methods. All of these measures, individually and taken together, work to ensure that PHI's transmission vegetation management program will ensure adequate clearance at all times, and therefore meets requirements R1.2 and R1.4 of NERC Standard FAC-003-1 on how the TVMP shall maintain clearances normally and under special circumstances. Please note that these clearances meet minimal safety clearances and do not in any way represent right-of-way width requirements.

The TVMP calls for each transmission right-of-way for the 230 kV and 500 kV system to be maintained at least once every four years on an annualized growing season basis (i.e. could span almost five years). Such maintenance will obtain required clearances between conductors and vegetation through an Integrated Vegetation Management approach that will maintain the height of vegetation above the floor either at zero for trees and un-desirable brush, or at three feet at maturity for desirable brush whose re-growth rate and height at maturity are low. Such a program can be assured of maintaining an acceptable clearance between the conductor and the vegetation over the duration of the cycle (i.e. the air gap as specified in IEEE 516-2003, Table 5, which is shown as Appendix B in this document). The entire system is further reinforced by the semi-annual aerial inspection that ensures that any fast growth, fallen tree, or other hazard is identified and dealt with. Note that the clearance is maintained throughout the wire zone under the conductor, and, in accordance with certain local standards, may allow a height at maturity of up to 15 feet at the borders of the right-of-way, which is still consistent with maintaining the required air gap clearance.

Clearance 1: The following clearances are targeted minimums:

115 kV	5 feet
138 kV	5 feet
230 kV	10 feet
500 kV	15 feet

Clearance 2: As derived from the IEEE Standard 526-2003, Section 42.2.3, Table 5, the calculated minimum clearances areas follows:

115 kV	2.46 feet
138 kV	2.95 feet
230 kV	5.15 feet
500 kV	14.70 feet

While Clearance 1 are targeted minimums to maximize safety and reliability, vegetation should encroach no closer than the calculated distances above (i.e. Clearance 2) from the conductors at maximized engineered sag.

PHI's experience through two cycles of transmission vegetation management has confirmed the parameters of this approach, with only occasional intervention as indicated by inspection, and no floor-caused ('grow-in') outages.

For clearances with respect to fallen tree in the right-of-way or from beyond it, PHI's right-of-way design is such that no side-trimming is generally required for bulk power lines. In addition, an integral part of the maintenance performed at least every four years on an annualized growing season basis is a ground-based inspection of the right-of-way and its surrounding 'walls' to look for trees which might be structurally weak (dead, split, undermined, etc.) and which have the potential due to their height and distance from the line to fall within the clearance gap. Any such trees or limbs are then removed; just as

they are when such conditions are spotted from the semi-annual aerial inspections (see the section in the Work Specification on Hazard Trees).

For those special circumstances in which PHI's standard method of vegetation management is not sufficient to ensure that clearance is maintained or we are unable due to right-of-way restrictions, PHI completes an exception report that includes the special methods and measures taken to ensure compliance in such circumstances. Appendix G contains the existing exception reports.

Moreover, as detailed in the section below on Work Specifications and in the attached contract specifications, PHI varies its methods to accommodate when local conditions dictate. Examples include:

- Some rights-of-way are maintained mainly through mowing, where the neighboring landowners prefer that method to the managed natural habitat PHI normally maintains.
- At the time of cycle maintenance, contractors follow PHI's specifications as to which species are desirable and un-desirable, treating them accordingly.
- Where necessary due to local conditions, PHI uses cutting by hand, spraying with different chemicals, or other special methods to accommodate streams, farm or pasture requirements.
- In wetlands, PHI may use low ground pressured tracked vehicles or mats that minimize the pressure on the ground and preserve wetland characteristics.

Imminent Threat Communications

The following processes shall be followed when vegetation is found to be an imminent vegetation threat to transmission system reliability. This process meets the requirement R1.5 of NERC Standard FAC-003-1 for communication imminent threats to transmission facilities due to vegetation conditions.

Process to report the vegetation problem to Transmission System Operations **(TSO)** -

The imminent vegetation threat shall be reported to the Sr System Operator (SSO).

The SSO will be provided with the name and contact information of the person reporting the problem; the transmission line number; location of the vegetation; likelihood of when the vegetation will fall or otherwise cause problems; the anticipated nature of the damage if the problem materializes; anticipated time to correct the problem; accessibility of the location. The SSO shall contact Vegetation Management or assign a trouble person to investigate. The SSO will make an assessment to work with PJM for switching or direction.

Process to Report the Tree Problems to Forestry - Contact the ACE, DPL or Pepco TSO who in turn will contact the Manager of Vegetation Management or the Staff Forester on call.

Process to Rectify the Tree Problem – Upon notification of the vegetation hazard, Vegetation Management shall initiate the action to remedy the problem. During work hours, the Manager of Vegetation Management will notify the Staff Forester about the emergency and after hours, the Staff Forester on call shall do so. The Staff Forester will immediately proceed to the location of the vegetation threat. The tree contractor's supervision will dispatch a crew to the site immediately upon notification of the emergency and meet the Staff Forester at the site. Subsequent to the field inspection, the Staff Forester shall contact the respective Sr System Operator to provide an evaluation of the situation and to advise if an outage will be required. If an outage is

necessary, TSO shall coordinate with PJM. The Staff Forester will contact the Sr System Operator when the work has been completed.

Compatible Use

The transmission system is a network of transmission lines which covers a land area of many thousands of acres. This land is managed for the reliable transmission of high voltage electricity, At the same time it is often possible for this land to be used for additional purposes, as long as such purposes do not interfere with the vegetation maintenance, the maintenance of the physical facilities and, of course, the transmission of electricity. These uses are referred to as "compatible uses." PHI installed most of its lines prior to the spread of suburban developments, and as a result the majority of the lines originally passed over farmers' fields and through rural woodlands. At that time, compatible use was generally limited to farming and some use by other utilities such as the telephone, water and gas companies.

As the population in the metropolitan area grew, many farms were turned into suburban residential communities. Where there were only one or two families in an area, there are now hundreds of families whose backyards adjoin the rights-of-way. As the numbers grew so did the number and diversity of compatible uses. PHI allows many compatible uses and there are presently private individuals, civic, governmental, and private organizations, and other utilities which use PHI property. These different groups represent a wide range of activities. There are numerous gardens, children's play areas, hiking, biking and horse trails, public street crossings, and one development even has part of its golf course on a right-of-way. In areas that have escaped development, grazing livestock and croplands are still a common sight under the wires.

To obtain permission to use PHI right-of-way property, the interested party must own or lease property adjacent to the PHI property or be a responsible organization, and must submit a written request to PHI's Real Estate and Right-of-Way Department. The request is then forwarded to engineering and to the transmission maintenance staff for investigation and recommendations. Each request is given careful consideration to determine whether or not it will interfere with the company's operations, current and planned. If it is decided that the requested use is compatible, permission is granted by

means of a letter of agreement which is sent to the party for their approval. There is no charge for using PHI property under the compatible use program.

The unauthorized use of PHI property is referred to as an encroachment. The right-of-way properties are particularly susceptible to encroachments because they border many private properties, are spread over a wide area and are difficult to patrol. Also, there are many people who either are not aware of or do not respect the fact that the rights-of-way are private property, and they know that PHI is an absentee owner. Certain uses of PHI property by outside parties are permitted, but only after a written agreement has been signed by both PHI and the party requesting the use. There is a wide variety of encroachments which occur on PHI right-of-way properties. Examples include sheds, swingsets, fences, trees, haul roads, and construction materials. Encroachments can be discovered by any of the transmission maintenance programs or by the staff during their activities throughout the year. Generally, what is required is that the responsible party for the encroachment be contacted by the transmission maintenance staff who requests that they remove the encroachment. If the party responsible does not remove the encroachment, then other steps are prescribed, up to and including legal action. However, most encroachments are removed after the initial request.

Trespassing is not permitted on PHI right-of-way properties. The reasons for this policy are: 1) the possibility of PHI being held liable in case of an injury, 2) the damage to PHI property and facilities, 3) the noise which annoys adjacent property owners, and 4) the debris left by trespassers. Even though it is not permitted, trespassing is a recurring problem on the rights-of-way.

The no-trespassing policy is enforced by PHI's Corporate Security Group and, if necessary, they ask for assistance from local law enforcement departments. However, posting "No Trespassing" signs, cleaning up debris, repairing property damage and erecting barricades are part of the transmission maintenance functions. Often it is necessary for the transmission maintenance and Corporate Security Group staffs to work together on right-of-way trespassing incidents.

A significant form of trespassing is that done with a motorized vehicle. To ensure consistent handling of such incidents, the transmission maintenance staff follows up on reported cases of trespassing which involves a motorized vehicle. Although PHI makes a sincere effort to deter trespassers, the rights-of-way by their nature are spread over a wide area and are therefore difficult to patrol. Other factors which compound the difficulty include the common knowledge that a power company is an absentee owner or lessee, certain individuals' attitudes toward private property, and the inability of law enforcement personnel to pursue trespassers over rough terrain.

Another nuisance to maintaining PHI rights-of-way is illegal dumping. It is an unfortunate situation, but each year PHI spends several thousand dollars cleaning up debris dumped on the rights-of-way by local citizens and businesses. In an attempt to reduce the trespassing and dumping problems, PHI constructs barricades which block public access to the fee simple rights-of-way but not easements where PHI does not own the land. The two main problems associated with barricades are: 1) there are so many places to gain access to the rights-of-way that PHI cannot barricade them all, and 2) an individual with the right equipment can get through any barricade. However, because of the barricade construction and debris removal program, PHI rights-of-way are becoming cleaner and more secure.

Work Specifications

Brush Control

Brush control is the term used to describe the process by which tall growing trees are eliminated from the rights-of-way. Tall growing trees, also referred to as "undesirables," are trees which have the potential to grow to a height that would interfere with the conductors. Vines which are growing up towers, poles, or guy wires are also considered undesirables. Control is accomplished through herbicide application on the ground or aerial application, machine cutting or hand cutting.

Treating the undesirable brush with herbicides is PHI's primary method of brush control. PHI is extremely conscientious with regard to the proper application of herbicides. PHI specifies both the chemical solution and the methods of application to be used on its rights-of-way and specifies only those herbicides which have been approved and registered by the Environmental Protection Agency (EPA) for use in controlling right-of-way vegetation. It is also necessary that the applicator be certified and licensed by the respective State's Department of Agriculture Pesticide Regulation.

Machine cutting is a method of brush control which employs the use of large, all- terrain cutting machines (e.g., Kershaw, brown brush hog, etc.). These machines are specifically designed for right-of-way work and they do an excellent job of cutting and mulching the vegetation. They are capable of cutting trees up to six inches in diameter and can negotiate heavy densities of brush. However, machine cutting is not selective. All vegetation, desirable and undesirable, is cut, giving the right-of-way a mowed appearance. PHI uses this method to manage areas with a high density of undesirable brush, or in an area which is to be converted to grass.

Hand cutting of undesirable brush is normally done by laborers equipped with chainsaws. When chemically treating an area, if any trees have grown to a height which

exceeds the allowable limits, they are hand cut and treated as necessary. Also, areas adjacent to water are hand cut to prevent any herbicides from getting into the water.

The chemical treatment is PHI's primary method of brush control. Consequently, the transmission maintenance staff has established a schedule by which each right-of-way is maintained at least once every four years on an annualized growing season basis. Of course, there are some exceptions where specific zoning or regulatory agencies limit the method of brush control to hand cutting or mowing, which must be done more often.

All brush control work is performed by a qualified contractor working in accordance with PHI's specifications. The contract is awarded through the competitive bid process, typically for a three-year contract.

See "Detailed Specifications for Brush Control" in Appendix E.

Hazard Tree

PHI defines a hazard tree (sometimes known as a danger tree) as any tree on or off a PHI right-of-way which meets both of the following criteria:

- The tree is structurally weak (dead, split, diseased etc.)
- The tree, if it fell toward the transmission facilities, could damage those facilities.

PHI inspects the right-of-way during the regular maintenance, during the semi-annual aerial inspections, and incidentally during the course of other duties. In the first two cases, personnel are instructed to look for hazard trees and to cite them as part of the work. Any such situation is then brought to the attention of transmission maintenance, which will either dispatch a hazard tree crew to handle the situation or, if observed by air or incidental observation by others, it may first be followed up with a close inspection from the ground before dispatching a hazard tree crew.

The hazard tree crew will then remove the hazard tree, or in some cases only the offending limb or branch, so that the risk to the conductor is eliminated. A typical hazard tree crew consists of tree trimmers and ground personnel. The crew is equipped with climbing and trimming equipment and must have a chipper available to chip the brush where necessary. All hazard tree work is performed by a qualified contractor working in accordance with PHI's specifications.

Selective Grass Mowing

PHI's grass mowing program is simply the mowing of grass, weeds and light brush with an agricultural type rotary brush mower such as a "Brush Hog".

The mowed acres are divided into two categories, A and B. The A acres are mowed 3 times to 6 times each year, while B mowing acres are scheduled for mowing just once each year. Generally speaking, the acres which fall into the A category are located in

urban or suburban areas, usually where housing subdivisions or apartment complexes abut the rights-of-way. PHI expects this program to expand as the areas adjacent to the rights-of-way continue to be developed. Currently the A category grass mowing is limited to portions of PHI's rights-of-way which are owned in fee simple (i.e. presently approximately 15% of the Pepco fee simple rights-of-way are defined as Category A and less than 115 acres in DPL and ACE). Category B or annual mowing is done as part of scheduled brush control work, usually in rural areas (e.g. presently only applies to Pepco).

The work is performed by a qualified contractor working in accordance with PHI specifications. The contract is awarded through the competitive bid process. A copy of the "Detailed Specifications for Mowing" is included as Appendix F.

Qualifications and Training

As the Transmission Owners, the PHI operating companies are responsible for ensuring that all personnel involved in the development and implementation of the TVMP are properly trained and qualified to perform their duties, as specified in requirement R1.3 of NERC Standard FAC-003-1. PHI has specified that its transmission rights-of-way shall be managed by a System Forester in the Asset Management organization and a Vegetation Management staff in the Operations organization, with such staff including Staff Foresters. The titles System Forester and Staff Forester shall be reserved for a degreed forester (or someone with sufficient years of relevant experience) who is also an ISA-certified arborist. .

PHI shall maintain documentation that its current staff meets these requirements.

In addition, PHI's contract specifications for all contractors include specific qualifications for those working on the system. See for example, section 2.3 of the Detailed Specifications for Brush Control in Appendix E.

Program Update and Approval

Beginning in 2007, PHI's TVMP shall employ an annual review process to keep it current. The process for updating the plan will be led by the PHI System Forester with oversight from the Vice President of Asset Management and as needed by the PHI NERC/ERO Compliance Steering Committee. Basic document control and versioning will be utilized.

- Documents will be reviewed annually for updates or as requirements/regulations or conditions change. The revision number will be indicated on the document.
- The initial draft will be submitted to the affected areas for comment. Comments received will be incorporated into the document or discussed until a resolution is reached.
- The final draft will be submitted for review. Revisions will be made as necessary.
- Upon completion of the review the final draft will be submitted for final signature by the Vice President, Asset Management.
- The final signed document will be dated and placed in a central filing system.

This process meets requirement R1 of NERC Standard FAC-003-1 for preparing and keeping current a TVMP.

Annual Workplan

PHI prepares an annual workplan that specifies the work to be done in order to implement, for that year, the TVMP. It includes details about which rights-of-way are to be maintained that year, including which methods are to be employed, taking into account local variations such as mechanical clearing, hand cutting, and herbicide treatment, including recognition of desirable and undesirable species as specified by PHI's TVMP.

The workplan includes consideration of any special access permits that may be required, such as permission to work on railroad rights-of-way, private easements, and government lands. The workplan takes into account any delays which such permits might require.

PHI has developed systems which allow PHI to specify the work and to track its timely completion according to specifications.

This plan meets requirement R2 of NERC Standard FAC-003-1 for creating and implementing an annual plan of work for its TVMP and having the means to track such work and its compliance with specifications.

Quarterly Reporting

PHI reports on a quarterly basis to its Regional Reliability Organization (RRO), Reliability*First*, its status with respect to vegetation-caused outages on its bulk power system (230 kV and 500 kV), as required by Reliability*First* and in compliance with requirement R3 of NERC Standard FAC-003-1 regarding quarterly reporting of vegetation-caused outages. The procedure is as follows:

- After the end of the quarter (April 1, July 1, October 1, January 1), operator logs (for ACE and DPL) and the Operator Daily Reports (for Pepco) will be reviewed to identify any vegetation related outages on facilities above 200 kV on the ACE and DPL system and on facilities above 115 kV on the Pepco system by the Operations Engineering Planning & Analysis engineer responsible for that region.
- For ACE and DPL, these results will be compared to System Operations outage database(s), a PJM outage reporting system, and an automatic equipment operations data base. The Operator logs are the official data of record. Any discrepancies shall be corrected in the other databases. For Pepco the results will be compared to the PJM outage reporting system.
- The raw results will be reviewed to screen out any line trippings where the line was automatically restored through auto-reclosing relays. The list will also be compared to records of major storm events in that region and those will be noted and screened. (Reference Appendix A, R3.2 for details on outages not required to be reported to the RRO). For ACE and DPL, the raw results will be reviewed with the Manager Operations Engineering Planning & Analysis (for ACE and DPL).
- The Operations Engineering Planning & Analysis engineer will complete a Vegetation Outage Report for each individual outage meeting the criteria. The Operations Engineering Planning & Analysis will review the list with the Manager Control Room Operations (for Pepco). (See Appendix H for Reliability*First* data submittal form.)
- The final screened list (if none the list should reflect that) will be saved for FAC-003-1 compliance reporting documentation by the 13th day of month following the end

of the quarter and submitted to the PHI Transmission Compliance Manager by the appropriate Manager Operations Engineering Planning & Analysis. The PHI Transmission Compliance Manager will submit the data to Reliability*First* for ACE, DPL, and Pepco

- Documentation will be saved, dated, and initialed by the Operations Planning engineer and Manager. Documentation will be retained for 5 years.[1]

[1] Meets FAC-003-1 Section D. Compliance 1.3 requirement.

APPENDICES

Appendix A – NERC Standard FAC-003-1

Standard FAC-003-1 — Transmission Vegetation Management Program

A. Introduction

1. Title: Transmission Vegetation Management Program

2. Number: FAC-003-1

3. Purpose: To improve the reliability of the electric transmission systems by preventing outages from vegetation located on transmission rights-of-way (ROW) and minimizing outages from vegetation located adjacent to ROW, maintaining clearances between transmission lines and vegetation on and along transmission ROW, and reporting vegetation-related outages of the transmission systems to the respective Regional Reliability Organizations (RRO) and the North American Electric Reliability Council (NERC).

4. Applicability:

4.1. Transmission Owner.

4.2. Regional Reliability Organization.

4.3. This standard shall apply to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.

5. Effective Dates:

5.1. One calendar year from the date of adoption by the NERC Board of Trustees for Requirements 1 and 2.

5.2. Sixty calendar days from the date of adoption by the NERC Board of Trustees for Requirements 3 and 4.

B. Requirements

R1. The Transmission Owner shall prepare, and keep current, a formal transmission vegetation management program (TVMP). The TVMP shall include the Transmission Owner's objectives, practices, approved procedures, and work specifications.[2]

[2] ANSI A300, Tree Care Operations – Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices, while not a requirement of this standard, is considered to be an industry best practice.

R1.1. The TVMP shall define a schedule for and the type (aerial, ground) of ROW vegetation inspections. This schedule should be flexible enough to adjust for changing conditions. The inspection schedule shall be based on the anticipated growth of vegetation and any other environmental or operational factors that could impact the relationship of vegetation to the Transmission Owner's transmission lines.

R1.2. The Transmission Owner, in the TVMP, shall identify and document clearances between vegetation and any overhead, ungrounded supply conductors, taking into consideration transmission line voltage, the effects of ambient temperature on conductor sag under maximum design loading, and the effects of wind velocities on conductor sway. Specifically, the Transmission Owner shall establish clearances to be achieved at the time of vegetation management work identified herein as Clearance 1, and shall also establish and maintain a set of clearances identified herein as Clearance 2 to prevent flashover between vegetation and overhead ungrounded supply conductors.

R1.2.1. Clearance 1 — The Transmission Owner shall determine and document appropriate clearance distances to be achieved at the time of transmission vegetation management work based upon local conditions and the expected time frame in which the Transmission Owner plans to return for future vegetation management work. Local conditions may include, but are not limited to: operating voltage, appropriate vegetation management techniques, fire risk, reasonably anticipated tree and conductor movement, species types and growth rates, species failure characteristics, local climate and rainfall patterns, line terrain and elevation, location of the vegetation within the span, and worker approach distance requirements. Clearance 1 distances shall be greater than those defined by Clearance 2 below.

R1.2.2. Clearance 2 — The Transmission Owner shall determine and document specific radial clearances to be maintained between vegetation and conductors under all rated electrical operating conditions. These minimum clearance distances are necessary to prevent flashover between vegetation and conductors and will vary due to such factors as altitude and operating voltage. These Transmission Owner-specific minimum clearance distances shall be no less than those set forth in the Institute of Electrical and Electronics Engineers (IEEE) Standard 516-2003 (*Guide for Maintenance Methods on Energized Power Lines*) and as specified in its Section 4.2.2.3, Minimum Air Insulation Distances without Tools in the Air Gap.

R1.2.2.1 Where transmission system transient overvoltage factors are not known, clearances shall be derived from Table 5, IEEE 516-2003, phase-to-ground distances, with appropriate altitude correction factors applied.

R1.2.2.2 Where transmission system transient overvoltage factors are known, clearances shall be derived from Table 7, IEEE 516-2003, phase-to-phase voltages, with appropriate altitude correction factors applied.

R1.3. All personnel directly involved in the design and implementation of the TVMP shall hold appropriate qualifications and training, as defined by the Transmission Owner, to perform their duties.

R1.4. Each Transmission Owner shall develop mitigation measures to achieve sufficient clearances for the protection of the transmission facilities when it identifies locations on the ROW where the Transmission Owner is restricted from attaining the clearances specified in Requirement 1.2.1.

R1.5. Each Transmission Owner shall establish and document a process for the immediate communication of vegetation conditions that present an imminent threat of a transmission line outage. This is so that action (temporary reduction in line rating, switching line out of service, etc.) may be taken until the threat is relieved.

R2. The Transmission Owner shall create and implement an annual plan for vegetation management work to ensure the reliability of the system. The plan shall describe the methods used, such as manual clearing, mechanical clearing, herbicide treatment, or other actions. The plan should be flexible enough to adjust to changing conditions, taking into consideration anticipated growth of vegetation and all other environmental factors that may have an impact on the reliability of the transmission systems. Adjustments to the plan shall be documented as they occur. The plan should take into consideration the time required to obtain permissions or permits from landowners or regulatory authorities. Each Transmission Owner shall have systems and procedures for documenting and tracking the planned vegetation management work and ensuring that the vegetation management work was completed according to work specifications.

R3. The Transmission Owner shall report quarterly to its RRO, or the RRO's designee, sustained transmission line outages determined by the Transmission Owner to have been caused by vegetation.

R3.1. Multiple sustained outages on an individual line, if caused by the same vegetation, shall be reported as one outage regardless of the actual number of outages within a 24-hour period. .

R3.2. The Transmission Owner is not required to report to the RRO, or the RRO's designee, certain sustained transmission line outages caused by vegetation: (1) Vegetation related outages that result from vegetation falling into lines from outside the ROW that result from natural disasters shall not be considered reportable (examples of disasters that could create non-reportable outages include, but are not limited to, earthquakes, fires, tornados, hurricanes, landslides, wind shear, major storms as defined either by the Transmission Owner or an applicable regulatory body, ice storms, and floods), and (2) Vegetation-related outages due to human or animal activity shall not be considered reportable (examples of human or animal activity that could cause a non-reportable outage include, but are not limited to, logging, animal severing tree, vehicle contact with tree, arboricultural activities or horticultural or agricultural activities, or removal or digging of vegetation).

R3.3. The outage information provided by the Transmission Owner to the RRO, or the RRO's designee, shall include at a minimum: the name of the circuit(s) outaged, the date, time and duration of the outage; a description of the cause of the outage; other pertinent comments; and any countermeasures taken by the Transmission Owner.

R3.4. An outage shall be categorized as one of the following:

R3.4.1. Category 1 — Grow-ins: Outages caused by vegetation growing into lines from vegetation inside and/or outside of the ROW;

R3.4.2. Category 2 — Fall-ins: Outages caused by vegetation falling into lines from inside the ROW;

R3.4.3. Category 3 — Fall-ins: Outages caused by vegetation falling into lines from outside the ROW.

R4. The RRO shall report the outage information provided to it by Transmission Owner's, as required by Requirement 3, quarterly to NERC, as well as any actions taken by the RRO as a result of any of the reported outages.

C. Measures

M1. The Transmission Owner has a documented TVMP, as identified in Requirement 1.

M1.1. The Transmission Owner has documentation that the Transmission Owner performed the vegetation inspections as identified in Requirement 1.1.

M1.2. The Transmission Owner has documentation that describes the clearances identified in Requirement 1.2.

M1.3. The Transmission Owner has documentation that the personnel directly involved in the design and implementation of the Transmission Owner's TVMP hold the qualifications identified by the Transmission Owner as required in Requirement 1.3.

M1.4. The Transmission Owner has documentation that it has identified any areas not meeting the Transmission Owner's standard for vegetation management and any mitigating measures the Transmission Owner has taken to address these deficiencies as identified in Requirement 1.4.

M1.5. The Transmission Owner has a documented process for the immediate communication of imminent threats by vegetation as identified in Requirement 1.5.

M2. The Transmission Owner has documentation that the Transmission Owner implemented the work plan identified in Requirement 2.

M3. The Transmission Owner has documentation that it has supplied quarterly outage reports to the RRO, or the RRO's designee, as identified in Requirement 3. .

M4. The RRO has documentation that it provided quarterly outage reports to NERC as identified in Requirement 4. .

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility
RRO
NERC

1.2. Compliance Monitoring Period and Reset
One calendar Year

1.3. Data Retention
Five Years

1.4. Additional Compliance Information
The Transmission Owner shall demonstrate compliance through self-certification submitted to the compliance monitor (RRO) annually that it meets the requirements of NERC Reliability Standard FAC-003-1. The compliance monitor shall conduct an onsite audit every five years or more frequently as deemed appropriate by the compliance monitor to review documentation related to Reliability Standard FAC-003-1. Field audits of ROW vegetation

conditions may be conducted if determined to be necessary by the compliance monitor.

2. Levels of Non-Compliance

2.1. Level 1:

2.1.1. The TVMP was incomplete in one of the requirements specified in any subpart of Requirement 1, or;

2.1.2. Documentation of the annual work plan, as specified in Requirement 2, was incomplete when presented to the Compliance Monitor during an on-site audit, or;

2.1.3. The RRO provided an outage report to NERC that was incomplete and did not contain the information required in Requirement 4.

2.2. Level 2:

2.2.1. The TVMP was incomplete in two of the requirements specified in any subpart of Requirement 1, or;

2.2.2. The Transmission Owner was unable to certify during its annual self certification that it fully implemented its annual work plan, or documented deviations from, as specified in Requirement 2.

2.2.3. The Transmission Owner reported one Category 2 transmission vegetation related outage in a calendar year.

2.3. Level 3:

2.3.1. The Transmission Owner reported one Category 1 or multiple Category 2 transmission vegetation-related outages in a calendar year, or;

2.3.2. The Transmission Owner did not maintain a set of clearances (Clearance 2), as defined in Requirement 1.2.2, to prevent flashover between vegetation and overhead ungrounded supply conductors, or;

2.3.3. The TVMP was incomplete in three of the requirements specified in any subpart of Requirement 1.

2.4. Level 4:

2.4.1. The Transmission Owner reported more than one Category 1 transmission vegetation-related outage in a calendar year, or;

2.4.2. The TVMP was incomplete in four or more of the requirements specified in any subpart of Requirement 1.

E. Regional Differences

None Identified.

Appendix B –Table 5 from IEEE 516-2003

Table 5—Example of detailed calculations for Minimum Air Insulation Distance 60 Hz. Energized work, without tools in the air gap, when the transient overvoltage factors is not known, in meters

Voltage in kilovolts phase to phase	Distance in meters	
	Phase to ground	Phase to phase
72.6—121	0.75 (2.46 ft)	1.09
138—145	0.90 (2.95 ft)	1.31
161—169	1.05 (3.44 ft)	1.52
230—242	1.57 (5.15 ft)	2.28
345—362	2.88 (9.45 ft)	4.18
500—550	4.48 (14.70 ft)	6.90
765—800	6.24 (20.47 ft)	10.22

NOTES

1—These distances take into consideration the highest transient overvoltage an employee will be exposed to on any system with air as the insulating medium and the maximum voltages shown.
2—Values are based on altitudes below 900 m. See Table 1 for correction factors for higher altitudes. It is not necessary to correct for atmospheric conditions.
3—Table distances do not include a factor for inadvertent movement. See 7.2 for inadvertent movement considerations. These factors must be added to the values to obtain the total MAD.
4—The clear live tool length should be equal to or exceed these values for the indicated voltage ranges.
5—The data used to formulate this table was obtained from test data taken with standard atmospheric conditions. Standard atmospheric conditions are defined as temperatures above freezing, wind less than 24 kilometer per hour, unsaturated air, normal barometer, uncontaminated air, and clean and dry insulators. If standard atmospheric conditions do not exist, extra care must be taken.
6—Data for this table was obtained from Table 7 and Table 11.
7—For values in feet, see Table D.3.

Appendix C: Maps of PHI's Transmission System

Maps of the transmission system for PHI's operating companies,

Atlantic City Electric Company
Delmarva Power & Light
Potomac Electric Power Company

are available to auditors on request. They contain security-sensitive information regarding the location of PHI transmission facilities.

Appendix D: Specifications for PHI's Aerial Inspection program

Detailed Specifications For
Aerial Patrol of PHI Transmission Lines

1. General Scope - The Company aerially patrols the transmission and selected sub-transmission lines (circuits) twice a year in a helicopter provided and flown by a contractor specializing in this activity. A Company representative acts as the observer and records unusual conditions or potential problems, GPS locations and notes in an electronic database. Each circuit is flown in its entirety with the exception of restricted air space.
2. The Company produces paper copies of maps showing location of the unusual conditions or potential problems with sufficient detail to allow field crews to locate these on the ground. Summary reports are produced for tracking ground inspection, and work completed.
3. Below is a list of typical problems and conditions observed on all RWs, both those owned in fee simple or easement, however, this is not an all-inclusive list.
    a) Tall brush
    b) Trees leaning in from wooded edges
    c) Vines growing up structures
    d) Beaver activity adjacent to the RW
    e) Activities which could cause an operation of the feeder.
    f) Woodpecker holes
    g) Leaning or damaged poles
    h) Tilted or broken crossarms

    On RWs which PHI owns in fee simple, additional observations include:
    i) Debris and abandoned cars
    j) Construction activity on or adjacent to the right-of-way
    k) Equipment, vehicles, materials, etc. on the right-of-way
    l) Erosion
    m)Encroachments and structures
    n) Trespassing
4. Any conditions observed which require rapid response by the Company will be reported to the appropriate personnel via cell phone as soon as practicable.
5. Copies of the reports will be sent to appropriate departments to deal with the conditions or problems found.
6. Tracking of the inspection, conditions found, work done and completion date will be the responsibility of the designated department.

Appendix E: Detailed Specifications for Brush Control

March 27, 2007

PEPCO HOLDINGS INC.

DETAILED SPECIFICATIONS FOR VEGETATION CONTROL

ON PEPCO, DELMARVA POWER AND ATLANTIC CITY ELECTRIC

RIGHTS-OF-WAY

SCOPE

- General Overview
- Unit Based Contract
- Time & Equipment Work
- Regulatory Compliance

METHODS

- Overview of Contractors Responsibilities
- Notification
- Access
- Personnel
- Equipment, Tools and Materials
- IVM & BMP's
- Clearing Prescriptions
  - Type I clearcut
  - Type II selective cut
- Vegetation Control
  - Chemical Vegetation Management
  - Mechanical Vegetation Management
  - Manual Vegetation Management
  - Cut, Treat and Chip

EMERGENCY AVAILIBILITY

COMPLETION

- Completion / Clean up
- Audit
- Complaints
- Damages
- Retention

PEPCO HOLDINGS INC.

DETAILED SPECIFICATIONS FOR VEGETATION CONTROL

ON PEPCO, DELMARVA POWER AND ATLANTIC ELECTRIC RIGHTS-OF-WAY

1.0 **SCOPE**

1.1 GENERAL OVERVIEW– The work covered by this Contract will primarily is the clearing of and/or application of herbicides to undesirable vegetation. This Contract also includes pruning, removal, and other miscellaneous work. The contractor shall follow Company's "Best Management Practices for Construction and Maintenance in Transmission Rights-of Ways" in all aspects of work details listed in these specifications. All clearing, tree pruning, and danger tree removal shall be performed only to the extent indicated and as directed by the Company. Restrictions and/or special provisions shall be strictly observed by the Contractor.

Circuits are to be worked in their Entirety. Contractor must manage vegetation on entire Rights-of-Way; not just the circuit awarded; i.e. shared Right-of-Way. Units are estimated in advance, if in question, seek clarification from the Company.

1.2 UNIT CONTRACT– The overwhelming majority of the work covered by this Contract shall be performed as unit work. The Contractor's unit price shall include all of the Contractor's expenses necessary to perform the unit. The Company shall pay the Contractor for the number of units completed at the applicable unit price. Time and material work is also included in these specifications. The Company anticipates performing a portion of the work on a time and material basis. However, work will only be performed on time and material rates if the Company deems such action necessary, and so instructs the Contractor.

The Company shall inspect and designate areas as meadow, light, medium or heavy brush, or areas where we wish to have all vegetation, including trees, cut down. These shall be provided to the Contractor before they bid the work, and they will be accepted as such as a condition of submitting a bid for the work. It shall be the contractor's responsibility to use the appropriate equipment and personnel for the type of work being performed. In these areas the Contractor shall comply with the following unless otherwise directed by the Company:

1.2.1. Brush Units - Bid packages for PEPCO and ACE differ from DPL in that brush units are delineated into Meadow, Light, Medium and Heavy. The breakdown is based upon stem density and height. DPL is delineated only as units of brush.

1.2.2. Quantity of Work - The Company has predetermined units but does not guarantee the estimated quantities of work. Variation encountered in the field shall be reported promptly to the company to accurately capture actual units; thus ensuring Contractor compensation. Payment shall be made only for work actually completed by the Contractor.

1.2.3. Additions and Deletions - The Company reserves the right to add or delete work. If the Company elects to alter the scope of the work, it shall first evaluate the change with regard to the original unit process. If, in the Company's opinion, the scope of the work is changed to the extent that the original units are no longer equitable, then the Contractor shall have the opportunity to complete the work utilizing submitted T&E prices.

1.2.4; Satisfactory Completion – All work done shall be entirely satisfactory to the Company and shall be subject to inspection by, and approval of, the Company. Any work which is not entirely satisfactory to the Company shall be corrected by the Contractor at the Contractor's expense.

1.3 TIME & EQUIPMENT WORK – Additional requirements may be imposed by the Company during the course of the project. The contractor is requested to submit Time and Equipment rates for miscellaneous work encountered not captured in unit rates. Work could include chemical, mechanical and/or manual vegetation control, tree trimming, and removal of trees, brush and/or debris. The Contractor will only be assigned work which can be performed utilizing the Contractor's personnel and equipment. Some miscellaneous work is not suited to be paid using the Contractor's unit price's and therefore is paid for at the time and material rates submitted by the Contractor. This work may be located anywhere on the PHI transmission or distribution systems. The following shall apply to miscellaneous work paid on the time and material rates:

1.3.1. The Contractor shall perform only the miscellaneous work assigned by the Company.

1.3.2. All miscellaneous work shall be done as directed by the Company and in accordance with these specifications.

1.3.3. The crew foreman is a working foreman.

1.3.4. The job sites are to be the crew headquarters and there shall be no payment of travel time to and from the job sites. Travel time during working hours, between job sites, will be paid.

1.3.5. Two hours labor will be paid if the work is postponed due to inclement weather after the crew has reported to the job site. There shall be no payment for equipment hours spent on standby due to inclement weather.

1.3.6. Overtime is defined as hours of work required by the Company outside of the Contractor's normal work day on site, or in excess of 40 hours in a normal work week. Overtime shall be paid at the overtime rates included in the Contractor's quotation. There shall be no overtime unless otherwise directed by the Company.

1.4. REGULATORY COMPLIANCE

1.4.1. LAWS – The Contractor shall comply with all laws and regulations applicable to the work performed under this contract. Should the Contractor seek further information for compliance guidelines, consult the Company. Some of the more prominent judicial regulatory agencies are:

U.S. Army Corp. of Engineers,

State of Maryland Public Service Commission,

State of Maryland Department of Natural Resources,

State of Delaware Public Service Commission,

State of Delaware Forest Service,

State of Virginia State Corporation Commission,

State of Virginia Division of Forestry,

State of New Jersey: Board of Public Utilities,

Dept of Environmental Protection, (includes Fish and Game)

Pinelands Commission

As stated in the Army Corp of Engineers, 1987 Wetland Manual, no wood or brush shall be left in wetlands, streams or bodies of water, whether tidal or non-tidal.

1.4.2. OSHA & ANSI Standards

Pruning - Roadside and urban pruning shall be performed according to the latest ANSI A-300 guidelines for Utility Pruning.

All remaining trees on the off-road R/W edge shall be pruned from 'ground to sky' along the front side of tree, so that no remaining tree branch is directed into the R/W. All Utility Pruning shall be performed in a manner as to protect tree health, condition and natural symmetry. Cuts shall be made according to the latest version of the Utility Pruning section of American National Standards Institute for Tree Care Operations, ANSI A-300, unless permission is granted by Company to use mechanical pruning equipment. Note: If 25% or more of the tree's crown must be removed in the pruning operation, the tree should be removed. Otherwise, pruning shall be performed in a manner as to protect tree health, condition and natural symmetry.

Hazard Trees – Reducing the height of a tree to prevent it from striking electrical facilities and leave the trunk as a den tree is acceptable only with prior Company approval.

Safety Compliance - All work is to be performed in compliance with all applicable federal, state and Company's safety requirements.
This includes OSHA 29CFR Part1910.269 ® and ANSI-Z133.1. Contractor shall provide for the protection of its employees all and such safety equipment as is prescribed by the common practice for the type of work being performed or as required by any laws, rules or regulations or the exercise of prudence. Such safety equipment shall include, but not be limited to; hard hats, hearing protection, gloves, safety glasses, chaps, first-aid kits, and other necessary equipment.

2.0 **METHODS**

OVERVIEW OF CONTRACTORS RESPONSIBILITIES –

2.1 NOTIFICATION - Contractor shall be responsible for notification/permission of any and all property owners and regulatory authorities relative to Rights-of-Way matters necessary for work to be performed. Duties include, but are not limited to door to door courtesy calls, door hangers and newspaper advertisements where necessary. Door hangers, (supplied) must include contractor's phone number. (business card or rubber stamp)

New Jersey Board of Public Utilities has implemented new notification policies for 2007. All work in the State of New Jersey must adhere to these regulations.

The Contractor will promptly comply with all reasonable requests of the property owners and tenants relative to the Right-of-Way access and to the general conduct of work. He shall not, however, enter into any agreements with property owners or tenants on other matters (such as the saving of logs or firewood, or the disposal of brush), without prior approval of the Company. In cases of disagreement between any landowner or tenant and the Contractor, the Contractor shall

notify the Company immediately. He shall cease to perform any further operations against the objections of the property owner or tenant until the matter(s) has been resolved to the satisfaction of the property owner, tenant and Company.

During the course of the work, the Contractor may find it necessary to enter into 3rd party agreements. These situations will be approved only if the agreement does not constitute a detriment to the Company or work in progress. Any agreements made between the Contractor and any other third party that is in any way connected with the elements of this project will be executed on an approved form, i.e.; sub-contracting.

If an adjacent property owner objects to this work and the Contractor is unable to resolve the situation, then the Contractor shall inform the Company and shall not perform any work in that area until instructed to do so by the Company.

If the Company directs the Contractor to skip a portion of the work due to adjacent property owner problems (or any other reason), the Company may, after the problem has been resolved, direct the Contractor to return to that area and complete the work, as long as the Company takes such action prior to the expiration date of this Contract.

2.2 ACCESS - Before entering any private property the Contractor must obtain the permission of the landowner or lessee.

The Contractor will establish and stake a baseline for the Right-of-Way. There shall be no chemical application or cutting outside of PHI rights-of-way.

Where an access road exists on an adjacent Right-of-Way, it shall be left in as "good or better" condition by the Contractor when the Contractor's clearing operations are concluded.

Any access roads, culverts, bridges, and/or fence openings constructed by others shall be maintained in as "good or better" condition by the Contractor during the Contractor's use of them.

Where new roads or other means of access (such as bridges, etc.,) are required to enter or traverse the Right-of-Way for construction and/or maintenance of the line, the work will be performed by the Contractor under the direction of the Company.

Where necessary to move equipment through cultivated fields, the Contractor shall use existing farm roads with the approval of the landowner. The Contractor shall make every effort not to damage gardens or crops located on the rights-of-way. There will be situations where the Company will support crop damages; but a thorough investigation of alternative access routes must be approved. Areas not possible to treat chemically due to proximity to crops shall be chemically treated after the crops have been harvested.

The Contractor shall be responsible for excessive and/or unapproved damages to crops in excess of those provided for by the Company. Written documentation to the Company is required for any area rendered inaccessible for treatment.

2.3 PERSONNEL - The Contractor shall furnish the supervision and labor necessary to perform the work covered by this Contract.

The Contactor's personnel must be competent and experienced in the type of work to be performed. Each crew working under this Contract shall be supervised by an individual supporting necessary qualifications required by law and/or The Company. Each foreman (or crew leader) will be a working foreman. Foremen must have at least one year of experience in the type of work performed and support a thorough knowledge of plant and tree identification in both the dormant and growing seasons. Foremen must remain on the job at all times, supervising the work. The Company reserves the right to have any employee of the Contractor removed from the job if he or she is considered to be incompetent or otherwise unfit.

Communication Facility – The contractor shall have a central communication facility, equipped with a telephone, a facsimile machine and a computer with email capability. The telephone must have message recording capabilities for times when personnel are not available to answer the phone. The facsimile machine must be on a dedicated phone line, and capable of both sending and

receiving messages. The telephone and the facsimile machine are to be on at all times. The Contractor must check for messages, facsimiles and emails at least once each business day.

Cellular Telephones – The Contractor shall equip each foreman with a cellular telephone which has a range that covers the PEPCO transmission system area. The cellular telephone is to remain on the job site, in proper working order, at all times during working hours.

Working Hours – The days and hours that the Contractor may work are restricted to daytime hours on non-holiday weekdays. No work is to be performed on weekends, or holiday observed by the Company, without prior permission from the Company.

Daily Location Report – During the progress of the work, the Contractor shall call (202) 388-2220 each morning by 7:00 a.m. and inform the Company of the location(s), number of personnel and type of work being performed that day.

Weekly Report – Each week, on a date specified by the Company, the Contractor shall submit to the Company a written report detailing the previous week's work, If, requested by the Company, the Contractor shall also provide this information at times other than the normal reporting time. All measurements shall be horizontal distances. All measurements and computations are subject to examination by, and approval of, the Company. From the weekly report submitted by the Contractor, the Company shall prepare and forward to the Contractor a statement summarizing the work together with a check for the work completed. The report shall include the following information:

Contractor's name

Foreman's name

Dates covered by the report

The quantities of unit work performed and the time and material quantities for any time and material work.

On a form supplied by the Company, the Contractor shall provide a sketch of each area treated or cut, showing the size of each area and the location by indicating structure numbers, roads, streams, fences and other landmarks.

2.4 EQUIPMENT, TOOLS AND MATERIALS

The Contractor shall furnish all supervision, equipment, tools, supplies and materials necessary to perform all operations covered by this Contract. All equipment, tools and materials must be of good quality, sound operating condition, be equipped with industry safety features and are subject to approval by the Company. The Company reserves the right to decline equipment, shut down crews and/or rescind this contract due to unsatisfactory equipment performance.

2.5 GENERAL STANDARDS

The Company reserves the right to designate the starting points of all work operations and, from time to time instruct the Contractor to clear any specific section or sections.

Under no circumstances shall the Contractor attach any ropes or winch cables to any pole, tower, or foundation, or use any such structures as anchors for winching equipment.

The Contractor shall inform the Company of any debris found on the rights-of-way. If the Company instructs the Contractor to remove the debris, the Contractor shall remove it and dispose of it in a legal manner.

The Contractor shall keep all gates closed and shall be responsible for any problems resulting from any open gate attributable to the Contractor's work.

Hedgerows and/or road screens across the Rights-of-Way that serve as field and/or property boundaries are to be removed. Hedgerows of compatible species need only be removed from access lane.

PHI does not promote any road screens; however, certain areas throughout the territory are sensitive to the management of these buffers. Roads screens shall be maintained as directed by the Company. For the most part, all road screens which have not been already removed will be removed during the Vegetation Management performed on the Right-of-Way during this cycle.

2.6 VEGETATION MANAGEMENT PRESCRIPTIONS AND BEST MANAGEMENT PRACTICES

Two methods of vegetation management operations are prescribed by the Company, defined as Type I and Type II. Details concerning these methods of operation are described below:

2.6.1 Type I – Clear Cutting

All trees and brush within the designated clearing limits of the Right-of-Way shall be cut and/or treated, as required by these specifications except as otherwise specified.

When designated for "Type I" clearing, all woody vegetation within the designated clearing limits is to be removed and/or treated. Clearing may be performed with timber harvesters, mowers, or by power saw. For ecological reasons, the use of shears, bulldozers or similar equipment may not be used without prior approval of the Company.

2.6.2 Type II – Selective Vegetation Management

When designated for "Type II" management, all vegetation within the "Wire Zone" of the

Right-of-Way that exceeds 3 feet at maturity shall be cut and/or treated. All vegetation within the "Border Zone" of the Right-of-Way that exceeds 15 feet in height at maturity shall be cut and/or treated.

Impact: The moving of logs, limb-wood and brush shall be done with regard to saving all desirable species practicable. Every effort will be made to prevent damage to desirable plants. Adequate precautions shall be taken so as not to remove or damage existing ground cover, brush or vegetation designated for preservation – either as herein noted or as directed by the Company.

Equipment: The clearing operation shall be planned so that there is a minimum of equipment movement in the areas where desirable species occur. The use of bulldozer blades to scrape and push cut vegetation or trees into position for storage, removal, or chipping, will not be permitted. Only bobcats, forklifts, winches or their approved equivalents will be permitted for this work to insure the integrity of low vegetation growth and the maintenance of valuable ground cover.
The following declarations pertain to both Type 1 and Type 2 Management techniques.
Structures: Where structures are located within selectively cleared areas, all woody vegetation shall be cut and/or treated.

