



Appendix G

Affected Environment Information

**APPENDIX G:
AFFECTED ENVIRONMENT INFORMATION**

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APPENDIX G-1: GENERALIZED STRATIGRAPHIC COLUMN

System	Series	Formation	Member	Description	Thickness (feet)	
DEVONIAN	Upper	Trimmers Rock	Millrift	Dark-gray to medium-dark gray siltstone, shale, and very fine-grained sandstone, coarsening upwards. Fossiliferous (brachiopods).	720-1,825	
			Sloat Brook			
	Middle	Mahantango		Medium-dark-gray siltstone and silty shale. Fossiliferous, biostromes (corals, brachiopods, pelecypods, bryozoans).	1,300-2,450	
			Middle	Marcellus	Brodhead Creek	Dark-gray, laminated to poorly bedded silty shale; depauperate brachiopods. Medium-dark gray shaly limestone.
	Stony Hollow	Medium-dark-gray to medium-gray, laminated to thin-bedded, shaly limestone fossiliferous (brachiopods).			150	
	Union Springs	Medium-dark-gray to dark-gray laminated shale; sheared along detachment.			50	
	Onondaga (Buttermilk Falls)	Seneca		Fossiliferous cherty limestone. Contains TIOGA ash bed.	15	
		Moorehouse (Stroudsburg)		Medium-gray limestone and argillaceous limestone with beds, pods and lenses of dark-gray chert. Fossiliferous (brachiopods, ostracodes), burrowed.	135	
		Nedrow (McMichal)		Medium-dark-gray calcareous argillite with lenses of light-medium gray fossiliferous limestone.	40	
		Edgecliff (Foxtown)		Medium-dark-gray calcareous siltstone and argillaceous limestone containing lenses of dark-gray chert. Fossiliferous, one-inch diameter crinoid "columnals" in lower half.	80	
	DEVONIAN	Lower	Schoharie		Medium-to medium-dark gray argillaceous calcareous siltstone. Fossiliferous (brachiopods, <i>Taonurus</i> burrows in lower half, vertical burrows in upper half).	100-150
				Esopus	Medium- to dark-gray silty shale and shaly to finely arenaceous siltstone. Poorly fossiliferous. Burrowed (<i>Taonurus</i>).	180-300
Oriskany Group			Ridgeley	Light- to medium-gray, fine- to coarse-grained calcareous sandstone and quartz-pebble conglomerate with minor siltstone, arenaceous limestone, and dark-gray chert. Fossiliferous (brachiopods).	0-16	
			Shriver Chert	Medium-dark-gray siliceous calcareous shale and siltstone and beds, lenses, and pods of dark-gray chert and minor calcareous sandstone. Fossiliferous (brachiopods), burrowed.	50-85	
Heiderberg Group			Port Ewen Shale	Medium-dark-gray poorly fossiliferous, irregularly laminated calcareous shale and siltstone grading up to fossiliferous, burrowed, irregularly bedded calcareous siltstone and shale.	150	
			Minisink Limestone	Dark- to medium-gray argillaceous fossiliferous limestone.	11-14	
			New Scotland	Maskenozha	Dark-gray silty calcareous laminated fossiliferous shale with lenticular argillaceous fossiliferous limestone.	45
				Flatbrookville	Medium-dark-gray silty and calcareous fossiliferous shale with lenticular medium-gray argillaceous, very fossiliferous limestone.	20-33
			Coeymans	Stormville	Medium-gray, fine- to coarse-grained, biogenic limestone, fine-to medium-grained arenaceous limestone, fine- to coarse-grained, crossbedded and planarbedded calcareous sandstone and quartz-pebble conglomerate, with some dark-gray chert. Fossiliferous (brachiopods, crinoids).	0-20
				Shawnee Island	Shawnee Island: Medium-gray, argillaceous and arenaceous irregularly bedded fossiliferous and burrowed limestone with chert at top. Contains bioherms of medium-light-gray very coarse grained crudely bedded biogenic limestone with corals, stromatoporoids, and shelly fauna (<i>Gypidula</i>). Thacher: Dark-gray, unevenly bedded limestone with yellowish-gray shale partings.	0-60
				Thacher Mbr of Manlius Fm	Thacher: Dark-gray, unevenly bedded limestone with yellowish-gray shale partings.	0-35
				Kalkberg Limestone	Medium-dark gray argillaceous massive fossiliferous limestone (diversified fauna) with nodules and lenses of dark-gray chert.	0-60
				Peters Valley	Medium-gray arenaceous limestone to light-medium-gray fine- to coarse-grained pebbly calcareous sandstone. Cross bedded, fossiliferous.	0-9
			Depue Limestone	Medium- to dark-gray arenaceous and argillaceous fossiliferous Limestone.	13-29	

				Ravena	Medium-dark-gray slightly argillaceous, fossiliferous limestone.	0-30
SILURIAN AND DEVONIAN	Up. Silurian & Low. Devonian	Rondout	Mashipacong		Medium-dark- to light-gray shale, calcareous shale, and very fine- to medium-grained argillaceous limestone. Mudcracks, cut and fill.	8-15
			Whiteport Dolomite		Dark- to medium-gray mud-cracked laminated dolomite.	5-10
			Duttonville		Dark- to medium-gray calcareous shale and argillaceous limestone. Mud-cracked intervals and biostromal limestone beds.	10-20
SILURIAN	Upper	Decker	Wallpack Center	Clove Brook	Wallpack Center: Lenticular and evenly bedded quartz-pebble conglomerate, calcareous sandstone and siltstone, argillaceous and arenaceous limestone and dolomite. Cross bedded, planar bedded, flaser bedded, fossiliferous. Clove Brook: Medium-gray to medium-dark gray fossiliferous (crinoidal) limestone with light-olive-gray shale partings near top.	0-85
		Bossardville Limestone		Dark- to medium-gray, laminated argillaceous limestone locally containing deep mud cracks (as much as 20 feet deep) grading up to dark-gray laminated limestone. Poorly fossiliferous (ostracodes).	12-110	
	Poxono Island		Light-olive-gray to green, calcareous and dolomitic, laminated, fissile to nonfissile shale, olive-green dolomite, sandstone, and siltstone.	500-800		
	Middle & Upper	Bloomsburg Red Beds		Red, green, and gray siltstone, shale, sandstone, and conglomeratic sandstone in upward-fining sequences. Cross-bedded and laminated, mud cracks, cut and fill, scattered ferroan dolomite concretions. Partly burrowed. Fish scales locally.	1,500	
	Lower and Middle	Shawangunk (Members lose their identity several miles northeast of Delaware Water Gap)	Tammany		Gray, fine- to coarse-grained, partly crossbedded, pyritic conglomerate, evenly bedded quartzite, and about 2% dark-gray argillite.	800
Lizard Creek				Gray to olive-gray, fine- to coarse-grained, partly crossbedded, pyritic, thin- to thick-bedded quartzite interbedded with thin- to thick bedded, gray argillite.	275	
Minsi				Gray to olive-gray, fine- to coarse-grained, partly crossbedded, pyritic and feldspathic, thin- to thick-bedded quartzite, conglomeratic quartzite, and conglomerate. Locally contains mud-cracked argillite.	300	
ORDOVICIAN	Middle and Upper Middle and Upper	Martinsburg	Pen Argyl		Dark-gray to grayish black, thick- to thin-bedded (some beds more than 20 feet thick), evenly bedded claystone slate, rhythmically interbedded with quartzose slate, subgraywacke, and carbonaceous slate. Taconic unconformity at top. Disappears under Shawangunk about one mile west of Delaware Water Gap.	3,000-6,000
			Ramseyburg		Medium- to dark-gray claystone slate alternating with light- to medium-gray, thin- to thick-bedded graywacke and graywacke siltstone.	2,800
			Bushkill		Dark- to medium-gray thin-bedded (beds do not exceed six inches thick), claystone slate with thin interbedded quartzose slate and graywacke siltstone and carbonaceous slate. Not exposed in Delaware Water Gap National Recreation Area.	4,000

APPENDIX G-2: MAJOR GEOLOGIC FORMATIONS THAT THE ALTERNATIVES WOULD CROSS WITHIN THE STUDY AREA

Period	Geologic Unit	Alternative						Description	Drainage	Ease of Excavation	Foundation Stability	Paleontology
		1	2	2b	3	4	5					
Devonian	Mahantango Formation	X	X	X	X	X		Medium-gray, olive-weathering, fine- to coarse-grained sandstone and numerous dark-gray to brown shale interbeds; includes "Centerfield coral reef" in eastern Pennsylvania	Good surface drainage	Moderately easy to moderately difficult; locally difficult; fast to moderate drilling rate	Good; need for excavation to sound material; need for under drainage	Formation well known for fossils; includes fossil findings of many species and specimens
	Marcellus Shale	X	X	X	X	X		Black, carbonaceous shale; limestone (Purcell member) is present locally; may contain abundant pyrite and siderite concretions and nodules; Tioga bentonite is included at base in eastern Pennsylvania	Good surface drainage	Moderately easy; fast drilling rate	Good; should be excavated to sound material	Sparse with fossils; those found indicate an oxygen-poor deep marine environment
	Buttermilk Falls Limestone	X	X	X	X	X		Medium-gray, fine to coarsely crystalline, fossiliferous, partly argillaceous limestone; gray, calcareous, silty shale; and dark-gray chert; deeply leached in western part of outcrop belt	Good surface drainage	Moderately difficult in east to easy in the west; drilling rate is moderate to fast	Generally good, but only fair where bedrock is deeply weathered; should be excavated to sound material	Includes fossiliferous grey limestone; many specimens found in this formation
	Esopus Formation	X	X	X	X	X		Very fine- to coarse-grained, gray to olive-gray, hard siltstone and medium- to dark-gray, silty shale	Good surface drainage	Moderately difficult; weathered zones in western part of the outcrop belt are easy; very closely spaced, blocky fracture pattern in siltstone facilitates excavation in some areas; drilling rate is moderate to fast	Good when excavated to sound bedrock	Somewhat fossiliferous; an important specimen used to justify a taxonomic revision was collected in this formation
	Ridgeley Sandstone	X	X	X	X			In eastern Pennsylvania, white to very light-gray quartz sandstone and fine-grained pebble conglomerate; fossiliferous	Good surface drainage	Difficult; degree and depth of weathering are a major factor; the greater the amount of weathered, friable rock, the easier to excavate; drilling rate is slow	Good when excavated to sound, fresh bedrock; deep weathering may be a special problem	Relatively fossil rich; trace fossils collected indicate a barrier beach
	Coeymans Formation	X	X	X	X			Gray, sandy and clayey limestone and gray, fine- to coarse-grained calcareous sandstone and quartz-pebble conglomerate; amount of limestone decreases westward	Good surface drainage, except in deeply leached, porous areas to the west, where surface drainage is moderate	Moderately difficult, except easy where deeply weathered and leached; drilling rate is moderate; in weathered zones, drilling rate is fast	Excellent in unweathered bedrock; fair to poor where deeply weathered, requiring special foundation design	Very abundant in fossils; contains trace fossils and fossil-rich patch reefs
Silurian	Decker Formation	X	X	X	X			Variable lithology; lenses and beds of medium- to light-gray, calcareous sandstone and siltstone, quartz-pebble conglomerate, and arenaceous fine- to coarse-grained limestone near the Delaware River, grading westward to silty, finely arenaceous limestone, calcareous siltstone, fine-grained calcareous sandstone, and shale	Good surface drainage	Easy where deeply weathered and leached; moderately difficult in unweathered bedrock; drilling rate is moderate to fast	Fair; should be excavated to sound material; may require special foundation support design in some areas	Abundantly fossiliferous with trace fossils present; many abundant marine fauna
	Poxono Island Formation	X	X	X	X			Limy, light-olive-gray to green, silty and sandy shale, olive-green dolomite, and minor thin interbeds of fine-grained limy sandstone	Good surface drainage	Moderately easy, should be rippable where steeply dipping; fast drilling rate	Good; should be excavated to sound bedrock	Not a commonly fossil-rich formation
	Bloomsburg Red Beds	X	X	X	X	X	X	Predominantly red shale and siltstone; some sandstone, thin impure limestone, and green shale	Good surface drainage	Moderately easy; relatively fast drilling rate	Good; should be excavated to sound material	Significant specimen findings in DEWA of a rare ancestral horseshoe crab; fish scales and vertebrate fossils have been found in this formation

Period	Geologic Unit	Alternative						Description	Drainage	Ease of Excavation	Foundation Stability	Paleontology
		1	2	2b	3	4	5					
	Shawangunk Formation	X	X	X	X	X	X	Light- to dark-gray, fine- to very coarse-grained sandstone and conglomerate containing thin shale interbeds; crossbedded; tightly cemented	Good surface drainage	Difficult; boulder fields on lower slopes beneath outcrop areas are a special problem; drilling rate is very slow	Good; excavate to sound bedrock	Sparsely fossiliferous; contains some fossils, including rare jellyfish-like fauna
Ordovician	Martinsburg Formation (including the Ramseyburg Member)	X	X	X	X	X	X	Buff-weathering, dark-gray shale and thin interbeds of siltstone, metabentonite, and fine-grained sandstone; brown-weathering, medium-grained sandstone containing shale and siltstone interbeds is present in the middle of the formation; basal part grades into limy shale and platy-weathering silty limestone Ramseyburg Member is interbedded medium- to dark-gray to brownish-gray, fine- to medium-grained, thin- to thick-bedded graywacke sandstone and siltstone and medium- to dark-gray, laminated to thin-bedded shale and slate	Good surface drainage	Moderately easy in shale; moderately difficult in limestone; difficult in sandstone; fast drilling rate	Good; should be excavated to sound rock; limestone should be investigated for solution openings	Oldest fossiliferous unit in DEWA; many specimens of certain groups have been identified from this formation

Source: USGS 2005, 1; 2006, 1; Geyer and Wilshusen 1982; NPS 2004.

