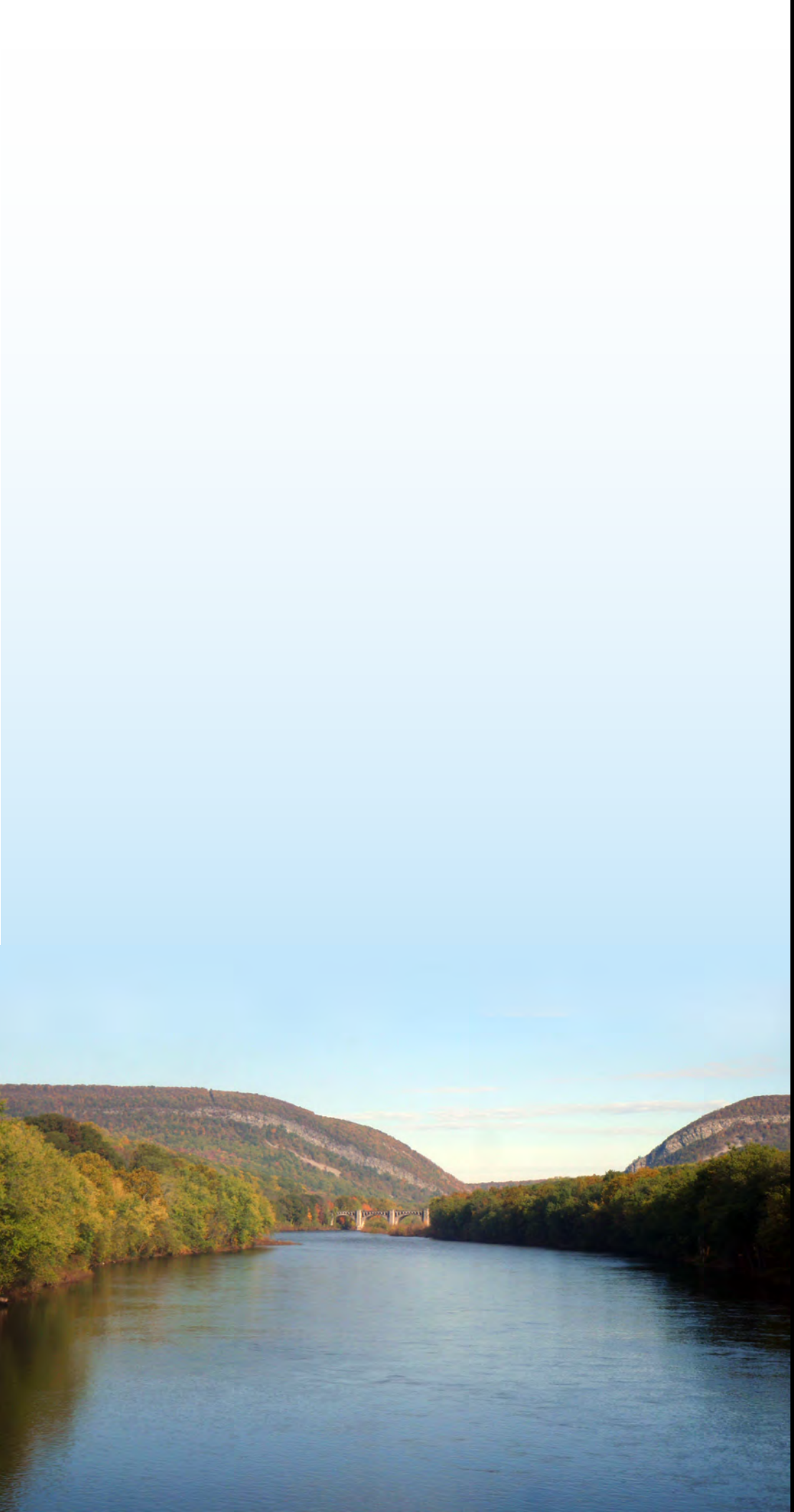

Appendix E

Cost Estimates for
All Action Alternatives

APPENDIX E:
COST ESTIMATES FOR ALL ACTION ALTERNATIVES

CLASS C CONSTRUCTION COST ESTIMATE

Project: Susquehanna to Roseland Double 500-kV Transmission Line

Park: Delaware Water Gap National Recreation Area, Middle Delaware National Scenic and Recreational River, Appalachian National Scenic Trail

PMIS (Project Management Information System): None identified

BASIS OF ESTIMATE

Date of Estimate: 06/09/10

Estimated By: Matt Williams/Laura Meyer

David Evans and Associates, Inc.

Supporting Material: Alternatives designs 06/04/10

Alternatives screening meeting at park 04/18/10-04/30/10

PPL and PSE&G's alternative 1 (alternative B) route Form 299, 11/08

Cost Data: Cost per mile

Unit Prices based on 2010 commodity pricing data

MARK-UPS AND ADD-ONS

Published Location Factor:

Average of surrounding location factors (RS Means [1])

Alternatives 2, 3, and 4: Average of surrounding location factors (Summit, Dover, Stroudsburg, Hazelton, and Scranton) = 2.7 percent

Alternatives 5, 6, and 7: Average of surrounding location factors (Summit, Dover, Stroudsburg, and Hazelton) = 4 percent

Project Remoteness:

Average distance from published location factors in the vicinity

Alternatives 2, 3, and 4: Average of 22 miles from published location factors

Alternative 5: Average of 13 miles from published location factors

Alternatives 6 and 7: Average of 20 miles from published location factors

Federal Wage Rate Factor:

32 Percent (Bureau of Labor Statistics [2])

Design Contingency:

In preliminary planning stage; therefore contingency set high

Of a range of 15-30%, assume 30%

Taxes:

NJ: 7%;

PA: 6% state sales tax + up to 1% for local jurisdictions; assume 7% included in unit costs

Standard General Conditions:

Expected to be high due to project size and complexity; of a range of 4-20%, assume 20%

Government General Conditions:

10 Percent within NPS Guidance Recommendations [3]

Bonds and Permits:

1.5 percent bond included in General Conditions.

Historic Preservation Factor:

Not applicable.

Overhead:

Included in unit cost

Profit:

Included in unit cost

Contracting Method Adjustment:

10 Percent within NPS Guidance Recommendations [3]

Inflation Escalation:

Assume start of construction to be October 2012.

38 months to mid-point of construction. Escalation assumed to be 7.6% over that period [4]

Comments:

Sitework detail included for transmission routes within NPS jurisdiction only.

1 - RS Means 2008 Building Construction Cost Data, 66th Annual Edition. Used an average of the published location factors in the vicinity of the proposed alignments.

2 - Bureau of Labor Statistics, National Compensation Survey, July 2008, Table 1. Pay relatives for major occupational groups in metropolitan areas: MSA for New York-Newark-Bridgeport, NY-NJ-CT-PA

3 - Applied only to portion of alternative within NPS units

4 - Reed Construction Data estimated 1%-2% for 2010; used 1.5%. Assumptions for future years are 2% for 2011 and 2012 and 4% for 2013

Alternative 2
Project: Susquehana to Roseland 500kV Transmission Line
Park: Delaware Water Gap NRA, Middle Delaware National Scenic and Recreational River, Appalachiar
PMIS: None identified

Estimate By: Laura Meyer
Date: 06/25/10

Reviewed By: Rebecca Smith
Date: 07/07/10

Estimate is based on 2010 costs

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Right-of-Way (42 acres per mile)	6165.6	acres	$20,000.00	$123,312,000
2	Construction	146.8	linear mile	$6,793,218.96	$997,244,543
3	Decommission 230kV Line	4.21	linear mile	$150,000.00	$631,500
	Subtotal Direct Construction Costs				**$1,121,188,043**
	Published Location Factor (4 Percent)				$44,847,522
	Remoteness Factor (22 miles)				$24,666,137
	Federal Wage Rate Factor (32 Percent)				$143,512,069
	Design Contingency (30 Percent)				$336,356,413
	Total Direct Construction Costs				**$1,670,570,184**
	Standard General Conditions (20 Percent)				$334,114,037
	Government General Conditions (10 Percent within NPS units)				$4,844,654
	Historic Preservation Factor (N/A)				$0
	Subtotal NET Construction Cost				**$2,009,528,874**
	Overhead (included in unit costs)				$0
	Profit (included in unit costs)				$0
	Estimated NET Construction Cost				**$2,009,528,874**
	Contracting Method Adjustment (10 percent within NPS units)				$5,827,634
	Inflation Escalation (38 mos to construction mid-point)				$152,607,957
	Total Estimated NET Cost of Construction				**$2,167,964,465**

Assumptions for Alternative 2									Resource:
Mobilization			LS	25000	per mile				
Towers:	Deadend	67282	2	134564	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Angle	57670	2	115340	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Tangent	48058	7	336409	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
Foundations:	Deadend	50000	2	100000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Angle	30000	2	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Tangent	10000	7	70000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
Access Roads	$/mile	350000	3	1050000	per mile				DEA Highway Division
ROW	42 acre/mile	$20000/ac		840000	per mile				Estimated land value
Conductor	114800	26		2984800	Cost of conductor per mile per phase			ACCC	Conductor: 5280 ft/mi * 1.15 * 3 wire/phase * 3 phase * 2 circuits
Shield wire	6400	3		19200	1 phase per mile				Shield Wire: 5280 * 1.2 + waste
OPGW	6400	17		108800	1 phase per mile				OPGW: 5280 * 1.2 + waste
Insulators	98	1200		115200	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Hardware	48	1000		48000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Dampers	36	300		10800	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Spacers	48	750		36000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Anti-galloping	16	500		8000	As required by the engineer				Hubbell Power Systems
Decommission 230kV Line	4.21	150,000		4302	total cost divided by alignment length = per mile				Previous expereince
Equipment:									
D9	500	18		9000	cost/day	days/mile		cost/mile	Means Cost Data
Excavator	400	18		7200	cost/day	days/mile		cost/mile	Means Cost Data
Grader	400	16		6400	cost/day	days/mile		cost/mile	Means Cost Data
Dump trucks	350	22		7700	cost/day	days/mile		cost/mile	Means Cost Data
Crane	500	22		11000	cost/day	days/mile		cost/mile	Means Cost Data
Line truck	355	22		7810	cost/day	days/mile		cost/mile	Means Cost Data
Foreman trucks	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Safety Supervisor	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Puller/Tensioner	335	21		7035	cost/day	days/mile		cost/mile	Means Cost Data
Reel rigs	225	21		4725	cost/day	days/mile		cost/mile	Means Cost Data
Auger	400	10		4000	cost/day	days/mile		cost/mile	Means Cost Data
Grounding				45000	per mile				Various Utility Contacts
Rods	100	8	3.12	2496	per mile				Various Utility Contacts
4/o copper	10000	2.25		22500	per mile				Various Utility Contacts
mats	32000	2.25		72000	per mile				Various Utility Contacts
Grounding Labor				20000	per mile				Various Utility Contacts
Guard Structures	4000	1 LS		4000	per mile				Various Utility Contacts
Splicing	18000	0.25	mile	4500	Cost per splice site per mile				Various Utility Contacts
Geotechnical	350000	1	LS	350000	per mile				Various Utility Contacts
Drainage	1500	27.5	LF	41250	per mile				Various Utility Contacts
Erosion control/BMP			LS	23500	per mile				Various Utility Contacts
Line Mechanics	475	22	4	41800	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Line Supervisor	525	22	1	11550	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Ground men	375	22	2	16500	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Laborer	300	18	4	21600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Supervisor	350	18	1	6300	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Safety Supervisor	400	22	2	17600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Construction Manager	450	22	1	9900	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Project Manager	550	22	1	12100	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Engineering	500	20	1	10000	per day/per month/per mile				DEA
Clean up			LS	35000	per mile				Means Cost Data
Demobolization			LS	25000	per mile				Means Cost Data
Reclaim Restablize			LS	50000	per mile				
Contingency			5-10%	650000	per mile				Estimated
Total Cost per mile				**7637521**					
				6793219					
Estimate By: Matthew Williams				TRUE					
Review By: Rebecca Smith									

Alternative 2b
Project: Susquehana to Roseland 500kV Transmission Line
Park: Delaware Water Gap NRA, Middle Delaware National Scenic and Recreational River, Appalachiar
PMIS: None identified

Estimate By: Becky Smith
Date: 08/12/11

Reviewed By: _____
Date: _____

Estimate is based on 2010 costs

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Right-of-Way (42 acres per mile)	6132	acres	$20,000.00	$122,640,000
2	Construction	146.8	linear mile	$6,933,944.82	$1,017,903,099
3	Decommission 230kV Line	4.21	linear mile	$150,000.00	$631,500
	Subtotal Direct Construction Costs				**$1,141,174,599**
	Published Location Factor (4 Percent)				$45,646,984
	Remoteness Factor (22 miles)				$25,105,841
	Federal Wage Rate Factor (32 Percent)				$146,070,349
	Design Contingency (30 Percent)				$342,352,380
	Total Direct Construction Costs				**$1,700,350,153**
	Standard General Conditions (20 Percent)				$340,070,031
	Government General Conditions (10 Percent within NPS units)				$4,931,015
	Historic Preservation Factor (N/A)				$0
	Subtotal NET Construction Cost				**$2,045,351,199**
	Overhead (included in unit costs)				$0
	Profit (included in unit costs)				$0
	Estimated NET Construction Cost				**$2,045,351,199**
	Contracting Method Adjustment (10 percent within NPS units)				$5,931,518
	Inflation Escalation (38 mos to construction mid-point)				$155,328,382
	Total Estimated NET Cost of Construction				**$2,206,611,099**

Assumptions for Alternative 2b									Resource:
Mobilization			LS	25000	per mile				
Towers:	Deadend	67282	2	134564	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Angle	57670	2	115340	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Tangent	48058	7.014	337064	per mile (reflect two add'l on NPS land)				Previous 2012 cost brought back to 2010 (2% assumed)
Foundations:	Deadend	50000	2	100000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Angle	30000	2	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Tangent	10000	7.014	70136.24	per mile (reflect two add'l on NPS land)				Concrete: $900/cy * (π/4(D^2)* Depth)/27
Access Roads	$/mile	350000	3	1050000	per mile				DEA Highway Division
ROW	42 acre/mile	$20000/ac		840000	per mile				Estimated land value
Conductor	114800	26		2984800	Cost of conductor per mile per phase			ACCC	Conductor: 5280 ft/mi * 1.15 * 3 wire/phase * 3 phase * 2 circuits
Shield wire	6400	3		19200	1 phase per mile				Shield Wire: 5280 * 1.2 + waste
OPGW	6400	17		108800	1 phase per mile				OPGW: 5280 * 1.2 + waste
Insulators	96	1200		115200	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Hardware	48	1000		48000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Dampers	36	300		10800	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Spacers	48	750		36000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Anti-galloping	16	500		8000	As required by the engineer				Hubbell Power Systems
Decommission 230kV Line	4.21	150,000		4302	total cost divided by alignment length = per mile				Previous expereince
New 230kV line									
Poles	83	$ 1,875		1060	total cost divided by alignment length = per mile				assume 40' poles every 360'. Includes augered hole and crossbar
Foundation	83	$ 20,896		11814	total cost divided by alignment length = per mile				assume same deadend/angle/tangent distribution as high-V
Cable	5.6	3,330,800		127060	total cost divided by alignment length = per mile				assume same materials as high-V
Equipment:									
D9	500	18		9000	cost/day	days/mile		cost/mile	Means Cost Data
Excavator	400	18		7200	cost/day	days/mile		cost/mile	Means Cost Data
Grader	400	16		6400	cost/day	days/mile		cost/mile	Means Cost Data
Dump trucks	350	22		7700	cost/day	days/mile		cost/mile	Means Cost Data
Crane	500	22		11000	cost/day	days/mile		cost/mile	Means Cost Data
Line truck	355	22		7810	cost/day	days/mile		cost/mile	Means Cost Data
Foreman trucks	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Safety Supervisor	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Puller/Tensioner	335	21		7035	cost/day	days/mile		cost/mile	Means Cost Data
Reel rigs	225	21		4725	cost/day	days/mile		cost/mile	Means Cost Data
Auger	400	10		4000	cost/day	days/mile		cost/mile	Means Cost Data
Grounding				45000	per mile				Various Utility Contacts
Rods	100	8	3.12	2496	per mile				Various Utility Contacts
4/o copper	10000	2.25		22500	per mile				Various Utility Contacts
mats	32000	2.25		72000	per mile				Various Utility Contacts
Grounding Labor				20000	per mile				Various Utility Contacts
Guard Structures	4000	1 LS		4000	per mile				Various Utility Contacts
Splicing	18000	0.25	mile	4500	Cost per splice site per mile				Various Utility Contacts
Geotechnical	350000	1	LS	350000	per mile				Various Utility Contacts
Drainage	1500	27.5	LF	41250	per mile				Various Utility Contacts
Erosion control/BMP			LS	23500	per mile				Various Utility Contacts
Line Mechanics	475	22	4	41800	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Line Supervisor	525	22	1	11550	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Ground men	375	22	2	16500	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Laborer	300	18	4	21600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Supervisor	350	18	1	6300	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Safety Supervisor	400	22	2	17600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Construction Manager	450	22	1	9900	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Project Manager	550	22	1	12100	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Engineering	500	20	1	10000	per day/per month/per mile				DEA
Clean up			LS	35000	per mile				Means Cost Data
Demobolization			LS	25000	per mile				Means Cost Data
Reclaim Restablize			LS	50000	per mile				
Contingency			5-10%	650000	per mile				Estimated
Total Cost per mile				**7778247**					
				6933945					
				TRUE					