Drainage: Drainage of any kind will not be altered from its original course without the prior, written and specific approval of the Company.

Stumps: All stumps shall be cut within the designated clearing limits of the Right-of-Way at a point no higher than 3 inches above ground. .

Debris Disposal: Unless otherwise directed by the Company, disposal of all wood, including brush and slash, shall become the responsibility of the Contractor. Chips are to be removed from the Right-of-Way or spread over the Right-of-Way area to a maximum depth of three inches (3") with specific permission from the property owner. No chips are to be placed in water, nor may wood be piled outside specified Right-of-Way width without permission of the property owner. Written approval of the Company must be obtained for any commercial logging.

Wood Disposal: When so designated logs and limb-wood four inches (4") in diameter and larger, shall be saved, cut into designated lengths and stacked at the edge of the Right-of-Way, or as directed by the Company. All roads and paths, regardless of whether or not they show recent use, shall be left clear of logs, except as designated by the Company, as an erosion control measure. No logs are to be left in ditches, drains or bodies of water of any description.

Erosion: On edges and banks of streams and other natural watercourses susceptible to erosion, clearing shall be performed in such a manner as to minimize surface soil disturbance. The existing root structure shall be left intact. The Contractor shall conduct operations to avoid any increase in the hazard of soil erosion. Chips are not to be placed in this area. All stream crossings shall be subject to approval of the Company.

Hazard Trees: A Hazard Tree is defined as a structurally unsound tree that could strike a target (Company's facilities) if it fails. Contractor shall identify and remove hazard trees along Right-of-Way edges, with specific permission from the property owner. If so designated by the Company, hazard trees may be topped below the electrical facilities. The trunk could be left standing to serve as a wildlife den tree.

2.7 VEGETATION CONTROL

Under no circumstances will it be permissible to leave cut cherry trees in a pasture or in an area where livestock might have an opportunity to eat the leaves. When cherry trees occur in a pasture area, the cut portions of the trees shall be removed from the pasture area.

2.7.1 Chemical Vegetation Control

The Contractor shall use only those herbicides and solutions which have been registered by the E.P.A. and approved by the Company. All chemical application is to be according to label directions. A copy of all labels and appropriate MSDS sheets for any materials on the site must

be kept on the job site at all times and presented when requested. The chemical solution shall be applied using appropriate pressure and nozzle type.

Extreme care shall be taken to avoid over spray or drift onto desirable species.

There shall be no chemical application when the wind velocity exceeds 20 mph.

The chemical solution shall not be applied when the stems or stumps are wet.

It is the responsibility of the Contractor to ensure proper application and uptake of the herbicides to kill the vegetation. Rain and other types of inclement weather may affect the uptake of the chemicals by the vegetation and require reapplication.

Some of the chemical applications which may be used in accordance with these specifications are listed below:

Low Volume Basal Application – The low volume basal application method shall be utilized from October 1st to March 31st or as directed by the Company. Personnel shall not attempt to spray stems or stumps that are more than 12 inches from the nozzle.

Stump Treatments – Unless in a pesticide restricted area, all stumps from trees cut by hand are required to be immediately treated with a company approved herbicide. Should the Contractor be found negligent, they are to return to the site immediately, flush stumps again and retreat. The chemical solution shall be applied to the stumps of all selected cut trees so as to completely wet the entire cambium area.

Selective Foliar Vegetation Control – The Contractor's unit price for the solution and method of chemical application designated by the Company shall include all the work described under this item. The Company shall designate the areas where the undesirable vegetation is to be chemically controlled. The units will be differentiated between Hydraulic and backpack applications. Backpack applications are to be applied utilizing "Thinvert" tools and material.

Alternative Chemicals, Solutions and Methods of Application – Alternative chemical, solutions and methods of application may be considered if recommended by the Contractor. However,

before any change of application commences, a description of each proposed chemical, solution and/or method of chemical application and any cost adjustment must be submitted to, and approved by, the Company.

Structures, poles and Towers All tree species, and all vines growing up any towers, poles or guy wires 10 feet or less in height, shall be chemically treated, using the solution and method of application designated by the Company. Also, all tree species exceeding 10 feet in height and all vines growing up any towers, pole or guy wires exceeding 10 feet in height, shall be cut and the stumps chemically treated.

Wetland Applications Tidal and non-tidal wetlands, including wetland buffers areas may be treated using an approved a low volume foliar application method, unless otherwise directed by the Company.

2.7.2. Mechanical Vegetation Control

This consists of mowing woody vegetation using the appropriate equipment as required by these specifications within the designated clearing limits of the Right-of-Way, except as otherwise specified.

All undesirable vegetation within the designated clearing limits of the Right-of-Way shall be cut not more than 3 inches from the ground and shall be completely severed.

Any portion of the designated area which the contractor is unable to mechanically cut shall be chemically or manually controlled as directed by the Company and in accordance with these specifications.

2.7.3. Manual Vegetation Control

There are areas where due to topography or lack of ready access for vehicles it will be necessary for the undesirable vegetation is to be manually controlled. In these areas the Contractor shall comply with the following unless otherwise directed by the Company.

All vegetation and all vines growing up any towers, poles or guy wires shall be cut. Also, any desirable species exceeding 10 feet in height shall be out. Certain areas in PHI territory require all desirable species 10 feet in height or less to remain when within 50 feet of a stream or other body of water. The Contractor shall seek clarification from the Company when in question.

All Stumps shall be cut parallel with the ground.

2.7.4. Cut, Treat and Chip

The Company shall designate the area where the undesirable vegetation is to be hand cut, the stumps chemically treated and the brush chipped. In these areas the Contractor shall comply with the following unless otherwise directed by the Company:

All woody vegetation shall be cut, with the stumps cut parallel to the ground and as close to the ground line as possible. Stumps higher than 2 inches will not be acceptable.

Unless specified, all stumps of live trees of species capable of resprouting shall be treated immediately with the low volume basal solution or other solution approved by the Company, with the exception of any tree which the Company deems inappropriate of treating.

EMERGENCY AVAILABILITY

If an emergency occurs within the Company's system during the course of this project, the Contractor must make the Contractor's crews available to the Company for emergency work. Crew(s) must remain available until Company releases them.

COMPLETION AND AUDIT

Completion and Cleanup by Areas - As the work of clearing is completed in each area, the Contractor shall promptly remove all tools and equipment and clean up the area. If, during the clearing operations, the Contractor makes deep ruts, stump holes or mounded areas, either on the Right-of-Way, or in areas accessing the Right-of-Way, that, in the judgment of the Company would cause future erosion or nuisance, all such conditions shall be graded to conform to previous

natural ground levels and this work will be performed by the Contractor to the complete satisfaction of the Company.

Complaints – The Contractor shall immediately inform the Company of any complaints which arise. Within 10 days of receiving a complaint, the Contractor shall make arrangements, which are satisfactory to the claimant, for the settlement of the complaint. The Contractor shall keep the Company informed of the status of each compliant and of any settlement made with the claimant. Where it is deemed advisable by the Company, a representative of the Company will accompany the Contractor's agent in the settlement of claims. An executed copy of the release for every damage claim settled shall be furnished to the Company. For claims not settled in a timely manner, the Company reserves the right to negotiate a settlement and the Contractor shall pay all expenses.

Damages - The Contractor will provide protection that, in the opinion of the Company, will prevent damage to property (including lawns, roads, fences, buildings, drains, bridges, and pipelines) by passage of equipment. The Contractor assumes sole responsibility for damages thereby incurred and shall notify the Company immediately if and when such damage should occur. Damage to property shall be repaired to a condition that is as good as or better than the original.

Audit of herbicide prescriptions can occur at anytime during the application season and can extend into the growing season of year following application. Representatives of the Company and the Contractor shall inspect the areas of Rights-of-Way treated and determine which areas, in the Company's opinion, have received incomplete chemical treatment. All re-treating work shall be done at the Contractor's expense and shall be subject to inspection by, and approval of, the Company. The chemical solution and method of application used for this work shall be designated by the Company.

Cutting practices will be subject to auditing at any time during the contract. Should work be found unacceptable, the Contractor shall return and manage the vegetation to the Company's approval at the Contractor's expense.

APPENDIX "A"

COMMON TREES AND SHRUBS TO BE PRESERVED

Provided they meet the height criteria specified under "Wire Zone" and "Border Zone", the following trees and shrubs shall be exempt from removal in the selective clearing areas:

SMALL TREES

White Flowering Dogwood (Cornus Florida)

Hercules Club (Arailia spinosa)

Redbud (Cercis canadensis)

Shadbush (Amelanchier canadensis)

Sumac (Rhus spp.)

Hawthorne (Crategus spp.)

LARGE SHRUBS

Alder (Alnus spp.)

Dwarf Willow (Salix humilis)

Choke Cherry (Prunus vinginiana)

Viburnum (Viburnum spp.)

Hazelnut (Corylus spp.)

Deciduous Holly (Ilex verticillata)

Elderberry (Sambucus spp.)

Dogwood(Cornus spp.)

Witch Hazel (Hammamelis virginiana)

Spicebush (Lindera benzoin)

Rhododendron (Rhododendron maximum)

SMALL SHRUBS

Mountain Laurel (Kalmia latifolia)

Bush Honeysuckle

Pinxter bloom Azalea (Thododendron nudiflorum)

Ground Hemlock (Taxus canadenis)

Huckleberries (Gaylussacia spp.)

Sweet Fern (Myrica pereqrina)

Blueberries (Vaccinium spp.)

Sweet Pepperbush (Clethra alnifolia)

Wild Azalea

Chinquapin

Chokeberry

All ferns, grasses and herbs

Appendix F: Detailed Specifications for Mowing

PEPCO[3]

DETAILED SPECIFICATIONS FOR TRACTOR MOWING

ON PEPCO RIGHTS-OF-WAY

1. General Scope - The work covered by this Contract will primarily be mowing grass and weeds on PEPCO rights-of-way. The work is typically performed with a farm tractor pulling a "bush-hog" mower. At times the grass and weeds may be tall and thick, and generally the terrain is rough. This Contract also includes weedeater work, manual vegetation control, and other miscellaneous work.
2. Unit Contract - The overwhelming majority of the work covered by this Contract shall be performed as unit work. The Contractor's unit price shall include all of the Contractor's expenses necessary to perform the unit. The Company shall pay the Contractor for the number of units completed at the applicable unit price. Time and material work is also included in these specifications and the Company anticipates performing a portion of the work on a time and material basis. However, work will only be performed on time and material rates if the Company deems such action necessary, and so instructs the Contractor.
3. Quantity of Work Not Guaranteed - The Company does not guarantee the estimated quantities of work. Payment shall be made only for work actually completed by the Contractor.
4. Three Year Contract - This Contract shall cover the time period between April 15, 2003 and December 31, 2005. The work shall be scheduled within that time period by the Company.
5. Personnel - The Contractor shall furnish the supervision and labor necessary to perform the work covered by this Contract. The Contractor's personnel must be competent and experienced in the type of work to be performed. A foreman (or

[3] This is the Pepco example

crew leader) who has at least one year of experience in the type of work being performed shall supervise each crew working under this Contract. The foreman may be a working foreman, but must remain on the job at all times, supervising the work. The Company reserves the right to have any employee of the Contractor removed from the job if he or she is considered to be incompetent or otherwise unfit.

6. Equipment, Tools and Materials - The Contractor shall furnish the equipment, tools, and materials necessary to perform the work covered by this Contract. All equipment, tools and materials must be of good quality, and are subject to approval by the Company.

7. Communication Facility - The Contractor shall have a central communication facility, equipped with a telephone and a facsimile machine. The telephone must have message recording capabilities for times when personnel are not available to answer the phone. The facsimile machine must be on a dedicated phone line, and capable of both sending and receiving messages. The telephone and the facsimile machine are to be on at all times. The Contractor must check for messages or facsimiles at least once each business day.

8. Pagers - The Contractor shall equip the crew foreman with an electronic paging device, which has a range that covers the PEPCO transmission system area. The pager is to remain with the foreman, in proper working order, at all times during working hours. The foreman is to respond as directed by the Company when contacted by way of the pager.

9. Cellular Telephones - The Contractor shall equip each crew foreman with a cellular telephone, which has a range that covers the PEPCO transmission system area. The cellular telephone is to remain on the job site, in proper working order, at all times during working hours.

10. Adjacent Property Owner Objections - If an adjacent property owner objects to this work and the Contractor is unable to resolve the situation, then the Contractor shall inform the Company and shall not perform any work in that area until instructed to do so by the Company.

11. Advance Notification - The Company maintains an Adjacent Property Owner Advance Notification List because certain adjacent property owners have expressed concern about our work in the past. The Contractor shall be informed as to which properties these are, and shall exercise due care. If the Company directs the Contractor to skip a portion of the work due to adjacent property owner problems (or any other reason), the Company may, after the problem has been resolved, direct the Contractor to return to that area and complete the work, as long as the Company takes such action prior to the expiration date of this Contract.

12. Right-of-Way Mowing Schedule - The transmission line acres are to be mowed three times per year, unless otherwise directed by the Company. The Company shall specify the three dates for beginning each of the three mowings. For first and second mowings, each mowing shall proceed without interruption and each mowing shall be completed within three weeks of its starting date. For the remaining mowing(s), each mowing shall proceed without interruption and each mowing shall be completed within four weeks of its starting date. If any of the mowings are not completed within the limits stated above, then payment to the Contractor shall be reduced by $200.00 for each work day over the applicable limit. The Company may extend the period of time allowed for any of the three mowings if conditions permit. The Company may waive part or all of the penalty if the Company deems such action appropriate.

13. Height of Mowing - All vegetation 2 inches or less in diameter at the base, shall be completely severed at a height of 4 inches or less.

14. Mow Entire Designated Area - The Contractor shall mow the complete width and length of each section of the right-of-way or substation designated by the Company, with the exception of obstacles such as gardens, crops, impassable terrain, wet areas and foreign objects. Single, movable objects shall be moved so that the entire area may be mowed. The Contractor shall mow within 6 inches or less of all other obstacles on right-of-way or substation properties.

15. Weedeater Work on Rights-of-Way - The Contractor shall use a string type trimmer to cut the grass and weeds growing around the Company's barricade

posts on the rights-of-way. Typically, the Company will assign this task one time each year, either during the third or fourth mowing. This work is a separate unit, paid for at the price bid by the Contractor.

16. Grass Clippings - Grass clippings and any other mowing debris shall be removed from public sidewalks and streets.

17. Boundaries - It shall be the Contractor's responsibility to determine, in the field, the boundaries of the areas to be mowed. The width and length of each section of right-of-way is given in the specification appendix.

18. Miscellaneous Work - Miscellaneous work includes miscellaneous mowing, miscellaneous weedeater work, and other manual vegetation control, such as removal of small trees, brush and/or debris, as directed by the Company. The Contractor will only be assigned work, which can be performed utilizing the Contractor's personnel and equipment. Some miscellaneous work is not suited to be paid using the Contractor's unit prices and therefore is paid for at the time and material rates submitted by the Contractor. Miscellaneous work may be located anywhere on the PEPCO transmission or distribution systems. The following shall apply to miscellaneous work performed on the time and material rates:

19.1. The Contractor shall perform only the miscellaneous work assigned by the Company.

19.2. All miscellaneous work shall be done as directed by the Company and in accordance with these specifications.

19.3. The crew foreman is a working foreman.

19.4. Two hours labor will be paid if the work is postponed due to inclement weather after the crew has reported to the job site. There shall be no payment for equipment hours spent on standby due to inclement weather.

19.5. Overtime is defined as hours of work required by the Company that are in excess of the Contractor's normal work day or in excess of 40 hours in a normal work week. Overtime shall be paid at the overtime rates included in the Contractor's quotation. There shall be no overtime unless otherwise directed by the Company.

20. Winching - Under no circumstances shall the Contractor attach any ropes or winch cables to any pole, tower, or foundation, or use any such structures as anchors for winching equipment.

21. Damage To Crops - The Contractor shall make every effort not to damage gardens or crops located on the rights-of-way.

22. Access via Private Property - Before entering any private property the Contractor must obtain the permission of the owner or lessee.

23. Debris - The Contractor shall inform the Company in writing of any debris found on Company property. If the Company instructs the Contractor to remove the debris, it shall be disposed of in a legal manner.

24. Laws - The Contractor shall comply with all laws and regulations applicable to the work performed under this contract.

25. Keep Gates Closed - The Contractor shall keep all gates closed and shall be responsible for any problems resulting from any open gate attributable to the Contractor's work.

26. Complaints - The Contractor shall immediately inform the Company of any complaints, which arise. Within 10 days of receiving a complaint, the Contractor shall make arrangements, which are satisfactory to the claimant, for the settlement of the complaint. The Contractor shall keep the Company informed of the status of each complaint and of any settlement made with the claimant. Where it is deemed advisable by the Company, a representative of the Company will accompany the Contractor's agent in the settlement of claims. An executed copy of the release for every damage claim settled shall be furnished to the Company. For claims not settled in a timely manner, the Company reserves the right to negotiate a settlement and the Contractor shall pay all expenses.

27. Working Hours - The days and hours that the Contractor may work are restricted to daytime hours on non-holiday weekdays. No work is to be performed on weekends, or holidays observed by the Company, without prior permission from the Company.

28. Daily Location Report - During the progress of the work, the Contractor shall call (202) 388-2220 each morning by 7:00 a.m. and inform the Company of the location(s) where the Contractor will be working that day.

29. Monthly Report - Each month, on a date specified by the Company, the Contractor shall submit to the Company a written report detailing the month's work. If requested by the Company, the Contractor shall also provide this information at times other than the normal monthly reporting time. From the monthly report submitted by the Contractor, the Company shall prepare and forward to the Contractor a monthly statement summarizing the work together with a check for the work completed. The monthly report shall include the following information:

29.1. Contractor's name

29.2. Foreman's name

29.3. Dates covered by the report

29.4. The quantities of unit work performed and the time and material quantities for any time and material work.

30. Adding or Deleting Work - The Company reserves the right to add or delete work. If the Company elects to alter the scope of the work, it shall first evaluate the change with regard to the original unit prices. If, in the Company's opinion, the scope of the work will be changed to the extent that the original prices are no longer equitable, then the Contractor shall have the opportunity to submit adjusted unit prices.

31. Interruption of Mowing Schedule - The Contractor shall, if directed by the Company, interrupt the planned mowing schedule and move to any location specified by the Company. The Contractor shall mow the area designated by the Company in accordance with these specifications and then return to the planned mowing schedule.

32. Satisfactory Completion - All work done shall be entirely satisfactory to the Company and shall be subject to inspection by, and approval of, the Company. The Contractor at the Contractor's expense shall correct any work, which is not entirely satisfactory to the Company.

Appendix G – Schedule 12e Filings

Transmission Provider: Delmarva Power

Date: 6/8/04

Source of Performance Delay/Prevention: Amtrak Railroad.

Subject: Amtrak Access Restrictions

Concern Level: Low

Description:

Access for hazard tree work is restricted on circuits 23010, 23012, 23013, 23015. Rights-of-way width varies as these circuits are constructed along Amtrak railroad lines with vegetation management rights restricted to the width of the railroad property rights. Access is limited and restricted and must be coordinated with railroad safety personnel. No vegetation management rights exist on private property outside of the railroad rights-of-way. This necessitates frequent removal or topping of off-ROW hazard trees.

Transmission Provider: Atlantic City Electric

Date: 6/8/04

Source of Performance Delay/Prevention: Atlantic City Expressway

Subject: Tree Clearing Restrictions

Concern Level: High

Description:

Rights-of-way width varies on Circuit 2310 as it parallels the Atlantic City Expressway where access and tree removals are restricted. The narrow widths of many sections of this right-of-way necessitate close inspections and annual tree pruning or hazard tree removals.

Transmission Provider: Atlantic City Electric

Date: 6/8/04

Source of Performance Delay/Prevention: Pinelands Commission

Subject: Ban on Herbicide Use

Concern Level: Medium

Description:

The Pinelands Commission Management Plan forbids the use of herbicides for vegetation management on utility rights-of-way. This restricts maintenance practices to mechanical or manual cutting of non-compatible vegetation. Cutting only serves to perpetuate the non-compatible, tall growing plants that threaten safety and reliability and inhibit emergency and repair crew access. Approximately 300 miles of Conectiv transmission rights-of-way is located within the Pinelands area.

In addition to restrictions on herbicide use, the Pinelands Commission has placed clearing restrictions on removal of trees, or mandated reduced clearances that necessitate frequent cycle pruning.

Transmission Provider: PEPCO

Date: 5/7/04

Source of Performance Delay/Prevention: U.S. Fish & Wildlife Service, Patuxent Wildlife Research Center

Subject: Burtonsville –Bowie 230kv Easement property, USFW dictate vegetation management.

Concern Level: Low

Description:

The Patuxent Wildlife Research Center has dictated how Pepco maintains the vegetation throughout the entire USFW property,13 spans (77acres). They hire a botanist and the staff wildlife biologist to monitor our work and only certain tree species can be treated with herbicide while others have to be cut at a height of 15 feet . The section of right-of-way is considered a major stop over for the neo-tropical migratory birds as food source during their flights north and south. In addition, we are constrained to perform vegetation/line maintenance , only during the months of September, October , November and December, because of the reproductive cycle of the whooping crane, which is an endangered species. We have to inspect this area every year and perform the necessary maintenance every 2 years, instead of the 4 year cycle.

Transmission Provider: PEPCO

Date: 5/7/04

Source of Performance Delay/Prevention: David Lines adjacent property owner.

Subject: Hawkins Gate to Morgantown 230kV- Wildlife area off route 6 in LaPlata, Maryland

Concern Level: Low

Description:

Pepco purchased this right-of-way property from the Lines' many years ago. The majority of the Lines' large farm, over 600 acres, is an established wildlife management area and for agriculture crops. We maintain the trees, brush and scrubs to a greater density and height than normal over our four year cycle. We must monitor this area every 2 years and take corrective action before the vegetation height encroaches our minimum clearance standards.

Transmission Provider: PEPCO

Date: 5/7/04

Source of Performance Delay/Prevention: Brinkwood compression area

Subject: Brighton to Burtonsville 230 & 500kV- Residential community with tall trees at the edge.

Concern Level: Low

Description:

Pepco purchased this right-of-way property for use of two 230kv towers and a 500kV line was compressed on the same property at a later date. This is the closest area for side clearance, on our 500kV system, of only 52 feet. There are "conflict" trees off the right-of-way that must be monitored every year, since some of them are over 100 feet tall and the wire sag is below that level.

Transmission Provider: PEPCO

Date: 5/11/04

Source of Performance Delay/Prevention: Amtrak Railroad Right-of-way.

Subject: Bowie to Benning 115kv, that parallels the Amtrak's R/R

Concern Level: Low

Description:
Pepco jointly shares Amtrak's electricity towers with two of our 115kv feeders. Pepco does not have any conflict tree rights and has limited access to the track area. We patrolled this line on 5/11/04 and have found 11 hazard tree locations. All hazard trees were removed by June 11, 2004.

ReliabilityFirst Corporation

TRANSMISSION OWNER
QUARTERLY VEGETATION OUTAGE REPORT

Quarter: _____ Year: _____

Requirements

All vegetation-related transmission line trips on lines of 200 kV or higher and any other lower voltage lines designated by ReliabilityFirst to be critical to the reliability of the electric system are to be reported to ReliabilityFirst on a quarterly basis by the 20th of January, April, July, and October for the previous quarter.

Reporting Instructions

All sustained transmission line outages shall be reported where the cause of the outage is contact with vegetation, except:

- Multiple sustained outages on an individual line, if caused by the same vegetation, shall be reported as one outage regardless of the actual number of outages within a 24-hour period.

Outage Reporting Exceptions

The following sustained transmission line outages caused by vegetation are not required to be reported:

1. Vegetation-related outages that result from vegetation falling into lines from outside the right-of-way that result from natural disasters shall not be considered reportable
   Examples of disasters that could create non-reportable outages include, but are not limited to, earthquakes, fires, tornados, hurricanes, landslides, wind shear, major storms as defined either by the transmission owner or an applicable regulatory body, ice storms, and floods.
2. Vegetation-related outages due to human or animal activity shall not be considered reportable (examples of human or animal activity that could cause a non-reportable outages include, but are not limited to, logging, animal severing tree, vehicle contact with tree, arboricultural activities or horticultural or agricultural activities, or removal or digging of vegetation).

Reporting Entity: _____

Reported by: _____

Title: _____

E-mail: _____

Phone: _____ Date of Report: _____

Number of Reportable Vegetation Outages in the quarter as specified above and in accordance with FAC-003-1: _____

- **If there were *no reportable* vegetation related outages for the quarter, then the requirement is complete and this page should be submitted to ReliabilityFirst Corporation.**
  > Email it to compliance@rfirst.org and/or fax it to 330-456-3648.

- **For *each reportable* outage, proceed to the next page and complete a table for each outage reported.**

ReliabilityFirst Corporation
TRANSMISSION OWNER
QUARTERLY VEGETATION OUTAGE REPORT

Individual Vegetation Related Transmission Line Outage
For EACH outage experienced, complete the following table.

Outage # __

Name of Transmission Owner (TO):	
Name of Transmission Line Involved in Outage: *(No circuit number please)*	
Voltage of Transmission Line: *(Please mark one)*	☐ 230 kV class ☐ 345 kV class ☐ 500 kV class ☐ 765 kV class ☐ ReliabilityFirst Designated Critical Lines <200 kV
Time and date of outage:	
Duration of outage:	
Line-loading (% of normal rating) of the involved line at the time of line trip: **NOTE:** This information should be provided whenever vegetation grew up from within or outside of the ROW and contacted the line, or if the line sagged into the vegetation.	
Description of cause of outage:	
Caused by Category 1, Category 2, or Category 3 vegetation: **NOTE:** Please check whether or not a Category 1 outage occurred as a result of a tree from inside or outside the right-of-way.	☐ **Category 1 — Grow-ins:** Outages caused by vegetation growing into lines from vegetation inside and/or outside of the right-of-way. ☐ Inside the right-of-way ☐ Outside the right-of-way ☐ **Category 2 — Fall-ins:** Outages caused by vegetation falling into lines from inside the right-of-way. ☐ **Category 3 — Fall-ins:** Outages caused by vegetation falling into lines from outside the right-of-way.
Counter measures or corrective steps taken by TO including timeframe to prevent future outages:	
Additional comments:	

> Please complete this form and email it, along with the cover sheet, to compliance@rfirst.org and/or fax it to 330-456-3648.

G PSEG. "Species Management." Procedure No. EN-AA-603, Rev. 0. Undated

H PSEG. "Threatened and Endangered Species." Procedure No. EN-AA-603-0001. Rev. 0. Undated.

I PSEG. "Baywide Abundance Monitoring Program, PSEG Estuary Enhancement Program." Bottom Trawl Survey Procedures Manual for Field and Laboratory, Rev. 3. April 1, 2009.

File 4.7.4 (S)

UNITED S[illegible]ES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1335 East-West Highway
Silver Spring, MD 20910
THE DIRECTOR

FILE COPY

Mr. Charles L. Miller, Director
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

MAY 14 1993

NON-PSEG

Dear Mr. Miller:

The enclosed Biological Opinion reinitiates consultation with the Nuclear Regulatory Commission under Section 7 (a) of the Endangered Species Act (ESA) regarding the Salem and Hope Creek Nuclear Generating Stations in Lower Alloways Creek Township, Salem County, New Jersey. This consultation is in response to the death of two Kemp's ridley sea turtles at the Salem plant in 1992, which exceeded the fatal Kemp's ridley take limit of one as specified in the August 1992 Opinion. An incidental take requirement has been appended to the new Opinion to elevate monitoring at the Salem Station intake structure to an hourly schedule (rather than every two hours) after one lethal take directly attributable to the nuclear generating station has occurred. The Opinion concludes that the continued operation of these plants may affect listed species, but are not likely to jeopardize their continued existence.

This Opinion contains an Incidental Take Statement, pursuant to Section 7 (b)(4) of the ESA, that authorizes the incidental taking of listed species while specifying the measures necessary to minimize the impacts of the Salem and Hope Creek Nuclear Generating Stations' circulating water system intake trash bars upon sea turtles. The take level authorized for these sites is ten shortnose sturgeon, 30 loggerheads with up to five mortalities, five green sea turtles with up to two mortalities, and five Kemp's ridleys with one mortality per year.

Consultation must be reinitiated if (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals impacts of the project that may affect listed species in a manner or to an extent not considered thus far in our opinions; (3) the identified activities are modified in a manner that causes an adverse effect to listed

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

species not previously considered; or (4) a new species is listed, or critical habitat is designated, that may be affected by the project.

I look forward to your continued cooperation in future consultations.

Sincerely,

Herbert W. Kaufman

for Nancy Foster, Ph.D.
Acting Assistant Administrator
for Fisheries

Enclosure

cc: (w/ enc.)
U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Mr. James C. Stone
Licensing Project Manager
One White Flint North
11555 Rockville Pike
Rockville, MD. 20852

ENDANGERED SPECIES ACT

SECTION 7 CONSULTATION

BIOLOGICAL OPINION

Agency: Nuclear Regulatory Commission

Activity: Reinitiation of a consultation in accordance with Section 7(a) of the Endangered Species Act regarding continued operation of the Salem and Hope Creek Nuclear Generating Stations on the eastern shore of the Delaware River in New Jersey.

Consultation Conducted By: National Marine Fisheries Service
Northeast Regional Office

Date Issued: 5/14/93

Background:

A formal consultation, in accordance with Section 7(a)(2) of the Endangered Species Act (ESA), was conducted by the National Marine Fisheries Service (NMFS) with the Nuclear Regulatory Commission (NRC) in 1979 to study the impingement of shortnose sturgeon at the Salem and Hope Creek Nuclear Generating Stations in Lower Alloways Creek Township, Salem County, New Jersey. The Biological Opinion, issued in April of 1980, concluded that operation of these plants would not jeopardize the continued existence of shortnose sturgeon.

Incidental captures of sea turtles at the Salem Nuclear Generating Station Circulating Water System (SNGS CWS) intake trash bars were documented by the Public Service Electric and Gas Company (PSE&G) and reported to NMFS according to reporting procedures established through an informal Section 7(a) consultation conducted among the PSE&G, NRC, NMFS, and the Environmental Protection Agency (EPA) during October 1981. Consultation was reinitiated on August 19, 1988 to evaluate the affects of these takes on the species of sea turtles involved. A Biological Assessment was prepared by PSE&G, reviewed by NRC, and received by NMFS in July, 1989. On January 2, 1991, NMFS issued a biological opinion which found that the continued operation of the Salem and Hope Creek Stations would affect sea turtles, but would not jeopardize the continued existence of any populations of threatened or endangered turtles. An incidental

take statement was issued which allowed the take of five Kemp's ridley (Lepidochelys kempi) and five green sea turtles (Chelonia mydas) per year with up to one Kemp's ridley mortality and two green turtle mortalities, ten loggerhead sea turtles (Caretta caretta) per year with up to five mortalities and two shortnose sturgeon mortalities each year. Consultation was reinitiated in the summer of 1992 to increase the total incidental take allowance of shortnose sturgeon and loggerhead sea turtles. An incidental take level of ten shortnose sturgeon, five Kemp's ridleys and five green turtles per year with up to two green turtle mortalities and one Kemp's ridley mortality, and 30 loggerheads with up to five mortalities was given. The PSE&G staff was also asked to evaluate possible causes of the increase in take levels, especially to assess the possibility that changes in plant activities caused the increase in takes of listed species.

Between June 18, 1992 and October 2, 1992, 15 sea turtles were recovered from the SNGS CWS intake trash bar area, including ten loggerhead sea turtles (live captures), four (one recapture) Kemp's ridleys and one green turtle (recovered dead). Two of the Kemp's ridley turtles were recovered dead and the third take was recaptured alive less than 24 hours after initial release. In addition, two shortnose sturgeon were recovered dead between November 2 and November 16, 1992. This biological opinion considers the summary report submitted by PSE&G on January 13, 1993, as well as additional sources of new information.

Proposed Activities:

This consultation addresses the potential impact of the continued operation of the Salem and Hope Creek Generating Stations to a revised list of species. The operating conditions of these stations have not changed since the issuance of the last biological opinion on August 4, 1992.

Listed Species Likely to Occur in the Project Area:

Project activities are known to affect endangered green sea turtles, Kemp's ridley sea turtles, shortnose sturgeon and threatened loggerhead turtles. Previous biological opinions (NMFS 1991 and 1980) contain complete lists with descriptions of those listed species under the jurisdiction of NMFS that may occur in the Delaware Bay area; those descriptions are applicable to this consultation through their reference herein.

Project Area:

The Salem and Hope Creek Generating Stations are located on the southern end of Artificial Island, New Jersey, on the eastern shore of the Delaware River Estuary, about 30 miles south of Philadelphia. Artificial Island is a peninsula created from a

natural sand bar in the early 1900's by the Army Corps of Engineers. The tidal river in this area narrows upstream of Artificial Island and turns nearly 60 degrees. Most of the river in this area is less than 18 feet deep. Deeper parts include the navigation channel that extends from the mouth of the bay to Trenton, New Jersey and has depths of up to 40 feet near Artificial Island.

Assessment of Impacts:

The biological opinion issued on January 2, 1991, contains a full assessment of impacts of the Salem and Hope Creek Generating Stations on endangered species occurring in the Delaware River off Artificial Island and is incorporated herein by reference. This assessment also considers past Opinions (NMFS 1992, 1991 and 1980), incident reports submitted by PSE&G as required by the incidental take statement, and the summary report submitted to NMFS on January 13, 1993.

Hope Creek Generating Station

Continued operation of the Hope Creek Generating Station is not expected to impact sea turtles. There have been no sea turtle takes documented at that site since operations began in February 1986. Therefore, since it has been determined that the continued operation of the Hope Creek Generating Station will not affect listed species (NMFS 1992), monitoring beyond normal cleaning operations is not necessary.

Salem Nuclear Generating Station Circulating Water System

No additional environmental sampling has taken place since the Station-related environmental sampling that was conducted between 1979 and 1991. Bottom trawl, midwater trawl and surface trawl surveys were conducted for 10 to 15 minute intervals during this sampling period, and all turtles were released unharmed (Table 1). Past biological opinions (NMFS 1992, 1991 and 1988) citing this sampling are incorporated herein by reference.

There have been a total of 85 incidental captures of sea turtles at the SNGS CWS intake trash bars between 1979 and October 1992, (Tables 2, 3 and 4). These include two green turtles, 23 Kemp's ridleys and 60 loggerhead turtles. Additionally, ten shortnose sturgeon have been taken lethally at the intake structure (Table 5).

Sea Turtles

Green turtles: Green turtles occur regularly, though in low numbers, in the embayments of the Atlantic coast from Florida through Cape Cod, Massachusetts. Three green turtles have been documented in association with PSE&G plant activities. A green

turtle was reported taken in a bottom trawl in 1980 and released alive, although its identification cannot be verified, as no photographs were archived. Another green turtle was reported taken at the SNGS CWS intake trash bars and released alive in September 1991, and the third take was recovered fresh dead in August 1992, suffering from a severe gash on the left side of its head behind the jaw. Additionally, a sea turtle identified as a Kemp's ridley taken at the SNGS CWS intake structure in 1984 (see Table 3) had measurements consistent with those of a green turtle, but no photographs exist to confirm its species identification.

Kemp's ridleys: Twenty-three Kemp's ridleys have been reported impinged at the SNGS CWS intake trash bars since 1979 (Table 3). Annual takes ranged from zero to six Kemp's ridleys. Eleven of these turtles were recovered dead or died shortly after discovery, with an average of 0.8 observed mortalities per year (range 0 to 2) observed in association with the SNGS CWS intake structure. One of the dead Kemp's ridleys was decomposed upon recovery and two had been hit by a boat. The average annual mortality of Kemp's ridleys due to plant activities, then is more accurately approximately 0.6 lethal takes per year.

Loggerheads: A total of sixty loggerheads were encountered in association with the SNGS CWS intake trash bars between 1979 and 1992 (Table 4). Zero to 23 loggerheads (21 individuals, two recaptures) were taken each year with an average of four turtles per year. Prior to 1991, the eight loggerheads taken in 1988 represented the largest number of loggerheads taken in one year. This represents an average of 1.3 lethal takes per year (range zero to six), however, six of the dead loggerheads were decomposed upon retrieval and four were reported as boat hits, so the actual lethal take level due to plant activities may be as low as 0.6 per year. All of the loggerheads taken in 1992 were captured and released alive.

While 1991 seems to be an anomalous year for sea turtle takes, the general upward trend observed at the Salem plant (Figure 1) is consistent with observations of sea turtle occurrence in the Long Island Sound and Chesapeake Bay. The percentage of sea turtles which have been recovered and released alive at the SNGS CWS intake trash bars has increased with the increase in incidental capture rates (Figure 1); release rates range from zero percent (1982, 1983 and 1986 when only 1 - 3 turtles were taken) to 96 percent in 1991 when 24 out of 25 takes were released alive. The increase in the percentage of sea turtles successfully released in 1991 (96 percent) and 1992 (87 percent) is probably also a result of the requirement established in 1991 to increase monitoring of the CWS trash racks during the season that turtles are known to occur in the Northeast embayments. However, since 1990, 40 percent (two of 5 takes) of the Kemp's ridleys and 50 percent (one of two takes) of the green turtles

recovered from the intake structure have been recovered dead. Kemp's ridleys and greens in the Delaware Bay are significantly smaller than the loggerheads found there. The higher percentage of mortalities of these species may be indicative of their greater susceptibility to drowning with respect to their size and stage of development. As a result of this possibility, once a lethal take of any species has been observed, intake inspections should be increased to once every hour to improve the chances of detection of the smaller endangered species before they drown.

Documented sizes of the sea turtles impinged at the SNGS indicate that all of the sea turtles reported were juveniles. Crouse et al. (1987) suggested the stability of loggerhead populations may be more sensitive to changes in the status of large juveniles than other developmental stages. It is generally believed that similar results will be found when the model is applied to the Kemp's ridley population. Cumulative stresses on the juvenile sea turtles in the Atlantic, then, may be impeding the recovery of this population.

There are a number of possible reasons for the incidental capture of sea turtles at the SNGS. The design velocity of 1 to 1.7 feet per second, is significantly less then the velocity of local currents within the estuary that may reach speeds of 3.3 to 4.3 feet per second. Although sea turtles have been observed swimming against currents stronger than those encountered at the SNGS CWS intake structure, sea turtles tracked in the Long Island Sound area seem to take advantage of currents when traveling (Morreale, pers. comm. 1990).

Passive drifting and the resultant susceptibility to impingement may occur at night, when sea turtles are less active. Prior to 1991 when monitoring was intermittent, however, documented discovery times did not show a clear temporal pattern of takes, and while many of the noted times coincided with shift changes, early morning recoveries were no more common than recoveries at other times of the day.

It is possible that the SNGS attracts sea turtles to the area of the CWS intake trash bars. Information on stomach contents of incidentally captured sea turtles recovered at this site indicate that many were actively feeding on blue crabs and other common prey species prior to their death. No quantitative diet study has been conducted and species listed under stomach contents on necropsy reports include only those most easily identified. The warm water discharge upstream of the CWS may increase the distribution of prey species to the area, and dead fish and other material dumped from the trash racks may provide food for the turtles or scavenging prey species. The water depth in this area is 7.6 to 9 meters, which is the typical feeding depth for Kemp's ridleys in Long Island Sound waters (Morreale, pers comm 1990). A review of benthic survey data may identify prey density and

distribution at various sites in the Bay and clarify the potential for attractions of invertebrates to this site.

Little is known about the distribution of sea turtles in Delaware Bay. Aerial surveys flown by the Virginia Institute of Marine Science in July of 1983 and 1984 resulted in only one sea turtle sighting. Bellmund et al. (1987) concluded that turtle densities in the lower Delaware Bay were low. Few strandings are reported in the Bay, but more may occur unnoticed or unreported. The Bay provides habitat similar to that used by large numbers of turtles in Chesapeake Bay and Long Island Sound. Information on turtle distribution throughout Delaware Bay is needed before the degree of attraction of the Salem Station can be determined.

Concern that the warm-water discharge may keep sea turtles in the area until surrounding waters are too cold for their safe departure is not supported by any existing data. Cold-stunning, the comatose condition of sea turtles subjected to water temperatures lower than 8°C, is common in Atlantic embayments (Meylan 1986, Ehrhart 1983). In New York waters, this occurs around mid-November (STSSN database, NMFS-SEFC). No incidental captures of sea turtles have been reported at SNGS later then early October, indicating that sea turtles leave this site before cold-stunning would occur. The thermal plume studies described in the Biological Assessment do not contribute to this finding. These studies appear to be based on a two-day overflight in June, 1982. No information is supplied for other seasons or other operating conditions.

Shortnose sturgeon

Ten shortnose sturgeon have been recovered in association with plant activities since 1978 (Table 5). Two of these sturgeon were taken in gillnet and bottom trawl gear off Artificial Island. The other eight were recovered dead or died shortly after discovery. Three of the documented takes occurred in a two-week period in 1991. Gillnet fishing activity was seen offshore of the plant at this time. Although fishermen did indicate they were catching increased numbers of sturgeon, it was impossible to determine whether the impingements at the plant were due to previous takes in nearby gillnets.

All of the shortnose sturgeon recovered in conjunction with plant activities were adults. Shortnose sturgeon reach maturity at 450-500 mm (Dadswell et al. 1984). Dadswell et al. (1984) lists documented takes of sturgeon in the vicinity of Artificial Island, including five taken between 1978 and 1981. While additional records exist for nearby waters and the Delaware Bay, the primary habitat for sturgeon in the Delaware River system is considered to be between Trenton and Florence, where a recent estimate of 6,000 to 14,000 adult shortnose sturgeon was

calculated (Hastings et al. 1987). The authors of that report, however, felt that the existing range could be limited by poor summer water quality downstream of Florence, near Philadelphia. The increase in shortnose sturgeon impingements at Artificial Island in 1991 and 1992 may be indicative of increased numbers of sturgeon in the Delaware or improved water quality. Shortnose sturgeon encountered in the fall and early winter months may be travelling downstream to deep saline waters typical of their wintering area in other river systems (Dadswell et al. 1984).

Cumulative Effects:

Cumulative impacts from unrelated, non-federal actions occurring in the Delaware Bay may affect protected species and their habitats. The Marine Mammal Stranding Center in Brigantine, New Jersey, reports an increase in the number of turtles hit by boats in New Jersey inshore waters. STSSN data show that turtles found in other northeast embayments die of various natural causes, including cold stunning, and human activities, such as incidental capture in fisheries, ingestion of or entanglement in debris, boat hits, and degradation of nesting habitat. The cause of death of most turtles recovered by the STSSN is unknown.

Conclusion:

Based upon our review of the information available on the biology and ecology of the endangered and threatened species in the North Atlantic affected by the continued operation of the Hope Creek and Salem Generating Stations, NMFS concludes that the continued operation of these stations is not likely to jeopardize the continued existence of the species listed above. The following factors form the basis for this conclusion:

(1) No impingements have been recorded at the Hope Creek Nuclear Generating Station. Thus, besides the normal cleanings, monitoring Hope Creek is no longer necessary.

(2) Three of the 15 turtle takes documented in 1992 at SNGS CWS were recovered dead. The necropsy reports indicate that the lethal takes were fresh dead, implying death by impingement on the SNGS CWS intake structure. The increased level of mortality, relative to previous years of monitoring, may be indicative of the presence of a higher number of endangered sea turtles in the upper Delaware Bay and the need for increased monitoring to be conducted hourly (rather than every two hours) after one lethal take has occurred. Prior to 1991, 25 to 100 percent of all sea turtles taken were dead or died shortly after recovery. The maximum number of observed lethal takes documented annually since 1979, are two Kemp's ridleys, (average = 0.8) and

six loggerheads (average = 1.3). The mortality of any Kemp's ridley is significant, but mortalities of less than two juvenile Kemp's ridleys per year is conservative and consistent with takes allowed in similar operations.

(3) The continued operation of the Hope Creek and Salem Generating Stations at existing levels is not expected to change the observed mortality levels.

(4) New information resulting from the mark/recapture study and proposed diet and telemetry studies will allow us to further assess and closely monitor impacts of the SNGS on sea turtles and their habitat and contribute to our knowledge of sea turtles in the Delaware estuarine system.

Conservation Recommendations:

The following conservation recommendations are suggested:

(1) In conjunction with NMFS, PSE&G engineers should continue to develop a research program to determine whether the Salem Station provides features attractive to sea turtles. This program should investigate habitat use, diet, and local and long term movements. Use of existing mark/recapture and telemetry methods should be considered. In this regard,

(2) Historic benthic survey data should be reviewed to identify prey density and distribution at various sites in the Delaware Bay and clarify the potential for attractions of invertebrates to this site.

(3) Conduct distribution surveys for sea turtles in the Bay.

(4) Conduct pesticide and heavy metal sampling during necropsy procedures on lethal turtle takes, if an agreement regarding protocol can be reached with the State of New Jersey Endangered Species and Non-Game Commission.

(5) Meet with NMFS annually to review incidental takes, assess the status of sea turtles in the Delaware Bay and to reconsider these recommendations accordingly.

Reinitiation of Consultation:

Reinitiation of formal consultation is required if: (1) the amount or extent of taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in

a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

Incidental Take Statement:

Section 7(b)(4) of the ESA requires that when an agency action is found to comply with Section 7(a)(2), NMFS will issue a statement specifying the impact of incidental taking of endangered species, provide reasonable and prudent measures necessary to minimize impacts, and set forth the terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

The 1980 biological opinion on the impact of the Salem and Hope Creek Nuclear Generating Stations on shortnose sturgeon theorized that potential take levels for shortnose sturgeon would be zero to 11 takes per year. It was determined that this level would not jeopardize that population. In the 1990 biological opinion, shortnose sturgeon takes were set at two per year due to the lack of reports in intervening years. Since information now indicates that the sturgeon population may be increasing in the Delaware River, and since three sturgeon were taken in 1991 and two in 1992, NMFS will maintain a cumulative incidental take level set in August 1992 for shortnose sturgeon at ten takes per year provided the applicable reasonable and prudent measures listed below are met.

The significance of each Kemp's ridley and green turtle mortality was considered in determining an allowable incidental take. A take limit of five Kemp's ridleys and five green turtles per year with up to two green turtle mortalities and one Kemp's ridley mortality, and thirty loggerheads with up to five mortalities is maintained, provided that the following reasonable and prudent measures are met:

(1) Comatose sea turtles must be resuscitated according to the procedures described in Appendix 1. These procedures must be posted in appropriate areas such as the fish pool buildings and the circulating water system operator's office.