APPENDIX G-3: MAJOR GEOLOGIC FORMATIONS/ROCK TYPES THAT THE ALTERNATIVES COULD CROSS OUTSIDE THE STUDY AREA

Period	Geologic Unit	Description	Alternative					
			1	2	2b	3	4	5
Jurassic	Boonton Formation	Reddish-brown to brownish-purple, fine-grained sandstone, siltstone, and mudstone	X	X	X	X	X	X
	Towaco Formation	Reddish-brown to brownish-purple, fine- to medium-grained micaceous sandstone, siltstone, and silty mudstone	X	X	X	X	X	X
Pennsylvanian	Llewellyn Formation	Gray, fine- to coarse-grained sandstone, siltstone, shale, conglomerate, and numerous anthracite coals in repetitive sequences	X	X	X	X	X	X
	Pottsville Formation	Predominantly gray sandstone and conglomerate; also contains thin beds of shale, claystone, limestone, and coal	X	X	X	X	X	X
Mississippian	Mauch Chunk Formation	Grayish-red shale, siltstone, sandstone, and some conglomerate; some local non-red zones	X	X	X	X	X	X
	Pocono Formation	Light-gray to buff or light-olive-gray, medium-grained crossbedded sandstone and minor siltstone; commonly conglomeratic at base and in middle	X	X	X	X	X	X
Mississippian into Devonian	Spechty Kopf Formation	Light- to olive-gray, fine- to medium-grained crossbedded sandstone, siltstone, and local polymictic diamictite, pebbly mudstone, and laminate						X
Devonian	Catskill Formation	Grayish-red sandstone, siltstone, shale, and mudstone; locally conglomeratic; contains gray sandstone in upper part	X	X	X	X	X	X
	Trimmers Rock Formation	Olive-gray siltstone and shale, characterized by graded bedding; marine fossils; some very fine-grained sandstone in northeast	X	X	X	X	X	X
	Mahantango Formation	Medium-gray, olive-weathering, fine- to coarse-grained sandstone and numerous dark-gray to brown shale interbeds; includes "Centerfield coral reef" in eastern Pennsylvania; also includes the following members, in descending order: Tully Limestone, Sherman Ridge Sandstone, Montebello Sandstone, Fisher Ridge Sandstone, Dalmatia Shale, and Turkey Ridge Sandstone	X	X	X	X	X	X
	Marcellus Shale	Black carbonaceous shale; limestone (Purcell Member) is present locally; may contain abundant pyrite and siderite concretions and nodules; Tioga bentonite is included at base in eastern Pennsylvania	X	X	X	X	X	X
Silurian	Bloomsburg Red Beds	Grayish-red, thin- to thick-bedded, poorly to moderately well sorted massive siltstone, sandstone, and local quartz-pebble conglomerate containing local planar to trough crossbedded laminations	X	X	X	X	X	X

Period	Geologic Unit	Description	Alternative					
			1	2	2b	3	4	5
Ordovician	Martinsburg Formation	Buff-weathering, dark-gray shale and thin interbeds of siltstone, metabentonite, and fine-grained sandstone; brown-weathering, medium-grained sandstone containing shale and siltstone interbeds is present in the middle of the formation; basal part grades into limy shale and platy-weathering, silty limestone						X
	Ramseyburg Member	Interbedded medium- to dark-gray to brownish-gray, fine- to medium-grained, thin- to thick-bedded graywacke sandstone and siltstone and medium- to dark-gray, laminated to thin-bedded shale and slate	X	X	X	X	X	X
	Bushkill Member	Interbedded medium- to dark gray, thinly laminated to thick-bedded shale and slate and less abundant medium-gray to brownish-gray, laminated to thin-bedded siltstone	X	X	X	X	X	X
	Lower Part of Beekmantown Group	Very thin- to thick-bedded, interbedded dolomite and minor limestone; upper beds are light olive-gray to dark-gray, fine- to medium-grained, thin- to thick-bedded dolomite	X	X	X	X	X	X
	Epler Formation	Very finely crystalline, light-gray limestone interbedded with gray dolomite; coarsely crystalline limestone lenses present						X
	Graywacke and Shale of Martinsburg Formation	Shale containing conspicuous graywacke; includes autochthonous sandstone and shale of Shochary Ridge						X
	Jacksonburg Formation	Dark-gray, shaly limestone (cement rock) having slaty cleavage; basal medium- to thick-bedded limestone (cement limestone) increases in thickness eastward						X
Cambrian	Allentown Dolomite	Very thin- to very thick-bedded dolomite containing minor orthoquartzite and shale; upper part is medium-light- to medium-dark-gray, fine- to medium-grained, locally coarse-grained, medium- to very thick-bedded dolomite	X	X	X	X	X	
	Leithsville Formation	Light- to dark-gray and light-olive-gray, fine- to medium-grained, thin- to medium-bedded dolomite	X	X	X	X	X	X
	Allentown Formation	Medium- to medium-dark-gray, thick-bedded dolomite and impure limestone; dark-gray chert stringers and nodules; laminated; oolitic and stromatolitic; some orange-brown-weathering calcareous siltstone at base						X

Period	Geologic Unit	Description	Alternative					
			1	2	2b	3	4	5
Proterozoic	Biotite-Quartz-Feldspar Gneiss	Gray-weathering, locally rusty, gray to tan or greenish-gray, fine- to medium-coarse-grained, moderately layered and foliated gneiss that is variable in texture and composition; composed of oligoclase, microcline microperthite, quartz, and biotite; locally contains garnet, graphite, sillimanite, and opaque minerals	X	X	X	X	X	X
	Hornblende Granite	Pinkish-gray- to medium-buff-weathering, pinkish-white or light-pinkish-gray, medium- to coarse-grained, gneissoid to indistinctly foliated granite and sparse granite gneiss composed principally of microcline microperthite, quartz, oligoclase, and hornblende	X	X	X	X	X	X
	Potassic Feldspar Gneiss	Light-gray- to pinkish-buff-weathering, pinkish-white to light-pinkish-gray, fine- to medium-grained, moderately foliated gneiss				X	X	X
	Pyroxene Granite	Gray- to buff- or white-weathering, greenish-gray, medium- to coarse-grained, massive, gneissoid to indistinctly foliated granite containing mesoperthite to microantiperthite, quartz, oligoclase, and clinopyroxene	X	X	X	X	X	X
	Quartz-Oligoclase Gneiss	White-weathering, light-greenish-gray, medium- to coarse-grained, moderately layered to indistinctly foliated gneiss	X	X	X	X	X	X
	Felsic to Mafic Gneiss	Light, medium-grained, predominantly quartz and feldspar of igneous origin						X
Unknown	Diorite	Made largely of white to light-gray plagioclase and black hornblende; may also contain biotite	X	X	X	X	X	X
	Miscellaneous formations/rock types <5%	NA	X	X	X	X	X	X

APPENDIX G-4: PERCENTAGE OF GEOLOGIC FORMATIONS CONTAINING LIMESTONE OUTSIDE THE STUDY AREA

	Pennsylvania Counties							New Jersey Counties		
	Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Alternatives	5	1,2,2b,3,4	All	All	4,5	1,2,2b,3,4	1,2,2b,3,4	All	All	All
Formation									0.89%	
Allentown Formation					11.11%					
Berkshire Valley and Poxono Island Formations, undivided								0.34%		
Bossardville Limestone									0.36%	
Buttermilk Falls Limestone				0.01%						
Buttermilk Falls Limestone through Esopus Formation, undivided	0.50%			4.20%						
Decker Formation through Poxono Island Formation, undivided	0.75%			1.69%						
Epler Formation					10.01%					
Jacksonburg Formation					5.75%					
Jacksonburg Limestone									0.69%	2.27%
Jacksonburg Limestone and Sequence at Wantage, undivided										0.29%
Kalkberg Limestone, Coeymans Limestone, Manlius Limestone									0.35%	
Leithsville Formation					4.25%					
Limestone of Martinsburg Formation					0.12%					
Minisink Limestone and New Scotland Formation									0.35%	
Ontelaunee Formation					0.62%					
Port Ewen Shale									0.34%	
Poxono Island Formation									1.16%	
Rickenbach Formation					3.54%					

	Pennsylvania Counties							New Jersey Counties		
	Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Ridgeley Formation through Coeymans Formation, undivided	0.50%			2.01%						
Rondout Formation and Decker Formation									0.30%	
Schoharie Formation				0.01%					0.50%	

Source: USGS 2005, 1, 2006, 1.

APPENDIX G-5: OTHER PUBLIC AND CONSERVATION LANDS THAT COULD BE CROSSED OUTSIDE THE STUDY AREA

County	State Game Lands/Wildlife Management Areas	State Parks	State Forests	Important Bird Areas/Important Mammal Areas	Federal Lands	National Wildlife Refuges	TNC Preserves
Carbon County, Pennsylvania	State Game Lands 40, 91, 129, 141, 149, and 168	Beltzville State Park, Hickory Run State Park, Lehigh Gorge State Park	Delaware State Forest, Weiser Forest	Hickory Run State Park IBA, Lehigh Valley/Lehigh Gorge State Park IMA, State Game Land 129/Hickory Run State Park/Holiday Pocono IMA	Beltzville Lake, Delaware and Lehigh National Heritage Corridor		
Lackawanna County, Pennsylvania	State Game Lands 91, 135, 300, 307, and 312	Archbald Pothole State Park Lackawanna State Park	Lackawanna State Forest		Lackawanna National Heritage Valley		Dick and Nancy Eales Preserve at Moosic Mountain
Luzerne County, Pennsylvania	State Game Lands 57, 91, 119, 149, 187, 206, 207, 224, 260, and 292	Frances Slocum State Park, Lehigh Gorge State Park, Nescopeck State Park, Ricketts Glen State Park	Lackawanna State Forest	Dutch Mountain Wetlands Complex– State Game Land 57 IBA, Lehigh Valley/Lehigh Gorge State Park IMA, Ricketts Glen State Park, Crevling Lake Area IBA, State Game Land 129/Hickory Run State Park/Holiday Pocono IMA, Susquehanna Riverlands IBA	Delaware and Lehigh National Heritage Corridor, Lackawanna National Heritage Valley		
Monroe County, Pennsylvania	State Game Lands 38, 127, 129, 168, 186, 221, 312, and 318	Big Pocono State Park, Gouldsboro State Park, Tobyhanna State Park	Delaware State Forest	Cherry Valley Watershed IMA, Delaware State Forest/ Bushkill Creek Area IMA, Delaware Water Gap IMA, Long Pond Preserve IBA, Long Pond Preserve IMA, Pocono Lake Preserve IBA, Pocono Lake/Adams Swamp/Two-Mile Run IMA, State Game Land 129/Hickory Run State Park/Holiday Pocono IMA, Tobyhanna and Gouldsboro State Parks/State Game Land 127 IMA	Delaware River Water Trail	Cherry Valley NWR	Cherry Valley, Fern Ridge Bog, Long Pond, Tannersville Cranberry Bog, Thomas Darling Preserve at Two-mile Run

County	State Game Lands/Wildlife Management Areas	State Parks	State Forests	Important Bird Areas/Important Mammal Areas	Federal Lands	National Wildlife Refuges	TNC Preserves
Morris County, New Jersey	Berkshire Valley, Black River, Budd Lake, Musconetcong River, Rockaway River, South Branch, Splitrock Reservoir Access, Wildcat Ridge	Farny State Park, Hacklebarney State Park, Hopatcong State Park		Allamuchy Mountain State Park IBA, Great Swamp National Wildlife Refuge IBA, Hatfield Swamp IBA, Northern Musconetcong Mountain Region IBA, Pequannock Watershed IBA, Picatinny Arsenal North/Denmark Lake IBA, Wildcat Ridge Wildlife Management Area and Splitrock Reservoir IBA	Morristown National Historical Park, Picatinny Arsenal, Crossroads of the American Revolution National Heritage Area	Great Swamp NWR	
Northampton County, Pennsylvania	State Game Land 168	Jacobsburg Environmental Education Center	Delaware State Forest		Delaware and Lehigh National Heritage Corridor, Delaware River Water Trail	Cherry Valley NWR	Minsi Lake/Totts Gap Corridor, Mount Bethel Fens
Pike County, Pennsylvania	State Game Lands 116, 180, 183, 209, and 316	Promised Land State Park	Delaware State Forest	Delaware State Forest/Bushkill Creek Area IMA, Delaware Water Gap IMA, Promised Land State Park, Bruce Lake Natural Area IBA, Shohola Waterfowl Management Area IBA, Upper Delaware Scenic River IBA	Delaware River Water Trail		