Estimate By: Matthew Williams
Revised By: Rebecca Smith

Alternative 3
Project: Susquehana to Roseland 500kV Transmission Line
Park: Delaware Water Gap NRA, Middle Delaware National Scenic and Recreational River, Appalachiar
PMIS: None identified

Estimate By: Laura Meyer
Date: 06/25/10

Reviewed By: Rebecca Smith
Date: 08/23/11

Estimate is based on 2010 costs

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Right-of-Way (42 acres per mile)	6610.8	acres	$24,000.00	$158,659,200
2	Construction	157.4	linear mile	$6,501,505.70	$1,023,336,998
3	Decommission 230kV Line	3.61	linear mile	$150,000.00	$541,500
	Subtotal Direct Construction Costs				**$1,182,537,698**
	Published Location Factor (2.7 Percent)				$31,928,518
	Remoteness Factor (22 miles)				$26,015,829
	Federal Wage Rate Factor (32 Percent)				$151,364,825
	Design Contingency (30 Percent)				$354,761,309
	Total Direct Construction Costs				**$1,746,608,179**
	Standard General Conditions (20 Percent)				$349,321,636
	Government General Conditions (10 Percent within NPS units)				$5,239,825
	Historic Preservation Factor (N/A)				$0
	Subtotal NET Construction Cost				**$2,101,169,640**
	Overhead (included in unit costs)				$0
	Profit (included in unit costs)				$0
	Estimated NET Construction Cost				**$2,101,169,640**
	Contracting Method Adjustment (10 percent within NPS units)				$6,303,509
	Inflation Escalation (38 mos to construction mid-point)				$159,567,355
	Total Estimated NET Cost of Construction				**$2,267,040,504**

Assumptions for Alternative 3									*Resource:*
Mobilization			LS	25000	per mile				
Towers	Deadend	67282	2	134564	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Angle	57670	2	115340	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Tangent	48058	6	288351	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
Foundations	Deadend	50000	1	50000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Angle	30000	2	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Tangent	10000	6	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
Access Roads	$/mile	350000	2	700000	per mile				DEA Highway Division
ROW	42 acre/mile	$24000/ac		1008000	per mile				Estimated land value
Conductor	114800	26		2984800	Cost of conductor per mile per phase			ACCC	Conductor: 5280 ft/mi * 1.15 * 3 wire/phase * 3 phase * 2 circuits
Shield wire	6400	3		19200	1 phase per mile				Shield Wire: 5280 * 1.2 + waste
OPGW	6400	17		108800	1 phase per mile				OPGW: 5280 * 1.2 + waste
Insulators	96	1200		115200	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Hardware	48	1000		48000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Dampers	36	300		10800	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Spacers	48	750		36000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Anti-galloping	16	500		8000	As required by the engineer				Hubbell Power Systems
Decommission 230kV Line	3.61	150000		3440.28	total cost divided by alignment length = per mile				Previous expereince
New 230kV line									
Poles	106	$ 1,875		1263	total cost divided by alignment length = per mile				assume 40' poles every 360'. Includes augered hole and crossbar
Foundation	106	$ 18,889		12721	total cost divided by alignment length = per mile				assume same deadend/angle/tangent distribution as high-V
Cable	7.2	3,330,800		152362	total cost divided by alignment length = per mile				assume same materials as high-V
Equipment:									
D9	500	18		9000	cost/day	days/mile		cost/mile	Means Cost Data
Excavator	400	18		7200	cost/day	days/mile		cost/mile	Means Cost Data
Grader	400	16		6400	cost/day	days/mile		cost/mile	Means Cost Data
Dump trucks	350	22		7700	cost/day	days/mile		cost/mile	Means Cost Data
Crane	500	22		11000	cost/day	days/mile		cost/mile	Means Cost Data
Line truck	355	22		7810	cost/day	days/mile		cost/mile	Means Cost Data
Foreman trucks	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Safety Supervisor	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Puller/Tensioner	335	21		7035	cost/day	days/mile		cost/mile	Means Cost Data
Reel rigs	225	21		4725	cost/day	days/mile		cost/mile	Means Cost Data
Auger	400	10		4000	cost/day	days/mile		cost/mile	Means Cost Data
Grounding				45000	per mile				Various Utility Contacts
Rods	100	8	3.12	2496	per mile				Various Utility Contacts
4/o copper	10000	2.25		22500	per mile				Various Utility Contacts
mats	32000	2.25		72000	per mile				Various Utility Contacts
Grounding Labor				20000	per mile				Various Utility Contacts
Guard Structures	4000	1 LS		4000	per mile				Various Utility Contacts
Splicing	18000	0.25	mile	4500	Cost per splice site per mile				Various Utility Contacts
Geotechnical	350000	1	LS	350000	per mile				Various Utility Contacts
Drainage	1500	27.5	LF	41250	per mile				Various Utility Contacts
erosion control/BMP			LS	23500	per mile				Various Utility Contacts
Line Mechanics	475	22	4	41800	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Line Supervisor	525	22	1	11550	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Ground men	375	22	2	16500	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Laborer	300	18	4	21600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Supervisor	350	18	1	6300	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Safety Supervisor	400	22	2	17600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Construction Manager	450	22	1	9900	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Project Manager	550	22	1	12100	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Engineering	500	20	1	10000	per day/per month/per mile				DEA
Clean up			LS	35000	per mile				Means Cost Data
Demobolization			LS	25000	per mile				Means Cost Data
Reclaim Restablize			LS	50000	per mile				
Contingency				650000	per mile				Estimated
Total Cost per mile				**7512946**					
				6501506					
Estimate By: Matthew Williams				TRUE					
Review By: Rebecca Smith									

Alternative 4
Project: Susquehana to Roseland 500kV Transmission Line
Park: Delaware Water Gap NRA, Middle Delaware National Scenic and Recreational River, Appalachiar
PMIS: None identified

Estimate By: Laura Meyer
Date: 06/25/10

Reviewed By: Rebecca Smith
Date: 08/23/11

Estimate is based on 2010 costs

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Right-of-Way (42 acres per mile)	6804	acres	$23,000.00	$156,492,000
2	Construction	162	linear mile	$6,734,179.15	$1,090,937,022
3	Decommission 230kV Line	3.61	linear mile	$150,000.00	$541,500
	Subtotal Direct Construction Costs				**$1,247,970,522**
	Published Location Factor (2.7 Percent)				$33,695,204
	Remoteness Factor (22 miles)				$27,455,351
	Federal Wage Rate Factor (32 Percent)				$159,740,227
	Design Contingency (30 Percent)				$374,391,157
	Total Direct Construction Costs				**$1,843,252,461**
	Standard General Conditions (20 Percent)				$368,650,492
	Government General Conditions (10 Percent within NPS units)				$1,290,277
	Historic Preservation Factor (N/A)				$0
	Subtotal NET Construction Cost				**$2,213,193,230**
	Overhead (included in unit costs)				$0
	Profit (included in unit costs)				$0
	Estimated NET Construction Cost				**$2,213,193,230**
	Contracting Method Adjustment (10 percent within NPS units)				$1,549,235
	Inflation Escalation (38 mos to construction mid-point)				$168,074,668
	Total Estimated NET Cost of Construction				**$2,382,817,133**

Assumptions for Alternative 4				Total					Resource:
Mobilization			LS	25000	per mile				
Towers:	Deadend	67282	1	67282	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Angle	57670	2	115340	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Tangent	48058	7	336409	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
Foundations:	Deadend	50000	1	50000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Angle	30000	2	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Tangent	10000	7	70000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
Access Roads	$/mile	350000	3	1050000	per mile				DEA Highway Division
ROW	42 acre/mile	$23000/ac		966000	per mile				Estimated land value
Conductor	114800	26		2984800	Cost of conductor per mile per phase			ACCC	Conductor: 5280 ft/mi * 1.15 * 3 wire/phase * 3 phase * 2 circuits
Shield wire	6400	3		19200	1 phase per mile				Shield Wire: 5280 * 1.2 + waste
OPGW	6400	17		108800	1 phase per mile				OPGW: 5280 * 1.2 + waste
Insulators	96	1200		115200	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Hardware	48	1000		48000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Dampers	36	300		10800	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Spacers	48	750		36000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Anti-galloping	16	500		8000	As required by the engineer				Hubbell Power Systems
Decommission 230kV Line	3.61	150,000		3343	total cost divided by alignment length = per mile				Previous expereince
New 230kV line									
Poles	39	$ 1,875		451	total cost divided by alignment length = per mile				assume 40' poles every 360'. Includes augered hole and crossbar
Foundation	39	$ 18,000		4333	total cost divided by alignment length = per mile				assume same deadend/angle/tangent distribution as high-V
Cable	2.6	3,330,800		53457	total cost divided by alignment length = per mile				assume same materials as high-V
Equipment:									
D9	500	18		9000	cost/day	days/mile		cost/mile	Means Cost Data
Excavator	400	18		7200	cost/day	days/mile		cost/mile	Means Cost Data
Grader	400	16		6400	cost/day	days/mile		cost/mile	Means Cost Data
Dump trucks	350	22		7700	cost/day	days/mile		cost/mile	Means Cost Data
Crane	500	22		11000	cost/day	days/mile		cost/mile	Means Cost Data
Line truck	355	22		7810	cost/day	days/mile		cost/mile	Means Cost Data
Foreman trucks	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Safety Supervisor	310	22		6820	cost/day	days/mile		cost/mile	Means Cost Data
Puller/Tensioner	335	21		7035	cost/day	days/mile		cost/mile	Means Cost Data
Reel rigs	225	21		4725	cost/day	days/mile		cost/mile	Means Cost Data
Auger	400	10		4000	cost/day	days/mile		cost/mile	Means Cost Data
Grounding				45000	per mile				Various Utility Contacts
Rods	100	8	3.12	2496	per mile				Various Utility Contacts
4/o copper	10000	2.25		22500	per mile				Various Utility Contacts
mats	32000	2.25		72000	per mile				Various Utility Contacts
Grounding Labor				20000	per mile				Various Utility Contacts
Guard Structures	4000	1 LS		4000	per mile				Various Utility Contacts
Splicing	18000	0.25	mile	4500	Cost per splice site per mile				Various Utility Contacts
Geotechnical	350000	1	LS	350000	per mile				Various Utility Contacts
Drainage	1500	27.5	LF	41250	per mile				Various Utility Contacts
Erosion control/BMP			LS	23500	per mile				Various Utility Contacts
Line Mechanics	475	22	4	41800	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Line Supervisor	525	22	1	11550	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Ground men	375	22	2	16500	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Laborer	300	18	4	21600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Supervisor	350	18	1	6300	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Safety Supervisor	400	22	2	17600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Construction Manager	450	22	1	9900	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Project Manager	550	22	1	12100	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Engineering	500	20	1	10000	per day/per month/per mile				DEA
Clean up			LS	35000	per mile				Means Cost Data
Demobolization			LS	25000	per mile				Means Cost Data
Reclaim Restablize			LS	50000	per mile				
Contingency			5 - 10%	650000	per mile				Estimated
Total Cost per mile				**7703522**					
				6734179					
Estimate By: Matthew Williams				TRUE					
Review By: Rebecca Smith									

Alternative 5
Project: Susquehana to Roseland 500kV Transmission Line
Park: Delaware Water Gap NRA, Middle Delaware National Scenic and Recreational River, Appalachiar
PMIS: None identified

Estimate By: Laura Meyer
Date: 06/25/10

Reviewed By: Rebecca Smith
Date: 08/23/11

Estimate is based on 2010 costs

Item No.	Description	Quantity	Unit	Cost/Unit	Total
1	Right-of-Way (42 acres per mile)	4620	acres	$23,000.00	$106,260,000
2	Construction	110	linear mile	$5,820,286.76	$640,231,544
3	Decommission 230kV Line	3.61	linear mile	$150,000.00	$541,500
	Subtotal Direct Construction Costs				**$747,033,044**
	Published Location Factor (4 Percent)				$29,881,322
	Remoteness Factor (13 miles)				$9,711,430
	Federal Wage Rate Factor (32 Percent)				$95,620,230
	Design Contingency (30 Percent)				$224,109,913
	Total Direct Construction Costs				**$1,106,355,938**
	Standard General Conditions (20 Percent)				$221,271,188
	Government General Conditions (10 Percent within NPS units)				$1,216,992
	Historic Preservation Factor (N/A)				$0
	Subtotal NET Construction Cost				**$1,328,844,117**
	Overhead (included in unit costs)				$0
	Profit (included in unit costs)				$0
	Estimated NET Construction Cost				**$1,328,844,117**
	Contracting Method Adjustment (10 percent within NPS units)				$1,461,729
	Inflation Escalation (38 mos to construction mid-point)				$100,915,289
	Total Estimated NET Cost of Construction				**$1,431,221,135**