(2) In 1991 and 1992, inspections of the SNGS CWS intake trash bars were required every two hours from June 1 through September 30. However, because sea turtles have been documented to occur in New York through the late fall, this monitoring exercise must be extended through October 15. Documentation, as specified in the 1991 biological opinion, must be sent to the Northeast Region, NMFS within 30 days of any incidental take.

(3) If a lethal incidental take of an endangered or threatened species occurs between June 1 through September 30, that is directly attributable to the plant intake structure, monitoring of the SNGS CWS intake structure must be conducted hourly (rather than every 2 hours). Two hour monitoring may be reestablished from October 1 through October 15, however, if a lethal take occurs, monitoring must again be conducted hourly.

(4) As mortality rates over the past two years indicate that the smaller species (i.e., Kemp's ridleys and green turtles), may be more susceptible to drowning, dip nets, baskets and other equipment must be used whenever possible to remove smaller sea turtles from the SNGS CWS intake structure in order to reduce trauma caused by the existing cleaning mechanism. Additionally, the monitoring staff must be instructed to conduct careful observations for the smaller turtles which may be more difficult to detect due to their small size and cryptic coloring.

(5) The Salem Nuclear Generating Station's CWS intake trash bars must be cleaned daily from June 1 to October 15.

(6) Live sea turtles must be inspected for signs of illness or injury. Any ill or injured turtle must be given appropriate medical attention, and must not be released until its condition has improved.

(7) Live turtles that exhibit no signs of illness or injury must be tagged and released. Tagging forms must be completed and forwarded to the NMFS' Southeast Fisheries Center at the address on the tagging form. The effects of turtle takes and releases must be assessed for at least 48 hours following release of all multi-tagged sea turtles. PSE&G monitoring of multi-tagged turtles must be reinitiated for at least 48 hours in the following week to obtain more definitive habitat utilization data. This dual monitoring requirement will remain in effect for the duration of the Endangered Species Act permit subject to reevaluation by NMFS.

(8) Dead sea turtles must be necropsied by qualified personnel. Identification of sex must be determined and stomach contents must be identified to determine whether waste products from the SNGS CWS trash racks are attracting sea turtles. Necropsy reports must be submitted to NMFS when completed.

(9) An annual review of incident reports must be conducted to identify trends in sea turtle and shortnose sturgeon takes.

References:

Crouse, D. T., L. B. Crowder and H. Caswell. 1987. A stage-based model for loggerhead sea turtles and implications for conservation. Ecology 68(5): 1412-1423.

Bellmund, S.a., J.A. Musick, R.C.Klinger, R.A.Byles, J.A.Keinath, and D.E. Barnard. 1987. Ecology of Sea Turtles in Virginia. Special Scientific Report no. 119, NMFS Contract # NA80FAC-00004.

Dadswell, M.J., B. D. Taubert, T. S. Squires, D. Marchette and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, Acipenser brevirostrum LeSueur 1818. FAO Fisheries Synopsis no. 140. NOAA Tech Report NMFS 14, U.S. Dept. of Commerce, 3300 Whitehaven St., Washington, DC.

Ehrhart, L. M. 1983. Marine turtles of the Indian River lagoon system. 1983 Florida Sci. 46(3/4): 337-346. 1983.

Hastings, R. W., J. C. O'Herron II, D. Schick, M. A. Lazzari. 1987. Occurrence and distribution of shortnose sturgeon, Acipenser brevirostum, in the upper tidal Delaware River. Estuaries, Vol. 10(4): 337-341.

Meylan, A. B. 1986. Riddle of the ridleys. Natural History Magazine, Amer. Mus. Nat. Hist. 11/86: 90-96.

Morreale, S. J. 1990. Personal Communication. Okeanos Ocean Research Foundation, Sea Turtle. Hampton Bays, New York.

Morreale, S.J. and E. A. Standora. 1988, 1989, 1990, 1991. Occurrence, movement and behavior of the Kemp's ridley and other sea turtles in New York waters. Annual reports to the New York State Department of Environmental Conservation Return a Gift to Wildlife Program.

National Marine Fisheries Service. 1991. Endangered Species Act Section 7 Consultation regarding the continued operation of the Salem and Hope Creek Nuclear Generating Stations. January 2, 1991.

National Marine Fisheries Service. 1980. Endangered Species Act Section 7 Consultation regarding the Impacts and Construction and Operation of Four Nuclear Generating Stations on Shortnose Sturgeon on the Delaware River. April 9, 1990.

FIGURE 1

SEA TURTLE TAKES

Salem Nuclear Generating Station, CWS

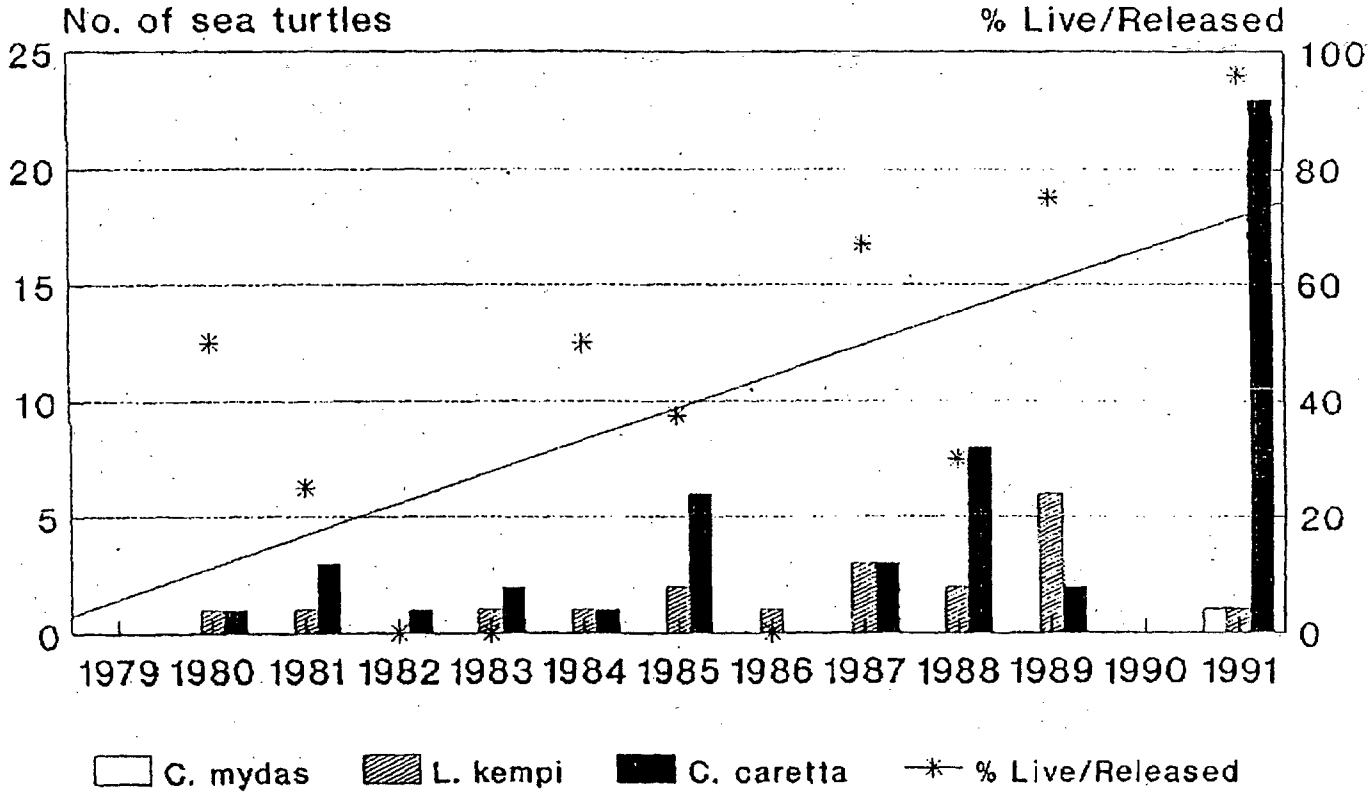


TABLE 1: Sea Turtle Incidents Related to Salem Generating Station Activities
1979 through January 1992

DATE	SPECIES	STATUS	COMMENTS
23 Aug 1979	C. caretta	Live/Released	Caught in bottom trawl
11 Aug 1980 02 Sep 1980	C. mydas C. caretta	Live/Released Live/Released	Caught in bottom trawl Caught in bottom trawl
30 Jun 1981	C. caretta	Dead	Seen floating
02 Jul 1984	C. caretta	Dead	Caught in trawl, decomposed
15 Jun 1987 14 Oct 1987	C. caretta C. caretta	Live/Released Dead on beach	Caught in bottom trawl Decomposed

TABLE 2 Chelonia mydas Impingements
Salem Nuclear Generating Station Circulating Water System
1979 through January 1993

DATE	STATUS	COMMENTS
16 Sep 1991	Live/Released	Released in Delaware River
31 Jul 1992	Dead	

TABLE 3 *Lepidochelys kempi* Incidental Captures
Salem Nuclear Generating Station Circulating Water System
1979 through January 1993

DATE	STATUS	COMMENTS
11 Aug 1980	Live/Released	Released in Delaware Bay
23 Sep 1981	Dead	Apparent boat hit
13 Jul 1983	Dead	
29 Aug 1984	Live/Released	Possible green turtle, released in Delaware Bay
11 Jun 1985 24 Jun 1985	Live/Released Dead	Release location unknown
05 Jul 1986	Dead	Decomposed
24 Sep 1987 24 Sep 1987 29 Sep 1987	Live/Died Dead Live/Released	 To Florida for release
05 Jul 1988 27 Jul 1988	Live/Released Dead	Released off Brigantine
05 Aug 1989 06 Aug 1989 08 Aug 1989 30 Aug 1989 06 Sep 1989 23 Sep 1989	Live/Released Live/Died Live/Released Live/Released Dead Live/Released	Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay
27 Jun 1991	Live/Released	Released in Delaware River
01 Sep 1992 04 Sep 1992 28 Sep 1992 02 Oct 1992	Dead Dead Live Live	 Recapture of 9/28/92 turtle

TOTAL: 23 TAKES; 12 LIVE/RELEASED, [redacted] DEAD

TABLE 4: *Caretta caretta* Incidental Captures
Salem Nuclear Generating Station
1979 through January 1993

DATE	STATUS	COMMENTS
11 Jul 1980	Dead	Apparent boat hit
03 Sep 1981	Live/Released	Release location unknown
08 Sep 1981	Dead	
14 Sep 1981	Dead	Decomposed
10 Jul 1982	Dead	Decomposed
11 Jul 1983	Dead	Decomposed
19 Jul 1983	Dead	Decomposed
03 Jul 1984	Dead	Apparent boat hit
08 Jun 1985	Dead	Apparent boat hit
15 Jul 1985	Dead	
05 Aug 1985	Dead	
07 Aug 1985	Dead	Dead 'one day'
10 Aug 1985	Live/Released	Release location unknown
30 Sep 1985	Dead	Apparent boat hit
14 Jul 1987	Live/Released	Release location unknown
16 Jul 1987	Live/Released	Release location unknown
20 Jul 1987	Live/Released	Release location unknown
05 Jul 1988	Live/Released	Released off Brigantine
09 Jul 1988	Live/Released	Released off Brigantine
12 Jul 1988	Dead	Apparent boat hit
12 Jul 1988	Dead	
12 Jul 1988	Dead	
12 Jul 1988	Dead	
15 Jul 1988	Dead	Decomposed
15 Jul 1988	Dead	

TABLE 4 (continued): Caretta caretta Incidental Captures
Salem Nuclear Generating Station
1979 through January 1993

DATE	STATUS	COMMENTS
01 Jul 1989	Live/Released	Released off Brigantine
25 Jul 1989	Live/Released	Released off Brigantine
05 Jun 1991	Live/Released	Released in Delaware River
11 Jun 1991	Live/Released	Released in Delaware River
15 Jun 1991	Live/Released	Released off Brigantine
23 Jun 1991	Live/Released	Released in Delaware River
24 Jun 1991	Dead	Decomposed
27 Jun 1991	Live/Released	Released in Delaware River
01 Jul 1991	Live/Released	Released off Brigantine
03 Jul 1991	Live/Released	Released in Delaware River
04 Jul 1991	Live/Released	Released in Delaware River
07 Jul 1991	Live/Released	Released in Delaware River
09 Jul 1991+	Live/Released	Released in Delaware River
09 Jul 1991	Live/Released	Released off Brigantine
11 Jul 1991*	Live/Released	Released in Delaware River
20 Jul 1991	Live/Released	Released in Delaware River
23 Jul 1991	Live/Released	Released in Delaware River
25 Jul 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
07 Aug 1991*	Recapture, Live/Released	Released in Delaware River
24 Aug 1991+	Recapture, Live/Released	Released in Delaware River
08 Sep 1991	Live/Released	Released in Delaware River
09 Sep 1991	Live/Released	Released in Delaware River
10 Sep 1991	Live/Released	Released in Delaware River

TABLE 4 (continued): Caretta caretta Incidental Captures
Salem Nuclear Generating Station
1979 through January 1993

DATE	STATUS	COMMENTS
18 Jun 1992	Live	
29 Jul 1992	Live	
28 Aug 1992	Live	
01 Sep 1992	Live	
09 Sep 1992	Live	
11 Sep 1992	Live	
12 Sep 1992	Live	
19 Sep 1992	Live	
20 Sep 1992	Live	
22 Sep 1992	Live	

TOTAL: 60 TAKES; 41 LIVE/RELEASED, 19 DEAD

TABLE 5: Acipenser brevirostrum Encounters Associated with the Salem and Hope Creek Nuclear Generating Station Activities 1978 through January 1993

DATE	SIZE	COMMENTS
12 Jan 1978	Fork length = 545 mm	SNGS CWS intake trash bars, decomposed
26 Jun 1978	Fork length = 625 mm	SNFS CWS intake trash bars, alive/died
24 Apr 1979	Total length = 991 mm	Gillnetted off Art. Island
27 Jul 1979	Total length = 862 mm	Bottom trawl off Artificial Island
01 May 1981	Fork length = 648 mm	SNGS CWS intake trash bars "dead fish" seen floating on previous day
22 Oct 1991	Total length = 782 mm Fork length = 720 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
28 Oct 1991	Total length = 802 mm Fork length = 743 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
06 Nov 1991	Total length = 802 mm Fork length = 668 mm	SNGS CWS intake trash bars alive/died
02 Nov 1992	Total length = 840 mm	SNGS CWS intake trash bars
16 Nov 1992	Total length = 824 mm	SNGS CWS intake trash bars

Appendix 1 - Handling and Resuscitation Procedures

Handling:

Do not assume an inactive turtle is dead. Pressing the soft tissue around the nose of a sea turtle may result in an eye reflex in a comatose turtle. The onset of rigor mortis is often the only definite indication that a turtle is dead.

Keep clear of the head.

Adult male sea turtles of all species other than leatherbacks have claws on their foreflippers. Keep clear of slashing foreflippers.

Pick up sea turtles by the front and back of the top shell (carapace). Do not pick up sea turtles by flippers, the head or the tail.

Resuscitation Procedures:

If a turtle appears to be comatose (unconscious), attempts should be made to revive it immediately. These procedures are designed to void the turtles' lungs of water by active pumping and passive drainage. Sea turtles have been known to revive up to 24 hours after these procedures have been followed:

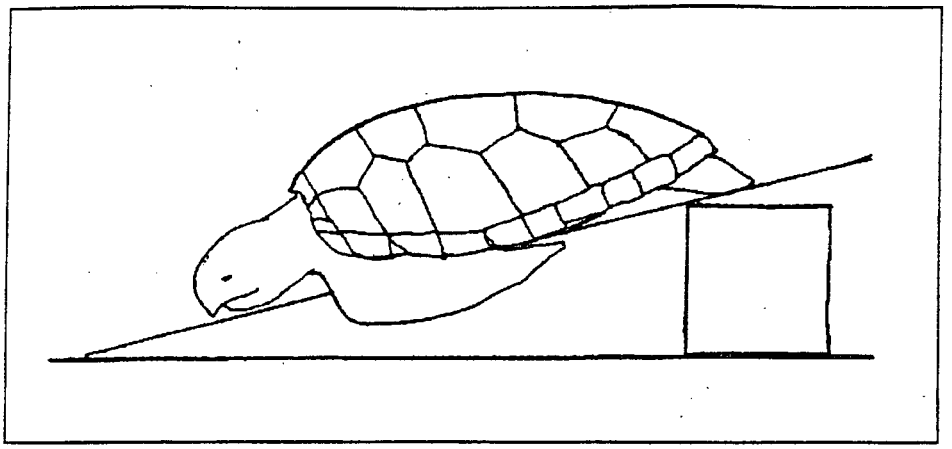
1) Place the turtle on its back and gently pump the breastplate. This may stimulate the animal to breathe and allow water to drain.

2) Place the animal on its breastplate and raise the hindquarters. The degree of elevation depends on the size of the turtle; greater elevations are required for larger turtles.

4) Keep the turtle shaded and moist and observe for 24 hours.

5) When the turtle has revived, release in a manner that minimizes the chances of reimpingement.

Appendix I (co .) - Handling and Resuscit on Procedures



Special Instructions for Cold-Stunned Turtles:

Comatose turtles found in water less than 10°C are probably "cold-stunned". This is most common in the fall and early winter. If a turtle appears to be cold-stunned, the following applies:

To increase blood flow, flap the flippers and rub the skin. Gradually, (over a period of six hours) move the turtle to a warmer area.

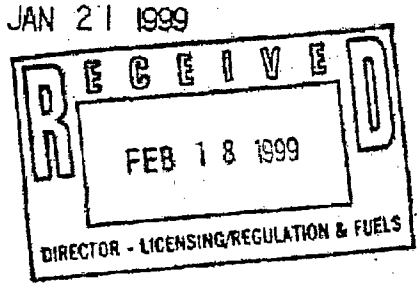
If possible, place the animal in a few inches of water that is warmer then the ocean. Do not cover the mouth or nostrils with water. It is not imperative that sea turtles be kept in water.

Dead sea turtles should be retained for necropsy.

NON-PSEG

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

JAN 21 1999



Thomas H. Essig, Acting Chief
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Essig:

This responds to the Nuclear Regulatory Commission's (NRC) June 15, 1998, request to reinitiate consultation with the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act(ESA), to remove a study requirement from the Incidental Take Statement (ITS) for the Salem and Hope Creek Nuclear Generating Station (SNGS) in Lower Alloways Creek Township, Salem County, New Jersey. Reasonable and prudent measure number seven (7) of the ITS, issued on May 14, 1993, required the Public Service Electric and Gas Company (PSEG), the operator of the SNGS, to track the movements of loggerhead sea turtles incidentally captured at the SNGS and released into Delaware Bay. NMFS required the study for the duration of the ITS or until reevaluation indicated that further investigation was no longer necessary. Based on our review of a June 1997 study report[1] and assessment of the causes of loggerhead sea turtle take at the SNGS (see review below), NMFS revised the ITS to omit the sea turtle study requirement. A new ITS is enclosed and should be attached to the biological opinion concerning operation of the SNGS.

The revised ITS also includes several other modifications, one new reasonable and prudent measure, and one new term and condition. These additional changes are listed below. NMFS and the U.S. Fish and Wildlife Service recently completed an endangered species consultation handbook (*Procedures for Conducting Consultation and Conferences Activities Under Section 7 of the Endangered Species Act*, March 1998, copy enclosed). Hence, we have modified the content and format of the enclosed ITS to comply with these new guidelines.

---

[1] "Evaluation of macrohabitat utilization by loggerhead sea turtles in Delaware Estuary using sonic and satellite tracking techniques." Final Report prepared by the Public Service Electric and Gas Company, Nuclear Business Unit, June 1997.

bcc: F/PR(R), NRC-J. Wilson, FSEG-J. Eggers, D. Hurka, F/NER4 - S. Gorski, K. Greene, F/NER3- N. Haley, F/PR3-Brewer, F/PR3
F/PR3:Brewer/713-1401.1/6/99:arc
Revised 1/20/99:arc
FN:G;Brewer/bioOpinions/snsgsits.doc

Changes to the Incidental Take Statement

1. NMFS decreased the annual allowable take of shortnose sturgeon from ten (10) to five (5) fish. This change reflects a review of annual and average take levels of shortnose sturgeon at the station (i.e., to generate an anticipated level of take). This take level is consistent with shortnose sturgeon take levels assigned for other federal projects in the Delaware River Estuary.

2. NMFS specified a period when ice barriers must be kept out of the circulating water intake (CWS) trash bar area (Reasonable and Prudent Measure Number 1). The reason for this requirement is detailed in the section below.

3. Any shortnose sturgeon recovered from the CWS intake trash bars must be scanned for Passive Integrated Transponder (PIT) tags using an appropriate scanner (Term and Condition Number 4).

4. A new Northeast Region contact for discussing this consultation and submitting reports is identified (Term and Condition Number 5).

5. The annual meeting requirement has been changed to an "as needed" basis (Term and Condition Number 6).

Background: Sea Turtle Study Requirement

In 1991, 23 loggerhead sea turtles were recovered from the SNGS CWS intake trash bar area. All but one of these turtles were recovered alive and released. Prior to 1991, eight loggerhead turtles taken in 1988 represented the largest number of turtles taken in one year. The increased take level in 1991, and another relatively high level of take in 1992 (n= 10), prompted concern that elevated ambient water temperatures, associated with SNGS operation, might attract sea turtles to the intake trash bar area. Therefore, when consultation was reinitiated with NRC in 1993, NMFS added a requirement to the revised ITS to track (via sonic and satellite transmitters) the movements of loggerhead sea turtles incidentally collected at the SNGS.

Between 1992 and 1996, the PSEG tracked the movements of seven loggerhead sea turtles (six in 1992 and one in 1994) in Delaware Bay. Following release, the tagged turtles were mostly relocated

in shallow habitats along the Delaware River shoreline in New Jersey and Delaware or mid-river near the shipping channel. None of the tagged turtles returned to the SNGS region though two of the loggerhead turtles swam ino two tidal tributaries of the bay, the Appoquinomink and Mahom rivers. The tagged loggerhead sea turtles' broad use of the Delaware River and shoreline during the tracking period suggests that suitable habitat exists for loggerhead sea turtles in the Delaware Bay region and that the SNGS region is not preferred habitat for the turtles.

The number of loggerhead sea turtles found on the intake trash bars between 1993 and 1996 (n= 2; one in 1993 and one 1995) was considerably lower than the total number collected in 1991 (n= 23) and closer to the overall average of loggerhead sea turtles taken at SNGS between 1979 and 1996 (mean = 3 turtles/ year). This information indicates that 1991 was an anomalous year for sea turtle takes at SNGS. In 1992, PSEG staff realized that ice barriers, which barricade the intake trash bar region from harmful ice conditions, had been left in place during the off season (Summer and Fall) of 1991 and 1992. The ice barriers probably hindered the sea turtles' ability to easily exit the trash bar region and increased their susceptibility to impingement on the trash racks. Since instituting ice barrier removal during the off season in 1993, the number of sea turtle takes has declined lending additional support for the conclusion that the ice barriers were largely responsible for increased takes in 1991 and 1992. The available tracking data does not provide any evidence that operation of the SNGS attracts sea turtles to the intake trash bar region. Although additional tracking data would improve our understanding of sea turtle distribution and habitat use in Delaware Bay, such a study is no longer a non-discretionary requirement of the NRC's Section 7 consultation concerning operation of the Salem and Hope Creek Nuclear Generating Station. However, since PSEG was unable to track Kemp's ridley and green sea turtles, changes in the capture composition (i.e., a shift towards green on Kemp's ridley) may require reevaluation.

Reinitiation Notice

As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over SNGS operation has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the operation of the SNGS that may affect listed species or critical habitat in a manner or to an extent not considered in the biological opinion; (3) operation of the SNGS is subsequently

modified in a manner that causes an effect to the listed species or critical habitat not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by SNGS operation. In instances where the amount or extent of incidental take is exceeded, the NRC must immediately reinitiate consultation to ensure compliance with Section 7 and Section 9 of the ESA.

NMFS appreciates your efforts to improve the understanding of sea turtle and sturgeon biology in Delaware Bay and further the intent of ESA by implementing conservation programs for listed species. I look forward to continued cooperation through the Section 7 consultation process.

Sincerely,

Hilda Diaz-Soltero
Director
Office of Protected Resources

Enclosures

INCIDENTAL TAKE STATEMENT

(Amended January 21, 1999)

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, hunt, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is any take of a listed species that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the NRC so that they become binding conditions of any grant or permit issued by the NRC, as appropriate, in order for the exemption in section 7(o)(2) to apply. The NRC has a continuing duty to regulate the activity covered by this incidental take statement. If the NRC (1) fails to assume and implement the terms and conditions, or (2) fails to require any contracted group to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to a permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the NRC, or any contracted group, must report the progress of the action and its impact on shortnose sturgeon to the NMFS as specified in the Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

The NMFS anticipates that, annually, five (5) Kemp's ridley, five (5) green turtles, thirty (30) loggerhead sea turtles, and five (5) shortnose sturgeon could be taken during operation of the Salem Nuclear Generating Station. The incidental take is expected to be in the form of injuries and mortalities. Lethal take limits for each species are one (1) Kemp's ridley, two (2) green turtles, and five (5) loggerhead sea turtles, and five (5) shortnose sturgeon. Sea turtles and shortnose sturgeon may be injured or killed by impingement in the circulating water intakes of the Salem Nuclear Generating Station.

The NMFS has determined anticipated take levels for the SNGS based on multiple factors, including: 1) history and type of take at the SNGS; 2) shortnose sturgeon and sea turtle occurrence in the Action area; and 3) duration of the project. The following includes a summary of the analysis on which anticipated take levels are based for project considered in this BO.

Sea turtle and sturgeon takes have been recorded at this station since 1979. Annual ranges, average take levels (over the sampling period), and total mortalities for each species are: green sea turtle: 0 to 1 (mean = 0.1 per year), with one mortality; Kemp's ridley sea turtle: 0 to 6 (mean = one per year) with 11 total mortalities; loggerhead sea turtles: 0 - 23 (mean = 3 per year), with 20 mortalities; and shortnose sturgeon: 0 to 3 (mean = 0.6 per year), with at least five mortalities. Sea turtle takes have occurred during the summer and fall months (5 June through 2 October) when water temperatures are suitable for foraging turtles. Shortnose sturgeon have been collected on the CWS intake trash bars in January (1), May (4), June (1), October (2), and November (3). Past research on shortnose sturgeon indicates that sturgeon mainly occur in the upper Delaware River. Long distance movements to the lower river and upper Bay occur in spring and summer, possibly for increased foraging opportunities. Some portion of the adult population may overwinter in brackish portions of the Delaware estuary, thus increasing their susceptibility to takes in late fall.

EFFECT OF THE TAKE

In the accompanying biological opinion, the NMFS determined that this level of anticipated take is not likely to result in jeopardy to Kemp's ridley, green, or loggerhead sea turtles, or shortnose sturgeon.

REASONABLE AND PRUDENT MEASURES

The NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of Kemp's ridley, green, and loggerhead sea turtles, and shortnose sturgeon:

1. Ice barriers must be removed from the intake trash bar area by May 1 and replaced after October 24.

2. The Salem Nuclear Generating Station's CWS intake trash bars must be cleaned at least three times per week between May 1 and November 15, and must be cleaned daily from June 1 to October 15.

3. The SNGS CWS intake trash bars must be inspected every two hours from June 1 through October 15.

4. If a lethal incidental take of a listed species occurs between June 1 and October 15, that is directly attributable to the plant intake structure, monitoring of the SNGS CWS intake structure must be conducted hourly (rather than every 2 hours).

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the NRC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Comatose sea turtles must be resuscitated according to the procedures described in Appendix 1. These procedures must be posted in appropriate areas such as the fish pool buildings and the circulating water system operator's office.

2. Live sea turtles must be inspected for signs of illness or injury. Any ill or injured sea turtle must be given appropriate medical attention, and must not be released until its condition has improved.

3. Dead sea turtles must be necropsied by qualified personnel. Identification of sex must be determined and stomach contents must be identified to determine whether waste products from the SNGS CWS trash racks are attracting sea turtles. Necropsy reports must be submitted to NMFS when completed.

4. Dead shortnose sturgeon must be inspected for external tags and passive integrated transponder (PIT) tags using an appropriate scanner. Tissue samples must be removed from dead fish and samples and carcasses shipped as instructed in Appendix III.

5. Unless otherwise notified by the NMFS' Northeast Regional Office, documentation of any incidental take must be sent, within 30 days of a take, to Nancy Haley, NMFS, Protected Resources Division, 212 Rogers Avenue, Milford, CT 06460 (fax number: 203. 579.7072). For shortnose sturgeon mortalities, use the mortality report shown in Appendix II.

6. As appropriate, the NMFS, NRC, and PSEG staff will review incident reports to identify trends in sea turtle and shortnose sturgeon takes and conservation recommendations that may improve understanding of listed species' biology in the region.

The NMFS believes that, annually, no more than five (5) Kemp's ridley, five (5) green, and thirty (30) loggerhead sea turtles, and five (5) shortnose sturgeon will be incidentally taken as a result of SNGS operation. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impacts of incidental take that might otherwise result from the plant's operation. If, during the course of this action, this level of incidental take is exceeded, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The NRC must immediately provide an explanation of the causes of the taking and review with the NMFS the need for possible modification of the reasonable and prudent measures.

APPENDIX II

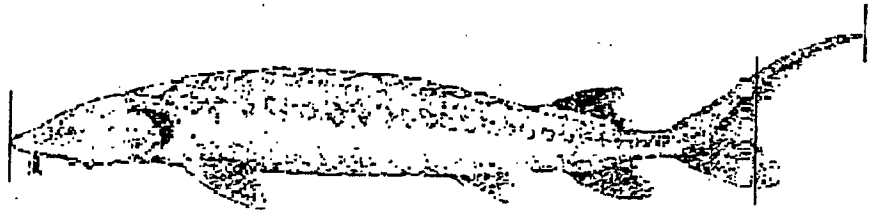
Mortality Record for Shortnose Sturgeon

Date: _____ Time of Day (fish discovered): _____

_____ Photos taken: Y / N

Tags detected: Y / N External: _____

_____ PIT #:_____



_____

Fork Length (FL, to nearest mm)

_____

Total Length (TL, to nearest mm)

Measurements: Fork Length: _____ in. / mm

Total Length: _____ in. / mm

Comments (condition of fish, how discovered, etc.):

Disposition of carcass and any tissues:

APPENDIX III

Instructions for Tissue Removal from Shortnose Sturgeon and Disposition of Carcasses

a.) Instructions for Tissue Removal from Shortnose Sturgeon:
Using a sharp knife, cut away a one centimeter square piece from the soft tissue on any of the fins. Place the sample in a sealed container containing 95% ethanol. Include a copy of the shortnose sturgeon mortality report with the shipment. Unless otherwise instructed by the NMFS, ship the sample to:

Dr. Ike Wirgin
Institute of Environmental Medicine
New York University Medical Center
Long Meadow Road
Tuxedo, New York 10987
(914) 351-2415

b.) Disposition of Fish Carcasses:
Unless otherwise instructed by the NMFS, transfer shortnose sturgeon mortalities to the institution listed below. Include a copy of the shortnose sturgeon mortality report with the specimen.

Academy of Natural Sciences
Department of Ichthyology
1900 Benjamin Franklin Parkway
Philadelphia, Pennsylvania 19103-1195

Contact: Bill Saul, Collection Manager
(215) 299- 1026

LOGGERHEAD SEA TURTLE DATA

DATE:	TA	CSL (cm)	CSW (cm)	WEIGHT (kg)	RECEIVED STATUS	RELEASE LOCATION	COMMENTS
08/23/79					LIVE	DELAWARE BAY	CAUGHT DURING TRAWL, RM15
06/30/80	*	50			DEAD	----	CWIS
07/11/80	*	64			DEAD	----	CWIS 12A
09/02/80					LIVE	EGG ISLAND POINT	CAUGHT DURING TRAWL
06/30/81					DEAD	----	OBSERVED FLOATING DURING TRAWL, LEFT IN WATER
09/02/81					LIVE	DE RIVER/OFFSHORE	CAUGHT DURING TRAWL
09/03/81	*	46.4	41.5		LIVE	SUNKEN SHIP COVE	CWIS 11B
09/08/81	*	51	57.5	40.8	DEAD	----	CWIS
09/13/81	*	52.3	43.1		DEAD	----	CWIS
07/10/82	*	29	28	3.6	DEAD	----	CWIS
07/11/83	*	45.6	41.7	14	DEAD	----	CWIS
07/19/83	*	54	34	22	DEAD	----	CWIS
07/02/84				42	DEAD	----	CAUGHT DURING TRAWL
07/03/84	*	35.56		34.02	DEAD	----	CWIS
07/11/84	*	81		25	DEAD	----	CWIS
06/08/85	*	48.3	35.6	7.9	DEAD	----	CWIS
07/15/85	*	52.5	43	15.9	DEAD	----	CWIS
07/22/85							OBSERVED BY SGS OPERATOR
08/05/85	*	59	49.5	27.2	DEAD	----	CWIS
08/07/85	*	50	40	29.5	DEAD	----	CWIS
08/10/85	*	53	43	15.9	LIVE	MMSC	CWIS
09/30/85	*	52	43	20	DEAD	----	CWIS
06/15/87		70	61		LIVE	DELAWARE BAY	CAUGHT DURING TRAWLS
07/14/87	*	40.6	38.1	13.6	LIVE	MMSC	CWIS
07/16/87	*	40.5	35.5	11.3	LIVE	MMSC	CWIS
07/20/87	*	69	54	36	LIVE	MMSC	CWIS
10/14/87		44.5	40.2		DEAD	----	FOUND DECOMPOSED ON AI BEACH
07/05/88	*	62	47	35	LIVE	MMSC	CWIS
07/09/88	*	35	32	16	LIVE	MMSC	CWIS
07/12/88	*	48	39	16	DEAD	----	CWIS
07/12/88	*	37	32	7	DEAD	----	CWIS
07/12/88	*	43	39	14	DEAD	----	CWIS
07/12/88	*	43	38	14	DEAD	----	CWIS
07/15/88	*	49	41	20	DEAD	----	CWIS
07/15/88	*	61	46	36	DEAD	----	CWIS
07/01/89	*	55.9	46.9	22.2	LIVE	MMSC	CWIS
07/25/89	*	48.3		17.2	LIVE	MMSC	CWIS
06/05/91	*	49.5	41.9	20.41	LIVE	DE RIVER/OFFSHORE	CWIS
06/11/91	*	46.8		15.9	LIVE	DE RIVER/STOW CREEK	CWIS
06/15/91	*	70.1		31.75	LIVE	BRIGANTINE, NJ	CWIS
06/23/91	*	46.4		18.03	LIVE	DE RIVER/OFFSHORE	CWIS
06/24/91	*	49.9			DEAD	----	CWIS
06/27/91	*	57.4		29.48	LIVE	DE RIVER/OFFSHORE	CWIS
07/01/91	*	57.3		32.55	LIVE	BRIGANTINE, NJ	CWIS
07/03/91	*	51.5	44.3	23.93	LIVE	DE RIVER/STOW CREEK	CWIS
07/04/91	*	44.2	38.9	15.76	LIVE	DE RIVER/STOW CREEK	CWIS
07/07/91	*	52.9	46.9	27.1	LIVE	DE RIVER/STOW CREEK	CWIS

07/09/91	*	50.9		44.5		20.4		LIVE		DE RIVER/OFFSHORE	CWIS
07/09/91	*	58.8		47.9		31.64		LIVE		BRIGANTINE, NJ	CWIS
07/11/91	*	44.6		39.3		15.76		LIVE		DE RIVER/OFFSHORE	CWIS
07/20/91	*	47		41		15.88		LIVE		DE RIVER/OFFSHORE	CWIS
07/23/91	*	49.5		43.9		19.28		LIVE		DE RIVER/OFFSHORE	CWIS
07/25/91	*	51.15		48.3		25.86		LIVE		DE RIVER/OFFSHORE	CWIS
08/01/91	*	48.9		41		19.05		LIVE		DE RIVER/OFFSHORE	CWIS
08/01/91	*	39.4		33.9		8.62		LIVE		DE RIVER/OFFSHORE	CWIS
08/07/91	*	46.5		40.5		17.27		LIVE (R)		DE RIVER/OFFSHORE	CWIS - RECAPTURE FROM 7/11/91
08/24/91	*	53.9		46.4		23.1		LIVE (R)		DE RIVER/OFFSHORE	CWIS 21A-RECAPTURE FROM 7/9/91
09/08/91	*	46.4		38.6		16.33		LIVE		DE RIVER/OFFSHORE	CWIS 23A
09/09/91	*	56.8		48.2		28.58		LIVE		DE RIVER/OFFSHORE	CWIS 11A
09/10/91	*	49.7		43.1		19.96		LIVE		DE RIVER/OFFSHORE	CWIS 22B
06/18/92	*	53.3		46		21.4		LIVE		DE RIVER/OFFSHORE	CWIS 22B
07/29/92	*	48.2		43.4		17.7		LIVE		DE RIVER/OFFSHORE	CWIS 22A
08/28/92	*	52.3		46.6		27		LIVE		DE RIVER/OFFSHORE	CWIS
09/01/92	*	50.2		42.3		23.2		LIVE		DE RIVER/OFFSHORE	CWIS
09/09/92	*	59.4		54.4		32.7		LIVE		DE RIVER/OFFSHORE	CWIS
09/11/92	*	50.6		43.2		21.5		LIVE		DE RIVER/OFFSHORE	CWIS
09/12/92	*	48.4		41.3		17.27		LIVE		DE RIVER/OFFSHORE	CWIS
09/19/92	*	51.9		44.5		24		LIVE		DE RIVER/OFFSHORE	CWIS
09/20/92	*	61.7		52.6		34.5		LIVE		DE RIVER/OFFSHORE	CWIS
09/22/92	*	54.2		46.7		25.5		LIVE		DE RIVER/OFFSHORE	CWIS
06/24/94	*	47.4		41.7		18.43		LIVE		DE RIVER/STOW CREEK	CWIS
07/02/95	*	51.1						DEAD		----	CWIS 22A
06/27/98	*	NA		NA		NA		DEAD		----	CWIS
07/12/00	*	60		55		NA		DEAD		----	Very badly decomposed. Only rear 2/3 of animal remained. Disposed of with river debries.
08/31/00	*	63		56.5		56.7		LIVE		DE RIVER/STOW CREEK	
08/31/01	*	53		50		NA		DEAD		----	Very badly decomposed. Most of right side was missing.
07/17/04		86		51				LIVE		DE RIVER/OFFSHORE	CAUGHT IN TRAWL
		AVERAGE									
		LENGTH =		51.137							
		AVERAGE					# OF				
		WIDTH =		42.939			TURTLES =		77		
		AVERAGE									
		WEIGHT =		21.135							

KEMP'S RIDLEY SEA TURTLE DATA

DATE:		CSL (cm)	CSW (cm)	WEIGHT (kg)	RECEIVED STATUS	RELEASE LOCATION	COMMENTS
08/11/80	*	28	27		LIVE	DE RIVER/OFFSHORE	CWIS 13A
09/23/81	*	32.5	29		DEAD	---	CWIS 12A
07/13/83	*	23	21	1.83	DEAD	---	CWIS
08/29/84	*	32.3	20.3		LIVE	SUNKEN SHIP COVE	CWIS
06/11/85	*	25.4	24.13	2.27	LIVE	MMSC	CWIS
06/24/85	*	27.9	25.4	1.81	DEAD	---	CWIS
07/05/86	*	18.7	16.5	1	DEAD	---	CWIS
09/24/87	*	21	19	1.3	LIVE	DIED AT MMSC	CWIS
09/24/87	*	25	22	2.3	DEAD	---	CWIS
09/29/87	*	23	22	2.2	LIVE	FLORIDA (MMSC)	CWIS
07/05/88	*	29	33	2	LIVE	MMSC	CWIS
07/27/88	*	25	23	1	DEAD	---	CWIS
08/05/89	*	23		1.9	LIVE	MMSC	CWIS
08/06/89	*	24		2.2	LIVE	DIED AT MMSC	CWIS
08/08/89	*	25.6		2.7	LIVE	MMSC	CWIS
08/30/89	*	23		2.3	LIVE	MMSC	CWIS
09/06/89	*	17		1.45	DEAD	---	CWIS
09/23/89	*	30		4.87	LIVE	MMSC	CWIS
06/27/91	*	26.4	25.3	2.72	LIVE	DE RIVER/OFFSHORE	CWIS
09/01/92	*	25.8	24.6	2.95	DEAD	---	CWIS
09/04/92	*	28.8	22.5	1.6	DEAD	---	CWIS
09/28/92	*	25.4	23.1	2.3	LIVE	DE RIVER/OFFSHORE	CWIS
10/02/92	*	25.4	23.1	2.3	LIVE (R)	DE RIVER/STOW CREE	9/28/92
07/17/93	*	24.6	22.3	2.05	LIVE	DE RIVER/OFFSHORE	CWIS

AVERAGE LENGTH =	25.408	
AVERAGE WIDTH =	23.513	NUMBER OF TURTLES = 24
AVERAGE WEIGHT =	2.1452	

GREEN SEA TURTLE DATA									
DATE:		CSL (cm)		CSW (cm)		WEIGHT (kg)	RECEIVED STATUS	RELEASE LOCATION	COMMENTS
08/11/80							LIVE	DE RIVER/OFFSHORE	FOUND DURING TRAWL
09/16/91	*	37.8		32.1		8.16	LIVE	DE RIVER/OFFSHORE	CWIS
08/31/92	*	29.9		24.2		3.9	DEAD	---	CWIS

Shortnose Sturgeon (*Acipenser brevirostrum*)

Date:		FL (cm)	TL (cm)	Weight (Kg)	Status	Location	Comments
01/12/1978	*	54.5			Dead	CWIS	Decomposed
06/26/1978	*	62.5			Live	CWIS	Alive, died
04/24/1979			99.1		Live	Trawl	Captured in Trawl, released
07/27/1979			86.2		Live	Trawl	Captured in Trawl, released
05/01/1981	*	44	NA	2.384	Dead	CWIS	
10/22/1991	*	72	80.2	4.05	Dead	CWIS	
10/28/1991	*	74.3	82.8	2.65	Dead	CWIS	
11/06/1991	*	66.8	78.2	2.9	Live	CWIS	Alive, died
11/02/1992	*	74.5	84	~ 4.0	Dead	CWIS	
11/16/1992	*	72	82.4	4.09	Dead	CWIS	
05/19/1994	*	72	83	3.3	Dead	CWIS	
05/20/1994	*	70.8	77.3	2.6	Dead	CWIS	
05/06/1998	*	NA	~ 61	NA	Live	CWIS	
05/14/1998	*	77.5	85.5	NA	Live	CWIS	
05/16/1998	*	~ 63.9	NA	3.18	Dead	CWIS	
03/31/1999	*	59	63	1	Live	CWIS	
04/18/2000	*	76	85	2.1	Dead	CWIS	
May 2002					Live	Bottom Trawl	Zone 13
Aug 2002					Live	Bottom Trawl	Zone 14
04/09/2003	*	~69	NA	~2.5	Live	CWIS	Live but tail was mostly severed and it died shortly after recovery
Jul 2003					Live	Bottom Trawl	Zone 14
Sept 2003					Live	Bottom Trawl	Zone 10
Apr 2004					Live	Bottom Trawl	Zone 8
Jul 2004					Live	Bottom Trawl	Zone 12
Sept 2004					Live	Bottom Trawl	Zone 14
Sept 2004					Live	Bottom Trawl	Zone 14
10/01/2004	*	64.6	73.7	1.1	Live	CWIS	Alive but died shortly after recovery. Appeared weak and underweight for it's size.
11/28/2007	*		67.4	5	Dead	CWIS	Decayed and decomposed, initially identified as Atlantic but tag inside carcass later identified as Shortnose
05/05/2008		752	841		Live	Trawl	Captured in trawl, released
06/09/2008		690	765		Live	Trawl	Captured in trawl, released
07/31/2008	*		508	0.9	Dead		Decayed and decomposed

Atlantic Sturgeon (*Acipenser oxyrhynchus*)

Date:		FL (cm)	TL (cm)	Weight (Kg)	Status	30 Day Ltr.	Location	Comments
May 1995					Live		Trawl	
Jun 2002					Live		Bottom Trawl	Zone 9
Aug 2002					Live		Bottom Trawl	Zone 11
Aug 2003					Live		Bottom Trawl	Zone 14
Aug 2003					Live		Bottom Trawl	Zone 14
Sept 2003					Live		Bottom Trawl	Zone 13
Nov 2003					Live		Bottom Trawl	Zone 14
Jun 2004					Live		Bottom Trawl	Zone 13
Jul 2004					Live		Bottom Trawl	Zone 14
Oct 2004					Live		Bottom Trawl	Zone 8
Oct 2004					Live		Bottom Trawl	Zone 12
Oct 2004					Live		Bottom Trawl	Zone 12
Oct 2004					Live		Bottom Trawl	Zone 12
Aug 2006					Live		Trawl	Zone 1

BIOLOGICAL OPINION COMPLIANCE

1. PURPOSE

1.1 This document, in conjunction with EN-AA-603-0001 (Threatened and Endangered Species) provides PSEG Nuclear personnel with direction in complying with the terms and conditions for the Incidental Take Statement associated with the Biological Opinion issued by the National Marine Fisheries Service (NMFS) to the United States Nuclear Regulatory Commission (NRC) for the operation of the Salem Generating Station's Circulating Water Intake Structure (CWIS), as amended January 21, 1999.

1.2 The Incidental Take Statement authorizes the regulated take of Threatened and Endangered (T&E) sea turtles and shortnose sturgeon incidental to the continued operation of the Salem CWIS. NMFS has determined (May 14, 1993) that continued operation of Hope Creek Generating Station is not expected to impact sea turtles and no additional monitoring is required. However, any take of a Threatened or Endangered species at Hope Creek shall be in accordance with EN-AA-603-0001, Threatened and endangered Species.

1.3 Affected species include the Loggerhead Sea Turtle (Caretta caretta), Kemp's Ridley Sea Turtle (Lepidochelys kempi), Green Sea Turtle (Chelonia mydas), and the fish species Shortnose Sturgeon (Acipenser brevirostrum)

2. TERMS AND DEFINITIONS

2.1 **Incidental Take** – The take of any listed T&E species that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

2.2 **Take** – to harass, hunt, pursue, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

2.3 **Threatened and Endangered Species (T&E Species)**: Those species listed as either threatened or endangered on state and/or federal lists of such species. The populations of these species are sufficiently at risk that regulatory intervention has been considered necessary to the survival of the species.