County	State Game Lands/Wildlife Management Areas	State Parks	State Forests	Important Bird Areas/Important Mammal Areas	Federal Lands	National Wildlife Refuges	TNC Preserves
Sussex County, New Jersey	Bear Swamp, Culvers Brook Access, Flatbrook-Roy, Hainesville, Hamburg Mountain, Little Flatbrook Access, Paulinskill River, Sparta Mountain, Trout Brook, Walpack, Weldon Brook, Whittingham	Allamuchy Mountain State Park, High Point State Park, Hopatcong State Park, Kittatinny Valley State Park, Stephens State Park, Swartswood State Park	Stokes State Forest	Allamuchy Mountain State Park IBA, Appalachian Mountains IBA, Bear Swamp Wildlife Management Area - Sussex IBA, Cedar Swamp/Farber Tract IBA, Clove Brook Road Corridor IBA, Delaware Water Gap and Valley IBA, Giant Fen Area IBA, Hamburg Mountain IBA, Hyper Humus Marshes IBA, Kittatinny Camp/Van Ness Road IBA, Kittatinny Mountain Eastern Slope IBA, Moe Mountain IBA, Pequannock Watershed IBA, Rockport Marsh IBA, Sparta Mountain Wildlife Management Area IBA, Stokes State Forest and High Point State Park IBA, Vernon Valley Grasslands/Pochuck Marsh IBA, Walkkill River National Wildlife Refuge IBA, Walpack Valley IBA, Wantage Grasslands IBA, Wawayanda Mountain IBA, Whittingham Wildlife Management Area IBA		Walkkill River National Wildlife Refuge	Arctic Meadows, Blair Creek, Johnsonburg Swamp, Kittatinny Ridge Preserves, Mashipacong Bogs, Minisink Valley, Muckshaw Ponds, Sussex Swamp Preserves
Warren County, New Jersey	Alpha Grasslands Preserve, Beaver Brook, Belvidere Access, Buckhorn Creek, Columbia, Hackettstown Hatchery, Harmony Access, Honey Run, Hummers Beach Access, Knowlton Access, Musconetcong River, Pequest, Pohatcong, Ratzman Access, Rockport, White Lake	Allamuchy Mountain State Park, Hopatcong State Park, Kittatinny Valley State Park, Stephens State Park	Jenny Jump State Forest, Worthington State Forest	Allamuchy Mountain State Park IBA, Alpha (Pohatcong) Grasslands IBA, Delaware Water Gap and Valley IBA, Jenny Jump State Forest IBA, Kittatinny Mountain Eastern Slope IBA, Merrill Creek Reservoir IBA, Mount Tammany Cliffs IBA, Old Mine Road IBA			Blair Creek, Johnsonburg Swamp, Kittatinny Ridge Preserves

County	State Game Lands/Wildlife Management Areas	State Parks	State Forests	Important Bird Areas/Important Mammal Areas	Federal Lands	National Wildlife Refuges	TNC Preserves
Wayne County, Pennsylvania	State Game Lands 70, 159, 299, 300, 310, and 312	Gouldsboro State Park, Prompton State Park, Tobyhanna State Park, Varden Conservation Area		Tobyhanna and Gouldsboro State Parks/State Game Land 127 IMA, Upper Delaware Scenic River IBA	Prompton Lake, Lackawanna National Heritage Valley, Delaware River Water Trail		Lacawac Sanctuary, Lehigh Pond, Long Eddy River Edges Preserve

Source: PGC 2010; NJDEP 2003, 2011; PADCNR 2011a, 2011b, 2011c; USFWS 2011a; National Atlas 2003a, 2003b; TNC 2010, 2011; Audubon PA 2010; NJ Audubon 2010; Lackawanna Heritage Valley Authority n.d.; Crossroads of the American Revolution Association 2010; Delaware & Lehigh National Heritage Area 2009; NPS 2011b.

APPENDIX G-6: SPECIES DOCUMENTED IN DEWA

SPECIES LIST FOR DEWA AND SPECIES OBSERVED DURING FIELD SURVEYS

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
Birds					
<i>Gavia stellata</i>	Red-throated Loon*				
<i>Gavia immer</i>	Common Loon*	x			
<i>Podiceps grisegena</i>	Red-necked Grebe*				
<i>Podiceps auritus</i>	Horned Grebe*				
<i>Podilymbus podiceps</i>	Pied-billed Grebe*				
<i>Phalacrocorax carbo</i>	Great Cormorant*				
<i>Phalacrocorax auritus</i>	Double-crested Cormorant*				
<i>Botaurus lentiginosus</i>	American Bittern*	x			
<i>Ixobrychus exilis</i>	Least Bittern*				
<i>Ardea herodias</i>	Great Blue Heron*	x	x		
<i>Casmerodius albus</i>	Great Egret*				
<i>Egretta thula</i>	Snowy Egret*				
<i>Egretta tricolor</i>	Tricolored Heron*				
<i>Egretta caerulea</i>	Little Blue Heron*				
<i>Butorides striatus</i>	Green Heron*	x			
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron*				
<i>Cygnus olor</i>	Mute Swan				
<i>Cygnus columbianus</i>	Tundra Swan*				
<i>Branta canadensis</i>	Canada Goose*	x			
<i>Branta bernicla</i>	Brant*				
<i>Chen caerulescens</i>	Snow Goose*				
<i>Aix sponsa</i>	Wood Duck*	x			
<i>Anas platyrhynchos</i>	Mallard*	x			
<i>Anas rubripes</i>	American Black Duck*				
<i>Anas strepera</i>	Gadwall*				
<i>Anas acuta</i>	Northern Pintail*				
<i>Anas americana</i>	American Wigeon*				
<i>Anas clypeata</i>	Northern Shoveler*				
<i>Anas discors</i>	Blue-winged Teal*				
<i>Anas crecca</i>	Green-winged Teal*				
<i>Aythya valisineria</i>	Canvasback*				
<i>Aythya americana</i>	Redhead*				
<i>Aythya collaris</i>	Ring-necked Duck*				
<i>Aythya marila</i>	Greater Scaup*				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Aythya affinis</i>	Lesser Scaup*				
<i>Clangula hyemalis</i>	Long-tailed Duck*				
<i>Melanitta nigra</i>	Black Scoter*				
<i>Melanitta fusca</i>	White-winged Scoter*				
<i>Bucephala clangula</i>	Common Goldeneye*				
<i>Bucephala albeola</i>	Bufflehead*				
<i>Lophodytes cucullatus</i>	Hooded Merganser*				
<i>Mergus merganser</i>	Common Merganser*	x			
<i>Oxyura jamaicensis</i>	Ruddy Duck*				
<i>Cathartes aura</i>	Turkey Vulture*	x		x	x
<i>Coragyps atratus</i>	Black Vulture*	x			
<i>Circus cyaneus</i>	Northern Harrier*				
<i>Accipiter striatus</i>	Sharp-shinned Hawk*	x			
<i>Accipiter cooperii</i>	Cooper's Hawk*	x	x		
<i>Accipiter gentilis</i>	Northern Goshawk*	x			
<i>Buteo lineatus</i>	Red-shouldered Hawk*	x		x	x
<i>Buteo platypterus</i>	Broad-winged Hawk*	x			
<i>Buteo jamaicensis</i>	Red-tailed Hawk*	x			
<i>Buteo lagopus</i>	Rough-legged Hawk*				
<i>Aquila chrysaetos</i>	Golden Eagle*				
<i>Haliaeetus leucocephalus</i>	Bald Eagle*	x			
<i>Pandion haliaetus</i>	Osprey*	x			
<i>Falco columbarius</i>	Merlin*				
<i>Falco sparverius</i>	American Kestrel*				
<i>Falco peregrinus</i>	Peregrine Falcon*				
<i>Phasianus colchicus</i>	Ring-necked Pheasant				
<i>Bonasa umbellus</i>	Ruffed Grouse				
<i>Meleagris gallopavo</i>	Wild Turkey	x			
<i>Fulica americana</i>	American Coot*				
<i>Rallus limicola</i>	Virginia Rail*				
<i>Porzana carolina</i>	Sora*				
<i>Pluvialis squatarola</i>	Black-bellied Plover*				
<i>Charadrius semipalmatus</i>	Semipalmated Plover*				
<i>Charadrius vociferus</i>	Killdeer*				
<i>Tringa melanoleuca</i>	Greater Yellowlegs*				
<i>Tringa flavipes</i>	Lesser Yellowlegs*				
<i>Tringa solitaria</i>	Solitary Sandpiper*	x			
<i>Actitis macularia</i>	Spotted Sandpiper*				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Calidris melanotos</i>	Pectoral Sandpiper*				
<i>Calidris minutilla</i>	Least Sandpiper*				
<i>Scolopax minor</i>	American Woodcock*				
<i>Gallinago gallinago</i>	Wilson's Snipe*				
<i>Larus philadelphia</i>	Bonaparte's Gull*				
<i>Larus atricilla</i>	Laughing Gull*				
<i>Larus delawarensis</i>	Ring-billed Gull*				
<i>Larus argentatus</i>	Herring Gull*				
<i>Larus glaucooides</i>	Iceland Gull*				
<i>Larus hyperboreus</i>	Glaucous Gull*				
<i>Larus fuscus</i>	Lesser Black-backed Gull*				
<i>Larus marinus</i>	Great Black-backed Gull*				
<i>Sterna caspia</i>	Caspian Tern*				
<i>Sterna hirundo</i>	Common Tern*				
<i>Zenaidura macroura</i>	Mourning Dove*	x			
<i>Columba livia</i>	Rock Dove				
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo*				
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo*				
<i>Tyto alba</i>	Barn Owl*				
<i>Asio otus</i>	Long-eared Owl*				
<i>Asio flammeus</i>	Short-eared Owl*				
<i>Bubo virginianus</i>	Great Horned Owl*				
<i>Nyctea scandiaca</i>	Snowy Owl*				
<i>Strix varia</i>	Barred Owl*	x			
<i>Aegolius acadicus</i>	Northern Saw-whet Owl*				
<i>Otus asio</i>	Eastern Screech-owl*				
<i>Caprimulgus vociferus</i>	Whip-poor-will*	x			
<i>Chordeiles minor</i>	Common Nighthawk*				
<i>Chaetura pelagica</i>	Chimney Swift*				
<i>Archilochus colubris</i>	Ruby-throated Hummingbird*	x		x	x
<i>Megaceryle alcyon</i>	Belted Kingfisher*	x			
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker*				
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker*	x		x	x
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker*				
<i>Picoides pubescens</i>	Downy Woodpecker*	x	x	x	x
<i>Picoides villosus</i>	Hairy Woodpecker*	x		x	
<i>Picoides arcticus</i>	Black-backed Woodpecker*				
<i>Colaptes auratus</i>	Northern Flicker*	x			

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Dryocopus pileatus</i>	Pileated Woodpecker*	x	x	x	x
<i>Contopus borealis</i>	Olive-sided Flycatcher*	x			
<i>Contopus virens</i>	Eastern Wood-pewee*	x	x	x	x
<i>Empidonax virescens</i>	Acadian Flycatcher*	x			
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher*				
<i>Empidonax traillii</i>	Willow Flycatcher*				
<i>Empidonax alnorum</i>	Alder Flycatcher*				
<i>Empidonax minimus</i>	Least Flycatcher*	x			
<i>Sayornis phoebe</i>	Eastern Phoebe*	x			
<i>Myiarchus crinitus</i>	Great Crested Flycatcher*	x			
<i>Tyrannus tyrannus</i>	Eastern Kingbird*	x	x		
<i>Lanius excubitor</i>	Northern Shrike*				
<i>Vireo olivaceus</i>	Red-eyed Vireo*	x	x		
<i>Vireo gilvus</i>	Warbling Vireo*	x			
<i>Vireo philadelphicus</i>	Philadelphia Vireo*				
<i>Vireo griseus</i>	White-eyed Vireo*				
<i>Vireo flavifrons</i>	Yellow-throated Vireo*	x			
<i>Vireo solitarius</i>	Blue-headed Vireo*	x			
<i>Cyanocitta cristata</i>	Blue Jay*	x	x	x	x
<i>Corvus corax</i>	Common Raven*	x		x	x
<i>Corvus brachyrhynchos</i>	American Crow*	x			
<i>Corvus ossifragus</i>	Fish Crow*				
<i>Eremophila alpestris</i>	Horned Lark*				
<i>Progne subis</i>	Purple Martin*				
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow*	x			
<i>Riparia riparia</i>	Bank Swallow*				
<i>Tachycineta bicolor</i>	Tree Swallow*	x			
<i>Hirundo pyrrhonota</i>	Cliff Swallow*				
<i>Hirundo rustica</i>	Barn Swallow*	x			
<i>Parus bicolor</i>	Tufted Titmouse*	x	x	x	x
<i>Parus atricapillus</i>	Black-capped Chickadee*	x		x	x
<i>Parus carolinensis</i>	Carolina Chickadee*				
<i>Sitta canadensis</i>	Red-breasted Nuthatch*	x		x	x
<i>Sitta carolinensis</i>	White-breasted Nuthatch*	x	x	x	x
<i>Certhia americana</i>	Brown Creeper*	x			
<i>Thryothorus ludovicianus</i>	Carolina Wren*	x			
<i>Troglodytes aedon</i>	House Wren*	x			
<i>Troglodytes troglodytes</i>	Winter Wren*				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Cistothorus palustris</i>	Marsh Wren*				
<i>Regulus satrapa</i>	Golden-crowned Kinglet*	x		x	x
<i>Regulus calendula</i>	Ruby-crowned Kinglet*	x			
<i>Poliophtila caerulea</i>	Blue-gray Gnatcatcher*	x	x	x	x
<i>Sialia sialis</i>	Eastern Bluebird*	x			
<i>Turdus migratorius</i>	American Robin*	x	x	x	x
<i>Hylocichla mustelina</i>	Wood Thrush*	x	x		
<i>Catharus fuscescens</i>	Veery*	x			
<i>Catharus ustulatus</i>	Swainson's Thrush*				
<i>Catharus minimus</i>	Gray-cheeked Thrush*				
<i>Catharus guttatus</i>	Hermit Thrush*	x			
<i>Dumetella carolinensis</i>	Gray Catbird*	x	x	x	x
<i>Mimus polyglottos</i>	Northern Mockingbird*				
<i>Toxostoma rufum</i>	Brown Thrasher*	x			
<i>Sturnus vulgaris</i>	European Starling	x			
<i>Anthus rubescens</i>	American Pipit*				
<i>Bombycilla cedrorum</i>	Cedar Waxwing*	x			
<i>Parula americana</i>	Northern Parula*	x			
<i>Vermivora celata</i>	Orange-crowned Warbler*				
<i>Vermivora peregrina</i>	Tennessee Warbler*				
<i>Vermivora chrysoptera X pinus</i>	Brewster's Warbler*	x			
<i>Vermivora pinus</i>	Blue-winged Warbler*	x			
<i>Vermivora chrysoptera</i>	Golden-winged Warbler*				
<i>Vermivora ruficapilla</i>	Nashville Warbler*				
<i>Dendroica petechia</i>	Yellow Warbler*	x			
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler*				
<i>Dendroica magnolia</i>	Magnolia Warbler*	x			
<i>Dendroica tigrina</i>	Cape May Warbler*				
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler*				
<i>Dendroica cerulea</i>	Cerulean Warbler*	x			
<i>Dendroica fusca</i>	Blackburnian Warbler*	x			
<i>Dendroica coronata</i>	Yellow-rumped Warbler*	x		x	x
<i>Dendroica virens</i>	Black-throated Green Warbler*	x			
<i>Dendroica discolor</i>	Prairie Warbler*	x			
<i>Dendroica palmarum</i>	Palm Warbler*				
<i>Dendroica pinus</i>	Pine Warbler*	x			
<i>Dendroica castanea</i>	Bay-breasted Warbler*				
<i>Dendroica striata</i>	Blackpoll Warbler*	x			