Assumptions for Alternative 5									Resource:
Mobilization			LS	25000	per mile				
Towers:	Deadend	67282	1	67282	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Angle	57670	1	57670	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
	Tangent	48058	4	192234	per mile				Previous 2012 cost brought back to 2010 (2% assumed)
Foundations:	Deadend	50000	1	50000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Angle	30000	2	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
	Tangent	10000	6	60000	per mile				Concrete: $900/cy * (π/4(D^2)* Depth)/27
Access Roads	$/mile	350000	1	350000	per mile				DEA Highway Division
ROW	42 acre/mile	$23000/ac		966000	per mile				Estimated land value
Conductor	114800	26		2984800	Cost of conductor per mile per phase			ACCC	Conductor: 5280 ft/mi * 1.15 * 3 wire/phase * 3 phase * 2 circuits
Shield wire	6400	3		19200	1 phase per mile				Shield Wire: 5280 * 1.2 + waste
OPGW	6400	17		108800	1 phase per mile				OPGW: 5280 * 1.2 + waste
Insulators	96	1200		115200	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Hardware	48	1000		48000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Dampers	36	300		10800	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Spacers	48	750		36000	3 phase 3 bundled conductor per mile				Hubbell Power Systems
Anti-galloping	16	500		8000	As required by the engineer				Hubbell Power Systems
Decommission 230kV Line	3.61	150,000		4923	total cost divided by alignment length = per mile				Previous expereince
New 230kV line									
Poles	25	$ 1,875		426	total cost divided by alignment length = per mile				assume 40' poles every 360'. Includes augered hole and crossbar
Foundation	25	$ 18,889		4293	total cost divided by alignment length = per mile				assume same deadend/angle/tangent distribution as high-V
Cable	1.7	3,330,800		51476	total cost divided by alignment length = per mile				assume same materials as high-V
Equipment:									
D9	500	18		9000	cost/day	days/mile		cost/mile	Means Cost Data
Excavator	400	18		7200	cost/day	days/mile		cost/mile	Means Cost Data
Grader	400	16		6400	cost/day	days/mile		cost/mile	Means Cost Data
Dump trucks	350	22		7700	cost/day	days/mile		cost/mile	Means Cost Data
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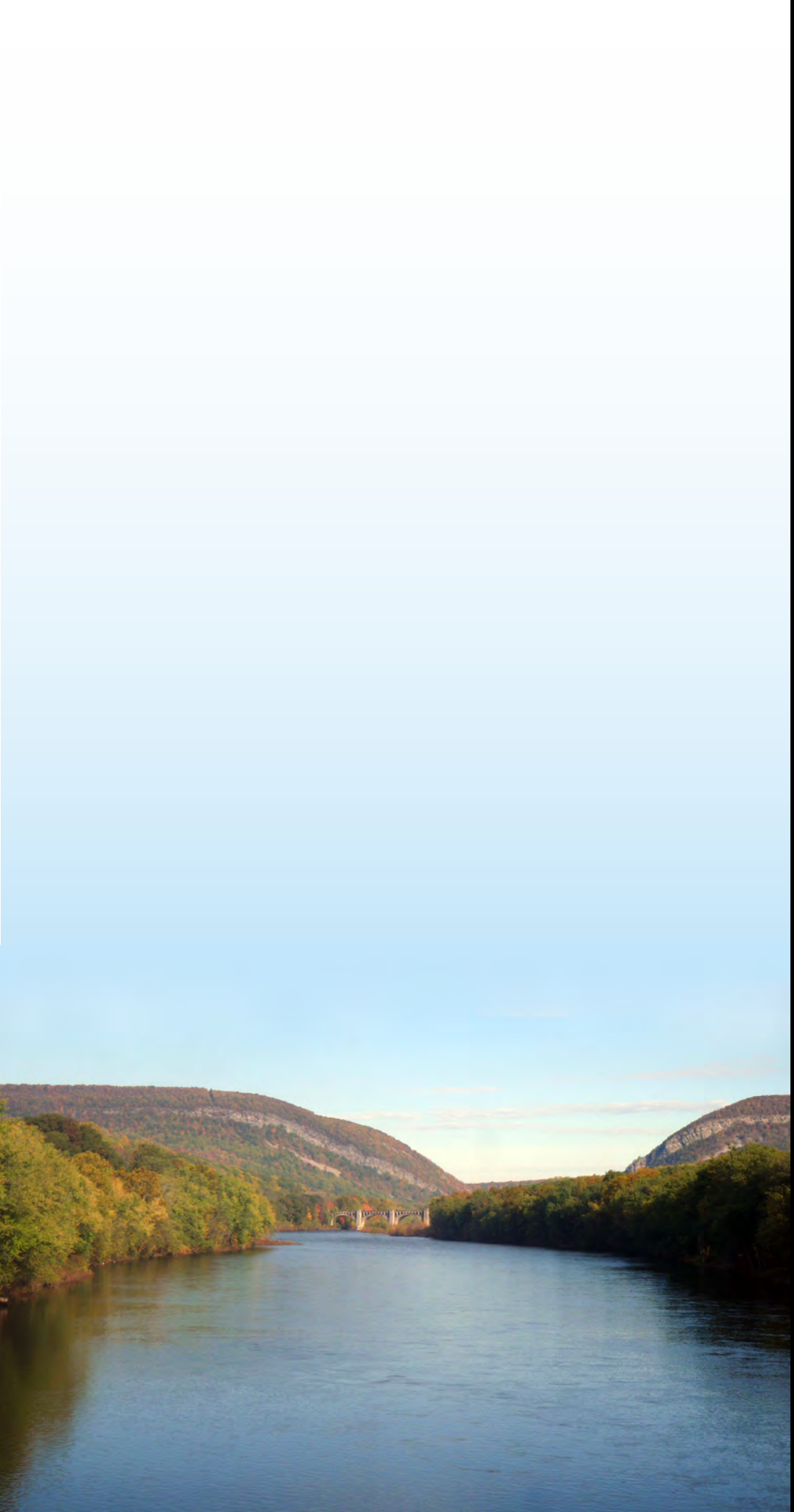
Line Supervisor	525	22	1	11550	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Ground men	375	22	2	16500	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Laborer	300	18	4	21600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Concrete Supervisor	350	18	1	6300	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Safety Supervisor	400	22	2	17600	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Construction Manager	450	22	1	9900	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Project Manager	550	22	1	12100	cost/day	days/mile	FTE	cost/mile	Various Utility Contacts
Engineering	500	20	1	10000	per day/per month/per mile				DEA
Clean up			LS	35000	per mile				Means Cost Data
Demobolization			LS	25000	per mile				Means Cost Data
Reclaim Restablize			LS	50000	per mile				
Contingency			5-10%	650000	per mile				Estimated
Total Cost per mile				**6791209**					
				5820287					
Estimate By: Matthew Williams				TRUE					
Review By: Rebecca Smith									



Appendix F

Mitigation Measures

APPENDIX F:
MITIGATION MEASURES

TABLE OF CONTENTS

APPENDIX F-1: MITIGATION MEASURES

While some alternatives may require specific mitigation measures, some best management practices (BMPs) are common to all action alternatives (alternatives 2-5). Correspondence regarding mitigation between the applicant and NPS can be found at the end of this appendix. Below are some BMPs/mitigation measures that would be required for all action alternatives:

GEOLOGY

- To reduce the impacts of drilling in unstable material, geotechnical boring would be required before construction to determine the appropriate depth needed to remove soils and weathered bedrock before reaching sound material where substantial excavation or blasting would occur.
- A blasting plan would be prepared and submitted to NPS for review and approval by a blasting expert before construction.
- The blasting plan would include details for the placement of the excavated rock.
  - The blasting plan would describe the areal extent of impact from blasting and measures to minimize impact of vibrations and fracturing caused by blasting.
  - Following each blast, the ground would be examined for signs of ground cracking or fracturing.
- Excavated rock would be used to the extent possible as substrate for the access roads.
- A preconstruction surface assessment would be completed prior to disturbance, and that if found, resources will be avoided, or if unavoidable, collected and properly cared for before the start of construction.
- Areas with potential paleontological resources must be monitored during construction activities.
- For tower locations abutting and adjacent to limestone fens, alternate techniques, including drilling, would be evaluated to minimize the potential for impact to the fens.
- The applicant would develop a buffer zone, that area beyond which blasting activities would not impact the geology and the fens.

Water and Soil Resources

- The applicant would prepare a spill prevention and response plan (SPRP) to reduce impacts on surface water, ground water, and aquatic species if equipment leaks or hazardous spills occur. The goal of the plan is to minimize the potential for a spill, contain any spillage to the smallest area possible, and to protect environmentally sensitive areas, including streams, rivers, and wetlands.
- The SPRP would include:
  - Procedures for fuel storage location, fueling activities, and construction equipment maintenance.
  - Lines of communication to facilitate the prevention, response, containment, and cleanup of spills during construction activities.
- Access roads would have a gravel surface, which is semipermeable to reduce the amount of stormwater runoff. A reduction in sheet flow would decrease the amount of sedimentation, total

suspended soils, contaminants, nutrients, and turbidity in surface waters and impacts on aquatic species.

- Spur roads would be constructed using geotextile fabric and stone, which would be removed at the conclusion of construction, and revegetated.
- To reduce the runoff potential of soils along the access roads outside the ROW, road grades and alignments would follow the contour of the land with smooth, gradual curves.
- Potential erosion areas would be inspected weekly or immediately after storm events. Ruts would be smoothed out and gravel would be spread to stabilize the roadway and prevent erosion.
- Soil and erosion control plans would be developed and implemented as mandated in state permits for PADEP and NJDEP.
- Erosion control methods such as silt fences and straw bales would be implemented during and after construction to reduce impacts of increased soil runoff on water resources. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams. The use of BMPs is estimated to reduce TSS by 40 percent, total nitrogen by 25 percent, and total phosphorus by 40 percent (Baldwin n.d., 1).
- Removal of vegetation would include use of herbicides approved for aquatic environments.
- A 50-foot buffer would be established near intermittent streams and a 100-foot buffer would be established near perennial streams to reduce impacts on water quality and aquatic species (PPL and PSE&G 2008, 7).
- To reduce impacts of blasting on aquatic communities, blasting would occur during winter months when not in areas with known snake dens. Winter is when the least number of aquatic species and individuals are present in nearby water bodies.

FLOODPLAINS

- Avoid construction or clearing vegetation within floodplains and floodplain buffers.
- Construct dikes or conveyance ditches to divert or carry flood flows away from the site.
- Modify structures to provide sufficient elevation above the flood crest (e.g., place structures on columns, walls, piles, or piers).
- Restore watershed conditions to eliminate accelerated runoff caused by soil compaction, poor vegetation cover, or the unnatural conveyance of water by roads, ditches, or trails.
- Compensate lost natural floodplain values.

WETLANDS

- Replacing or double-circuiting an existing line rather than building a new line, which has the following advantages:
  - Little additional ROW clearing, because the new line would be placed in the center of the existing ROW.
  - No additional changes to land use patterns, because they have already adapted to the existing ROW.

- Designing access roads to avoid wetlands wherever possible, including 50-foot buffers surrounding wetland areas where construction would not occur wherever possible, and full vegetation clearing would not be allowed.
- During construction, timber mats would be used in areas outside the access roads to minimize soil compaction.
- Staging, tower, and pulling and splicing locations would be located to avoid wetlands and rare and unique communities inside and outside the study area wherever possible. During planning, design engineers would work closely with park staff to avoid these areas within park boundaries.
- Spanning wetlands with towers wherever possible.
- Limiting construction to winter months when soil and water are more likely to be frozen and vegetation is dormant.
- Using mats and wide-track vehicles whenever possible when crossing wetlands, because some wetlands never freeze.
- Carefully cleaning construction equipment after working in areas infested with known invasive and/or exotic plant species.
- Director's Order 77-1 states that for new actions where impacts on wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restores wetlands on NPS lands, where possible, at a minimum acreage ratio of 1:1. This compensatory mitigation would be required where clearing in a wetland would occur, as clearing is considered a loss.

VEGETATION

- An NPS approved, long-term, park-specific vegetation management plan from both utilities would be developed and implemented for the operation and maintenance of the line. These plans would address invasive species management, including early detection, monitoring, and treatment for target invasive species using an integrated pest management approach. Additionally, an invasive species management plan would address the possible spread of invasive species via wooden spools used to supply wire. Other topics in the vegetation management plan would include vegetation restoration (native seeding and plantings, with annual monitoring and re-treatment as needed to achieve minimum acceptable outcomes); management of sensitive species and sensitive habitats during routine maintenance; the use of best management practices to include restrictions on use of machinery and equipment time-of-year restrictions on vegetation in sensitive areas; pre-approval by NPS on pesticide and herbicide use; and off-site compensation. The vegetation management plan would also include an equipment cleaning plan that would address techniques for removal of any invasive seed sources prior to entering the parks.
- The area to be cleared would be clearly delineated to minimize the amount of vegetation removed.
- Wetlands would be clearly delineated prior to clearing activities and avoided during these activities, where possible; however, wooded wetlands would be subject to tree clearing if non-compatible species were present.
- Existing roads would be used with minimal development of new access roads.
- Areas disturbed during construction of the transmission line would be seeded promptly with a conservation mix approved by NPS and monitored for the spread of invasive plant species.

- Maintenance crews would enter the ROW on foot and use handheld equipment for vegetation maintenance in sensitive areas.
- Disturbance to native plant species would be minimized to the greatest extent possible during construction and maintenance to prevent the spread of non-native species.
- Equipment would be cleaned after leaving areas where invasive species are known to occur and before entering sensitive areas.
- All materials (e.g., gravel) used in the construction area would be from sources that had been inspected and found to be free of invasive species.
- To decrease the potential for spreading invasive species, mulched or chipped vegetation would not be used in areas of the parks outside the area in which the vegetation was removed.
- During construction, timber mats would be used in areas outside the access roads to minimize soil compaction.
- The applicant would be required to complete measures for the annual suppression of invasive plants within the ROW, for the life of the project. Additionally, the applicant would be required to complete this same suppression in the decommissioned ROW for the applicable alternatives (3-5).

LANDSCAPE CONNECTIVITY, WILDLIFE HABITAT, AND WILDLIFE

- A seasonal restriction on maintenance activities from March 15 through July 31 would be imposed to prevent unauthorized take of nests and unfledged chicks protected under the MBTA. An avian protection plan (APP) will be developed and would be a condition of the applicant's permit. A summary of an example APP is included in appendix F-2.
- A seasonal restriction on maintenance activities in March and April would be imposed in areas of known amphibian migration to prevent direct mortality of spring peepers, wood frogs, spotted salamanders, red spotted newts, and Jefferson salamanders.
- Following the clearing of vegetation, brush piles would be left alongside the ROW to provide habitat for a variety of wildlife species.
- Spur roads would be removed, and the ROW would be maintained to provide bird habitat.

The following bird-safe standards and design components will be employed to minimize bird electrocution (PSE&G 2010, 23):

- APLIC-recommended eagle-safe standards will be used in areas that contain known eagle nests or foraging habitats; these standards require at least 60 inches of horizontal and 48 inches of vertical separation of energized and grounded parts of electrical equipment.
- An alternative raptor-safe design standard will be used in areas where eagles are unlikely to occur but that contain nests or habitats for raptor species; this design standard includes a clearance of 48 inches to minimize electrocution potential based on the wing length (and wrist-to-wrist distance) of certain raptors.
- APLIC-recommended bird-safe standards will be used for areas with concentrations of tall birds (wading birds, including herons and egrets); these standards require at least 60 inches of horizontal and 60 inches of vertical separation of energized and grounded parts of electrical equipment.

The following design components will be employed to minimize bird collisions with the lines (PSE&G 2010, 23):

- Flight diverters or transmission line markers will be used where technically feasible for the static wires to reduce collision hazards in areas known to support species of birds that are at higher risk of collision and areas with topographic features and habitats that could attract concentrations of breeding or migrating birds.
- OPGW will be used for the transmission line, which is larger in profile than typical stand-alone ground wire and will be roughly 0.2 inch thicker than the existing wires on the S-R Line and should be more visible to birds.
- Bundled conductors will be used to make the transmission lines more visible to birds than a nonbundled configuration; each bundled conductor will consist of three wires grouped together with spacers separating the wires.

SPECIAL STATUS SPECIES

- Preconstruction surveys would be conducted for presence of special-status species, habitat, nests, dens, and new hibernacula. This is particularly important because construction would not occur for some time following the completion of the NEPA process and special-status species could begin using habitat between site surveys and construction activity. If special-status species, nests, dens, or habitats are found, then the suitable habitat would be flagged and avoided during construction if possible.
- Potentially, the modification of the placement of towers, access roads, laydown areas, and other ground-disturbing activities would be implemented in order to avoid areas that support special-status species.
- Prior to any ground-disturbing or vegetation clearing activities, a qualified biologist would conduct pre-construction surveys for special status species, and determine if relocation was an appropriate mitigation measure for any species found. It is possible that some species such as reptiles, amphibians, and mussels identified during the preconstruction surveys could be collected and relocated prior to or during construction activities, if this was found to be beneficial or appropriate for the species present at the site. If relocation were to be undertaken, a plan for the relocation of the special status species would be designed in accordance with the appropriate federal and state agencies and a qualified and permitted biologist would collect and relocate individuals to nearby suitable habitat.
- If special status plant populations could not be avoided, consultations with appropriate federal and state agencies might be required, depending on the listing status of the species present. These consultations would determine appropriate mitigation measures for any populations affected by the proposed project. Appropriate measures could include the creation of offsite populations through seed collection or transplanting, preservation, and enhancement of existing populations, or restoration or creation of suitable habitat in sufficient quantities to compensate for the impact.
  - Translocation includes digging up plants and moving them to appropriate portions of the corridor that would not be affected by the proposed construction activities.
  - Seeds can also be collected from plants that will be removed and either planted directly or germinated in a nursery and then planted in appropriate locations.
- If special–status wildlife species or occupied habitat cannot be avoided, mitigation would include species-specific Conservation and Mitigation plans to be prepared and implemented by

recognized and qualified zoologists, including individuals certified by the USFWS or state conservation agencies. These individuals would complete on-site monitoring. These plans would include:

  - Conservation measures, such as time-of-year restrictions.
  - Pre-construction surveys.
  - Construction monitoring.
  - Habitat preservation habitat restoration components.
  - Post-construction monitoring as needed.

- Park staff or representatives from appropriate, state or federal agencies who were experienced in managing or monitoring special status species would also be on site to monitor for special-status species during the construction activities to verify that special-status species are not in the active construction area.
- An Avian Protection Plan (APP) would be completed in accordance with the Bald Eagle Guidelines (USFWS 2007) and APLIC standards would be a condition of the applicant's permit. Some of the proposed alternatives are not consistent with the Bald Eagle Guidelines, as discussed in the EIS.
  - The APP would include elements that provide for training for all utility and contractor personnel on compliance with applicable regulations, procedures to be implemented for avoidance and minimization of disturbance, reporting bird mortality, required permits, accepted construction standards for reducing bird impacts, methodology for evaluation of risks to migratory birds, opportunities for enhancement of bird populations or habitat, public awareness and education, and identification of key resources.
  - The standards described in APLIC (1994) would be followed and would also comply with the APLIC *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006).
  - Proposed construction and maintenance activities would follow and adhere to the Bald Eagle Guidelines (USFWS 2007), which would minimize the potential for "take" on the bald eagle.
  - To reduce impacts on birds from collisions with the transmission line, the APP (PSE&G 2010) would be written in compliance with APLIC standards and would use the current best available technologies.
- Invasive plant species would continue to be identified and controlled through the applicant's invasive plant management plans. In addition, an aggressive invasive plant management plan developed and implemented by the applicant would include ongoing monitoring and treatment.
- Rare species, especially plants and small reptiles and amphibians, are vulnerable to illegal collecting, and even small numbers collected annually for a number of years could jeopardize the local population, as demonstrated by Garber and Burger (1995).
  - Existing and proposed new access roads, especially access roads, could act as an attractive nuisance and/or recreation opportunity, by inviting visitors to areas inhabited by rare species and increasing visitor encounters with these species.
  - It has been demonstrated by Garber and Burger (1995, 1152 and 1158) that when formerly intact, undisturbed, forested areas are opened to human recreation, the extinction of special-status species can occur in that particular area.