For the purposes of this procedure, regulated species include the Loggerhead Sea Turtle (Caretta caretta), Kemp's Ridley Sea Turtle (Lepidochelys kempi), Green Sea Turtle (Chelonia mydas), and the fish species Shortnose Sturgeon (Acipenser brevirostrum)

3. RESPONSIBILITIES

3.1 Chemistry / Environmental Personnel - Responsible for ensuring that the Terms and Conditions of the Incidental Take Statement for the Salem CWIS are met in accordance with the currently amended Biological Opinion. Also responsible for preparing and submitting Incidental Take reports and coordinating with the NRC/NMFS/NJDEP on an as-needed basis. Responsible for the implementation of Biological Opinion compliance at the site. Site Environmental Personnel shall be cognizant of those indigenous species which are currently regulated under the Incidental Take Statement.

3.2 Salem Shift Manager – Responsible for ensuring that inspections and operational measures required under the terms and conditions of the Incidental Take Statement are implemented.

3.3 Operations Personnel – Responsible for conducting inspections and taking actions as specified by the Terms and Conditions of the Incidental Take Statement and reporting any take of a potentially Threatened or Endangered species to Environmental Staff.

4. MAIN BODY

NOTE: The take of any Threatened or Endangered species requires reporting to the US Nuclear Regulatory Commission, National Marine Fisheries Service, and New Jersey Department of Environmental Protection as specified in EN-AA-603-0001, Threatened and Endangered Species .

4.1 The Incidental Take Statement issued by the NMFS for the response to T&E species encountered at the Salem Generating Station's CWIS specifies requirements for the prevention of and response to any such encounters. The following steps outline the preventative and responsive measures. The procedure EN-AA-603-0001, Threatened and Endangered Species, details the specific responses to an actual take of one of these species.

4.1.1 **REMOVE** ice barriers at the Salem CWIS from the intake trash bar area between May 1 and October 24 of each year [SC.OP-PT.ZZ-0002].

4.1.2 **INSPECT** Salem CWIS trash bars for the presence of T&E species every two hours between June 1 and October 25 of each year.[SC.OP-PT.ZZ-0002]

1. **CLEAN** the Salem CWIS trash bars at least three times per week between May 1 and November 15. [SC.OP-PT.ZZ-0002]

2. **CLEAN** the Salem CWIS daily between June 1 and October 15 of each year. [SC.OP-PT.ZZ-0002]

4.1.3 **If** a lethal incidental take of a listed species occurs between June 1 and October 15 that is directly attributable to the Salem CWIS, **then MONITOR** the trash racks every hour for the presence of listed species. [SC.OP-PT.ZZ-0002]

4.1.4 **RESPOND** to the presence of a listed species. Reference EN-AA-603-0001, Threatened and Endangered Species

4.1.5 Annually **VERIFY** that the Sea Turtle Resuscitation Poster is installed and legible.

4.1.6 **If** a sea turtle is comatose, **then RESUSCITATE** in accordance with EN-AA-603-0001, Threatened and Endangered Species

4.1.7 **INSPECT** live sea turtles for signs of illness or injury in accordance with EN-AA-603-0001, Threatened and Endangered Species

4.1.8 **PROCESS** dead sea turtles or shortnose sturgeon in accordance with EN-AA-603-0001, Threatened and Endangered Species

4.1.9 **SUBMIT** documentation to the NMFS, USNRC, and NJDEP in accordance with EN-AA-603-0001, Threatened and Endangered Species.

4.1.10 **If** the level of incidental take exceeds the provisions of the Incidental Take Statement, **then INITIATE** a review of the incidental take with the NRC and NMFS.

1. No more than five (5) Kemp's ridley, five (5) green turtles, and thirty (30) loggerhead sea turtles and five (5) shortnose sturgeon may be taken in a year.

2. Lethal take limits for each species are one (1) Kemp's ridley, two (2) green turtles, five (5) loggerhead sea turtles, and five (5) shortnose sturgeons.

4.1.11 **REVIEW** incident reports as appropriate, or as directed by the NRC/NMFS, to identify trends in sea turtle and shortnose sturgeon takes and conservation recommendations.

5. **DOCUMENTATION** - Retain all documentation and reports in accordance with EN-AA-101.

6. REFERENCES

6.1.1 EN-AA-603-0001, Threatened and Endangered Species.

6.1.2 National Marine Fisheries Service Section 7 Consultation/Biological Opinion regarding the take of marine turtles and shortnose sturgeon at the Salem Circulating Water Intake Structure, as amended January 21, 1999.

6.1.3 SC.OP-PT.ZZ-0002, Station Preparations for Seasonal Conditions.

6.1.4 50 CFR 17, Endangered and Threatened Wildlife and Plants.

6.1.5 N.J.A.C 7:25, Division of Fish and Wildlife Rules

7. ATTACHMENTS - None

SPECIES MANAGEMENT

TABLE OF CONTENTS

SPECIES MANAGEMENT

1. PURPOSE

1.1 This document, in conjunction with EN-AA-603-0001 (Threatened and Endangered Species) provides direction in safely responding to various interactions with plants and animals that may occur at the Salem and Hope Creek Generating Stations

1.2 This procedure cannot anticipate all possible encounters with plants or animals at the Stations. This document provides guidance to the Site Environmental Coordinator and Site Environmental Personnel on the kinds of encounters that may occur.

2. TERMS AND DEFINITIONS

2.1 **Nuisance Species:** Those species that are **not** State or Federal Threatened or Endangered Species, and are potentially injurious to humans, fish, or wildlife or their habitats, or to the interests of agriculture, horticulture, forestry, or other human endeavor - includes:

2.1.1 **Noxious weeds**: Those plant species that are highly invasive, usually are non-native to the region, and significantly and adversely interfere with human activities.

2.1.2 **Vermin**: Those animals, including mice, rats, and some insects that can significantly and adversely interfere with human activity and/or carry disease.

2.2 **Threatened and Endangered Species (T&E Species):** Those plant or animal species listed as either threatened or endangered on state and/or federal lists of such species. The populations of these species are sufficiently at risk that regulatory intervention has been considered necessary to the survival of the species.

Such species have typically included the Loggerhead Sea Turtle (Caretta caretta), Kemp's Ridley Sea Turtle (Lepidochelys kempi), Green Sea Turtle (Chelonia mydas), the Shortnose Sturgeon (Acipenser brevirostrum), Bald Eagle (Haliaeetus leucocephalus), and the Osprey (Pandion haliaetus). [Reference EN-AA-603-0001]

2.3 **Vegetation**: Any and all plant material rooted to the ground or Station structures.

2.4 **Wildlife** – For the purposes of this procedure, those animals that are neither nuisance species nor T&E speces, for which some response may be necessary to ensure the safety and reliability of the facility, the safety of it's personnel, or the safety of the animal concerned, as appropriate. This includes aquatic, terrestrial, and avian (i.e. bird) species.

3. RESPONSIBILITIES

3.1 Site Environmental and Radwaste Supervisor - Responsible for ensuring that all Species Management activities occurring at the site complies with all applicable environmental regulations, and is also responsible for determining the appropriate response to a particular Species Management incident within the framework of this procedure, applicable regulations, and safe practices.

3.2 Site Environmental Personnel – Responsible for the implementation of Species Management activities at the site. Site Environmental Personnel shall be cognizant of those indigenous species which are currently listed as either threatened or endangered under Federal (50 CFR 17.11) or State (NJAC 7:7-3.38) regulations.

3.3 Facilities Superintendent – Responsible for the implementation of Species Management activities at the site. Site Environmental Personnel shall be cognizant of those indigenous species which are currently listed as either threatened or endangered under Federal (50 CFR 17.11) or State (NJAC 7:7-3.38) regulations

3.4 All Station Personnel – Responsible for reporting any encounters with species (plant or animal) to the Facilities Superintendent or Site Environmental Personnel that may:

- Pose a threat to the health or safety of station personnel; or
- Adversely interfere with Station operations, including but not limited to electrical generation, electrical transmission, security, solid waste disposal, food service; or
- Involve the interaction with a T&E species as defined above.

CAUTION

Do not approach, harass, or feed any animals observed on the site.

4. MAIN BODY

4.1 Nuisance Species

4.1.1 Nuisance species may pose an immediate or latent threat to the health or safety of station personnel and/or safe Station operations, including but not limited to electrical generation, electrical transmission, security, solid waste disposal, food service. Examples include:

- Undesirable vegetation that interferes with security safeguards
- Venomous insects (e.g. hornets, bees) that colonize areas of the site and pose an immediate health/safety risk
- Potential disease-carrying rodents or insects that appear with regularity in human-occupied areas of the site

4.1.2 Management of nuisance species usually requires the services of an exterminator or licensed herbicide applicator. The Site Environmental Coordinator will **EVALUATE** whether a nuisance species infestation requires an external professional or if the infestation can be addressed with internal resources (e.g. with over-the-counter sprays, traps, etc.)

4.1.3 **If** the Site Environmental Coordinator determines that an external professional is required to safely address a nuisance species infestation, **then** the external professional **shall** be licensed in accordance with the provisions of N.J.A.C. 7:30-1 through N.J.A.C. 7:30-13.

4.1.4 **If** the Site Environmental Coordinator determines that an internal resource can safely address a nuisance species infestation, **then** the internal resource **shall** be aware of the precautions and practices outlined in Section 4.1.2 – Wildlife and Fish, and **shall** utilize all nuisance species handling equipment (e.g. over-the-counter sprays, traps, etc.) in accordance with the manufacturers' instructions.

4.2 Wildlife

4.2.1 This section applies to any encounters with wildlife on the site that are neither nuisance species nor T&E species as defined above. Examples include:

- A wild raccoon is reported within a security zone
- An injured bird is reported on site
- A coyote is seen in the parking lot
- A live animal is reported within a non-radiologically controlled building or structure
- A dead bird or mammal is reported on-site.

4.2.2 Terrestrial wildlife species, including deer, foxes, raccoons, opossums, coyotes, bobcats, muskrats, otters, bats, and feral cats or dogs may occur on site or even within the Security Zone or Protected Area. Aquatic wildlife includes such species as terrapin and fish. Avian wildlife includes bird species such as raptors, owls, and swallows. Such an occurrence can, in some cases, threaten the safety of site personnel or visitors, the safe operation of the units, or PSEG Nuclear property.

4.2.3 Wildlife may be protected under various laws, even if not considered T&E species.

4.2.4 The deliberate harassment, harming, or killing of any wild animal, including those on the Site or Site Access Road, beyond the provisions of the applicable procedures is forbidden and could result in disciplinary and/or legal action.

CAUTION

Wild birds and mammals can scratch or bite. Proper personal protective equipment including, at a minimum heavy-duty leather gloves, sturdy leather boots, and safety glasses must be worn at all times to prevent injury. Some bird species will aggressively attack any shiny object, including rings, eyeglasses, belt buckles, keys, etc.

1. **If** a live animal is reported on-site, **then DIRECT** personnel to keep at least 30 feet away from the animal, if it is safe and/or possible for them to do so.

   – **If** the animal appears to be injured, sick, or behaving unexpectedly, **then CONTACT** an animal control service immediately. **Do not** attempt to trap or apprehend the animal directly. The nearest licensed animal control specialists to Salem/Hope Creek are:

   Hoffman's Exterminating Co, Inc.

   Contact - 856-468-0183

   or

   United Wildlife Control

   Contact – 1-888-488-1415

- **If** the animal is on-site, but **not** in a security zone, protected area, or site building, structure, or enclosure, **then MONITOR** the animal from a safe distance.
-

CAUTION

Do not feel obligated to attempt to handle any animal encountered on site. The risks of doing so must be evaluated on a case-by-case basis. Always DEFER to trained animal control specialists if doubts exist as to the safety of a response.

CAUTION

Wild birds and mammals, even dead ones, can carry diseases, including bird-flu and rabies. Use caution when handling any bird or mammal, and thoroughly wash hands and other areas of contact with soap and water after any encounter.

CAUTION

Wild birds and mammals are unpredictable. Cornered or frightened animals can appear docile, but rapidly can become agitated or aggressive without warning.

CAUTION

Many wild birds and mammals can be surprisingly strong. Caution should be used in handling or guiding the animal to prevent injury to personnel or to the animal.

2. **If** a live animal is in a security zone, **then COORDINATE** with the Security Department to facilitate safe access to the area for animal recovery.

3. **If** the animal is within a building or other enclosure, **then ATTEMPT** to provide the animal with an unobstructed egress (e.g. an open door) when it is possible to do so safely. Often, wild animals are able to find their own way out after they are allowed to calm down. **BLOCK** pathways to areas from which extraction of the animal might become more difficult or pose a greater risk to plant personnel and equipment if it is possible and safe to do so.

4. **If** it is deemed necessary to probe or prod the animal to move in a desired direction, **then USE** a long-handled implement (e.g. broom, shovel, pipe) to do so to maximize distance to the animal.

5. Large tarps or drop-cloths may be used to create temporary, movable barricades to prevent or block animal movement in certain directions. **ENLIST** available personnel to aid recovery efforts, as necessary.

6. **If** the animal charges or exhibits other aggressive behavior, **then** immediately **STOP** recovery efforts and **BACK AWAY**. Allow the animal time and space to calm down.

7. The Facilities Superintendent will determine if an animal encounter requires the services of an external animal control specialist.

8. **If** the animal appears dead, **then APPROACH** it with caution. Often, animals can appear dead if they are frightened, traumatized, injured, or diseased.

– **If** the animal reacts by moving, running, or calling, **then RESPOND** in accordance with Steps 3 through 9 above.

If the animal is a bird that appears to be injured and on the ground within the site, then the Site Environmental Coordinator **should** CONTACT

9. **If** the animal is dead, **then** do **not TOUCH** the animal directly. Use gloves, a shovel, etc. as necessary to remove the animal. **PLACE** the carcass in a plastic trash bag for disposal as solid waste. **DISCARD** gloves, and **WASH** hands with soap and water. Animal carcasses are to be disposed of as non-hazardous solid waste.

4.3 Aquatic Wildlife

4.3.1 Fish species can interact with station intake structures. At the Salem Circulating Water Intake Structure, fish are handled routinely as part of the biological monitoring program required by the Salem Station's New Jersey Pollutant Discharge Elimination System Permit. An excessive kill of fish at the intake requires the notification of the USNRC. [Reference EN-AA-601]

4.3.2 Shortnose sturgeon are a T&E species and should be handled in accordance with the procedures in EN-AA-603-0001. In addition, resource management agencies have requested that the non-T&E Atlantic sturgeon be handled using identical procedures.

4.3.3 Several resource management agencies have requested any captured Flathead catfish (*Pylodictus olivaris*) are not to be returned live to the Delaware River. This is a non-native, invasive species and has the potential to become a nuisance.

1. **If** a flathead catfish is collected and positively identified by on-site biological monitoring contractors or a qualified fisheries biologist, **then KILL** the fish and dispose of it as solid waste.

4.3.4 Snapping turtles, diamondback terrapins, and T&E marine sea turtles all have the potential to be observed on the site. A guide to identifying these species is attached to this procedure and is posted at the Salem Circulating Water Intake Structure. T&E sea turtles are to be handled in accordance with EN-AA-603-0001, Threatened and Endangered Species. All other turtles found on site should be handled as terrestrial animals as discussed above.

4.4 Avian Wildlife

4.4.1 Birds may be protected under various laws, even if they are not T&E species. Some examples include barn swallows, herons and egrets, and seagulls.

4.4.2 T&E avian species that may be encountered on the site could include the bald eagle (*Haliaeetus leucocehpalus*), peregrine falcon (*Falco peregrinus*), and the osprey (*Pandion haliaetus*). **Do not** harass or attempt to handle these animals.

1. These bird species have been known to nest or perch on station/transmission infrastructure.

2. If any bird appears to be building or occupying a nest on Station or transmission infrastructure, then REPORT the bird to the Site Environmental Coordinator.

3. The Site Environmental Coordinator will arrange for positive identification of the bird and will provide further direction, as may be required by applicable regulations.

4. If a T&E bird appears to be injured and on the ground within the site, then the Site Environmental Coordinator shall CONTACT Tri-state Bird Rescue and Research at the following number:

302-737-9543 (answered from 9 am - 5 pm EST daily)

4.5 Vegetation

4.5.1 Vegetation on the site shall be managed in accordance with EN-AA-603-0002.

4.5.2 Although the presence of T&E plants on the site is unlikely because of Artificial Island's dredge-spoil construction and subsequent disturbances, T&E plant species have been observed under nearby transmission lines in Lower Alloway Creek. In particular, the endangered swamp pink (*Helonias bullata*) may be encountered in transmission line freshwater wetlands. This species is depicted in the attachment to this procedure.

4.5.3 **If** a plant species is encountered that may be a T&E species, **then CONTACT** the Site Environmental Coordinator to have the plant identified.

4.5.4 Threatened and Endangered Species

1. Aquatic T&E Species may include the Loggerhead Sea Turtle (*Caretta caretta*), Kemp's Ridley Sea Turtle (*Lepidochelys kempi*), Green Sea Turtle (*Chelonia mydas*), the Shortnose Sturgeon (*Acipenser brevirostrum*), and Atlantic Sturgeon (*Acipenser oxyrhynchus*).

A. The handling and disposition of these aquatic T&E species is proceduralized in EN-AA-603-0001, Threatened and Endangered Species. [EN-AA-603-0001]

4.6 Species Management in Radiological Areas

4.6.1 Species management in radiological controlled areas invokes specialized radiological protection requirements.

4.6.2 **If** a species is observed in a radiological controlled area, **then REPORT** the observation to the Site Environmental Coordinator.

4.6.3 The Site Environmental Coordinator will coordinate with the Station-specific Radiation Protection Department to respond to the incident on a case-by-case basis.

5. **DOCUMENTATION** – None

6. REFERENCES

EN-AA-601, Environmental Protection Plan Compliance

EN-AA-601-0001, Biological Opinion Compliance

EN-AA-603-0001, Threatened and Endangered Species

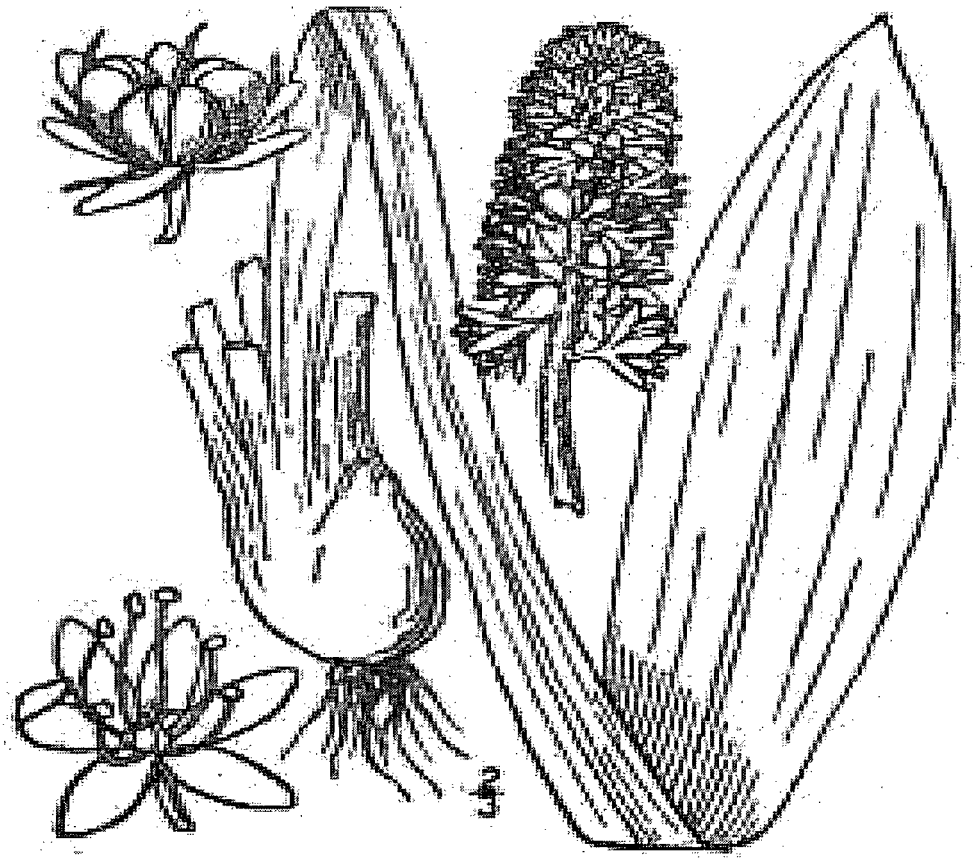
National Marine Fisheries Service Section 7 Consultation/Biological Opinion regarding the take of marine turtles and shortnose sturgeon at the Salem Circulating Water Intake Structure, as amended January 21, 1999

7. ATTACHMENTS

7.1 Attachment 1 – Species of Note

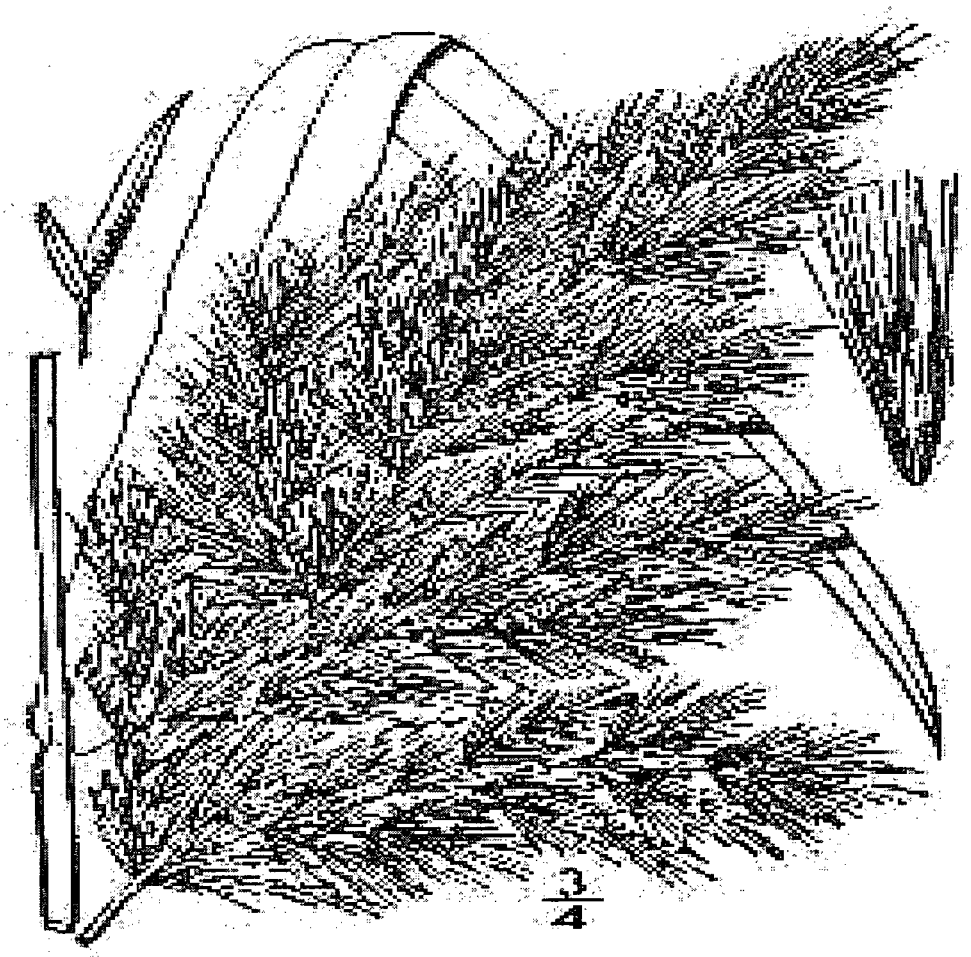
7.2 Attachment 2 – Sea Turtle Resuscitation

ATTACHMENT 1
SPECIES OF NOTE
Page 1 of 8



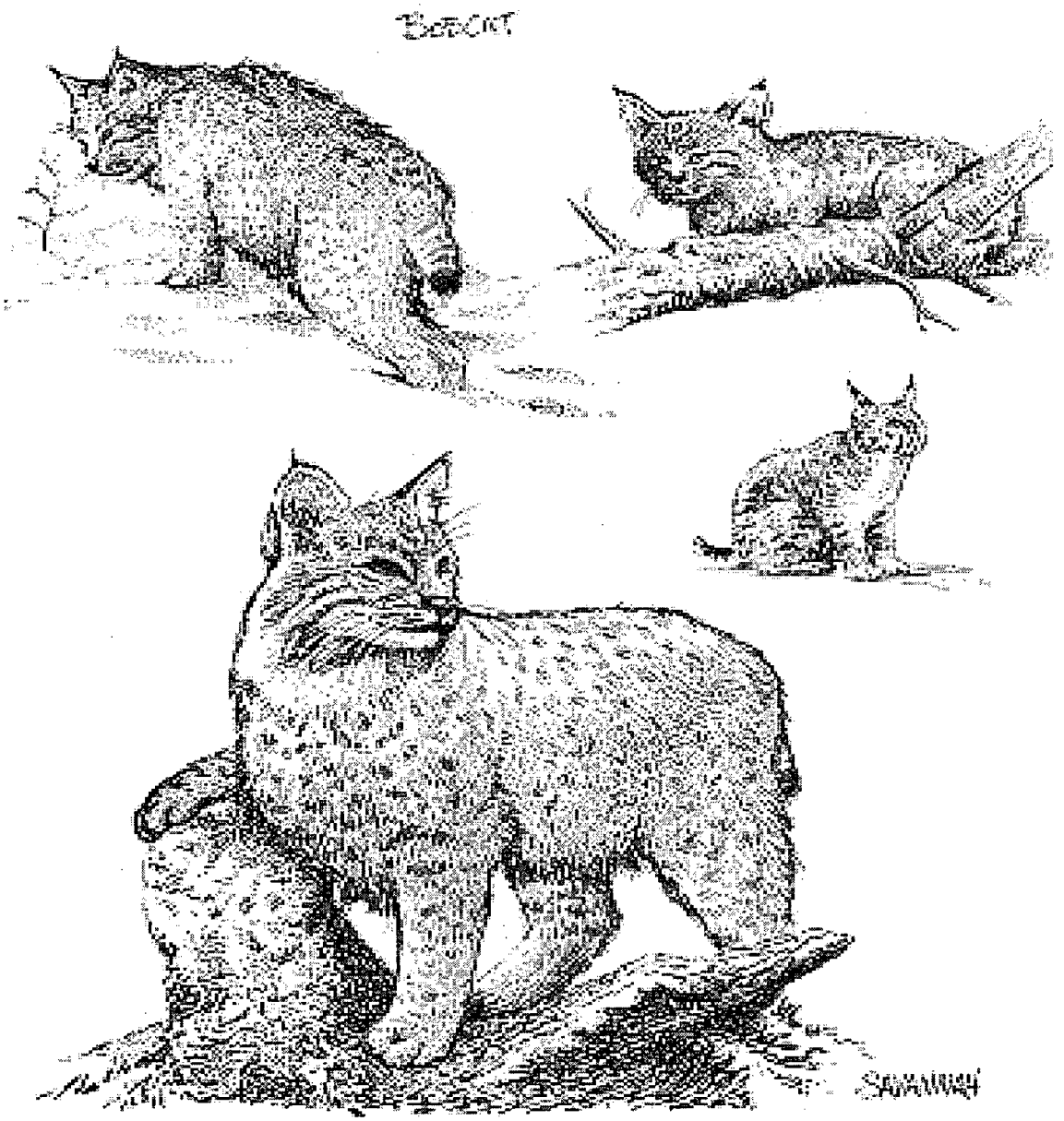
Swamp Pink (*Helonias bullata*) – ENDANGERED SPECIES

ATTACHMENT 1
SPECIES OF NOTE
Page 2 of 8



Common reed (*Phragmites australis*) seed head – plants emerge in the spring and can grow up to 15' tall by fall. Dead standing stalks remain through winter. – Can be a nuisance species.

ATTACHMENT 1
SPECIES OF NOTE
Page 3 of 8

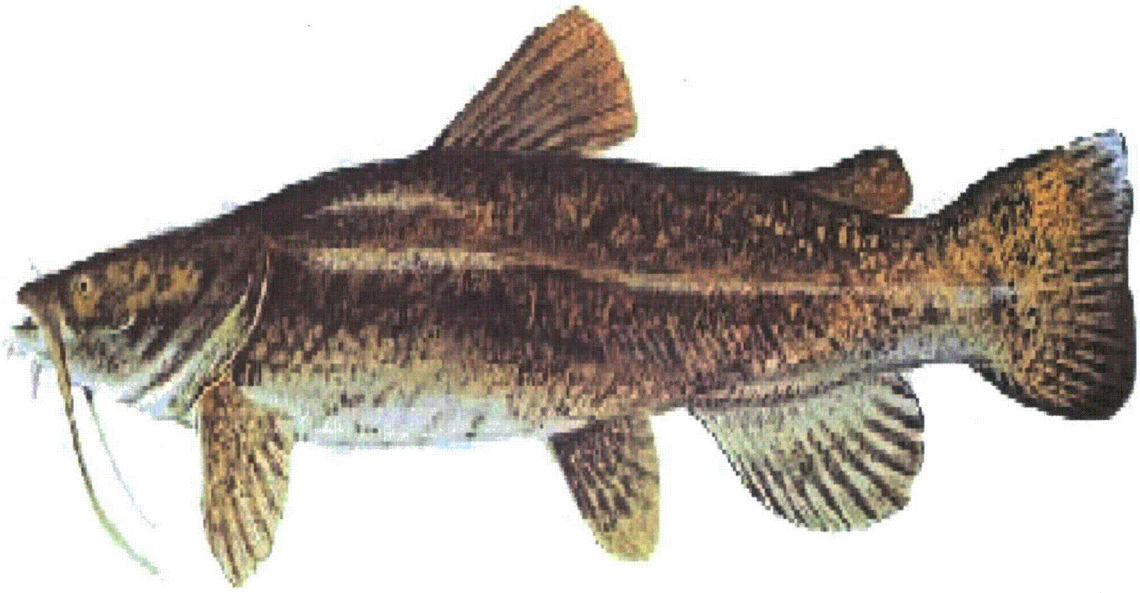


Bobcat (*Lynx rufus*) – Bobcats have been reported in the vicinity of the station. Bobcats are larger and stockier than feral house cats. The shortened tail and tapered ear hair are distinguishing characteristics.

ATTACHMENT 1
SPECIES OF NOTE
Page 4 of 8

Coyote (*Canis latrans*) – Large, dog-like carnivore. Can appear dusky, grey, brown, or nearly black. Snout is narrow and relatively pointed. My be easily confused with some feral domesticated dog breeds such as German Shepards (especially when wet or muddy),

ATTACHMENT 1
SPECIES OF NOTE
Page 5 of 8



Flathead Catfish (*Pylodictus olivaris*) - a non-native, invasive species and has the potential to become a nuisance. Can grow to several feet in length.

ATTACHMENT 1
SPECIES OF NOTE
Page 6 of 8

Muskrat (*Ondatra zibethicus* - top) and Nutria (*Myocastor coypus* - bottom). Muskrats are common native wetland species and rarely grows longer than 2 feet (half of which is the tail). Nutria is an introduced nuisance species and can grow to twice the size of muskrats.

ATTACHMENT 1
SPECIES OF NOTE
Page 7 of 8

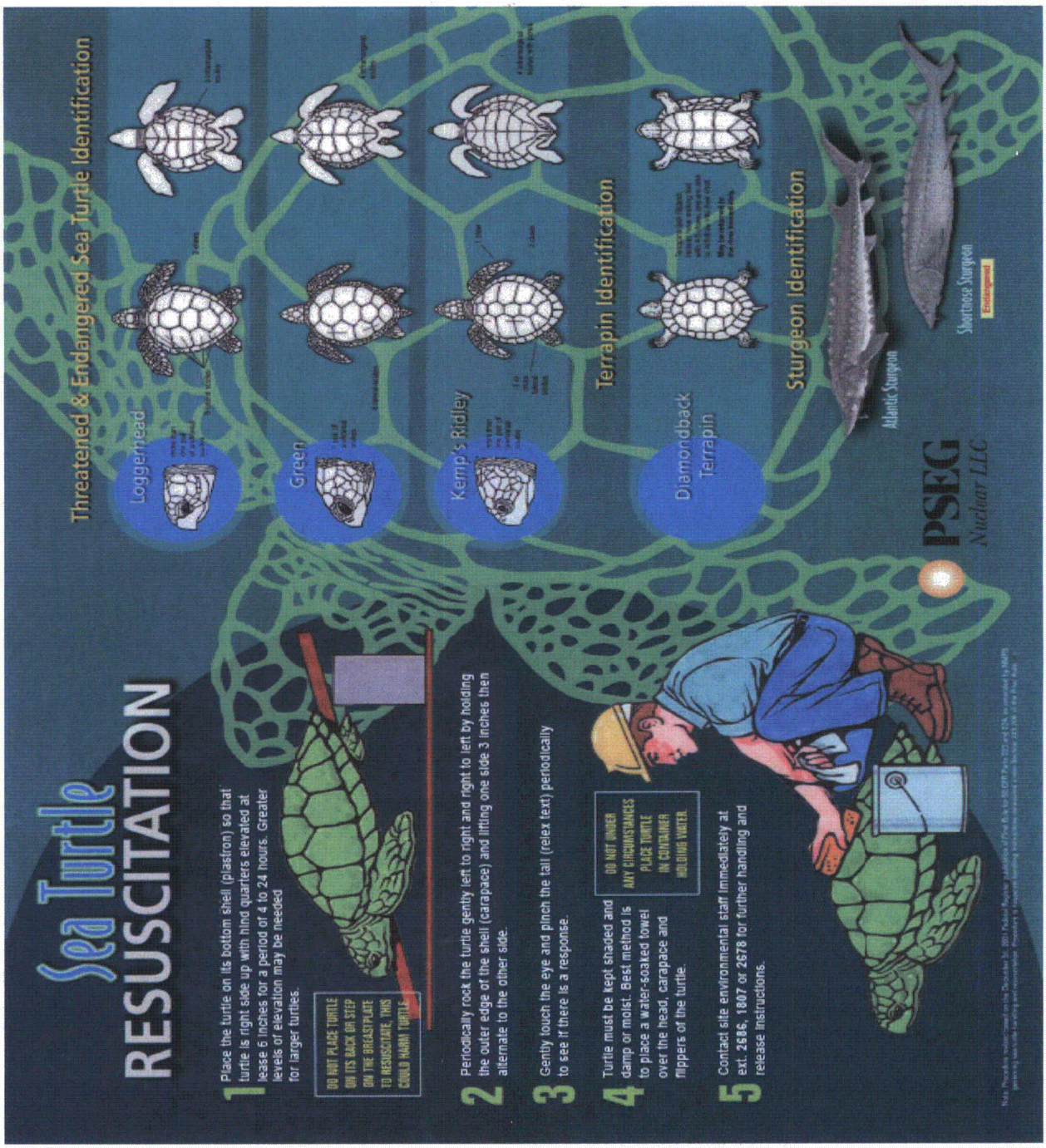
Osprey (*Pandion haliaetus*) and nest – Commonly seen nesting on transmission towers and foraging in the marsh.

ATTACHMENT 1
SPECIES OF NOTE
Page 8 of 8

Bald Eagle (*Haliaeetus leucocehpalus*)

ATTACHMENT 2

SEA TURTLE RESUSCITATION



THREATENED AND ENDANGERED SPECIES

1. PURPOSE

1.1 This procedure details the processes for implementing the Threatened and Endangered (T&E) Species requirements established in EN-AA-603, Environmental Protection Compliance, and as required by the requirements of the National Marine Fisheries Service Section 7 Consultation/Biological Opinion regarding the take of marine turtles and shortnose sturgeon at the Salem Circulating Water Intake Structure.

- Identification of Threatened and Endangered (T&E) Species
- Resuscitation of comatose Sea Turtles
- Disposition of T&E Species
- Reporting and Documentation

1.2 The responses to all other species, including to additional potential T&E species, are proceduralized under EN-AA-603, Species Management.

2. MATERIAL AND SPECIAL EQUIPMENT

2.1 Tools and Equipment

2.1.1 Identification of T&E Species

- T&E Identification Guide/Placard
- Digital Camera

2.1.2 Recovery and Resuscitation of Sea Turtles

- Personal Protective Equipment (PPE), including:
  - Work gloves
  - Eye protection
  - Hard Hat
  - Waterproof Knee Boots
  - Personal Flotation Device
- One 5-gallon bucket
- Stokes Basket (located at the Salem CWIS) and associated lifting equipment
- Pen and paper
- One 6 – 8' 2" x 12" board, or equivalent

2.1.3 Disposition of T&E Species

- Pick-up truck
- One 5-gallon bucket
- Tape measure
- Large cloth towel
- Tarp or Transport Tank
- Passive Integrated Transponder (PIT) tag scanner
- Personal Protective Equipment (PPE), including:
  - Work gloves
  - Eye protection
  - Hard Hat
  - Waterproof Knee Boots
  - Personal Flotation Device
- Large Plastic Garbage Bags
- Pen and paper
- Freezer
- Sharp Knife

2.2 Reporting and Documentation

- Mortality Record for Shortnose Sturgeon
- Digital Camera

3. PRECAUTIONS, LIMITATIONS, AND PREREQUISITES

3.1 Precautions

3.1.1 Many animals, including marine turtles, can bite or scratch. **AVOID** placing hands near a turtle's mouth or any of its 4 legs (also known as "flippers" or "fins").

3.1.2 Marine turtles can weigh as much as 150 lbs. - **USE** appropriate lifting equipment and procedures as required to avoid personal injury or property damage.

3.1.3 Turtles and sturgeon can be large and powerful. **USE** caution to avoid injury to personnel or the animal. **USE** additional personnel as needed to facilitate safe animal handling.

3.2 Limitations

3.2.1 This procedure applies to aquatic T&E Species encountered at Salem Circulating Water Intake Structure (CWIS). Procedures for responding to aquatic T&E species encountered during the NJPDES Biological Monitoring Program in the Delaware River are provided in the Procedures for the Baywide Biological Monitoring Program.

3.3 Prerequisites

3.3.1 A T&E Species (or potential T&E Species) observed or reported at the Salem CWIS

3.3.2 Section 7 Consultation/Incidental Take Permit

3.3.3 Determination if assistance or special equipment is required to access and recover the animal.

3.3.4 Pre-Job Briefing

4. MAIN BODY

4.1 **If** a potential T&E species is found impinged on intake structure trash racks, in the trash rakes, or on traveling screens, **then NOTIFY** the Site Environmental Staff

- The Salem Environmental Supervisor may **ASSIGN** the following steps to biological monitoring consultants or Salem Environmental staff as appropriate.

4.2 **NOTIFY** the security department if access to the animal requires suspension of security provisions and/or the disabling of security equipment. **WAIT** for the security department to authorize accessing the animal.

4.3 **IDENTIFY** the species using T&E Identification Guide or identification placard posted at the Salem CWIS.

4.4 **If** the animal is **not** a shortnose sturgeon and **not** a sea turtle, **then** no further steps under this procedure are required. **STOP**. No further action is necessary to comply with T&E species regulations and permits.

4.5 **If** identification is uncertain, **then CONTACT** a qualified fisheries biologist from the impingement / entrainment contractor, if onsite, to identify the animal. Alternatively, **CONTACT** the contractor at one of their contact numbers posed in the North Fish Counting Building at the Salem CWIS

4.6 **If** the animal is a shortnose sturgeon, **then SKIP** to STEP 4.8.

4.7 **If** the animal is a T&E sea turtle, **then ASSESS** its condition

4.7.1 **If** the turtle appears dead, **then SKIP** to STEP 4.7.24 below

4.7.2 **If** the turtle is obviously alive, **then CAPTURE** the turtle using appropriate caution to avoid injury to personnel or the animal

4.7.3 **CLOSE** the pool drain valve in one of the two Impingement Collection Pools at the Salem CWIS

4.7.4 **CLOSE** the pool screen

4.7.5 **MOVE** the turtle to one the of the Impingement Collection Pools at the Salem CWIS

4.7.6 **EXAMINE** the turtle for metal tags along the trailing edge of each leg (flipper) or any markings or tags on its carapace (shell).

1. **If** any tags are found, then **RECORD** the numbers on the tag(s).
2. **PHOTOGRAPH** the turtle and any identifying marks (scars, injuries, tags)

4.7.7 **OPEN** the impingement sampling flap gate

4.7.8 **FILL** the impingement sampling pool with river water from the fish trough until approximately 8" of water is in the pool

4.7.9 **CLOSE** the impingement sampling flap gate

4.7.10 **OBSERVE** the turtle for 2 hours.

4.7.11 **If** the turtle appears ill or injured, **then TREAT** the turtle with appropriate medical attention.

4.7.12 **If** the turtle appears healthy and uninjured, **then PREPARE** to remove the turtle from the site.

1. **CONTACT** Security to arrange removal of the turtle from the site.
2. **DRIVE** the transport truck to the appropriate pool.
3. **LINE** the truck bed with tarp or **PLACE** transport tank in truck bed.

4.7.13 **MEASURE** the carapace width and carapace length

4.7.14 Gently **REMOVE** turtle from the pool

4.7.15 **FILL** a 5-gallon bucket with river water from the pool and **PLACE** in truck

4.7.16 **OPEN** the pool drain valve

4.7.17 Gently **PLACE** the turtle in the bed of the truck

4.7.18 **WET** towels with river water from bucket

4.7.19 **COVER** turtle with wet towels, taking care not to cover the turtle's head

4.7.20 **DRIVE** to the Security Center to leave site.

4.7.21 **DRIVE** to PSEG's Public Access Observation area at the Bayside Tract:

From Shiloh, NJ, take Rt. 49 to Rt. 620 South (Roadstown-Greenwich Road). Follow Rt. 620 to Rt. 623 (Ye Greate Street) in Greenwich, NJ. Turn left onto Ye Greate Street and continue through Greenwich to Rt. 642 (Bacon's Neck Road). Turn right onto Bacon's Neck Road and follow to end. Make a right onto Tyndall Island Road and then a left onto Bayside Road. Make a left onto Caviar Tower Road to get to the observation area. P located at:

http://www.pseg.com/environment/estuary/pdf/map-BAYSIDE.pdf

4.7.22 Gently **REMOVE** the turtle from the truck and place on shoreline facing the water

4.7.23 **PHOTOGRAPH** the turtle's release

4.7.24 **If** the turtle is obviously dead, **then SKIP** to STEP 4.7.26 below.

Obviously dead turtles may appear in advanced states of decomposition, or large, vital portions of the animal may be missing or severely damaged.

4.7.25 **If** the turtle appears stunned or unconscious, **then INITIATE** resuscitation procedure.

1. **If** the turtle is still in the water, **then** safely **RECOVER** the turtle using the Stokes Basket at the Salem CWIS.

2. **MOVE** the turtle to one the of the Impingement Collection Pools at the Salem CWIS

3. **PLACE** the turtle on its bottom shell (plastron) on a board (or other surface) so that the turtle is right side up.

4. **ELEVATE** its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours by inclining the board. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles.

5. Periodically, **ROCK** the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side.

6. Gently **TOUCH** the eye with the dull end of a pen and **PINCH** the tail (reflex test) periodically to see if there is a response.

7. **KEEP** sea turtles being resuscitated shaded and moist but do **not** **PLACE** into a container of water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

8. **If** the turtle recovers within the 24 hour observation period, **then** **FOLLOW** STEP 4.3.4 above.

9. **If** the turtle **does not recover** in the 24 hour resuscitation period, then **SKIP** to STEP 4.7.26 below.

4.7.26 **EXAMINE** dead turtle for tags. Tags are usually metal, and applied to the trailing edge of the front flippers. **IF** a tag is found, then **RECORD** the number or other information from the tag.

4.7.27 **PHOTOGRAPH** the turtle.

4.7.28 **MEASURE** carapace width and carapace length

4.7.30 **PLACE** the turtle in an appropriately sized, heavy duty plastic bag.

4.7.31 **FREEZE** the turtle in a large freezer until necropsy can be performed by a qualified biologist.

1. Necropsy **must** include identification of turtle sex and stomach contents.

4.7.32 **CONTACT** the NMFS for authorization to dispose of the carcass. **IF** approved, **then DISPOSE** of the carcass as solid waste [EN-AA-307]

4.7.33 **If** the NMFS requests the carcass, **then ARRANGE** for transport or delivery as instructed.

4.7.34 **NOTIFY** the site Operations Department to notify the Nuclear Regulatory Commission of contact with NMFS.

4.7.35 **NOTIFY** the NJDEP Division of Fish and Wildlife:

Southern Region Office

Endangered and Nongame Species

856-629-0261.

4.8 **If** the animal is a shortnose sturgeon, **then MEASURE** the length of the animal from the tip of the snout to the tip of the tail (Total Length) and from the tip of the snout to the notch in the tail (Fork Length).

4.8.1 **RECORD** any injuries that are externally visible.

4.8.2 **If** the sturgeon is alive, **then** immediately **RELEASE** the sturgeon to the Delaware River.

4.8.3 **If** the sturgeon is dead, **then PLACE** the sturgeon in an appropriately sized, heavy duty plastic bag **and FREEZE**.

1. **EXAMINE** the carcass for external tags or internal Passive Integrated Transponder (PIT) tags using an appropriate scanner.

2. **PHOTOGRAPH** the strurgen.

3. **COMPLETE** Shortnose Sturgeon Mortality Report (Attachment 1).

4. **FORWARD** Mortality Report and photographs to Shortnose Sturgeon Coordinator at NMFS:

   Dana Hartley

   Dana.Hartley@noaa.gov

   (978) 281-9300 x6514

5. **CONTACT** the Shortnose Sturgeon Coordinator at NMFS for instructions on disposition of the carcass.

6. **If** the NMFS requests the carcass, **then ARRANGE** for delivery to:

   Dana Hartley

   One Blackburn Drive

   Gloucester, MA 01930

7. **NOTIFY** the site Operations Department to notify the Nuclear Regulatory Commission of contact with NMFS.

8. **NOTIFY** the NJDEP Division of Fish and Wildlife:

   Southern Region Office

   Endangered and Nongame Species

   856-629-0261.

9. **REPORT** the record of any T&E take (live or dead) and necropsy results, if applicable, to the National Marine Fisheries Service within 30 days of the take.