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Dendroica dominica</i>	Yellow-throated Warbler*				
<i>Helmitheros vermivorus</i>	Worm-eating Warbler*	x			
<i>Protonotaria citrea</i>	Prothonotary Warbler*				
<i>Mniotilta varia</i>	Black-and-white Warbler*	x			
<i>Setophaga ruticilla</i>	American Redstart*	x			
<i>Seiurus aurocapillus</i>	Ovenbird*	x			
<i>Seiurus noveboracensis</i>	Northern Waterthrush*	x			
<i>Seiurus motacilla</i>	Louisiana Waterthrush*	x			
<i>Oporornis formosus</i>	Kentucky Warbler*				
<i>Oporornis agilis</i>	Connecticut Warbler*				
<i>Oporornis philadelphia</i>	Mourning Warbler*				
<i>Geothlypis trichas</i>	Common Yellowthroat*	x		x	x
<i>Wilsonia pusilla</i>	Wilson's Warbler*	x			
<i>Wilsonia canadensis</i>	Canada Warbler*	x			
<i>Wilsonia citrina</i>	Hooded Warbler*	x	x		
<i>Icteria virens</i>	Yellow-breasted Chat*				
<i>Piranga rubra</i>	Summer Tanager*	x			
<i>Piranga olivacea</i>	Scarlet Tanager*	x	x		
<i>Cardinalis cardinalis</i>	Northern Cardinal*	x	x	x	x
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak*	x			
<i>Guiraca caerulea</i>	Blue Grosbeak*				
<i>Passerina cyanea</i>	Indigo Bunting*	x		x	x
<i>Pipilo erythrophthalmus</i>	Eastern Towhee*	x	x	x	x
<i>Spizella arborea</i>	American Tree Sparrow*				
<i>Spizella pusilla</i>	Field Sparrow*	x			
<i>Spizella passerina</i>	Chipping Sparrow*	x			
<i>Ammodramus savannarum</i>	Grasshopper Sparrow*				
<i>Passerculus sandwichensis</i>	Savannah Sparrow*				
<i>Pooecetes gramineus</i>	Vesper Sparrow*				
<i>Zonotrichia albicollis</i>	White-throated Sparrow*	x		x	x
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow*				
<i>Passerella iliaca</i>	Fox Sparrow*				
<i>Melospiza melodia</i>	Song Sparrow*	x			
<i>Melospiza lincolni</i>	Lincoln's Sparrow*				
<i>Melospiza georgiana</i>	Swamp Sparrow*	x			
<i>Junco hyemalis</i>	Dark-eyed Junco*	x		x	x
<i>Calcarius lapponicus</i>	Lapland Longspur*				
<i>Plectrophenax nivalis</i>	Snow Bunting*				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Sturnella magna</i>	Eastern Meadowlark*				
<i>Dolichonyx oryzivorus</i>	Bobolink*				
<i>Molothrus ater</i>	Brown-headed Cowbird*	x			
<i>Agelaius phoeniceus</i>	Red-winged Blackbird*	x			
<i>Euphagus carolinus</i>	Rusty Blackbird*				
<i>Quiscalus quiscula</i>	Common Grackle*	x			
<i>Icterus galbula</i>	Baltimore Oriole*	x			
<i>Icterus spurius</i>	Orchard Oriole*	x			
<i>Coccothraustes vespertinus</i>	Evening Grosbeak*				
<i>Pinicola enucleator</i>	Pine Grosbeak*				
<i>Carpodacus purpureus</i>	Purple Finch*			x	x
<i>Carpodacus mexicanus</i>	House Finch*				
<i>Loxia curvirostra</i>	Red Crossbill*				
<i>Loxia leucoptera</i>	White-winged Crossbill*				
<i>Carduelis flammea</i>	Common Redpoll*				
<i>Carduelis pinus</i>	Pine Siskin*				
<i>Carduelis tristis</i>	American Goldfinch*	x		x	x
<i>Passer domesticus</i>	House Sparrow				
Mammals					
<i>Didelphis virginiana</i>	Virginia Opossum				
<i>Blarina brevicauda</i>	Northern Short-Tailed Shrew				
<i>Cryptotis parva</i>	Least Shrew				
<i>Sorex hoyi</i>	Pygmy Shrew				
<i>Sorex cinereus</i>	Masked Shrew				
<i>Sorex fumeus</i>	Smokey Shrew				
<i>Sorex palustris</i>	Water Shrew				
<i>Condylura cristata</i>	Star-Nosed Mole	x			
<i>Scalopus aquaticus</i>	Eastern Mole				
<i>Pipistrellus subflavus</i>	Eastern Pipistrelle				
<i>Eptesicus fuscus</i>	Big Brown Bat				
<i>Lasiurus borealis</i>	Eastern Red Bat				
<i>Lasiurus cinereus</i>	Hoary Bat				
<i>Myotis leibii</i>	Eastern Small-Footed Myotis	x			
<i>Myotis lucifugus</i>	Little Brown Bat				
<i>Myotis septentrionalis</i>	Northern Myotis				
<i>Ursus americanus</i>	Black Bear	x	x	x	x
<i>Procyon lotor</i>	Common Raccoon	x			
<i>Mustela frenata</i>	Long-Tailed Weasel	x			

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Mustela vison</i>	Mink				
<i>Lutra canadensis</i>	River Otter				
<i>Mephitis mephitis</i>	Striped Skunk				
<i>Canis latrans</i>	Coyote		x		
<i>Vulpes vulpes</i>	Red Fox				
<i>Urocyon cinereoargenteus</i>	Gray Fox				
<i>Lynx rufus</i>	Bobcat	x			
<i>Marmota monax</i>	Woodchuck	x			
<i>Sciurus carolinensis</i>	Gray Squirrel	x		x	x
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	x			
<i>Glaucomys volans</i>	Southern Flying Squirrel				
<i>Tamias striatus</i>	Eastern Chipmunk	x		x	x
<i>Castor canadensis</i>	American Beaver	x			
<i>Napaeozapus insignis</i>	Woodland Jumping Mouse				
<i>Zapus hudsonius</i>	Meadow Jumping Mouse				
<i>Peromyscus maniculatus</i>	Deer Mouse		x		
<i>Peromyscus leucopus</i>	White-Footed Mouse				
<i>Synaptomys cooperi</i>	Southern Bog Lemming				
<i>Clethrionomys gapperi</i>	Southern Red-Backed Vole	x			
<i>Microtus pennsylvanicus</i>	Meadow Vole				
<i>Microtus pinetorum</i>	Woodland Vole				
<i>Ondatra zibethicus</i>	Common Muskrat	x			
<i>Rattus norvegicus</i>	Norway Rat				
<i>Mus musculus</i>	House Mouse				
<i>Erethizon dorsatum</i>	Porcupine	x	x		
<i>Lepus americanus</i>	Snowshoe Hare				
<i>Sylvilagus floridanus</i>	Eastern Cottontail	x			
<i>Odocoileus virginianus</i>	White-Tailed Deer	x	x	x	x
Amphibians					
<i>Notophthalmus viridescens viridescens</i>	Red-Spotted Newt	x	x	x	x
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander				
<i>Ambystoma maculatum</i>	Spotted Salamander	x			
<i>Ambystoma opacum</i>	Marbled Salamander	x			
<i>Ambystoma platineum</i>	Silvery Salamander				
<i>Desmognathus fuscus fuscus</i>	Northern Dusky Salamander	x	x		
<i>Desmognathus ochrophaeus</i>	Mountain Dusky Salamander				
<i>Eurycea bislineata</i>	Northern Two-Lined Salamander		x		
<i>Eurycea longicauda longicauda</i>	Long-Tailed Salamander				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Gyrinophilus porphyriticus porphyriticus</i>	Northern Spring Salamander				
<i>Hemidactylum scutatum</i>	Four-Toed Salamander				
<i>Plethodon glutinosus</i>	Northern Slimy Salamander	x	x		
<i>Plethodon cinereus</i>	Red-back Salamander	x	x	x	x
<i>Pseudotriton ruber ruber</i>	Northern Red Salamander				
<i>Rana catesbeiana</i>	American Bullfrog	x		x	x
<i>Rana clamitans melanota</i>	Green Frog	x	x	x	x
<i>Rana palustris</i>	Pickerel Frog	x		x	x
<i>Rana pipiens</i>	Leopard Frog	x	x		
<i>Rana sylvatica</i>	Wood Frog	x		x	x
<i>Bufo americanus americanus</i>	Eastern American Toad	x	x	x	x
<i>Bufo woodhousii fowleri</i>	Fowler's Toad	x			
<i>Acris crepitans crepitans</i>	Northern Cricket Frog				
<i>Hyla versicolor</i>	Gray Treefrog	x			
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	x	x		
Reptiles					
<i>Chelydra serpentina serpentina</i>	Common Snapping Turtle	x			
<i>Sternotherus odoratus</i>	Common Musk Turtle				
<i>Chrysemys picta</i>	Painted Turtle	x			
<i>Pseudemys rubriventris</i>	Redbelly Turtle				
<i>Clemmys guttata</i>	Spotted Turtle				
<i>Clemmys insculpta</i>	Wood Turtle	x			
<i>Glyptemys muhlenbergii</i>	Bog Turtle				
<i>Graptemys geographica</i>	Common Map Turtle				
<i>Trachemys scripta elegans</i>	Red-Eared Slider				
<i>Terrapene carolina carolina</i>	Eastern Box Turtle	x			
<i>Eumeces fasciatus</i>	Five-Lined Skink	x			
<i>Sceloporus undulatus hyacinthinus</i>	Northern Fence Lizard	x		x	x
<i>Carphophis amoenus amoenus</i>	Eastern Worm Snake				
<i>Coluber constrictor constrictor</i>	Northern Black Racer	x			
<i>Diadophis punctatus edwardsii</i>	Northern Ringneck Snake	x		x	x
<i>Elaphe obsoleta obsoleta</i>	Black Rat Snake	x			
<i>Heterodon platirhinos</i>	Eastern Hognose Snake	x			
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake	x			
<i>Nerodia sipedon sipedon</i>	Northern Water Snake	x			
<i>Opheodrys vernalis</i>	Smooth Green Snake	x			
<i>Storeria dekayi dekayi</i>	Northern Brown Snake				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Storeria occipitomaculata</i> <i>occipitomaculata</i>	Northern Redbelly Snake				
<i>Thamnophis sirtalis sirtalis</i>	Eastern Garter Snake	x	x		
<i>Thamnophis sauritus sauritus</i>	Eastern Ribbon Snake	x			
<i>Crotalus horridus</i>	Timber Rattlesnake	x	x		
<i>Agkistrodon contortrix mokasen</i>	Northern Copperhead	x			
Fish					
<i>Petromyzon marinus</i>	Sea Lamprey				
<i>Amia calva</i>	Bowfin				
<i>Anguilla rostrata</i>	American Eel	x			
<i>Oncorhynchus mykiss</i>	Rainbow Trout				
<i>Salmo trutta</i>	Brown Trout				
<i>Salvelinus fontinalis</i>	Brook Trout				
<i>Alosa aestivalis</i>	Blueback Herring				
<i>Alosa pseudoharengus</i>	Alewife				
<i>Alosa sapidissima</i>	American Shad				
<i>Dorosoma cepedianum</i>	Gizzard Shad				
<i>Carpionodes cyprinus</i>	Quillback				
<i>Esox americanus</i>	Redfin Pickerel				
<i>Esox masquinongy</i>	Muskellunge				
<i>Esox niger</i>	Chain Pickerel				
<i>Cyprinus carpio</i>	Common Carp				
<i>Exoglossum maxillingua</i>	Cutlips Minnow				
<i>Cyprinella analostana</i>	Satinfish Shiner				
<i>Catostomus commersoni</i>	White Sucker				
<i>Ameiurus catus</i>	White Catfish				
<i>Ameiurus natalis</i>	Yellow Bullhead				
<i>Ameiurus nebulosus</i>	Brown Bullhead				
<i>Ictalurus punctatus</i>	Channel Catfish				
<i>Noturus gyrinus</i>	Tadpole Madtom				
<i>Noturus insignis</i>	Margined Madtom				
<i>Campostoma anomalum</i>	Central Stoneroller				
<i>Notemigonus crysoleucas</i>	Golden Shiner				
<i>Notropis amoenus</i>	Comely Shiner				
<i>Luxilus cornutus</i>	Common Shiner				
<i>Notropis hudsonius</i>	Spottail Shiner				
<i>Notropis procne</i>	Swallowtail Shiner				
<i>Rhinichthys atratulus</i>	Blacknose Dace				