  - To reduce the impacts of illegal collection or harassment of special-status species, access roads would be closed to the public and law enforcement would monitor illegal activities in these areas, if this were deemed practical and/or effective. There would be an increase in patrols along the access roads and any new ROW.

- Law enforcement, resource staff would monitor these areas for invasive species, vegetation, wildlife, and erosion, and the presence of park staff may dissuade visitors from entering these illegal areas.
- Road closures and/or patrols prior to and during construction activities at locations where it was deemed effective to implement these measures.
- Seasonal restrictions would be implemented to reduce impacts on special-status species. Seasonal restrictions would be site specific, based on species present and their use of the site and include the following:
  - Seasonal restrictions on tree clearing from March 15 through July 31 would prevent the unauthorized take of nests and unfledged chicks of birds protected by the MBTA (USFWS 2010). This seasonal restriction would protect the majority of the special-status bird fledglings that may occur in the study areas for each alternative. Therefore, the permanent and seasonal resident nesting special-status bird species would not be forced to abandon nests or young, because tree clearing would not occur during the nesting season; no direct mortality of eggs, young, or adults would occur as a result.
  - Seasonal restrictions for disturbance of bald eagles would include a restriction within 1,000 feet of bald eagle nests between December 15 and August 31, the bald eagle nesting period. This restriction is recommended in the Bald Eagle Guidelines (USFWS 2007).
  - Seasonal restrictions for tree clearing and construction would be implemented from December 15 to March 31 in the vicinity of bald eagle roosts.
  - To prevent cutting of potential roost trees for the Indiana bat, a season restriction from April 1 through September 30, which includes the restriction of cutting trees with a DBH greater than 8.7 inches would be implemented.
  - A seasonal restriction from April 1 through October 31 preventing the cutting of all trees or snags with a DBH greater than 5 inches would be implemented to avoid potential impacts on northern myotis and other tree-roosting bats.
  - In areas with known snake dens, blasting activities are recommended to occur between April and September, after special-status snake species have left overwintering dens.
  - Seasonal restrictions for Neotropical birds and bats would also benefit nesting and birthing reptile species in the spring and summer.
  - Seasonal restrictions on construction and road use to protect wood turtles during their active season (late April/mid- May through late September/early November).

Various measures to specifically protect bog turtles would be undertaken in accordance with the *Bog Turtle (*Clemmys muhlenbergii*) Northern Population Recovery Plan* (USFWS 2001), and the bog turtle conservation zones presented in Appendix A of this document. These actions would be undertaken where appropriate as mitigation measures. Future coordination with appropriate Federal and State agencies would clarify the extent to which adverse effects to the bog turtle would be likely to occur and would determine whether a BA would be required. The FEIS and the BA for this project will include more details concerning impacts and mitigation measures to the bog turtle as appropriate. The following bog turtle conservation zones have been designated with the intent of protecting and recovering known bog

turtle populations within the northern range of this species. The conservation suggestions for each zone are meant to guide the evaluation of activities that may affect high-potential bog turtle habitat, potential travel corridors, and adjacent upland habitat that may serve to buffer bog turtles from indirect effects. Nevertheless, it is important to recognize that consultations and project reviews will continue to be conducted on a case-by-case basis, taking into account site- and project-specific characteristics.

- **Zone 1**: This zone includes the wetland and visible spring seeps occupied by bog turtles. Bog turtles rely upon different portions of the wetland at different times of year to fulfill various needs; therefore, this zone includes the entire wetland (the delineation of which will be scientifically based), not just those portions that have been identified as, or appear to be, optimal for nesting, basking or hibernating. In this zone, bog turtles and their habitat are most vulnerable to disturbance; therefore, the greatest degree of protection is necessary. Within this zone, the following activities are likely to result in habitat destruction or degradation and should be avoided. These activities (not in priority order) include:
  - development (e.g., roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures)
  - wetland draining, ditching, tiling, filling, excavation, stream diversion and construction of impoundments
  - heavy grazing
  - herbicide, pesticide or fertilizer application
  - mowing or cutting of vegetation
  - mining
  - delineation of lot (e.g., for development, even if the proposed building or structure will not be in the wetland)
- Some activities within this Zone 1 may be compatible with bog turtle conservation but warrant careful evaluation on a case-by-case basis:
  - light to moderate grazing
  - non-motorized recreational use (e.g., hiking, hunting, fishing)
- **Zone 2**: The boundary of this zone extends at least 300 feet from the edge of Zone 1 and includes upland areas adjacent to Zone 1. Activities in this zone could indirectly destroy or degrade wetland habitat over the short or long-term, thereby adversely affecting bog turtles. In addition, activities in this zone have the potential to cut off travel corridors between wetlands occupied or likely to be occupied by bog turtles, thereby isolating or dividing populations and increasing the risk of turtles being killed while attempting to disperse. Some of the indirect effects to wetlands resulting from activities in the adjacent uplands include:
  - changes in hydrology (e.g., from roads, detention basins, irrigation, increases in impervious surfaces, sand and gravel mining);
  - degradation of water quality (e.g., due to herbicides, pesticides, oil and salt from various sources including roads, agricultural fields, parking lots and residential developments);
  - acceleration of succession (e.g., from fertilizer runoff); and
  - introduction of exotic plants (e.g., due to soil disturbance and roads).

  Zone 2 acts as a filter and buffer, preventing or minimizing the effects of land-use activities on bog turtles and their habitat. This zone is also likely to include at least a portion of the

groundwater recharge/supply area for the wetland. Activities that should be avoided in this zone due to their potential for adverse effects to bog turtles and their habitat include:

- development (e.g., roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures)
- mining
- herbicide application
- pesticide or fertilizer application
- farming (with the exception of light to moderate grazing - see below)
- certain types of stream-bank stabilization techniques (e.g., rip-rapping)
- delineation of lot (e.g., for development, even if the proposed building or structure will not be in the wetland)
- Careful evaluation of proposed activities on a case-by-case basis will reveal the manner in which, and degree to which activities in this zone would affect bog turtles and their habitat.

Assuming impacts within Zone 1 have been avoided, evaluation of proposed activities within Zone 2 will often require an assessment of anticipated impacts on wetland hydrology, water quality, and habitat continuity. Activities that are likely to be compatible with bog turtle conservation but that should be evaluated on a case-by-case basis within this zone include:

- light to moderate grazing
- non-motorized recreational use (e.g., hiking, hunting, fishing)
- mowing or cutting of vegetation

- **Zone 3**: This zone includes upland, wetland, and riparian areas extending either to the geomorphic edge of the drainage basin or at least one-half mile beyond the boundary of Zone 2. Despite the distance from Zone 1, activities in these areas have the potential to adversely affect bog turtles and their habitat. This particularly applies to activities affecting wetlands or streams connected to or contiguous with Zone 1, because these areas may support undocumented occurrences of bog turtles and/or provide travel corridors. In addition, some activities (e.g., roads, groundwater withdrawal, water/stream diversions, mining, impoundments, dams, "pump-and-treat" activities) far beyond Zone 1 have the potential to alter the hydrology of bog turtle habitat, therefore, another purpose of Zone 3 is to protect the ground and surface water recharge zones for bog turtle wetlands. Where the integrity of Zone 2 has been compromised (e.g., through increases in impervious surfaces, heavy grazing, channelization of stormwater runoff), there is also a higher risk of activities in Zone 3 altering the water chemistry of bog turtle wetlands (e.g., via nutrient loading, sedimentation, and contaminants). Activities occurring in this zone should be carefully assessed in consultation with the Fish and Wildlife Service and/or appropriate State wildlife agency to determine their potential for adverse effects to bog turtles and their habitat. Prior to conducting activities that may directly or indirectly affect wetlands, bog turtles and/or bog turtle habitat surveys should be conducted in accordance with accepted survey guidelines.

Other conservation and/or mitigation measures to protect the bog turtle suggested by the Recovery Plan include the restoration of disrupted wetland hydrology, the control of invasive species, reconnection of fragmented habitat, population monitoring, and protection of nests from collection and predation (USFWS 2001).

ARCHEOLOGY

- Preserving a site that contains archeological resources by avoiding the disturbance or destruction of potential resources. Site areas might be cordoned off and deliberately avoided by construction activities, thereby preserving the potential resource for future scientific study.
- At known archeological sites, data recovery would occur, which in most situations would involve substantial excavation for the purpose of recovering a sample of the significant data contained in the site, as well as detailed analyses of the recovered data. However, DEWA maintains a 100% standard for data recovery, which exceeds both state and federal standards. This, in the event that data recovery excavations are required within NPS boundaries, the site would be fully excavated.
- Alternative mitigation measures may also be required such as the development of exhibits and other kinds of interpretive materials. While such measures are not an alternative to DEWA's practice of 100% site excavation, alternative mitigation measures would be developed and would include input from all interested parties in the project.
  - Subsequently, some kind of public-oriented presentation is done, such as building a display or exhibit showing artifacts, graphics, and text explaining why the site was dug. The exhibit can be permanent or portable.
  - Alternatively, a public document can be produced, such as a book, booklet, or pamphlet about the site that can be made available to the public.

HISTORIC ARCHITECTURE

- Some of these adverse visual impacts may be mitigated through strategic placement of transmission towers to be as visually unobtrusive as possible. Adverse visual impacts can also be mitigated through selection of color and finish that blend in with the vegetation of the area.
- Some of these adverse visual impacts may be mitigated through placement of trees and other vegetation between the historic architectural resource and the transmission line. These measures are most effective in situations where the transmission line is sufficiently far removed from the historic structure so as to be mostly or totally hidden from view by vegetative screening. In the best of circumstances, however, towers, lines, and ROW may still be visible five months of the year (November - March) when leaves are off the trees).
- Some of these adverse visual impacts may be mitigated through preparation of materials that interpret the history and architecture of the study area to the public at large. Possible work products include published histories, websites, brochures, exhibits, wayside panels, and driving/walking tours.
- Mitigation can also include improving the physical condition of other structures.

CULTURAL LANDSCAPES

- Design modifications, which could include both strategic placement of the transmission towers to be as visually unobtrusive as possible and selections of color and finish of the towers that might blend them more into the surrounding landscape.
  - Alignments should be at lower elevations or behind higher elevations to mitigate visual impacts of the corridor.
  - Any design changes to the towers should be discussed and reviewed before action is taken.

  - Some of the current efforts to conceal cell towers by giving them the appearance of an artificial tree only call more attention to the tower, failing to mitigate the visual impact. Colors and finish that blend more with the landscape might be more desirable.

- Some of these adverse visual impacts may be mitigated through placement of trees and other vegetation between the cultural landscape resources and the transmission line corridor. These measures are most effective in situations where the transmission line is sufficiently far removed from the resource so as to be mostly or totally hidden from view by vegetative screening. Landscape plans in and around the corridor alignment should be developed as mitigation measures for cultural landscapes.
- Adverse impacts occur to the vernacular component cultural landscapes in some situations where the historic viewshed from the site contains the tower corridor. In this case, planting plans can be developed to screen the towers and the historic viewshed can be interpreted on the site. Interpretation should also include the evolution of the cultural landscapes through use by the people whose occupancy and activity shaped the landscape.
- Some of these adverse visual impacts may be mitigated through preparation of materials that interpret the larger cultural landscapes of the study area as well as the component vernacular cultural landscapes in the study area to the public at large. Possible work products include published histories, websites, brochures, exhibits, wayside panels and driving/walking tours.
- Mitigation can also include improving the physical condition of other cultural landscapes.

INFRASTRUCTURE, ACCESS AND CIRCULATION

Prior to Construction Activities:

- Develop a construction staging plan with the NPS and other parklands.
- Develop a traffic control plan in conjunction with NPS, other parklands, and local jurisdictions.
- Work with NPS and affected agencies to develop a cooperative agreement for the control of unauthorized public access and use on NPS and other federal and state lands that could result from the proposed project.
- The agreement would address various provisions related to unauthorized access, such as:
  - Additional measures to be taken to discourage unauthorized use of the project corridor and associated access roads.
  - Periodic inspection for unauthorized access and any resulting damage.
  - Repair of any damage from unauthorized access.
- Develop a media strategy/notification plan as a means to notify local residents, businesses, and officials of closures and changes in traffic patterns.

During Construction Activities:

- Design and construct new access roads to minimize runoff and soil erosion.
- Install gates at the entrances to access roads to reduce unauthorized use. Coordinate gate locks with landowners.
- Restore public roadways to their pre-construction conditions or better upon completion of project construction activities.

- Reclaim any road-related disturbance areas after construction is completed.

VISUAL RESOURCES

During Project Design several mitigation measures would be undertaken. Measures under APLIC to decrease bird collisions and electrocutions would supersede visual resource mitigation measures that directly contradict those found under the APLIC guidelines in areas where both sets of mitigation measures would be applicable:

- Locate new access roads within previously disturbed areas wherever possible.
- Route the alignment of new access roads to follow landform contours where practicable, providing that such alignment does not impact additional resource values, to minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape.
- Place structures in designated areas so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers would be placed so as to minimize the disturbance.
- Place tower structures at the maximum feasible distance from roadway and trail crossings, and where preservation of existing vista(s) is particularly important. Distances would be within the limits of standard tower structure design.
- Use non-reflective neutral colored paints and coatings approved by the NPS to reduce reflection, glare, and/or contrast on structures.
- Use non-reflective insulators (i.e., non-ceramic or porcelain).
- Use non-specular conductors to reduce reflectivity.
- Locate construction staging areas away from visually sensitive locations.
- Conceptual landscaping in the form of vegetation planted outside but along the utility ROW.

During Construction and Maintenance Activities:

- Restrict construction vehicle movement outside the ROW to NPS-approved routes. Should additional road access be required, permission must be granted by the NPS prior to disturbance, and appropriate remuneration fees would be assessed.
- Keep areas around the towers clean and free of debris.
- Maintain a clean construction site and remove all related equipment, materials, and litter following construction.
- Preserve vegetation within the 150-foot-wide right-of-way that would not interfere with maintenance access needs.
- Revegetate disturbed areas with approved species.
- Provide regular maintenance of access roads and fences within and leading to the corridor.
- Cut stumps close to ground.

- Implement "low-impact tree clearing" which involves directional tree-felling, both mechanically and by hand.
- Rehabilitate and/or restore disturbed areas.

SOUNDSCAPES

- Comply with county and city noise ordinances.
- Provide advanced notice of construction to affected residences, businesses, and public facilities.
- Install sound-control devices on all construction equipment.
- Install muffled exhaust on all construction equipment and vehicles except helicopters, if used.
- Limit construction activities to daytime hours.

VISITOR USE

- Develop an OHV/ATV deterrent plan prior to construction activities.
- Coordinate construction schedules with NPS and other managers of affected recreation areas to avoid peak visitor use periods and notify visitors of construction.
- Permanently close and revegetate spur roads to discourage OHV/ATV use. For roads still in use, restrict access by unauthorized users as identified in the OHV/ATV deterrent plan. (See Infrastructure, Access, and Circulation for similar mitigation measures).
- Prior to construction develop a media strategy/notification plan as a means to notify local residents and visitors of closures.

HEALTH AND SAFETY

- Safety and emergency plans for the project would be developed prior to construction activities.
- Operators of the construction equipment and vehicles would be fully trained to reduce the chance of accidents.
- Construction equipment would be inspected for malfunctions or faulty parts to reduce the risk of leaking fluids which could harm the environment or humans from contact.
- Safety devices such as traveling grounds, guard structures, and radio equipped public safety roving vehicles and lineman would be in place prior to the initiation of wire stringing activities.
- Guard poles or guard structures would be installed at all transportation, flood control, and utility crossings, and may be installed at parks or near residences. Guard poles are temporary facilities designed to stop the travel of the conductor should it momentarily drop below a conventional stringing height.
- Use of the immediate area in which construction would occur would be restricted for safety reasons (PPL and PSE&G 2008, A10-6) to minimize impacts on park visitors during construction of the line within the parks.
- Construction areas would be fenced off in areas outside of the park, but inside the study area, where the public could access the construction site.

- A safety representative would be stationed at APPA crossings during any and all construction to maintain public safety.
- A safety watchman would be on the river during stringing operations to stop any boat traffic if an incident does occur or if conditions otherwise warrant (PPL and PSE&G 2008, 6).
- Road closures and traffic control would be implemented to minimize the risk of accidents from occurring during the construction period.
- Helicopters would be regularly maintained and inspected and the operation would be performed by individuals certified/licensed in helicopter aviation.
- Operators conducting aerial work in support of the utility may encounter hazards from the various types of flight profiles, terrain, infrastructure, weather, and operation at low levels and speeds.
  - To reduce the potential risk of a collision, the crew would identify potential collision hazards and make corrective actions prior to taking flight.
  - While in flight, the crew would exercise concentration, maintain situational awareness, be knowledgeable of their area of operations, maintain effective communications, and establish clear roles and responsibilities.