   National Marine Fisheries Service

   Northeast Regional Office

   Protected Resources Division

   212 Rogers Ave.

   Milford, CT 06460

10. **INCLUDE** a completed Shortnose Sturgeon Mortality Report (if applicable) and **INCLUDE**:

    - Date and time of take
    - Photographs
    - Measurements

5. RETURN TO NORMAL

After marine turtles or shortnose sturgeon are dispositioned in accordance with the above steps, normal conditions are entered. Inspections at the Salem CWIS resume in accordance with EN-AA-601-0001, Biological Opinion Compliance

6. REFERENCES

6.1 EN-AA-601, Environmental Protection Plan Compliance

6.2 EN-AA-601-0001, Biological Opinion Compliance

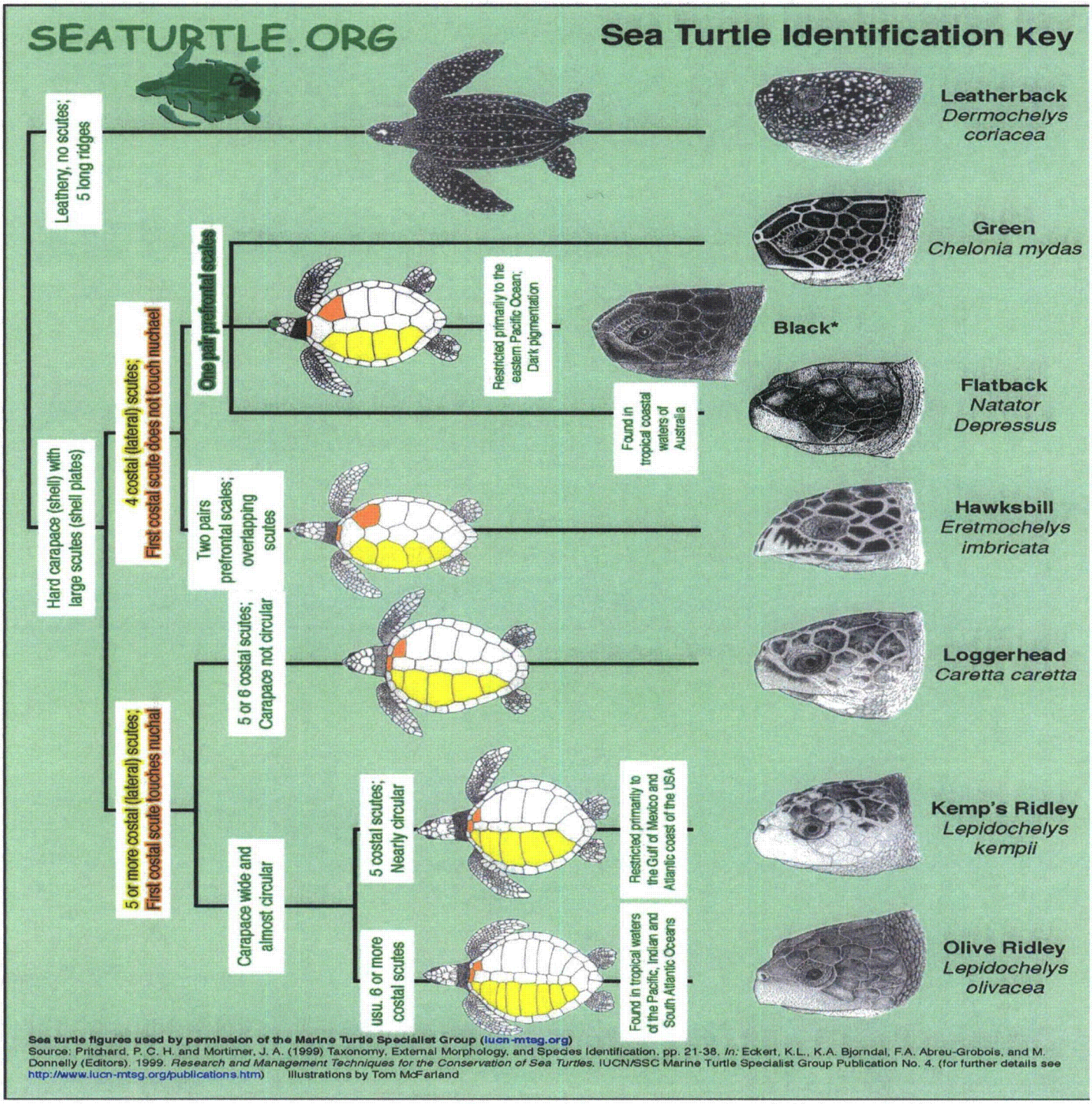
6.3 EN-AA-603, Species Management

6.4 National Marine Fisheries Service Section 7 Consultation/Biological Opinion regarding the take of marine turtles and shortnose sturgeon at the Salem Circulating Water Intake Structure, as amended January 21, 1999

7. ATTACHMENTS

Attachment 1	Threatened and Endangered Turtle and Sturgeon Identification
Attachment 2	Shortnose Sturgeon Report
Attachment 3	Shortnose Sturgeon Reporting Requirements

ATTACHMENT 1
THREATENED AND ENDANGERED TURTLE AND STURGEON IDENTIFICATION
Page 1 of 4



Sea turtle figures used by permission of the Marine Turtle Specialist Group (iucn-mtsg.org)
Source: Pritchard, P. C. H. and Mortimer, J. A. (1999) Taxonomy, External Morphology, and Species Identification. pp. 21-38. *In:* Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (Editors). 1999. *Research and Management Techniques for the Conservation of Sea Turtles.* IUCN/SSC Marine Turtle Specialist Group Publication No. 4. (for further details see http://www.iucn-mtsg.org/publications.htm) Illustrations by Tom McFarland

ATTACHMENT 1
THREATENED AND ENDANGERED TURTLE AND STURGEON IDENTIFICATION
Page 2 of 4

Species Descriptions

Leatherback — Baula, Tortuga Laúd, Tora — ***Dermochelys coriacea***

Color dark gray/black with white spots; **Carapace** tapered; leathery with 5 ridges
Max Length 165 - 180 cm; **Plastron** relatively small
Max Weight 400 - 500 kg; **Head** tooth-like notch on either side of upper jaw; no scales
Range all oceans, subarctic to tropical; pelagic

Green Turtle — Tortuga Verde, Tortuga Blanca — ***Chelonia mydas***

Color J: radiating streaks; A: brown, buff; **Carapace** 4 costal scutes
Max Length 120 cm; **Plastron** yellowish, 4 inframarginal scutes
Max Weight 230 kg; **Head** round face; serrated jaw; 1 pair elongate prefontal scales
Range all subtropical and tropical seas; bays and coastal waters

Black Turtle* — Tortuga Negra, Prieta — ***Chelonia* mydas**

Color black or grayish with black markings; **Carapace** 4 costal scutes
Max Length 90 cm; **Plastron** cream to gray; 4 inframarginal scutes
Max Weight 150 kg; **Head** round face; serrated jaw; 1 pair elongate prefontal scales
Range East Pacific Ocean; bays and coastal waters
*The status of the Black turtle or east Pacific green turtle, sometime referred to as *Chelonia agassizii* or *C. mydas agassizii*, remains uncertain. Recent genetic evidence supports an Atlantic-Mediterranean vs. Indian-Pacific grouping, while morphological and behavioral data suggest an east Pacific species or subspecies.

Flatback Turtle — Kikila, Tortuga Franca Oriental — ***Natator depressus***

Color olive grey; **Carapace** 4 costal scutes; broad and round; upturned margins
Max Length 100 cm; **Plastron** yellowish; 4 inframarginal scutes
Max Weight 90 kg; **Head** preoccular scale; wide; flat; triangular
Range tropical coastal Australia

Hawksbill Turtle — Tortuga Carey — ***Eretmochelys imbricata***

Color amber and brown streaks; **Carapace** 4 costal scutes; (usually) overlapping scutes; oval
Max Length 90 cm; **Plastron** cream with dark blotches front and rear; 4 inframarginal scutes
Max Weight 80 kg; **Head** curved beak; distinct overbite; 2 pair prefrontal scales
Range all oceans; tropical waters; reef areas

Loggerhead — Caguama, Amarilla, Cabezona, Tortuga Boba — ***Caretta caretta***

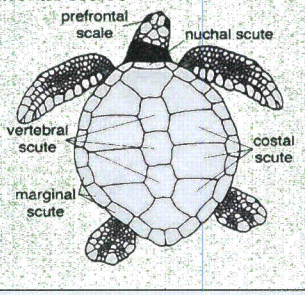
Color red brown to brown; **Carapace** longer than wide; 5 or more costal scutes, first very small
Max Length 90 - 110 cm; **Plastron** yellow to orange, 3 inframarginal scutes
Max Weight 100 - 180 kg; **Head** large head; 4 or more prefontal scales
Range all oceans; primarily temperate waters, near shore, often associate with structures (i.e., wrecks, platforms)

Kemp's Ridley — Tortuga Lora, Cotorra — ***Lepidochelys kempii***

Color gray to light olive green; **Carapace** round; 5 (sometimes 6) costal scutes
Max Length 70 cm; **Plastron** white to yellow; 4 inframarginal scutes with pores
Max Weight 40 - 50 kg; **Head** triangular; relatively large; 2 pair prefrontal scales
Range Gulf of Mexico, eastern USA; coastal; < 16° N

Olive Ridley — Tortuga Golfina, Tortuga Olivacea, Parlama — ***Lepidochelys olivacea***

Color gray to olive green; **Carapace** nearly round; 6 - 9 costal scutes, number may be asymmetrical
Max Length 70 - 80 cm; **Plastron** cream/white; 4 inframarginal scutes with pores
Max Weight 45 - 60 kg; **Head** triangular; relatively large; 2 pair prefrontal scales
Range tropical waters of Pacific, Indian and South Atlantic Oceans; pelagic



Produced in cooperation with:

REEF

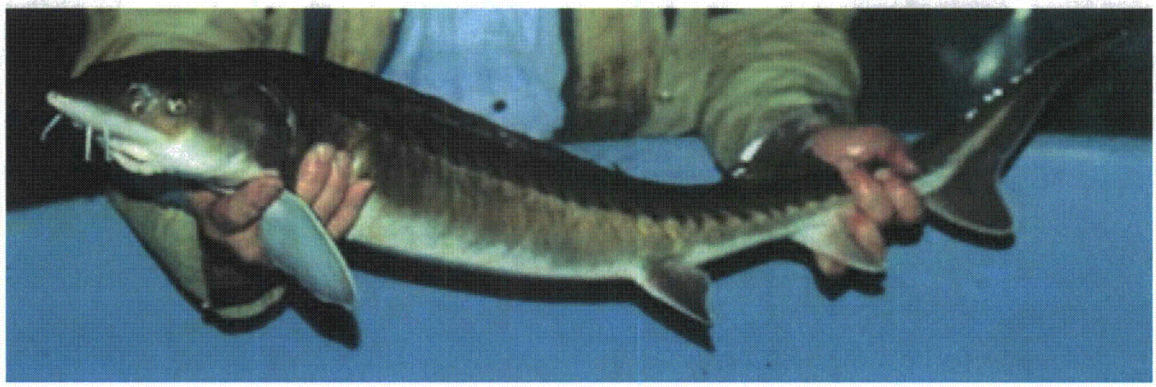
SUGGESTED REFERENCES

Bjorndal, KA (Editor). 1995. Biology and Conservation of Sea Turtles (Revised Edition). Smithsonian Institution Press, Washington, DC.

Eckert, KL, KA Bjorndal, FA Abreu-Grobois, and M Donnelly (Editors). 1999. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publications No. 4.

Lutz, PL, and J Musick (Editors). 1996. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

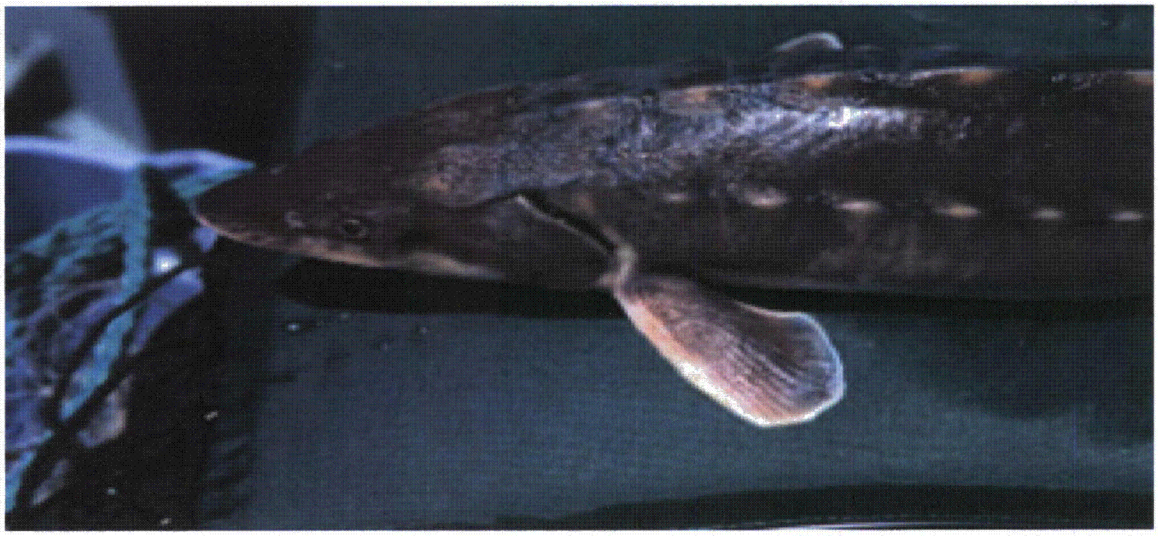
ATTACHMENT 1
THREATENED AND ENDANGERED TURTLE AND STURGEON IDENTIFICATION
Page 3 of 4



Shortnose Sturgeon
(*Acipenser brevirostrum*)

Sturgeon are primitive-looking fishes, with a heterocercal tail (the upper lobe is much longer than the lower lobe) and a body covered with 5 rows of large bony plates. These heavy, cylindrical fish have an elongated, bony snout, with a tube-like mouth located on the underside of the head. The mouth protrudes several inches when the fish is feeding. Shortnose sturgeon range in color from grayish-olive to brownish above, shading to white on the belly.
Shortnose sturgeon can be distinguished from Atlantic sturgeon by the relative width of their mouths. Shortnose sturgeon could be called "bigmouth" sturgeon; their mouth widths (inside the lips) are greater than 60 percent of the distance between the eyes, while Atlantic sturgeon have small mouths that measure 50 percent or less of the distance measured between the eyes.

ATTACHMENT 1
THREATENED AND ENDANGERED TURTLE AND STURGEON IDENTIFICATION
Page 4 of 4



Atlantic Sturgeon
Acipenser oxyrhinchus

An elongate fish, pentagonal in cross section, with a heterocercal tail and shark-like fins. Top of head and back bluish black, shading to white on belly. Mid-dorsal scutes oval, longer than broad, and without pronounced hooks on their keels; spines and keels on mid-dorsal scutes white, contrasting with dark-colored back. Upper half of dorso-lateral scutes matching background, lower half paler than background. Front edges of pectoral and pelvic fins and lower lobe of caudal fin white. Snout moderately long, with transverse row of 4 barbels on underside. Mouth narrow, less than half as wide as distance between eyes. TL: female to 14' (4.3 m), male to 8'3" (2.5 m).

ATTACHMENT 2
SHORTNOSE STURGEON REPORT
Page 1 of 2

INCIDENTAL TAKE OF SHORTNOSE STURGEON

OCCURRENCE DATE:

FACILITY: Salem Generating Station, Unit 1
PSEG Nuclear LLC
Hancocks Bridge, NJ 08038

IDENTIFICATION OF OCCURRENCE:

A shortnose sturgeon (*Acipenser brevirostrum*) was [removed from the Circulating Water System (CWS) Intake trash racks]/[CAPTURED DURING ROUTINE BIOLOGICAL MONITORING IN THE Delaware Estuary] at the Salem Generating Station. The sturgeon was recovered on_____ . Shortnose sturgeon are federally listed as "endangered" species under the Endangered Species Act of 1973, as amended.

CONDITIONS PRIOR TO OCCURRENCE:

[DATE]	**UNIT 1**	**100**
PERCENT POWER		
	Unit 2	100 percent power

DESCRIPTION OF OCCURRENCE:

DATE	TIME	STATUS	INTAKE BAY	FORK LENGTH (MM)	TOTAL LENGTH (MM)	WEIGHT (KG)

[Example]During [routine cleaning of the trash racks]/[routine biological monitoring]/[routine intake inspection], Maintenance Common personnel recovered the sturgeon, which was [alive in good health/damaged/dead/decaying]. Station Environmental responded and confirmed the identification of the sturgeon as a Shortnose Sturgeon. The sturgeon was examined, measured, weighed and scanned for Passive Integrated Transponder (PIT) tags. [No response was obtained]/[the response identified tag ___] when the sturgeon was scanned for PIT tags.

ATTACHMENT 2
SHORTNOSE STURGEON REPORT
Page 2 of 2

The U. S. Nuclear Regulatory Commission (NRC), the National Marine Fisheries Service (NMFS) and the New Jersey Department of Environmental Protection (NJDEP) have been notified regarding this occurrence.

APPARENT CAUSE OF OCCURRENCES

Based on historical and recent records, shortnose sturgeon appear to utilize the entire Delaware estuary-river complex, from the river mouth to New Hope, Pennsylvania (0-238 river kilometer - rkm). Spawning occurs north of Trenton, 128 rkm upstream from the Salem and Hope Creek Generating Stations. It is unlikely that larval or post-larval fish would travel the distance downstream to the site. Adult Shortnose sturgeon may move into the surrounding area during fall migration to wintering grounds. Healthy adult and juvenile shortnose sturgeon are strong enough swimmers that they should be able to escape from intake velocities typically encountered at the trash bars. Sturgeon that are in a weakened (or deceased) condition may be subject to impingement.

ANALYSIS OF OCCURRENCE

Between 1978 and [2008], a total of [eighteen (18)] Shortnose sturgeon have been collected at the CWS intake, two in 1978, one in 1981, three in 1991, two in 1992, two in 1994, three in 1998, one in 1999, one in 2000, one in 2003, one in 2004, one in 2007, [explain] .

CORRECTIVE ACTIONS

[Example] The trash racks are required to be inspected every two hours from June 1 through October 15, cleaned three times per week from May 1 and November 15, and as mentioned above, are required to be cleaned daily between June 1 and October 15. Observations are made specifically for sea turtles and sturgeon during this time. During the remaining months the trash racks are inspected daily for debris load and cleaned as necessary. Since the Shortnose sturgeon was not recovered alive and it is not likely that the facility caused the death, it is felt that the measures in place are sufficient and no other actions are warranted at this time.

ATTACHMENT 3
REPORTING REQUIREMENTS
Page 1 of 2

REPORTING REQUIREMENTS
Appendix II to Section 7 Consultation

Photographs should be taken and the information requested below should be collected in association with all protected species (sea turtles and shortnose sturgeon) impingements. This documentation should be sent to the:

National Marine Fisheries Service
Habitat Conservation Branch
One Blackburn Drive
Gloucester, MA 01930-2298

Protected Species Impingements
Salem and Hope Creek Generating Stations

Observers full name:

Reporters full name:

Species identification: Shortnose Sturgeon (*Acipenser brevirostrum)*

Site of impingement: Salem Generating Station – [Where]

Date and time impingement was observed:

ATTACHMENT 3
REPORTING REQUIREMENTS
Page 2 of 2

Date and time of animal was collected:

Tidal stage at time of collection:

Date and time of last observation of screen:

Water temperature at site at time of impingement: (C)

Average percent of power generating capacity achieved per unit over the 48 hours previous to impingement: Unit 1 - 100 percent power
Unit 2 - 100 percent power

Condition of animal:

Shortnose Sturgeon Measurements:

Fork Length:

Total Length: mm

Weight: kg

Remarks:

Baywide Abundance Monitoring Program
PSEG Estuary Enhancement Program

Bottom Trawl Survey Procedures Manual for Field and Laboratory

Revision 3
Effective 04/01/2009

K. A. Strait	06/05/09
Approved	Date
Katherine J. Darmody	06/09/09
Received	Date
Alvin L. Maiden	6/9/2009
Received	Date

Baywide Abundance Monitoring Program – Bottom Trawl Survey Procedures Manual Revision History Summary

Revision #3 to the Bay-Wide Trawl Survey Program – Bottom Trawl Component Procedures Manual was prepared to reflect changes to PSEG contacts for capture of threatened and endangered species and to reflect sampling requirements for each routine sampling year, in general terms. This revision also reflects the removal of the intensive program procedures.

Revision #2 to the Bay-Wide Trawl Survey Program – Bottom Trawl Component Procedures Manual was prepared to reflect additional changes to the PSEG contact for capture of threatened and endangered species and to incorporate sampling requirements for 2008.

Revision #1 to the Bay-Wide Trawl Survey Program – Bottom Trawl Component Procedures Manual Rev. 0 dated 04/01/2002 was prepared to reflect changes to the PSEG contacts for capture of threatened and endangered species.

Baywide Abundance Monitoring Program – Bottom Trawl Survey

Introduction

The Bottom Trawl Survey is a component of an established trawl monitoring survey conducted annually by the Estuary Enhancement Program, as a special condition of the NJPDES Permit. The survey augments an established trawl monitoring survey conducted annually by the Delaware Department of Natural Resources and Environmental Control (DNREC) in the inshore waters (along the Delaware shore) of the Delaware Bay and lower Delaware River between river km 0 – 123 (RM 77). This survey will provide abundance data for bay anchovy, spot, weakfish, white perch, striped bass, American shad, blueback herring, alewife, Atlantic croaker, bluefish, Atlantic silversides, Atlantic menhaden, and blue crab, all of which are considered "target species".

Briefly, the Bottom Trawl program entails sampling during daylight hours within the Delaware River estuary from the mouth of the Bay to the C&D canal, following a defined schedule from April through November. For the purposes of this study, daylight is defined as the period beginning one hour after sunrise and ending one hour before the subsequent sunset. The number of samples required for each collection period has been predetermined. Sampling during each collection period involves trawling on the bottom with a semi-balloon otter trawl following a prescribed deployment procedure. All sampling is of standard duration at a standard speed, against the direction of the prevailing tide.

Data Quality Objective

- To produce accurate catch per unit effort (CPUE) statistics of target species

Data Quality Elements

- Tow duration
- Tow speed
- Trawl fishing performance

Sampling Frequency and Location

Each year, the bottom trawl survey will be conducted once per month from April through November. Collections will be randomly allocated each month from sampling zones 1 – 8 (40 samples / month for eight months or 320 samples).

Sampling Gear and Implementation

Bottom hauls are taken with a 4.9-m (16 ft) semi-balloon otter trawl. The otter trawl used in this study is identical to the one utilized in the DNREC Small Trawl Survey and is described as follows:

> Sixteen ft semi-balloon trawl; 17 ft head rope; 21 ft footrope; net made of nylon netting of the following size mesh and thread; 1 1/2" stretch (3/4" square) mesh no. 9 thread body; 1 1/4" stretch (5/8" square) mesh no. 15 thread cod end, fully rigged with four 2" I.D. net rings at top and bottom for lazy line and purse rope. Inner liner of 1/2" stretch (1/4" square) mesh no. 63 knotless nylon netting inserted and hogtied in cod end. Head and footropes of 3/8" diameter poly-Dacron net rope with legs extended 3 ft and galvanized wire rope thimbles spliced in at each end. Six 1 1/2" x 2 1/2" sponge floats spaced evenly on bosom of head rope. Net treated in green net dip. Trawl doors are 24" in length and 12" in width. Doors made of 3/4" marine ply board 1 1/4 x 1 1/4" straps and braces, and 1/2 x 2" bottom shoe runner. 3/16" chain bridle, lap links and 5/16" swivels at the head of each bridle. 40' leg lines to common tow line. Towline = ½ inch.

The trawl (and doors) is fished as rigged by the manufacturer (all links on doors free and functional). A towline to water depth ratio of 10:1 is to be maintained. If, in the judgment of the field crew leader, conditions (e.g. depth and or current, bottom substrate, etc.) preclude this ratio, the scope may be shortened to a minimum of 6:1.

Prior to each sampling effort, the Senior Biologist will give to the boat crew(s) a list of randomly selected bottom trawl sites (cells) to be sampled. Table 2 lists the distribution of these samples among the sampling zones for each month to be sampled. Zones are indicated in Figure 1.

A minimum water depth of five feet is required for bottom trawl sampling. The sample should be taken in an area that is representative of the average water depth of that cell, as indicated by the navigational chart. For example, if a 20% of a trawl cell contains a 60-foot deep channel, and 80% contains an area of 30-foot deep flats, the sample will be collected in the 30-foot flats. A clear path will be selected to avoid crab pots, fishing boats, and other obstacles. Obstructions such as jetties, large numbers of crab pots, navigational aids, the main shipping channel, boat or ship traffic, or submerged obstacles can be safety hazards and can prevent sampling a representative area of the zone. Avoid these areas by either moving to another representative area of the cell, or if necessary, by selecting the nearest cell within the zone as an alternative.

Water depth is determined by the vessels' depth finder. A towline to fishing depth of 10:1 is to be maintained. Include the bridle length in the calculation.

To insure that the trawl net will fish properly, make certain that:

- The towrope is securely attached to the bridle, and that the bridle is securely attached to the net.
- The cod-end of the net is securely tied along with the cod-end liner within.
- The net is not torn.
- All shackles are tightly connected. The doors have curved edges forward and the metal runners on the bottom, and the net and the cod-end are not twisted or knotted. The trawl and doors are fished as rigged by the manufacturer (all links on the doors free and functional). The net should not be separating from the float or chain lines.

Note: Spare rigged nets are carried onboard as replacements for damaged nets. Minor tears can be repaired in the field using net mending twine or plastic cable ties.

All collections are of **10-min (timed by mechanical timer or stopwatch) duration** at a **standard speed of 6.0 feet per second (fps)** and against the prevailing tide. Fishing time commences when all required towline is deployed, and the deck crew informs the helmsman that the net is "fishing".

At the commencement of sample collection, data are entered into the appropriate fields on the data form (Figure 2). These include start time, and start latitude and longitude coordinates. While trawling, it is the boat operator's responsibility to maintain the established boat speed, monitor water depth, and navigate around any surface or submerged obstacle in the path of the net. During this period, the crew must maintain vigilance of the towrope to ensure maintenance of a proper scope angle and tautness such that a departure from normal fishing attitude is readily detected and corrective actions (speed or towline adjustment) can be effected. If the trawl becomes hung on a bottom obstruction, abort the tow, empty the net, inspect it for damage, and repeat the collection. At completion of the time interval the boat is stopped and the trawl retrieved. If upon retrieval, it is discovered that obstructions (e.g., crab pots) have become entangled within the net mouth, repeat the tow.

Upon retrieval of the net, all appropriate fields are completed on the data form. These include ending time, and ending latitude and longitude coordinates. In addition, physicochemical measurements are collected at this time.

Tow speed standardization is required at the commencement of each tow. To standardize to 6.0 fps (water speed):

- Deploy Bottom Trawl
- Place flowmeter or speedometer probe over side of the boat (beyond bow wake turbulence) and adjust boat rpm to achieve 6.0 fps.

If, when sampling a cell, the tow is aborted due to fouling on a bottom obstruction, a second tow within the same cell will be made at a different location within a cell. If the second attempt is aborted due to fouling on a bottom obstruction, an adjacent cell will be selected. If this process is repeated for the same cell in three sampling events, the cell will be added to a list of permanently excluded cells.

Sample Processing

After completion of the haul, the net is emptied and finfish and blue crab specimens are identified to the lowest practicable taxonomic level (usually species), and enumerated. To assure removal of all specimens be sure to shake down cod end and examine the full length net for small specimens entangled or gilled in the mesh, and specimens (e.g., blue crab) which may be clinging to the liner.

Identification keys are to be included in the equipment package on each vessel. Any unidentifiable specimens should be preserved, size permitting, in a 10 percent formalin solution in a labeled jar for subsequent examination. To enhance preservation of specimens greater than 150 mm, cut a small slit in the abdominal cavity on the right side of the fish and puncture the swim bladder. If specimens are too large for preservation or retention (e.g., sharks and rays), note and record as many morphological and structural characteristics as possible and take a photograph (camera on board) of specimens prior to release.

When an extremely large number of a species is taken (more than 2,000 specimens), their number may be estimated by representative sub-sampling. The following sub-sampling technique is to be utilized. Fill an appropriate size container for the particular species to an identified level and count the specimens in this sub-sample. Repeat this procedure for three sub-samples. Compute the average number of specimens per sub-sample. Process the entire species' catch by repeated filling of the container, maintaining a count of the number of sub-samples required. The estimated total number taken is computed as the product of the number per sub-sample times the number of sub-samples required to process the catch.

With each collection, a sub-sample of 100 specimens of each target species is to be measured by 1-mm interval. **Target species are blueback herring, alewife, American shad, bay anchovy, weakfish, spot, Atlantic croaker, white perch, striped bass, bluefish, Atlantic silversides, Atlantic menhaden, and blue crab.** Species with emarginate or forked caudal fins are measured from the tip of the snout to the caudal fork (FL). Species without a caudal fork are measured to the tip of the longest caudal ray (TL). If fewer than 100 specimens of a target species are collected, all should be measured. Non-target species are enumerated.

All fish are returned to the water except those for future designated use in specific fisheries programs (e.g., food habits). Retained specimens are put in labeled jars and preserved in a 10 percent formalin solution or an alternate preservative as a special study may require. All labels must be made of rag paper (waterproof) and inscribed using indelible ink.

Water chemistry measurements are made in conjunction with all collections. Air temperature, water temperature, dissolved oxygen, and salinity are recorded using the appropriate instrumentation (e.g. YSI Model 85, Cole Parmer, etc.). Water transparency is measured with a limnological secchi disk. Surface, mid-depth and bottom measurements are made with all collections where water depth is greater than 10 ft. Depths of less than 10 feet require only surface measurements. Any value that appears abnormally high or low is re-measured and noted on the field sheet that the value was checked. In addition, record tidal stage and weather/water conditions with all collections.

Threatened or endangered species

The capture of a shortnose sturgeon or any species of sea turtle invokes special handling and requires notification to the Salem Generating Station - Chemistry, Radwaste and Environmental Department, and the Estuary Enhancement Program.

HANDLING PROCEDURE FOR SHORTNOSE STURGEON

1) All shortnose sturgeon taken need to have the following information recorded:
   - Date
   - Time of day
   - Observers full name
   - Photos taken Y/N
   - External tags detected Y/N Tag ID#
   - Fork Length in/mm
   - Total Length in/mm
   - Location collected (e.g., river mile, GPS point, and/or Loran coordinates)
   - Comments (condition of fish, how discovered, etc.)

2) Dead shortnose sturgeon should be placed on ice until delivered to the Chemistry, Radwaste and Environmental Department. Live fish are returned to the river after the requisite data has been collected to prevent mortality.

3) The Chemistry, Radwaste, and Environmental Department and the Estuary Enhancement Program must be notified on the next business day concerning dead or live, released shortnose sturgeon. The Salem Chemistry, Radwaste and Environmental Department will provide further guidance as necessary. Contact numbers are as follows:

   Salem Chemistry, Radwaste and Environmental Department
   - Luis Cataldo W: 856.339.2307
   - Gamon Biggs W: 856.339.2678

Estuary Enhancement Program

- Ken Strait W: 856.339.3929
  C: 609.685.5290
- Brenda Evans W: 856.339.3923
  C: 609.743.3765

SEA TURTLE HANDLING PROCEDURES

1) All sea turtles taken need to have the following information recorded:
   - Observer's full name
   - Species identification
   - Site of capture
   - Date and time of animal was collected
   - Tidal stage at time of collection
   - Water temperature at time of impingement
   - Condition of animal
   - Photos taken Y/N
   - Tags detected Y/N
   - Comments (condition of animal, how discovered, etc.)
   - Sea Turtle Measurements:
     Carapace Length (straight line):
     Carapace Width (straight line):
     Carapace Length (over curve):
     Carapace Width (over curve):
     Weight:

2) Dead sea turtles should be placed on ice until delivered to the Chemistry, Radwaste and Environmental Department. Live, healthy sea turtles fish are returned to the river after the requisite data has been collected to prevent mortality.

3) The Chemistry, Radwaste, and Environmental Department and the Estuary Enhancement Program must be notified on the next business day concerning dead or live, released sea turtles. Contact numbers are as follows:

Salem Chemistry, Radwaste and Environmental Department

- Luis Cataldo W: 856.339.2307
- Gamon Biggs W: 856.339.2678

Estuary Enhancement Program

- Ken Strait W: 856.339.3929
  C: 609.685.5290
- Brenda Evans W: 856.339.3923
  C: 609.743.3765

4) Resuscitation must be attempted on sea turtles that are comatose, or inactive, by:
   a) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.
   b) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

5) Live sea turtles must be inspected for signs of illness or injury. All ill or injured sea turtles must be given appropriate medical attention, and must not be released until its condition has improved. **The Chemistry, Radwaste, and Environmental Department and the Estuary Enhancement Program must be notified immediately concerning ill or injured sea turtles and will provide further guidance as necessary.**

The Chemistry, Radwaste and Environmental Department is responsible for notifications to the appropriate state and federal agencies.

While not endangered, the capture of an Atlantic sturgeon requires the recording of a length measurement. This is to be recorded on the field sheets in the manner of target species.

In addition, several resource management agencies have requested any captured Flathead catfish (*Pylodictus olivaris*) are not to be returned live to the Delaware River; however they should be measured and recorded on the field sheets in the manner of target species. This is a non-native, invasive species and has the potential to become a nuisance.

Laboratory Methods

Return those fishes not identifiable by field personnel to the laboratory for identification. A reference collection is kept in the laboratory to supplement taxonomic keys and references. When neither field nor laboratory personnel are able to identify a specimen, it is forwarded to an expert in fish identification. Table 1 provides a bibliographic listing of the current taxonomic keys and references. Fishes retained for subsequent study are preserved in the following manner:

1. Fish are maintained in the field preservative (10 percent formalin) for 7 to 10 days.
2. Fish are then washed in fresh water and allowed to remain in fresh water at least 24 hrs.
3. Step 2 is repeated.
4. Fish are stored in 40 percent isopropyl alcohol solution.

Data Form Instructions

Data forms are to be filled out in accordance with the following set of instructions. An example data form is provided as Figure 2.

Serial Number – Unique serial number generated by contractor

Date - Enter the date of the sample collection (DD/MM/YYYY)

Investigators – Enter the initials of the personnel collecting the sample

Project – Enter the project (Bottom Trawl)

Site – Enter the Trawl Zone (1-8)

GPS Group – Enter the number of the "cell" sampled

Survey Method – Enter "Bottom Trawl"

Gear – Enter "16 ft. Bottom Trawl"

Tide stage – Circle the appropriate entry according the following guidelines:

- F1 – Flood 1 – First half of the flood tide
- F2 – Flood 2 – Second half of the flood tide
- FS – Flood Slack
- E1 – Ebb 1 – First half of the ebb tide
- E2 – Ebb 2 – Second half of the ebb tide
- ES – Ebb Slack
- Other – Extremely high or low tides (provide detail in "notes")

Weather – Circle the appropriate entry according to the following guidelines:

- 1 – Clear/Sunny
- 2 – Partly Cloudy
- 3 – Overcast
- 4 – Light Rain
- 5 – Heavy Rain
- 6 – Fog
- 7 – Snow
- 8 – Other
- 9 – Hazy

Wind direction – Circle the appropriate wind direction

Wave Height – Circle the appropriate wave height according to the following guidelines:

- 1 – Calm (0 inches)
- 2 – Slight (0-6 inches)
- 3 – Moderate (6-18 inches)
- 4 – Rough (18 inches to 4 feet)
- 5 – Very Rough (4-8 feet)

Start Time – Record the start time using a 24-hour format (military time).

End Time - Record the end time using a 24-hour format (military time).

Air Temp – Record the air temperature to the nearest 0.5°C

Surface Temperature – Record the surface water temperature to the nearest 0.5°C

Mid-Depth Temperature – Record the mid-depth water temperature to the nearest 0.5°C

Bottom Temperature – Record the bottom water temperature to the nearest 0.5°C

Surface Salinity – Record the surface water salinity to the nearest 0.5 ppt

Mid-Depth Salinity – Record the mid-depth water salinity to the nearest 0.5 ppt

Bottom Salinity – Record the bottom water salinity to the nearest 0.5 ppt

Surface DO – Record the surface water dissolved oxygen to the nearest 0.5 mg/l

Mid-Depth DO – Record the mid-depth water dissolved oxygen to the nearest 0.5 mg/l

Bottom DO– Record the bottom water dissolved oxygen to the nearest 0.5 mg/l

Depth – Record the minimum and maximum water depth during the sampling (in feet)

Depth of sample – Record approximate minimum and maximum values (in feet). For the bottom trawl survey, this is the same as "Depth".

Depth strata – B=Bottom, I=Integrated, M=Mid-Depth, K=Mid-depth to Bottom, S=Surface, J=Surface to Mid-Depth

Water Clarity – Record the Secchi disk measurement in inches

Start Latitude – Record the starting latitude in degrees, minutes, and seconds

Start Longitude – Record the starting longitude in degrees, minutes, and seconds

Stop Latitude – Record the stopping latitude in degrees, minutes, and seconds

Stop Longitude – Record the stopping longitude in degrees, minutes, and seconds

Start Flowmeter – Not applicable for the bottom trawl survey

Stop Flowmeter – Not applicable for the bottom trawl survey

Notes – Any comments, observations, or notes not covered in the above fields.

Species – Enter the scientific name of the species collected (Spell out genera when ambiguities may occur (e.g. *M. saxatalis* could be either *Morone saxatalis* or *Menticirrus saxatalis*)

Life stage – Not applicable for the bottom trawl survey

Total counted – record the total number of the individual fish species collected for the appropriate species (if sub-sampling is utilized, use the "Notes" box to the right for recording the number per container and numbers of containers counted)

Total Weight – N/A

Weight Units – N/A

Total Measured – Record the number of individual fish measured (cannot exceed total taken)

Measurement Technique – Circle the appropriate option (F=Fork Length, T=Total Length, Other = Carapace width, wingspan, etc.)

Min Length – Not applicable

Max Length – Not applicable

Notes – Record any fish anomalies, sub-sampling data, etc. in this box.

Length – For target species, enter the three-digit length interval (e.g. if a fish was 68 mm in length, record "**068**" in these boxes).

Frequency – Enter the number of fish taken in each length interval (e.g. if four fish were taken in the 68 mm length interval, "**04**" would be entered. The completed entry for this length interval would read "**06804**")

Continue as above until the entire catch has been processed. Upon completion of a day's sampling, the field biologist proofs the data form for any errors or omissions that may have occurred. The field biologist should initial the field "Proof 1 by:" at the bottom of the field after proofing the data. A second proof will be performed prior to data entry. The examiner should initial the field "Proof 1 by:" at the bottom of the field after proofing the data. The data entry technician will initial the field "Input By:" upon entering the data into the computerized database.

Quality Assurance

A quality assurance program is to be implemented for all field, laboratory, and data handling activities of the bay-wide trawl survey to ensure that work protocols meet high standards of accuracy. The following defines personnel responsibilities associated with field aspects of this program.

The sampling crew leader is responsible for ensuring that all field-related functions are performed according to approved Standard Operating Procedures (SOP) and is accountable for verifying data sheet accuracy. Field crew leaders must have at least two years of fisheries collection experience before being assigned to this position.

The project principal investigator (PI) conducts audits of the performances of the field crews by observing their activities directly. While in the field on selected days, the PI functions as an independent observer of activities, comparing the procedures used against the SOP and the program work plan. The PI must be a trained biologist with a minimum of five years experience in the conduct of similar research projects.

Table 1 - Taxonomic Keys and References

Bigelow, H. B., and W. C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv. Fish. Bull. 74, Vol. 53:577 p.

Breder, C. M., Jr. 1948. Field book of marine fishes of the Atlantic Coast. G. P. Putnams and Sons, New York. 332 p.

Eddy, S. 1957. The freshwater fishes. Wm. C. Brown Co., Dubuque, Iowa. 253 p.

Flescher, D. D. 1980. Guide to some trawl-caught marine fishes from Maine to Cape Hatteras, North Carolina. NOAA Tech. Rept., NMFS Circ. 431. 35 p.

Hildebrand, S. F., and W. C. Schroeder. 1928. Fishes of Chesapeake Bay. U.S. Fish Wildl. Serv. Bull. Pt. 1, Vol. 53:388 p.

Robins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. A list of common and scientific names of fishes from the United States and Canada. 5th ed. American Fisheries Society. Special Publ. No. 20. 183 p.

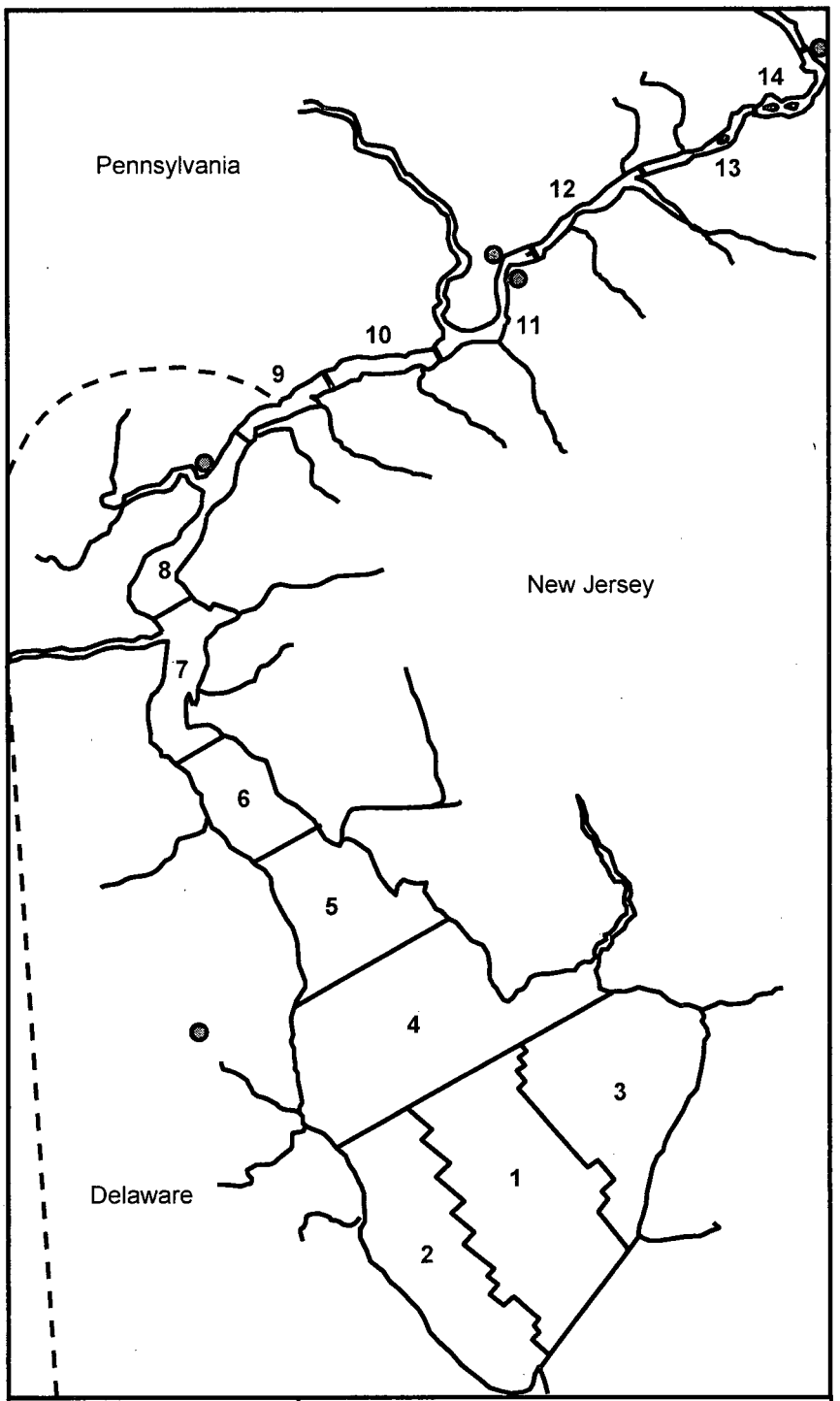
Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Can., Bull. 184:966 p.

U.S. Fish & Wildlife Service. 1978. Development of fishes of the mid-Atlantic Bight: an atlas of egg, larval and juvenile stages. U.S. Fish Wildl. Serv. Doc. FWS/OBS-78/12.

Wang, J.C.S., and R. J. Kernehan. 1979. Fishes of the Delaware Estuaries: A guide to early life histories. Ecological Analysts, Inc. 410 p.