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Rhinichthys cataractae</i>	Longnose Dace				
<i>Semotilus atromaculatus</i>	Creek Chub				
<i>Semotilus corporalis</i>	Fallfish				
<i>Fundulus diaphanus</i>	Banded Killifish				
<i>Morone americana</i>	White Perch				
<i>Morone saxatilis</i>	Striped Bass				
<i>Ambloplites rupestris</i>	Rock Bass				
<i>Enneacanthus gloriosus</i>	Bluespotted Sunfish				
<i>Lepomis auritus</i>	Redbreast Sunfish				
<i>Lepomis cyanellus</i>	Green Sunfish				
<i>Lepomis gibbosus</i>	Pumpkinseed				
<i>Lepomis macrochirus</i>	Bluegill				
<i>Micropterus dolomieu</i>	Smallmouth Bass				
<i>Micropterus salmoides</i>	Largemouth Bass				
<i>Pomoxis annularis</i>	White Crappie				
<i>Pomoxis nigromaculatus</i>	Black Crappie				
<i>Etheostoma olmstedii</i>	Tessellated Darter				
<i>Perca flavescens</i>	Yellow Perch				
<i>Percina peltata</i>	Shield Darter				
<i>Stizostedion vitreum</i>	Walleye				
<i>Cottus cognatus</i>	Slimy Sculpin				
Invertebrates					
<i>Alasmidonta heterodon</i>	Dwarf Wedgemussel				
<i>Alasmidonta undulata</i>	Triangle Floater				
<i>Alasmidonta varicosa</i>	Brook Floater				
<i>Anodonta implicata</i>	Alewife Floater				
<i>Elliptio complanata</i>	Eastern Elliptio				
<i>Lampsilis cariosa</i>	Yellow Lampmussel				
<i>Cambarus bartonii</i>	Appalachian Brook Crayfish				
<i>Orconectes limosus</i>	Spinycheek Crayfish				
<i>Trichoptera</i>	Caddisfly Sp.				
<i>Ephemeroptera</i>	Mayfly Sp.				
<i>Plecoptera</i>	Stonefly Sp.				
<i>Calopteryx maculata</i>	Ebony Jewelwing	x			
<i>Lestes vigilax</i>	Swamp Spreadwing	x			
<i>Argia fumipennis</i>	Variable Dancer	x			
<i>Ischnura posita</i>	Fragile Forktail	x			
<i>Ischnura verticalis</i>	Eastern Forktail	x			

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Aeshna tuberculifera</i>	Black Tipped Darner	x			
<i>Aeshna verticalis</i>	Green Striped Darner	x			
<i>Anax junius</i>	Common Green Darner	x			
<i>Boyeria vinosa</i>	Fawn Darner	x			
<i>Epiaeschna heros</i>	Swamp Darner	x			
<i>Gomphus borealis</i>	Beaverpond Clubtail	x			
<i>Epithea (Tetragoneuria) cynosura</i>	Common Baskettail	x			
<i>Celithemis elisa</i>	Calico Pennant	x			
<i>Celithemis eponina</i>	Halloween Pennant	x			
<i>Erythemis simplicicollis</i>	Eastern Pondhawk	x			
<i>Ladona julia</i>	Chalk Fronted Corporal	x			
<i>Leucorrhinia frigida</i>	Frosted Whiteface	x			
<i>Leucorrhinia intacta</i>	Dot-Tailed Whiteface	x			
<i>Libellula luctuosa</i>	Widow Skimmer	x			
<i>Plathemis lydia</i>	Common Whitetail	x			
<i>Libellula pulchella</i>	Twelve Spotted Skimmer	x		x	x
<i>Libellula vibrans</i>	Great Blue Skimmer	x			
<i>Pachydiplax longipennis</i>	Blue Dasher	x			
<i>Perithemis tenera</i>	Eastern Amberwing	x			
<i>Sympetrum semicinctum</i>	Band Winged Meadowhawk	x			
<i>Sympetrum vicinum</i>	Autumn Meadowhawk	x			
<i>Tramea lacerata</i>	Black Saddlebags	x			
<i>Cordulegaster spp.</i>	Unid. Spiketail	x			
<i>Somatochlora spp.</i>	Unid. Emerald	x			
<i>Epargyreus clarus</i>	Silver Spotted Skipper	x			
<i>Erynnis baptisiae</i>	Wild Indigo Duskywing	x			
<i>Thymelicus lineola</i>	European Skipper	x			
<i>Hesperia leonardus</i>	Leonard's Skipper	x			
<i>Polites peckius</i>	Peck's Skipper	x			
<i>Pompeius verna</i>	Little Glassywing	x			
<i>Poanes massasoit</i>	Mulberry Wing	x			
<i>Euphyes conspicua</i>	Black Dash	x			
<i>Papilio glaucus</i>	Tiger Swallowtail	x		x	x
<i>Papilio troilus</i>	Spicebush Swallowtail	x			
<i>Pieris rapae</i>	Cabbage White	x			
<i>Colias philodice</i>	Clouded Sulphur	x			
<i>Colias eurytheme</i>	Orange Sulphur	x			
<i>Phoebis sennae</i>	Cloudless Sulphur	x			

Scientific Name	Common Name	Alternatives			
		1, 2, 2b	3	4	5
<i>Lycaena phlaeas</i>	American Copper	x			
<i>Cupido comyntas</i>	Eastern-Tailed Blue	x			
<i>Celastrina ladon</i>	Spring Azure	x			
<i>Celastrina neglecta</i>	Summer Azure	x			
<i>Danaus plexippus</i>	Monarch	x			
<i>Speyeria cybele</i>	Great Spangled Fritillary	x			
<i>Phyciodes tharos</i>	Pearl Crescent	x			
<i>Euphydryas phaeton</i>	Baltimore Checkerspot	x			
<i>Polygonia interrogationis</i>	Question Mark	x			
<i>Polygonia comma</i>	Eastern Comma	x			
<i>Vanessa atalanta</i>	Red Admiral	x			
<i>Vanessa cardui</i>	Painted Lady	x			
<i>Vanessa virginiensis</i>	American Lady	x			
<i>Limenitis Archippus</i>	Viceroy	x			
<i>Enodia anthedon</i>	Northern Pearly Eye	x			
<i>Satyroides appalachia</i>	Appalachian Brown	x			
<i>Megisto cymela</i>	Little Wood Satyr	x			
<i>Coenonympha tullia</i>	Common Ringlet	x			

* Indicates migratory species

Bold text indicates special-status species, identified as such by Pennsylvania, New Jersey, or both

All species listed were documented by NPS, those with checkmarks in the alternatives boxes were observed during 2010 & 2011 field surveys.

APPENDIX G-7: LIFE HISTORY REQUISITES FOR SPECIAL STATUS SPECIES NOT OBSERVED OR OTHERWISE DOCUMENTED

AQUATIC WILDLIFE SPECIES

Eastern Pearlshell (*Margaritifera margaritifera*): The eastern pearlshell is found in small streams and rivers that support host fish species: brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*) or Atlantic salmon (*S. salar*) and uses a variety of substrates (CT DEP 2010). They generally live buried in clean, mixed stable substrates. The eastern pearlshell is considered critically imperiled in Pennsylvania and has been known from several sites in the Delaware River in Pennsylvania; however, it appears to be extirpated from Monroe County and is now known from only one population in Schuylkill County (NatureServe 2009). Its status is undetermined in New Jersey (NatureServe 2009).

Ironcolor Shiner (*Notropis chalybaeus*): The ironcolor shiner prefers pools and slow runs of low gradient, small acidic creeks and small rivers with sandy substrate (Nature Serve 2009). The ironcolor shiner may be extirpated from Pennsylvania though it was once known from the Delaware River; however, it has not been documented in DEWA waters since 1978 (Nature Serve 2009; NPS 2010). It is considered critically imperiled in both Pennsylvania and New Jersey (Nature Serve 2009).

Banded Sunfish (*Enneacanthus obseus*): This species is considered critically imperiled in Pennsylvania and appears to be extirpated from its historic range in the Middle Delaware River (Pike County). It is currently known only from the lower Delaware River near Philadelphia, Pennsylvania (NatureServe 2009). The banded sunfish prefers small ponds, and backwaters of creeks as well as small and large rivers and boggy brooks over sand or mud in sluggish, acidic, heavily vegetated waters (NatureServe 2009).

TERRESTRIAL WILDLIFE SPECIES

Cobblestone Tiger Beetle (*Cicindela marginipennis*): Cobblestone tiger beetles are a federal species of concern. They are found on gravel and cobblestone bars that have small patches of sand, on the upstream ends of treed islands in small to large river systems associated with islands or bends in large rivers. These gravel bars are sparsely vegetated (TNC 2004, 2; Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2008, 8–9). The historic range of the cobblestone tiger beetle was believed to stretch from West Virginia to Indiana and Pennsylvania, but it is now only found in isolated areas in several states in the northeastern United States, including within the Delaware River in New Jersey (COSEWIC 2008; New Hampshire Fish and Wildlife Service [NHFWS] 2005, 1–2). Dam construction, river channelization, water pollution, and the use of ATVs may have contributed to the decline of this species (COSEWIC 2008, 12). The cobblestone tiger beetle has historically occurred on a few islands within DEWA and MDSR. However, the current status of these occurrences is unknown. An invertebrate survey of the corridors for alternatives 1, 2, and 2b did not observe cobblestone tiger beetles (EcolSciences 2009). Because the type of habitat required by the cobblestone tiger beetle is not found within areas that will be disturbed in the study area (all gravel or cobblestone bars would be spanned by the transmission line), this invertebrate species was dismissed from further analysis.

Superb jewelwing (*Calopteryx amata*): Superb jewelwing dragonflies are a New Jersey State threatened species. This species of dragonfly is found near fast-moving streams with areas of dense canopy and abundant stream vegetation. The superb jewelwing has a range along the east coast from Maine to North Carolina. In New Jersey their habitat is limited to northwestern Sussex County along fast-moving streams. The superb jewelwing is threatened in New Jersey due to limited range and habitat vulnerability (CWFNJ 2012). An invertebrate survey of the DEWA corridors for alternatives 1, 2, and 2b resulted in no

spotting of the superb jewelwing within areas that will be disturbed in the study area (EcolSciences 2009). This invertebrate species was dismissed from further analysis.

Harpoon clubtail (*Gomphus descriptus*): The harpoon clubtail dragonfly is considered threatened in New Jersey due to rarity and limited suitable habitat. Harpoon clubtail dragonflies inhabit rivers and streams near gravel bars. Much of their time is spent burrowing. Within New Jersey these dragonflies are limited to the ridges and valleys of Sussex County (CWFNJ 2012). The harpoon clubtail dragonfly was not observed during an invertebrate survey of the corridors for alternatives 1, 2, and 2b (EcolSciences 2009). This invertebrate species was dismissed from further discussion since suitable habitat will not be disturbed in the study area.

Kennedy's emerald (*Somatochlora kennedyi*): The Kennedy's emerald dragonfly is threatened in New Jersey. These dragonflies are known to inhabit streams flowing through open habitats, like marshes and bogs. The Kennedy's emerald distribution ranges from Massachusetts west to Minnesota within the United States (Massachusetts Division of Fisheries and Wildlife n.d). New Jersey is the southern limit of the Kennedy's emerald has a limited distribution. Sussex County contains the only known population in New Jersey. The rarity and the sensitivity of habitat threaten the Kennedy's emerald in New Jersey (CWFNJ 2012). An invertebrate survey of the corridors for alternatives 1, 2, and 2b did not observe any Kennedy's emerald dragonflies (EcolSciences 2009). This species was dismissed from further analysis because suitable habitat for this species will not be disturbed in the study area.

Gray petaltail (*Tachopteryx thoreyi*): The gray petaltail dragonfly is listed as endangered in New Jersey. This dragonfly is a woodland species that inhabits small seepages with skunk cabbage and ferns. The gray petaltail range is thought the eastern United States and limited to Bergen, Morris, Passaic, and Sussex Counties in New Jersey. This species is endangered in New Jersey since the largest know colony was destroyed during a residential development (CWFNJ 2012). This dragonfly species was not located in the corridors for alternatives 1, 2, and 2b during an invertebrate survey (EcolScience 2009). The gray petaltail was dismissed from further analysis since disturbance to suitable habitat will not occur within the study area.