REFERENCES

Avian Power Line Interaction Committee (APLIC)

1994 *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*.

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Gregory J. Smith
Manager-Transmission Expansion

PPL Electric Utilities
Two North Ninth Street, GENN5
Allentown, PA 18101-1179

ppl™

June 1, 2011

Mr. John Donahue
Delaware Water Gap National Recreation Area
One River Road
Bushkill, PA 18324

Ms. Pamela Underhill
Appalachian National Scenic Trail
252 McDowell Street
Harper's Ferry, WV 25425

Re: Susquehanna Roseland Mitigation Concept

Dear John and Pam:

I have enclosed a draft of PPL's and PSEG's (collectively, the "Applicants") Mitigation Conceptual Plan. Although the mitigation planning is in its early stages, the Applicants want to clearly confirm to the National Park Service that the Applicants are committed to mitigation for any unavoidable impacts that result from the construction of the Applicant's planned Susquehanna to Roseland 500 kV transmission line. The Applicants are providing this to you as information that can be used as the NPS prepares the draft Environmental Impact Statement.

Additionally, when we last spoke, you mentioned that the Park Service would provide the Applicants with an acreage range that will likely be needed for mitigation based upon GIS modeling that the Park Service has had performed on the potential visual impacts. We would greatly appreciate your sharing that acreage range with us as to enable us to better understand the scope of the mitigation that might be necessary.

Please call me if you have any questions about this Mitigation Conceptual Plan.

Sincerely,

Gregory J. Smith

cc: Ron Reybitz
John Valeri
Andrew Tittler
Rob Pollock

\31488301.1

May 31, 2011

Applicants' Mitigation Concept for the Susquehanna – Roseland 500 kV Transmission Line Project

Public Service Electric and Gas Company (PSE&G) and PPL Electric Utilities Corporation (PPL), collectively known as the Applicants, would like to reiterate their intent, as initially set forth in their National Park Service (NPS) application, to properly mitigate for impacts to NPS lands from the Applicants' proposal to construct the Susquehanna – Roseland 500 kV Transmission Line Project (the "Project"). This statement outlines Applicants' conceptual plan to address potential adverse impacts. This conceptual plan was developed based upon impacts to NPS lands and is thus only applicable to NPS Alternatives 2 and 8. The NPS resources are the Delaware Water Gap National Recreation Area (DEWA), the Middle Delaware National Scenic River (Scenic River), and the Appalachian National Scenic Trail (APPA).

The Applicants have looked extensively at various possible routing alternatives to construct the line between Susquehanna and Roseland. The most suitable route was defined as the route minimizing the effect of the transmission line on all factors of the natural and human environment, while avoiding unreasonable routes, extreme costs, and non-standard design requirements to the extent possible.

The Applicants and their routing consultant teams, along with public outreach and other specialty consultants, undertook a 6-month program of identifying potential routes in their respective states. This program involved intensive analysis through reviewing maps, Geographic Information Systems (GIS) data sets, and aerial photography; conducting field analysis; and subsequently identifying three Alternative Routes for further evaluation.

Once the Alternative Routes were identified, the Applicants and their routing teams held public workshops throughout the project study area; consulted with various federal, state, and local regulatory and resource agencies and other stakeholders; and conducted additional analysis of the three routes comparing land use, rights-of-way, environmental, cost, public input, and other factors, in order to identify a preferred route.

As a result of the intensive routing study, the Applicants have determined that the best route for the new line resulting in the least overall impact on the natural and human environments is a route that traverses through approximately 4.18 miles of land held by the NPS in Pennsylvania and New Jersey along the path of an existing 230 kV transmission line owned and operated by the Applicants. The preferred route makes use of existing transmission line rights-of-way for the overwhelming majority of the route in both states (100 percent in New Jersey and more than 90 percent in Pennsylvania). The preferred route was submitted to, and subsequently approved by, the public utility regulatory agencies in both states. The preferred route is the same route being evaluated by the NPS in Alternatives 2 and 8 by the NPS as part of its Environmental Impact Statement.

The Applicants have put forth a proposal to either avoid or minimize impacts of the Project by using Best Management Practices that will become part of the NPS Special Use and Construction Permits for the construction of the Project. However, the Applicants recognize that there may be instances where impacts cannot be avoided or minimized. In such instances, the Applicants are prepared to mitigate unavoidable impacts by providing land preservation based, primarily, on the impact of the Project on viewsheds. The Applicants will work with the NPS to arrive at a reasonable methodology to determine the appropriate mitigation, including developing formulae or methodologies to determine the amount of land preservation and the types of property interests necessary to achieve the mitigation objectives. The land preservation can then be accomplished by direct property interest acquisitions or by working with (and funding) one or more third party conservation organizations that identify and acquire land as part of their organizational mission.

United States Department of the Interior

NATIONAL PARK SERVICE
Delaware Water Gap National Recreation Area
Bushkill, Pennsylvania 18324

IN REPLY REFER TO:

D5015

JUN 27 2011

Mr. Gregory Smith
Manager, Transmission Expansion
PPL Electric Utilities
Two North Street, GENPL3.
Allentown, Pennsylvania 18101-1179

Dear Mr. Smith:

Thank you for your correspondence of June 1, 2011, including your most recent iteration of the applicant's mitigation concept. We will make every effort to ensure that the EIS reflects your efforts to propose mitigation for the impacts caused by alternatives number two (#2) and number eight (#8) as you have requested. However, the mitigation is non-specific and has become less substantive with each new iteration.

Regarding your second request, we cannot agree that we reached an understanding that the National Park Service (NPS) would propose mitigation measures for the applicant. We were at an impasse on that issue in our meeting. It was suggested that the applicant propose their mitigation strategy and you, as the applicant's representative, requested that the NPS should define how impacts would be ameliorated in a quantitative fashion.

The EIS process will define the impacts; this activity is still in process. Any efforts to offset impacts proposed by the applicant will be included in the document such as your concept included in the June 1, 2011, correspondence. It is not the role of the NPS to negotiate mitigation at this stage of the process, before any decision is made. We remain open to including any commitments made by the applicant in the document so that the public has a complete understanding of the potential benefits along with the impacts from the proposal.

We look forward to continuing a fruitful dialogue on all aspects of the project.

Sincerely,

John J. Donahue
Superintendent
Delaware Water Gap National Recreation Area &
Middle Delaware National Scenic and
Recreational River
(570) 426-2418

Pamela Underhill
Superintendent
Appalachian National Scenic Trail
(304) 535-6279

APPENDIX F-2: AVIAN PROTECTION PLAN

As part of mitigation for the proposed plan, an Avian Protection Plan (APP) will be developed and would be a condition of the applicant's permit. This example of an APP is a plan developed by PSE&G for the New Jersey Highlands Council. While this APP provides an example of what an APP might be similar to for the proposed S-R Line, the below plan has not been reviewed by NPS, and NPS was not a participant in the development of this plan. An APP for the proposed S-R Line would be developed and reviewed by NPS.

PSE&G has developed an APP (PSE&G 2010) in accordance with the *Avian Protection Plan Guidelines* (APP Guidelines), a joint guidance document prepared by APLIC and USFWS (2005). The APP Guidelines, along with related guidance documents, are considered the most current and comprehensive guidance tools to reduce the risks that result from bird interactions with electrical utility facilities, including electrocution by and collision with the proposed transmission line. Related documents that were used to develop the APP included *Suggested Practices for Raptor Protection on Power Lines* (Miller et al. 1975), *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), and *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994* (APLIC 1994). The APP is also closely integrated with the CMP for the S-R Line through the New Jersey Highlands (PSE&G 2009), which has several components that relate to bird habitats, including the Transmission ROW Management Plan, Wetland and Transition Area Mitigation Plan, Stream and Riparian Habitat Restoration Plan, Critical Wildlife Habitat Endangered Species Mitigation Plan, and the Forest Management Plan. The APP describes the bird resources and issues in the project area, defines the methods that PSE&G will employ to avoid and minimize the direct and indirect impacts of the project on bird resources, and identifies bird enhancement opportunities that PSE&G will implement during operation of the project. This section summarizes some of the best available technologies incorporated in the APP to reduce potential bird collisions and electrocutions associated with the proposed transmission line.

Transmission lines are known to pose collision risks to birds. Collisions occur when birds fail to avoid the lines, either because they cannot detect the lines or cannot maneuver to avoid them once they have detected the lines (PSE&G 2010, 8). Bird collisions with power lines often occur when a transmission line runs perpendicular to a flight path used by birds that move back and forth from feeding and roosting sites on a daily basis or when migrant birds are traveling at reduced altitudes (usually in inclement weather) and encounter the structures. Therefore, the most successful strategies for mitigating collision-induced bird injury and mortality to date have focused on improving visibility of transmission lines, particularly the static wire (PSE&G 2010, 8). Additionally, transmission towers can pose an electrocution risk to birds because towers provide perching, loafing, and sometimes nesting opportunities for birds close to energized and/or grounded hardware (PSE&G 2010, 7). Electrocution can occur when a bird simultaneously contacts electrical equipment either phase to phase or phase to ground (APLIC 2006, ix). This normally occurs when a bird attempts to perch on a transmission tower/pole with insufficient clearance between these elements; other birds, such as raptors, may also use the poles for nesting and could be electrocuted while landing. Bird electrocutions typically occur on power lines with voltages less than 60 kV because there is inadequate separation between energized conductors and hardware or ground conductors and hardware (APLIC 2006, ix, 106). Therefore, transmission line structures that are considered safe for birds are lines that provide a minimum horizontal and vertical separation to accommodate both the wrist-to-wrist wing span and the height of a particular bird or group of birds (PSE&G 2010, 8), because the body size of birds is one of the most important characteristics that make certain species susceptible to electrocution (APLIC 2006, 24).

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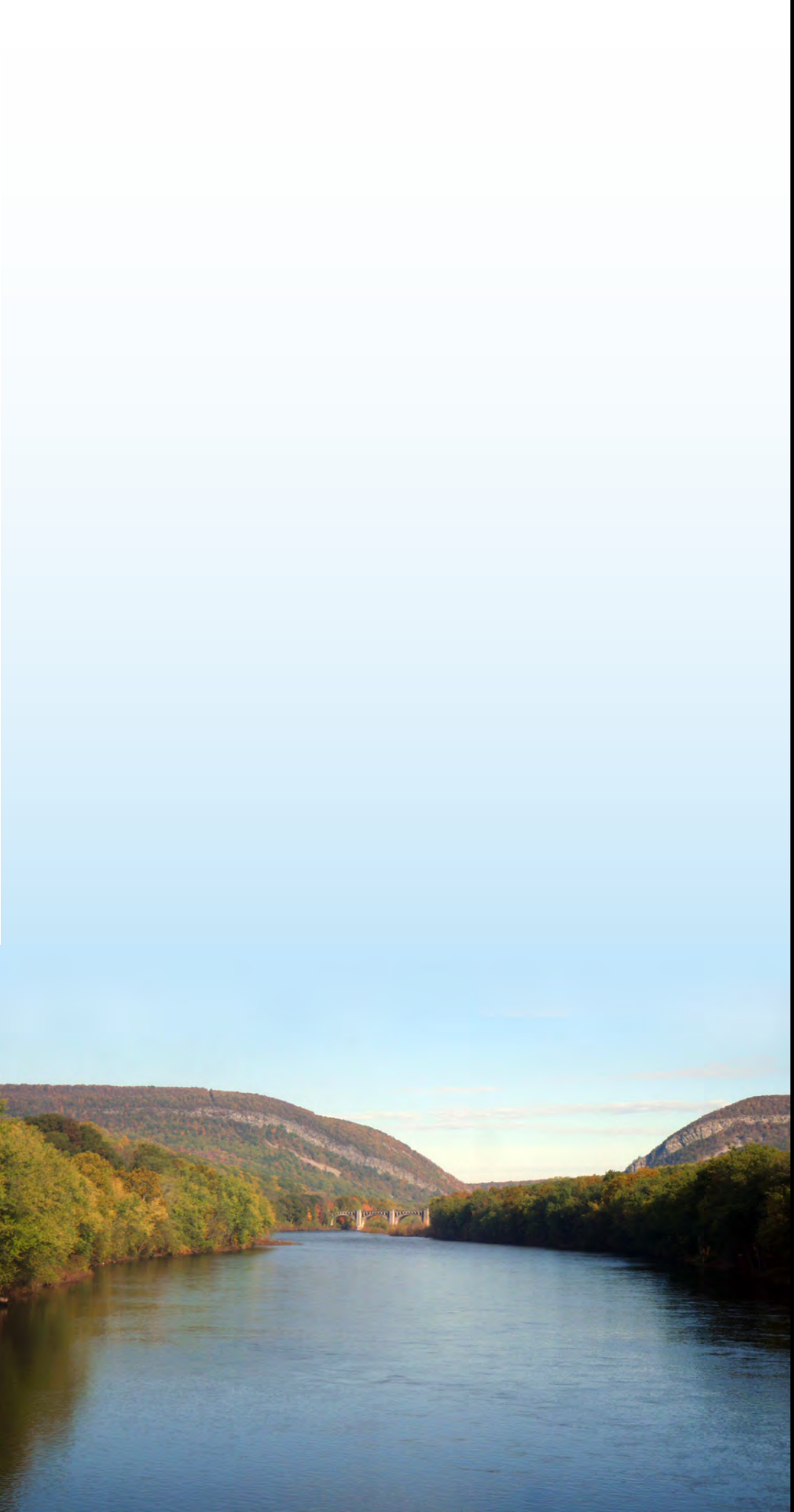

Appendix G

Affected Environment Information

APPENDIX G:
AFFECTED ENVIRONMENT INFORMATION

TABLE OF CONTENTS

APPENDIX G-1: GENERALIZED STRATIGRAPHIC COLUMN

System	Series	Formation	Member	Description	Thickness (feet)
DEVONIAN	Upper	Trimmers Rock	Midrift	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	800-950
			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, *Taonurus* 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 (*Taonurus*).	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
		Oriskany Group: 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
		Helderberg 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
		Helderberg Group: Minisink Limestone		Dark- to medium-gray argillaceous fossiliferous limestone	11-14
		Helderberg Group: 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
		Helderberg Group: 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 / Thacher Mbr of Manlius Fm	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 (*Gypidula*). Thacher: Dark-gray, unevenly bedded limestone with yellowish-gray shale partings.	0-60 / 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 / 0-50
		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 loose 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 quazrtzose 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%					
Ridgeley Formation through Coeymans	0.50%			2.01%						

	Pennsylvania Counties							New Jersey Counties		
	Carbon	Lackawanna	Luzerne	Monroe	Northampton	Pike	Wayne	Morris	Sussex	Warren
Formation, undivided										
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, Wallkill River National Wildlife Refuge IBA, Walpack Valley IBA, Wantage Grasslands IBA, Wawayanda Mountain IBA, Whittingham Wildlife Management Area IBA		Wallkill 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					
Gavia stellata	Red-throated Loon*				
Gavia immer	Common Loon*	x			
Podiceps grisegena	Red-necked Grebe*				
Podiceps auritus	Horned Grebe*				
Podilymbus podiceps	Pied-billed Grebe*				
Phalacrocorax carbo	Great Cormorant*				
Phalacrocorax auritus	Double-crested Cormorant*				
Botaurus lentiginosus	American Bittern*	x			
Ixobrychus exilis	Least Bittern*				
Ardea herodias	Great Blue Heron*	x	x		
Casmerodius albus	Great Egret*				
Egretta thula	Snowy Egret*				
Egretta tricolor	Tricolored Heron*				
Egretta caerulea	Little Blue Heron*				
Butorides striatus	Green Heron*	x			
Nycticorax nycticorax	Black-crowned Night-heron*				
Cygnus olor	Mute Swan				
Cygnus columbianus	Tundra Swan*				
Branta canadensis	Canada Goose*	x			
Branta bernicla	Brant*				
Chen caerulescens	Snow Goose*				
Aix sponsa	Wood Duck*	x			
Anas platyrhynchos	Mallard*	x			
Anas rubripes	American Black Duck*				
Anas strepera	Gadwall*				
Anas acuta	Northern Pintail*				
Anas americana	American Wigeon*				
Anas clypeata	Northern Shoveler*				
Anas discors	Blue-winged Teal*				
Anas crecca	Green-winged Teal*				
Aythya valisineria	Canvasback*				
Aythya americana	Redhead*				
Aythya collaris	Ring-necked Duck*				
Aythya marila	Greater Scaup*				

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

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

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

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

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

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

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

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

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

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

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

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

* Indicates migratory species

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 Schuykill 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 2010b). 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.