Table 2 - Bottom trawl sample allocation, by zone

Zone	Samples per month
1	4
2	6
3	8
4	6
5	4
6	4
7	4
8	4



PSEG Services Corp, LLC	Figure 1 – Sampling Zones for Estuary-wide Trawl Programs

FIGURE 2 – Data Form

ESD Observation Event ID:

DATA FORM
BAYWIDE FINFISH MONITORING FISH PROCESSING

Serial No. ______________ Date:___________ Investigators:_______________ Project __________ Site:_______________

GPS Group:____________ Survey Method:__________ Gear:_____________ Tide Stage: F1 F2 FS E1 E2 ES Other

Weather: 1 2 3 4 5 6 7 8 9 Wind: N NE E SE S SW W NW Wave Height: 1 2 3 4 5 Start Time:_____ End Time:_____

Air Temp:___.__ Surface Water Temp:___.__ Mid- Water Temp:___.__ Bot Water Temp:___.__ Surface Sal:___.__ Mid-Sal:___.___ Bot Sal:___.__

Surface DO:___.__ Mid DO:___.__ Bot DO:___.__ DEPTH Min:______ Max ______ Depth of Sample: Min:______ Max:______ Depth Strata:___________

Water Clarity:_________ Start Lat:____°_____'______" Start Long.:____°_____'______" Stop Lat:____°_____'______" Stop Long.:____°_____'______"

Start Flowmeter:______________ Stop Flowmeter:_______________ Notes:____

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

Page _____ of ______ Proof 1 By:__________ Proof 2 By:______________ Input By:_____________

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

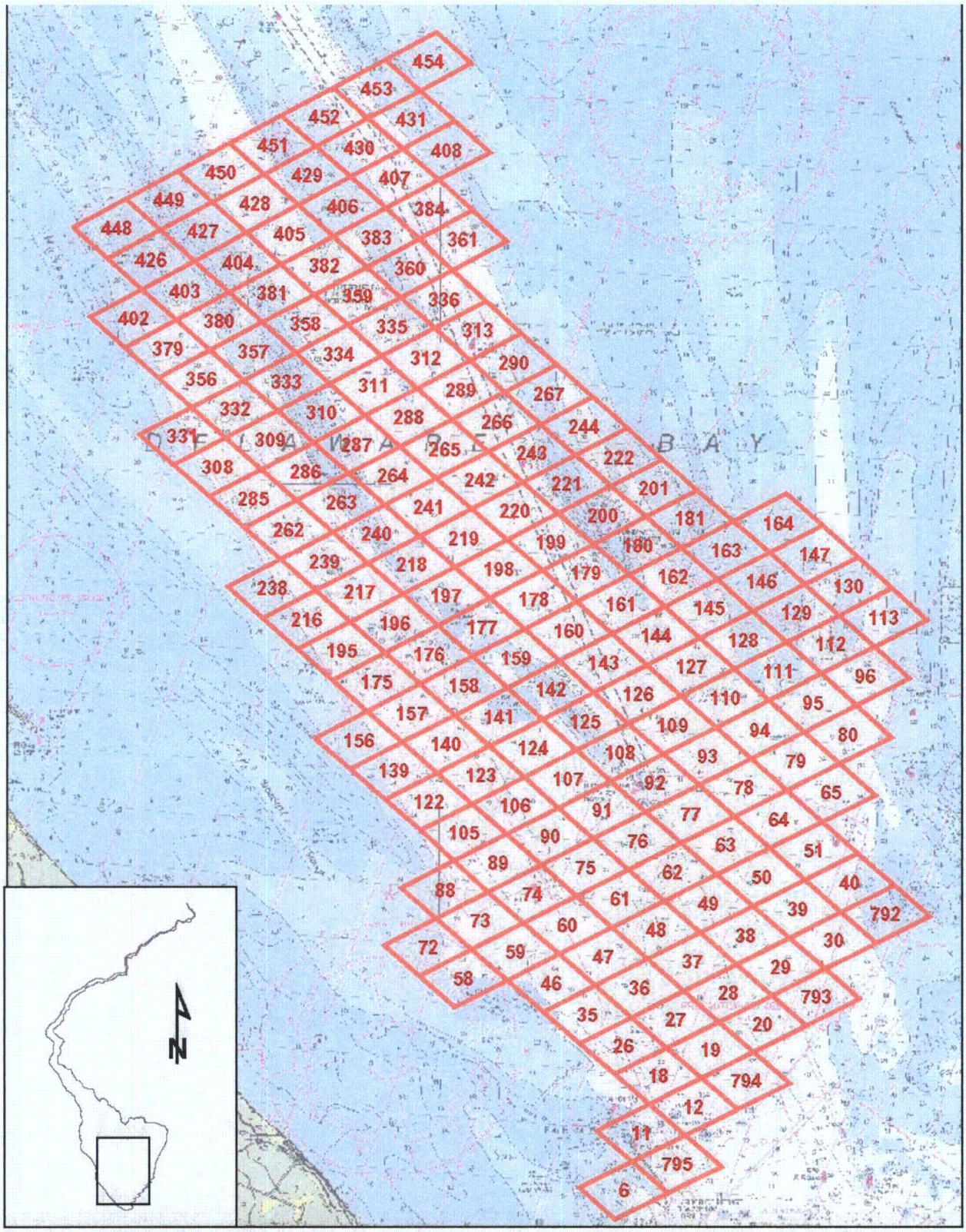
Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

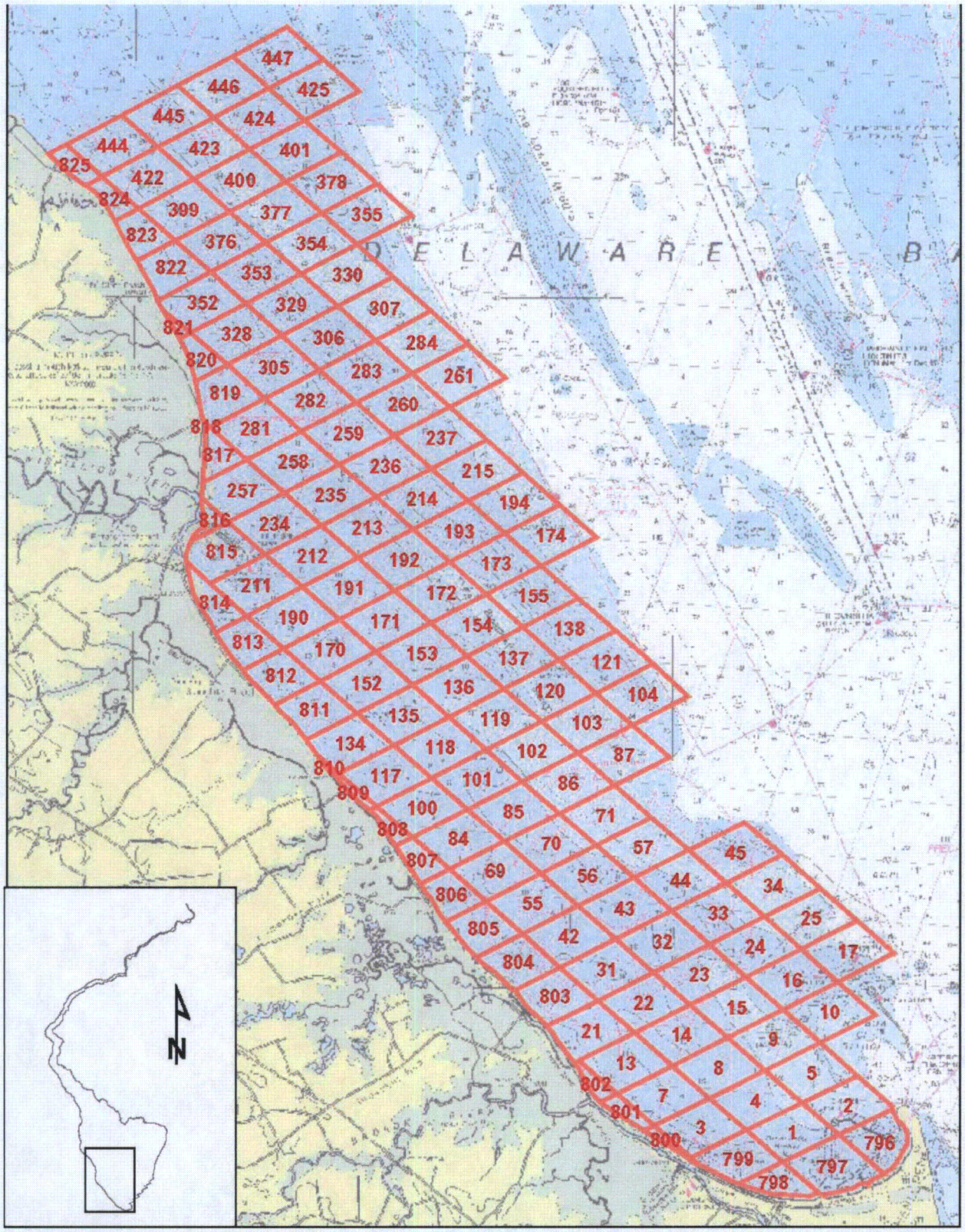
Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq

SPECIES	LIFE STAGE	TOTAL COUNTED	TOTAL WEIGHT	WEIGHT UNITS	TOTAL MEASURED	MEASUREMENT UNIT	MEASURE TECHNIQUE	MIN LENGTH	MAX LENGTH	NOTES
	E L J A			g kg other		mm m in ft	F T Other			

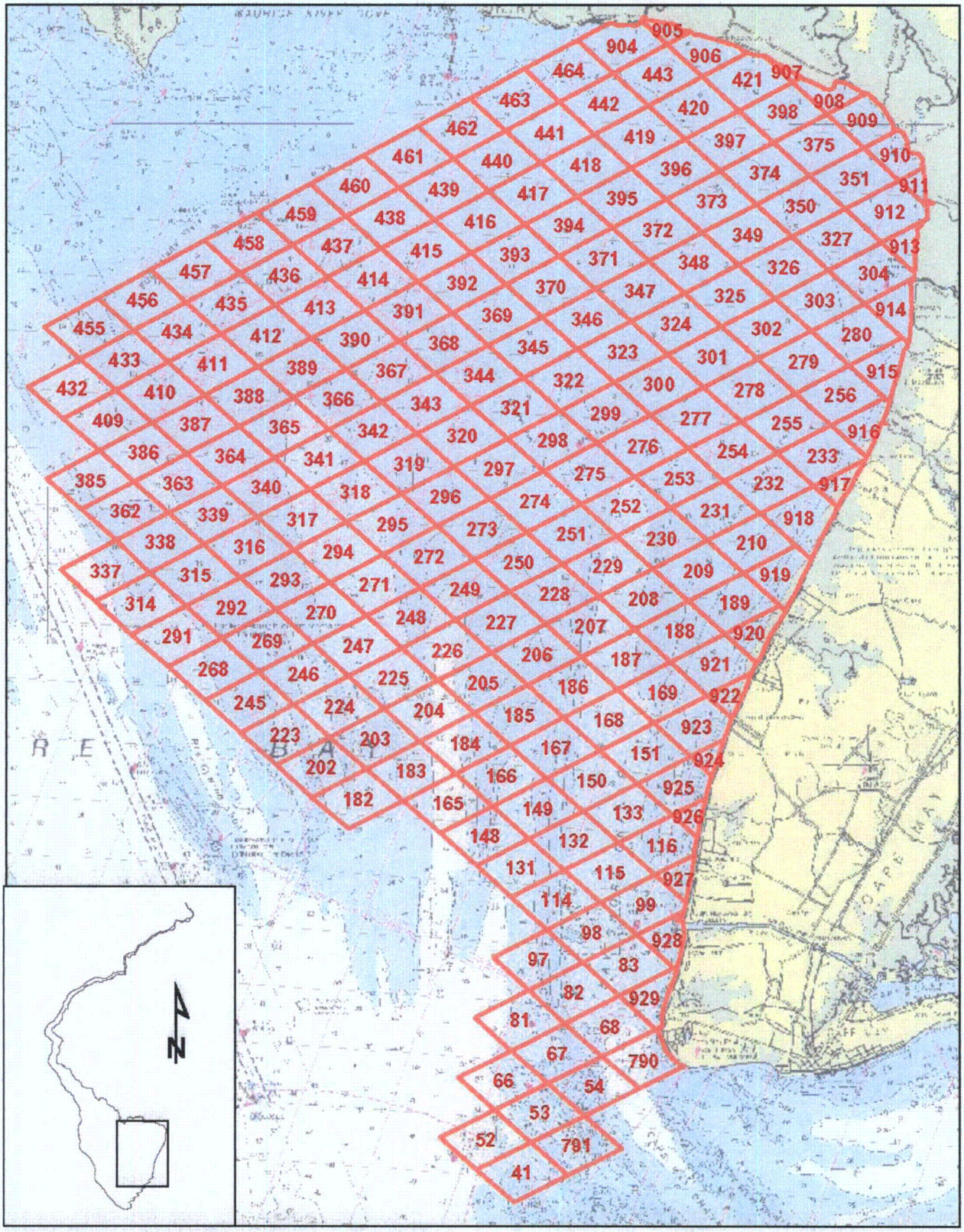
Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq	Length	Freq



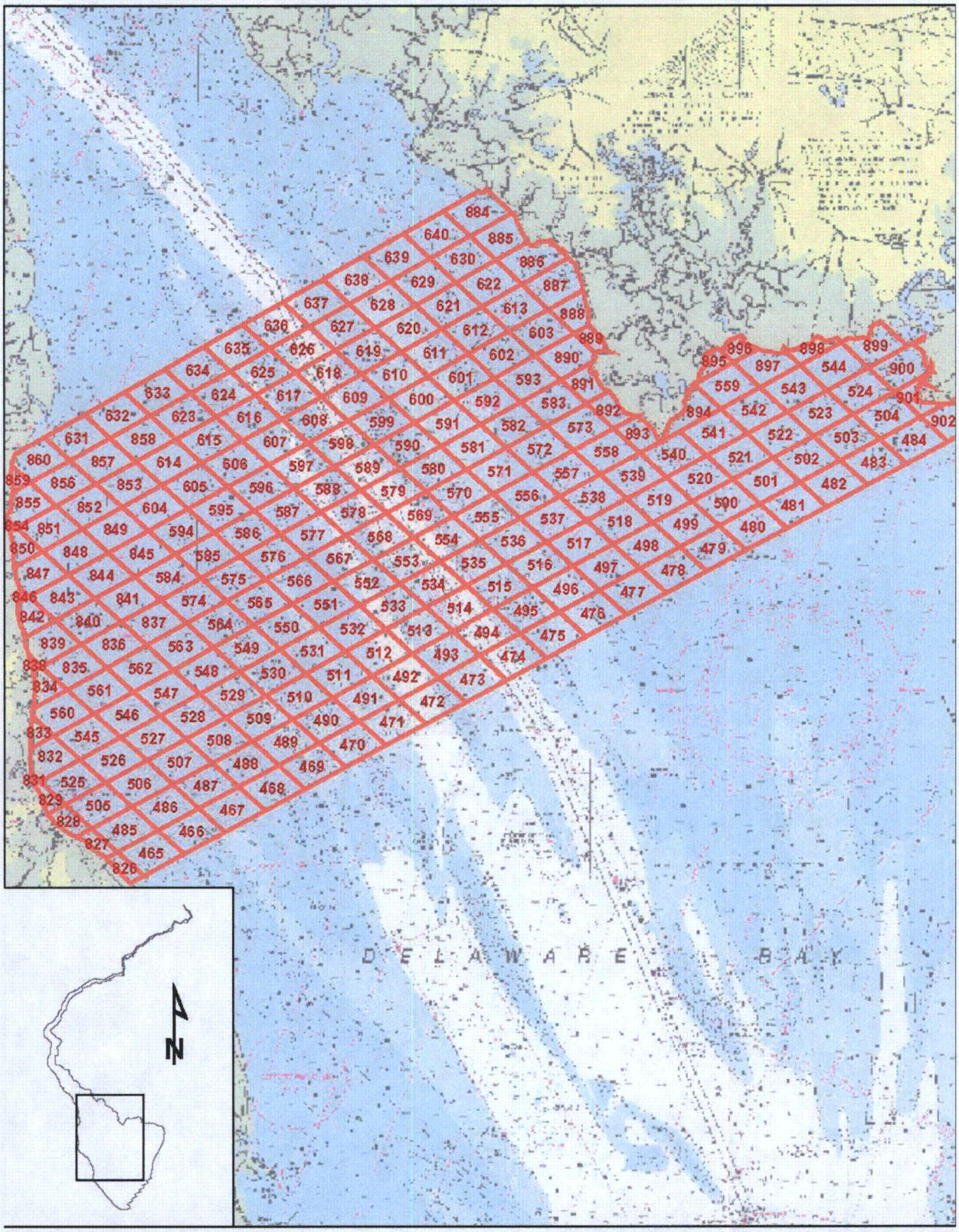
Sampling Grid Strata 1



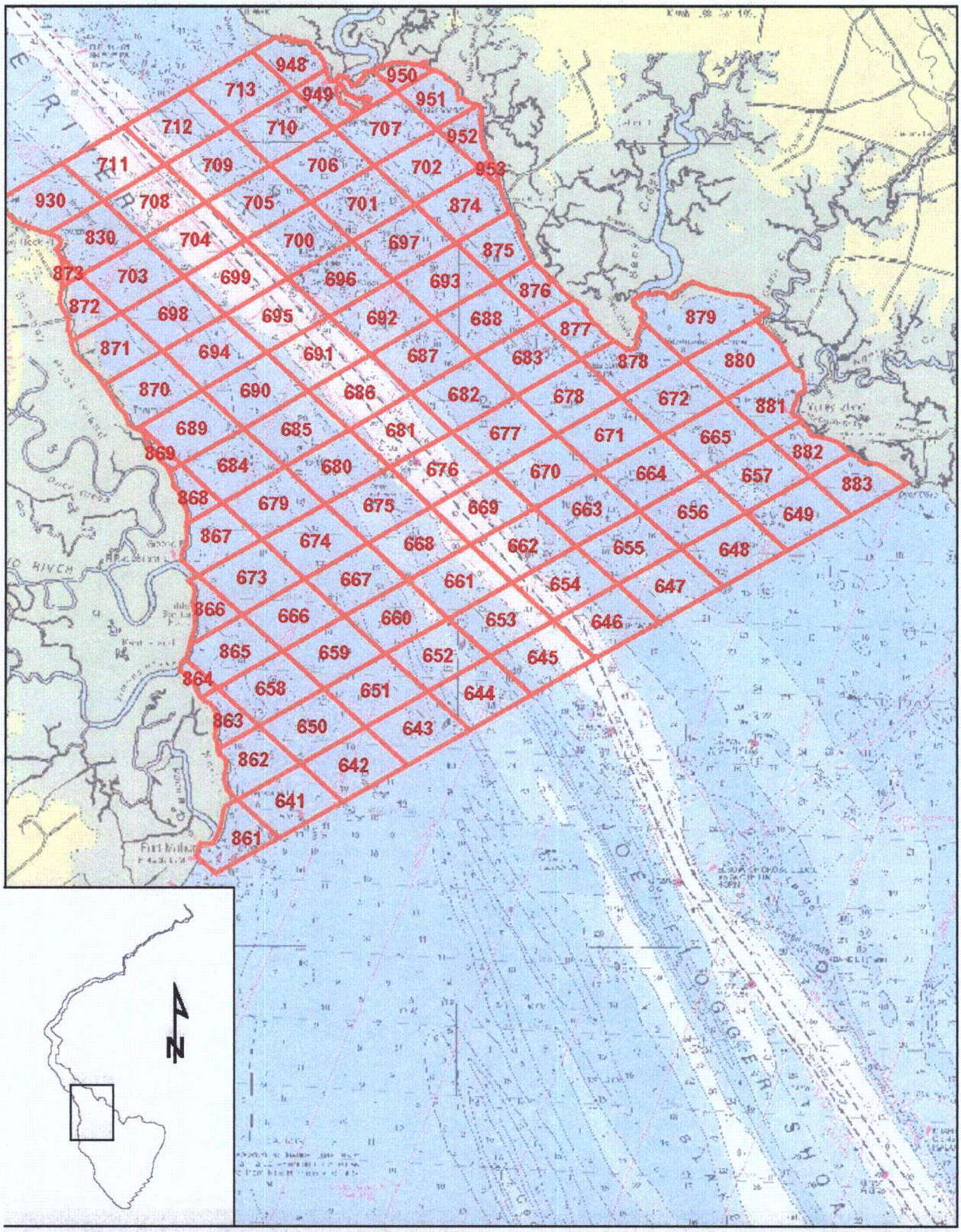
Sampling Grid Strata 2



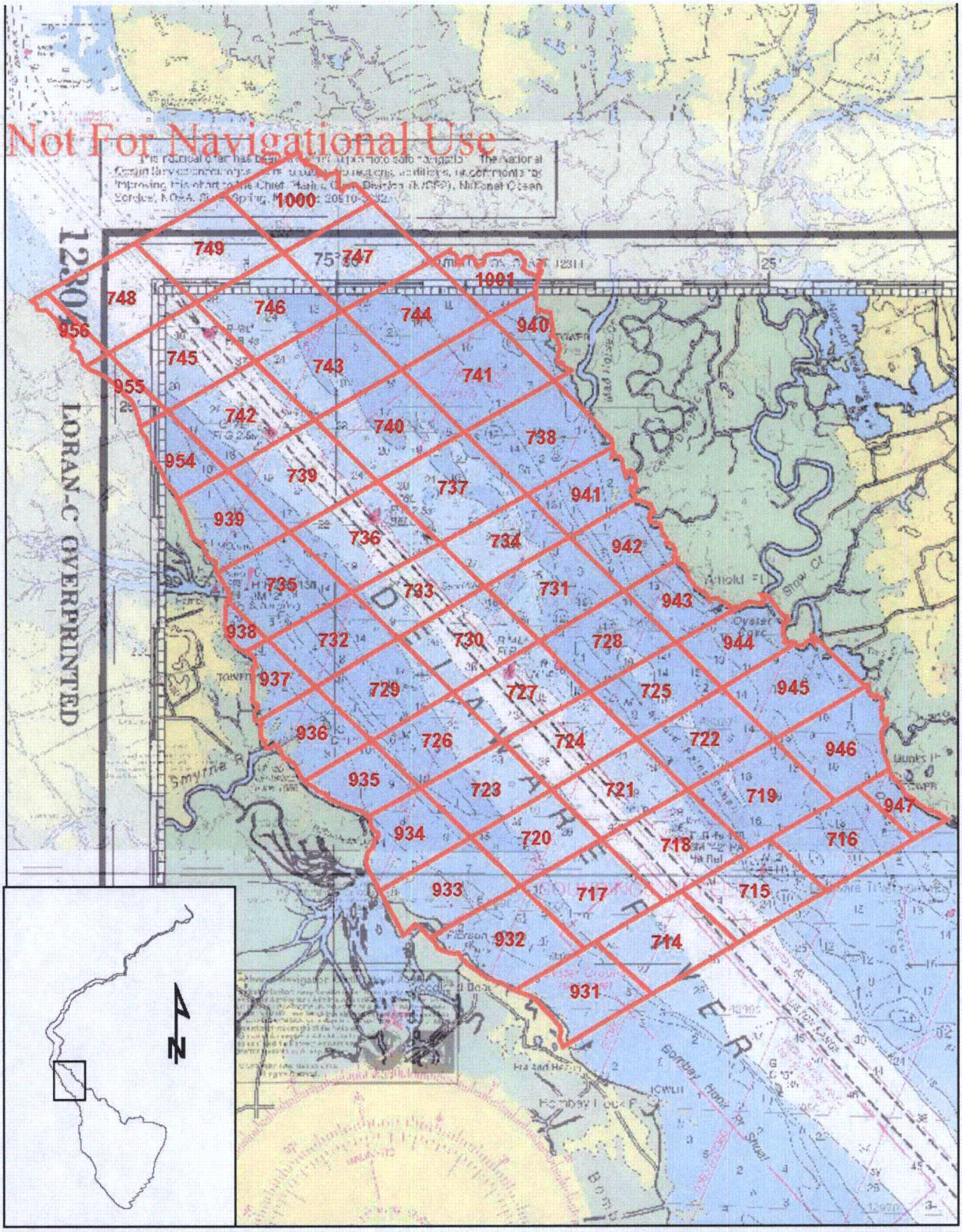
Sampling Grid Strata 3



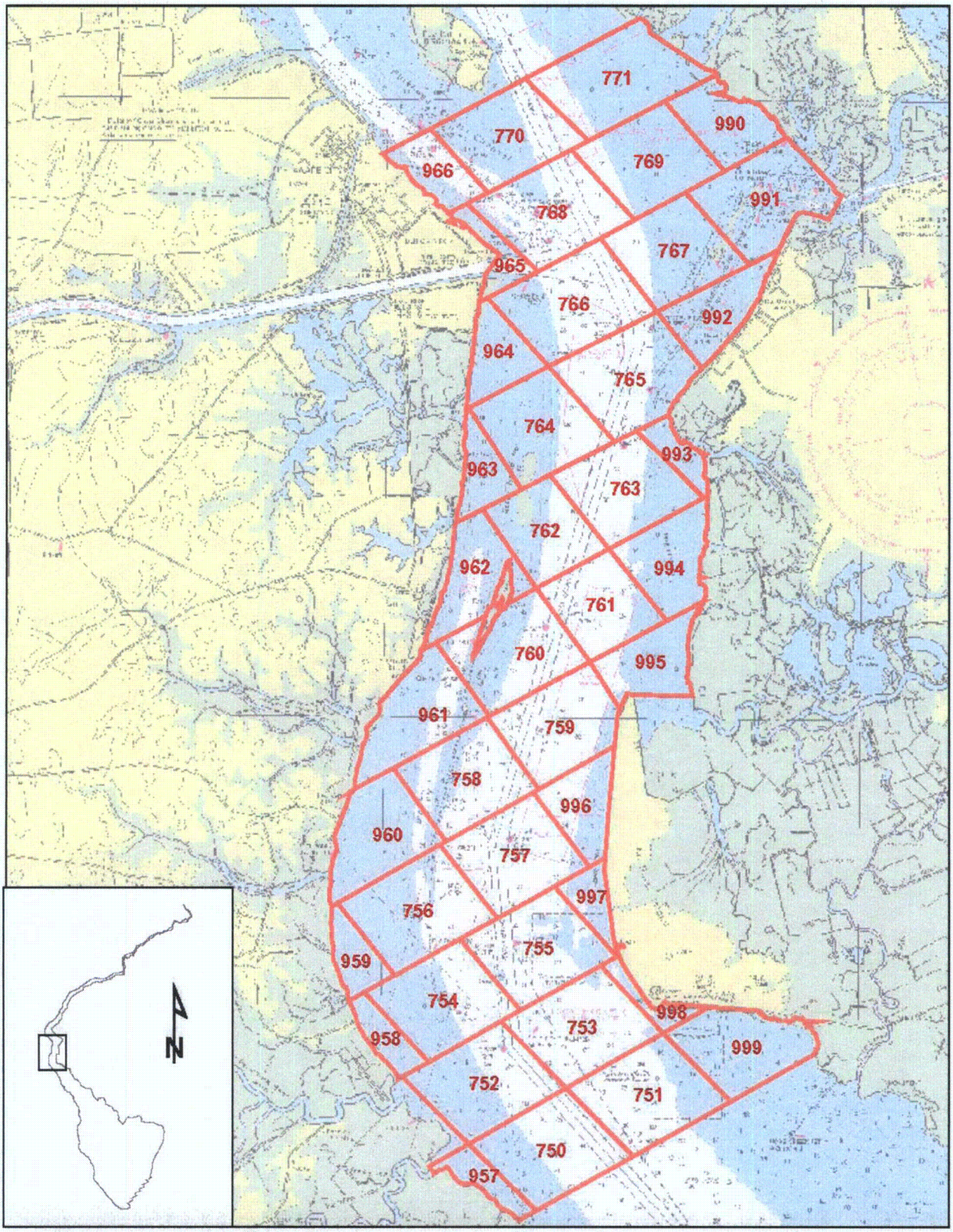
Sampling Grid Strata 4



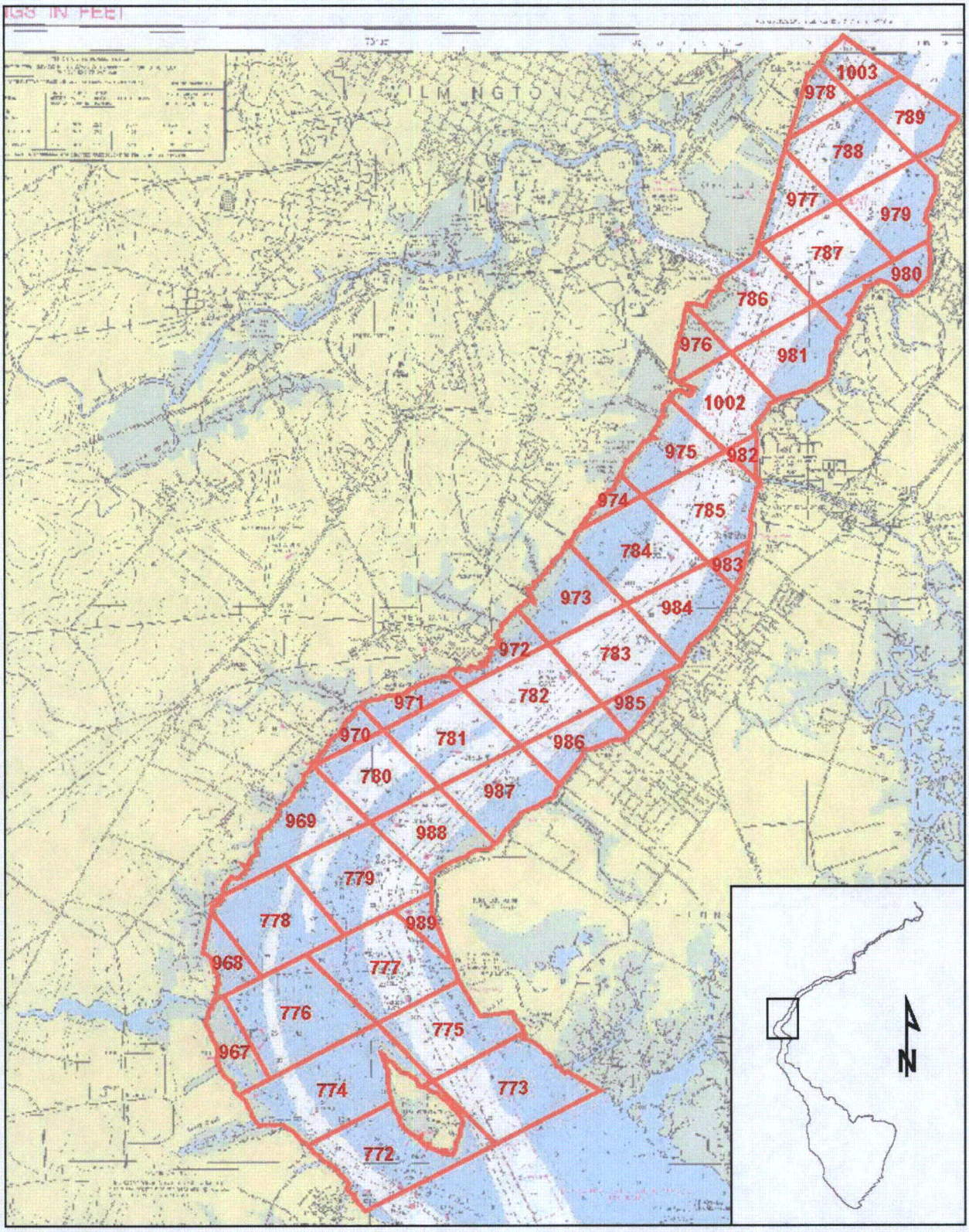
Sampling Grid Strata 5



Sampling Grid Strata 6



Sampling Grid Strata 7



Sampling Grid Strata 8

Salem/ Hope Creek Environmental Audit – Post-Audit Information

Question #: PSEG-4 **Category:** Threatened and Endangered Species

Statement of Question: Please provide the following documents that were made available during the Salem and HCGS License Renewal Environmental Audit.

PSE&G Transmission Corridor Information, including:

A Letter to NJDEP (10/28/09)
B Letter to USFWS (10/23/09)
C Letter from USFWS on 11/04/09
D Pinelands Management Plan
E Management Matrix for Salem-New Freedom Line
F Letter to NJDEP on 2/7/10

PEPCO Holdings, Inc. Transmission Corridor Information, including:

G Environmental Permitting Manual
H Transmission Vegetation Management Program

Response: The documents requested are being provided.

List Attachments Provided:

PSE&G Transmission Corridors Information:

A Letter from PSE&G (R. Tripodi) to NJDEP (L. Fisher) regarding PSE&G Freshwater Wetlands Permit No. 000-02-0031.2, Endangered Species Compliance During Electric Transmission Rights-Of-Way Vegetation Maintenance Activities. 10/28/2009

B Letter from PSE&G (R. Tripodi) to USFWS (W. Walsh) regarding PSE&G Freshwater Wetlands Permit No. 000-02-0031.2, Endangered Species Compliance During Electric Transmission Rights-Of-Way Vegetation Maintenance Activities. 10/23/2009.

C Letter from USFWS (Acting Supervisor, New Jersey Field Office) to PSE&G (R. Tripodi) concurring that adverse effects on federally listed or candidate threatened or endangered species are not likely if PSE&G implements the vegetation maintenance activities listed in its letter to USFWS dated 10/23/2009. 11/04/09.

D Lathrop, R. and J. Bunnell. *New Jersey Pinelands Electric-Transmission Right-of-Way Vegetation Management Plan*. Final Draft. February 2009.

E The Environmental Compliance Matrix page applicable to the Salem – New Freedom South Transmission Line is being provided. The columns labeled "Federal Species" and "State Species" on the page provided during the Salem and Hope Creek License Renewal Environmental Audit are redacted. (Note: This page is also being provided in response to Item # ENV-94.)

F Letter from PSE&G (D. GrossMueller) to NJDEP (L. Fisher) regarding PSE&G Freshwater Wetlands Permit No. 000-02-0031.2, Endangered Species Compliance During Electric Transmission Rights-Of-Way Vegetation Maintenance Activities. 2/07/2010.

PEPCO Holdings, Inc. (PHI) Transmission Corridors Information:

G ENSR/AECOM. *Environmental Permitting Manual, Final*. Prepared for Pepco Holdings Inc., Environmental Planning. Doc. No. 01855-043. September 2006.

H Pepco Holdings, Inc. *Transmission Vegetation Management Program for Pepco, Atlantic City Electric, and Delmarva Power & Light*. Rev. 2. 3/05/2008.

tel: 973.430.7000, fax: 973-624-9047

PSEG
Services Corporation

October 28, 2009

Ms. Linda Fisher
Division of Land Use Regulation
New Jersey Department of Environmental Protection
5 Station Plaza
501 East State Street
Trenton, New Jersey 08609

RE: PUBLIC SERVICE ELECTRIC AND GAS COMPANY (PSE&G)
FRESHWATER WETLANDS PERMIT NO. 000-02-0031.2
ENDANGERED SPECIES COMPLIANCE
DURING ELECTRIC TRANSMISSION RIGHTS-OF-WAY
VEGETATION MAINTENANCE ACTIVITIES

Dear Ms. Fisher:

This letter is being provided to you to update your files concerning the Public Service Electric and Gas Company (PSE&G) application for a Freshwater Wetlands General Permit No. 1 for Electric Transmission Rights-of-Way (ROW). PSE&G has been updating its internal procedures for ROW maintenance in order to provide greater protection for both Federally and State-listed threatened and endangered (T&E) species. PSE&G is working to modify practices from its past vegetation maintenance program that required extensive tree cutting; to one that maintains the ROWs by mowing brush and eventually grasses. Moving forward with this modified maintenance program into the future, it is hoped that ROWs overgrown with woody vegetation will become the exception rather than the norm. PSE&G anticipates adopting the conservation measures identified by the United States Fish and Wildlife Service (USFWS) and the New Jersey Department of Environmental Protection's (NJDEP's) existing document entitled "Utility Right-of-Way No-Harm Best Management Practices" (2009).

The USFWS and the NJDEP Endangered and Non-Game Species Program (ENSP) personnel have conducted an assessment of PSE&G's entire electric transmission network in order to identify ROW spans containing Federally and State-listed plants and animals. This information is being entered into PSE&G's Environmental Geographic Information System (GIS) database, which PSE&G refers to as the Matrix. The Matrix is a span by span description of the environmental constraints along each of PSE&G's electric transmission lines. The Matrix includes environmental restrictions such as: areas which will not receive mechanized maintenance; areas with threatened and endangered species timing restrictions, best management practices, wetlands, streams and riparian zones; as well as areas that require maintenance activities to be conducted by hand.

Traditionally, PSE&G preformed vegetation maintenance along its Rights-of-Way (ROW) between January and June. To accommodate the timing restrictions for most Federal and State

T&E species, it is PSE&G's intention to perform the majority of the electric transmission vegetation maintenance activities between October 1 and March 31. Conducting maintenance during these winter months will also minimize impacts to nesting birds, which are protected under the Migratory Bird Treaty Act (MBTA).

Additional Best Management Practices (BMPs) to protect natural resources include:

- Raising the mower blades to at least six inches (6") above the ground in any areas authorized by NJDEP for the use of motorized equipment in wetlands;
- Conducting surveys for upland plants identified within ROWs. These surveys include:
  - Field assessment for the upland plant species;
  - If the species is present, an area surrounding the plant colony will be flagged and the area will be hand cut to prevent impacting the plants;
  - If the species is not identified during the survey, the mower head will be set at three inches (3") in suitable habitat, identified during the field survey; and
  - Mowing will be conducted during the winter months when the plants are not active.
- Riparian areas containing T&E plants will be cut by hand;
- Herbicide application within riparian areas when necessary; will include basal treatment and stump treatment only, utilizing herbicides designated for use in aquatic environments. There will be no broadcast spraying of herbicides; and
- In upland areas the mower head will be mounted on a one inch (1") skid plate to prevent soil disturbances.

In addition, PSE&G is exploring the potential to mark electric transmission structures indicating spans with environmental restrictions which include, but are not limited to: areas which do not receive mechanized maintenance; areas with threatened and endangered species timing restrictions, wetlands, streams and riparian zones; and areas which require maintenance activities to be conducted by hand. PSE&G is investigating several methods of marking electric transmission structures and will keep the NJDEP updated on the process.

Should you have any questions or require additional information, please contact Dr. David Grossmueller of our offices at (973) 430-5228.

Very truly yours,

Raymond A. Tripodi

Raymond A. Tripodi
Manager-Corporate Licenses and Permits

Environmental Health & Safety
80 Park Plaza, T17 Newark, NJ 07102-4194
Tel: 973.430.7000 Fax: 973.624.9047

PSEG
Services Corporation

October 23, 2009

Ms. Wendy Walsh
U.S. Fish and Wildlife Service
New Jersey Field Office
927 North Main Street
Heritage Square, Building D
Pleasantville, New Jersey 08232

**RE: PUBLIC SERVICE ELECTRIC AND GAS COMPANY (PSE&G)
FRESHWATER WETLANDS PERMIT NO. 000-02-0031.2
ENDANGERED SPECIES COMPLIANCE DURING
ELECTRIC TRANSMISSION RIGHT-OF WAY
VEGETATION MAINTENANCE ACTIVITIES**

Dear Ms. Walsh:

Pursuant to your August 19, 2009 electronic mail correspondence, your May 28, 2008 letter, and subsequent coordination regarding vegetation maintenance along Public Service Electric and Gas Company (PSE&G) electric transmission Rights-of-Way (ROW), PSE&G is providing this letter to confirm our commitment to protecting both Federally and State listed threatened and endangered species. As discussed during our meeting of August 19, 2009, PSE&G is working to shift from vegetation maintenance which requires extensive tree cutting to one which maintains the ROWs by mowing brush and eventually grasses. As the new maintenance program continues, it is hoped that ROWs overgrown with woody vegetation will become the exception rather than the norm. PSE&G adopts the conservation measures recommended by the U.S. Fish and Wildlife Service (USFWS) for each species as follows:

Indiana Bat

- PSE&G will maintain a seasonal restriction on cutting trees greater than five (5) inches in diameter at breast height (dbh) from April 1 through November 15 in those spans identified by the USFWS as hibernacula foraging habitat (HI) and as hibernacula and maternity colony foraging habitat (HIMA).

- In spans identified as maternity colony foraging habitat (MA), PSE&G will maintain a seasonal restriction on cutting trees greater than five (5) inches in diameter at breast height (dbh) from April 1 through September 30.

- PSE&G does not believe it can fully implement USFWS's recommendation to "notify the Service before cutting any suitable roost tree at any time of year." The main purpose for PSE&G's application for the GP-1 was to obtain pre-approval for its vegetative maintenance activities in an attempt to avoid impact to Federal and/or State protected species, avoid numerous independent submittals to Federal and State regulators, and

avoid down time to PSE&G's work schedule while awaiting regulatory response. In consideration of the numerous seasonal tree cutting restrictions, which in certain areas can reduce the annual cutting season to 30 days, a notification / response requirement would adversely impact PSE&G's ability to complete its other regulatory obligations. As you are aware, the New Jersey Public Board of Utilities (NJBPU) regulations required PSE&G to clear its ROWs of woody vegetation (greater than three (3) feet) under the power lines and no woody vegetation greater then 15 feet in the areas adjacent to the power lines. However, within hibernation (HI) and/or maternity areas (MA), PSE&G will make every effort to trim and/or girdle (with or without herbicide) suitable roost trees instead of removing them, to the extent possible given the NJBPU vegetative maintenance requirements. Suitable roost trees are described in the USFWS document "Characteristics of Indiana Bat Summer Habitat."

- For spans marked as occurring within the Geographic Range of the bats (P), PSE&G will not cut more than five (5) trees greater than five (5) inches in diameter at breast height (dbh) per linear mile between April 1 and September 30 unless such a tree is found to exist at a height determined to pose a hazard to system reliability and/or PSE&G would violate its other regulatory obligations. Under such circumstances, PSE&G will notify USFWS of the tree location and our intention to cut or trim, and will implement additional site-specific USFWS recommendations if possible.

Bog Turtle

- PSE&G will utilize a recognized, qualified bog turtle surveyor to examine spans identified by the USFWS as potential habitat (P) or an extant occurrence (E) of the bog turtle. Areas identified by the surveyor as suitable bog turtle habitat, plus a 150-foot buffer, will be flagged prior to any vegetation maintenance activities being conducted in that span, and a recognized, qualified bog turtle surveyor will be on-site during maintenance activities in flagged areas.

- PSE&G will conduct all maintenance activities by hand within flagged areas; will avoid stepping on hummocks or tussocks when working in flagged areas; will not allow the use of motorized equipment in flagged areas; and will not allow the storage of materials or equipment in flagged areas.

- PSE&G will remove woody vegetation within the flagged areas by hand between October 15 and March 31; will not pull woody vegetation out by the roots in the flagged areas to prevent disturbing potential hibernacula; and will use only glyphosate-based herbicides applied manually and directly to stumps in the flagged areas.

- All flagging will be removed upon completion of work in the area.

- PSE&G will not apply herbicide in known nesting areas between June 1 and August 30 to protect the habitat. Known nesting areas include all flagged areas associated with an extant occurrence (E) of the bog turtle as identified by the USFWS and/or observation of an actual bog turtle in the field.

- In accordance with the timing restrictions set forth in the New Jersey Department of Environmental Protection's (NJDEP) existing "Utility Right-of-Way No-Harm Best Management Practices (2009)" PSE&G will avoid disturbance in areas identified by the USFWS and confirmed by a recognized, qualified surveyor as known or suitable bog

turtle habitat during nesting (May 1 – June 30). PSE&G will follow all other applicable bog turtle provisions of the most current version of the "Utility Right-of-Way No-Harm Best Management Practices," including any provisions that are more restrictive than those listed above.

- Upon completion of recognized, qualified bog turtle surveyor's results report, PSE&G will forward a copy to USFWS for its files.

Swamp Pink

- On ROW spans identified by USFWS as potential habitat (P) or an extant occurrence (E) of swamp pink, PSE&G will utilize a qualified botanist to survey any suitable forested wetland habitat on and adjacent to the ROW for the presence or absence of swamp pink. Survey reports will be provided to USFWS as surveys are completed.

- PSE&G will utilize a qualified botanist to flag a 200 foot radius around any identified swamp pink population and no maintenance activities of any kind will be initiated within the flagged areas without USFWS approval. All flagging will be removed upon completion of work in the area.

- Herbicide application within 500 feet of a known population will be to woody stumps only, and will be conducted manually.

Dwarf Wedgemussel

- PSE&G will conduct all vegetation maintenance activities by hand within 300 feet of streams identified by USFWS as potential habitat (P) for the dwarf wedgemussel. If herbicide is necessary in these areas, application will be to woody stumps only and will be conducted manually.

Small Whorled Pogonia

- PSE&G will conduct a preliminary habitat assessment along spans identified by USFWS as potential habitat (P) for small whorled pogonia to determine if any areas of suitable upland woods are designated for removal. If so, PSE&G will arrange for a qualified botanist to survey such woods for the presence or absence of this species between late July and mid-September (before frost). The habitat assessment and results of any survey will be provided to USFWS upon completion of the survey. Further consultation will be conducted if any small whorled pogonia plants are found.

Other Listed Plants

- In spans identified by USFWS as potential habitat (P) for Knieskern's beaked-rush, American chaffseed, and/or sensitive joint vetch, PSE&G will not use herbicide and will raise mower blades to at least 6 inches above the ground. PSE&G does not perform vegetative maintenance activities in the tidal marshes required by sensitive joint vetch.

Bog Asphodel

- PSE&G will arrange for a qualified botanist to survey suitable habitats in and adjacent to spans identified by USFWS as potential habitat (P) for bog asphodel for the presence or

absence of this Federal candidate species. Survey results will be provided to USFWS. Further consultation will be conducted if any bog asphodel plants are found at the completion of the survey.

Bald Eagle

- It is anticipated that PSE&G will comply with the National Bald Eagle Management Guidelines; however, PSE&G wishes to reserve the right to discuss this matter until such time as we complete our review of the Guidelines. PSE&G will notify the USFWS if the Guidelines cannot be implemented, to determine if a permit is required under the Bald and Golden Eagle Protection Act.

- Unless NJDEP indicates otherwise, PSE&G will, in accordance with the timing restrictions set forth in NJDEP's existing "Utility Right-of-Way No-Harm Best Management Practices (2009)," PSE&G avoid disturbance within 1000 feet of areas identified by the NJDEP as eagle nesting and foraging buffers during nesting (December 15 August 31).

It should be noted that the NJDEP is currently conducting an assessment of PSE&G's entire electric transmission network in order to identify spans containing State listed plants and animals, including bald eagles.

PSE&G will contact USFWS annually at least 60 days prior to the start of vegetative maintenance activities to request any new information regarding the locations of potential habitat or extant occurrences of federally listed species within its electric transmission system. During this annual coordination process, the continued implementation of the above-listed conservation measures, with any appropriate modifications, will be confirmed. It is PSE&G's intention to perform the majority of our transmission vegetation maintenance activities between October 1 through March 31 so as to accommodate the timing restrictions for most Federal and State threatened and endangered species. Conducting maintenance during these winter months will also minimize impacts to nesting birds, which are protected under the Migratory Bird Treaty Act. As an additional best management practice to protect natural resources, PSE&G will raise mower blades to at least 6 inches above the ground in any areas authorized by NJDEP to use motorized equipment in wetlands.

In addition, PSE&G is exploring the potential to mark electric transmission structures) indicating spans with environmental restrictions which include, but are not limited to: areas which do not receive mechanized maintenance; areas with threatened and endangered species timing restrictions, wetlands, streams and riparian zones; and areas which require maintenance activities be conducted by hand. PSE&G is exploring several methods of marking electric transmission structures and will keep the USFWS updated on the process.

As a final item, PSE&G has been working with the USFWS personnel at the Great Swamp National Wildlife Refuge (GSNWR) to restore bog turtle habitat. Refuge staff have expressed an interest in participating in common reed eradication projects along the ROW within the Refuge. To date, Refuge staff members have not expressed any preferred vegetation management practices however PSE&G will continue to coordinate directly with Refuge staff to develop vegetation management tools which complement the management goals of the Refuge. PSE&G will include a discussion of future vegetative maintenance practices within GSNWR in the final restoration plan that will be developed in cooperation with Refuge staff.

If you have any questions or require additional information, please contact Dr. David Grossmueller of our offices at (973) 430-5228.