Brook snaketail (*Ohpiogomphus asperses*): Brook snaketail dragonflies are threatened in New Jersey. This species inhabits clear sand bottomed fast-moving streams, often flowing through dense woodlands. The brook snaketail occurs from Nova Scotia west to Quebec and south to North Carolina (Massachusetts Division of Fisheries and Wildlife 2008). In New Jersey the brook snaketail is limited to the northwest Ridge and Valley areas. This species is threatened in New Jersey due to its rarity and lack of suitable breeding habitat (CWFNJ 2012). Brook snaketail dragonflies were not observed during an invertebrate survey of the corridors for alternatives 1, 2, and 2b (EcolScience 2009). Suitable habitats will not be disturbed within the study area therefore the brook snaketail dragonfly has been dismissed from further analysis.

Blue-spotted Salamander (*Ambystoma laterale*): The blue-spotted salamander inhabits hardwood forests that contain soil types of sandy and silt loams, gravelly, loamy sand, or muck soil types. Ground cover usually consists of rotting logs, rocks, and leaf litter where blue-spotted salamanders can remain in moist depressions. Areas of temporary standing water typically serve as breeding areas. The blue-spotted salamander was listed as endangered in New Jersey in 1974 based on the declining population numbers, believed to be associated with habitat loss and pesticide use (NJ ENSP 2001). The blue-spotted salamander presently remains state-listed as endangered by Pennsylvania and New Jersey. No potential habitat for the blue-spotted salamander has been identified within the study area and will therefore be dismissed from further discussion.

PLANTS

Northern Arrowhead (*Sagittaria cuneata*): Northern arrowhead is state-listed by New Jersey as endangered. It is an aquatic plant that is found in swampy areas or standing water in ponds, lakes, stream edges, and ditches and is considered an obligate-wetland plant. This species is found in marshes and wetlands throughout temperate North America, extending from north-central Alaska to Labrador and south to California and northern Texas (NRCS 2010). Because Northern arrowhead was not observed in New Jersey, where it is listed, along the alignment for any of the alternatives, this plant species was dismissed from further analysis.

Yellow sedge (*Carex flava*): Yellow sedge is state-listed by Pennsylvania as a threatened species. The yellow sedge is a wetland-obligate species that occurs mostly in the northern United States and in Canada. This species is perennial sedge that grows to a maximum of 2.5 feet. Fruiting occurs from June to August (NRCS 2010). Yellow sedge was not observed during any of the vegetation surveys (NPS 2011a; Mellon 2010); therefore, this species was dismissed from further analysis.

Long's sedge (*Carex longii*): Long's sedge is a wetland species that can be found from Texas to Wisconsin and east to the Atlantic Coast of the United States. It can be found on sandy lakeshores and in bogs. Blooming occurs in June, with fruiting following from July to September (NRCS 2010). Long's sedge is state-listed by Pennsylvania as tentatively undetermined, but is proposed as a threatened species. Long's sedge was not observed during any of the field surveys (NPS 2011a; Mellon 2010) and there are no records of this species occurring within the study area for this project; therefore, this species was dismissed from further analysis.

Matted-spikerush (*Eleocharis intermedia*): Matted-spikerush is an annual, grass-like, wetland plant that inhabits the eastern United States from Minnesota south to Tennessee and Mississippi and northeast to Maine and Canada (NRCS 2010). Matted-spikerush is state-listed by Pennsylvania as a threatened species and is protected by the Highlands Protection and Planning Act. Matted-spikerush was not observed during any of the field surveys (NPS 2011a; Mellon 2010) and there are no records of this species occurring within the study area for this project; therefore, this species was dismissed from further analysis.

Northeastern Bulrush (*Scirpus ancistrochaetus*): The northeastern bulrush is a member of the sedge family (Cyperaceae) and is found in ponds, wet depressions, or shallow sinkholes within small wetland complexes. Northeastern bulrush is highly tolerant of seasonally variable water levels. Not all botanists consider the northeastern bulrush to be a distinct species; however, based on morphological and genetic evidence as well as botanical expertise of an expert in the genus *Scirpus*, the USFWS recognizes the northeastern bulrush as a distinct species (USFWS 1993, 1, 2). Threats to the species include habitat loss and degradation caused by wetland draining, dredging, and filling for residential and agricultural development (USFWS 1993, 1). Northeastern bulrush is federally listed as an endangered species. It is also state-listed by Pennsylvania as an endangered species, although it is proposed to be changed to a (Pennsylvania) state-listed threatened species. Northeastern bulrush was not observed during any of the field surveys (NPS 2011a; Mellon 2010) and there are no records of this species occurring within the study area for this project. Because northeastern bulrush was not observed within the alignment for any of the alternatives and there are no records of occurrence, this plant species was dismissed from further analysis.

Small-whorled Pogonia (*Isotria medeoloides*): The small-whorled pogonia is a member of the orchid family (Orchidaceae) and is listed as federally threatened, as well as state-listed by Pennsylvania as endangered. This species is sparse but widely distributed, with a range extending from southern Maine and New Hampshire to northern Georgia and southeastern Tennessee. The small-whorled pogonia occurs on upland sites in mixed deciduous or mixed deciduous/coniferous forests that are generally second- or

third-growth successional stages. Habitat characteristics include sparse to moderate ground cover, relatively open understory, and proximity to features that create long-persisting breaks in forest canopy (USFWS 1992, 1). Deer browsing, fragmentation, and possibly alterations in soil moisture were identified as threats to the small-whorled pogonia. Species within the northern range emerge from leaf litter in May and flower in June. An individual plant may stay in flower from 4 days to nearly 2 weeks (USFWS 1992, 20). Small-whorled pogonia was not observed during any of the field surveys (NPS 2011a; Mellon 2010) and there are no records of this species occurring within the study area for this project. Because small-whorled pogonia was not observed within the alignment for any of the alternatives and there are no records of occurrence, this plant species was dismissed from further analysis.

Swamp Pink (*Helonias bullata*): Swamp pink is a federally threatened species and is state-listed by New Jersey as endangered, which is also protected by the Highlands Protection and Planning Act. Swamp pink is a perennial herbaceous plant with a small pink flower and oblong, dark-green leaves; the evergreen leaves of swamp pink can be seen year-round, and flowering occurs between March and May (USFWS 2011b). Swamp pink is a wetland plant species and occurs in a variety of palustrine forested wetlands, including swampy forested wetlands bordering meandering streamlets, headwater wetlands, sphagnum Atlantic white-cedar swamps, and spring seepage areas (USFWS 2011b). The primary threats to swamp pink are the indirect effects of off-site activities and development, such as pollution, introduction of invasive species, and subtle changes in groundwater and surface water hydrology (USFWS 2011b).

Canadian Serviceberry (*Amelanchier canadensis*): Canadian serviceberry is currently not state-listed by Pennsylvania; however, it is proposed to be listed as endangered. This deciduous species usually found as a small shrub or tree in wet sites. It blooms in late March and the resulting fruits provide food for wildlife (University of Connecticut 2010). Canadian serviceberry was not observed during any field surveys (NPS 2011a; Mellon 2010) and there are no records of this species occurring within the study area for this project. Because Canadian serviceberry was not observed within the alignment for any of the alternatives and there are no records of occurrence, this plant species was dismissed from further analysis.

APPENDIX G-8: RARE AND UNIQUE COMMUNITIES PRESENT WITHIN THE COUNTIES OF PENNSYLVANIA AND NEW JERSEY THAT COULD BE TRAVERSED BY THE S-R LINE

Common Name	State Rank	Pennsylvania Counties							New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Acidic broadleaf swamp	Vulnerable				X	X					
Acidic glacial lake	Imperiled to vulnerable	X	X				X	X			
Acidic glacial peatland complex	Not ranked						X	X			
Acidic shrub swamp	Vulnerable	X			X			X			
Aster-like boltonia/small-headed aster/field mint herbaceous vegetation	Critically imperiled to imperiled									X	X
Atlantic white-cedar/great rhododendron swamp	Critically imperiled									X	
Basin graminoid-forb fen	Critically imperiled					X					
Big bluestem/Indian grass river grassland	Vulnerable					X		X			
Birch (black-gum) rocky slope woodland	Imperiled					X					
Black spruce swamp	Critically imperiled								X	X	X
Black spruce/tamarack palustrine woodland	Imperiled						X	X			
Black spruce/tamarack peatland forest	Vulnerable						X				
Black spruce woodland bog	Critically imperiled								X	X	
Boreal conifer swamp	Vulnerable		X		X		X				
Broadleaf/conifer swamp	Vulnerable to apparently secure				X						

Common Name	State Rank	Pennsylvania Counties							New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Calcareous glacial lake	Critically imperiled							X			
Calcareous riverside outcrop community	Critically imperiled (PA) Critically imperiled to imperiled (NJ)					X				X	
Calcareous riverside seep community	Critically imperiled								X		
Calcareous seepage swamp	Critically imperiled					X					
Cave aquatic community	Imperiled									X	X
Cave terrestrial community	Imperiled									X	
Circumneutral broadleaf swamp	Imperiled to vulnerable					X					
Dry-mesic calcareous forest	Imperiled (unknown)									X	X
Dry oak/heath woodland	Vulnerable	X	X		X	X	X				
Ephemeral/fluctuating natural pool	Vulnerable	X		X	X	X					
Glacial bog	Vulnerable		X	X	X			X			
Hemlock/hardwood swamp	Imperiled								X	X	
Hemlock/mixed hardwood palustrine forest	Vulnerable to apparently secure		X	X	X		X	X			
Hemlock palustrine forest	Vulnerable	X									
Herbaceous vernal pond	Vulnerable to apparently secure					X					
Highbush blueberry/sphagnum wetland	Secure						X				
High-gradient clearwater creek	Vulnerable	X			X		X				

Common Name	State Rank	Pennsylvania Counties							New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Inland acidic seep community	Critically imperiled									X	
Leatherleaf/bog rosemary peatland	Imperiled to vulnerable		X	X	X		X	X			
Leatherleaf/cranberry peatland	Imperiled to vulnerable						X				
Leatherleaf/sphagnum boreal dwarf scrub shrub	Critically imperiled									X	
Little bluestem/Pennsylvania sedge opening	Vulnerable to apparently secure						X				
Limestone fen	Critically imperiled									X	X
Limestone glade	Critically imperiled									X	
Low heath scrub shrub	Critically imperiled	X	X	X	X			X			
Marl fen plant association	Critically imperiled									X	
Mesic central forest	Imperiled				X						
Mesic scrub oak/heath/pitch pine barrens	Critically imperiled	X		X	X						
Natural pond	Imperiled to vulnerable		X								
Northern Appalachian acidic cliff community	Secure	X	X	X				X			
Northern Appalachian acidic rocky summit community	Imperiled	X	X	X	X						
Northern Appalachian boulder field	Secure	X									
Northern Appalachian calcareous cliff community	Imperiled			X		X					
Northern Appalachian calcareous rocky summit community	Critically imperiled			X							

Common Name	State Rank	Pennsylvania Counties							New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Northern Appalachian shale barren	Imperiled						X				
Northern Appalachian shale cliff community	Imperiled					X	X				
Northern conifer forest	Imperiled to vulnerable	X			X						
Northern hardwood forest	Imperiled to vulnerable				X		X				
Northern hardwood/conifer forest	Vulnerable							X			
Pitch pine/mixed hardwood woodland	Imperiled to vulnerable	X									
Pitch pine/scrub oak woodland	Imperiled to vulnerable						X				
Poor fen	Critically imperiled							X			
Prairie fen	Critically imperiled									X	
Prairie sedge/spotted joe/pye-weed marsh	Critically imperiled to imperiled					X					
Red spruce/mixed hardwood palustrine forest	Vulnerable			X	X		X	X			
Red spruce palustrine forest	Vulnerable	X	X	X	X		X	X			
Red spruce palustrine woodland	Imperiled to vulnerable	X					X				
Red-cedar/prickly-pear shale scrub shrub	Imperiled						X				
Rice cut-grass/green-fruited bur-reed/water smartweed seasonally flooded herbaceous vegetation	Vulnerable									X	
Rich red maple/black ash swamp	Critically imperiled to vulnerable									X	X

Common Name	State Rank	Pennsylvania Counties							New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Ridgetop dwarf-tree forest	Vulnerable	X		X	X		X				
Riverside ice scour community	Critically imperiled to imperiled							X			
Scrub oak scrub shrub	Vulnerable	X	X	X	X		X				
Shale cliff/rock outcrop community	Imperiled (unknown)										X
Shrub fen	Critically imperiled				X						
Skunk cabbage/golden saxifrage forest seep	Apparently secure to secure					X					
Sphagnum/beaked rush peatland	Vulnerable						X				
Sycamore/green ash/American elm/ red-osier dogwood forest	Critically imperiled to imperiled									X	X
Talus cave community	Imperiled to apparently secure			X							
Talus slope community	Imperiled to vulnerable									X	X
Waterfall and plungepool	Vulnerable to apparently secure				X		X				
Water-willow (<i>Decodon verticillatus</i>) shrub wetland	Vulnerable						X				
Xeric central conifer forest	Vulnerable to apparently secure						X				
Yellow water-crowfoot/clearweed/water smartweed herbaceous vegetation	Vulnerable									X	X

Common Name	State Rank	Pennsylvania Counties						New Jersey Counties		
		Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex

Source: PNHP 2010; NJDEP 2008a, 2008b, 2008c.

Note: Communities in *italics* are found in New Jersey only; communities in **bold** are found in Pennsylvania only.

Ranking Definitions: **Critically imperiled:** At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

Apparently secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

Secure: Common; widespread and abundant.

Not ranked: Conservation status not yet assessed.

Unknown: Possibly in peril range-wide but status uncertain; need more information.