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, sphagnous 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 burreed/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 (*Decodon verticillatus*) 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	Warren

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 Vernals, Berry Run Barrens, Black Creek Gorge, Black Shanty Run, Broad Mountain West, Carpsrocus Creek Thickets, Christmans Ponds, Christmans Wetland, Cross Run Vernals, 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 Vernals, Frya Run Watershed, Island Park, Jacobsburg Environmental Ecucation 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, Ledgedale 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, Silkmans 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; PATNC 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 Vancampens Glen

Source: NJDEP 2007

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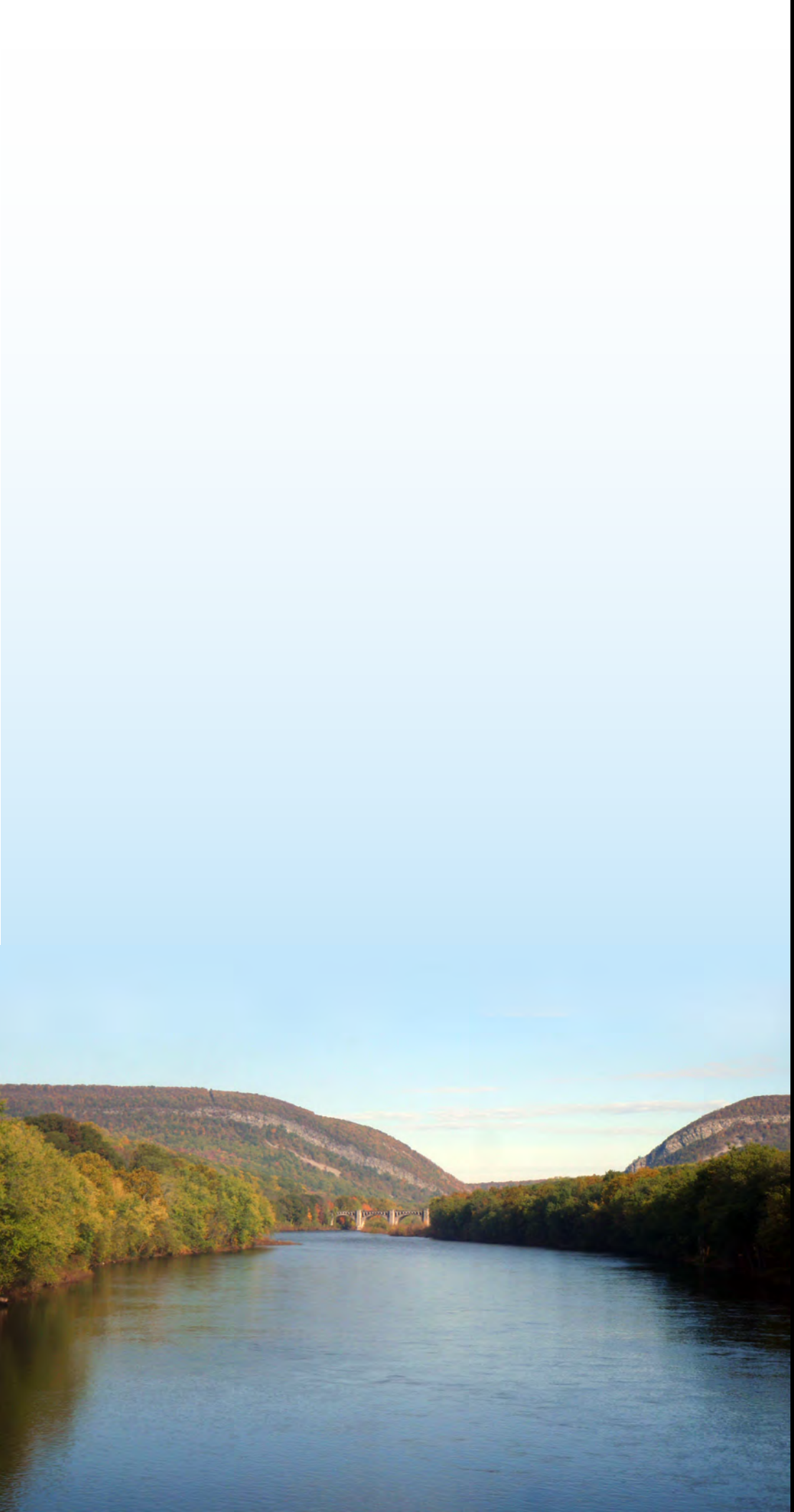

Appendix H

Projects Assessed for Cumulative Impacts

APPENDIX H:
PROJECTS ASSESSED FOR CUMULATIVE IMPACTS AS OF AUGUST 31, 2011

Action Project	Project Description	Date	Location	Impact Type
Infrastructure - Roads (includes Road Repair / Line Painting / Sign Upgrades / Regrade)				
Smooth Ride Initiatives: Road Surface Rehabilitation throughout DEWA (all park road paving projects)	Work included roadway pavement overlay, milling at all roadway transitions and road connections, pavement of aprons on connecting roads and driveways to allow smooth transition, repainting of pavement markings on all overlaid and sealed sections, grading and grubbing to re-establish roadway shoulders and drainage, guardrail reinforcement or replacement, crack and slurry seal of roadways and parking areas, installation of reflective roadway markers, traffic marking and lane stripe painting, and associated traffic control, signage, flaggers, construction surveying, and testing.	2006/ 2007; ongoing	DEWA- NJ, PA Inside the study area	Adverse: Temporary impacts to visitors during work (construction zones, noise, extra signage) Beneficial: Longer-term (several years), beneficial visitor use (no potholes, smooth driving surface), NPS Ops (less patching, issues with flat tires, etc.).
US Route 209 Roadway Surface and Health and Safety Improvements (in design, may be subject to change).	Purpose is to reduce crashes along the US 209 corridor while protecting park resources and preserving and improving the visitor experience along the corridor. Planned work will consist of milling and paving the roadway to improve the overall traction and surface condition of the roadway and implementation of selected traffic health and safety improvements. Includes left turn lane from NB US 209 onto Bushkill Falls Road and full traffic signal. Replacement of roadway signage throughout corridor. Electronic info boards at North & South Contact Stations. Safety improvements include signing, etc. to warn motorists of highly active wildlife crossings areas along US 209 near Tom's Creek and Zimmerman Flats.	In process 2011	DEWA – PA	Adverse: Bushkill Falls Road intersection will be larger and more "urban." More signs (sign pollution) and potential for noise pollution (rumble strips). Beneficial: Health and safety. Safer intersection through turn lane and signals. Signs in good condition and meeting MUTCD standards for retro-reflectivity. Signage to warn motorists of highly active wildlife crossing areas.

Action Project	Project Description	Date	Location	Impact Type
PennDOT SR 2001 Road Project	Correction of substandard horizontal and vertical roadway curvature and replacement of the existing bridge and culvert crossings of Randalls Creek, Bar Road Run, Toms Creek, Briscoe Creek (Alicia's Creek), Hornbecks Creek, and Dingmans Creek. Also included are resurfacing, shoulder improvements, signing, guiderail adjustments, and a curve straightening. Following is information directly from PennDOT Cat Ex Evaluation & Programmatic Section 4(f) Eval (Aug 2004): Existing roadway is 9 ft lanes with no shoulders. New will be 11 ft lanes with 8 ft shoulders. Horizontal and vertical curvature fixes require realignment of the roadway substantially in some areas. Entire project (3 sections, one currently under construction) require up to 23 property takes and 27 residential relocations. Utility pole relocation throughout project and one underground water line relocated. Total length of streams impacted by project = 8,257 ft. Wetland impacts = 3.61 total; 1.57 EV. Wetland impacts mitigated on NPS lands through 5.01 acre constructed wetland. Increased pavement and bridges may have adverse impact on flood elevations. Vegetation impacts (forested lands, etc.) and mitigated through reseeding. Impacts to NPS lands = 37.8 acres (mitigated through land exchanges). Cultural resources present but having no adverse effect. Tax base reductions from takings. No impacts on economic activity. Temporary construction impacts to air quality, noise levels, water quality, soil erosion & sedimentation.	Present. 2009-2011	DEWA – PA Reconstruct SR 2001 (Milford Road) from its intersection with SR 739 in Delaware Township south to intersection with US Route 209 in Bushkill, PA for approx. 21.7 kilometers (13.5 miles).	Beneficial: gateway communities, safety and socioeconomics. Adverse: Geology, air quality, soundscapes, water quality, floodplains and wetlands, visitor experience, socioeconomics, gateway communities. Contributes to fragmentation of ecological landscapes and residential encroachment.
Old Mine Road South Rehabilitation Same as other Road Paving projects (proposed, may be subject to change).	South Old Mine road (1.1 mi.) will be reconstructed to repair pavement failures occurring since last reconstruction in 2001. In process.	Future. Proposed 2011	DEWA – NJ Inside the study area	Adverse: Threatened and endangered plant and animal species concerns. Beneficial: Health and safety, operations, visitor experience (repairs potholes, etc.).

Action Project	Project Description	Date	Location	Impact Type
Rehabilitate River Road	River Road requires complete reconstruction using proper road base material and modern construction techniques including reflectors, signage, guardrails, 80 culverts. *Environmental assessment completed but not finalized; no Decision Document Project is tabled for now.*	Proposed 2015; currently tabled but could be completed at a later date.	DEWA – PA	Adverse: Cultural resources (increasing "modernization/ urbanization" to roadway. Natural resources (migrations). Potential one-way impacts to gateway community commuters. Visitor experience (both adverse and beneficial) by making roadway safety improvement (change experience of small rural roadway). Beneficial: Health and safety traffic would become more "park" traffic, and not commuters.
DEWA 14(7) Rehab Remainder of US 209	Reconstruct remaining sections of US 209 mile 5.3 to 16.1. Includes health and safety improvements at the intersection of US 209 and PA SR 739, Eshback Launch (milepost 6.5), and Chestnut Ridge Road (milepost 11). Recommendations listed in the FHWA's 1986 draft Engineering Study, 1995 Design Scoping Report, and 1992 Traffic Health and Safety Study include pavement milling, reconstruction and widening of the road base, asphalt pavement and sign replacement.	Proposed 2015	DEWA – PA	Change to "look and feel" of US 209 into major roadway (not park road). Short-term impacts to visitors (detours, construction zones, etc.).
Alternative Transportation Program	DEWA has identified alternative transportation systems (ATS) as a means to enhance mobility options for visitors while conserving the natural, cultural, and scenic resources of the park. ATS options include transit, pedestrian, bicycle, or water resources-based transportation options to give visitors an alternative means of travel to and within national parks. An alternative transportation feasibility study was conducted at DEWA to evaluate the effectiveness of various ATS options.	Proposed/ future	DEWA - NJ, PA Inside the study area	POTENTIAL: REVIEW UNDER NEPA NOT COMPLETED YET. By providing alternative forms of transportation, ATS can reduce the impacts of personal vehicle use on park resources, while improving the visitor experience. Long-term impacts include infrastructure needs (stop shelters, larger/improved pull-outs for destinations, bus traffic on park roads). Dispersed use throughout the US 209 corridor. Long-term needs may include building accessory structures (shelters, etc.). More signage. Reduces # of car trips on 209 for recreational users of trail & river.

Action Project	Project Description	Date	Location	Impact Type
US 209 Commercial Use Expiration 2015	Commercial vehicles are currently permitted on US 209 with fee payment. Commercial traffic will be prohibited on US 209 after 2015.	Future - 2015	DEWA – PA	Beneficial & adverse to gateway communities, socioeconomics, NPS operations. Beneficial: visitor use and experience, soundscapes
Marshalls Creek Traffic Relief project	PennDOT project. Phase 3 of the traffic relief project is a bypass route proposed around the Village of Marshalls Creek to alleviate traffic issues at US 209/Milford Rd/Seven Bridges Road. Marshalls Creek is gateway community.	Proposed	Monroe County, PA	Adverse: Some may include vegetation, habitat loss, water quality. Benefits: Socioeconomics. Improvement of traffic through Marshalls Creek may reduce traffic on River Rd.
I-80 weigh station	Upgrade of weigh station facility on Interstate 80 east of Kittatinny Point. Project in-progress by NJDOT. On DEWA boundary, in the Water Gap - Columbia, NJ right under some of the proposed alternatives. Includes lighting upgrades along I-80 within DEWA. Weigh station would have septic system (none currently existing).	Proposed	DEWA-NJ Inside study area	Adverse: Archeological resources. Water quality. Visual resources. Lighting upgrades may cause more “urban” feel; NPS asked that lighting is night-sky friendly. Unclear on what design they are using. Beneficial: Socioeconomics, Public Health & Safety.
NJ to PA Lackawanna Passenger Rail Cutoff (Highspeed Passenger Train from NE PA to NYC)	New Jersey Transit proposal for high speed passenger train from Northeastern Pennsylvania to New York City. This project would restore rail service along an abandoned railroad ROW to restore service from Scranton, Pennsylvania to Hoboken, New Jersey. *An EA was completed in 2008, and a FONSI for the project was received in 2009. There are funding issues for this project.*	Proposed	NJ, PA	Adverse: Soundscapes, viewshed. Beneficial: Socioeconomics, infrastructure

Action Project	Project Description	Date	Location	Impact Type
Infrastructure - Bridges/Dams/Culverts (includes Repair/Replacement)				
DEWA 14(10) US 209-Rehabilitation MP 4.3 TO 5.3 and replace Toms Creek Bridge	Rehabilitation of US Route 209 and replacement of the Toms Creek Bridge along US Route 209. Rehab will consist of milling off the asphalt pavement surface, rubblizing the original concrete slabs, widening the pavement structure to a uniform width, and installing underdrains to facilitate subsurface drainage. Ditches will be reshaped to obtain improved drainage. Includes shoulder repairs and asphalt overlay of the Township road being utilized as a detour. Repair of Toms Creek Road Bridge and roadway approaches to be used as a detour of US 209 when Toms Creek Bridge is replaced. Repairs include rehabilitation and stabilization of bridge abutment and foundation, and surrounding stream bank. Bridge, roadway, and stream bank were severely undermined during the flooding events of September 2004 and April 2005, and continue to erode endangering the bridge. Sediment removal within the channel will also be performed to help direct the stream flow away from the bridge and eroding stream bank.	2005 - ongoing	DEWA - PA	Adverse: Water quality, Species of Concern. Visitor Experience, Invasive species. Beneficial: Infrastructure, safety.
DEWA 14(10) US 209-Rehabilitation MP 4.3 TO 5.3 and replace Toms Creek Bridge	Rehabilitation of US Route 209 and replacement of the Toms Creek Bridge along US Route 209. Rehab will consist of milling off the asphalt pavement surface, rubblizing the original concrete slabs, widening the pavement structure to a uniform width, and installing underdrains to facilitate subsurface drainage. Ditches will be reshaped to obtain improved drainage. Includes shoulder repairs and asphalt overlay of the Township road being utilized as a detour. Repair of Toms Creek Road Bridge and roadway approaches to be used as a detour of US 209 when Toms Creek Bridge is replaced. Repairs include rehabilitation and stabilization of bridge abutment and foundation, and surrounding stream bank. Bridge, roadway, and stream bank were severely undermined during the flooding events of September 2004 and April 2005, and continue to erode endangering the bridge. Sediment removal within the channel will also be performed to help direct the stream flow away from the bridge and eroding stream bank.	2005 - ongoing	DEWA - PA	Adverse: Water quality, Species of Concern. Visitor Experience, Invasive species. Beneficial: Infrastructure, safety.