Very truly yours,

Raymond A. Tripodi

Raymond A. Tripodi
Manager - Corporate Licenses and Permits

cc: Larry Torok, NJDEP
Linder Fisher, NJDEP

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice

In Reply Refer to:

2009-I-0707

NON-PSEG

NOV 4 2009

Raymond A. Tripodi, Manager
Corporate Licenses and Permits
PSEG Services Corporation
80 Park Plaza, T17
Newark, New Jersey 07102-4194
Attention: Dr. David Grossmueller

Dear Mr. Tripodi:

The U.S. Fish and Wildlife Service (Service) has reviewed your October 23, 2009 letter adopting conservation measures for federally listed species that Public Service Electric and Gas Company (PSE&G) will implement during vegetation maintenance activities within its existing electric transmission Right-of-Way (ROW) system, which is located in Sussex, Passaic, Bergen, Warren, Morris, Essex, Hudson, Hunterdon, Somerset, Union, Middlesex, Mercer, Burlington, Camden, Gloucester, and Salem Counties, New Jersey. PSE&G has applied to the New Jersey Department of Environmental Protection (NJDEP) for renewal of a general permit (000-02-0031.2) under the New Jersey Freshwater Wetlands Protection Act (N.J.S.A. 13:9B *et seq.*) to authorize vegetation maintenance within the PSE&G transmission system through 2014. PSE&G's adopted conservation measures were developed in coordination with the Service, pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) and the Bald and Golden Eagle Protection Act (54 Stat. 250; 16 U.S.C. 668-668d). The conservation measures refer to transmission system segments (spans) that have been identified by the Service as habitat for federally listed and candidate species. This information was transmitted to PSE&G as a GIS shapefile via electronic mail on September 30, 2009.

Based upon PSE&G's adoption of the conservation measures listed in your October 23, 2009 letter, the Service concurs that continued vegetation maintenance activities within the transmission system are not likely to adversely affect federally listed or candidate species. The conservation measures also include practices to avoid or minimize adverse impacts to bald eagles, other migratory birds, Great Swamp National Wildlife Refuge, and wetlands. The Service appreciates the cooperation of PSE&G to develop and adopt these measures. As described in your October 23, 2009 letter, PSE&G will coordinate annually with the Service to determine if any new locations or information regarding federally listed species has become available, and to consider if any of the conservation measures require modification.

Please contact Wendy Walsh at (609) 383-3938, extension 48, if you have any questions or require further assistance regarding federally listed threatened or endangered species.

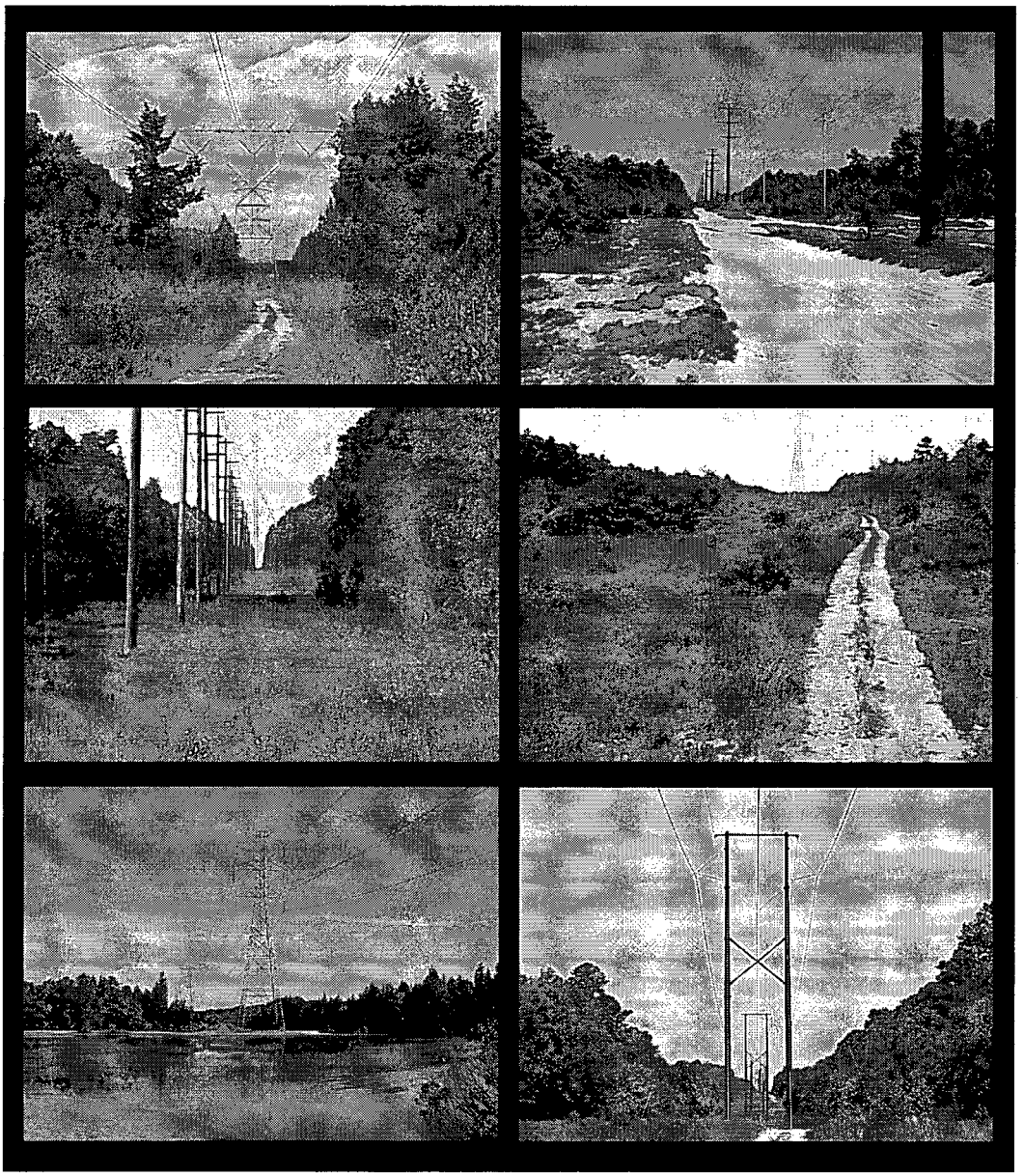
Sincerely,

Acting Supervisor

cc: Linda Fisher, DLUR
Larry Torok, DLUR
Steve Henry, Great Swamp NWR
Coop Chavis, OLE
Jorris Naiman, DOI Solicitor

NON-PSEG

NEW JERSEY PINELANDS ELECTRIC-TRANSMISSION RIGHT-OF-WAY VEGETATION-MANAGEMENT PLAN



FINAL DRAFT

FEBRUARY 2009

NEW JERSEY PINELANDS
ELECTRIC-TRANSMISSION RIGHT-OF-WAY
VEGETATION-MANAGEMENT PLAN

Prepared by

Richard G. Lathrop, Jr., PhD
Center for Remote Sensing & Spatial Analysis
Rutgers University
New Brunswick, NJ 08901

and

John F. Bunnell
NJ Pinelands Commission
New Lisbon, NJ 08064

FEBRUARY 2009

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

We thank Dr. Robert A. Zampella of the Pinelands Commission who developed the work plan that we followed and who provided essential guidance throughout this project. Mariana Du Brul from the Pinelands Commission played an important role early on in the project. John Bognar, Aaron Love, Jim Trimble, Zewei Miao, and Bernie Isaacson of the Rutgers University Center for Remote Sensing and Spatial Analysis; Jessica Sanders, Wes Brooks, and Jason Grabosky of the Rutgers University Department of Ecology, Evolution, and Natural Resources; and Nicholas Procopio, Katherine Reinholt, Patrick Burritt, and Jennifer Ciraolo of the Pinelands Commission provided valuable assistance at various stages of the project.

We sincerely appreciate the collaboration with Atlantic City Electric, Public Service Enterprise Group, and Jersey Central Power and Light. Their cooperation and patience throughout this project was outstanding. We also extend our gratitude to Ted Gordon for his advice on the timing restrictions for threatened and endangered plants and Gerry Moore, Ted Gordon, the U.S. Fish and Wildlife Service, and the New Jersey Department of Environmental Protection Endangered and Nongame Species Program and Office of Natural Lands Management for providing threatened and endangered species plant and animal data.

INTRODUCTION

In 2006, the Pinelands Commission contracted with the Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA) to develop a span-by-span vegetation-management plan for the bulk-electric-transmission rights-of-way (ROWs) in the Pinelands Area. Bulk-transmission lines have a 69 kV capacity or greater. This ROW plan contains specific vegetation-management prescriptions for each of the 3,041 spans that compose the 233 mi (2,695 ac) of Pinelands ROW. These ROWs are managed by three utility companies, including Public Service Enterprise Group (PSEG), Jersey Central Power & Light (JCP&L), and Atlantic City Electric (ACE), which is a Pepco Holdings, Inc. (PHI) company. The utility companies, along with the New Jersey Board of Public Utilities, were important partners in this project.

The specific goal of this project was to develop a ROW vegetation-management plan to create and maintain relatively stable and sustainable, early successional habitats that:

1. Represent characteristic Pinelands-reference habitats, such as scrub-shrub vegetation, emergent wetlands, and intermittent ponds;
2. Provide habitat for native Pinelands plants and animals, including threatened and endangered species;
3. Reflect the size, shape, and spatial distribution of characteristic Pinelands-reference habitats;
4. Reflect local soils and hydrologic features;
5. Reflect within-patch heterogeneity similar to characteristic reference habitats;
6. Maximize natural re-vegetation and minimize planting;
7. Are compatible with surrounding landscapes (e.g., locate grasslands adjacent to farmland);
8. Ensure transmission reliability and safety;
9. Require minimal subsequent management; and
10. Minimize the need for individual Pinelands permit reviews.

To accomplish this goal, a work plan was developed to complete the following five major tasks:

1. Task 1. Create a geographic-information system (GIS) database of bulk-electric-transmission rights-of-way in the Pinelands.
2. Task 2. Map and characterize managed right-of-way and Pinelands-reference habitats.
3. Task 3. Compare patch and landscape characteristics of managed right-of-way and Pinelands-reference habitats.
4. Task 4. Summarize right-of-way vegetation-management strategies used by utility companies in the Pinelands and in areas adjacent to the Pinelands.
5. Task 5. Develop a dynamic span-by-span vegetation-management plan for Pinelands rights-of-way.

In separate sections of this report, we describe the methods and results for each of these five tasks and provide recommendations regarding the implementation of the plan. The GIS layer that contains span-specific vegetation-management prescriptions is available on the Commission's web site at www.state.nj.us/pinelands/.

TASK 1. CREATE A GEOGRAPHIC-INFORMATION-SYSTEM DATABASE OF BULK-ELECTRIC-TRANSMISSION RIGHTS-OF-WAY IN THE PINELANDS

The objective of this first task was to create a geographic-information-system (GIS) database that included a span-by-span GIS layer for Pinelands ROWs (ROW span layer), data from each utility company on historical vegetation-management activities, land-use/land-cover and soils data, and recent aerial photography. We used these data to complete various portions of the other tasks in this report. For this Task, we explain the collection of transmission-line data, describe the creation of the ROW span layer, and list the other data that was assembled in the database.

GIS DATA COLLECTION AND ASSEMBLY

Transmission-line Data

In early 2006, we obtained geographic data for the bulk-electric-transmission lines for the Pinelands Area from each utility company. PSEG provided GIS polygon data, PHI supplied GIS line data for ACE, and JCP&L supplied geographic coordinates for each tower location in spreadsheet format. The data were imported, extracted, and re-formatted into a single GIS layer in ArcGIS (Environmental Systems Research Institute, Redlands CA., USA, 1999-2006) software (Figure 1.1).

ROW Span layer

To create the ROW span layer, we used the re-formatted GIS layer and mapped the transmission lines between substations to identify individual circuits and confirm geographic coverage. Using aerial photographs from 2002 and 2006, utility towers were located and a standard ROW buffer width for that particular circuit was applied to create a polygonal coverage (Figure 1.2). The buffer widths varied by utility company and roughly corresponded to the boundaries of the existing managed ROW corridor visible from the aerial photographs.

For each tower that was visible on the aerial photographs, boundaries were generated to separate the circuits into individual polygons or spans (Figure 1.2). A span is the portion of a ROW between two adjacent towers. We assigned a unique alpha-numeric identifier to each span that included information on the utility company, circuit, and span number.

There were situations in which multiple lines and/or circuits shared the same ROW corridor. Up to seven circuits shared the same corridor in some locations. For most cases with multiple circuits, the spans in that corridor were subdivided into parallel sets of spans (Figure 1.3). The resulting ROW span layer included 233 miles of Pinelands ROW, contained 3,041 individual spans, and covered 2,695 acres. The ROW span layer served as the foundation for the project because it represented the boundary for mapping vegetation within Pinelands ROWs and allowed for linking span-by-span vegetation-management prescriptions to specific geographic areas of the Pinelands.

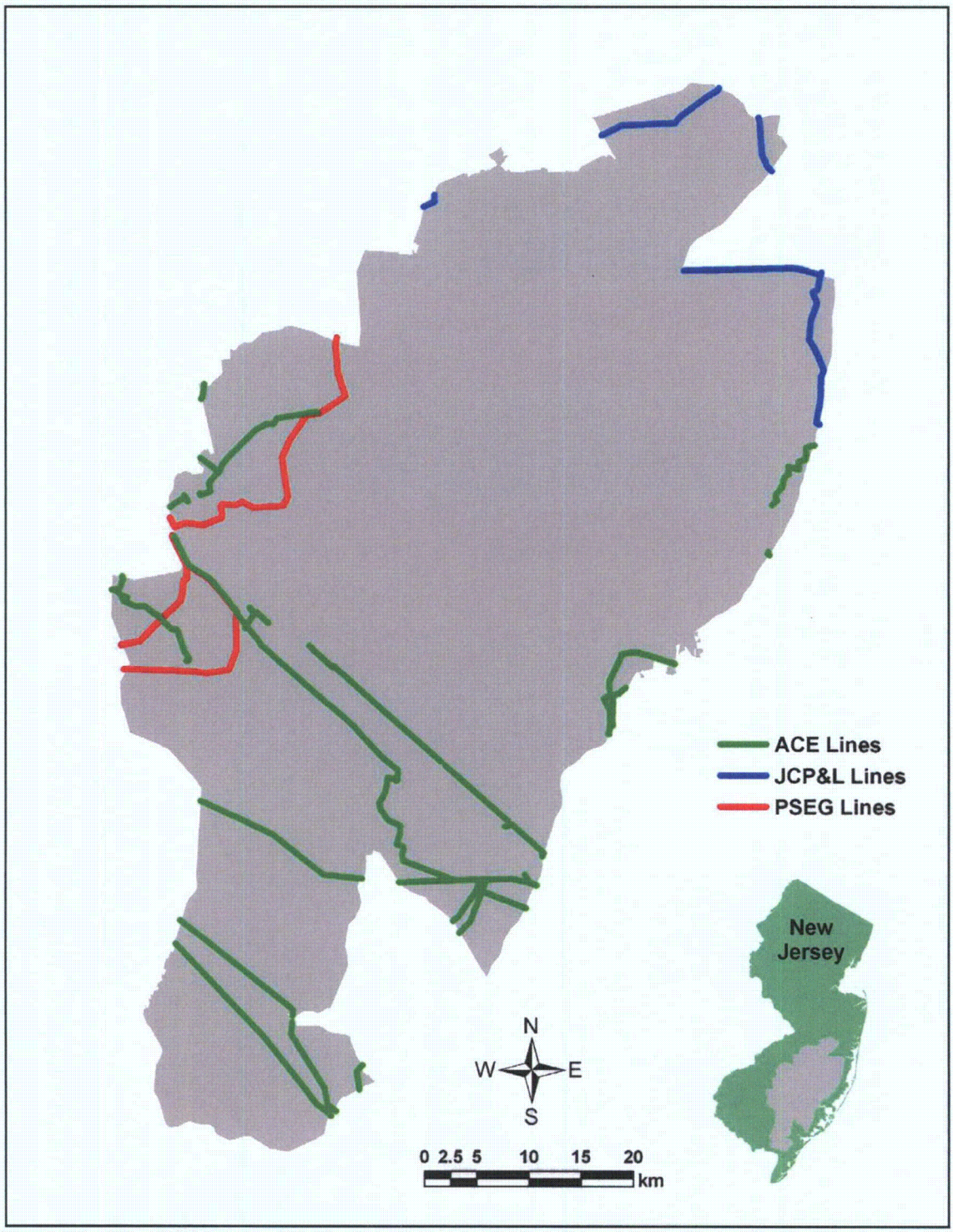


Figure 1.1. The GIS layer of bulk-electric transmission-line rights-of-way in the Pinelands Area managed by Atlantic City Electric (ACE), Jersey Central Power and Light (JCP&L), and Public Service Enterprise Group (PSEG). The Pinelands Area is shown in gray.

Other Data Collected for the Database

We obtained information from utility company representatives on both vegetation-management techniques that they currently use in the Pinelands and also historical vegetation-management data. The geographic extent and detail of the historical data received from each utility company varied. PSEG provided span-by-span records of past management in GIS format (Figure 1.4), JCP&L supplied span-specific information only on recommended management activities, and ACE offered a report that provided general recommendations for all of their ROWs (PHI 2006).

Other GIS data and digital-image data were compiled and added to the project database. These data included:

1. NJDEP 1995/1997 land-use/land cover (LU/LC): New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). *NJDEP 1995/1997 Land use/Land cover Update.* Edition 1.3 (FINAL). Trenton, New Jersey. http://www.state.nj.us/dep/gis/lulc95shp.html

2. NJDEP 2002 land-use/land cover (LU/LC): New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). *NJDEP 2002 Land use/Land cover Update.* Edition 20080304. Trenton, New Jersey. http://www.state.nj.us/dep/gis/lulc02shp.html

3. NRCS SSURGO soils data: United States Department of Agriculture, Natural Resources Conservation Service. *Soil Survey Geographic (SSURGO) Database.* Published 20061207. Fort Worth, Texas. http://soils.usda.gov/survey/geography/ssurgo/

4. 2002 digital aerial photography: State of New Jersey Office of Information Technology, Office of Geographic Information Systems. Color infrared, acquired February/March, 2002. *New Jersey 2002 High Resolution Orthophotography.* Published 20030731. Trenton, New Jersey. http://njgin.state.nj.us/

5. 2006 digital aerial photography: United States Department of Agriculture (USDA)-Farm Service Agency (FSA) Aerial Photography Field Office (APFO). Source scale 1:40,000, Natural color, acquired August 2006. *USDA-FSA APFO NAIP MrSID Mosaics, 2006.* Published 2006. Salt Lake City, Utah. http://www.fsa.usda.gov/

6. 2007 digital aerial photography: State of New Jersey Office of Information Technology, Office of Geographic Information Systems. Color infrared, acquired March, 2007. *New Jersey 2007 High Resolution Orthophotography.* Published 20081001. Trenton, New Jersey. http://njgin.state.nj.us/

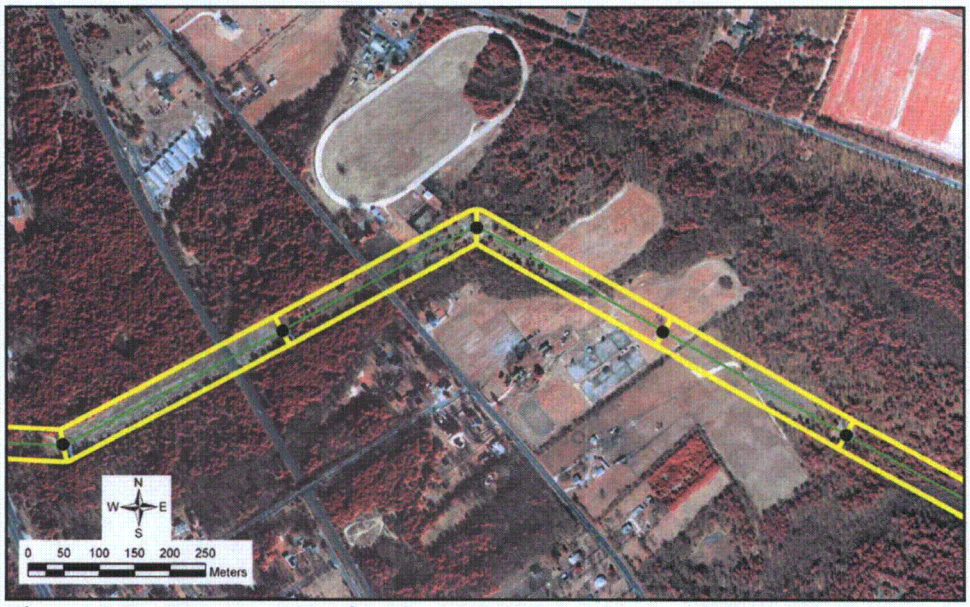


Figure 1.2. An example of a single ROW corridor with individual spans in yellow, the circuit path in green, and tower locations as black dots on a 2002 aerial photograph.

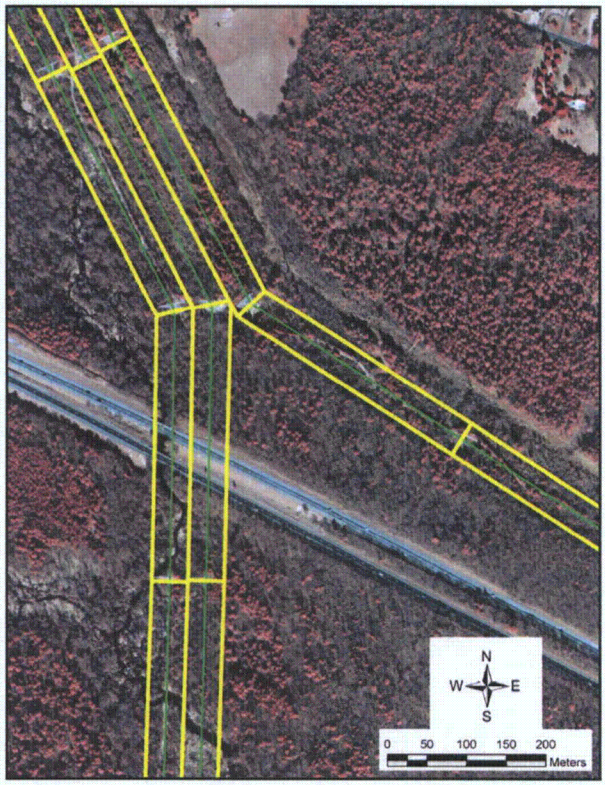


Figure 1.3. An example of parallel ROW corridors with spans in yellow and circuit paths in green on a 2002 aerial photograph.

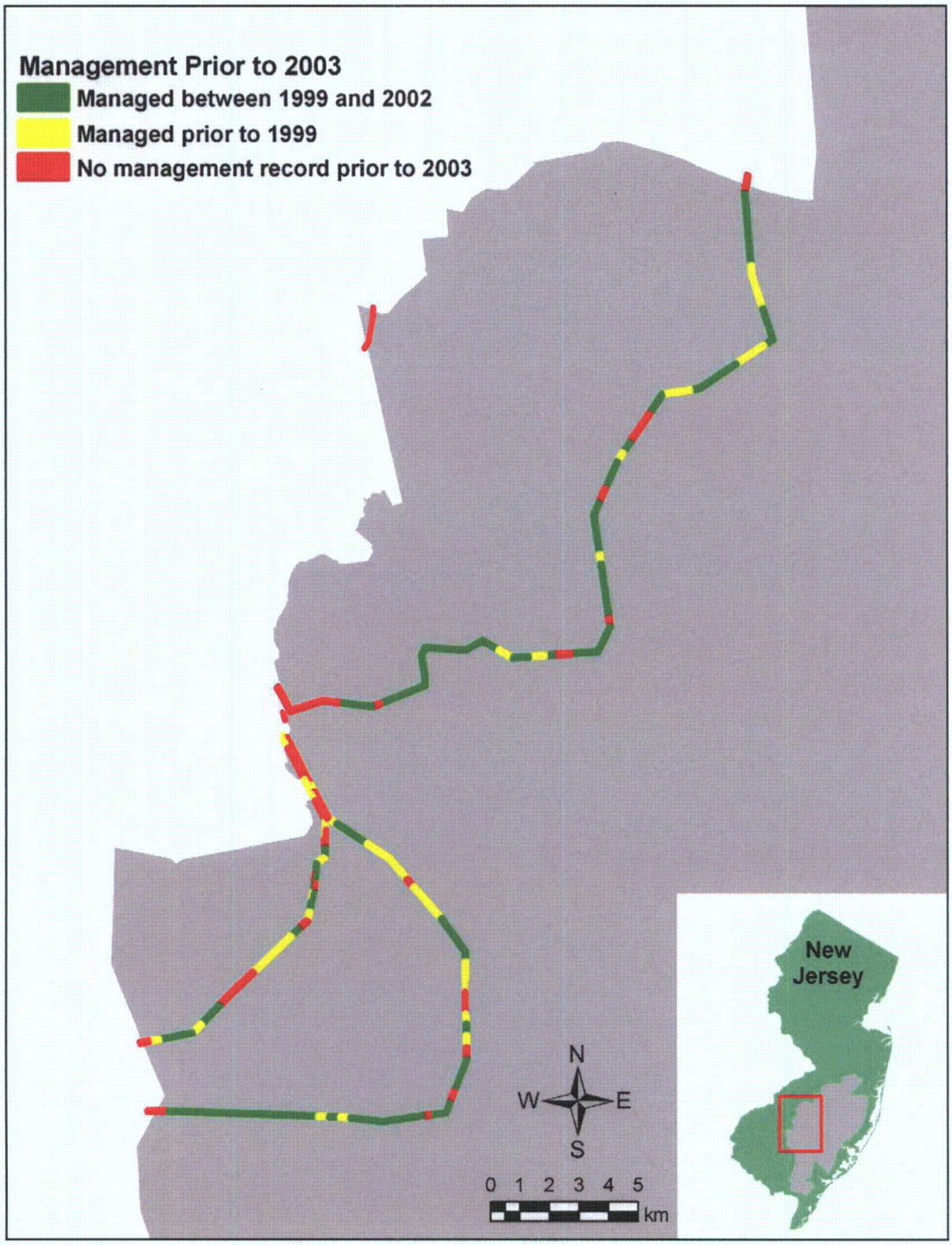


Figure 1.4. Vegetation-management history for a selected portion of bulk-electric transmission-line rights-of-way in the Pinelands Area. The Pinelands Area is shown in gray.

TASK 2. MAP AND DESCRIBE MANAGED RIGHT-OF-WAY AND PINELANDS-REFERENCE HABITATS

As mentioned in the Introduction, one of the goals of this project was to develop a ROW vegetation-management plan to create and maintain relatively stable and sustainable, early successional habitats that reflect the size, shape, and spatial distribution of characteristic Pinelands-reference habitats. To address this goal, the first step was to identify the structural attributes of vegetation associated with both the managed-ROW and Pinelands-reference habitats. To accomplish this, we mapped land cover in the managed-ROW habitats and in a randomly selected sample of Pinelands-reference habitats. We used data collected from field sampling in both ROW and reference habitats to assess the accuracy of the created maps. For this Task, we describe the random sampling of reference habitats and the mapping process and accuracy assessment results for ROW and reference habitats. The maps were then used in Task 3 of the report to compare various patch and landscape characteristics of ROW and reference habitats.

METHODS

Random Sample of Pinelands-reference-habitat Patches

We selected a sample of Pinelands-reference-habitat patches from outside the managed-ROW corridors to typify 'early successional' vegetation types characteristic of the broader Pinelands ecosystem. The reference-habitat data were created by extracting the early successional patch types from the NJDEP 1995/97 land-use/land-cover (LU/LC) data. The source for these data is listed at the end of Task 1. Early successional patch types included a variety of scrub/shrub, emergent marsh, and old-field cover types (Table 2.1).

Table 2.1. The number of patches, quartile patch-size values, and area values for all Pinelands-reference-habitat patches and the random sample of reference-habitat patches. These patch types represent the early successional patch types from in the NJDEP 1995/97 land-use/land-cover data. Refer to Table 2.2 for explanation of land-use/land-cover codes.

	All Reference-patch Types					Random Sample of Reference-patch Types						
	# of	Patch-size Quartiles			Total	# of	Patch-size Quartiles			Sample	% of	% of Total
NJDEP LU/LC Patch Type	Patches	25th	50th	75th	Area	Patches	25th	50th	75th	Area	Total Area	# of Patches
Upland-patch Types												
Coniferous brush/shrubland	1,906	1.6	2.9	5.9	22,268	110	1.6	3.1	5.8	1,121	5.0	5.8
Deciduous brush/shrubland	1,493	1.6	2.9	6.2	13,731	85	1.8	2.7	5.8	726	5.3	5.7
Mixed brush/shrubland	1,793	1.9	3.4	7.2	17,477	99	2.1	3.6	8.5	1,005	5.7	5.5
Old field	1,972	1.6	2.6	5.1	10,609	107	1.5	2.6	4.9	662	6.2	5.4
Wetland-patch Types												
PEM	1,381	1.2	2.4	5.4	9,603	74	1.1	2.2	6.4	495	5.2	5.4
PEM/PSS	349	3.3	7.1	15.8	5,388	21	3.5	5.4	15.8	270	5.0	6.0
PSS/PFO	285	3.2	8.0	15.5	3,864	18	1.3	8.8	17.0	196	5.0	6.3
PSS1	2,904	1.4	2.9	6.5	17,510	152	1.0	2.2	6.7	888	5.1	5.2
PSS1/3, PSS1/8	342	2.9	5.3	9.8	2,725	18	2.7	4.8	11.7	172	6.3	5.3
PSS1/4	612	2.3	4.9	10.1	5,913	35	2.1	3.7	8.4	321	5.4	5.7
PSS3	172	2.3	4.4	10.3	1,719	12	1.9	3.9	14.0	103	6.0	7.0
PSS4/1	434	2.6	5.5	13.9	6,412	24	2.6	4.4	11.9	332	5.2	5.5
PSS4	471	1.7	3.5	8.0	3,961	27	2.4	4.3	9.1	209	5.3	5.7
PSS8	428	1.8	4.2	9.1	3,952	26	1.6	4.2	6.8	207	5.2	6.0

We selected a random sample of each early successional patch types from the LU/LC data that was equivalent to about 5% of the total area of each patch type, which also represented about 5% of the total number of patches of each patch type. The number of patches and quartile patch-size and total-area values were generated for the entire population of reference-patch types and for the sample of reference-patch types. Qualitatively, the summary statistics for the sample are similar to those for the entire population of reference-habitat patches (Table 2.1).

Mapping ROW and Reference Habitats

We mapped land cover for the entire inventory of managed-ROW habitats and the random sample of Pinelands-reference habitats (Figures 2.1 and 2.2). The NJDEP 1995/97 LU/LC boundaries were used as a starting point because the 2002 LU/LC data were not available when this work was completed. For the ROW patches and the sample of reference patches, the LU/LC data were modified as needed with additional photointerpretation using the 2002 aerial photographs. Mapping was conducted at a backdrop photo scale of approximately 1:2,500. Boundaries of distinct homogeneous-vegetation patches were delineated based on a 0.25 acre (1,000 m^2) minimum-mapping unit. For the ROW habitats, distinct access roads were mapped as separate polygons. All mapping was completed in the state-plane coordinate system.

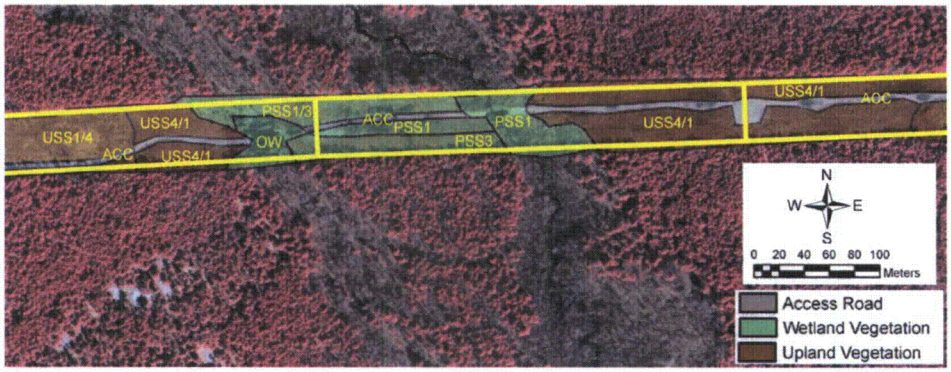


Figure 2.1. Example of land-cover mapping completed for managed-ROW habitats. See Table 2.2 for explanation of land-cover codes.

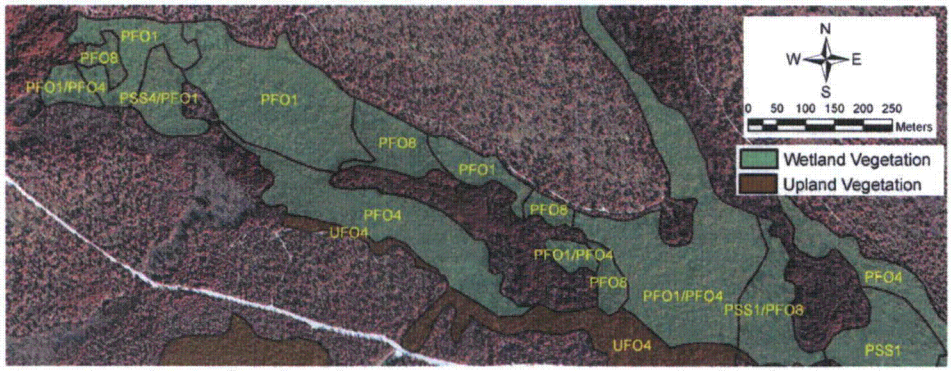


Figure 2.2. Example of land-cover mapping completed for Pinelands-reference habitats. See Table 2.2 for explanation of land-cover codes.

We classified the resulting ROW and reference-habitat patches into upland and wetland cover types (Table 2.2). The upland classification applied was a modified Anderson scheme, the same as that used in the NJDEP 1995/97 LU/LC data. The wetlands mapping used the U. S. Fish and Wildlife Service National Wetland Inventory classification scheme (Cowardin 1979). Dominant and subordinate vegetation components were included in the classification as needed. For example, palustrine scrub/shrub with deciduous shrubs (PSS1) as the dominant component and needle-leaved evergreen shrubs (PSS4) as the subordinate component was denoted as PSS1/4. The percentage cover for the dominant-vegetation-layer components (i.e., tree, shrub, herb, bare ground) was estimated separately using a ranked scale of 1 to 5 (low to high). This ranking was based on the Braun-Blanquet cover scale, where 1 = <5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, and 5 = >75% cover (Mueller-Dombois and Ellenberg 1974).

Field Sampling of ROW and Reference Habitats

To assess the accuracy of the photo-interpretation and mapping described above and to characterize the vegetation structure and composition of the managed-ROW and Pinelands-reference habitat patches, we field surveyed selected patches during the leaf-on period of May through October in 2006. We selected patches for field surveys of ROW and reference habitats using two criteria. First, the proportion of wetland to upland patches in the selected field-survey patches matched that for the ROW and reference habitats. Secondly, to facilitate access and minimize travel time, reference patches were selected from areas within 100 m of a paved road (based on New Jersey Department of Transportation series 600 roads or above) and managed-ROW patches were selected from areas within 800 m (0.5 mi) of a paved road. ROW patches were not selected from the first span along the paved road.

The selected patches were then visited. For reference-habitat patches, we used a global-positioning system (GPS) to navigate to the patches. For ROW patches, we used the ROW span layer as a guide. The entire length of the selected ROW patch was walked along the access road. For all of the ROW and reference patches surveyed, we classified the LU/LC of each patch noting both dominant and subordinate cover types. To characterize the structural composition of the patches, we ranked the percentage cover of the tree, shrub, herb and ground layers and deciduous versus coniferous cover using the 1 to 5 ranks from the Braun-Blanquet scale. Trees were defined as single-stem woody plants >6 m in height. Scrub/shrub was defined as woody plants <6 m tall.

For ROW and reference habitats, the height of the majority of the scrub/shrub layer was estimated for patches with scrub/shrub >1.5 m. We estimated the species dominance of the tree, shrub, and herb layer using the following scheme: dominant (>50%), co-dominant (25-50%), present (<25%), and rare (<5%). We also noted the composition of the ground layer as woody debris, leaf litter, or bare soil. We took two digital color photographs of each ROW patch shooting from the center of the patch looking toward the opposite towers. We also photographed reference patches. The type of past vegetation-management activity (e.g., mowing, trimming, topping, etc.) and the time since that activity occurred was estimated for ROW patches.

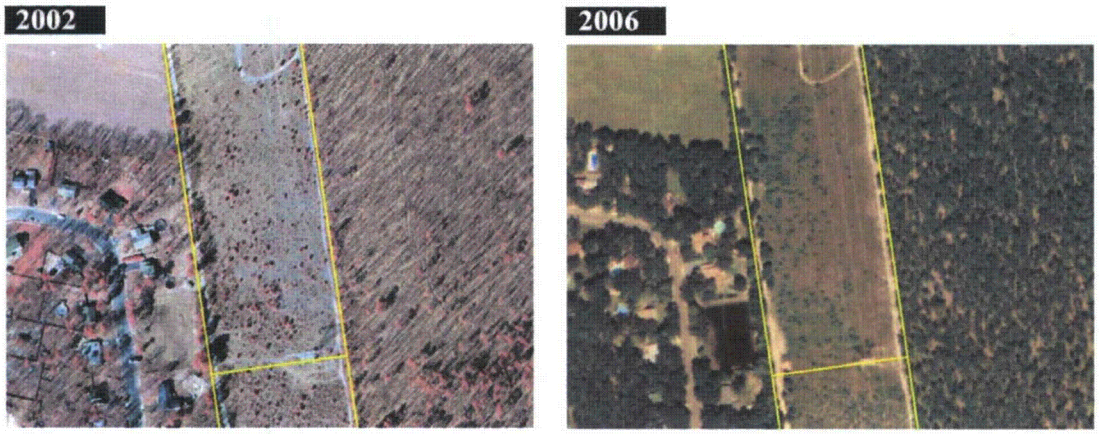
Table 2.2. Level I and II land-use/land-cover classification for managed-ROW and Pinelands-reference habitats. Patches were originally mapped and classified to level III, but levels I and II are shown because only these two levels were included in the analyses. Various level III combinations of deciduous (1), broad-leaved evergreen (3), needle-leaved evergreen (4), or Atlantic white cedar (8) are classified as mixed in the level II classification (e.g., PFO_MIX). Combinations of two different classes (e.g., PFO_PSS) were also mixed.

Level I Class	Level II Class	Description of Level II Class
PFO		Palustrine Forest
	PFO1	Palustrine Forest, Deciduous
	PFO4	Palustrine Forest, Needle-leaved Evergreen
	PFO8	Palustrine Forest, Atlantic White Cedar
	PFO_MIX	Palustrine Forest, Mixed
	PFO_PSS	Palustrine Forest/Palustrine Scrub/shrub, Mixed
PSS		Palustrine Scrub/shrub
	PSS1	Palustrine Scrub/shrub, Deciduous
	PSS3	Palustrine Scrub/shrub, Broad-leaved Evergreen
	PSS4	Palustrine Scrub/shrub, Needle-leaved Evergreen
	PSS8	Palustrine Scrub/shrub, Atlantic White Cedar
	PSS_MIX	Palustrine Scrub/shrub, Mixed
	PSS_PEM	Palustrine Scrub/shrub/Palustrine Emergent Marsh, Mixed
EM		Emergent Marsh
	PEM	Palustrine Emergent Marsh
	PSS_PEM	Palustrine Scrub/shrub/Palustrine Emergent Marsh, Mixed
	EEM	Estuarine Emergent Marsh
USS		Upland Scrub/shrub
	USS1	Upland Scrub/shrub, Deciduous
	USS3	Upland Scrub/shrub, Broad-leaved Evergreen
	USS4	Upland Scrub/shrub, Needle-leaved Evergreen
	USS_MIX	Upland Scrub/shrub, Mixed
	USS_UFO	Upland Scrub/shrub/Upland Forest, Mixed
UFO		Upland Forest
	UFO1	Upland Forest, Oak
	UFO4	Upland Forest, Pine
	UFO_MIX	Upland Forest, Mixed
	UFO_USS	Upland Forest/Upland Scrub/shrub, Mixed
OLDF	OLDF	Old Field
OTHER		Other: Bare Land, Beach, Open Water
	BARE	Bare Land, Beach
	OW	Open Water
ALT		Altered Land
	ACC	ROW Access Road
	DEV	Urban/developed
	EXT	Extractive Mining
	DEV	Urban/developed
	AG	Agriculture

Accuracy Assessment of ROW and Reference Habitats

To assess the accuracy of the photo-interpretation and mapping described above for the ROW and reference patches, we compared the LU/LC class designated for the aerial-photo-interpreted patches to the class assigned to the patches in the field. A total of 275 ROW and 89 reference patches were available for the comparison of the mapped and the field-surveyed dominant LU/LC class. The patches in which the mapped and field classifications did not match were flagged for further inspection to determine if there was a consistent bias in the aerial photo-interpretation and mapping. As part of this further examination, we evaluated other patch-attribute data, such as co-dominant class, dominant species list, field observations on recent vegetation-

management actions, and available ground photographs. We also referred to the 2002 color-infrared leaf-off aerial photography and the leaf-on summer of 2006 USDA FSA APFO color imagery (see Task 1 for imagery sources and Figure 2.3 for an example of each).



1-ft. Resolution Color Infrared Orthophotography
Image Date: Feb./Mar. 2002 statewide fly-over (leaf-off)
Source: NJOIT Office of Geographic Information Systems

1-m. Resolution Natural Color Aerial Photography
Image Date: August 5, 2006 (leaf-on)
Source: USDA FSA Aerial Photography Field Office

Figure 2.3. Comparison of 2002 color-infrared leaf-off aerial photography and 2006 color leaf-on photography for a selected portion of Pinelands ROW.

RESULTS

Accuracy Assessment for Managed-ROW Mapping

Of the 275 patches included in the accuracy assessment for the managed-ROW habitats, the dominant LU/LC class for 133 patches correctly matched between the aerial-photo-interpreted and the field classifications (Table 2.3). The other 142 patches did not match initially so additional data from these patches were evaluated to help explain the discrepancies between the interpreted and field classifications. Nineteen of the mismatched patches were a partial match because the dominant/co-dominant classifications shared at least one cover type. Eighteen of the 142 patches did not match because of incorrect aerial-photo-interpreted classifications. These 18 patches included eight patches where uplands and wetlands were confused and ten patches with other miscellaneous misclassifications.

Thirty-five of the mismatched patches did not match initially due to three types of incorrect field classifications (Table 2.3). The first type of incorrect field classification was a mismatch for 17 patches because of a discrepancy between the species list compiled in the field and the dominant/co-dominant classification originally given in the field. These 17 patches were considered a correct or partial patch when the dominant/co-dominant classifications were corrected to match the species list and Braun-Blanquet ranks from the field data. The second type of incorrect field classification was a mismatch for six patches that occurred when the field data characterized only a portion of the larger patch. The third type of incorrect field classification was a mismatch for 12 patches in which there was an unaccountable difference

between the dominant/co-dominant classification given in the field, the species data collected in the field, and the aerial photos (e.g., an old field classification for an area that is clearly heavily forested).

Seventy mismatched patches were a mismatch due to a temporal difference in land cover (Table 2.3). The aerial photographs used to classify the managed-ROW patches were from 2002 and the field work was completed in 2006. Vegetation in those patches was managed during that period resulting in a mismatch.

From the original 275 managed-ROW patches available for the assessment, we deleted the six patches in which the field data only characterized a portion of the larger patch, the 12 patches with an unaccountable difference, and the 70 patches with a temporal difference (Table 2.3). This resulted in a total of 187 possible patches to use in the assessment. We added the number of patches that correctly matched (133) to those with a partial match (36) for a total of 169 correct patches. The 169 correct patches out the possible 187 patches resulted in a 90% accuracy for the managed-ROW mapping.

Table 2.3. Results of the comparison of LU/LC classifications from aerial-photo-interpretations and field-survey data for 275 managed-ROW patches.

Results from Comparison of Mapped and Field Classification	Correct or Partial Match	Incorrect LU/LC Classification	Deleted From Analysis
Correct Match	133	-	-
Partial Match			
ROW and field patch shared at least one dominant or co-dominant cover type	19	-	-
Incorrect aerial-photo classification			
Confusion between uplands and wetlands	-	8	-
Other misclassification	-	10	-
Incorrect field classification			
Mismatch between field species list and LU/LC classification in the original field data			
Full or partial match when LU/LC classification is corrected to match species list and dominant/co-dominant scale from field	17	-	-
Field data characterized only a portion of the whole patch	-	-	6
Unaccountable difference between LU/LC classification given in the field and the species data from the field and the aerial-photo interpretation	-	-	12
Temporal difference due to vegetation-management activities between 2002 and 2006.	-	-	70
Total	169	18	88

Accuracy Assessment for Pinelands-reference Mapping

Of the 89 patches included in the accuracy assessment for Pinelands-reference habitats, the dominant LU/LC classification derived from the aerial-photo interpretations correctly matched the field classifications for 45 patches (Table 2.4). The other 44 patches did not match initially so additional data from these patches were evaluated to help explain the discrepancies between the interpreted and field classifications. Nine of the 44 patches were a partial match because the dominant/co-dominant classifications shared at least one cover type. Eleven of the 44 patches did not match because of incorrect aerial-photo-interpreted classifications. These 11 patches included three patches where PFO4 and PFO8 were confused, four patches where

uplands and wetlands were confused, and four patches with other miscellaneous misclassifications.

Table 2.4. Results of the comparison of LU/LC classifications from aerial-photo-interpretations and field-survey data for 89 Pinelands-reference patches.

Results from Comparison of Mapped and Field Classification	Correct or Partial Match	Incorrect LU/LC Classification	Deleted From Analysis
Correct Match	45	-	-
Partial Match			
ROW and field patch shared at least one dominant or co-dominant cover type	9	-	-
Incorrect aerial-photo classification			
Confusion between PFO4/PFO8	-	3	-
Confusion between uplands and wetlands	-	4	-
Other misclassification	-	4	-
Incorrect field classification			
Mismatch between field species list and LU/LC classification in the original field data			
Full or partial match when LU/LC classification is corrected to match species list and dominant/Co-dominant scale from field	7	-	-
Difference unable to be resolved	-	-	1
Field data only characterized a portion of the whole patch	-	-	3
Unaccountable difference between LU/LC classification, species data from field, and aerial-photo interpretation	-	-	11
Altered-land covers not representative of reference habitats	-	-	2
Total	61	11	17

Twenty-two of the 44 patches did not match initially due to three types of incorrect field classifications (Table 2.4). The first type of incorrect field classification was a mismatch for eight patches because of a discrepancy between the species list compiled in the field and the dominant/co-dominant classification originally given in the field. Of these eight patches, seven were considered a correct or partial match when the dominant/co-dominant classifications were corrected to match the species list and Braun-Blanquet ranks from the field data. No reason for the other mismatched patch could be identified. The second type of incorrect field classification was a mismatch for three patches that occurred when the field data characterized only a portion of the larger patch. The third type of incorrect field classification was a mismatch for 11 patches in which there was an unaccountable difference between the dominant/co-dominant classification given in the field, the species data collected in the field, and the aerial photos (e.g., an old field classification for an area that is clearly heavily forested). Two patches were dominated by human-altered land-cover types (e.g., grass median), which are not representative of Pinelands-reference habitats.