APPENDIX G-9: NATURAL HERITAGE SITES/OUTSTANDING NATURAL FEATURES

OUTSTANDING NATURAL FEATURES IDENTIFIED IN PENNSYLVANIA BY THE NATURE CONSERVANCY

County	Natural Heritage Sites
Carbon County, PA	Aquashicola Creek Wetlands, Bake Oven Knob, Bear Creek Lake, Bears Rocks, Beltzville Lake Vernal, Berry Run Barrens, Black Creek Gorge, Black Shanty Run, Broad Mountain West, Carpsrocus Creek Thickets, Christmans Ponds, Christmans Wetland, Cross Run Vernal, Devil's Potato Patch/Little Gap, East Side Wetland, Fawn Run Wetlands, Fourth Run Wetlands, Francis E. Walter Reservoir Site, Glen Onoko, Golf Course Wetland, Hell Creek Barrens, Hickory Run Boulder Field, Hickory Run Campground, Hickory Run Headwaters, Hickory Run Wetland, Hughes Swamp, Indian Mountain Barren, Irishtown Run, Keipers Run, Kidder Wetlands, Lake Harmony/Big Boulder Lake, Lehigh Gap, Lehigh Gorge at Sandy Run, Lehigh Gorge at Tank Hollow, Leonardsville Swamps, Mahoning Creek Wetlands, Mauch Chunk Ridge Barrens, Mosey Wood Wetlands, Mud Run Natural Area, Mud Swamp, Owl Creek Wetlands, Penn Forest/Wild Creek Reservoirs, Penn Haven Oak Barren, Penrose Swamp Barrens, Pine Run Woods, Pocono Mountain Barren, Pocono Mountain Wetlands, Quakake Creek Wetland, Roundhead Mountain Barren, Schoch Barrens Complex, Schoch Thicket, Scrub Mountain, Spring Mountain, Stone Mountain Woods, Stony Ridge, Swamp Run, and Yellow Run Barren
Lackawanna County, PA	AD 431 Mine – Riverdrift, America Swamp, Archbald Pothole, Atherton Pond, Bald Mountain, Balsam Swamp-Lackawanna, Bassett Pond, Bear Lakeigrassy Pond, Bear Swamp-Moscow, Behler Swamp, Bell Mountain Outcrops, Blue Shutter Road Swamp, Brzostek Swamp, Carpenter Swamp, Chapman Lake, Corby Swamp, County Line Island, Daleville Swamp, Dunmore Bald, Dunmore Swamps, Eagle Lake, Elmhurst Mud Pond, English Swamp, Fallbrook Swamp, Horseshoe Swamp, Johnson Pond-Westend Pond Complex, Kizer Pond, Lake Kewanee Bog, Long Swamp, Mash Creek Marsh, Montage Mountain Foothills, Montage Rocky Summit, Moosic Bend Lackawanna River, Moosic Lake, Moosic Mountain Barrens, Mountain Mud Pond, Nay Aug Gorge, Newton Lake/Mud Pond, Nines Pond, Painter Creek Bog, Panther Gorge, Panther Hill Site, Pittston Road Bog, Potter Creek Bog, Sadler Avenue AMLF #2 Site, Salem Hill Barren, Sand Springs Woods, Sickler Pond, Stafford Bald, Swartz Road Swamp, Tannery Road Swamp, Tunkhannock Creek, West Mountain Summit, and Wyoanna Cliffs

County	Natural Heritage Sites
Luzerne County, PA	Abrahams Creek Wetlands, Andy Pond, Arbutus Peak, Bald Mountain Road Swamp, Bear Creek At Shades Creek, Bear Creek Railroad Site, Bear Hollow, Bear Swamp, Beaver Run Wetlands, Behren Pond, Benton Station Fields, Black Creek Flats, Blue Nob Ridgetop Dwarf-Tree Forest, Boulder Run Swamp, Briggsville Vernal Pools, Campbell's Ledge, Canada Bog, Central Mountain, Choke Creek Shrub Swamp, Council Cup Cliffs, County Line Islands, County Line Swamp, Cranberry Pond, Dogtown Mines, Dorrance Bog, Dreck Creek Watershed, Dry Land Hill Pools, East Fork Harveys Creek (North), East Fork Harveys Creek (South), Edgewood Vernal Pools, Five Points Swamp, Folstown Mud Pond, Frances E. Walter Reservoir, Gardner Creek Reservoir, Glen Lyon Anthracite Mine, Grand View, Haas Route 115, Hanover Crossing Wetland, Harris Pond, Harveys Lake, Haystack Mountain, Hell's Kitchen, Hell's Kitchen AMLF # 3 Site, Hell's Kitchen, Anthracite Mine, Hobbie Meadow, Humboldt Barren, Huntington Creek, Ice Caves, Indefatigable Swamp, Indian Lake Swamp, Kendall Creek Wetland, Kirby Park, Kitchen Creek Falls, Kitchen Creek Ravines, Lake Jean, Lake Leigh, Lee Swamp, Lehigh Gorge, Lehigh River - Route 115 Bridge Site, Lehigh River at Choke Creek, Lilly Lake, Mill Creek at Suscon, Mountain Springs Lakes, Mud Pond, Mud Pond Woods, Mylet's Corners, Nanticoke Marsh, Nescopeck Creek Valley, Nescopeck Mountain Barrens, Nevel Swamp, Nuangola Lake, Nuangola Railroad Tunnel, Nuangola Station Swamp, Old Beaver Dam Swamp, Old Boston Mine, Opossum Swamp, Opperman Pass, Orloski's Bog, Penobscot Mountain Ridgetop, Perrins Marsh, Pine Creek, Pipeline Swamp, Pipeline Swamp North, Pittston Rookery, Plains Flats, Popples Quarry Pond, Red Bear Swamp, Ricketts Glen Swamp, Roaring Brook Swamp, Route 11 Boat Launch, Scotch Run, Shades Glen Headwaters, Shickshinny Mountain Ridgetop, Shickshinny Mountain, Shingle Run, Slocum Marsh, Sorber Run Lake, State Game Lands #14, State Game Lands #573, Stockton Mountain Barrens, Summer Hill Bog, Suscon Railroad Grade Site, Susquehanna River at Duryea, Susquehanna River at Exeter, Susquehanna River at Hanover Green, Susquehanna River at Mocanaqua, Susquehanna River at Nanticoke, Susquehanna River in Columbia County (North), Susquehanna Riverlands, Sylvan Lake, Tannery Road Site/Behler Swamp, The Meadows/ Beech Lake, The Tubs, Tillbury Knob, Valmont Industrial Park, Wapwallopen Gorge, Wilkes-Barre Mountain, Wolf Run Headwater Swamp, Wright Creek Watershed (A), Wright Creek Watershed (B), Wright Creek Watershed (C), and Wyoming Mountain Barrens
Monroe County, PA	Adams Swamp, Appalachian Trail, Arnott Fen, Bender Swamp, Big Marsh, Big Offset Barren, Big Spring, Bloomer Swamp, Bond Hill Falls, Boulder Field, Bradys Swamp, Camelback Mountain, Cherry Creek Fen, Circle Bog, Cresco Heights, Delaware River, Dutch Hill, Eschenbaugh Swamp, Fern Ridge Bog, Goose Pond Run Falls, Goose Pond Swamp, Green Ridge Marsh, H. Bender Falls, Halfmoon Lake, Huckleberry Marsh, Intake Dam Woods, Kintz Swamp, Lake Mineola Marsh, Lake Naomi Shrub Swamps, Lake Naomi, Laurel Drive Bog, Leavitt Falls, Little Pond Swamp, Lon Price Marsh, Long Pond Macrosite Preserve, Longpatch Swamp, Lost Lakes, Mount Wisner, Mud and Sipos Swamp Area, Pinemere Camp Swamp, Pocono Creek Floodplain Forest, Pocono Lake Preserve, Pocono Plateau Lake Wetlands, Pond Swamp, Ramaque Lake Swamp, Ramot Bog, Sand Spring, Schoch Barren, Selfice Swamp, Seven Pines Mountain, Spruce Cabin Pond, Spruce Cabin Run, Spruce Mountain Run Falls, Spruce Mountain, Stillwater Lake Swamps, Stoney Run Pond, Stony Run, Tannersville Bog, The Mash, Tims Swamp, Twomile Run Swamp, Underwood Swamp, Upper Buck Hill Creek, Vogt Farm Wetland, Wagner Way Swamp, Wagners Bog, Wallpack Bend Cliff, Wild Creek Reservoir Watershed, and Zimmer Wildlife Sanctuary
Northampton County, PA	Angle Swamp, Arrow Island, Bear Swamp, Bertsch Creek Seep, Big Offset Barren, Binney And Smith Woods, Blue Mountain, Bull Run, Bushkill Creek Watershed, Delaware River Water Gap, Delaware Shore Near Keifer Island, East Bangor Wetland Complex, East Johnsonville Swamp, Eastern Industries Quarry, Easton Bluff, Five Points Wetland, Foul Rift, Fox Gap Pond, Frost Hollow Overlook, Getters Island, Getz Swamp, Granite Hill, Grand Central Woods, Hellertown Marsh, Hellertown Reservoir Area Vernal, Frya Run Watershed, Island Park, Jacobsburg Environmental Education Center, Lake Poco, Lehigh Gap, Lehigh Slopes, Little Gap, Little Offset Swamp, Lohman Swamp, Lohman Wetlands, Mariton Uplands, Martins Creek Watershed, Minsi Lake Vernal Ponds, Morgan Hill, Mount Jack Limestone Outcrop, Mount Bethel Fens, Neffs Pond, Old Sow Island, Oughoughton Creek Power, Polly Acres Swamp, Portland Powerplant Site, Raesly Wood, Raubs Island, Raubsville Lock 22-23 Delaware River, Redington Cave, Rismiller Woods, School Road Swamp, Springtown Marsh, Steel City Slopes, Totts Gap, Totts Gap Swamp, Weaversville Ponds, and Whippoorwill Island

County	Natural Heritage Sites
Pike County, PA	Bald Hill Swamp, Bald Hill, Balsam Swamp, Beaver Lake, Ben Bush Swamp, Big Bear Swamp, Big Dam Ridge Swamp, Big Swamp, Blooming Grove Long Pond Swamp, Bruce Lake, Buck Bar, Buckhorn Oak Barre, Bushkill Falls, Bushkill Shale Cliff, Bushkill Swamp, Conservation Island, Corilla Lake, Crooked Swamp, Crossroads Tavern Woods, Deep Brook, Delaware River, Dingmans Falls, Dry Brook Shale Barren, East Mountain Thicket, Edgemere Road Woods, Elbow Swamp, Eschbach Heights Shale Barren, Fairview Lake, Forest Lake, Fulmer Falls, Gates Run, Germantown Swamp, Glenside Shale Barren, Hemlock Farms Barren, High Knob, Holsey Meadow Swamp, Little York Swamp, Lackawaxen River, Lake Belle, Lake Giles, Lake Laura, Lake Maskenozha, Lake Paupack, Lake Scott, Ledgesdale Swamp, Lehman Township Woods, Little Bushkill Swamp, Little Mud Pond Swamp, Little Mud Pond, Little Teedyuskung Lake Bog, Long Swamp, Low Knob, Lower Shapnack Island, Mainses Pond, Maple Swamp, Mashipacong Shale Cliff, Matamoras Cliffs, Milford Cliffs, Millrift Cliffs, Millrift Pine Flats, Mud Pond Region, Old Port Jervis Road Shale Cliff, Painter Swamp, Paupack Falls, Pecks Pond Bog, Pinchot Falls, Pine Lake, Pocono Environmental Education Center, Point Peter, Poison Brook Swamp, Raymondskill Falls, Rock Hill Pond, Sagamore Swamp, Sawkill Mud Pond, Shapnack Island, Shoemakers Barren, Shohola Falls Swamp, Silver Lake, Smiths Swamp, Spruce & Rowland Swamps, Sunrise Swamp, Sunset Creek Ravine, Taylortown Swamp, Tinkwig Creek, Toms Creek, Twelvemile Pond, Twin Lakes, Well Road Swamp, Wallenpaupack Creek, White Birch Swamp, and Wolf Lake
Wayne County, PA	Abrahamsville Cliffs, Aldenville Mud Pond, B'nai B'rith Bog, Barkley Lake, Bear Swamp, Beaver Pond, Belmont Lake, Bender Swamp, Bethel Swamp, Beyea Pond, Bigelow Lake, Buckingham Boat Access, Butternut Creek, Carley Brook Bog, Carr Pond, Chestnut Lake, Clemo Pond, Conkling Hill, Crockenburg Pond, Crooked Mud Pond, Damascus Cliffs, Delaware River, Delaware River, Dripping Cliffs, Dyberry Creek Rookery, East/West Branches Dyberry Creek, Elk Lake, Farrell Corners Fen, Finnegan Corners, Flat Rock Bog, Forest City Station Bald, Freytown Swamp, Gas Hollow, Girdland Bog, Hancock River Ledges, Hardwood Ridge, Harvey Cleveland Bog, Hawks Nest, Hawley Bog, Hiawatha Lake, Hoadley Pond, Holberts Pond, Howell Pond, Island Lake, Lackawaxen River, Lake Ariel, Lake Henry, Lake Lacawac, Lakewood Bog, Lehigh Pond, Little Bigelo, Little Hickory Lake, Lookout Bog, Lovelace Pond, Lower Woods, Maple Grove Church Bald, Maple Grove Wildflower Site, Maple Grove, Marsh Pond, Milanville Riverwash South, Milanville Riverwash, Milanville Woods, Miller Pond, Moosic Mountains, Mount Ararat, Narrowsburg Bend, Orson Glade, Pennsylvania Gas & Water Co. Lands, Peterson Lake, Pine Swamp, Pipeline Bog, Poyntelle Lake Orson, Prompton Bog, Rock Lake, Rocky Run, Salem Hill Barren, Schoolhouse Creek, Shehawken Lake, Silkman's Swamp, Sly Lake, Snag Pond, Spruce Lake, Spruce Pond, Star Pond, Starrucca Creek Tributary, Stockport Woods, Sugarloaf Mountain, Thousand-acre Swamp, Topps Bog, Upper Woods Pond, Wallsnpaupack Creek, Wangum Creek, West Damascus Rookery, and White Oak Pond

Sources: PA TNC 1990; PA TNC 1991; PA TNC 1998; PA TNC 1999; PA TNC 2005a; PA TNC 2005b; PA TNC 2006.