Action Project	Project Description	Date	Location	Impact Type
Repair Failing Watergate Dam #10 (may be subject to change).	This dam is listed on the NPS Dams Inventory as NPS Number: 15 with a National ID number of NJ00831. This earthen embankment structure has a height of 16 feet and has a storage capacity of 60 acre/feet. This is the largest dam in the Watergate Recreation site. This project would rehabilitate this dam by replacing the low level water resources outlet, repair the sluffed off area on the face of the dam, remove woody vegetation from the dam, rebuild the spillway and spillway bridge, and protect the toe of the dam with rip rap.	2011 in design	DEWA – NJ Inside the study area	Adverse: Water quality, wetlands, Species of special concern Visitor Experience, Cultural Landscapes.
DEWA 14(13) US Route 209 - Raymondskill Creek Bridge Rehabilitation	FHWA Project 14(13): Rt. 209 Raymondskill Bridge 014P Rehabilitation. Includes replacement of existing super-structure over Raymondskill Creek, repair existing bridge abutments, and scour issues. Also includes replacement of the existing guardrail and asphalt pavement approaches.	2011	DEWA - PA	Adverse: Negligible affects on geology, air quality, soundscapes, water quality, floodplains, fish/fish habitat, visitor use and experience, socioeconomics. Cultural and Archeological resources at the mouth of the creek.
Repair historic stone culverts on Mountain Road	Project includes masonry repairs including some dismantling and repointing. The structures included are the Walpack/Mountain Road Culvert, Buttermilk Falls Culvert, and Mountain Road/Shaffer House Culvert. Culverts are very similar in design and construction detailing and are experiencing similar failures, though they each present some differing "root causes" of deterioration and challenges. According to HPTC, Buttermilk Falls is an excellent example of the stone culverts in the area and should be a priority to repair and preserve. *The Park intends to seek funding to repair these resources.*	Proposed	DEWA - NJ	Beneficial: Infrastructure, cultural resources

Action Project	Project Description	Date	Location	Impact Type
Delaware River Bridge projects- DRJTBC	The Delaware Water Gap Toll Bridge is a dual roadway, multi-span, steel plate structure that measures 2465 feet in length. The bridge carries Interstate 80 across the Delaware River providing a gateway from eastern metropolitan areas to Pocono tourist and recreational destinations. The bridge carried an average of 53900 vehicles (both directions) per day in 2009. Ongoing improvements include bridge maintenance; scour repair is proposed.	Ongoing and proposed work	DEWA-NJ Inside the study area	Adverse: There are staging and construction related impacts to APPA related to this project. Some visitor use issues (confusion with road closures, construction signage, etc.). Scour repair is proposed at this time; may impact river users by diverting to one side of river. Water quality and protected aquatic species would be protected by cofferdams around each pier. May need some staging on park land.
Infrastructure - Structures (includes Interior and Exterior Repair and Rehabilitation / Facility Improvements)				
DEWA Regrade 6 Historic Building Sites Phase II	Project will regrade 6 historic building sites for drainage and accessibility. Replacement and/or repair of existing storm water resources drainage systems are necessary in some cases and the installation of new storm water resources drainage where it does not currently exist. Buildings include: Peters House, Slateford Farmhouse, and the Depue House.	Proposed	DEWA - NJ, PA Parkwide Inside the study area	Beneficial: Grading corrects site drainage problems that cause recurring damage to buildings, driveways and parking areas. Where possible, the grading will provide for accessibility to buildings. Maintenance of historic/significant structures.
Pocono Environmental Education Center (PEEC) Cabin Replacement	Project rehabilitated/replaced the visitor cabins at PEEC. Before there were over 300 beds available in 53 three season cabins on the PEEC campus; project provided 250 beds in substantially fewer buildings for three season use. Value analysis looked at cost effective ways to provide the number of beds desired and determined its more cost effective to replace the cabins versus rehabilitate them.	01/24/2005	DEWA - PA	Adverse: Soil, surface water. Beneficial: visitor use and experience, health and safety, operations and management.

Action Project	Project Description	Date	Location	Impact Type
Sustainable Comfort Stations	Project replaced existing failing, substandard, and temporary chemical toilets at various locations with permanent odor-free vault toilets incorporating the US Forest Service Sweet Smelling Toilet (SST) design features in accordance with Directors Orders #83, Public Health.	2005-2008	DEWA - NJ, PA These replacements occurred throughout the park with many in the south end. Inside the study area	Beneficial: These locations are heavily visited sites used for fishing, picnicking, camping, hiking, recreation, and boat access. Units consist of single or double vault toilet buildings, vandal resistant construction, meeting the latest ADA requirements, and aesthetically pleasing design to conform to park design guide. Vegetation from spilled portable toilets was restored, and landscaping was done in the areas to complement the natural sites. Wayside exhibits were installed at the highest visitor locations to provide education and interpretation of the resource.
Hazardous Structure Demolition / Deconstruction (Phase I)	The park has identified approximately 70 structures (including small outbuildings, animal pens, etc.). Phase I will include structures which can be deconstructed (and materials salvaged) or demolished with minor effects or less on park resources. Project has been funded.	2005 - 2011	DEWA - NJ, PA Parkwide Inside the study area	Beneficial: The work includes removal of primary structures, such as residences and barns; removal of outbuildings, such as garages and sheds; and removal of hazardous materials, such as asbestos and lead paint. Sites will be restored to a natural condition, which includes final grading and seeding with native vegetation. Changes to overall landscape from removal of structures. Reduces hazards to park visitors and wildlife. Reduces park infrastructure. Reduces law enforcement needs for break-ins, re-securing, vandalisms, arsons.
Hazardous Structure Demolition / Deconstruction (Phase II)	Any structures or sites which have an unknown or more than minor effect on park resources were held for Phase II (as funding permits), when all data, consultation, and mitigations necessary and required can be accomplished and those structures can then be removed. An EA is under contract and will commence in 2011.	Proposed	DEWA - NJ, PA Parkwide Inside the study area	

Action Project	Project Description	Date	Location	Impact Type
Kittatinny Point Visitor Center - Storm Recovery	The existing Kittatinny Point Visitor Center was flooded during the April 2006 and June 2006 flooding of the Delaware River. Project demolished the existing visitor center (60'x 60') leaving the visitor bathrooms and employee office area (25'x 60') in place. Project also included demolition of all septic piping, and wiring for employee bathroom and office area. The existing foundation was used to construct 60'x 60' open-air picnic pavilion. Project extended walls of remaining visitor structure to the ceiling of the new pavilion. The siding and walls of the remaining structure were finished in a log cabin or faux log cabin motif to complement the new building. Roof style, line and color were done to match new VC building highest number of visitors	2006	DEWA – PA Inside the study area	Beneficial: Visitor use and experience, operations and facilities. Built on piers to be above flood elevation. Old building area made into pavilion.
Infrastructure - Utilities (includes Water/Gas/Electric transmission, distribution, upgrades and maintenance)				
Appalachian Trail Relocation near the Columbia Gas Pipeline Crossing	The Appalachian Trail Conservancy and the Wilmington Trail Club has relocated approximately 1,100 feet of the footpath of the Appalachian National Scenic Trail. The relocation was constructed to mitigate the impacts of the proposed Columbia Gas pipeline upgrade on the Appalachian Trail. Relocation moved the footpath of the Trail away from views of an existing communications tower and a direct line of sight down the pipeline right-of-way to the west. The Trail treadway now crosses the pipeline right-of-way on a flat bench just below the ridgeline.	2007/ 2008	APPA (at crossing of Columbia Gas Pipeline in NJ) Inside the study area	Adverse: Visitor use and experience. Vegetation. Beneficial: Improvements to visitor use and experience, scenic resources.
Met-Ed removal of unused power poles and transformers	There are currently 61 poles and 4 transformers. None are utilized or would be in the future. Concern exists that transformers could begin leaking if not removed, and cross-braces on some poles have fallen already. The project would consist of removing transformers, dropping the poles by chainsaws (where feasible) and winding up all wire and removing hardware. *Project was proposed but was never undertaken due to a lack of funding and interest from the utility. Only transformers were removed (2010).*	Proposed 2007/ 2008, never completed	DEWA - PA Smithfield Beach and Hialeah area. Along Freeman Tract Road in Bushkill. Inside the study area	Beneficial: Restore area back to natural conditions. Improved visitor use and experience, scenic resources. Some poles may be used to help block off old driveways which are being accessed by illegal ATV riders, removed transformers, not poles; close to alternative 2 (potential mitigation).

Action Project	Project Description	Date	Location	Impact Type
Met-Ed Enhanced Vegetation Management Program	Met-Ed has multiple miles of electrical ROWs within the park. Line is 34-kV transmission line and if disabled a regional area would be affected. *Projects were proposed but were never undertaken due to a lack of funding and interest from the utility.*	Proposed 2008, never completed	DEWA - PA Throughout the park US 209 from Bushkill to Raymondskill Rd, Raymondskill Rd to Milford Road, Johnny Bee Rd to the Dingmans Visitor Center, Bushkill Falls Rd, Milford Rd, and Mountain Rd. Inside the study area	Adverse: Under their Enhanced Vegetation Management Program most trimming or removal would be from within the ROW but some problem trees might need to be removed. Problem tree is described as a tree or limb with high probability of falling across the line and taking out the line.
Tennessee Gas Line Proposal	Gas line expansion proposal. FERC has begun an EA, with public meetings. Project includes installation of 30 in diameter pipe in 22 miles of Pike and Wayne Counties, PA, and Sussex County, NJ. *In process.*	Current proposal	DEWA, APPA, PA, NJ The proposed line crosses the northern boundary of DEWA in Pike County and then APPA in Sussex County NJ.	Adverse: Potential impacts to archeology, vegetation, visitor experience, water quality. Residents, threatened and endangered species, Wetlands, water bodies and groundwater, fish and other wildlife, cultural resources, geology, Soils, Land use, Air and noise quality.
Columbia Gas Transmission Corporation pipeline increase	Columbia Gas is planning to remove and replace an existing natural gas pipeline to meet current demands. The gas pipeline traverses both within and outside of DEWA. DEWA Natural Gas Pipeline Enlargement Act (Dec 2005). ROW traverses 3.5 mi of DEWA. Act granted NPS the authority to change the ROW for the two land parcels to be consistent with the remainder of the ROW this allowing Columbia Gas to expand the size of the pipeline to meet current demands*. An EA is in process for the section in northern Pike County to New York State.*	2005 – 2008 for DEWA; future for removal and expansion	APPA in Northampton County, PA and in and outside of DEWA in Monroe, and Pike Counties, PA. Inside and Outside the study area	Adverse: Visitor use and experience, riparian and wetland habitat, invasive species, vegetation, water quality.

Action Project	Project Description	Date	Location	Impact Type
Northeast Supply Link Expansion – Palmerton Loop	Williams is developing a pipeline project to transport growing domestic natural gas supply to Pennsylvania, New York and New Jersey markets. The Northeast Supply Link Project is designed to deliver approximately 250,000 dekatherms of natural gas per day to the region by November 2013. It would involve the construction of 13 miles of additional pipe segments, called loops, in Pennsylvania and New Jersey, in addition to additional compression and existing facility modifications. This requires additional pipeline facilities in PA and NJ. Palmerton Loop is 3.7 miles of 42-inch pipe.	2012	Appalachian Trail crossing in PA. Inside the study area. Other expansion in NE PA and NW NJ.	Adverse: Residents, threatened and endangered species, Wetlands, water bodies and groundwater, Fish, vegetation and other wildlife, Cultural resources, geology, soils Land use, Air and noise quality.
Dominion/Allegheny Power 500-kV Transmission Line Project	The National Park Service (NPS) is preparing an Environmental Assessment (EA) to evaluate options to approve or deny an application for a special use permit for construction submitted by Dominion Virginia Power (DVP). The special use permit, if approved, would allow for the reconfiguration of an existing transmission line. The current right of way contains one 500 kilovolt (kV) transmission line. DVP proposes to replace the existing transmission line with twin parallel 500-kV transmission lines; all within the existing 150 foot transmission line right-of-way.	Ongoing	APPA This line crosses the Appalachian National Scenic Trail about six miles southeast of Front Royal, Virginia.	Adverse: No new land would be cleared for the removal and installation of the reconfigured transmission lines. To ensure that the full range of issues related to this proposed action are addressed in the EA, the park is soliciting public comments and concerns from all interested parties.

Action Project	Project Description	Date	Location	Impact Type
Potomac-Appalachian Transmission Highline (PATH) ROW EIS	The PATH Allegheny Transmission Company, LLC, PATH Allegheny Virginia Transmission Corporation (PATH-VA), and the Potomac Edison Company (Potomac Edison),have proposed construction of a new 765-kV electric transmission line the proposed project would follow existing rights-of-way on NPS and would require new ROW on USFS land. Proposal would require constructing, operating and maintaining new towers to accommodate an 765-kV transmission lines. *The application for this project has been withdrawn from the State Utility Commissions.*	Project on hold pending a re-evaluation after forecast modeling has been completed	On Federal lands in MD, VA and WV managed by the National Park Service, Harpers Ferry National Historical Park (HAFE), the Appalachian National Scenic Trail (APPA), Potomac Heritage National Scenic Trail (POHE) and the Chesapeake and Ohio Canal National Historical Park (CHOH). Also, Monongahela National Forest (MNF).	
PJM Interconnection proposal	The PJM Board authorized an additional $1.8 billion in transmission upgrades and improvements to keep the electrical grid reliable for the 51 million people living within its region. The upgrades were identified through PJM's Regional Transmission Expansion Plan, which forecasted reliability needs through 2025. It approved removing from the regional plan a proposed 500-kilovolt (kV) line connecting the Branchburg, Roseland and Hudson substations in northern New Jersey. Instead, existing lines will be upgraded and two new underground 230-kV cables will be installed to address projected overloads. In addition, the board reaffirmed its previous decision supporting the continued need for the Mid-Atlantic Power Pathway project by 2015.	Current, proposed	Northern NJ	Unknown

Action Project	Project Description	Date	Location	Impact Type
PPL Electric Utilities Northeast/Pocono Reliability Project	PPL Electric Utilities will be building three new electrical substations to serve customers in the region. To supply these substations they will need to build about 60 miles of new 230-kilovolt power line, with 150-foot ROW, and, on average, 145-foot steel monopoles. To connect these new substations to the existing 69-kilovolt lines they will need to build short segments of 69-kilovolt line – about 6 to 8 miles in total for the three facilities and add a second set of wires to the poles of an existing 10-mile, 69-kilovolt power line that runs from Lakeville to Cherry Ridge. Also as part of this project, PPL will be rebuilding an existing 69-kilovolt line that runs from the Peckville area in Lackawanna County to Honesdale, Wayne County. The line is about 20 miles long, and the project entails replacing the existing 70-foot wood poles with 95-foot steel monopoles.	Ongoing	PA Lackawanna, Monroe, Wayne, Pike and Luzerne counties	Unknown
PPL proposal for 138-12-kV substation	Proposal for 138-12-kV Substation in Moore Township, PA. Located at the base of the Kittatinny Ridge this proposal opens up additional areas to electric transmission.	9/2010	Moore Twp, PA Outside the study area	Adverse: Potential for affecting the viewshed in the immediate vicinity of the Appalachian National Scenic Trail.
Infrastructure - Communications (includes telephone, cell tower, cable/fiber optics, emergency towers and networks)				
Existing towers within approximately 5 miles of DEWA boundary	Existing tower locations within approximately 5 miles of DEWA boundary: • Fire Towers 1 • Cell Towers 22 • Minarets 12 • Transfer Stations 4 • Total Transmission Towers 509 - small (178) - medium (185) - large (107) - undefined (39)	Proposed, ongoing	NJ, PA	Adverse: Land use, Scenic resources and visitor experience, cultural resources including landscapes, socioeconomics, gateway communities, aerial hazards for rescue and fire operations.

Action Project	Project Description	Date	Location	Impact Type
Infrastructure - Visitor Access (includes rehabilitation or upgrades to boat launches, comfort stations, visitor center, beaches, picnic areas, camping, fishing)				
Rehabilitate Childs Park	This project has two major components, to remove dead and dying hemlock trees and reforest the site, and to rehabilitate and restore the cultural features and the public use facilities. The hemlock forest has been infected by wooly adelgid, which is killing the forest. The decline of the forest has created serious human health and safety concerns, and will have significant adverse impacts on the high-quality trout stream that that runs through the site.	ongoing	DEWA - PA	Beneficial: To address the health and safety concerns, all of the dead and dying trees must be removed. To address the health of the ecosystem, a restoration of the area must follow, which includes maintaining healthy hemlock trees, mitigating the effects of hemlock disease and mortality, and restoring/ replanting native vegetation to impacted sites. To address the cultural features and to rehab the public use facilities, the following work must be done: Pave existing parking area and provide parking for 80 cars and 2 buses; Restore impacted areas used for informal parking; Obliterate 3 existing failed vault toilets and construct a 10-stall toilet facility; Recondition 2 existing CCC Era picnic shelters and rehabilitate 50 picnic sites; Rehabilitate and repair trail and trail bridges within the site; Rehabilitate existing and install new bilingual wayside exhibits and signs; Restore picnic site

Action Project	Project Description	Date	Location	Impact Type
NJ Swim Beach (Turtle Beach)	The swim beach is located on the Delaware River at the Coppermine Inn site on Old Mine Road in Warren Co., NJ. The purpose is to provide an accessible opportunity for protected swimming that will meet visitor demand on the NJ side of the Delaware River, as recommended in the General Management Plan (GMP) (NPS 1987).	2006-2010	DEWA – NJ Inside the study area	Adverse: Soils, vegetation, RTE species, water quality. Beneficial: The project is needed to meet the park's legislative mandate to provide safe, cost effective, and harmonious outdoor recreation opportunities for visitors while conserving the natural, cultural, and scenic resources of the recreation area. Closure of the existing informal New Jersey swim beach that has evolved at the Depew Recreation Site is needed to eliminate exposure of park visitors to potentially hazardous river swimming and to eliminate adverse impacts to the state-designated threatened turtle.
Kittatinny Boat Launch Replacement	The concrete boat launch site at Kittatinny Point (API 78) was destroyed by the flooding and has been closed since April 2005. Launch needs to be completely reconstructed. The plan reviewed and approved is to rebuild the boat launch in-kind by removing remaining asphalt and replacing to the high water resources line. Below the high water resources line, Articulating Concrete Block (ACB) would be used instead of asphalt. The launch would be keyed in at the bottom of the ramp in the river bed. *Project currently does not have funding.*	Planned permit but no funding currently	DEWA – PA Inside the study area	Beneficial: Improved visitor use and experience, improved safety and health, improvements to operations and management.
River Campsite Restoration of Flood Damaged Sites	During the floods in 2004, 2005, and 2006, the Delaware River rose to levels at or near a 100-year (1% annual chance) flood. Prior to the floods, DEWA was operating 94 campsites within the river corridor. Approximately 30 sites were too heavily damaged or sites were unsafe or no longer extant to be returned to the same locations. Project assesses locations for 30 campsites to be restored in the river corridor, while avoiding impacts to natural and cultural resources, and providing campsites in locations and configurations appropriate for the visiting river users. DEWA has partnered with the US Forest Service and is developing and Environmental Assessment.	Planned	DEWA - NJ, PA Inside the study area	Beneficial: Improved visitor use and experience, prevention of soil erosion and compaction, improved safety and health, improvements to operations and management, habitat restoration.