From the original 89 reference patches available for the accuracy assessment, we deleted the patch in which the reason for the mismatch could not be identified, the three patches in which the field data only characterized a portion of the patch, the 11 patches with an unaccountable difference, and the two patches that were not representative of Pinelands-reference habitats (Table 2.4). This resulted in a total of 72 possible patches to use in the assessment. We added the number of patches that correctly matched (45) to those with a partial match (16) for a total of 61 correct patches. The 61 correct patches out the possible 72 patches resulted in an 85% accuracy for the reference mapping.

TASK 3. COMPARE PATCH AND LANDSCAPE CHARACTERISTICS OF MANAGED RIGHT-OF-WAY AND PINELANDS REFERENCE HABITAT TYPES

As mentioned in the Introduction, one of the goals of this project was to prepare a ROW vegetation-management plan to create and maintain relatively stable and sustainable, early successional habitats that reflect the size, shape, and spatial distribution of characteristic Pinelands-reference habitats. Using the spatial-analysis capabilities of GIS software, we measured a variety of landscape pattern indices using the digitized mapped boundaries of the managed-ROW and the random sample of Pinelands-reference habitats. To determine if ROW habitats were similar to reference habitats, we compared patch structure, composition, size, shape, and diversity; and the landscape setting between ROW and reference habitats. We also determined the spatial relationship between ROW patch types and patch types in the adjacent landscape to assess whether or not ROW patches were compatible with the surrounding landscape.

METHODS

ROW and Reference Land-cover Class Composition

For this analysis, we compared the overall LU/LC class composition of managed-ROW and the sample of Pinelands-reference habitats. We determined the number of patches, the area, and the percentage area for each Level I class (Table 2.2) and qualitatively compared these values between ROW and reference habitats.

ROW and Reference Patch Size, Shape, and Diversity

We compared the patch size, shape, and diversity for ROW and the sample of reference habitats. For both ROW and reference habitats, patch size and patch shape metrics were generated for Level I classes, whereas the patch diversity measures were determined for Level II classes (Table 2.2).

Patch-shape Metrics. We used two different software programs to generate a full suite of landscape-pattern indices for each Level I class for ROW and the sample of reference habitats. The landscape-pattern indices included the size, edge, shape, area-weighted shape, perimeter to area ratio, and area-weighted fractal dimension for each patch. The two programs, V-Late 1.1 and Patch Analyst 3.1, consisted of ArcGIS plug-in/extensions and operated in polygon vector mode re-projected from state plane to a universal transverse mercator (UTM) map projection (UTM was required by the V-Late software). V-Late 1.1 (ArcMap 9 plug-in) was initially used as the primary plug-in with Patch Analyst 3.1 (ArcView 3.x extension) used to validate the V-Late results. The validation outputs from Patch Analyst were consistent with V-Late results. Patch Analyst provided additional landscape metrics not available in V-Late and vice-versa, therefore, both the V-Late and Patch Analyst output tables were included in the analysis.

A non-parametric Wilcoxon Rank Sum test (2-sided t approximation) was used to assess differences between the ROW and reference-patch metrics for each Level I class using the SAS statistical package (SAS Institute Inc., Cary, NC, USA, 2002-2003). Because we completed multiple tests, we employed the conservative standard Bonferonni correction to the p-value. The

seven patch types for each landscape metric resulted in a corrected p-value of 0.007 (α level = 0.05/7).

Patch-diversity Metrics. We calculated land-cover class richness and the Shannon-Weiner index to compare land-cover diversity between the managed-ROW and the sample of Pinelands-reference habitats. Class richness was the number of class types for ROW and reference habitats. The Shannon-Weiner index reflects the abundance and evenness of patch types in ROW and reference habitats using the formula:

$$H' = -\sum_{i=1}^{S} (p_i)(\ln p_i)$$

where:

H' = Shannon-Weiner index of diversity,
S = number of patches or patch size,
i = land-use/land-cover type, and
p_i = proportion of measurements in class i.

We calculated the Shannon-Weiner diversity index for ROW and reference habitats using both the number of patches and patch size. Diversity and class richness values were determined using the Level II classification (Table 2.2).

Vegetation Adjacent to ROW and Reference Habitats

We completed a linear-adjacency analysis to summarize which land-cover types most frequently shared a boundary with managed-ROW patches. We placed a 100-ft buffer on all ROW corridors and clipped the NJDEP 1995/97 LU/LC data to the buffer. The NJDEP 1995/97 patches in the buffer and the ROW patches mapped from the interpretation of 2002 aerial photography were converted from polygons to lines. We determined adjacency by intersecting the two line datasets using the GIS. Line-segment lengths were calculated and the length of the adjacency was tabulated for each ROW patch type.

We only determined adjacency for the ROW patches in contact with the adjacent landscape, i.e. along the interface of the ROW boundary and the adjacent landscape. We did not determine the adjacency of ROW patches to other ROW patches because the goal was to assess whether or not the ROW patches were compatible with the surrounding landscape. The adjacency process is illustrated in Figure 3.1.

Comparing the Edaphic-landscape Setting of ROW and Reference Habitats

The objective of this analysis was to compare the edaphic-landscape setting of managed-ROW and Pinelands-reference habitats using soil characteristics from the STATSGO and SSURGO database. We extracted three soil variables, including the soil associations from the STATSGO data and the soil series and drainage rating from the SSURGO data. These three variables were compared qualitatively between the managed-ROW and the sample of Pinelands-reference habitats.

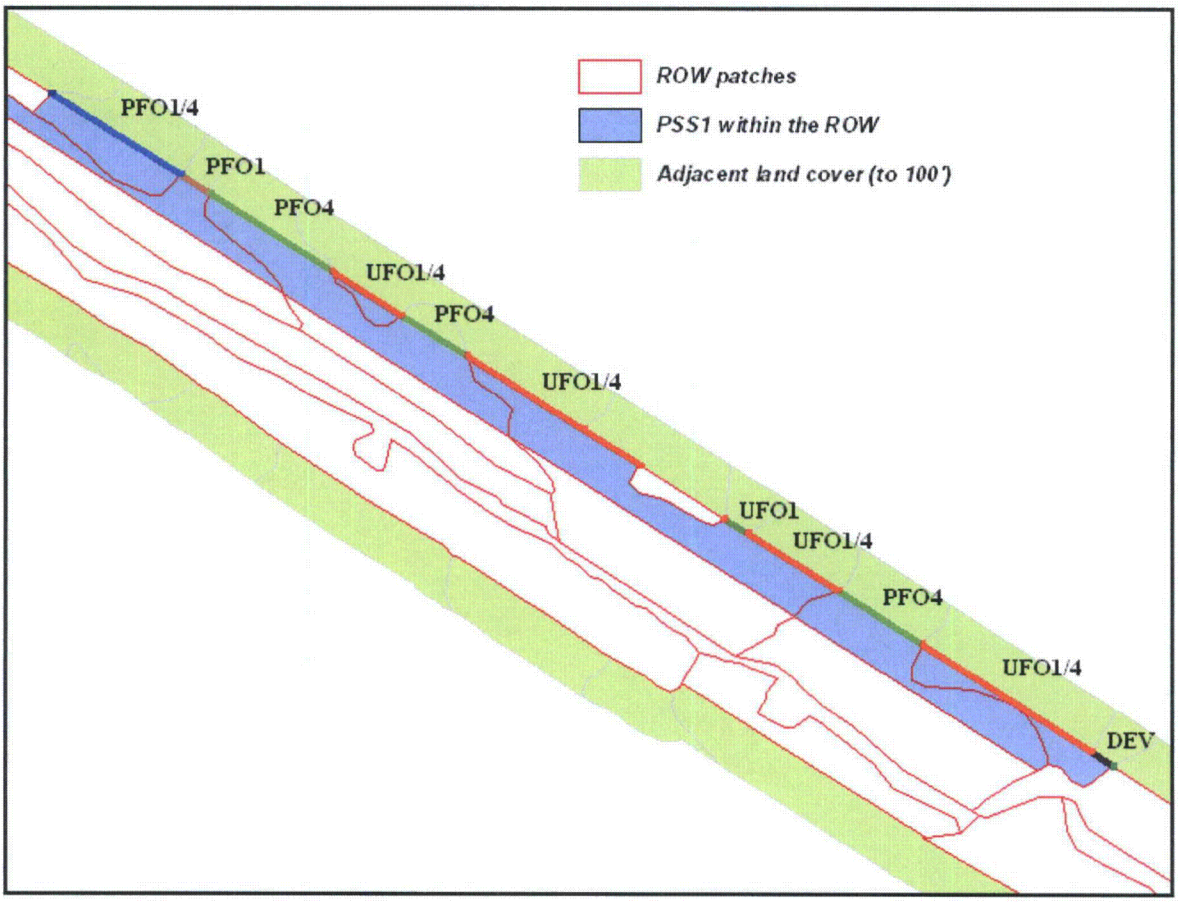


Figure 3.1. An example of the adjacency analysis for palustrine scrub/shrub (PSS1) in managed-ROW habitats. Thick colored lines indicate contact between PSS1 patches in the ROW and various land-cover patches in the adjacent landscape. Land-cover classes are shown for patches in the adjacent landscape.

RESULTS

ROW and Reference LU/LC Class Composition

As previously explained we extracted the sample of Pinelands-reference habitats from 1995/97 LU/LC data and then re-mapped the sample using 2002 aerial photography. In many cases, the smaller minimum-mapping unit (0.25 acre or 1000 m^2) used in the re-mapping process resulted in a vegetation-patch structure that was more finely mapped because the original polygons were subdivided (Figure 3.2). Although the Pinelands-reference sample was originally selected from 1995/97 early successional scrub/shrub, emergent-wetland, and old-field classes, the re-mapped reference patches contained a large number of patches and total area of upland forest (UFO) and palustrine forest (PFO). A total of 2,799 UFO patches covered 42% of the total reference-habitat area and a 1,778 PFO patches covered 26% of the total reference-habitat

area. The large number of forest patches is most likely due to a combination of the finer-scale mapping, the higher quality spatial resolution and spectral response of the imagery from 2002 compared to 1995, and natural successional processes with scrub/shrub communities growing up into forest in the absence of disturbance.

UFO and PFO represented 8% and 4% of the ROW habitats, respectively. To compare the early successional patch types among ROW and reference habitats, we removed the forest patches and the human-altered patches from both ROW and reference habitats. Upland (USS) and palustrine (PSS) scrub/shrub together represented 80% of the early successional reference habitats and 76% of the early successional ROW habitats (Tables 3.2 and 3.3). PSS dominated reference habitats and USS dominated ROW habitats. Old Field (OLDF) patches represented a similar total area of the early successional ROW and reference habitats. Although much of the OLDF area in ROW habitats was associated with developed and agricultural landscapes, some was due to New Jersey Department of Environmental Protection Division of Fish and Wildlife food plots located on Wildlife Management Areas. Emergent-wetland (EM) cover was slightly higher for the early successional reference habitats compared to the early successional ROW habitats. Open water (Other) was relatively rare in both types of habitats. Access road (ACC) patches were present only in ROW habitats.

Table 3.2. Level I land-cover summary statistics for early successional Pinelands-reference patch types. See Table 2.2 for explanation of Level I classifications.

Reference-class Type	Number of Patches	Patch-size Statistics (ac)				% of Total Area
		Mean	Standard Deviation	Variance	Total Area	
PSS	188	4.8	8.5	71.6	906	56
USS	90	4.4	6.1	37.2	395	24
EM	55	2.9	5.2	26.6	158	10
OLDF	52	2.8	6.2	37.9	148	9
Other	21	0.6	0.7	0.4	12	<1
Total	406				1,619	100

Table 3.3. Level I land-cover summary statistics for early successional managed-ROW patch types. See Table 2.2 for explanation of Level I classifications. Access roads (ACC) are shown because this patch type was only mapped in ROW habitats.

ROW-Class Type	Number of Patches	Patch-size Statistics (ac)				% of Total Area
		Mean	Standard Deviation	Variance	Total Area	
USS	514	2.6	3.9	15.3	1,359	52
PSS	351	1.8	3.1	9.4	630	24
ACC	170	1.4	2.1	4.4	238	9
OLDF	150	1.9	3.4	11.6	289	11
EM	57	1.3	2.9	8.4	74	3
Other	30	1.1	1.9	3.5	33	1
Total	1,422				3,011	100

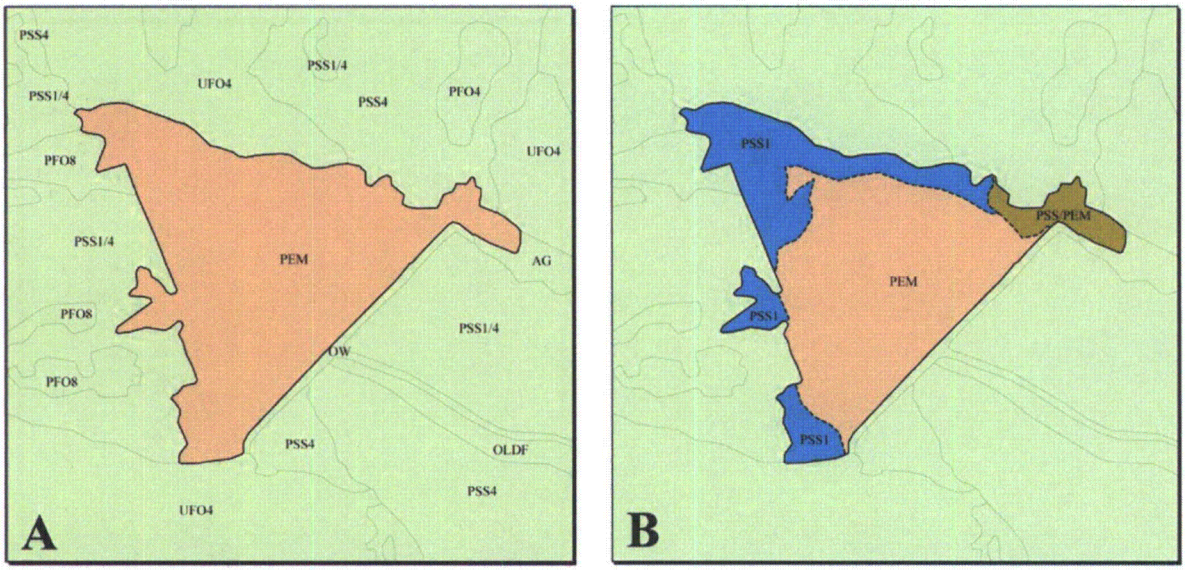


Figure 3.2. An example of subdividing a Pinelands-reference patch into several patch types. Panel (A) shows the original patch from 1995/97 data and panel (B) shows the patch subdivided and re-classified using the 2002 imagery.

ROW and Reference Patch Size, Shape, and Diversity

Patch-shape Metrics. With one exception, mean patch size was smaller for managed-ROW patch types compared to Pinelands-reference patch types (Tables 3.2 and 3.3). The exception of was the class Other, which includes open water (OW) patches. With one exception, the Wilcoxon Rank Sum test results indicated that ROW-patch types were significantly smaller with shorter patch-edge lengths compared to reference-patch types (Table 3.4). The exception was OW patches, which comprise a small percentage of the number of patches and area of ROW and reference habitats (Tables 3.2 and 3.3). The generally smaller size of the ROW patches is likely due to the patches being bound by the relatively narrow ROW corridor.

Most of the managed-ROW patch types exhibited a significantly higher shape index, area-weighted-shape index, perimeter-to-area ratio, and area-weighted-fractal dimension (Table 3.4). The exceptions were the shape index and area-weighted-shape index for OW and PEM patches, which displayed the same trend but were not significant, and the area-weighted-shape index for PSS, which showed a significant opposite trend. The greater values for the various patch-shape metrics for most managed-ROW patch types suggests that ROW patches have a complex, convoluted edge. However, visual inspection of the ROW patches indicated that they were not more convoluted, but were generally long and thin and therefore departed from a simple compact shape, such as a circle.

Patch-diversity Metrics. As mentioned in the Methods section, we used the Level II classifications when calculating the patch-diversity metrics. Therefore, the number of patches used in these calculations was 2,893 for ROW habitats and 1,611 for reference habitats (Table 3.5). ROW and references habitats displayed a similar diversity in the number and size of patches (Table 3.5).

Table 3.4. Comparison of patch metrics for managed-ROW and Pinelands-reference habitats using a Wicoxon Rank Sum 2-sided test. Comparisons followed by an asterisk are significant at a corrected p-value of 0.007. See Table 2.2 for class descriptions.

Class	Patch Size	Patch Edge	Shape Index	Area Weighted Shape Index	Perimeter: Area Ratio	Area-weighted Fractal Dimension
OLDF	ROW < REF*	ROW < REF*	ROW > REF*	ROW > REF*	ROW > REF*	ROW > REF*
OW	ROW < REF	ROW < REF	ROW > REF	ROW > REF	ROW > REF*	ROW > REF*
EM	ROW < REF*	ROW < REF*	ROW > REF	ROW > REF	ROW > REF*	ROW > REF*
PFO	ROW < REF*	ROW < REF*	ROW > REF*	ROW > REF*	ROW > REF*	ROW > REF*
PSS	ROW < REF*	ROW < REF*	ROW > REF*	ROW < REF*	ROW > REF*	ROW > REF*
UFO	ROW < REF*	ROW < REF*	ROW > REF*	ROW > REF*	ROW > REF*	ROW > REF*
USS	ROW < REF*	ROW < REF*	ROW > REF*	ROW > REF*	ROW > REF*	ROW > REF*

Table 3.5. Land-cover class richness and Shannon-Weiner diversity indices for managed-ROW and Pinelands-reference patches. Attributes were determined from the Level II classes in Table 2.2.

Attribute	Managed-ROW Patches	Pinelands-reference Patches
Number of Patches	2,893	1,611
Class Richness	27	25
Shannon-Weiner Index		
Using Number of Patches	2.50	2.66
Using Patch Size	2.49	2.49

Vegetation Adjacent to ROW and Reference Habitats

The total length of the boundary along the interface between the ROW habitats and the adjacent landscape outside the ROW was approximately 445 mi. For the ROW habitats, about 44% of the boundary was upland scrub/shrub (USS), 19% was palustrine scrub/shrub (PSS), 19% was altered land (ALT), 9% was old field (OLDF), 5% was upland forest (UFO), 2% was palustrine forest (PFO), and 2% was emergent marsh (EM). ALT in the ROW habitats included the access road (ACC), other human-altered-land covers, and bare land (OTHER).

For the adjacent land cover outside the ROW, about 50% of the boundary was UFO, 18% was PFO, 19% was ALT, and 13% was PSS and EM. The ALT in the adjacent habitats included transportation/utilities/communications, development, agriculture, and extractive mining. A significant proportion of this adjacent-altered land consisted of roadways and rail lines, most notably the Atlantic City Expressway and a parallel Conrail railway corridor to the north.

PSS patches in the ROW displayed the highest percentage adjacency to PFO (61.5%) patches in the adjacent landscape (Table 3.6). USS patches in the ROW displayed the highest percentage adjacency to UFO (71.1%) patches in the adjacent landscape OLDF patches in the ROW showed a relatively high percentage adjacency to ALT (27.5%) and UFO (54.4%). For the association with ALT, the utility companies usually managed ROWs in developed and agricultural landscapes more intensely resulting in herbaceous-dominated spans. Some of the association between ROW OLDF and adjacent UFO was due to NJDEP Division of Fish and Wildlife food plots, which are located in forest landscapes.

Table 3.6. Summary of linear-adjacency results for managed-ROW habitats. Values are the percentage of the ROW boundary for each patch type in the adjacent landscape.

	Adjacent Patch Types								
	ALT	OLDF	USS	UFO	EEM	PEM	PSS	PFO	Other
ROW Patch Types									
ALT	43.5	1.6	4.0	44.4	-	0.1	1.5	3.8	1.0
OLDF	27.5	9.7	5.0	54.5	-	-	0.7	2.1	0.5
USS	13.5	0.9	6.7	71.1	0.1	0.1	1.2	6.1	0.3
UFO	13.0	0.5	5.6	75.6	-	-	0.3	4.9	0.1
EM	2.8	0.8	-	2.0	72.6	9.9	1.3	7.8	2.7
PSS	10.2	0.4	1.1	9.6	-	1.3	15.3	61.5	0.4
PFO	1.8	-	0.7	6.3	0.6	0.2	5.7	84.5	0.2
OTHER	8.8	-	-	25.2	-	2.4	3.0	22.5	38.0

The Landscape Setting of ROW and Reference Habitats

Comparison of the soil-association, soil-series, and soil-drainage class data indicated that the managed-ROW habitats and Pinelands-reference habitats were located in similar landscape settings. The Atsion-Manahawkin-Berryland, Downer-Sassafras-Hammonton, Lakehurst-Lakewood-Atsion, and Aura-Downer-Sassafras soil associations together comprise almost the entire area of ROW (94%) and reference habitats (87%) (Table 3.7). The individual percentages for each soil association were also similar between ROW and reference habitats. For the various soil series, Downer and Manahawkin soils dominated the ROW habitats and Lakehurst, Atsion, Manahawkin, and Downer soils dominated reference habitats (Table 3.7). The percentage composition of the various soil-drainage classes was also similar for ROW and reference habitats (Table 3.7). The two contrasting drainage classes, well-drained soils and very poorly drained soils, represented the greatest percentages of both ROW and reference habitats.

Table 3.7. Soil-association, soil-series, and drainage-class composition (%) of managed-ROW and Pinelands-reference habitats. A dash indicates an attribute covered <1% or was not associated with ROW or reference habitats.

Soil Attributes	ROW	Reference
STATSGO Soil Associations		
Atsion-Manahawkin-Berryland	37	44
Downer-Sassafras-Hammonton	25	14
Lakehurst-Lakewood-Atsion	16	19
Aura-Downer-Sassafras	16	10
Hammonton-Woodstown-Mullica	3	4
Sulfaquents-Udothends-Psamments	2	1
Woodmansie-Atsion-Downer	-	5
Westphalia-Freehold-Pasquotank	-	2
SSURGO Soil Series		
Downer	19	10
Manahawkin	10	11
Aura	8	6
Berryland	7	9
Lakehurst	7	13
Lakewood	7	8
Atsion	7	15
Evesboro	6	2
Woodstown	4	2
Sassafras	3	1
Mullica	3	4
Atsion-Berryland	3	3
Hammonton	3	3
Galloway	3	2
Pits	2	1
Aura-Downer	2	-
Transquacking	1	-
Fluvaquents	-	2
Ingleside	-	1
Woodsmansie	-	2
(Water)	-	1
SSURGO Natural Drainage-class		
Well drained	38	22
Very poorly drained	22	26
Moderately well drained	15	20
Excessively drained	13	10
Poorly drained	10	19
Somewhat poorly drained	2	2
Unrated	-	1
Somewhat excessively drained	-	-

TASK 4. SUMMARIZE RIGHT-OF-WAY VEGETATION-MANAGEMENT STRATEGIES USED BY UTILITY COMPANIES INSIDE AND OUTSIDE THE PINELANDS

To ensure electrical energy reliability, utility companies have an ongoing need to manage vegetation within the ROW corridor to minimize interference with the tower infrastructure and overhead transmission lines. The primary objective of ROW vegetation management is to reduce the height of trees and shrubs beneath the transmission lines and to remove trees or branches along the boundary of the ROW corridor that have the potential to fall into the wires. Vegetation management occurs on a fairly regular return cycle to keep pace with regenerating vegetation. For this Task, we describe the existing range of ROW vegetation-management strategies that are used by utility companies in the Pinelands, in areas adjacent to the Pinelands, and in other regions of the east coast.

BACKGROUND

The clearance needs of transmission lines are defined by New Jersey Board of Public Utilities (NJBPU), Occupational Safety and Health Administration (OSHA), National Energy Regulatory Commission (NERC), U.S. Department of Energy (DOE), and National Security Administration (NSA) rules. In May 2006, a memorandum of understanding (MOU) established that the Edison Electric Institute (EEI), which is an association of shareholder-owned electric companies, would work with federal land-management bureaus, Department of the Interior, the Forest Service, and the EPA to develop cooperative ROW integrated-vegetation-management (IVM) practices (EEI 2006). This MOU was included in the final report to the Federal Energy Regulatory Commission (FERC) on the Northeast U.S. blackout (C. N. Utility Consulting 2004). Recommendations from the FERC report (C. N. Utility Consulting 2004), the related U.S.-Canada Task Force (United States - Canada Power System Outage Task Force 2004), and the MOU (EEI 2006) are reflected in the current NJBPU standards (NJBPU 2006).

The MOU mentions the wire-zone border-zone design as a preferred configuration for electric-transmission ROWs, where low shrub-forb-grass cover is desired directly beneath the transmission lines (wire zone) and taller shrub-forb cover is preferred along the ROW border (border zone) (Figure 4.1). Although habitat diversity plays a secondary role, the primary objective of the wire-zone border-zone design is to remove undesirable species, including trees that have the potential to grow to a height that may interfere with the transmission lines and vines that grow up towers, poles or guy wires (Bramble and Byrnes 1996, PHI 2006).

Based on 2002 LU/LC data, about 75% of the Pinelands are forested habitats. Upland forests are composed of pine and/or oak species, lowland forests are pine dominated, and swamps support pine, cedar, red maple, and black gum. Based on the results in Task 3, about 72% of the vegetation in the ROW corridor was woody vegetation (60% scrub/shrub and 12% forest) and only 11% of the ROW vegetation was herbaceous (9% old-field uplands and 2% emergent wetlands). Controlling undesirable species in a forest-dominated region represents an ongoing challenge for utility companies in the Pinelands.

Although the Pinelands is largely forested, there are also several species of shrubs common to upland and wetland forests of the region. Shrub cover can be dense, exceeding 60% in upland and wetland forest plots (Zampella 1990). As mentioned in the Introduction, the primary goal of this ROW project was to develop a ROW vegetation-management plan to create and maintain relatively stable and sustainable, early successional habitats that represent characteristic Pinelands-reference habitats, such as scrub-shrub vegetation, emergent wetlands, and intermittent ponds.

Although a secondary, but no less important, objective was to ensure transmission reliability and safety, the ecological goal of this ROW plan differs from the shrub-forb-grass endpoint that is recommended in the MOU described above.

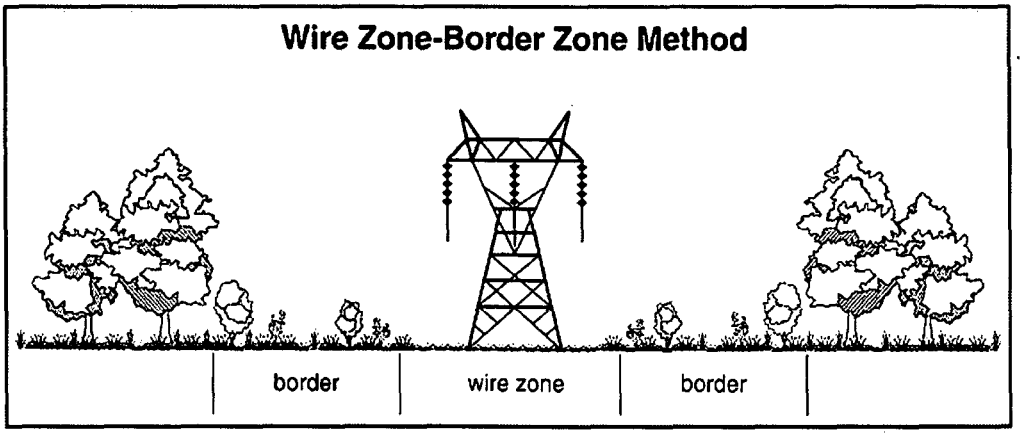


Figure 4.1. A cross section of a ROW corridor showing the transmission-line tower and vegetation in the wire zone, border zone, and adjacent landscape. The source of the figure is Yahner et al. (2001a).

VEGETATION-MANAGEMENT STRATEGIES USED IN THE PINELANDS

As mentioned in Task 1, we obtained information on vegetation-management techniques used in the Pinelands from the foresters and land managers of the three utility companies. Because current Pinelands Commission regulations do not permit the use of herbicides to control the growth of woody vegetation, vegetation management in Pinelands ROWs is limited to manual and mechanical control measures. The most commonly employed methods consisted of mowing, manually cutting individual woody stems to the ground, topping woody vegetation to a target height, or a combination of the three.

Manual Cutting of Vegetation

Manual cutting (i.e., hand cutting) involves cutting stems close to the ground that are too large to mow or topping trees or tall shrubs at some higher height using a chainsaw or similar hand tools (Figure 4.2). Manual cutting of taller vegetation can be accomplished using hydraulic platforms or bucket trucks to place the saw operator at the proper height. Chain or circular saws mounted on poles can also be used.

In the Pinelands, manual cutting was used in wetlands because equipment associated with mowing can cause excessive soil disturbance or risk equipment damage. Manual topping was also used in the Pinelands to reduce tree height where it was deemed that the trees or tall shrubs not be entirely removed (Figure 4.3). To reduce the amount of slash left in a ROW, logs and branches that result from manual-cutting activities should be chipped (Nickerson 1992).

Figure 4.2. Atlantic white cedar (*Chaemacyparis thyoides*) stumps from manual cutting.

Figure 4.3. Upland scrub/shrub-dominated community with 8 to 10 ft pitch pine (*Pinus rigida*) trees two years after being topped. Species are white oak (*Quercus alba*), pitch pine, highbush blueberry (*Vaccinium corymbosum*), black huckleberry (*Gaylussacia baccata*), and bracken fern (*Pteridium aquilinum*).

Mowing Vegetation

Types of Mowers. Mowing was reported to be the most commonly used vegetation-management practice in the Pinelands. Mowing can be done with large rotary, flail, or circular-saw mowers mounted on a boom, pushed, or pulled over the vegetation in the ROW using equipment on wheels or tracks. Rotary blades are similar to a standard gas-powered lawn mower, but in either single or multiple large-blade configurations within an industrial housing. Flail mowers are comprised of multiple blades rotating parallel to the direction of travel that shear off vegetation caught within the mowing box. Circular-saw mowers are single or multiple large saw blades within an open housing designed to pull or trap vegetation against the blade(s) for cutting. Most mower housings are mounted on hydraulic booms to control the height and angle of the mow. Mounted mowers can be used to trim the vertical walls of the ROW corridor. This practice does not result in clean pruning, but does control vegetation dimension (ANSI 2001).

In the Pinelands, the contracted vegetation-management company determined the type of equipment used for mowing, but utility company foresters assigned the vegetation-management prescription, suggested methods to be used, and occasionally provided specific management direction. Mowing was typically used in grass-forb-dominated habitats (Figures 4.4). PHI specifications call for mowing grass ROWs annually in sparsely populated areas and from four to six times per year in urban and suburban areas (PHI 2006). Mowing was also normally used for habitats dominated by small-diameter (<6 in) scrub/shrub or re-sprouting trees (Figure 4.5). PHI specifications call for woody vegetation to be mowed to within 4 in from the ground (PHI 2006).

Figure 4.4. A grass-forb-dominated community in an agricultural matrix the first year after a mow. Species are grass species and multiflora rose (*Rosa multiflora*).

Restrictions on Mowing. Mowing was usually limited to wetlands that were at the drier end of the upland-to-wetland gradient (Figure 4.6). These mineral-soil wetlands lacked a thick organic layer and well-developed hummock-hollow topography that would be more susceptible to disturbance by heavy equipment. Mowing was also restricted in other locations where equipment was unable to reach the target vegetation, such as on slopes or near transmission-line towers.

Figure 4.5. An upland-scrub/shrub-dominated community the second year after a mow. Species are white oak (*Quercus alba*), black cherry (*Prunus serotina*), high-bush blueberry (*Vaccinium corymbosum*), scrub oak (*Quercus ilicifolia*), winged sumac (*Rhus copallina*), and grass and forb species.

Coppice Growth

Unfortunately, both mowing and cutting trees and shrubs often results in stump sprouting, or coppice growth (Figure 4.7), which can increase the density of sprouts. Coppice growth converts a single woody stem into multiple stems that can grow several feet per year if connected to a viable root system (Bramble and Byrnes 1983, McLoughlin 1997). Sprouts may originate from lateral buds on residual-stem material or from the near-surface root mass (Johnstone 1990). Coppice growth has been reported for birch (Nowak et al. 2002) and dogwood (Boeken and Canham 1995) in New York, red maple in Massachusetts (ECI 1989), mixed hardwoods, oak, and red maple in Pennsylvania (Bramble and Byrnes 1983, Yahner and Hutnick 2004) and mixed pine and hardwoods in North Carolina (Porteck et al. 1994).

Figure 4.6. A wetland-scrub/shrub-dominated community the first year after a mow. Species are red maple (*Acer Rubrum*), highbush blueberrry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*), cinnamon fern (*Osmunda cinnamomea*).

Figure 4.7. Pine stump re-sprouting after being mowed.

Vegetation-management Return Intervals

As mentioned in Task 1, long-term vegetation-management data were not available from the three utility companies so we were unable to determine specific return intervals used for vegetation management. However, discussions with the utility foresters suggested that a three to four year return interval was common practice, with specific recommendations based on annual site evaluations. Our field observations during the summer of 2006 suggested that up to four-year intervals were the norm for all three utility companies (Figure 4.7). However, we also observed ROW areas with forest vegetation that did not appear to have ever been managed and other areas where trees were allowed to grow very tall since last managed.

As mentioned in Task I, ACE follows the vegetation-management directives established by their parent corporation PHI (PHI 2006). ROWs managed by ACE are inspected each year to guide annual-work plans and associated budgets. Aerial surveys are conducted for each circuit twice each year, including one time during the dormant season and one time during the growing season. Aerial inspections are supplemented with ground inspections to evaluate safety sign integrity, tower maintenance, access-road maintenance, and vegetation compliance.

Figure 4.7. Upland pine-herbaceous area four to five years after the last management. Species are pitch pine (*Pinus rigida*) and Virginia pine (*Pinus virginiana*).

VEGETATION-MANAGEMENT STRATEGIES USED IN AREAS OUTSIDE THE PINELANDS

The most substantial difference between vegetation-management techniques used inside and outside the Pinelands is the use of herbicides outside the region. A survey of 81 utility companies throughout the United States and parts of Canada indicated that, of the total area of ROWs in which vegetation was actively managed in 1995, about 73% was managed by mowing and manual cutting and 27% was managed using various herbicide treatments (Sulak and Kielbaso 2004). In the 1980's, Delmarva Power, a subsidiary of PHI that manages ROWs in the coastal plain of Delaware, Maryland, and Virginia, changed its vegetation-management policy from one that relied primarily on mowing to one in which herbicides were preferred (Johnstone 1990). ACE, a PHI subsidiary in New Jersey, also uses herbicides as the primary method of vegetation control in areas adjacent to the Pinelands (PHI 2006). Herbicide treatments include foliar applications during the growing season, dormant-stem applications in the dormant season, and a cut-stubble/vine application throughout the year (PHI 2006). In areas adjacent to water where herbicides are prohibited, manual cutting is generally used and stumps are chemically treated to inhibit sprouting (PHI 2006).

Several Pennsylvania studies have been completed where various vegetation-management techniques were compared, but the vegetation in these regions differs from that of the Pinelands. In a long-term study in the uplands of the Allegheny Mountain and Piedmont regions of Pennsylvania, six commonly used vegetation-management prescriptions were compared, including manual cutting, mowing, mowing plus herbicide, stem-foliage spray, foliage spray, and selective-basal spray (Bramble et al. 1991). Although many of the plant species differed between the two physiographic regions, the vegetation structure that resulted from each prescription was considered similar in both areas. Manual cutting resulted in tree sprout-shrub dominated cover with some forbs and grass; mowing and selective-basal spray resulted in cover dominated by shrubs, forbs, and grass; and mowing plus herbicide, stem-foliage spray, and foliage spray resulted in cover dominated by grass and forbs (Bramble et al. 1991). Similar results were found in a subsequent study of the Piedmont region (Bramble and Byrnes 1996) and in the Allegheny Mountain region of Pennsylvania (Yahner and Hutnik 2004), but in the mountain region shrub cover, mostly blueberry (*Vaccinium* spp.), had increased in relation to forb and grass cover overtime for the mowing plus herbicide, stem-foliage spray, and foliage spray prescriptions. In Massachusetts wetlands, Nickerson (1992) found a similar basic pattern in that manual-cutting and mowing prescriptions resulted in more tree and shrub cover and less herbaceous cover compared to various herbicide treatments.

Several wildlife studies have also been completed in Pennsylvania ROWs in which the same six vegetation-management prescriptions were compared. Bird-species richness and total abundance was much greater for mowing, mowing plus herbicide, foliar spray, basal spray, and stem-foliage spray compared to manual cutting, which supported the lowest bird richness and abundance similar to the adjacent Allegheny Mountain forest land (Yahner et al. 2002). Most of the increased bird richness and abundance for the other five prescriptions was due to the border zones, which were dominated by shrub-forb-grass cover, rather than the wire zone, which is largely forb-grass cover (Yahner et al. 2002). Only two bird species were abundant in the herbaceous wire zones.

Results of reptile and amphibian studies conducted in Pennsylvania ROWs varied. In the Allegheny Mountain region, Yahner et al. (2001b) studied the same vegetation-management prescriptions mentioned above, with the exception of mowing. Compared to the four herbicide

prescriptions, manual cutting resulted in the lowest combined reptile and amphibian richness and number of observations. The higher richness and number of observations for the herbicide prescriptions was primarily due the increased snake abundance in the more open herbaceous conditions. In the Piedmont region, Yahner et al. (2001a) studied the same vegetation-management prescriptions mentioned previously, except for basal spray. Manual cutting and mowing supported a similar species richness and number of observations of reptiles and amphibians compared to the three herbicide prescriptions.

CONCLUSIONS AND RECOMMENDATIONS

For this Task, we summarized the vegetation-management strategies used to maintain transmission-line ROW corridors inside and outside the Pinelands region. Due to restrictions on the application of herbicides in the Pinelands and because a comprehensive technical review of the potential impacts of herbicide use on plants and animals is beyond the scope of this ROW project, the span-specific vegetation-management prescriptions described in Task 5 were limited to variations on cutting and mowing.

Cutting and mowing are well-established methods in the Pinelands and elsewhere. Both are effective for controlling vegetation height and have fairly predictable return intervals that can be adjusted for regeneration or habitat expectations. Compared to mowing, manual cutting is relatively expensive and carries greater risk to personnel due to the reliance on chainsaws, but causes less disturbance to wetland vegetation and soils due to the lack of heavy equipment needed and can be useful in small or otherwise inaccessible areas where mowing is not feasible. Both mowing and manual cutting activities can result in environmental dosing of petroleum products, such as fuels, lubrication oils, or hydraulic fluids (Nickerson 1992).

Neither mowing nor manual cutting permanently removes trees from ROWs, but mowing can result in much lower tree density compared to manual cutting (Bramble and Byrnes 1996, Yahner and Hutnik 2004). Mowing can also result in more shrub and herbaceous cover compared to manual cutting (Bramble et al. 1991, Bramble and Byrnes 1996, Yahner and Hutnik 2004). Both mowing and manual cutting have been reported to maintain a similar species composition to that of adjacent wetland forest in Massachusetts (Nickerson 1992). In the Pinelands, the results presented in Task 3 indicated that patch diversity and edaphic-landscape characteristics were similar for ROW and Pinelands-reference habitats. Although the upland to wetland proportion of scrub-shrub differed, early successional patch types were also similar between ROW and reference habitats. Pinelands ROW habitats were created by mowing and manual cutting. The main difference between ROW and reference habitat types was that ROW patches were smaller and more linear compared to reference patches, which was likely due to the patches being managed in a narrow ROW.

The primary ecological goal of this ROW project was to create and maintain relatively stable and sustainable, early successional habitats that represent characteristic Pinelands-reference habitats, such as scrub-shrub vegetation, emergent wetlands, and intermittent ponds. Based on the results presented in Part 3, these end-point land-cover types comprised about 63% of the ROW habitats. Future conversion of the 12% of the ROW habitats that was upland and wetland forest to upland and wetland scrub/shrub would bring the percentage of ROW habitats that meets the goal to 75%. Since the remaining 25% of the ROW habitats was comprised of access-road, old-field, and human-altered land uses, the ROW project goal seems attainable through the use of various mowing and manual-cutting activities.

TASK 5. DEVELOP A DYNAMIC SPAN-BY-SPAN VEGETATION-MANAGEMENT PLAN FOR PINELANDS RIGHTS-OF-WAY.

The objective of this task was to develop a GIS-based span-by-span vegetation-management plan for the bulk electric-transmission ROWs in the Pinelands. To accomplish this, we characterized the current vegetation along the approximately 233 miles of ROW and assigned a vegetation-management prescription to each of the 3,041 spans contained in the ROW span GIS layer (see Task 1). The vegetation-management prescriptions were variations on mowing and manual and mechanized cutting (see Task 4) and, for some spans, included timing restrictions due to the presence of wetlands or nearby records of threatened or endangered species.

METHODS

ROW Spans, Area, and Length

We used the ROW span layer to determine the number of spans and the amount of ROW area managed by each utility. We generated centerlines for each ROW corridor in the GIS layer and used these lines to calculate the length of ROW for each utility. We also calculated the percentage of the total number of spans, total area, and total length for each utility.

Characterizing Existing ROW Vegetation

As mentioned previously, the vegetation-management information obtained from the utility companies was not sufficient to allow the development of individual span-specific recommendations. Therefore, we chose to survey the existing vegetation along Pinelands ROWs using a combination of field and aerial photograph interpretation methods. We completed field surveys during the summer and fall of 2007 and visually interpreted vegetation cover from 2007 aerial photography. Because of on-going vegetation management on the ROWs, aerial photographs from 2002 and 2006 were also examined to more accurately characterize existing vegetation.

For the field and aerial photograph surveys, we estimated the percentage cover of forest, topped trees, tree sprouts, shrub oaks, shrubs, herbaceous, and bare ground in each span. Field surveys were conducted by slowly driving ROW access roads and periodically stopping to photograph and categorize the vegetation. When completing the aerial photograph interpretations, it was difficult to differentiate tree sprouts, shrubs, and shrub oak so these three cover types were often combined as scrub/shrub. The cover categories for all surveys included dominant (>50%), co-dominant (25-50%), subordinate (<25%), and present (<5%).

Vegetation-management Prescriptions

We assigned a vegetation-management prescription to each of the spans in the GIS layer using the terms *cut trees manually*, *cut trees mechanically*, or *mow*. Cut trees manually means to cut trees or topped trees at the base by hand with the use of chainsaws or similar hand tools. Cut trees mechanically means to cut trees or topped trees at the base with the use of machines.

Mowing refers to shearing off any woody and herbaceous vegetation with the use of a machine. The type of machine used for a mowing prescription can be determined by the utility company.

Each span was assigned a cutting and/or mowing prescription based on the vegetation characterized through the field and aerial-photograph surveys. If forest (Figure 5.1) or topped trees (Figure 5.2) were present in a span, we assigned a prescription to cut those trees. In spans where tree-sprout cover was low compared to shrub cover, we assigned a prescription to cut the tree sprouts manually when tree sprouts and shrubs were well mixed (Figure 5.3) or to mow only the tree sprouts and not the shrubs when the tree sprouts and shrubs were distributed in relatively distinct patches (Figure 5.4). For spans where tree-sprouts were present with little to no shrub cover, we prescribed mowing for that span (Figure 5.5). We also prescribed mowing for spans that were already well-groomed herbaceous areas in developed and agricultural landscapes and for spans that crossed herbaceous patches maintained by the New Jersey Department of Environmental Protection Division of Fish and Wildlife for food plots (Figure 5.6).

When assigning a prescription to a span, we also considered whether the span was upland or wetland. Compared to the field visits, we were more conservative when applying prescriptions to wetland spans using the aerial photographs. Some of the wetland spans that were field surveyed supported too many tree sprouts for manual tree cutting to be practical. In those cases, a mowing prescription was applied. For wetland spans interpreted from aerial photographs, if standing water, access road flooding, or significant soil disturbance was visible on the aerial photographs, we applied a manual tree cutting prescription to the span rather than a mowing prescription to avoid soil disturbances associated with mowing equipment. We also indicated how to dispose of branches and logs that result from cutting trees.

Timing Restrictions

Wetlands. Timing restrictions were incorporated into the vegetation-management prescriptions of some spans due to the presence of wetlands. If a prescription called for wetland forest to be cut, the work was prescribed to occur July 1 through October 31, which is the period of low water-table levels in Pinelands wetlands (Zampella et al. 2001). This was done to minimize wetland-soil disturbance during vegetation-management activities.

Threatened and Endangered Species. Records for threatened and endangered (T&E) species were obtained from local botanists, the New Jersey Department of Environmental Protection Office of Natural Lands Management and Endangered and Nongame Species Program, the United States Fish and Wildlife Service, and the New Jersey Pinelands Commission. T&E data were composed of polygon and point data.

Timing restrictions were applied to some prescriptions because of known occurrences of T&E species. We placed a 1,000 foot buffer around each span and determined whether or not a T&E plant or animal record was found either on or within 1,000 feet of the span. For each span associated with one or more T&E records, we examined the vegetation-management prescription to determine if timing restrictions were necessary to minimize impact to the species. For example, if a barred owl (*Strix varia*) record was associated with a forested span, the prescription was modified to avoid cutting trees during the active period of mating, nesting, and fledging. If mowing was the prescription for a span that contained a population of T&E plant species, mowing was restricted to a window after the period of growth, flowering, and seed set. Activity times for animals were obtained from NJDEP (2004) and Beans and Niles (2003). Flowering and seed set times were obtained from Stone (1911) and Hough (1983) with the advice of a local botanist.

Figure 5.1. Example of a span dominated by forest. The vegetation-management prescription is to manually cut the topped trees.

Figure 5.2. Example of a span dominated by herbaceous vegetation and tree sprouts, but with individual topped trees. The vegetation-management prescription is to manually cut the topped trees and mow.

Figure 5.3. Example of a span dominated by shrubs with a few scattered tree sprouts. The vegetation-management prescription is to manually cut the trees.

Figure 5.4. Example of a span dominated by shrubs and trees. The vegetation-management prescription is to mow the trees and avoid mowing the shrubs.

Figure 5.5. Example of a span dominated by herbaceous vegetation and tree sprouts with few or no shrubs. The vegetation-management prescription is to mow.

Figure 5.6. Example of span dominated by herbaceous vegetation. The span is a food plot on a New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Wildlife Management Area. The vegetation-management prescription is to mow.