NATURAL HERITAGE PRIORITY SITES IDENTIFIED IN NEW JERSEY BY NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

County	Natural Heritage Sites
Morris County, NJ	Bartley Ravine, Black River Meadow, Budd Lake Bog, Budd Lake Outlet, Chester Railroad Site, Green Pond Mountain, Green Pond Mountain North, Ironia, Isabels Site, Lake Denmark, Lincoln Park Gravel Pits, Mount Freedom, Mount Hope Bog, New Russia Gravel Pit Site, Picatinny Lake, Splitrock Reservoir Site, Valhalla Hemlock Glen, Great Piece Meadows, Pequannock River, Bridge to Nowhere, Pompton River Gravel Bar Site, and Sparta Pine Swamp
Sussex County, NJ	Andover Junction Site, Andover Ridge, Arctic Meadows, Branchville, Breakneck Mountain, Bridge to Nowhere, Brighton Meadow, Buckmire Pond, Buttermilk Falls, Cherry Ridge Ravine, Colesville, Crater Lake, Dingmans Ferry Bridge Site, Edison Bog, Emmens Station Site, First Time Fen, Flatbrook Valley Roadbank Site, Flatbrookville Rivershore, Franklin Mine, Franklin Quarry, Franklin Yard, Greendell Marsh, Greendell Powerline Site, Hainesville Woods, Hampton Ridge, Hardistonville, Heaters Pond Ridge, Hemlock Pond, High Point, Hopkins Corner Site, Hyper Humus, Johnsonburg, Kittatinny Cliffs and Talus, Kuser Cedar Swamp, Lake Grinnell Bog, Lubbers Run, Mashipacong Bogs, McAfee Quarry, Millville Ravine, Montague Rivershore-Bridge, Montague Rivershore-West, Montague Rivershore-White Brook, Montague Woods, Morris Lake Woods, Muckshaw Ponds, Ogdensburg Glades, Ogdensburg Meadow, Old Mine Road Site, Perona Lake, Rosencrans Ferry Site, Rudeville, Sawmill Pond Swamp, Second Chance, Shermans Glen, Shuster Pond, Site 564, Smith Ferry Site, Sparta Avenue, Sparta Pine Swamp, Sparta Station Site, Springdale, Steam Mill Site, Sterling Hill, Sterling Mine, Stillwater Ridge, Stockholm Slope, Sussex Mills, Swartswood Lake, Swartswood Sinkhole Ponds, Vernon Valley, Wallpack Center Road Site, Wallpack Ravine, Wallpack Ridge, Waterloo, Wawayanda Lake, Wawayanda Swamp, Wildcat Ravine and Bog, Wolf Lake, Woodruffs Gap, and Wrights Pond Bluffs
Warren County, NJ	Belvidere Riverside, Blairstown White Lake, Buttermilk Bridge Site, Columbia Floodplain, Dancing Leaves Site, Delaware, Depew Island, Dildine Island, Flatbrookville Rivershore, Foul Rift, Ghost Lake, Glovers Pond, Greendell Marsh, Greendell Ridge, Hardwick Meadow, Harmony Shore, High Rock Mountain, Hutchinson, Johnsonburg, Limestone Ridge Marsh, Luck Low Site, Luse Pond, Manunka Chunk Bluffs, Millbrook Gap, Mountain Lake Bog, Mt. Tammany, Pequest, Phillipsburg Bluffs, Pohatcong Mountain, Poxono Island, Poxono Shore, Riegelsville Bluffs, Shuster Pond, Southtown Sinkhole, Squires Corner Site, Swayze, Three Nest Cliff, Tocks Swamp, and Van Campen Glen

Source: NJDEP 2007

APPENDIX G-10: GENERAL CONFORMITY APPLICABILITY ANALYSIS

The preferred alternative for the proposed project (alternative 2) would be constructed within the U.S. Environmental Protection Agency (USEPA) designated northeastern ozone (O₃) transport region, a multi-state ozone nonattainment area. The project is thereby potentially subject to the federal General Conformity Rule established at 40 CFR Part 93 Subpart B. A general conformity applicability analysis was conducted to determine if increases in air pollution from the construction of the preferred alternative (alternative 2) would cause or contribute to new violations of the National Ambient Air Quality Standards (NAAQS).

1. Regulatory Background: General Conformity Applicability Analysis

The General Conformity Rule was established to ensure that federal activities do not interfere with efforts to return nonattainment areas back into compliance with the NAAQS. In particular, Section 176(c) of the Clean Air Act prohibits federal agencies, departments, or instrumentalities from engaging in, supporting, licensing, or approving any action, in an area that is in nonattainment of the NAAQS, which does not conform to a USEPA approved state implementation plan. Therefore, the NPS must determine whether or not the project would interfere with the goals in the affected state implementation plans.

Pursuant to Clean Air Act Section 176(c) requirements, the USEPA promulgated 40 CFR Part 51, Subpart W and Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions except for those federal actions related to transportation plans, programs, and projects under Title 23 U.S. Code or the Federal Transit Act, which are subject to Transportation Conformity (40 CFR Part 93 Subpart A).

Alternative 2 would be constructed in areas of both Pennsylvania and New Jersey. In Pennsylvania, counties associated with the S-R line, including Pike, Monroe, Wayne, Northampton, Lackawanna, Luzerne, and Carbon Counties, are considered to be in attainment with the NAAQS. In New Jersey, counties associated with the S-R line, including Warren, Sussex, and Morris Counties, are considered to be in attainment for all criteria air pollutants except ozone. Morris County is also in nonattainment for PM_{2.5}. The general conformity applicability analysis has been based on the assumption that the proposed project is within the ozone transport region and a PM_{2.5} nonattainment area.

To regulate the emission levels resulting from a project, federal actions located in nonattainment areas are required to demonstrate compliance with the General Conformity Rule. The project area is located within a nonattainment area; therefore, a General Conformity Rule applicability analysis was conducted.

Section 93.153 of the General Conformity Rule sets applicability requirements for projects through establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant nonattainment area designations. Projects with total emissions below the *de minimis* levels are exempt from the requirements of the rule. Those at or above the levels are required to perform a conformity determination as established in the rule. The *de minimis* levels apply to the largest single-year total of direct and indirect project emissions, from stationary and mobile sources, that can occur during the construction and operation phases of the action.

The NPS has completed a General Conformity Rule applicability analysis in order to determine if air quality impacts from the preferred alternative 2 are significant. For ozone, emissions have been estimated for the ozone precursor pollutants NO_x and volatile organic compounds (VOCs). Annual emissions for these compounds were estimated for each of the project actions (construction and maintenance) to determine if they would be below or above the *de minimis* levels established in the rule. The *de minimis* threshold for moderate ozone nonattainment areas in an ozone transport region is 100 tons per year (TPY) for NO_x and 50 TPY for VOCs. The *de minimis* levels for PM_{2.5} established in the rule are 100 TPY for directly emitted PM_{2.5} and each of the precursors SO₂ and NO_x.

Sources of NO_x, VOCs, PM_{2.5}, and SO₂ associated with the proposed project would include emissions from land clearing and logging equipment, construction equipment, vehicles including workers' vehicles, trucks hauling and delivering construction materials, and off-gassing from resurfacing of paved roads. It also includes emissions from maintenance operations including worker's vehicles and landscaping equipment.

2. General Conformity Applicability Analysis

For this project, construction-related and maintenance operations-related general conformity analysis was performed for the preferred alternative (alternative 2). This conformity analysis and air emissions evaluation will follow the criteria specified in 40 CFR Part 51, and 93, Determining Conformity of General Federal Actions to State or Federal Implementation Plans: Final Rule (April 5, 2010). The emissions evaluation will also follow all NEPA-related criteria provided in 40 CFR Part 6.

The analysis of construction and maintenance operations emissions was based on estimates of the type and quantity of construction equipment likely to be involved in the project. Air emissions have been evaluated by use of the National Mobile Inventory Model (NMIM) software package, which incorporates data from the USEPA NONROAD 2005 and MOBILE 6.02 programs.

2.1 Construction Phase Emissions

Construction emission would result from the operation of heavy land clearing and logging equipment, delivery trucks and construction equipment, worker commuter vehicles, and asphalt paving.

The annual construction related emissions are provided in table G-1.

TABLE G-1: CONSTRUCTION EMISSIONS

Year	Pollutants (tons/year)					
	VOC	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
2013	1.41	13.85	10.33	0.03	0.27	0.26

2.2 Maintenance Operations Phase Emissions

The source of maintenance operations emissions are the sawing equipment and the operational (motor vehicle) sources. Table G-2 provides operations related emissions.

TABLE G-2: OPERATIONS EMISSIONS

Year	Pollutants (tons/year)					
	VOC	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
2014	3.15E-03	3.00E-02	1.54E-02	2.74E-05	1.99E-03	1.93E-03

3. Summary of Construction and Operations Emissions

The emissions from construction and maintenance operations occur in different years and do not combine on an annual basis. Table G-3 shows that emissions associated with constructing and maintenance operating the preferred alternative 2, when compared to the *de minimis* values for an area that is in moderate nonattainment for ozone; nonattainment for PM_{2.5} established in 40 CFR § 93.153 (b) for NO_x, PM_{2.5}, and SO₂ for 100 tons per year; and for VOCs of 50 tons per year, fall below the *de minimis* values.

TABLE G-3: ANNUAL EMISSIONS

Activity	Pollutants (tons/year)			
	VOC	NO _x	SO ₂	PM _{2.5}
<i>de minimis</i> levels	50	100	100	100
Construction (2013)	1.41	13.85	0.03	0.26
Maintenance Operations (2014)	0.003	0.03	2.74E-05	0.002

4. Conclusion

The total direct and indirect emissions from stationary and mobile sources associated with the proposed project in any given year are less than the *de minimis* levels established under the General Conformity Rule. Hence, a full conformity determination is not required and the proposed project is not subject to the Rule.

5. Additional Considerations – Carbon Sequestration

The park is considered as a carbon sink. The contribution of preferred alternative (alternative 2) to climate change through greenhouse gas emissions was further analyzed.

TABLE G-4: DEFORESTATION DATA FOR ALTERNATIVE 2

Dominant Species	Acres - ROW Expansion	Acres - Roads outside of ROW
Autumn-olive, Gray Dogwood, Eastern Red Cedar	1.5	0
Black Cherry, Tulip Poplar, Red Maple, White Ash	8.4	0
Chestnut Oak, Northern Red Oak, Black Oak	7.3	0
Chestnut Oak, Sweet Birch	4	0
Eastern Hemlock, Chestnut Oak, White Oak, Northern Red Oak, Scarlet Oak, Sweet Birch	0.9	0
Eastern Hemlock, Yellow Birch, Sugar Maple	15.7	0.31
Eastern Red Cedar	3.2	0
Eastern White Pine	0	0.15
Eastern White Pine, Eastern Hemlock	2	0
Eastern White Pine, Northern Red Oak, Black Oak, American Beech	2.1	0.03
Northern Red Oak, Black Oak, White Oak, Sweet Birch, Eastern White Pine	5.4	0.04
Northern Red Oak, Sugar Maple, Tulip Poplar	1.7	0
Pine species Planted Forest	0.4	0
Silver Maple, American Elm	1.2	0
Smooth Alder	1	0
Sugar Maple, Yellow Birch, American Beech	27.6	0.18
Sweet Birch, Red Maple	8	0
Sycamore, Green Ash	0.5	0
White Oak, Northern Red Oak, Black Oak, Flowering Dogwood	17.6	0.49
Total	108.5	1.2

Carbon sequestration rates for avoided deforestation have been estimated to be up to 172.1 tons of carbon per acre per year. Based on the total acres of mature forest removed for the expansion of the right-of-way and creation of access roads, the amount of carbon sequestration potential lost from deforestation could be as much as 18,879 metric tons of carbon per year. However, the forest in the right-of-way will be replaced by grassland. The Chicago Climate Exchange had credited carbon sequestration due to grass plantings at 1 metric ton of CO₂ per acre per year, or around 0.273 metric tons of carbon per acre per year. The uptake of carbon for the right-of-way area if converted to grass would be around 30 metric tons of carbon per year.

TABLE G-5: CARBON SEQUESTRATION ESTIMATES

Activity	Sequestration Rate (metric tons C/acre/yr)	Applied Area	Sequestration Rate for S-R (metric tons C/yr)
Deforestation (ROW and access roads)	-172.1	109.7	-18879.37
Grass plantings (ROW)	0.273	108.5	29.6205

Source: USDOT 2010; Center for Integrated Natural Resources & Agricultural Management n.d.

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