Action Project	Project Description	Date	Location	Impact Type
Trail Development and Restoration (includes erosion prevention, road protection, habitat restoration)				
Joseph M McDade Recreational Trail Realignment	Re-align approximately 20 miles of the Joseph M. McDade Recreational Trail (McDade Trail). This previously approved and partially constructed 32-mile trail parallels the Delaware River in PA. The trail would stretch almost the full length of the park, providing access to the two largest communities bordering DEWA – Shawnee-on-Delaware to the south and the borough of Milford to the north.	1998-2010	DEWA – PA Inside the study area	Beneficial: Re-alignment reduced impact to habitats on the Hogback from hikers and bikers. The newly aligned portions of the trail are similar to the original alignment in following historic road traces, connecting historic properties, existing facilities and a variety of natural environments, thus providing an intimate glimpse of the natural and cultural history of the area.
Park-wide Invasive Species Control Programs	The management goal is to find occurrences of invasive wetland plant species and use integrated pest management techniques to suppress or eliminate patches within the park. The goal of the park's control program is to suppress invasive species populations and allow native species to return.	Ongoing	DEWA Inside the study area	Beneficial: Habitat is put at risk when invasive species are left unmanaged; altering ecological processes, degrading wildlife habitat, and decreasing biological diversity. Threatened open-canopy wetlands support rare plant communities along with marsh birds, small mammals; special concern reptiles, and a rare butterfly.
Illegal Activities				
Illegal off-road vehicle use	Illegal access on roads, trails, right-of-ways. Cutting of park locks and destruction of gates.	Past/ present/ future	Parkwide DEWA -NJ, PA Inside the study area	Adverse: Impacts park operations. Soil compaction and disturbance, habitat loss, invasive species introduction.
Illegal collection – flora and fauna	Illegal collection of flora and fauna, especially rare, threatened and endangered species for personal collection or sales.	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Loss of local species diversity.
Illegal collection – artifacts	Illegal collection of artifacts for personal collection or sales.	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Impacts park operations, Property damage. Loss of historic, cultural and recreational resources.

Action Project	Project Description	Date	Location	Impact Type
Illegal hunting / poaching	Illegal hunting or killing for personal use or sales.	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Impacts park operations. Loss of local species diversity.
Trespassing / vandalism	Illegal access, stealing signs, vandalism, destruction, graffiti of park property.	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Impacts park operations, Property damage. Loss of historic, cultural and recreational resources.
Arson	Intentional setting of fires resulting in destruction of park property	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Impacts park operations, Property damage. Loss of historic, cultural and recreational resources.
Encroachment	Illegal building, development or use of park property	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Impacts park operations, Property damage
Illegal woodcutting	Cutting of firewood for personal use or sale.	Past/ present/ future	Parkwide DEWA - NJ, PA Inside the study area	Adverse: Habitat loss.
Energy Generation Related				
FERC relicensing of Yards Creek Generating Station	This is a 400 MW pumped storage project The project is located on Yards Creek, a tributary to the Paulinskill River, which is a tributary to the Delaware River. The Project is owned and operated by FirstEnergy and Public Service Electric & Gas (PSEG) and consists of an upper and lower reservoir, a powerhouse with three reversible pump turbines, and associated electrical and water resources conveyance features. The Project is currently licensed with the Federal Energy Regulatory Commission (FERC) as FERC Project No. 2309; this license expires in February, 2013.	License expires 2013, 2011 application is due	Warren County, NJ (in the townships of Blairstown and Hardwick). Outside the study area	Beneficial: Potential for trail improvements and additional recreational opportunities. There is a project visitor center and a Boy Scout Camp located within the Project Boundary and the Appalachian trail runs near the upper reservoir. Adverse: Local hydrology and fish habitat impacted.

Action Project	Project Description	Date	Location	Impact Type
Marcellus Shale Natural Gas	Much of the new drilling interest taking place in northeastern Pennsylvania and southern New York is targeted at reaching the natural gas found in the Marcellus Shale formation, which underlies about 36 percent of the Delaware River Basin. Because Marcellus Shale is considered a tight geologic formation, natural gas deposits were not previously thought to be practically and economically mineable using traditional techniques. New horizontal drilling and extraction methods, coupled with higher energy costs, have given energy companies reason to take a new interest in mining the natural gas deposits within the Marcellus Shale.	Proposed	Delaware River Watershed (NY, NJ, PA)	Adverse: New extraction methods require large amounts of fresh water resources to fracture the formation to release the natural gas. A significant amount of water resources used in the extraction process is recovered, but this "frac water resources" includes natural gas and chemicals added to facilitate the extraction process, as well as brine and other contaminants released from the formation. Many affects to geology, water quality, and habitat are still unknown.
Martins Creek Power Plant, Coal Burning Facility	NJ Department of Environmental Protection petitioned the federal government to mandate a reduction in air pollution spewing from the RRI Energy's power plant in Portland, Pa., across the across the Delaware River from Knowlton in Warren County. DEP Commissioner Bob Martin announced he signed a petition under the federal Clean Air Act to ask the U.S. Environmental Protection Agency to force the plant to cut down on its emissions.	5/2010, ongoing	Portland, PA Plant is in Lower Mount Bethel Township, Northampton County. Outside the study area	Beneficial: If enforced this would improve air quality in the area.
Martins Creek Power Plant, Coal Burning Facility	On Aug. 23, 2005 there was a spill of more than 100 million gallons of contaminated water resources and fly ash into the Delaware River from PPL Generation LLC and PPL Martins Creek LLC's Martins Creek power plant PA Department of Environmental Protection filed suit against PPL Generation LLC and PPL Martins Creek LLC.	2005	Portland, PA In Lower Mount Bethel Township, Northampton County. Outside the study area	Adverse: Water quality and fish habitat.

Action Project	Project Description	Date	Location	Impact Type
Susquehanna Nuclear Reactor Upgrades	The operators of the Susquehanna Nuclear Power Plant near Berwick shut down one of the facility's two reactors March 2010 for refueling and maintenance upgrades as part of four-year plan to generate more electricity. PPL Corp., which owns the plant in southern Luzerne County, will replace roughly 40 percent of uranium fuel used to power the Unit 1 reactor, install a digital control system and replace turbines that run pumps to feed water resources used in cooling the reactor. In November 2009, the Nuclear Regulatory Commission also granted 20-year extensions of the operating licenses for each unit at the Susquehanna plant.	Ongoing	Berwick, PA	Unknown
Wind turbines in Northeastern PA	Northeastern Pennsylvania has the right kind of wind -- at the right elevation and the right speed -- to turn the 100-foot blades of wind turbines. Pennsylvania produces more megawatts by windmill than any state east of the Mississippi. And more than half of the working wind turbines in the state are in the region, with two in the Hazleton area and 43 in Waymart.	Ongoing	Northeastern PA. Outside the study area	Potential adverse impacts on migratory birds and bats. Visual impacts.
PA Fish and Boat Commission, Natural Gas Leasing and Water Access Programs	Projects may be approved on lands or waters when the projects are designed and implemented in such a way that they have little or no negative impact on the resource or property use. The Commission will not enter into natural gas leasing projects which are developmental in nature, meaning it will not permit the installation or use of production wells or any other type of natural gas production equipment on its properties. Under the Water Access Program, the Commission will consider requests to use its property to access, acquire or transport water resources.	Ongoing	PA PA Fish and Boat controls over 43,000 acres in the state	Adverse: New extraction methods require large amounts of fresh water resources to fracture the formation to release the natural gas. A significant amount of water resources used in the extraction process is recovered, but this "frac water resources" includes natural gas and chemicals added to facilitate the extraction process, as well as brine and other contaminants released from the formation. Many affects to geology, water quality, and habitat are still unknown.

Action Project	Project Description	Date	Location	Impact Type
Commercial / Industrial				
Airport improvements	Overflights and gliding from airports located in Mount Pocono, PA; Orange County, NY (Stewart); Blairstown, NJ; Stroudsburg, PA; Newton, NJ Add: Newark Flight Patterns -	Ongoing	Sussex and Warren Counties, NJ, Monroe County, PA Outside the study area	Adverse: Visitor Use and experience. Impacts to natural soundscapes from noise.
Fernwood Casino	Fernwood Resort has the necessary zoning permits to open a gaming facility within 6-12 months (9/2010). Could open with 500 slots and 26 table games drawing up to 1 million people. *State permit was not granted but could be in the future.*	Proposed	Monroe County, PA Outside the study area	Beneficial: stimulate local economy. Adverse: potential for impacts to infrastructure
Alpine Rose Auto Racetrack	The racetrack will be constructed in Eldred Township, Monroe County, Pennsylvania and would result in the clearing of forest along the north face of the Kittatinny Ridge to create approximately 4 miles of driving courses.	Proposed	Monroe County, PA APPA viewshed. Outside the study area	Adverse: Visitor use and experience, scenic resources. Impacts to soundscapes.
Leases and Permits				
Issuance of Special Use Permits related to Visitor Use	DEWA routinely issues special use permits related to such visitor uses including but not limited to weddings, baptisms, canoe races, reunions/reserved picnic sites, and 1st Amendment expressions. All applications for permits are catalogued. Permits are authorized by the Superintendent or Chief Ranger (as his designee). Any proposals that may fall outside the typical permitted activities will require discussion with the Superintendent and a separate NEPA review.	Ongoing	DEWA - NJ, PA Inside the study area	Adverse: These uses are for short-term use and will have no environmental disturbance or minimal disturbance that is easily and readily remediable. Most activities are at certain developed locations within the park, and have use criteria within the permit, such as "only on grassy picnic area."
Incidental Business Permits / Commercial Visitor Services	Project is for the reissuance/continuance of Incidental Business Permits for Commercial Visitor Services within the park. Permits are reissued every two years and require review. There are currently 37 Incidental Business Permits (Commercial Use Authorizations (CUA) operating within the recreation area providing services to park visitors including: canoe livery; guided fishing trips; rock climbing instruction; SCUBA diving instruction; and emergency tow truck operation. Majority of these have been operating in the park for more than 25 years.	Ongoing	DEWA - NJ, PA Inside the study area	Adverse: Any new requests for IBP/CUA will be reviewed case-by-case and after approval, may be added to the list for reissuance.

Action Project	Project Description	Date	Location	Impact Type
Agricultural leases	No-till practices employed in leased agricultural fields.	Ongoing	DEWA - NJ, PA Inside the study area	Beneficial: Areas preserve cultural and open space aesthetics. Also provide wildlife habitat.
Pike County Agricultural Security Areas (ASAs)	Agricultural Security Areas designated in Pike County allow farmers to be compensated for maintaining agricultural land.	Ongoing	Pike County, PA Outside the study area	Beneficial: Areas preserve cultural and open space aesthetics. Stimulates local economy. Also provides wildlife habitat.
Fire Management (includes fuel reduction, prescribed fire, habitat management)				
DEWA Prescribed Burn Program	Utilize prescribed fire as a resource management tool.	Past, Present, Future	Parkwide DEWA - PA	Adverse: Visitor use and experience. Beneficial: Perpetuate the overall scenic landscape, maintain wildlife habitat, perpetuate native plant species, reduce or control invasive exotic plant species, and to prevent an increase in hazardous fuel loadings. Hundreds of acres are burned annually.
DEWA Hazard Fuel Reduction Program	Mechanical treatment of vegetation to reduce the threat of wildland fire to communications infrastructure and adjacent landowner property. Provide defensible space around historic structures and culturally significant areas.	Past, Present, Future	Parkwide DEWA – PA, NJ	Adverse: Visitor use and experience. Beneficial: The action includes measures to mitigate potential impacts to federally endangered Indiana bats by imposing a no-cut period of April 1 to September 30 on trees that fit the criteria of summer bat roosts. Hundreds of acres are managed annually.
Residential Development				
Residential Development	Local residential developments planned adjacent to the park in Monroe and Pike Counties, PA.	Ongoing	NJ, PA	Adverse: Increased effects of urbanization and suburbanization in these areas; requiring additional infrastructure to support the communities.
Habitat Restoration/Improvement				
Weed Eradication Programs	Pennsylvania's Resources Conservation and Development programs.	Ongoing	PA Outside the study area	Beneficial: Work to control spread of non-native invasive species and educate landowners on the benefits of native plant species

Action Project	Project Description	Date	Location	Impact Type
Wildlife Habitat Incentive Program (WHIP)	USDA NRCS implements this program in both Pennsylvania and New Jersey. The program provides information for landowners and project reimbursements for improvement of wildlife and fish habitat.	Ongoing	PA, NJ Inside and outside the study area	Beneficial: Improvement of wildlife and fish habitat.
Important Bird/Mammal Areas (IBAs and IMAs)	The designation of Important Bird Areas by the National Audubon Society chapters in New Jersey and Pennsylvania and Important Mammal Areas in Pennsylvania under the joint partnership of the National Wildlife Federation, Pennsylvania Wildlife Federation, Pennsylvania Federation of Sportsmen's Clubs, Mammal Technical Committee/Pennsylvania Biological Survey, and the Carnegie Museum of Natural History.	Ongoing	PA, NJ Inside and outside the study area	Beneficial: Designation helps preserve critical habitat for wildlife, including rare and protected species.
County and Township Open Space and Conservation Plans	All of the counties surrounding the parks, and many of the other counties outside the study area have plans for greenspace, open space, and conservation areas.	Ongoing	PA, NJ Outside the study area	Plans indicate current status and trends of the natural resources, as well as the current growth, and provide recommendations for acreage for conservation and priority conservation areas. Many of these plans also include provisions for parks and green space areas.
County Farmland Preservation Programs	All of the counties surrounding the parks, and many of the other counties outside the study area have plans for farmland preservation	Ongoing	PA, NJ	Beneficial: Plans indicate current status and trends of agricultural resources. The plans aim to preserve agricultural lands through grants or other incentives
State Forest Stewardship Programs	A federal funded program that encourages management of private forestland for non-commodity benefits.	Ongoing	PA, NJ	Beneficial: The program aims to preserve forest land through cost share benefits
Common waters Fund	A privately funded program that is focused on preserving forests and water Quality in the upper Delaware River watershed.	Ongoing		Beneficial: The fund gives grants to landowners for the preservation of forests and the watershed.
NJ DEP Programs	State programs include the Natural Areas system, Natural Heritage Program, and natural land trust.	Ongoing	NJ	Beneficial: Programs are focused on the preservation of natural areas and wildlife inventory
PADCNR Programs	State programs include the Greenway Program, Natural Heritage Program, and the Pocono Forest and Waters Conservation Landscape Initiative.	Ongoing	PA	Beneficial: Programs are focused on the preservation of natural areas and wildlife inventory

Action Project	Project Description	Date	Location	Impact Type
The Nature Conservancy	A non-profit organization focusing on conservation nation-wide.	Ongoing	PA, NJ	Beneficial: May buy land for preservation or contribute funds to obtain land for future preservation
National Wildlife Refuges	The Wallkill National Wildlife Refuge and the Cherry Valley Wildlife Refuge are both located within the study area in NJ and PA, respectively.	Ongoing	PA, NJ	Beneficial: The refuges focus on preserving land for biodiversity.
NJ Highlands Council	A state funded program that was formed under the Highlands Act. The council has issued a master plan that focuses on preservation through land use incentives.	Ongoing	NJ	Beneficial: Issues grants for zooming analysis, sustainable agriculture and other conservation type grants within the planning area.